Annual Groundwater Monitoring Report

Southwestern Electric Power Company

H. W. Pirkey Power Plant

East Bottom Ash Pond CCR Management Unit

CN600126767; RN100214287

Registration No: CCR104

Hallsville, Texas

January 31, 2024

Prepared by:
American Electric Power Service Corporation
1 Riverside Plaza
Columbus, Ohio 43215

SOUTHWESTERN ELECTRIC POWER COMPANY℠

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Abbreviations:
ASD - Alternate Source Demonstration
CCR – Coal Combustion Residual
GWPS - Groundwater protection standards
SSI - Statistically Significant Increase
SSL - Statistically Significant Level
TCEQ – Texas Commission on Environmental Quality

I. Overview

This *Annual Groundwater Monitoring Report* (Report) has been prepared to report the status of activities for the preceding year at the East Bottom Ash Pond (EBAP) CCR unit at Pirkey Power Plant. Southwestern Electric Power Company is wholly-owned subsidiary of American Electric Power Company (AEP). The Texas Commission on Environmental Quality's (TCEQ's) CCR rules require that the Annual Groundwater Monitoring Report be posted to the operating record for the preceding year no later than January 31, 2024.

In general, the following activities were completed:

- At the start of the current annual reporting period, the EBAP was operating under the Assessment monitoring program.
- At the end of the current annual reporting period, the EBAP was operating under the Assessment monitoring program.
- The EBAP initiated an assessment monitoring program on April 3, 2018.
- Groundwater samples were collected for AD-2, AD-4, AD-12, AD-18, AD-31, and AD-32 in February, June, and August 2023 and analyzed for Appendix III and Appendix IV constituents, as specified in 30 TAC §352.941 or §352.951*et seq* and AEP's *Groundwater Sampling and Analysis Plan (2021)*.
- Groundwater data underwent various validation tests, including tests for completeness, valid values, transcription errors, and consistent units.
- Data and statistical analysis not available for the previous reporting period indicates that during the 2nd semi-annual 2022 sampling event (November 2022):

  The following Appendix IV parameters exceeded established groundwater protection standards:

  - Lithium at AD-31 and AD-32
  - Cobalt at AD-2, AD-31 and AD-32

  The following Appendix III parameters exceeded background:

  - Boron at AD-2 and AD-32
  - Calcium at AD-32
  - Chloride at AD-2, AD-31 and AD-32
  - Fluoride at AD-32
  - Sulfate at AD-2, AD-31, and AD-32
  - TDS concentrations at AD-2, AD-31, and AD-32

- A successful ASD for the 2nd semi-annual 2022 Appendix IV parameters that exceeded the GWPS was certified on June 27, 2023 and submitted to TCEQ June 27, 2023 for approval.
- During the 1st semi-annual sampling event held in June 2023:

  The following Appendix IV parameters exceeded established groundwater protection standards:

  - Lithium at AD-31 and AD-32
  - Cobalt at AD-2, AD-31, and AD-32

  The following Appendix III parameters exceeded background:

  - Boron at AD-2 and AD-32
  - Calcium at AD-2 and AD-32
  - Chloride at AD-2, AD-31, and AD-32
  - Sulfate at AD-2, AD-31, and AD-32
  - TDS concentrations at AD-2, AD-31, and AD-32
- A successful ASD for the 1st semi-annual 2023 Appendix IV parameters that exceeded the GWPS was certified October 16, 2023 and submitted to TCEQ November 14, 2023 for approval.
- During the 2nd semi-annual sampling event held in August 2023:

  The following Appendix IV parameters exceeded established groundwater protection standards:

  - Lithium at AD-2, AD-31 and AD-32
  - Cobalt at AD-2, AD-31, and AD-32

  The following Appendix III parameters exceeded background:

  - Boron at AD-2 and AD-32
  - Calcium at AD-2 and AD-32
  - Chloride at AD-2, AD-31, and AD-32
  - Sulfate at AD-2, AD-31, and AD-32
  - TDS concentrations at AD-2, AD-31, and AD-32
- A successful ASD for the 2nd semi-annual 2023 Appendix IV parameters that exceeded the GWPS was certified October 17, 2023 and submitted to TCEQ November 14, 2023 for approval.

- Because an alternate source for the SSL(s) was identified, but no alternate source for the SSI(s) was identified, EBAP remained in Assessment Monitoring.
- A statistical process in accordance with 30 TAC §352.931 to evaluate groundwater data was updated, certified, and posted to AEP's CCR website in 2021 titled: AEP's *Statistical Analysis Plan (*Geosyntec 2021). The statistical process was guided by USEPA's *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* ("Unified Guidance," USEPA, 2009).
- On April 25, 2023, EBAP ceased receipt of CCR and non-CCR wastestreams and commenced closure by removal for this CCR Unit in accordance with the certified closure plan.
- The CCR material was removed from April to June of 2023 from the EBAP. An additional 12 inches of soil was then removed, finishing in July of 2023. The last inspection for the removal was completed on July 20, 2023. The groundwater monitoring samples for final closure were collected in August 2023.
- On October 17, 2023, the EBAP was closed by removal in accordance with 30 TAC §352.1221 (40 CFR 257.102) and the most recent Written Closure Plan. A Closure Completion Notification that was certified by a Professional engineer was submitted to TCEQ. Groundwater monitoring will continue until TCEQ's Executive Director issues a closure certification.

The major components of this annual report, to the extent applicable at this time, are presented in sections that follow:

- A map, aerial photograph or a drawing showing the CCR management unit(s), all groundwater monitoring wells and monitoring well identification numbers;
- All of the monitoring data collected, including the rate and direction of groundwater flow, plus a summary showing the number of samples collected per monitoring well, the dates the samples were collected and whether the sample was collected as part of detection monitoring or assessment monitoring programs (Attached as **Appendix 1**);
- Statistical comparison of monitoring data to determine if there have been SSI(s) or SSL(s) (Attached as **Appendix 2**);
- A discussion of whether any alternate source demonstrations were performed, and the conclusions (Attached as **Appendix 3**);
- A summary of any transition between monitoring programs, or an alternate monitoring frequency, for example the date and circumstances for transitioning from detection monitoring to assessment monitoring, in addition to identifying the constituents detected at a SSI over background concentrations (where applicable);

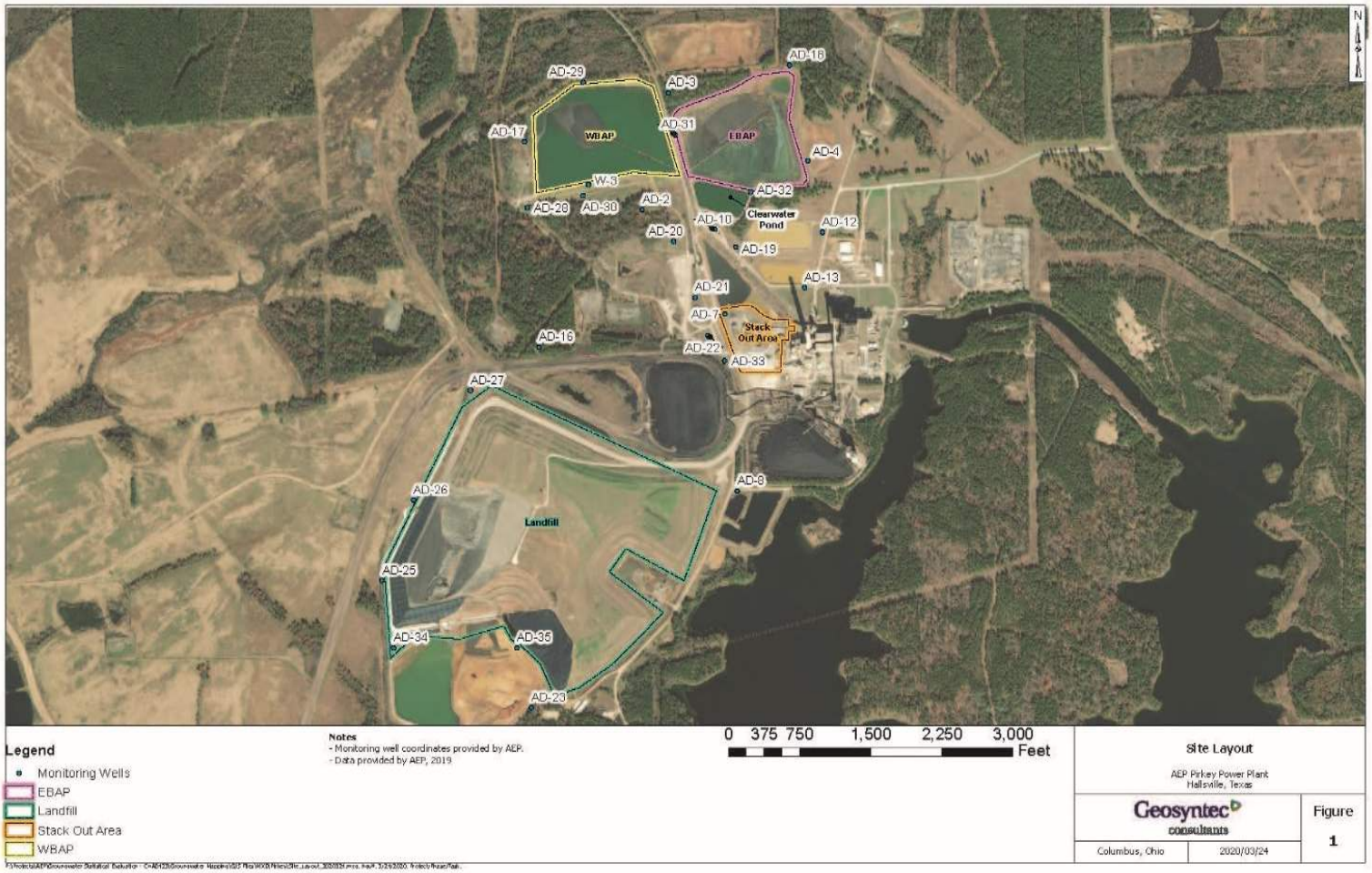
- Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a statement as to why that happened;
- Other information required to be included in the annual report such as field sheets, analytical reports, etc. (**Appendix 4 and 5**).

In addition, this report summarizes key actions completed, and where applicable, describes any problems encountered and actions taken to resolve those problems. The report includes a projection of key activities for the upcoming year.

II. Groundwater Monitoring Well Locations and Identification Numbers

The figure that follows depicts the PE-certified groundwater monitoring network, the monitoring well locations and their corresponding identification numbers.

EBAP Monitoring Wells	
Up Gradient	Down Gradient
AD-4	AD-2
AD-12	AD-31
AD-18	AD-32



III. Monitoring Wells Installed or Decommissioned

Pirkey Power Plant ceased operation of its coal-fired boilers on March 31, 2023. The Plant is currently being demolished, and one the designated downgradient monitoring wells (AD-7) for the FGD Stack Out Area was decommissioned during September 2023 because it was located within the boundary (footprint) of the Stack Out Area where demolition activities are occurring.

There were no new groundwater monitoring wells installed during 2023. The network design, as summarized in the *Groundwater Monitoring Network Design Report* (May 25, 2016) and as posted at the CCR website for Pirkey Power Plant's EBAP, did not change. That network design report, viewable on the AEP CCR web site, discusses the facility location, the hydrogeological setting, the hydrostratigraphic units, the uppermost aquifer, downgradient monitoring well locations and the upgradient monitoring well locations.

IV. Groundwater Quality Data and Static Water Elevation Data, With Flow Rate and Direction and Discussion

Appendix 1 contains tables showing the groundwater quality data collected during the establishment of background quality, and during detection and assessment monitoring. Static water elevation data from each monitoring event also are shown in **Appendix 1**, along with the groundwater velocity calculations, groundwater flow direction and potentiometric maps developed after each sampling event.

The sampling event conducted February 2023 satisfies the requirement of 40 CFR 257.95(b)/30 TAC 352.951.

V. Groundwater Quality Data Statistical Analysis

Appendix 2 contains the statistical analysis report(s).

Data and statistical analysis not available for the previous reporting period indicates that during the 2nd semi-annual 2022 sampling event (November 2022):

The following Appendix IV parameters exceeded established groundwater protection standards:

- Lithium at AD-31 and AD-32
- Cobalt at AD-2, AD-31 and AD-32

The following Appendix III parameters exceeded background:

- Boron at AD-2 and AD-32
- Calcium at AD-32
- Chloride at AD-2, AD-31 and AD-32
- Fluoride at AD-32

- Sulfate at AD-2, AD-31, and AD-32
- TDS concentrations at AD-2, AD-31, and AD-32

During the 1st semi-annual sampling event held in June 2023:

The following Appendix IV parameters exceeded established groundwater protection standards:

- Lithium at AD-31 and AD-32
- Cobalt at AD-2, AD-31, and AD-32

The following Appendix III parameters exceeded background:

- Boron at AD-2 and AD-32
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- Sulfate at AD-2, AD-31, and AD-32
- TDS concentrations at AD-2, AD-31, and AD-32

During the 2nd semi-annual sampling event held in August 2023:

The following Appendix IV parameters exceeded established groundwater protection standards:

- Lithium at AD-2, AD-31 and AD-32
- Cobalt at AD-2, AD-31, and AD-32

The following Appendix III parameters exceeded background:

- Boron at AD-2 and AD-32
- Calcium at AD-2 and AD-32
- Chloride at AD-2, AD-31, and AD-32
- Sulfate at AD-2, AD-31, and AD-32
- TDS concentrations at AD-2, AD-31, and AD-32

VI. Alternate Source Demonstration

A successful ASD for the 2nd semi-annual 2022 Appendix IV parameters that exceeded the GWPS was certified on June 27, 2023 and submitted to TCEQ June 27, 2023 for approval.

A successful ASD for the 1st semi-annual 2023 Appendix IV parameters that exceeded the GWPS was certified October 16, 2023 and submitted to TCEQ November 14, 2023 for approval.

A successful ASD for the 2nd semi-annual 2023 Appendix IV parameters that exceeded the GWPS was certified October 17, 2023 and submitted to TCEQ November 14, 2023 for approval.

The successful ASDs are found in **Appendix 3**.

Because an alternate source for the SSL(s) was identified, but no alternate source for the SSI(s) was identified, EBAP remained in Assessment Monitoring.

VII. Discussion About Transition Between Monitoring Requirements or Alternate Monitoring Frequency

The EBAP will remain in assessment monitoring unless all Appendix III and IV parameters are below background values for two consecutive monitoring events (return to detection monitoring) as prescribed by 30 TAC §352.951(c). If an Appendix IV parameter exceeds its respective GWPS and an ASD is determined not to be satisfactory to the executive director, an assessment of corrective measures will be undertaken as required by 30 TAC §352.961.

Regarding defining an alternate monitoring frequency, the groundwater velocity and monitoring well production are high enough at this facility that no modification to the semiannual assessment monitoring frequency is needed.

VIII. Other Information Required

As required by the CCR assessment monitoring rules in 30 TAC §352.951, sampling all CCR wells for the required Appendix III and IV parameters was completed in 2023.

Appendix 2 also contains a memorandum that explains the reissuance of select analytical laboratory reports to correct laboratory equipment data quality assurance/quality control issues.

On April 25, 2023, EBAP ceased receipt of CCR and non-CCR wastestreams and commenced closure by removal for this CCR Unit in accordance with the certified closure plan.

The CCR material was removed from April to June of 2023 from the EBAP. An additional 12 inches of soil was then removed, finishing in July of 2023. The last inspection for the removal was completed on July 20, 2023. The groundwater monitoring samples for final closure were collected in August 2023.

On October 17, 2023, the EBAP was closed by removal in accordance with 30 TAC §352.1221 (40 CFR 257.102) and the most recent Written Closure Plan. A Closure Completion Notification certified by a Professional engineer was submitted to TCEQ. Groundwater monitoring will continue until TCEQ's Executive Director issues a closure certification.

IX. Description of Any Problems Encountered in 2023 and Actions Taken

No significant problems were encountered. The low flow sampling effort went smoothly, and the schedule was met to support the annual groundwater report preparation covering the year 2023 groundwater monitoring activities.

X. A Projection of Key Activities for the Upcoming Year

Key activities for next year include:

- Assessment monitoring sampling will be conducted;
- Conduct the annual groundwater sampling event for all constituents listed in appendix III and IV as required by 30 TAC 352.951;
- Perform statistical analysis on the sampling results for the Appendix III and Appendix IV parameters as required by 30 TAC 352.951;
- Conduct ASD(s) if GWPSs are exceeded;
- Responding to any new data received in light of CCR rule requirements;
- Preparation of the next annual groundwater report until TCEQ's Executive Director issues a closure certification.

APPENDIX 1- Groundwater Data Tables and Figures

Figures and Tables follow, showing the groundwater monitoring data collected, the rate and direction of groundwater flow, and a summary showing the number of samples collected per monitoring well. The dates that the samples were collected also is shown.

Table 1. Groundwater Data Summary: AD-2
Pirkey - EBAP
Appendix III Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
5/11/2016	Background	1.27	1.43	28	< 0.083 U1	4.4	68	238
7/14/2016	Background	1.34	1.38	28	< 0.083 U1	4.2	71	216
9/7/2016	Background	1.3	2.65	20	< 0.083 U1	4.2	49	216
10/13/2016	Background	1.48	1.29	31	< 0.083 U1	3.6	67	230
11/14/2016	Background	1.36	1.44	28	< 0.083 U1	3.9	72	240
1/12/2017	Background	1.48	1.6	30	< 0.083 U1	3.9	94	244
3/1/2017	Background	1.62	1.28	28	< 0.083 U1	4.1	80	262
4/11/2017	Background	1.65	1.71	50	< 0.083 U1	4.0	88	254
8/24/2017	Detection	1.46	2.06	24	< 0.083 U1	4.3	64	200
12/21/2017	Detection	1.38	2.92	24	< 0.083 U1	--	64	206
3/22/2018	Assessment	1.99	1.97	30	< 0.083 U1	4.2	105	220
8/21/2018	Assessment	2.14	1.65	46	< 0.083 U1	4.7	130	312
2/28/2019	Assessment	2.25	1.96	31.8	0.1 J1	3.5	129	384
5/22/2019	Assessment	2.17	2.19	29.6	0.1 J1	4.0	137	316
8/12/2019	Assessment	2.16	3.30	28.4	0.1 J1	4.6	128	306
3/11/2020	Assessment	2.78	2.50	29.7	0.14	4.0	178	374
6/3/2020	Assessment	2.44	2.44	29.3	0.15	4.6	174	387
11/2/2020	Assessment	2.62	1.99	29.2	0.11	3.9	158	347
3/9/2021	Assessment	2.76	2.48	30.2	0.23	4.0	209	450
5/25/2021	Assessment	2.78	2.7	29.8	0.22	3.6	215	430
11/16/2021	Assessment	2.62	2.63	29.2	0.15	3.4	200	410
3/29/2022	Assessment	3.02	3.13	31.4	0.20	3.9	241	460 L1
6/21/2022	Assessment	3.26	3.4	29.7	0.21	4.0	259	490
11/15/2022	Assessment	2.83	2.80	30.5	0.21	4.0	259	480
2/27/2023	Assessment	3.22	3.53	31.4	0.22	3.8	268	510
6/26/2023	Assessment	3.06	3.53	30.8	0.19	3.9	271	530
8/23/2023	Assessment	3.05	3.37	30.9	0.20	3.8	271	490

Table 1. Groundwater Data Summary: AD-2
Pirkey - EBAP
Appendix IV Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
5/11/2016	Background	< 0.93 U1	< 1.05 U1	38	0.514594 J1	< 0.07 U1	< 0.23 U1	10	1.446	< 0.083 U1	< 0.68 U1	< 0.00013 U1	0.098	< 0.29 U1	2.08256 J1	< 0.86 U1
7/14/2016	Background	< 0.93 U1	< 1.05 U1	38	0.46511 J1	< 0.07 U1	0.401928 J1	11	0.723	< 0.083 U1	< 0.68 U1	0.051	0.068	0.862706 J1	< 0.99 U1	< 0.86 U1
9/7/2016	Background	< 0.93 U1	< 1.05 U1	39	0.439699 J1	< 0.07 U1	0.493592 J1	10	1.489	< 0.083 U1	< 0.68 U1	0.048	0.675	< 0.29 U1	< 0.99 U1	1.26444 J1
10/13/2016	Background	< 0.93 U1	< 1.05 U1	39	0.40165 J1	< 0.07 U1	0.885421 J1	11	2.65	< 0.083 U1	< 0.68 U1	0.052	0.048	< 0.29 U1	1.3807 J1	< 0.86 U1
11/14/2016	Background	< 0.93 U1	< 1.05 U1	34	0.367353 J1	< 0.07 U1	< 0.23 U1	10	2.121	< 0.083 U1	< 0.68 U1	0.048	0.154	< 0.29 U1	1.23147 J1	< 0.86 U1
1/12/2017	Background	< 0.93 U1	< 1.05 U1	37	0.376129 J1	< 0.07 U1	< 0.23 U1	10	1.656	< 0.083 U1	< 0.68 U1	0.052	0.093	< 0.29 U1	< 0.99 U1	< 0.86 U1
3/1/2017	Background	< 0.93 U1	< 1.05 U1	37	0.413652 J1	< 0.07 U1	< 0.23 U1	10	1.267	< 0.083 U1	< 0.68 U1	0.051	0.037	< 0.29 U1	< 0.99 U1	< 0.86 U1
4/11/2017	Background	< 0.93 U1	< 1.05 U1	37	0.435396 J1	< 0.07 U1	0.243798 J1	11	0.807	< 0.083 U1	< 0.68 U1	0.052	0.028	< 0.29 U1	< 0.99 U1	< 0.86 U1
3/22/2018	Assessment	< 0.93 U1	< 1.05 U1	33.28	0.45 J1	< 0.07 U1	< 0.23 U1	12.43	1.053	< 0.083 U1	< 0.68 U1	0.05379	0.042	< 0.29 U1	1.61 J1	< 0.86 U1
8/21/2018	Assessment	< 0.01 U1	0.52	29.0	0.428	0.06	0.406	13.6	1.059	< 0.083 U1	0.338	0.0479	0.02 J1	0.06 J1	1.1	0.096
2/28/2019	Assessment	0.02 J1	0.53	26.1	0.5 J1	0.06	0.1 J1	13.9	1.261	0.1 J1	0.355	0.0591	0.027	< 0.4 U1	1.5	< 0.1 U1
5/22/2019	Assessment	< 0.4 U1	< 0.6 U1	25.6	< 0.4 U1	< 0.2 U1	< 0.8 U1	15.5	0.832	0.1 J1	< 0.4 U1	0.0542	0.063	< 8 U1	0.9 J1	< 0.1 U1
8/12/2019	Assessment	< 0.02 U1	0.35	22.8	0.402	0.06	0.292	13.0	1.812	0.1 J1	0.288	0.0560	0.044	< 0.4 U1	0.8	0.1 J1
3/11/2020	Assessment	< 0.02 U1	0.52	21.9	0.499	0.08	0.247	17.7	0.1882	0.14	0.600	0.0476	0.056	4.37	1.5	0.1 J1
6/3/2020	Assessment	< 0.02 U1	0.45	19.7	0.474	0.07	0.243	16.5	1.412	0.15	0.389	0.0464	0.085	< 0.4 U1	1.5	0.1 J1
11/2/2020	Assessment	< 0.02 U1	0.41	21.5	0.463	0.07	0.254	16.9	0.961	0.11	0.435	0.0490	0.037	< 0.4 U1	1.3	0.1 J1
3/9/2021	Assessment	< 0.02 U1	0.68	19.6	0.564	0.09	0.280	20.2	0.681	0.23	0.517	0.0473	0.074	< 0.1 U1	2.3	0.1 J1
5/25/2021	Assessment	< 0.02 U1	0.55	18.9	0.541	0.094	0.38	21.7	1.16	0.22	0.46	0.0483	0.057	< 0.1 U1	1.68	0.09 J1
11/16/2021	Assessment	< 0.02 U1	0.62	19.2	0.575	0.078	0.37	21.2	1.69	0.15	0.51	0.0539	0.049	< 0.1 U1	1.75	0.11 J1
3/29/2022	Assessment	< 0.04 U1	0.82	18.2	0.75	0.102	0.90	22.7	1.76	0.20	0.5	0.0653	0.092	< 0.2 U1	2.7	0.10 J1
6/21/2022	Assessment	< 0.1 U1	2.0	17.5	0.85	0.11	0.5 J1	25.7	1.87	0.21	0.6 J1	0.0688	0.244	< 0.5 U1	2.7	0.3 J1
11/15/2022	Assessment	< 0.02 U1	0.40	16.8	0.561	0.086	0.43	19.6	1.41	0.21	0.60	0.0556	0.058	< 0.1 U1	1.28	0.11 J1
2/27/2023	Assessment	< 0.02 U1	0.90	15.9	0.787	0.128	0.52	28.9	1.03	0.22	0.68	0.0636	0.051	< 0.1 U1	2.65	0.12 J1
6/26/2023	Assessment	0.009 J1	1.14	13.5	0.744	0.119	0.49	27.3	1.36	0.19	0.60	0.0595	0.157	< 0.1 U1	4.32	0.11 J1
8/23/2023	Assessment	0.008 J1	0.78	13.8	0.715	0.116	0.48	25.8	2.49	0.20	0.64	0.0601	0.270	< 0.1 U1	2.72	0.11 J1

Table 1. Groundwater Data Summary: AD-4
Pirkey - EBAP
Appendix III Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
5/11/2016	Background	0.02	1.63	4	< 0.083 U1	5.4	23	148
7/14/2016	Background	0.02	2.32	4	< 0.083 U1	4.9	20	157
9/8/2016	Background	0.02	2.37	5	< 0.083 U1	4.9	20	136
10/13/2016	Background	0.03	2.87	6	< 0.083 U1	4.1	19	164
11/15/2016	Background	0.04	2.71	5	< 0.083 U1	4.3	19	152
1/12/2017	Background	0.03	2.94	5	< 0.083 U1	4.8	18	148
3/1/2017	Background	0.03	2.86	4	< 0.083 U1	4.7	18	148
4/10/2017	Background	0.04	1.91	5	< 0.083 U1	4.4	21	140
8/24/2017	Detection	0.06229	2.04	5	< 0.083 U1	4.6	20	94
3/22/2018	Assessment	0.0331	1.41	3	< 0.083 U1	4.8	23	132
8/21/2018	Assessment	0.018	2.38	7	< 0.083 U1	4.8	21	158
2/28/2019	Assessment	0.021	1.57	3.56	0.11	4.9	22.9	192
5/23/2019	Assessment	0.021	1.71	3.31	0.15	5.0	24.6	150
8/14/2019	Assessment	< 0.02 U1	1.97	6.22	0.12	5.5	21.7	146
3/11/2020	Assessment	< 0.02 U1	1.46	3.42	0.13	5.4	24.2	166
6/3/2020	Assessment	0.02 J1	1.72	3.65	0.14	5.4	24.7	168
11/4/2020	Assessment	0.02 J1	2.33	3.66	0.05 J1	4.9	18.7	162
3/9/2021	Assessment	0.02 J1	1.72	3.63	0.12	5.2	21.5	146
5/25/2021	Assessment	0.032 J1	1.7	3.60	0.14	4.6	22.6	150
11/16/2021	Assessment	0.012 J1	2.13	3.94	< 0.02 U1	4.3	17.2	130
3/29/2022	Assessment	0.019 J1	1.84	3.80	0.08	4.9	22.2	140 L1
6/21/2022	Assessment	0.020 J1	2.51	3.92	0.05 J1	4.4	20.5	160
11/16/2022	Assessment	0.019 J1	2.25	4.14	< 0.02 U1	4.7	16.6	130
2/28/2023	Assessment	0.028 J1	2.22	4.08	0.05 J1	4.9	19.9	140
6/27/2023	Assessment	0.018 J1	2.90	3.97	0.02 J1	4.5	18.9	150
8/23/2023	Assessment	0.027 J1	2.18	3.88	0.04 J1	4.6	18.5	130

Table 1. Groundwater Data Summary: AD-4
Pirkey - EBAP
Appendix IV Constituents

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
5/11/2016	Background	< 0.93 U1	3.95918 J1	75	1	0.133362 J1	0.396808 J1	8	0.729	< 0.083 U1	< 0.68 U1	0.013	0.00891 J1	< 0.29 U1	1.79183 J1	< 0.86 U1
7/14/2016	Background	< 0.93 U1	8	127	1	< 0.07 U1	3	9	4.271	< 0.083 U1	< 0.68 U1	0.041	0.037	< 0.29 U1	1.73546 J1	1.87362 J1
9/8/2016	Background	< 0.93 U1	5	123	1	0.111076 J1	2	8	0.193	< 0.083 U1	< 0.68 U1	0.04	0.01151 J1	< 0.29 U1	< 0.99 U1	< 0.86 U1
10/13/2016	Background	< 0.93 U1	11	183	0.830588 J1	< 0.07 U1	7	7	2.381	< 0.083 U1	< 0.68 U1	0.034	0.01005 J1	< 0.29 U1	1.60451 J1	0.868603 J1
11/15/2016	Background	< 0.93 U1	< 1.05 U1	114	0.53145 J1	< 0.07 U1	0.446412 J1	6	1.072	< 0.083 U1	< 0.68 U1	0.035	0.01268 J1	< 0.29 U1	< 0.99 U1	< 0.86 U1
1/12/2017	Background	< 0.93 U1	< 1.05 U1	149	0.406228 J1	< 0.07 U1	0.305795 J1	4.5062 J1	2.599	< 0.083 U1	< 0.68 U1	0.03	0.01146 J1	< 0.29 U1	< 0.99 U1	< 0.86 U1
3/1/2017	Background	< 0.93 U1	< 1.05 U1	131	0.354085 J1	< 0.07 U1	< 0.23 U1	4.45689 J1	1.089	< 0.083 U1	< 0.68 U1	0.033	0.01224 J1	< 0.29 U1	< 0.99 U1	< 0.86 U1
4/10/2017	Background	< 0.93 U1	< 1.05 U1	94	0.915299 J1	0.0796 J1	0.240917 J1	8	0.684	< 0.083 U1	< 0.68 U1	0.047	0.00554 J1	< 0.29 U1	< 0.99 U1	< 0.86 U1
3/22/2018	Assessment	< 0.93 U1	< 1.05 U1	66.74	1.15	0.26 J1	< 0.23 U1	9.39	1.283	< 0.083 U1	< 0.68 U1	0.05374	< 0.005 U1	< 0.29 U1	1.99 J1	< 0.86 U1
8/21/2018	Assessment	< 0.01 U1	1.30	121	0.400	0.02 J1	0.198	4.43	1.331	< 0.083 U1	0.098	0.0294	0.005 J1	< 0.02 U1	0.04 J1	0.096
2/28/2019	Assessment	< 0.02 U1	0.26	70.5	0.9 J1	0.01 J1	0.1 J1	6.92	0.818	0.11	0.106	0.0513	< 0.005 U1	< 0.4 U1	0.03 J1	< 0.1 U1
5/23/2019	Assessment	< 0.4 U1	< 0.6 U1	61.7	0.5 J1	< 0.2 U1	1 J1	7.86	0.5173	0.15	< 0.4 U1	0.0516	< 0.005 U1	< 8 U1	< 0.6 U1	< 0.1 U1
8/14/2019	Assessment	< 0.02 U1	0.17	73.5	1.04	< 0.01 U1	0.08 J1	6.52	0.833	0.12	0.06 J1	0.0484	< 0.005 U1	< 0.4 U1	0.04 J1	< 0.1 U1
3/11/2020	Assessment	< 0.02 U1	1.16	69.0	0.965	< 0.01 U1	0.1 J1	7.89	0.2327	0.13	0.06 J1	0.0415	< 0.002 U1	< 0.4 U1	< 0.03 U1	< 0.1 U1
6/3/2020	Assessment	< 0.02 U1	0.52	67.9	0.527	< 0.01 U1	0.2 J1	7.15	0.87	0.14	0.06 J1	0.0380	< 0.002 U1	< 0.4 U1	< 0.03 U1	< 0.1 U1
11/4/2020	Assessment	0.03 J1	5.30	124	0.922	0.03 J1	0.433	4.40	1.45	0.05 J1	0.402	0.0274	0.008	< 0.4 U1	0.1 J1	0.1 J1
3/9/2021	Assessment	< 0.02 U1	0.30	87.9	0.679	0.01 J1	0.2 J1	6.50	0.576	0.12	< 0.05 U1	0.0331	0.002 J1	< 0.1 U1	< 0.09 U1	0.06 J1
5/25/2021	Assessment	< 0.02 U1	0.13	80.7	0.489 M1	0.012 J1	0.24	6.86	0.83	0.14	< 0.05 U1	0.0335 M1	< 0.002 U1	< 0.1 U1	< 0.09 U1	0.06 J1
11/16/2021	Assessment	< 0.02 U1	0.25	122 M1, P3	0.280	0.022	0.28	3.08	1.60	< 0.02 U1	< 0.05 U1	0.0211	0.015	< 0.1 U1	< 0.09 U1	0.08 J1
3/29/2022	Assessment	< 0.02 U1	1.10	93.2	0.641	0.010 J1	0.31	6.16	1.15	0.08	0.07 J1	0.0383	0.017	< 0.1 U1	< 0.09 U1	0.07 J1
6/21/2022	Assessment	< 0.02 U1	0.30	124	0.407	0.021	0.46	4.10	1.31	0.05 J1	< 0.05 U1	0.0220	0.004 J1	< 0.1 U1	< 0.09 U1	0.09 J1
11/16/2022	Assessment	< 0.02 U1	0.21	128	0.195	0.019 J1	0.44	3.00	0.40	< 0.02 U1	< 0.05 U1	0.0212	0.005	< 0.1 U1	< 0.09 U1	0.10 J1
2/28/2023	Assessment	< 0.02 U1	0.26	115	0.594	0.015 J1	0.41	5.60	1.90	0.05 J1	< 0.05 U1	0.0311	0.004 J1	< 0.1 U1	< 0.09 U1	0.09 J1
6/27/2023	Assessment	0.018 J1	1.23	132	0.376	0.021	0.56	3.89	1.72	0.02 J1	0.15 J1	0.0240	0.003 J1	< 0.1 U1	0.14 J1	0.09 J1
8/23/2023	Assessment	0.011 J1	0.36	117	0.246	0.021	0.40	3.63	2.24	0.04 J1	0.07 J1	0.0243	0.003 J1	< 0.1 U1	0.04 J1	0.08 J1

Table 1. Groundwater Data Summary: AD-12
Pirkey - EBAP
Appendix III Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
5/11/2016	Background	0.03	0.362	5	< 0.083 U1	4.4	4	94
7/13/2016	Background	0.03	0.26	6	< 0.083 U1	3.1	4	75
9/7/2016	Background	0.04	0.343	6	< 0.083 U1	3.9	7	63
10/12/2016	Background	0.03	0.271	7	1	3.4	8	92
11/14/2016	Background	0.04	0.331	8	< 0.083 U1	2.6	6	80
1/11/2017	Background	0.03	0.315	7	< 0.083 U1	4.8	6	76
2/28/2017	Background	0.04	0.434	5	< 0.083 U1	3.6	4	50
4/11/2017	Background	0.05	0.299	6	0.2565 J1	4.7	7	72
8/23/2017	Detection	0.0495	0.245	6	0.213 J1	4.8	6	52
3/21/2018	Assessment	0.01397	0.269	5	< 0.083 U1	4.2	3	< 2 U1
8/20/2018	Assessment	0.017	0.338	10	< 0.083 U1	4.4	4	94
2/27/2019	Assessment	0.03 J1	0.4 J1	6.08	0.09	5.2	3.6	36
5/21/2019	Assessment	0.020	0.3 J1	6.30	0.09	4.1	4.0	80
8/12/2019	Assessment	< 0.02 U1	0.278	7.24	0.06 J1	4.9	2.6	90
3/10/2020	Assessment	0.02 J1	0.3 J1	6.08	0.10	4.9	3.7	62
6/2/2020	Assessment	< 0.02 U1	0.2 J1	5.63	0.10	4.0	3.9	91
11/2/2020	Assessment	0.03 J1	0.3 J1	4.65	0.08	4.3	3.3	74
3/8/2021	Assessment	0.01 J1	0.2 J1	6.46	0.11	4.1	3.8	68
5/24/2021	Assessment	0.032 J1	0.2 J1	5.54	0.12	4.2	5.46	70
11/15/2021	Assessment	0.012 J1	0.28	8.03	0.07	3.5	2.90	90
3/28/2022	Assessment	0.021 J1	0.20	6.10	0.07	3.9	3.80	60 L1
6/20/2022	Assessment	0.042 J1	0.32	7.59	0.09	4.3	4.81	80
11/15/2022	Assessment	0.013 J1	0.36	8.03	0.08	4.7	3.39	70
2/27/2023	Assessment	0.021 J1	0.34	6.51	0.07	3.8	3.90	70
6/26/2023	Assessment	0.019 J1	0.21	4.68	0.06	4.6	2.9	80
8/23/2023	Assessment	0.017 J1	0.22	4.74	0.07	3.8	3.5	75
10/17/2023	Assessment	0.015 J1	0.27	6.74	0.07	3.8	2.7	58

Table 1. Groundwater Data Summary: AD-12
Pirkey - EBAP
Appendix IV Constituents

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
5/11/2016	Background	< 0.93 U1	< 1.05 U1	26	0.219521 J1	< 0.07 U1	0.710981 J1	1.58207 J1	0.2073	< 0.083 U1	< 0.68 U1	< 0.00013 U1	< 0.005 U1	< 0.29 U1	1.73953 J1	< 0.86 U1
7/13/2016	Background	< 0.93 U1	< 1.05 U1	23	0.190337 J1	< 0.07 U1	0.68835 J1	1.29444 J1	2.909	< 0.083 U1	< 0.68 U1	0.008	< 0.005 U1	< 0.29 U1	< 0.99 U1	< 0.86 U1
9/7/2016	Background	< 0.93 U1	< 1.05 U1	30	0.232192 J1	< 0.07 U1	0.353544 J1	1.66591 J1	0.881	< 0.083 U1	< 0.68 U1	0.01	< 0.005 U1	< 0.29 U1	< 0.99 U1	< 0.86 U1
10/12/2016	Background	< 0.93 U1	< 1.05 U1	27	0.149553 J1	< 0.07 U1	0.529033 J1	1.56632 J1	0.257	1	< 0.68 U1	0.012	< 0.005 U1	< 0.29 U1	< 0.99 U1	< 0.86 U1
11/14/2016	Background	< 0.93 U1	< 1.05 U1	28	0.152375 J1	< 0.07 U1	0.32826 J1	1.47282 J1	0.767	< 0.083 U1	< 0.68 U1	0.013	< 0.005 U1	< 0.29 U1	< 0.99 U1	< 0.86 U1
1/11/2017	Background	< 0.93 U1	< 1.05 U1	23	0.126621 J1	< 0.07 U1	0.650158 J1	1.09495 J1	1.536	< 0.083 U1	< 0.68 U1	0.01	< 0.005 U1	< 0.29 U1	< 0.99 U1	< 0.86 U1
2/28/2017	Background	< 0.93 U1	< 1.05 U1	26	0.149219 J1	< 0.07 U1	0.325811 J1	1.29984 J1	0.416	< 0.083 U1	< 0.68 U1	0.009	< 0.005 U1	< 0.29 U1	< 0.99 U1	0.994913 J1
4/11/2017	Background	< 0.93 U1	< 1.05 U1	24	0.159412 J1	< 0.07 U1	0.416007 J1	1.33344 J1	0.3895	0.2565 J1	< 0.68 U1	0.008	0.01364 J1	< 0.29 U1	< 0.99 U1	< 0.86 U1
3/21/2018	Assessment	< 0.93 U1	< 1.05 U1	25.82	0.16 J1	< 0.07 U1	1.05	1.49 J1	0.784	< 0.083 U1	< 0.68 U1	0.00722	< 0.005 U1	< 0.29 U1	< 0.99 U1	< 0.86 U1
8/20/2018	Assessment	< 0.01 U1	0.11	27.8	0.159	0.01 J1	0.330	1.72	1.128	< 0.083 U1	0.089	0.0143	< 0.005 U1	0.04 J1	0.1	0.04 J1
2/27/2019	Assessment	< 0.4 U1	< 0.6 U1	22.5	< 0.4 U1	< 0.2 U1	< 0.8 U1	1.37	0.225	0.09	< 0.4 U1	0.00688	< 0.005 U1	< 8 U1	< 0.6 U1	< 2 U1
5/21/2019	Assessment	< 0.4 U1	< 0.6 U1	21.7	< 0.4 U1	< 0.2 U1	< 0.8 U1	1.15	0.201	0.09	< 0.4 U1	0.00576	< 0.005 U1	< 8 U1	< 0.6 U1	< 0.1 U1
8/12/2019	Assessment	< 0.02 U1	0.07 J1	23.8	0.154	< 0.01 U1	0.204	1.30	0.237	0.06 J1	0.08 J1	0.00829	< 0.005 U1	< 0.4 U1	0.2 J1	< 0.1 U1
3/10/2020	Assessment	< 0.02 U1	0.09 J1	21.7	0.139	0.01 J1	0.2 J1	1.21	3.0706	0.10	0.09 J1	0.00547	< 0.002 U1	< 0.4 U1	0.2	< 0.1 U1
6/2/2020	Assessment	< 0.02 U1	0.09 J1	19.0	0.132	< 0.01 U1	0.208	1.02	0.799	0.10	0.09 J1	0.00505	< 0.002 U1	< 0.4 U1	0.3	< 0.1 U1
11/2/2020	Assessment	0.05 J1	0.09 J1	18.9	0.122	< 0.01 U1	0.204	1.04	0.929	0.08	0.09 J1	0.00510	< 0.002 U1	< 0.4 U1	0.3	< 0.1 U1
3/8/2021	Assessment	< 0.02 U1	0.07 J1	22.9	0.150	0.007 J1	0.2 J1	1.19	0.214	0.11	0.07 J1	0.00570	< 0.002 U1	< 0.1 U1	0.2 J1	< 0.04 U1
5/24/2021	Assessment	< 0.02 U1	0.08 J1	23.1	0.136	0.005 J1	0.24	1.19	0.60	0.12	0.07 J1	0.00500	< 0.002 U1	< 0.1 U1	0.31 J1	< 0.04 U1
11/15/2021	Assessment	< 0.02 U1	0.05 J1	26.5	0.148	0.01 J1	0.30	1.38	1.76	0.07	0.07 J1	0.0110	< 0.002 U1	< 0.1 U1	0.10 J1	< 0.04 U1
3/28/2022	Assessment	< 0.02 U1	0.09 J1	20.2	0.127	0.009 J1	0.35	1.01	0.76	0.07	0.09 J1	0.00604	< 0.002 U1	< 0.1 U1	0.33 J1	< 0.04 U1
6/20/2022	Assessment	< 0.02 U1	0.08 J1	24.2	0.135	0.008 J1	0.63	1.35	0.63	0.09	0.08 J1	0.00949	< 0.002 U1	< 0.1 U1	0.16 J1	< 0.04 U1
11/15/2022	Assessment	< 0.02 U1	0.06 J1	30.6	0.153	0.007 J1	0.45	1.59	1.46	0.08	0.08 J1	0.0119	< 0.002 U1	< 0.1 U1	0.23 J1	< 0.04 U1
2/27/2023	Assessment	< 0.02 U1	0.07 J1	27.5	0.155	0.013 J1	0.36	1.50	1.17	0.07	0.1 J1	0.00885	< 0.002 U1	< 0.1 U1	0.35 J1	< 0.04 U1
6/26/2023	Assessment	0.015 J1	0.11	16.3	0.110	0.007 J1	0.45	0.932	0.45	0.06	0.11 J1	0.00487	< 0.002 U1	0.7	0.23 J1	< 0.02 U1
8/23/2023	Assessment	0.013 J1	0.10	15.6	0.129	0.007 J1	0.45	0.855	1.34	0.07	0.11 J1	0.00494	< 0.002 U1	0.5	0.23 J1	< 0.02 U1
10/17/2023	Assessment	0.01 J1	0.06 J1	23.6	0.142	0.006 J1	0.31	1.19	1.08	0.07	0.07 J1	0.00891	< 0.002 U1	< 0.1 U1	0.21 J1	< 0.02 U1

Table 1. Groundwater Data Summary: AD-18
Pirkey - EBAP
Appendix III Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
5/10/2016	Background	0.01	0.548	8	< 0.083 U1	4.5	7	108
7/14/2016	Background	0.01	0.409	8	< 0.083 U1	4.7	7	116
9/8/2016	Background	0.01	0.343	8	< 0.083 U1	4.7	8	110
10/13/2016	Background	0.02	0.56	7	< 0.083 U1	4.1	10	124
11/15/2016	Background	0.02	0.59	7	< 0.083 U1	4.4	7	134
1/12/2017	Background	0.01	0.415	7	< 0.083 U1	4.7	10	128
3/1/2017	Background	0.01	0.224	6	< 0.083 U1	4.1	7	108
4/10/2017	Background	0.01	0.304	7	< 0.083 U1	4.1	8	102
8/24/2017	Detection	0.0278	0.435	8	< 0.083 U1	4.9	8	68
3/22/2018	Assessment	0.01642	0.292	6	< 0.083 U1	5.4	6	100
8/21/2018	Assessment	0.012	0.321	10	< 0.083 U1	5.1	8	118
2/28/2019	Assessment	< 0.02 U1	0.490	8.19	0.02 J1	5.0	6.1	84
5/23/2019	Assessment	0.013	0.684	8.82	0.02 J1	5.2	10.6	104
8/13/2019	Assessment	< 0.02 U1	0.647	8.49	0.01 J1	5.2	6.6	90
3/11/2020	Assessment	< 0.02 U1	0.3 J1	7.34	0.02 J1	4.4	6.1	90 J1
6/3/2020	Assessment	< 0.02 U1	0.2 J1	8.30	0.03 J1	4.5	6.3	119
11/3/2020	Assessment	--	--	--	--	4.4	--	--
11/4/2020	Assessment	< 0.02 U1	0.2 J1	6.30	0.02 J1	--	6.3	100
3/9/2021	Assessment	0.009 J1	0.2 J1	6.61	0.02 J1	4.5	6.6	113
5/25/2021	Assessment	0.021 J1	0.3	7.16	0.02 J1	4.4	7.46	100 P1
11/16/2021	Assessment	--	--	--	--	3.9	--	--
11/17/2021	Assessment	0.01 J1	0.20	5.99	< 0.02 U1	--	6.23	100
3/29/2022	Assessment	0.009 J1	0.24	5.26	< 0.02 U1	4.4	7.31	140 L1
6/21/2022	Assessment	--	--	--	--	4.6	--	--
6/22/2022	Assessment	< 0.009 U1	1.49	5.20	< 0.02 U1	--	6.47	110
11/15/2022	Assessment	--	--	--	--	4.5	--	--
11/16/2022	Assessment	0.011 J1	0.19	4.94	< 0.02 U1	--	6.55	90
2/28/2023	Assessment	< 0.009 U1	0.18	5.49	< 0.02 U1	4.4	7.52	100
6/27/2023	Assessment	0.009 J1	0.23	5.28	< 0.02 U1	4.4	8.2	110
8/23/2023	Assessment	0.012 J1	3.17	5.02	0.02 J1	4.4	6.9	88
10/18/2023	Assessment	0.011 J1	0.35	5.05	< 0.02 U1	3.9	10	98

Table 1. Groundwater Data Summary: AD-18
Pirkey - EBAP
Appendix IV Constituents

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
5/10/2016	Background	< 0.93 U1	< 1.05 U1	157	0.262755 J1	0.109247 J1	1	1.82932 J1	0.847	< 0.083 U1	< 0.68 U1	0.004	0.01536 J1	< 0.29 U1	1.71074 J1	< 0.86 U1
7/14/2016	Background	< 0.93 U1	3.77261 J1	139	0.243326 J1	< 0.07 U1	3	2.16037 J1	3.264	< 0.083 U1	< 0.68 U1	0.02	0.064	0.41347 J1	2.45009 J1	< 0.86 U1
9/8/2016	Background	< 0.93 U1	< 1.05 U1	115	0.226343 J1	< 0.07 U1	0.779959 J1	1.09947 J1	1.105	< 0.083 U1	< 0.68 U1	0.019	0.03	< 0.29 U1	< 0.99 U1	< 0.86 U1
10/13/2016	Background	< 0.93 U1	< 1.05 U1	112	0.192611 J1	< 0.07 U1	0.631027 J1	2.24885 J1	1.161	< 0.083 U1	< 0.68 U1	0.026	0.01416 J1	< 0.29 U1	< 0.99 U1	< 0.86 U1
11/15/2016	Background	< 0.93 U1	< 1.05 U1	94	0.107171 J1	< 0.07 U1	0.724569 J1	1.66054 J1	1.486	< 0.083 U1	< 0.68 U1	0.017	0.029	< 0.29 U1	< 0.99 U1	< 0.86 U1
1/12/2017	Background	< 0.93 U1	< 1.05 U1	99	0.169196 J1	< 0.07 U1	0.411433 J1	1.62881 J1	0.976	< 0.083 U1	< 0.68 U1	0.026	0.01887 J1	< 0.29 U1	< 0.99 U1	< 0.86 U1
3/1/2017	Background	< 0.93 U1	< 1.05 U1	99	0.105337 J1	< 0.07 U1	0.572874 J1	0.976724 J1	0.468	< 0.083 U1	< 0.68 U1	0.017	0.01086 J1	< 0.29 U1	< 0.99 U1	< 0.86 U1
4/10/2017	Background	< 0.93 U1	< 1.05 U1	105	0.130316 J1	< 0.07 U1	0.967681 J1	0.98157 J1	0.648	< 0.083 U1	< 0.68 U1	0.019	0.0096 J1	< 0.29 U1	< 0.99 U1	< 0.86 U1
3/22/2018	Assessment	< 0.93 U1	< 1.05 U1	97.75	0.09 J1	< 0.07 U1	< 0.23 U1	0.97 J1	0.942	< 0.083 U1	< 0.68 U1	0.01647	0.006 J1	< 0.29 U1	1.53 J1	< 0.86 U1
8/21/2018	Assessment	0.02 J1	1.01	99.8	0.129	0.02 J1	0.809	1.18	1.108	< 0.083 U1	0.280	0.0175	0.014 J1	0.08 J1	0.2	0.060
2/28/2019	Assessment	< 0.4 U1	< 0.6 U1	106	< 0.4 U1	< 0.2 U1	< 0.8 U1	1.11	0.615	0.02 J1	0.7 J1	0.0177	0.009 J1	< 8 U1	< 0.6 U1	< 2 U1
5/23/2019	Assessment	< 0.4 U1	< 0.6 U1	131	< 0.4 U1	< 0.2 U1	< 0.8 U1	1.47	0.492	0.02 J1	< 0.4 U1	0.0209	0.009 J1	< 8 U1	< 0.6 U1	< 0.1 U1
8/13/2019	Assessment	< 0.02 U1	0.45	100	0.118	0.02 J1	0.212	1.25	0.473	0.01 J1	0.2 J1	0.0183	0.023 J1	< 0.4 U1	0.09 J1	< 0.1 U1
3/11/2020	Assessment	< 0.02 U1	0.09 J1	97.1	0.09 J1	0.01 J1	0.1 J1	0.948	4.813	0.02 J1	< 0.05 U1	0.0134	0.003 J1	< 0.4 U1	0.05 J1	< 0.1 U1
6/3/2020	Assessment	< 0.02 U1	0.22	100	0.1 J1	0.01 J1	0.2 J1	0.950	0.728	0.03 J1	0.06 J1	0.0132	0.007	< 0.4 U1	0.09 J1	< 0.1 U1
11/4/2020	Assessment	< 0.02 U1	0.29	89.3	0.08 J1	0.01 J1	0.1 J1	0.917	1.169	0.02 J1	0.06 J1	0.0128	0.028	< 0.4 U1	0.2 J1	< 0.1 U1
3/9/2021	Assessment	< 0.02 U1	0.28	88.7	0.09 J1	0.01 J1	0.271	0.827	0.331	0.02 J1	0.08 J1	0.0131	0.006	< 0.1 U1	0.1 J1	< 0.04 U1
5/25/2021	Assessment	< 0.02 U1	0.42	103	0.088	0.014 J1	0.55	0.964	0.77	0.02 J1	0.15 J1	0.0127	0.014	< 0.1 U1	0.13 J1	0.05 J1
11/17/2021	Assessment	< 0.02 U1	0.19	82.2	0.078	0.011 J1	0.31	0.801	1.91	< 0.02 U1	< 0.05 U1	0.0124	0.030	< 0.1 U1	0.11 J1	< 0.04 U1
3/29/2022	Assessment	0.02 J1	1.55	90.1	0.106	0.01 J1	1.40	0.842	2.01	< 0.02 U1	0.53	0.0137	0.021	< 0.1 U1	0.38 J1	0.05 J1
6/22/2022	Assessment	< 0.02 U1	0.30	79.3	0.073	0.012 J1	0.47	0.790	0.73	< 0.02 U1	0.11 J1	0.0108	< 0.007 U1	< 0.1 U1	0.14 J1	< 0.04 U1
11/16/2022	Assessment	< 0.02 U1	0.25	77.4	0.071	0.009 J1	0.54	0.723	1.61	< 0.02 U1	0.08 J1	0.0125	0.018	< 0.1 U1	0.12 J1	< 0.04 U1
2/28/2023	Assessment	< 0.02 U1	0.26	77.9	0.085	0.01 J1	0.38	0.750	1.10	< 0.02 U1	0.18 J1	0.0123	0.006	< 0.1 U1	< 0.09 U1	< 0.04 U1
6/27/2023	Assessment	0.009 J1	0.55	89.0	0.132	0.013 J1	0.57	0.933	2.53	< 0.02 U1	0.13 J1	0.0138	0.010	< 0.1 U1	0.15 J1	0.04 J1
8/23/2023	Assessment	0.056 J1	0.54	70.6	0.115	0.015 J1	1.15	0.731	1.27	0.02 J1	0.43	0.0119	0.005	0.1 J1	0.18 J1	0.03 J1
10/18/2023	Assessment	0.023 J1	0.43	84.0	0.127	0.018 J1	0.52	1.26	1.27	< 0.02 U1	0.12 J1	0.0186	0.084	< 0.1 U1	0.17 J1	0.05 J1

Table 1. Groundwater Data Summary: AD-31
Pirkey - EBAP
Appendix III Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
5/11/2016	Background	0.08	10.4	18	< 0.083 U1	4.5	63	286
7/13/2016	Background	0.03	4.27	18	< 0.083 U1	3.5	66	245
9/7/2016	Background	0.03	3.47	18	< 0.083 U1	3.7	60	260
10/12/2016	Background	0.04	4.41	18	< 0.083 U1	4.0	62	276
11/14/2016	Background	0.04	4.7	18	< 0.083 U1	3.2	66	266
1/11/2017	Background	0.03	4.43	19	< 0.083 U1	4.4	79	252
2/28/2017	Background	0.04	3.89	14	< 0.083 U1	3.6	68	212
4/11/2017	Background	0.04	3.64	16	< 0.083 U1	3.6	69	252
8/23/2017	Detection	0.01752	2.24	18	< 0.083 U1	4.5	52	228
12/21/2017	Detection	--	--	20	< 0.083 U1	--	58	224
3/22/2018	Assessment	0.04078	3.11	16	< 0.083 U1	4.5	76	260
8/21/2018	Assessment	0.022	2.86	25	< 0.083 U1	4.9	72	274
2/28/2019	Assessment	0.03 J1	2.77	18.8	0.1 J1	5.0	74.8	74
5/23/2019	Assessment	0.021	3.29	18.7	0.13	5.1	79.9	240
8/12/2019	Assessment	< 0.02 U1	2.86	21.6	0.16	4.1	70.0	250
3/10/2020	Assessment	0.03 J1	2.80	21.7	0.14	3.5	74.6	246
6/2/2020	Assessment	0.02 J1	2.92	22.1	0.16	4.2	81.4	288
11/2/2020	Assessment	0.03 J1	2.76	21.2	0.13	3.7	77.8	268
3/8/2021	Assessment	0.02 J1	2.69	18.5	0.17	3.8	81.1	279
5/24/2021	Assessment	0.026 J1	3.0	18.1	0.17	3.6	86.4	130
11/16/2021	Assessment	0.024 J1	2.68	20.1	0.13	2.8	76.6	250
3/28/2022	Assessment	0.026 J1	2.75	21.8	0.13	3.4	80.8	260 L1
6/20/2022	Assessment	0.028 J1	2.65	23.2	0.14 J1	3.5	89.0	270
11/15/2022	Assessment	0.035 J1	2.63	24.3	0.14	4.3	79.1	250
2/27/2023	Assessment	0.017 J1	2.70	23.4	0.13	3.5	82.2	260
6/26/2023	Assessment	0.025 J1	2.69	21.2	0.10	4.2	82.1	280
8/23/2023	Assessment	0.021 J1	2.10	21.9	0.10	4.0	69.4	240

Table 1. Groundwater Data Summary: AD-31
Pirkey - EBAP
Appendix IV Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
5/11/2016	Background	< 0.93 U1	93	712	10	0.858875 J1	212	50	7.32	< 0.083 U1	57	0.077	1.797	0.893978 J1	1.84045 J1	< 0.86 U1
7/13/2016	Background	< 0.93 U1	3.41559 J1	69	1	< 0.07 U1	10	11	3.38	< 0.083 U1	< 0.68 U1	0.096	0.32	0.316083 J1	1.11301 J1	< 0.86 U1
9/7/2016	Background	< 0.93 U1	4.34007 J1	88	2	< 0.07 U1	15	11	2.345	< 0.083 U1	< 0.68 U1	0.094	0.284	< 0.29 U1	< 0.99 U1	< 0.86 U1
10/12/2016	Background	< 0.93 U1	6	76	1	< 0.07 U1	14	11	3.88	< 0.083 U1	1.54023 J1	0.097	0.347	< 0.29 U1	< 0.99 U1	< 0.86 U1
11/14/2016	Background	< 0.93 U1	11	125	2	0.174662 J1	30	14	3.202	< 0.083 U1	3.93298 J1	0.096	0.523	0.401556 J1	1.03392 J1	< 0.86 U1
1/11/2017	Background	< 0.93 U1	3.92088 J1	77	1	< 0.07 U1	12	10	2.725	< 0.083 U1	< 0.68 U1	0.093	0.384	< 0.29 U1	< 0.99 U1	1.01921 J1
2/28/2017	Background	< 0.93 U1	< 1.05 U1	44	0.998308 J1	< 0.07 U1	3	9	2.684	< 0.083 U1	< 0.68 U1	0.09	0.138	< 0.29 U1	< 0.99 U1	< 0.86 U1
4/11/2017	Background	< 0.93 U1	3.31744 J1	73	1	0.0944 J1	12	11	3.521	< 0.083 U1	< 0.68 U1	0.097	0.333	< 0.29 U1	< 0.99 U1	< 0.86 U1
3/22/2018	Assessment	< 0.93 U1	3.32 J1	70.83	1.24	0.12 J1	9.62	11.12	2.955	< 0.083 U1	< 0.68 U1	0.09732	1.389	< 0.29 U1	1.98 J1	< 0.86 U1
8/21/2018	Assessment	0.02 J1	1.92	57.7	0.729	0.06	2.39	9.29	4.13	< 0.083 U1	1.41	0.0556	1.112	0.24	2.5	0.113
2/28/2019	Assessment	< 0.4 U1	< 0.6 U1	33.1	1 J1	< 0.2 U1	< 0.8 U1	9.38	3.156	0.1 J1	< 0.4 U1	0.0864	0.01 J1	< 8 U1	< 0.6 U1	< 2 U1
5/23/2019	Assessment	< 0.4 U1	< 0.6 U1	37.9	0.9 J1	< 0.2 U1	< 0.8 U1	10.3	3.40	0.13	< 0.4 U1	0.0928	0.057	< 8 U1	< 0.6 U1	< 0.1 U1
8/12/2019	Assessment	< 0.02 U1	0.53	35.0	0.850	0.06	0.365	8.69	2.196	0.16	0.325	0.0875	1.027	< 0.4 U1	0.4	< 0.1 U1
3/10/2020	Assessment	< 0.02 U1	0.27	34.8	0.835	0.07	0.357	9.56	3.814	0.14	0.260	0.0669	0.183	< 0.4 U1	0.4	< 0.1 U1
6/2/2020	Assessment	< 0.02 U1	0.21	32.7	0.868	0.06	0.292	9.62	2.656	0.16	0.2 J1	0.0682	0.046	< 0.4 U1	0.4	< 0.1 U1
11/2/2020	Assessment	< 0.02 U1	0.26	34.0	1.10	0.07	0.2 J1	11.2	3.02	0.13	0.211	0.0895	0.144	< 0.4 U1	0.3	0.1 J1
3/8/2021	Assessment	< 0.02 U1	0.22	33.6	0.857	0.07	0.282	9.78	1.697	0.17	0.218	0.0664	0.095	< 0.1 U1	0.4	0.08 J1
5/24/2021	Assessment	< 0.02 U1	0.23	33.2	0.723	0.066	0.41	10.4	1.60	0.17	0.20	0.0638	0.059	0.1 J1	0.28 J1	0.09 J1
11/16/2021	Assessment	< 0.02 U1	0.26	32.1	0.801	0.063	0.39	9.18	3.39	0.13	0.34	0.0648	1.790	< 0.1 U1	0.33 J1	0.08 J1
3/28/2022	Assessment	< 0.02 U1	0.26	32.8	0.854	0.068	0.51	9.14	2.41	0.13	0.29	0.0687	0.103	< 0.1 U1	0.38 J1	0.09 J1
6/20/2022	Assessment	< 0.02 U1	0.42	34.1	1.03	0.071	0.59	9.61	4.60	0.14 J1	0.35	0.0844	0.089	< 0.1 U1	0.33 J1	0.08 J1
11/15/2022	Assessment	< 0.02 U1	0.30	35.8	0.863	0.066	0.74	9.41	3.81	0.14	0.34	0.0681	0.610	< 0.1 U1	0.38 J1	0.10 J1
2/27/2023	Assessment	< 0.02 U1	0.30	35.6	0.935	0.079	0.62	10.5	4.05	0.13	0.31	0.0737	0.130 J1	< 0.1 U1	0.27 J1	0.09 J1
6/26/2023	Assessment	0.009 J1	0.36	32.9	1.08	0.064	0.63	10.1	4.29	0.10	0.33	0.0889	0.077	< 0.1 U1	0.78	0.09 J1
8/23/2023	Assessment	< 0.008 U1	0.32	31.7	0.818	0.052	0.56	8.14	5.50	0.10	0.32	0.0644	0.890	< 0.1 U1	0.33 J1	0.08 J1

Table 1. Groundwater Data Summary: AD-32
Pirkey - EBAP
Appendix III Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
5/11/2016	Background	0.708	7.41	12	< 0.083 U1	4.3	124	206
7/13/2016	Background	5.23	33.9	32	0.67 J1	3.3	461	835
9/7/2016	Background	5.78	37.4	35	< 0.083 U1	3.1	479	884
10/12/2016	Background	4.26	27.1	29	0.8585 J1	3.3	430	720
11/14/2016	Background	5.52	35.9	34	0.7468 J1	3.0	621	922
1/11/2017	Background	5.05	40	35	< 0.083 U1	3.9	683	894
2/28/2017	Background	2.73	18.4	19	< 0.083 U1	3.1	285	490
4/11/2017	Background	1.46	11	15	0.4468 J1	3.2	200	372
8/23/2017	Detection	0.716	7.15	14	1.962	4.3	115	288
12/21/2017	Detection	2.56	17.1	22	0.5932 J1	--	324	504
3/21/2018	Assessment	0.628	6.32	15	< 0.083 U1	4.1	113	288
8/21/2018	Assessment	2.45	17.8	28	< 0.083 U1	3.9	321	548
2/28/2019	Assessment	0.679	6.62	17.5	0.40	3.2	121	222
5/21/2019	Assessment	0.555	5.35	18.6	0.31	3.2	105	292
8/12/2019	Assessment	1.77	13.3	24.9	0.67	4.0	228	448
8/16/2019	Assessment	1.92	14.6	26.1	0.83	--	273	522
3/10/2020	Assessment	0.656	6.84	20.5	0.39	3.7	117	286
6/2/2020	Assessment	0.557	5.75	24.1	0.41	3.9	93.6	327
11/2/2020	Assessment	4.04	34.3	36.2	1.40	3.4	690	1,070
3/8/2021	Assessment	2.87	34.2	33.5	1.08	3.5	714	1,020
5/24/2021	Assessment	2.11	21.7	25.4	1.25	3.3	452	340
11/15/2021	Assessment	1.70	16.8	24.3	0.78	2.8	334	580
3/28/2022	Assessment	0.773	8.05	25.2	0.44	3.1	157	330 L1
6/20/2022	Assessment	0.909	7.25	30.6	0.42	3.0	147	320
11/15/2022	Assessment	1.26	12.0	22.7	0.49	4.0	244	450
2/27/2023	Assessment	0.767	7.69	25.1	0.44	3.3	151	340
6/26/2023	Assessment	0.595	5.26	14.5	0.13	3.8	119	260
8/23/2023	Assessment	0.418	3.71	12.7	0.07	3.6	73.0	190

Table 1. Groundwater Data Summary: AD-32
Pirkey - EBAP
Appendix IV Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
5/11/2016	Background	< 0.93 U1	3.77019 J1	35	3	0.293016 J1	5	27	2.501	< 0.083 U1	< 0.68 U1	0.016	0.925	< 0.29 U1	< 0.99 U1	< 0.86 U1
7/13/2016	Background	< 0.93 U1	13	58	8	0.729634 J1	18	74	6.41	0.67 J1	< 0.68 U1	0.119	13.916	0.76212 J1	3.88793 J1	< 0.86 U1
9/7/2016	Background	< 0.93 U1	3.25886 J1	35	8	0.601583 J1	6	70	4.846	< 0.083 U1	< 0.68 U1	0.111	1.68	< 0.29 U1	< 0.99 U1	1.09263 J1
10/12/2016	Background	< 0.93 U1	10	50	7	0.589066 J1	15	65	17.32	0.8585 J1	< 0.68 U1	0.972	7.285	< 0.29 U1	1.93488 J1	< 0.86 U1
11/14/2016	Background	< 0.93 U1	6	37	9	0.78793 J1	8	75	3.731	0.7468 J1	< 0.68 U1	0.114	3.624	< 0.29 U1	< 0.99 U1	1.078 J1
1/11/2017	Background	< 0.93 U1	6	37	7	0.602157 J1	9	69	4.342	< 0.083 U1	< 0.68 U1	0.115	7.202	< 0.29 U1	< 0.99 U1	0.991051 J1
2/28/2017	Background	< 0.93 U1	4.56273 J1	30	5	0.389491 J1	5	45	4.001	< 0.083 U1	< 0.68 U1	0.095	7.927	< 0.29 U1	2.53854 J1	< 0.86 U1
4/11/2017	Background	< 0.93 U1	< 1.05 U1	26	4	0.440252 J1	3	35	4.32	0.4468 J1	< 0.68 U1	0.095	2.755	< 0.29 U1	< 0.99 U1	< 0.86 U1
3/21/2018	Assessment	< 0.93 U1	3.05 J1	41.25	3.17	0.55 J1	5.38	25.8	4.922	< 0.083 U1	< 0.68 U1	0.103	6.4	< 0.29 U1	2.18 J1	< 0.86 U1
8/21/2018	Assessment	0.01 J1	4.81	17.2	3.70	0.47	0.646	43.5	6.01	< 0.083 U1	0.714	0.0689	2.649	0.04 J1	15.0	0.238
2/28/2019	Assessment	< 0.4 U1	2 J1	28.9	3.34	0.2 J1	2 J1	25.0	4.67	0.40	< 0.4 U1	0.0919	1.135	< 8 U1	3 J1	< 2 U1
5/21/2019	Assessment	< 0.4 U1	0.8 J1	35.6	2.77	0.3 J1	1 J1	23.5	5.37	0.31	0.4 J1	0.0897	1.371	< 8 U1	1 J1	0.2 J1
8/12/2019	Assessment	< 0.02 U1	3.43	38.5	3.65	0.40	1.70	33.7	5.70	0.67	0.996	0.0964	4.127	< 0.4 U1	7.3	0.2 J1
8/16/2019	Assessment	< 0.1 U1	2.77	27.9	4.88	0.46	0.5 J1	40.4	--	0.83	0.6 J1	0.103	--	< 2 U1	7.8	< 0.5 U1
3/10/2020	Assessment	< 0.02 U1	0.88	28.7	2.51	0.30	0.379	23.9	5.741	0.39	0.343	0.0711	1.70	< 0.4 U1	2.6	0.2 J1
6/2/2020	Assessment	< 0.02 U1	0.98	31.9	2.35	0.25	0.675	20.8	4.445	0.41	0.405	0.0696	3.97	< 0.4 U1	2.3	0.2 J1
11/2/2020	Assessment	0.02 J1	6.29	22.0	8.90	0.79	1.17	74.0	8.88	1.40	1.23	0.0987	1.40	< 0.4 U1	25.3	0.4 J1
3/8/2021	Assessment	< 0.02 U1	5.54	18.5	5.78	0.66	0.754	61.9	3.701	1.08	0.970	0.0618	1.07	< 0.1 U1	22.2	0.3 J1
5/24/2021	Assessment	< 0.02 U1	2.39	16.9	3.96 M1	0.529	0.71	50.5	5.38	1.25	0.52	0.0629 M1	0.800	< 0.1 U1	9.21	0.21
11/15/2021	Assessment	< 0.02 U1	2.39	22.5	3.90	0.452	0.75	39.9	4.60	0.78	0.52	0.0698	1.400	< 0.1 U1	7.70	0.25
3/28/2022	Assessment	< 0.02 U1	1.05	30.0	2.89	0.323	0.60	25.1	5.90	0.44	0.38	0.0731	1.900	< 0.1 U1	3.42	0.17 J1
6/20/2022	Assessment	< 0.02 U1	1.81	32.3	3.28	0.318	0.68	27.2	13.87	0.42	0.43	0.0923	2.700	< 0.1 U1	2.67	0.17 J1
11/15/2022	Assessment	< 0.02 U1	1.73	24.4	3.77	0.404	0.82	34.8	5.28	0.49	0.66	0.0812	1.500	< 0.1 U1	5.95	0.24
2/27/2023	Assessment	< 0.02 U1	0.89	26.3	3.19	0.360	0.44	29.4	5.83	0.44	0.40	0.0837	2.200	< 0.1 U1	2.68	0.18 J1
6/26/2023	Assessment	0.012 J1	1.53	23.4	0.905	0.042	0.61	15.9	3.93	0.13	0.17 J1	0.0500	0.760	< 0.1 U1	1.59	0.11 J1
8/23/2023	Assessment	0.013 J1	2.19	22.7	0.921	0.071	0.83	11.3	5.16	0.07	0.26	0.0482	0.950	< 0.1 U1	1.04	0.10 J1

Notes:
- -: Not analyzed
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag.
In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.
L1: The associated laboratory control sample (LCS) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits.
M1: The associated matrix spike (MS) or matrix spike duplicate (MSD) recovery was outside acceptance limits.
mg/L: milligrams per liter
P1: The precision between duplicate results was above acceptance limits.
P3: The precision on the matrix spike duplicate (MSD) was above acceptance limits.
pCi/L: picocuries per liter
SU: standard unit
µg/L: micrograms per liter

Table 1. Groundwater Elevation Data Summary
Pirkey Power Plant

Geosyntec Consultants

Unit	All Units	East Bottom Ash Pond					West Bottom Ash Pond				
Gradient	Upgradient	Upgradient		Downgradient			Upgradient		Downgradient		
Well	AD-12	AD-4	AD-18	AD-2	AD-31	AD-32	AD-3	AD-18	AD-17	AD-28	AD-30
Jan-2016	371.05	359.16	360.52	328.55	346.60	352.32	347.03	360.52	--	321.39	323.70
May-2016	372.17	360.07	359.26	328.35	348.21	352.74	348.04	359.26	329.38	321.82	324.26
Jul-2016	365.68	352.34	356.99	327.46	345.46	348.53	346.00	356.99	325.93	320.44	322.49
Jan-2017	365.11	353.27	357.06	327.65	343.78	347.44	344.19	357.06	324.70	320.27	322.23
Feb-2017	368.79	355.32	359.21	327.96	344.53	348.44	345.53	359.21	326.27	320.59	322.88
Apr-2017	372.97	356.62	358.63	329.09	344.58	349.09	345.53	358.63	326.27	320.69	322.88
Aug-2017	367.68	353.58	358.23	327.63	343.57	349.73	343.49	358.23	324.18	320.07	322.04
Mar-2018	370.57	359.04	360.00	328.36	344.10	351.42	344.56	360.00	327.13	321.79	323.29
Aug-2018	357.99	350.39	355.99	326.99	342.73	347.58	343.28	355.99	324.12	319.93	321.70
Feb-2019	372.43	360.40	354.61	329.21	348.31	352.86	348.36	354.61	331.11	321.86	324.54
May-2019	373.12	361.18	360.74	328.91	349.68	354.14	349.37	360.74	331.66	322.61	325.21
Aug-2019	361.90	354.10	357.09	327.60	346.63	353.12	346.08	357.09	326.45	320.40	322.63
Mar-2020	373.10	360.56	360.58	329.23	346.95	352.55	347.22	360.58	336.07	321.98	323.94
Jun-2020	381.55	360.25	359.98	328.06	347.95	352.87	347.76	359.98	328.04	321.28	323.40
Nov-2020	361.86	349.70	354.98	327.57	342.84	346.13	342.89	354.98	324.36	319.99	321.90
Mar-2021	373.52	359.14	359.99	329.00	346.24	350.30	346.58	359.99	329.37	322.06	324.19
May-2021	375.56	360.45	360.46	329.57	347.27	351.28	347.46	360.46	329.03	323.10	324.94
Jul-2021	--	--	--	--	--	--	--	--	--	--	--
Nov-2021	358.32	351.40	355.55	327.36	342.79	348.72	342.60	355.55	323.77	319.98	321.80
Jan-2022	--	--	--	--	--	--	--	--	--	--	--
Mar-2022	373.28	359.58	359.17	328.17	344.58	351.73	344.19	359.17	325.80	321.05	323.14
Jun-2022	360.55	351.31	356.01	327.07	342.36	349.94	342.22	356.01	323.48	320.11	321.54
Aug-2022	--	--	--	--	--	--	341.84	--	--	--	--
Nov-2022	363.46	351.15	355.11	327.52	341.97	348.00	340.85	355.11	322.61	319.73	321.81
Feb-2023	368.74	356.04	359.57	328.12	344.34	349.48	--	359.57	--	--	--
Mar-2023	--	--	--	--	--	--	--	--	--	--	--
Jun-2023	369.17	352.66	357.96	327.55	340.46	343.36	341.82	357.96	325.13	320.45	322.07
Aug-2023	362.47	347.25	354.17	326.59	337.74	341.46	--	354.17	--	--	--
Oct-2023	360.29	--	352.80	--	--	--	338.07	352.80	322.93	319.77	321.28

Notes:
1. Groundwater elevation measured in feet above mean sea level.

Table 1. Groundwater Elevation Data Summary
Pirkey Power Plant

Geosyntec Consultants

Unit	Stackout Pad				Landfill					
Gradient	Upgradient	Downgradient			Upgradient			Downgradient		
Well	AD-13	AD-7	AD-22	AD-33	AD-8	AD-16	AD-27	AD-23	AD-34	AD-36
Jan-2016	354.15	349.31	350.29	351.13	347.21	347.68	--	321.23	307.61	--
May-2016	355.11	349.98	350.83	351.62	348.03	350.97	335.29	321.98	307.61	--
Jul-2016	352.31	347.54	347.55	349.88	347.10	343.32	331.47	321.97	307.61	--
Jan-2017	352.01	347.04	347.20	348.56	345.74	343.09	330.04	320.99	307.61	--
Feb-2017	352.81	347.96	348.52	349.32	346.00	344.54	331.59	321.00	307.61	--
Apr-2017	352.68	347.87	348.45	349.25	345.81	344.69	331.24	320.85	307.61	--
Aug-2017	352.62	347.40	347.37	349.31	346.31	342.71	330.05	320.77	307.61	--
Mar-2018	353.25	348.46	349.62	350.10	346.11	344.63	332.49	320.17	307.61	--
Aug-2018	349.14	344.57	344.05	347.23	345.24	340.03	328.61	320.31	306.66	--
Feb-2019	355.63	350.21	350.90	351.99	348.05	351.21	335.03	320.88	307.61	--
May-2019	355.87	350.82	351.99	352.95	348.60	351.92	336.53	320.99	--	--
Aug-2019	350.87	346.85	346.70	349.96	347.33	343.92	330.71	321.29	305.87	303.16
Mar-2020	355.71	350.64	351.80	352.68	--	--	--	--	DRY	303.21
Jun-2020	355.17	350.25	350.95	352.54	348.61	349.39	--	320.79	307.61	303.78
Nov-2020	350.93	346.45	346.12	348.71	346.63	343.07	329.77	320.83	307.00	302.88
Mar-2021	355.22	350.13	351.33	351.84	--	--	--	--	--	--
May-2021	356.42	350.97	352.31	352.95	348.58	350.52	337.25	320.32	307.61	302.22
Jul-2021	--	--	--	--	--	--	--	--	307.61	302.42
Nov-2021	349.43	345.08	345.25	348.40	346.48	341.99	329.69	320.49	307.20	301.66
Jan-2022	--	--	--	--	--	--	--	320.00	307.61	--
Mar-2022	353.99	348.66	349.66	350.15	--	--	--	--	307.61	--
Jun-2022	349.75	345.35	345.49	348.35	346.27	342.41	330.10	319.87	307.00	301.49
Aug-2022	--	--	--	--	--	--	--	319.81	306.84	301.35
Nov-2022	349.93	345.56	345.20	347.43	344.23	341.65	328.48	319.72	307.61	301.35
Feb-2023	353.36	348.68	349.47	350.18	--	--	--	319.56	307.61	301.51
Mar-2023	354.24	--	350.03	350.48	--	--	--	--	--	--
Jun-2023	352.47	347.83	348.29	349.81	346.88	342.44	332.67	320.13	--	299.99
Aug-2023	--	--	--	--	--	--	--	320.39	307.61	302.91
Oct-2023	348.85	--	344.70	346.93	345.07	339.45	328.43	320.35	307.61	300.48

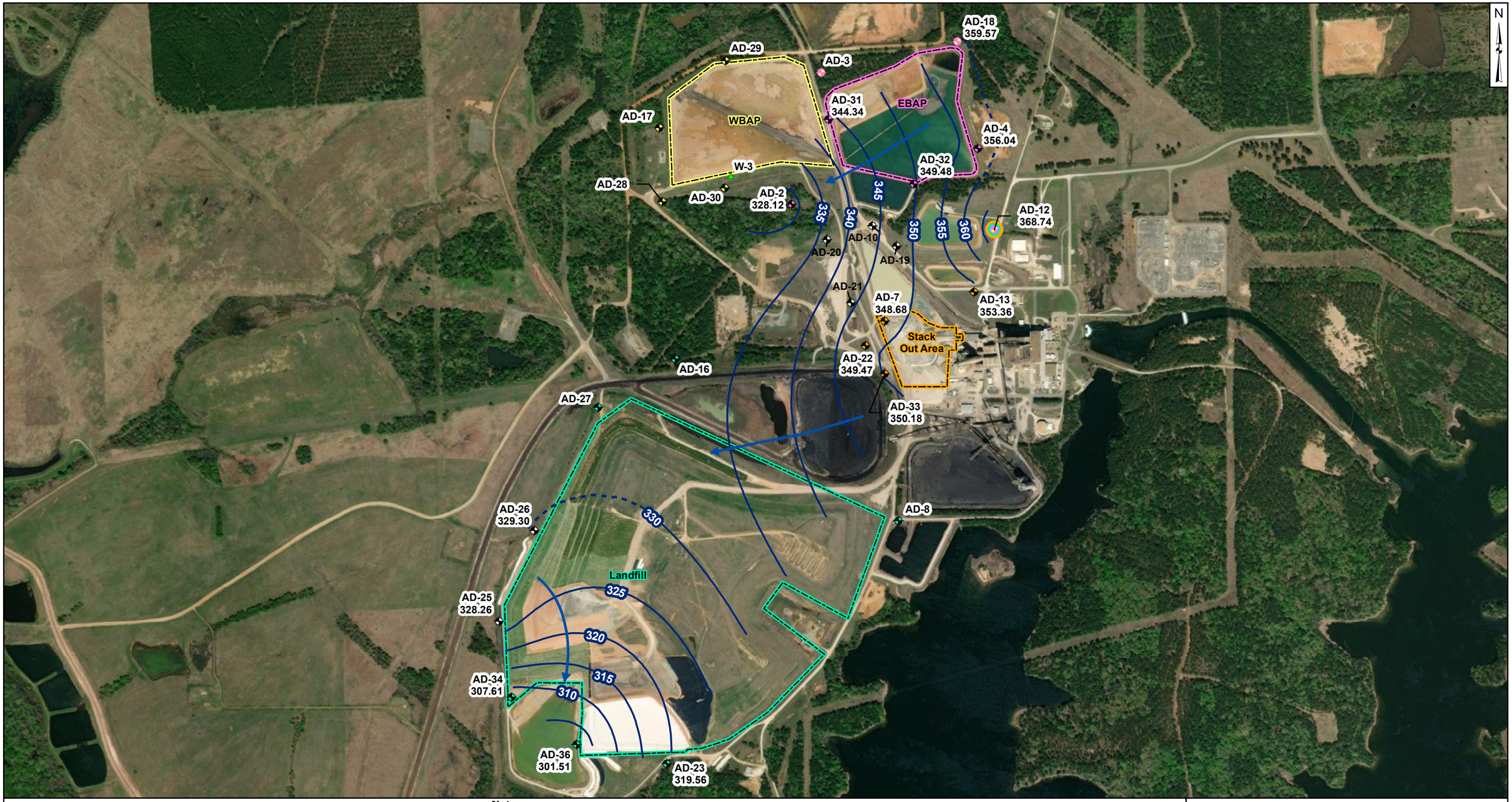
Notes:
1. Groundwater elevation measured in feet above mean sea level.

Table 1: Residence Time Calculation Summary
Pirkey East Bottom Ash Pond

Geosyntec Consultants, Inc.

			2023-02		2023-06		2023-08		2023-10	
CCR Management Unit	Monitoring Well	Well Diameter (inches)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)
East Bottom Ash Pond	AD-2 [2]	4.0	27.2	4.5	22.8	5.3	17.1	7.1	NC	NC
	AD-4 [1]	4.0	10.1	12.1	10.1	12.0	6.3	19.3	NC	NC
	AD-12 [1]	4.0	35.7	3.4	44.0	2.8	30.4	4.0	20.3	6.0
	AD-18 [1]	2.0	12.1	5.0	15.8	3.8	15.0	4.0	10.4	5.9
	AD-31 [2]	2.0	20.8	2.9	20.6	3.0	14.9	4.1	NC	NC
	AD-32 [2]	2.0	14.0	4.4	26.7	2.3	20.3	3.0	NC	NC

Notes:
[1] - Background Well
[2] - Downgradient Well



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 February 27 and 28, 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-3, AD-8, AD-10, AD-16, AD-17, AD-19, AD-20, AD-21, AD-27, AD-28, AD-29, AD-30, and W-3 were not gauged during the February 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
February 2023

AEP Pirkey Power Plant
Hallsville, Texas

Geosyntec consultants

Columbus, Ohio | 2023/10/05

Figure 1

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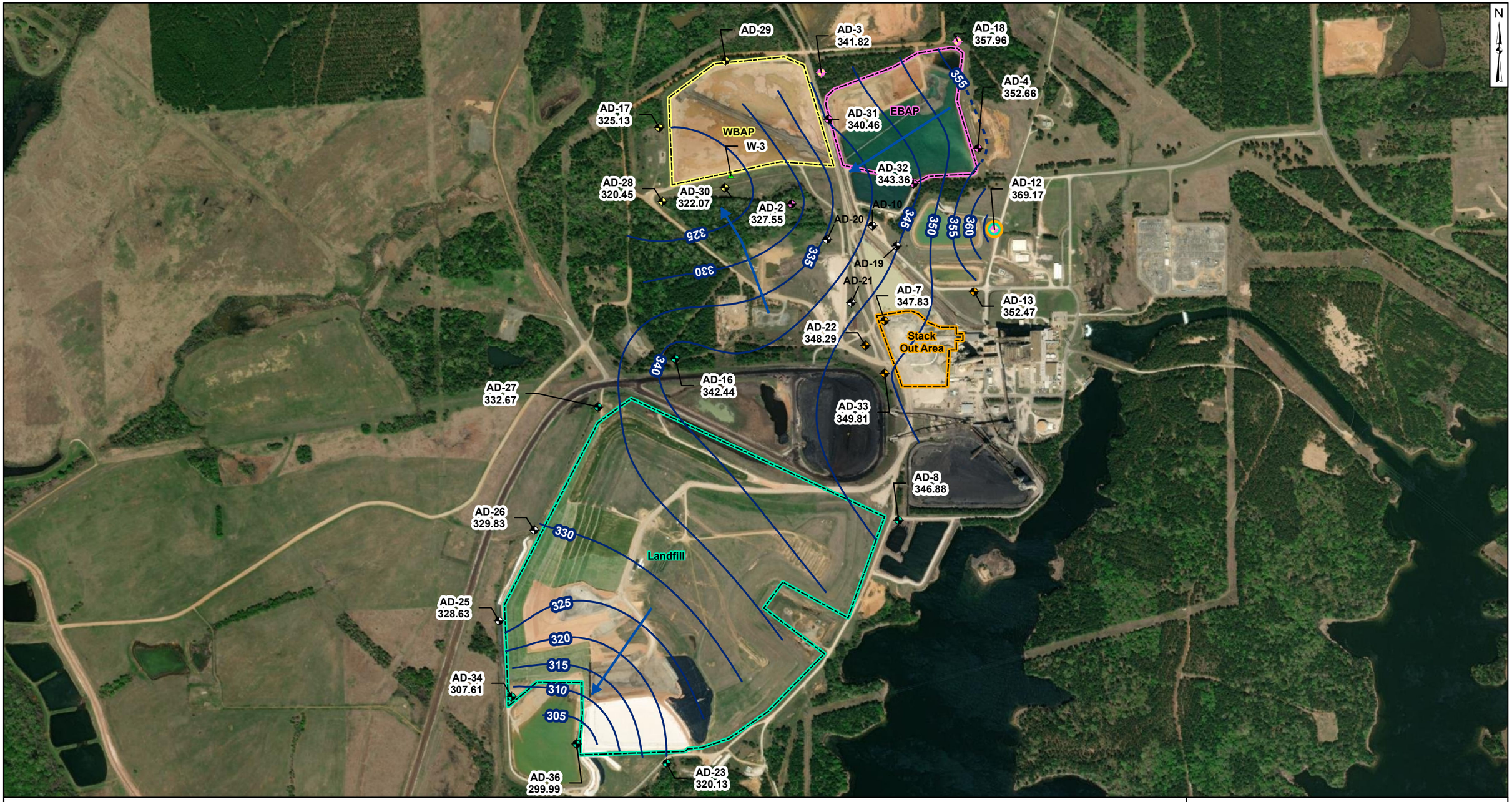

Legend

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 **2**

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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 August 23, 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-03, AD-07, AD-08, AD-13, AD-16, AD-17, AD-22, AD-25, AD-26, AD-27, AD-28, AD-29, AD-30, AD-33 and W-3 were not gauged during the August 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).
7. Removal of CCR plus one foot of material was completed on July 20, 2023 for the East Bottom Ash Pond (EBAP).

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
August 2023

AEP Pirkey Power Plant
Hallsville, Texas

Geosyntec consultants

Columbus, Ohio | 2023/10/06

Figure **3**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Pirkey\2023\AEP-Pirkey_GW_2023-08Pirkey.mxd. ASoltero. 10/6/2023. Project/Phase/Task.

APPENDIX 2- Statistical Analyses

The reports summarizing the statistical evaluation follow.

Geosyntec consultants

engineers | scientists | innovators

STATISTICAL ANALYSIS SUMMARY, EAST BOTTOM ASH POND

H.W. Pirkey Power Plant

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 Number: CHA8500B

March 29, 2023

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LIST OF TABLES

LIST OF ATTACHMENTS

ACRONYMS AND ABBREVIATIONS

ASD	alternative source demonstration
CCR	coal combustion residuals
EBAP	East Bottom Ash Pond
GWPS	groundwater protection standard
LCL	lower confidence limit
LPL	lower prediction limit
mg/L	milligrams per liter
PQL	practical quantitation limit
QA/QC	quality assurance and quality control
SSI	statistically significant increase
SSL	statistically significant level
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TDS	total dissolved solids
UPL	upper prediction limit

1. INTRODUCTION

In accordance with Texas Commission on Environmental Quality (TCEQ) regulations regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (Texas Administrative Code [TAC] Title 30, Chapter 352), groundwater monitoring has been conducted at the East Bottom Ash Pond (EBAP), an existing CCR unit at the H.W. Pirkey Power Plant in Hallsville, Texas. Recent groundwater monitoring results were compared to site-specific groundwater protection standards (GWPSs) to identify potential exceedances.

Based on detection monitoring conducted in 2017 and 2018, statistically significant increases (SSIs) over background were concluded for boron, calcium, chloride, total dissolved solids (TDS), and sulfate at the EBAP. An alternative source was not identified at the time, so the EBAP initiated assessment monitoring in 2018. GWPSs were set in accordance with 30 TAC § 352.951(b) and a statistical evaluation of the assessment monitoring data was conducted. During 2022, sampling events for both Appendix III parameters and Appendix IV parameters, as required by § 352.951(a), were completed in March and June. During the June 2022 assessment monitoring event, statistically significant levels (SSLs) were observed for cobalt and lithium (Geosyntec 2022a). In accordance with § 352.951(e), an alternative source demonstration (ASD) was successfully completed (Geosyntec 2022b). Therefore, the unit remained in assessment monitoring. One assessment monitoring event was conducted at the EBAP in November 2022 in accordance with § 352.951(a). The results of the November 2022 assessment event are documented in this report.

Prior to conducting the statistical analyses, the groundwater data underwent several validation tests, including those for completeness, sample tracking accuracy, transcription errors, and consistent use of measurement units. No data quality issues were identified which would impact data usability.

The monitoring data were submitted to Groundwater Stats Consulting, LLC for statistical analysis. GWPSs were reestablished for the Appendix IV parameters. Confidence intervals were calculated for Appendix IV parameters at the compliance wells to assess whether SSLs of Appendix IV parameters were present above the GWPS. SSLs were identified for cobalt and lithium for the November 2022 event. Thus, either the unit will move to an assessment of corrective measures or an ASD will be conducted to evaluate if the unit can remain in assessment monitoring. Certification of the selected statistical methods by a qualified professional engineer is documented in Attachment A.

2. EAST BOTTOM ASH POND EVALUATION

2.1 Data Validation and QA/QC

During the November 2022 assessment monitoring event, one set of samples was collected for analysis from each background and compliance well to meet the requirements of § 352.951(a). Samples from November 2022 were analyzed for all Appendix III and Appendix IV parameters. A summary of data collected during this assessment monitoring event may be found in Table 1.

Chemical analysis was completed by an analytical laboratory certified by the National Environmental Laboratory Accreditation Program. Quality assurance and quality control (QA/QC) samples completed by the analytical laboratory included the use of laboratory reagent blanks, continuing calibration verification samples, and laboratory-fortified blanks.

A data quality review was completed to assess whether the data met the objectives outlined in TCEQ Draft Technical Guidance No. 32 related to groundwater sampling and analysis (TCEQ 2020). As noted in the review memorandum (Attachment B), the data were deemed usable for supporting project objectives. The analytical data were imported into a Microsoft Access database, where checks were completed to assess the accuracy of sample location identification and analyte identification. Where necessary, unit conversions were applied to standardize reported units across all sampling events. Exported data files were created for use with the Sanitas™ v.9.6.36 statistics software. The export file was checked against the analytical data for transcription errors and completeness. No QA/QC issues were noted which would impact data usability.

2.2 Statistical Analysis

Statistical analyses for the EBAP were conducted in accordance with the November 2021 Statistical Analysis Plan (Geosyntec 2021a). Time series plots and results for all completed statistical tests are provided in Attachment C.

The data obtained in November 2022 were screened for potential outliers. No outliers were identified for this event.

2.2.1 Establishment of GWPSs

A GWPS was established for each Appendix IV parameter in accordance with the Statistical Analysis Plan (Geosyntec 2021a). The established GWPS was set to whichever was greater of the background concentration and the maximum contaminant level for each Appendix IV parameter. To determine background concentrations, an upper tolerance limit was calculated using data that were pooled from the background wells collected during the background monitoring and assessment monitoring events. Tolerance limits were calculated parametrically with 95% coverage and 95% confidence for chromium, combined radium, and lithium. Nonparametric tolerance limits were calculated for arsenic, barium, beryllium, cadmium, cobalt, fluoride, lead, mercury, and selenium due to apparent nonnormal distributions, and for antimony, molybdenum, and thallium due to a high nondetect frequency. Upper tolerance limits and the final GWPSs are summarized in Table 2.

2.2.2 Evaluation of Potential Appendix IV SSLs

A confidence interval was constructed for each Appendix IV parameter at each compliance well. Confidence limits were generally calculated parametrically ($\alpha = 0.01$). However, nonparametric confidence limits were calculated in some cases (e.g., when the data did not appear to be normally distributed or when the nondetect frequency was too high). An SSL was concluded if the lower confidence limit (LCL) exceeded the GWPS (i.e., if the entire confidence interval was above the GWPS). Calculated confidence limits are shown in Attachment C.

The following SSLs were identified at the Pirkey EBAP:

- The LCL for cobalt exceeded the GWPS of 0.00939 milligrams per liter (mg/L) at AD-2 (0.0125 mg/L), AD-31 (0.00952 mg/L), and AD-32 (0.0324 mg/L).
- The LCL for lithium exceeded the GWPS of 0.0519 mg/L at AD-31 (0.0681 mg/L) and AD-32 (0.0786 mg/L).

As a result, either the Pirkey EBAP will move to an assessment of corrective measures or an ASD will be conducted to evaluate whether the unit can remain in assessment monitoring.

2.2.3 Establishment of Appendix III Prediction Limits

Upper prediction limits (UPLs) were previously established for all Appendix III parameters following the background monitoring period. Intrawell tests were used to evaluate potential SSIs for pH, and interwell tests were used to evaluate potential SSIs for boron, calcium, chloride, fluoride, sulfate, and TDS. Interwell and intrawell prediction limits are updated periodically during the assessment monitoring period as sufficient data become available.

Mann-Whitney tests (Wilcoxon rank-sum tests) were performed to determine whether the newer data are affected by a release from the EBAP. Because the interwell Appendix III limits and the Appendix IV GWPSs are based on data from upgradient wells, which were not expected to have been impacted by a release, these tests were used for intrawell Appendix III tests only. Mann-Whitney tests were used to compare the medians of historical data (May 2016–June 2020) with the more recent compliance samples (November 2020–June 2022). Results were evaluated to determine whether the medians of the two groups were similar at the 99% confidence level. Where no significant difference was found, the new compliance data were added to the background data set.

The complete Mann-Whitney test results and a summary of the significant findings can be found in Attachment C. No statistically significant differences were found between the two groups. Therefore, the background data sets for pH were updated to include all available data through June 2022.

Prediction limits for the interwell tests were recalculated using historical data collected through November 2022 during assessment monitoring events. New background well data were tested for outliers before being added to the background data set. Background well data were also evaluated for statistically significant trends using the Sen's Slope/Mann-Kendall trend test, and the results are included in Attachment C.

After the revised background set was established, a parametric or nonparametric analysis was selected based on the distribution of the data and the frequency of nondetect data. Estimated results under the reporting limit (i.e., practical quantitation limit [PQL]) but above the method detection limit—that is, "J-flagged" data—were considered detections and the estimated results were used in the statistical analyses. Nonparametric analyses were selected for data sets with at least 50% nondetect data or data sets that could not be normalized. Parametric analyses were selected for data sets (either transformed or untransformed) that passed the Shapiro-Wilk/Shapiro-Francía test for normality. The Kaplan-Meier nondetect adjustment was applied to data sets with between 15% and 50% nondetect data. For data sets with fewer than 15% nondetect data, nondetect data were replaced with one half of the PQL. The selected analysis (i.e., parametric or nonparametric) and transformation (where applicable) for each background data set are shown in Attachment C.

Interwell UPLs were updated for boron, calcium, chloride, fluoride, sulfate, and TDS using historical data through November 2022. Intrawell UPLs and lower prediction limits (LPLs) were updated for pH using the historical data through June 2022. The updated prediction limits are summarized in Table 3. The prediction limits were calculated for a one-of-two retesting procedure: If at least one sample in a series of two is not above the UPL (or, in the case of pH, is neither less than the LPL nor greater than the UPL), then it can be concluded that an SSI has not occurred. In practice, where the initial result does not exceed the UPL (or, in the case of pH, is neither less than the LPL nor greater than the UPL), a second sample will not be collected. The retesting procedures allow achieving an acceptably high statistical power to detect changes at compliance wells for constituents evaluated using intrawell prediction limits.

2.2.4 Evaluation of Potential Appendix III SSIs

While SSLs were identified for the Appendix IV parameters, a review of the Appendix III results was also completed to assess whether concentrations of Appendix III parameters at the compliance wells were above background concentrations.

Data collected during the November 2022 assessment monitoring event from each compliance well were compared to the recalculated prediction limits to evaluate results above background values. The results from this event and the prediction limits are summarized in Table 3. The following were detected above the UPLs:

- Boron concentrations were detected above the interwell UPL of 0.0437 mg/L at AD-2 (2.83 mg/L) and AD-32 (1.26 mg/L).
- Calcium concentrations were detected above the interwell UPL of 2.94 mg/L at AD-32 (12.0 mg/L).
- Chloride concentrations were detected above the interwell UPL of 8.84 mg/L at AD-2 (30.5 mg/L), AD-31 (24.3 mg/L), and AD-32 (22.7 mg/L).
- Fluoride concentrations were detected above the interwell UPL of 0.257 mg/L at AD-32 (0.49 mg/L).
- Sulfate concentrations were detected above the interwell UPL of 24.7 mg/L at AD-2 (259 mg/L), AD-31 (79.1 mg/L), and AD-32 (244 mg/L).

- TDS concentrations were detected above the interwell UPL of 170 mg/L at AD-2 (480 mg/L), AD-31 (250 mg/L), and AD-32 (450 mg/L).

While the prediction limits were calculated for a one-of-two retesting procedure, SSIs were conservatively assumed if the November 2022 sample was above the UPL or below the LPL. Based on these results, concentrations of Appendix III constituents appear to be above background levels at compliance wells.

2.3 Conclusions

A semiannual assessment monitoring event was conducted at the EBAP in accordance with the CCR Rule. The laboratory and field data were reviewed prior to statistical analysis, with no QA/QC issues identified that impacted data usability. A review of outliers identified no potential outliers in the November 2022 data. GWPSs were reestablished for the Appendix IV parameters. A confidence interval was constructed at each compliance well for each Appendix IV parameter; SSLs were concluded if the entire confidence interval was above the GWPS. SSLs were identified for cobalt and lithium.

The interwell prediction limits for boron, calcium, chloride, fluoride, sulfate, and TDS and the intrawell prediction limits for pH were updated to incorporate more recent data. Appendix III results were compared to established prediction limits, with values above the UPL detected for boron, calcium, chloride, pH, sulfate, and TDS.

Based on this evaluation, either the Pirkey EBAP CCR unit will move to an assessment of corrective measures or an ASD will be conducted to evaluate whether the unit can remain in assessment monitoring.

3. REFERENCES

TCEQ. 2020. Topic: Coal Combustion Residuals (CCR) Groundwater Monitoring and Corrective Action Draft Technical Guidance No. 32. May.

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Geosyntec. 2022b. Alternative Source Demonstration - Texas State CCR Rule. Pirkey East Bottom Ash Pond. Geosyntec Consultants, Inc. January.

TABLES

Table 1. Groundwater Data Summary
Groundwater Statistical Summary
Pirkey Plant - East Bottom Ash Pond

Well ID		AD-2	AD-4	AD-12	AD-18	AD-31	AD-32
Well Classification		Compliance	Background	Background	Background	Compliance	Compliance
Parameter	Unit	11/15/2022	11/16/2022	11/15/2022	11/16/2022	11/15/2022	11/15/2022
Antimony	µg/L	0.1 U1	0.1 U1	0.1 U1	0.1 U1	0.1 U1	0.1 U1
Arsenic	µg/L	0.40	0.21	0.06 J1	0.25	0.30	1.73
Barium	µg/L	16.8	128	30.6	77.4	35.8	24.4
Beryllium	µg/L	0.561	0.195	0.153	0.071	0.863	3.77
Boron	mg/L	2.83	0.019 J1	0.013 J1	0.011 J1	0.035 J1	1.26
Cadmium	µg/L	0.086	0.019 J1	0.007 J1	0.009 J1	0.066	0.404
Calcium	mg/L	2.80	2.25	0.36	0.19	2.63	12.0
Chloride	mg/L	30.5	4.14	8.03	4.94	24.3	22.7
Chromium	µg/L	0.43	0.44	0.45	0.54	0.74	0.82
Cobalt	µg/L	19.6	3.00	1.59	0.723	9.41	34.8
Combined Radium	pCi/L	1.41	0.4	1.46	1.61	3.81	5.28
Fluoride	mg/L	0.21	0.06 U1	0.08	0.06 U1	0.14	0.49
Lead	µg/L	0.60	0.2 U1	0.08 J1	0.08 J1	0.34	0.66
Lithium	mg/L	0.0556	0.0212	0.0119	0.0125	0.0681	0.0812
Mercury	µg/L	0.058	0.005	0.005 U1	0.018	0.610	1.500
Molybdenum	µg/L	0.5 U1	0.5 U1	0.5 U1	0.5 U1	0.5 U1	0.5 U1
Selenium	µg/L	1.28	0.5 U1	0.23 J1	0.12 J1	0.38 J1	5.95
Sulfate	mg/L	259	16.6	3.39	6.55	79.1	244
Thallium	µg/L	0.11 J1	0.10 J1	0.2 U1	0.2 U1	0.10 J1	0.24
Total Dissolved Solids	mg/L	480	130	70	90	250	450
pH	SU	3.96	4.68	4.73	4.46	4.28	3.99

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
SU: standard unit
U1: Not detected at or above method detection limit (MDL). For statistical analysis, parameters that were not detected were replaced with the reporting limit.
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.

Table 2. Appendix IV Groundwater Protection Standards
Statistical Analysis Summary
Pirkey Plant - East Bottom Ash Pond

Constituent Name	MCL	Calculated UTL	GWPS
Antimony, Total (mg/L)	0.00600	0.000100	0.00600
Arsenic, Total (mg/L)	0.0100	0.0110	0.0110
Barium, Total (mg/L)	2.00	0.183	2.00
Beryllium, Total (mg/L)	0.00400	0.00115	0.00400
Cadmium, Total (mg/L)	0.00500	0.000260	0.00500
Chromium, Total (mg/L)	0.100	0.00326	0.100
Cobalt, Total (mg/L)	n/a	0.00939	0.00939
Combined Radium, Total (pCi/L)	5.00	3.20	5.00
Fluoride, Total (mg/L)	4.00	0.257	4.00
Lead, Total (mg/L)	n/a	0.00500	0.00500
Lithium, Total (mg/L)	n/a	0.0520	0.0520
Mercury, Total (mg/L)	0.00200	0.0000640	0.00200
Molybdenum, Total (mg/L)	n/a	0.00500	0.00500
Selenium, Total (mg/L)	0.0500	0.00245	0.0500
Thallium, Total (mg/L)	0.00200	0.00187	0.00200

Notes:
Calculated UTL (upper tolerance limit) represents site-specific background values.
Grey cells indicate the GWPS is based on the calculated UTL. Either the UTL is higher than the MCL or an MCL does not exist.
mg/L: milligrams per liter
pCi/L: picocuries per liter
MCL: maximum contaminant level
GWPS: groundwater protection standard

Table 3. Appendix III Data Summary
Statistical Analysis Summary
Pirkey - East Bottom Ash Pond

Geosyntec Consultants, Inc.

Analyte	Unit	Description	AD-2	AD-31	AD-32
			11/15/2022	11/15/2022	11/15/2022
Boron	mg/L	Interwell Background Value (UPL)	0.0437		
		Analytical Result	**2.83**	0.035	**1.26**
Calcium	mg/L	Interwell Background Value (UPL)	2.94		
		Analytical Result	2.80	2.63	**12.0**
Chloride	mg/L	Interwell Background Value (UPL)	8.84		
		Analytical Result	**30.5**	**24.3**	**22.7**
Fluoride	mg/L	Interwell Background Value (UPL)	0.257		
		Analytical Result	0.21	0.14	**0.49**
pH	SU	Intrawell Background Value (UPL)	4.7	5.1	4.3
		Intrawell Background Value (LPL)	3.4	2.8	2.6
		Analytical Result	4.0	4.3	4.0
Sulfate	mg/L	Interwell Background Value (UPL)	24.7		
		Analytical Result	**259**	**79.1**	**244**
Total Dissolved Solids	mg/L	Interwell Background Value (UPL)	170		
		Analytical Result	**480**	**250**	**450**

Notes:
Bold values exceed the background value.
Background values are shaded gray.
µg/L: micrograms per liter
mg/L: milligrams per liter
SU: standard units
UPL: upper prediction limit
LPL: lower prediction limit

ATTACHMENT A
Certification by Qualified Professional Engineer

Certification by Qualified Professional Engineer

I certify that selected and above described statistical method is appropriate for evaluating the groundwater monitoring data for the Pirkey East Bottom Ash Pond CCR management area and that the requirements of 40 CFR 257.93(f) have been met.

David Anthony Miller

Printed Name of Licensed Professional Engineer

David Anthony Miller

Signature

112498	Texas	03.29.2023
License Number	Licensing State	Date

ATTACHMENT B
Data Quality Review Memorandum

Geosyntec consultants

500 West Wilson Bridge Road, Suite 250
Worthington, Ohio 43085
PH 614.468.0415
FAX 614.468.0416
www.geosyntec.com

Memorandum

Date:	January 20, 2023
To:	David Miller (AEP)
Copies to:	Leslie Fuerschbach (AEP)
From:	Allison Kreinberg (Geosyntec)
Subject:	Data Quality Review – H.W. Pirkey Power Plant November 2022 Sampling Event

This memorandum summarizes the findings of a data quality review for groundwater samples collected at the H.W. Pirkey Power Plant, located in Pittsburg, Texas in November 2022. The groundwater samples were collected to comply with the Texas Commission on Environmental Quality's (TCEQ's) regulations regarding the disposal of coal combustion residuals (CCRs) in landfills and surface impoundments (Title 30 Chapter 352, "CCR Rule"). The groundwater samples were analyzed for 40 CFR 257 Appendix III and IV constituents, plus additional constituents collected to support site evaluation efforts.

The following sample data groups (SDGs) were associated with the November 2022 sampling event and are reviewed in this memorandum:

- Dolan Chemical Laboratory (Groveport, Ohio) Job ID # 223647
- Dolan Chemical Laboratory (Groveport, Ohio) Job ID # 223649
- Dolan Chemical Laboratory (Groveport, Ohio) Job ID # 223664
- Dolan Chemical Laboratory (Groveport, Ohio) Job ID # 223668

The laboratory reports for SDGs 223647 and 223649 were reissued in December 2022 with amended matrix spike precision calculations. The data included in the revised laboratory reports associated with these SDGs were reviewed to assess if they met the objectives outlined in TCEQ Draft Technical Guideline No. 32[1] prior to submittal of this data to TCEQ.

[1] TCEQ. 2020. Topic: Coal Combustion Residuals (CCR) Groundwater Monitoring and Corrective Action Draft Technical Guidance No. 32. May.

The following data quality issues were identified:

- As reported in SDG 223664, chromium, cobalt, and molybdenum were detected in the equipment blank sample "Equipment Blank" collected on 11/16/2022. The detected chromium concentration in the equipment blank (0.47 µg/L) was more than 10% of the detected values in the groundwater samples, which could result in high bias for all groundwater chromium results. The detected cobalt concentration in the equipment blank (0.143 µg/L) was more than 10% of the detected value in sample "AD-18" (0.723 µg/L), which could result in high bias in the "AD-18" cobalt results. The estimated molybdenum concentration in the equipment blank (0.2 µg/L) was more than 10% of the detected value in sample "Duplicate-2" (0.2 µg/L), which could result in high bias in the "Duplicate-2" molybdenum results. Molybdenum was not detected in the other groundwater samples.

- As reported in SDG 223649, the relative percent difference (RPD) for sulfate concentrations from parent sample "AD-36" and duplicate sample "Landfill Duplicate" was 86%. The "AD-36" sulfate results should be considered estimated.

- As reported in SDG 223664, the following matrix spike (MS) and matrix spike duplicate (MSD) recovery for sodium (160% and 223%, respectively) associated with sample "AD-2" was above the acceptable range of 75-125%. The MS recovery for sodium (50.4%) associated with sample "AD-30" was below the acceptable range of 75-125%. The associated samples ("AD-2" and "AD-30") were flagged M1: the associated MS or MSD recovery was outside acceptance limits. The "AD-2" and "AD-30" sodium results should be considered estimated. Sodium is not a regulated Appendix III or IV constituent.

- As reported in SDG 223664, the RPD for radium-226 (52.5%) in the laboratory duplicate was above the acceptable limit of 25%. The "AD-12" radium-226 result was flagged P1: the precision between duplicate results was above acceptance limits. The "AD-12" radium-226 results should be considered estimated.

Based on these findings, the majority of the data reported in these SDGs are considered accurate and complete. Although the QC failures mentioned above will result in some limitations of data use since the affected results are considered estimated or have elevated reporting limits, the data are considered usable for supporting project objectives.

ATTACHMENT C
Statistical Analysis Output

GROUNDWATER STATS CONSULTING

February 23, 2023

Geosyntec Consultants
Attn: Ms. Allison Kreinberg
500 W. Wilson Bridge Road, Suite 250
Worthington, OH 43085

Re: Pirkey EBAP - Assessment Monitoring Event & Background Update 2022

Dear Ms. Kreinberg,

Groundwater Stats Consulting, formerly the statistical consulting division of Sanitas Technologies, is pleased to provide the evaluation of groundwater data and the background update through 2022 for American Electric Power Company's Pirkey EBAP. The analysis complies with the Texas Commission of Environmental Quality rule 30 TAC 352 as well as with the United States Environmental Protection Agency (USEPA) Unified Guidance (2009).

Sampling at each of the wells below began at Pirkey EBAP for the Coal Combustion Residuals (CCR) program in 2016. The monitoring well network, as provided by Geosyntec Consultants, consists of the following:

- **Upgradient wells:** AD-4, AD-12, and AD-18
- **Downgradient wells:** AD-2, AD-31, and AD-32

Data were sent electronically, and the statistical analysis was reviewed by Andrew Collins, Project Manager of Groundwater Stats Consulting. The analysis was conducted according to the Statistical Analysis Plan and initial screening evaluation prepared in November 2017 by GSC and approved by Dr. Kirk Cameron, PhD Statistician with MacStat Consulting, primary author of the USEPA Unified Guidance, and Senior Advisor to GSC.

The CCR program consists of the following constituents listed below. The terms "constituent" and "parameter" are interchangeable.

- **Appendix III** (Detection Monitoring) **-** boron, calcium, chloride, fluoride, pH, sulfate, and TDS
- **Appendix IV** (Assessment Monitoring) **–** antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, combined radium 226 + 228, fluoride, lead, lithium, mercury, molybdenum, selenium, and thallium

Time series and box plots for Appendix III and IV parameters are provided for all wells and constituents, and are used to evaluate concentrations over the entire record (Figures A & B, respectively). A summary of the values identified as outliers in this report and through previous screenings follows this letter. These values are deselected prior to the statistical analysis. All flagged values may also be seen in a lighter font and disconnected symbol on the time series graphs (Figure C).

In earlier analyses, data at all wells were evaluated for the following: 1) outliers; 2) trends; 3) most appropriate statistical method for Appendix III parameters based on site characteristics of groundwater data upgradient of the facility; and 4) eligibility of downgradient wells when intrawell statistical methods are recommended. Power curves were provided during the initial background screening and demonstrated that the selected statistical methods for Appendix III parameters comply with the USEPA Unified Guidance recommendations as discussed below. During this analysis, data were screened for updating Appendix III and IV background statistical limits, which was last performed in February 2022, as described below.

Summary of Statistical Methods:

Based on the original background screening described in the original screening report, the following statistical methods were selected for Appendix III parameters:

1) Intrawell prediction limits, combined with a 1-of-2 resample plan for pH
2) Interwell prediction limits, combined with a 1-of-2 resample plan for boron, calcium, chloride, fluoride, sulfate, and TDS

Parametric prediction limits are utilized when the screened historical data follow a normal or transformed-normal distribution. When data cannot be normalized or the majority of data are non-detects, a nonparametric test is utilized. While the false positive rate associated with the parametric limits is based on an annual 10% (5% per semi-annual event) as recommended by the EPA Unified Guidance (2009), the false positive rate

associated with the nonparametric limits is dependent upon the available background sample size, number of future comparisons, and verification resample plan. The distribution of data is tested using the Shapiro-Wilk/Shapiro-Francia test for normality. After testing for normality and performing any adjustments as discussed below (US EPA, 2009), data are analyzed using either parametric or non-parametric prediction limits.

- No statistical analyses are required on wells and analytes containing 100% non-detects (USEPA Unified Guidance, 2009, Chapter 6).
- When data contain <15% non-detects, simple substitution of one-half the reporting limit is utilized in the statistical analysis. The reporting limit utilized for non-detects is the most practical quantification limit (PQL) as reported by the laboratory.
- When data contain between 15-50% non-detects, the Kaplan-Meier non-detect adjustment is applied to the background data. This technique adjusts the mean and standard deviation of the historical concentrations to account for concentrations below the reporting limit.
- Nonparametric prediction limits are used on data containing greater than 50% non-detects.

Natural systems continuously evolve due to physical changes made to the environment. Examples include capping a landfill, paving areas near a well, or lining a drainage channel to prevent erosion. Periodic updating of background statistical limits is necessary to accommodate these types of changes. In the intrawell case, data for all wells and constituents may be re-evaluated when a minimum of 4 new data points are available to determine whether earlier concentrations are representative of present-day groundwater quality. In the interwell case, prediction limits are updated with upgradient well data following each sampling event after careful screening for any new outliers. In some cases, deselecting the earlier portion of data may be necessary prior to construction of limits so that resulting statistical limits are conservative (lower) from a regulatory perspective and capable of rapidly detecting changes in groundwater quality. Even though the data are excluded from the calculation, the values will continue to be reported and shown in tables and graphs.

Note that while the most recent PQL is used for non-detect values, the historic reporting limit of 0.005 mg/L was used for lead and molybdenum in order to maintain statistical limits that are conservative from a regulatory perspective.

Appendix III Background Update Summaries

January 2021

Proposed background data were originally screened during December 2019. Prior to updating background data sets during the January 2021 background update, pH (which is evaluated using intrawell methods) at all wells and boron, calcium, chloride, fluoride, sulfate, and TDS (which are evaluated using interwell methods) at upgradient wells were re-evaluated using Tukey's outlier test and visual screening. Tukey's Outlier test did not identify any additional statistical outliers.

The Mann-Whitney (Wilcoxon Rank Sum) test was used to compare the medians of historical data through February 2019 to the new compliance samples at each well through June 2020 to evaluate whether the groups are significantly different at the 99% confidence level. A statistically significant difference was identified for pH in well AD-4. However, because this is an upgradient well and limited data are available, the background data were updated to include all data through June 2020.

The Sen's Slope/Mann Kendall trend test was used to evaluate data at upgradient wells for boron, calcium, chloride, fluoride, sulfate and TDS, which are tested using interwell prediction limits, to identify statistically significant increasing or decreasing trends. The results of the trend analyses showed all data are consistent over time. The statistically significant trends noted for boron at well AD-18 and fluoride and wells AD-4 and AD-12 were artificial trends that resulted from estimated values and non-detects, with no detections reported above the practical quantitation limit. No other statistically significant increasing or decreasing trends were noted. Interwell prediction limits, combined with a 1-of-2 resample plan, were updated using all available data through November 2020 from upgradient well for the constituents listed above.

February 2022

Upgradient well data through November 2021 were re-screened for the purpose of updating the interwell prediction limits for boron, calcium, chloride, fluoride, sulfate and TDS.

Outlier Analysis

Prior to updating background data, Tukey's outlier test and visual screening were used to evaluate data at all upgradient wells through November 2021, for boron, calcium, chloride, fluoride, sulfate, and TDS. Tukey's outlier test on pooled upgradient well data for

these constituents did not identify any additional statistical outliers since the last background update; therefore, no new outliers were flagged. Additionally, no changes to previously flagged outliers were made. As mentioned above, flagged data are displayed in a lighter font and as a disconnected symbol on the time series reports, as well as in a lighter font on the accompanying data pages. A summary of those findings was submitted with the report.

For pH, which uses intrawell prediction limits, values were not re-evaluated for new outliers as these records had insufficient samples for updating background during this evaluation period.

Intrawell – Prediction Limits

Intrawell prediction limits using all historical data through June 2020 combined with a 1-of-2 resample plan, were constructed for pH and a summary of the limits was provided with the report. As discussed earlier, background data sets for parameters utilizing intrawell prediction limits will be updated after the Fall 2022 sample event when a minimum of 4 compliance samples are available.

Interwell – Trend Test Evaluation

The Sen's Slope/Mann Kendall trend test was used to evaluate data at upgradient wells for boron, calcium, chloride, fluoride, sulfate, and TDS, which are tested using interwell prediction limits, to identify statistically significant increasing or decreasing trends. The results of the trend analyses showed all data are stable over time. The statistically significant trends noted for fluoride in wells AD-4, AD-12, and AD-18 were artificial trends that resulted from estimated values and non-detects, with no detections reported above the practical quantitation limit. No other statistically significant increasing or decreasing trends were noted.

Interwell – Prediction Limits

Interwell prediction limits, combined with a 1-of-2 resample plan, were updated using all available data through November 2021 from upgradient wells for the constituents listed above. Time series plots were included with the interwell prediction limit graphs to display concentrations at upgradient wells that were used to construct the statistical limits. Interwell prediction limits pool upgradient well data to establish a background limit for an individual constituent.

February 2023

During this analysis, Tukey's outlier test and visual screening were used to evaluate data through June 2022 at all wells for pH, which is tested using intrawell prediction limits, and through November 2022 at upgradient wells for boron, calcium, chloride, fluoride, sulfate, and TDS, which are tested using interwell prediction limits. (Figure C).

Outlier Analysis

Tukey's outlier test on all wells for pH did not identify any values; therefore, no new values were flagged (Figure C). Tukey's outlier test on pooled upgradient well data identified both high and low values for fluoride as outliers; however, no new values were flagged as the reported measurements were similar to remaining measurements within the record (Figure C). Additionally, no changes to previously flagged outliers were made. As mentioned above, flagged data are displayed in a lighter font and as a disconnected symbol on the time series reports, as well as in a lighter font on the accompanying data pages. A summary of Tukey's test results follows this letter.

Intrawell – Mann-Whitney Test

For pH, which is tested using intrawell prediction limits, the Mann-Whitney (Wilcoxon Rank Sum) test was used to compare the medians of historical data through June 2020 to the new compliance samples at each well through June 2022 to evaluate whether the medians are statistically similar at the 99% confidence level, in which case background data may be updated with compliance data (Figure D). No statistically significant differences were identified; therefore, all records were updated with compliance data. A summary of the Mann-Whitney results follows this report.

Intrawell – Prediction Limits

Intrawell prediction limits using all historical data through June 2022 combined with a 1-of-2 resample plan, were constructed for pH and a summary of the limits follows this letter (Figure E). No comparison of compliance measurements was made in this analysis.

Interwell – Trend Test Evaluation

The Sen's Slope/Mann Kendall trend test was used to evaluate data at upgradient wells for boron, calcium, chloride, fluoride, sulfate, and TDS, which are tested using interwell prediction limits, to identify statistically significant increasing or decreasing trends at the 99% confidence level (Figure F). The results of the trend analyses showed all data are

stable over time. The statistically significant decreasing trend noted for fluoride in well AD-12 resulted from elevated reporting limits early in the record with no detections reported above the practical quantitation limit. No other statistically significant increasing or decreasing trends were noted.

Interwell – Prediction Limits

Interwell prediction limits, combined with a 1-of-2 resample plan, were updated using all available data through November 2022 from upgradient wells for the constituents listed above (Figure G). Time series plots were included with the interwell prediction limit graphs to display concentrations at upgradient wells that were used to construct the statistical limits. Interwell prediction limits pool upgradient well data to establish a background limit for an individual constituent. A summary table of the updated limits may be found following this letter in the Prediction Limit Summary Table. No comparison of compliance data was made in this analysis.

Evaluation of Appendix IV Parameters – November 2022

Prior to evaluating Appendix IV parameters, background data are screened through visual screening and Tukey's outlier test on pooled upgradient wells for potential outliers and extreme trending patterns that would lead to artificially elevated statistical limits.

For the current analysis, Tukey's outlier test on pooled upgradient well data through November 2022 identified outliers for fluoride, as discussed earlier. No new values were flagged as outliers as they were similar to concentrations at neighboring upgradient wells or were below the MCL.

Additionally, downgradient well data through November 2022 were screened through visual screening using time series graphs. Since the downgradient well data are used to construct confidence intervals, a regulatory conservative approach is taken in that values that are marginally high relative to the rest of the data are retained unless there is particular justification for excluding them. No changes were to previously flagged data were made.

Interwell Upper Tolerance Limits

Interwell upper tolerance limits were used to calculate background limits from all available pooled upgradient well data through November 2022 for Appendix IV parameters to determine the background limit for each constituent (Figure H). For parametric limits a target of 95% confidence and 95% coverage is used. The confidence and coverage levels

for nonparametric tolerance limits are dependent upon the number of background samples.

Groundwater Protection Standards

Background limits were compared to the Maximum Contaminant Levels (MCLs) in the Groundwater Protection Standard (GWPS) table following this letter to determine the highest limit for use as the GWPS in the Confidence Interval comparisons (Figure I).

Confidence Intervals

Confidence intervals were then constructed on downgradient wells with data through November 2022 for each of the Appendix IV parameters using the highest limit of either the MCL or background as discussed above (Figure J). Only when the entire confidence interval is above a GWPS is the well/constituent pair considered to exceed its respective standard. Complete results of the confidence interval results follow this letter. The following confidence interval exceedances were noted:

- Cobalt: AD-2, AD-31, and AD-32
- Lithium: AD-31 and AD-32

Thank you for the opportunity to assist you in the statistical analysis of groundwater quality for the Pirkey EBAP. If you have any questions or comments, please feel free to contact me.

For Groundwater Stats Consulting,

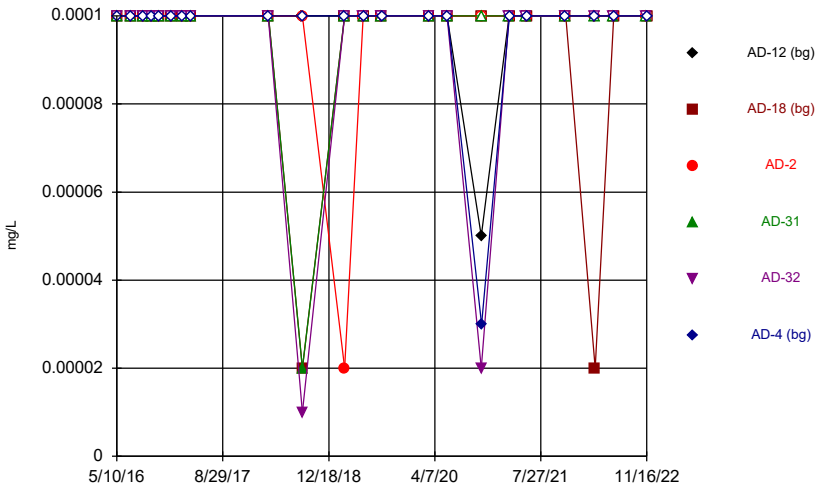
Easton Rayner
Groundwater Analyst

Andrew Collins
Project Manager

FIGURE A
Time Series

Sanitas™ v.9.6.36 . UG
Hollow symbols indicate censored values.

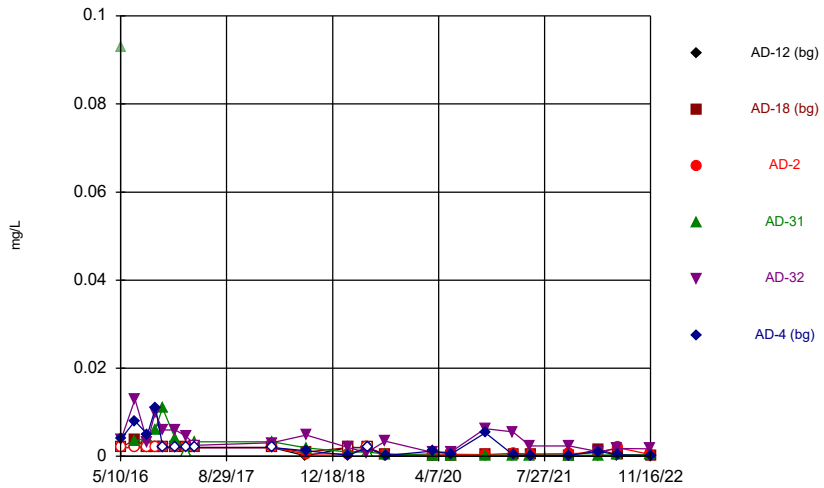
Time Series



Constituent: Antimony, total Analysis Run 2/20/2023 2:21 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG
Hollow symbols indicate censored values.

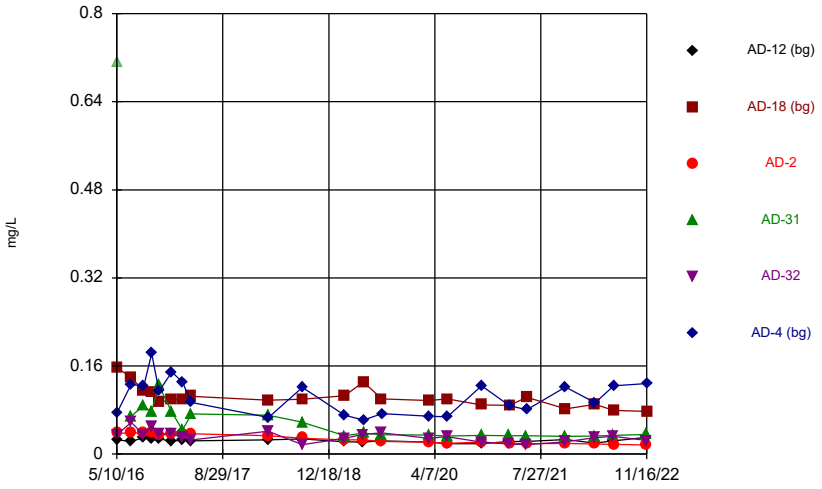
Time Series



Constituent: Arsenic, total Analysis Run 2/20/2023 2:21 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

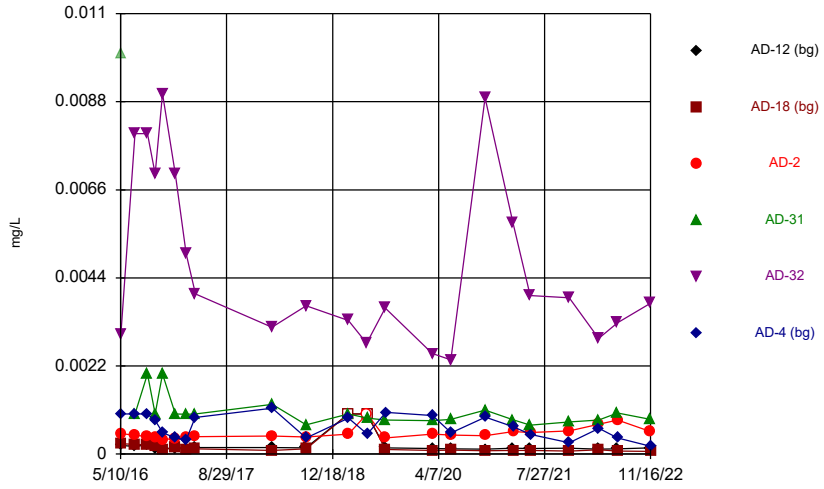
Time Series



Constituent: Barium, total Analysis Run 2/20/2023 2:21 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG
Hollow symbols indicate censored values.

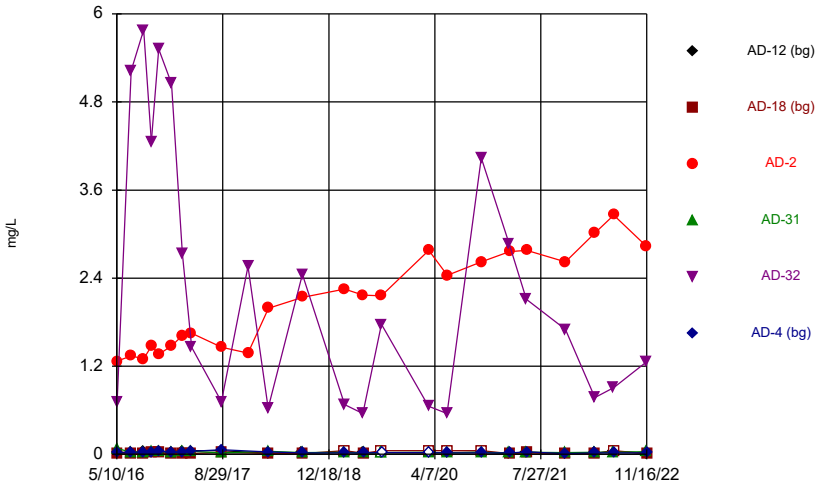
Time Series



Constituent: Beryllium, total Analysis Run 2/20/2023 2:21 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG
Hollow symbols indicate censored values.

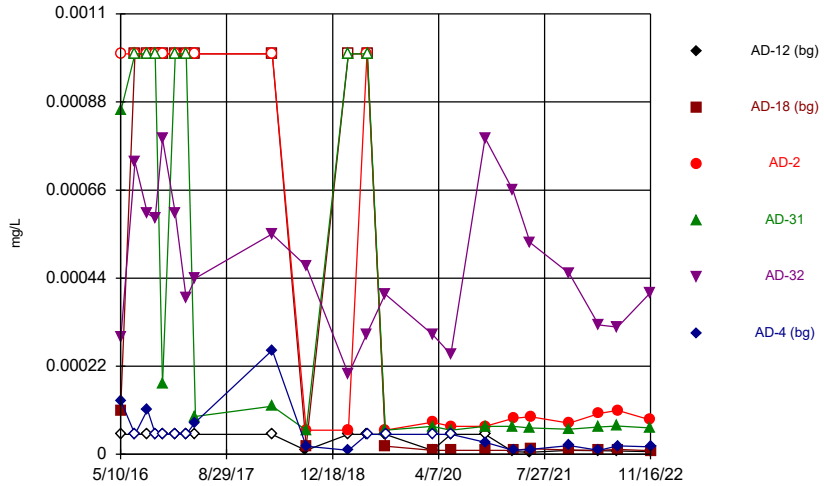
Time Series



Constituent: Boron, total Analysis Run 2/20/2023 2:21 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG
Hollow symbols indicate censored values.

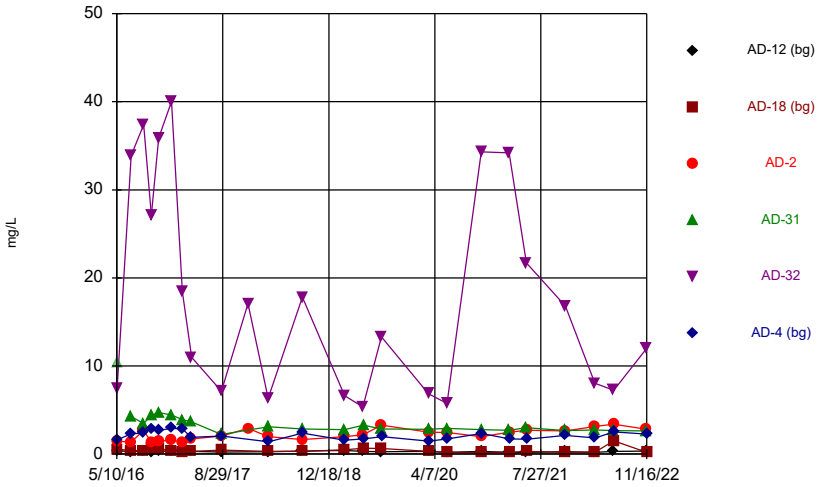
Time Series



Constituent: Cadmium, total Analysis Run 2/20/2023 2:21 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

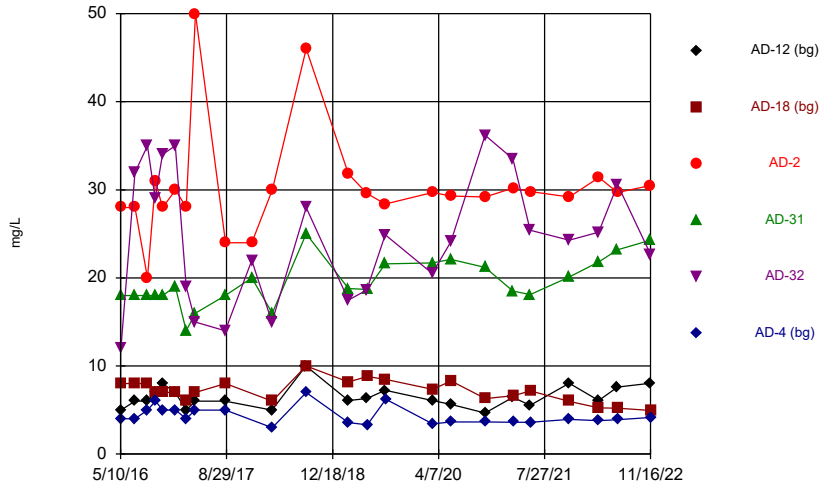
Time Series



Constituent: Calcium, total Analysis Run 2/20/2023 2:21 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

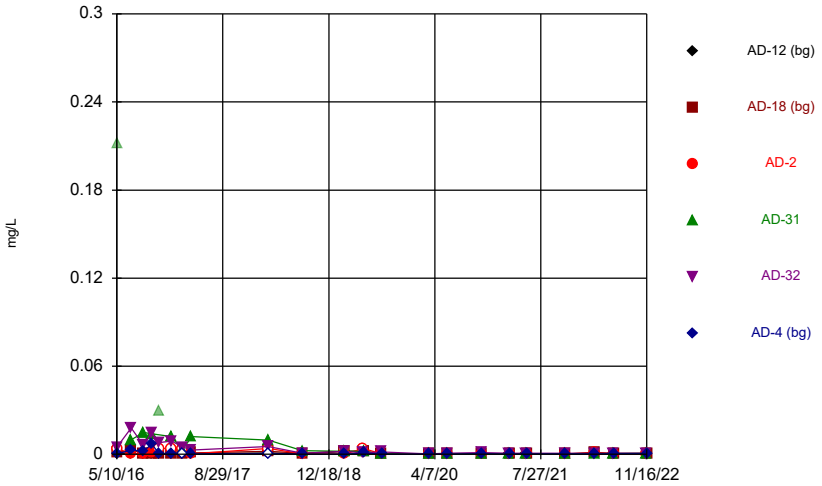
Time Series



Constituent: Chloride, total Analysis Run 2/20/2023 2:21 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG
Hollow symbols indicate censored values.

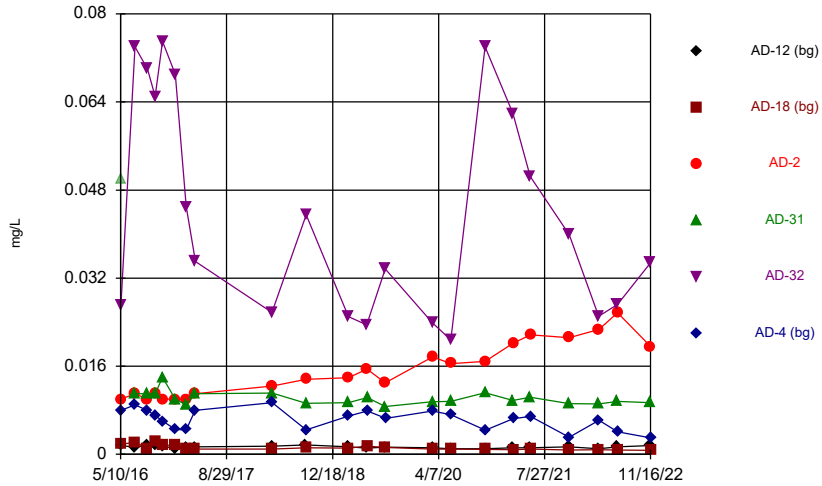
Time Series



Constituent: Chromium, total Analysis Run 2/20/2023 2:21 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

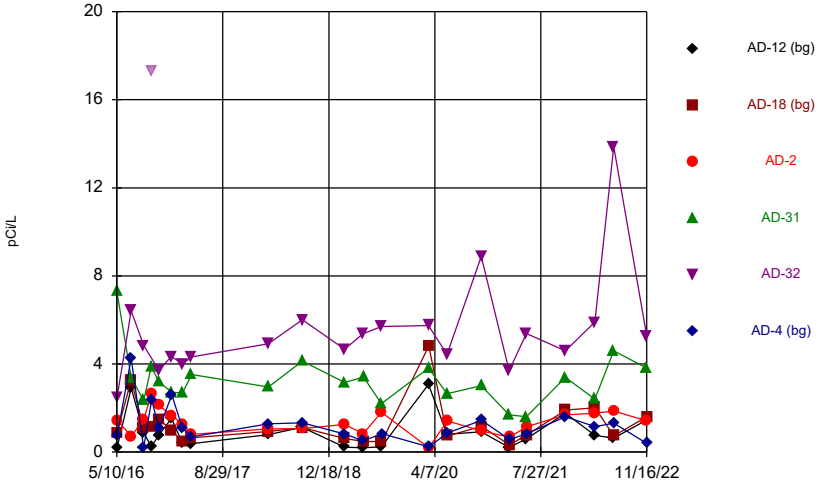
Time Series



Constituent: Cobalt, total Analysis Run 2/20/2023 2:21 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

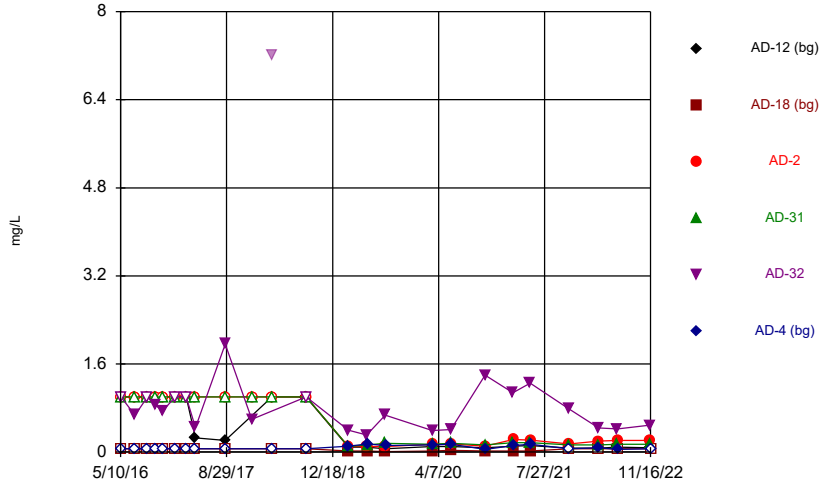
Time Series



Constituent: Combined Radium 226 + 228 Analysis Run 2/20/2023 2:21 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG
Hollow symbols indicate censored values.

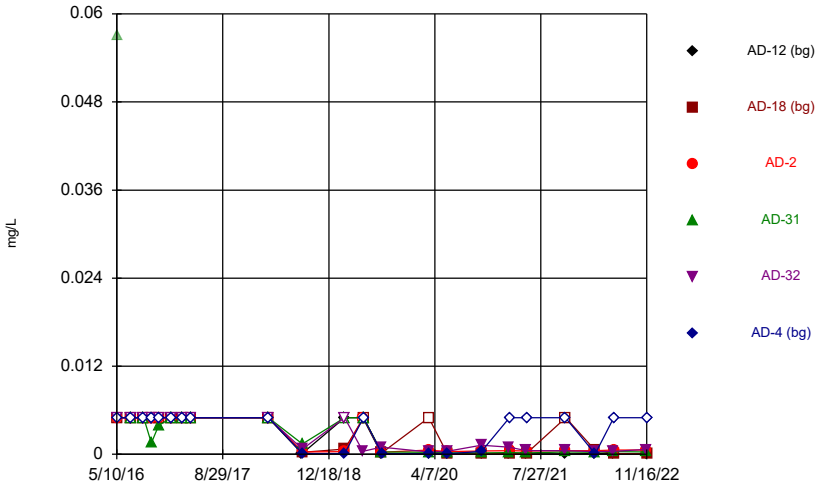
Time Series



Constituent: Fluoride, total Analysis Run 2/20/2023 2:21 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG
Hollow symbols indicate censored values.

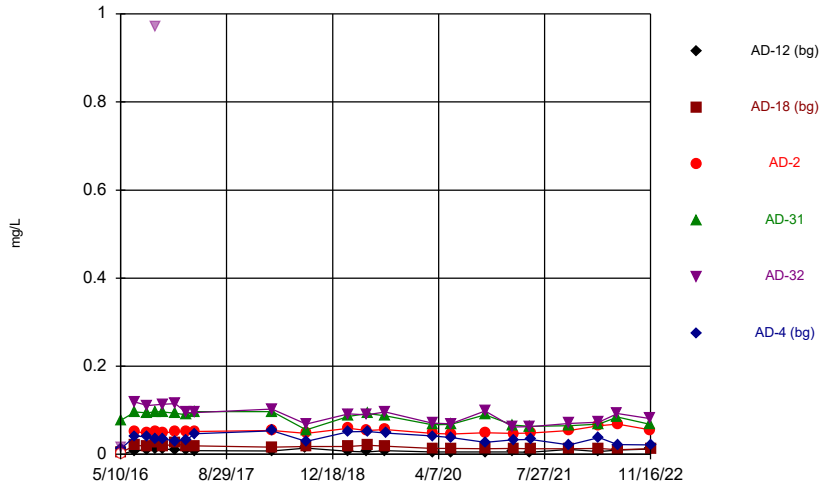
Time Series



Constituent: Lead, total Analysis Run 2/20/2023 2:21 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG
Hollow symbols indicate censored values.

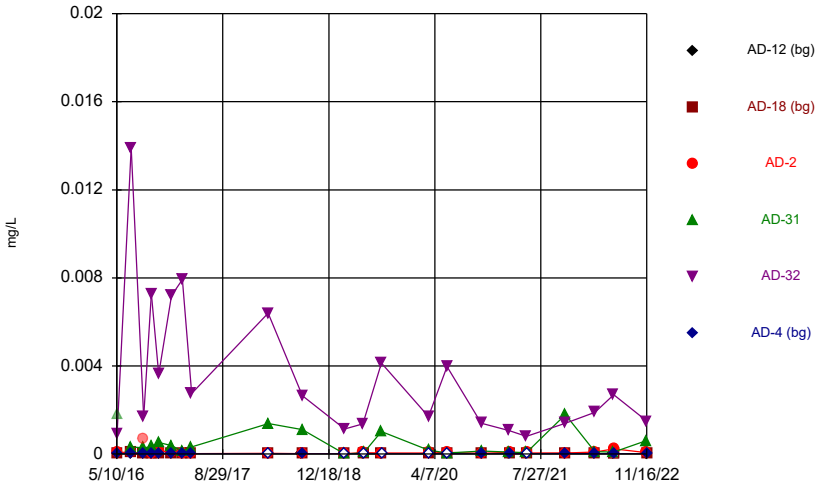
Time Series



Constituent: Lithium, total Analysis Run 2/20/2023 2:21 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG
Hollow symbols indicate censored values.

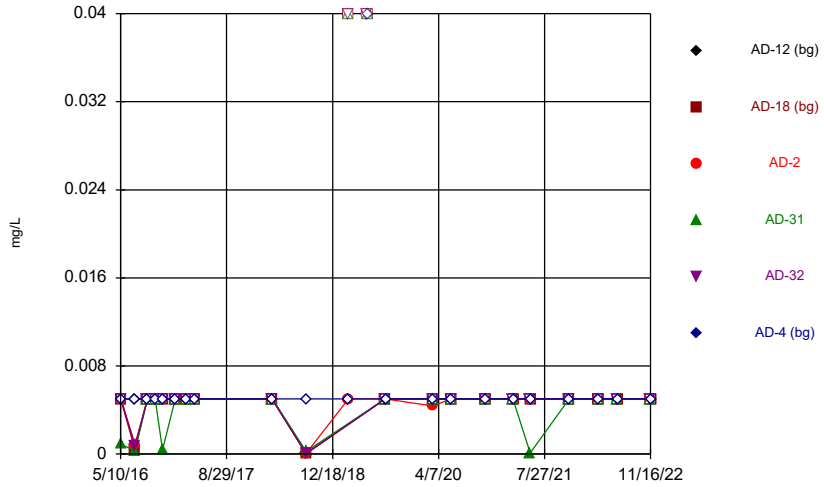
Time Series



Constituent: Mercury, total Analysis Run 2/20/2023 2:21 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG
Hollow symbols indicate censored values.

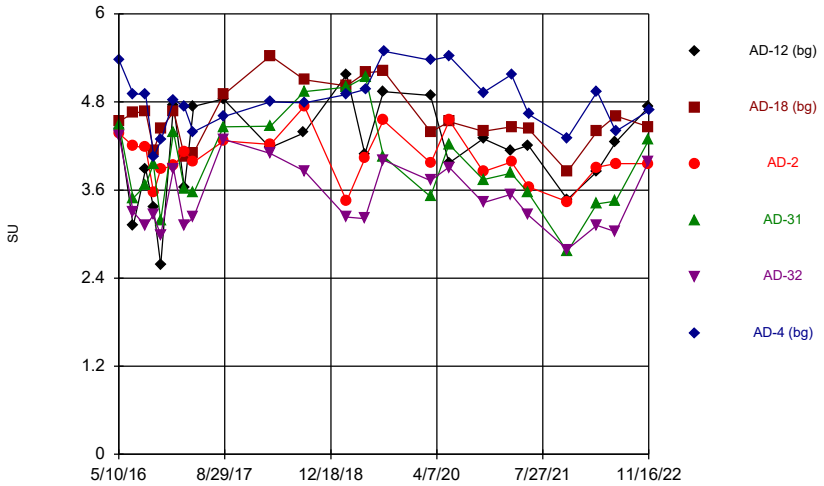
Time Series



Constituent: Molybdenum, total Analysis Run 2/20/2023 2:21 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

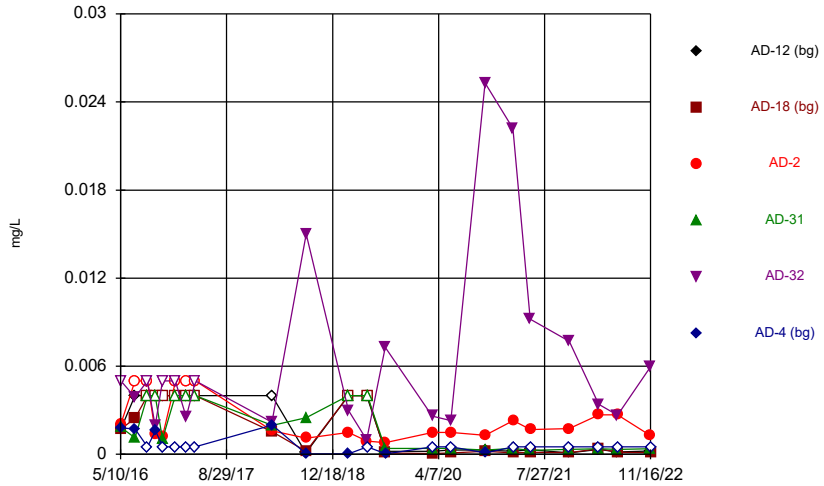
Time Series



Constituent: pH, field Analysis Run 2/20/2023 2:21 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG
Hollow symbols indicate censored values.

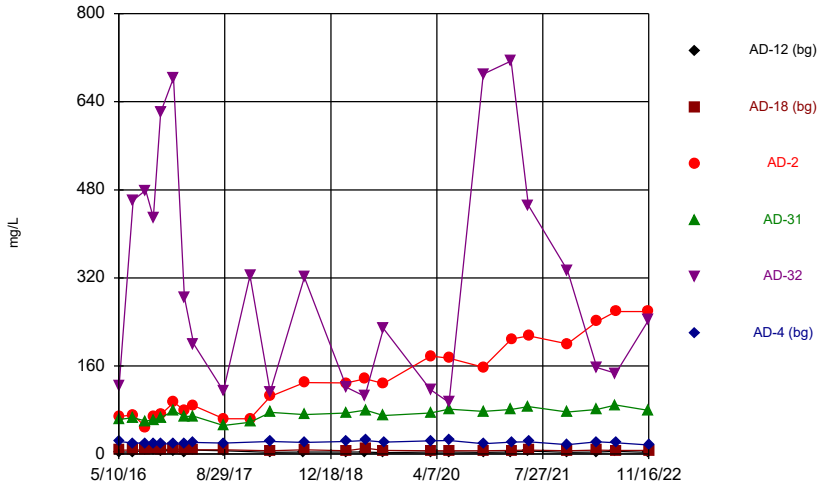
Time Series



Constituent: Selenium, total Analysis Run 2/20/2023 2:21 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

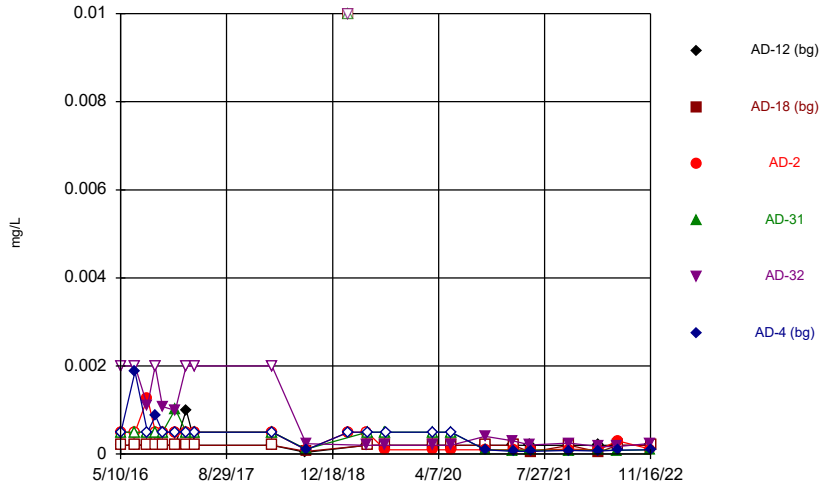
Time Series



Constituent: Sulfate, total Analysis Run 2/20/2023 2:21 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG
Hollow symbols indicate censored values.

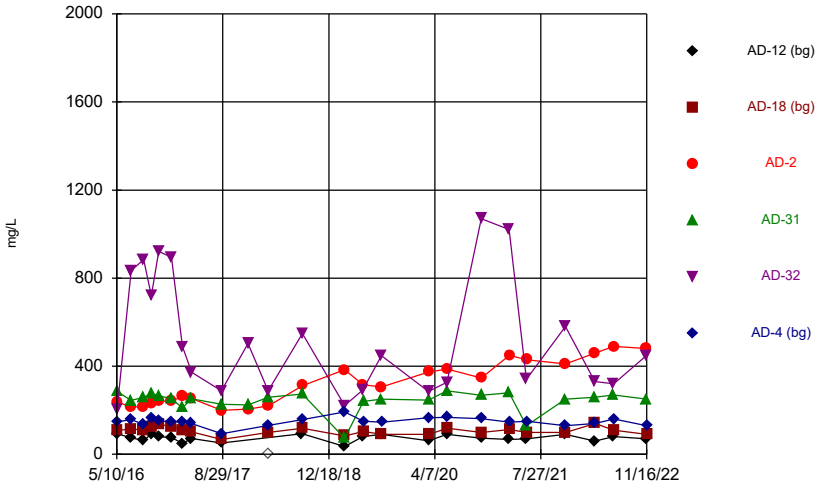
Time Series



Constituent: Thallium, total Analysis Run 2/20/2023 2:21 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG
Hollow symbols indicate censored values.

Time Series

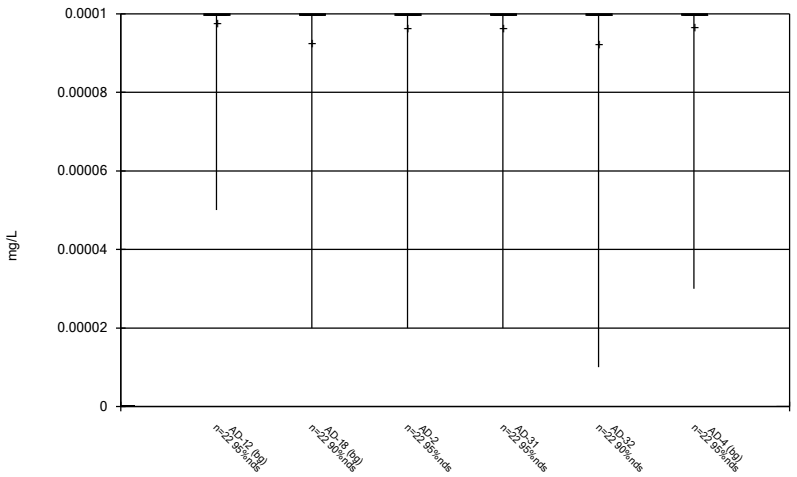


Constituent: Total Dissolved Solids Analysis Run 2/20/2023 2:21 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

FIGURE B
Box Plots

Sanitas™ v.9.6.36 . UG

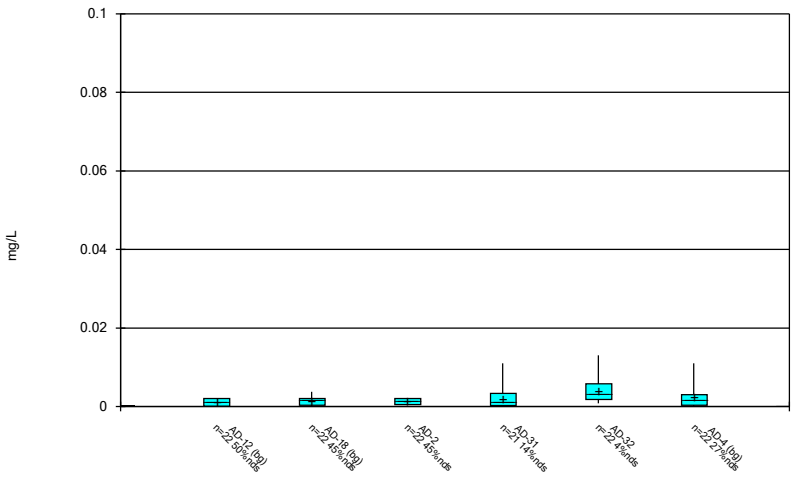
Box & Whiskers Plot



Constituent: Antimony, total Analysis Run 2/20/2023 2:22 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

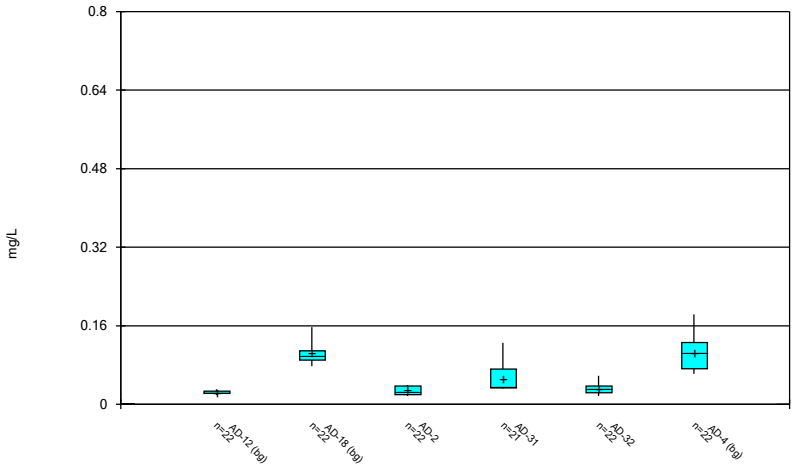
Box & Whiskers Plot



Constituent: Arsenic, total Analysis Run 2/20/2023 2:22 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

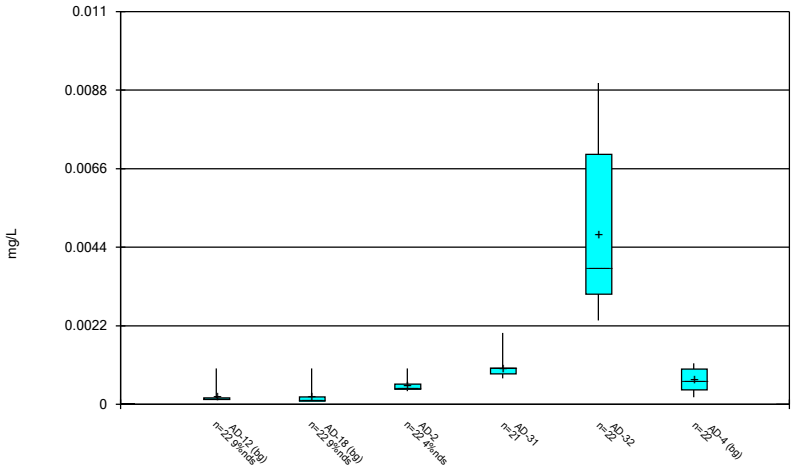
Box & Whiskers Plot



Constituent: Barium, total Analysis Run 2/20/2023 2:22 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

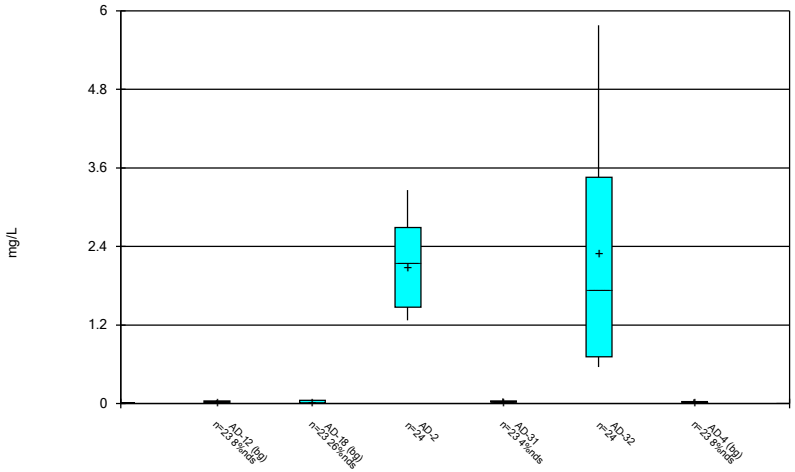
Sanitas™ v.9.6.36 . UG

Box & Whiskers Plot



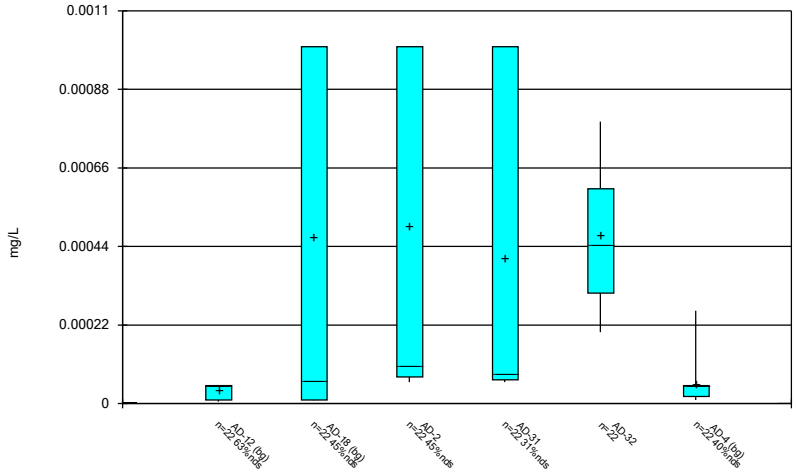
Constituent: Beryllium, total Analysis Run 2/20/2023 2:22 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Box & Whiskers Plot



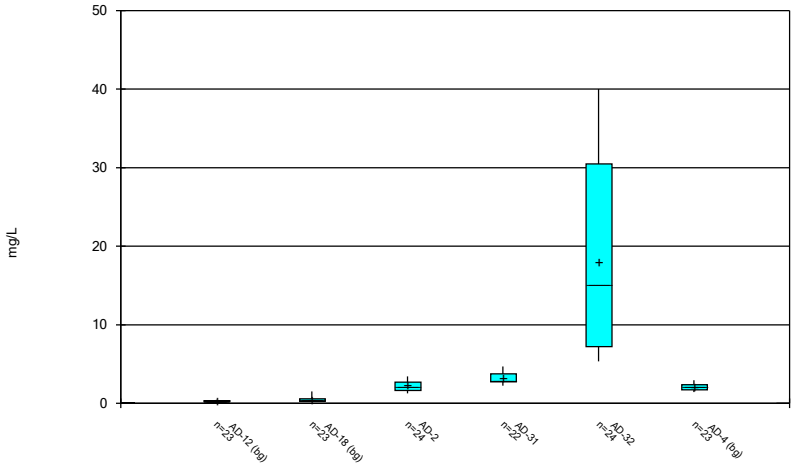
Constituent: Boron, total Analysis Run 2/20/2023 2:22 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Box & Whiskers Plot



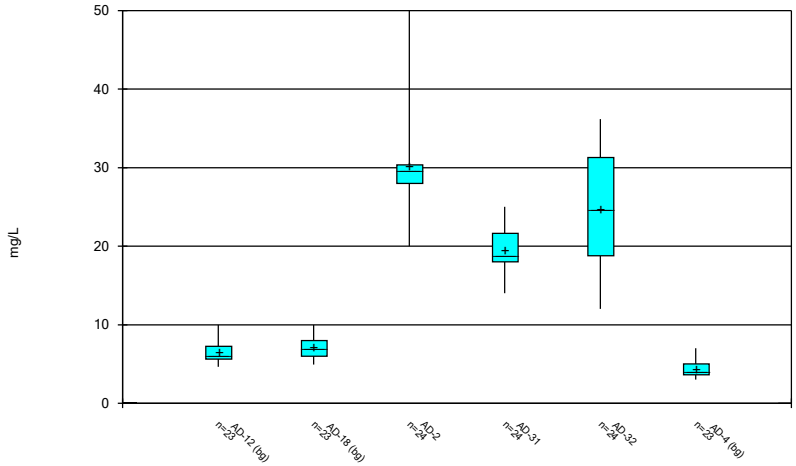
Constituent: Cadmium, total Analysis Run 2/20/2023 2:22 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Box & Whiskers Plot



Constituent: Calcium, total Analysis Run 2/20/2023 2:22 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

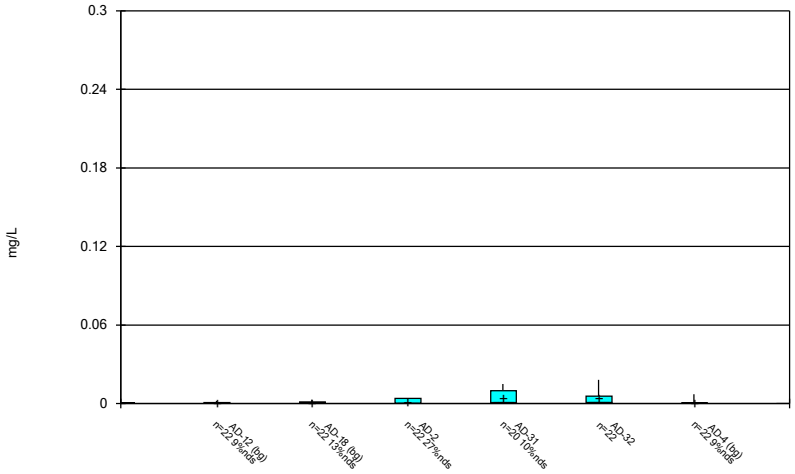
Box & Whiskers Plot



Constituent: Chloride, total Analysis Run 2/20/2023 2:22 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

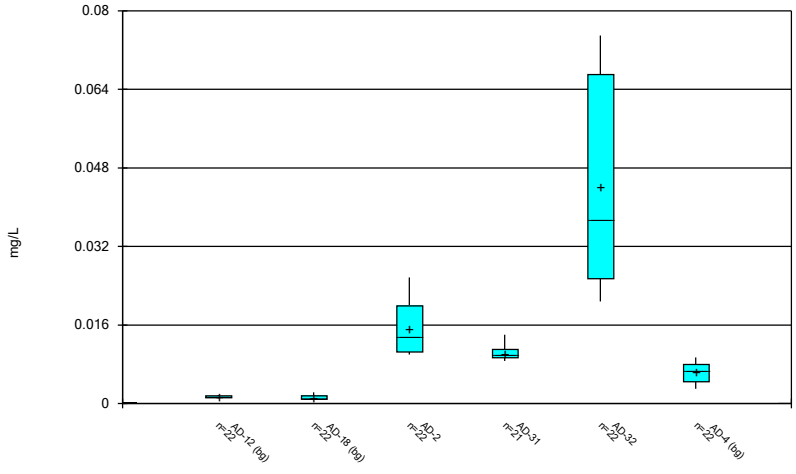
Box & Whiskers Plot



Constituent: Chromium, total Analysis Run 2/20/2023 2:22 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

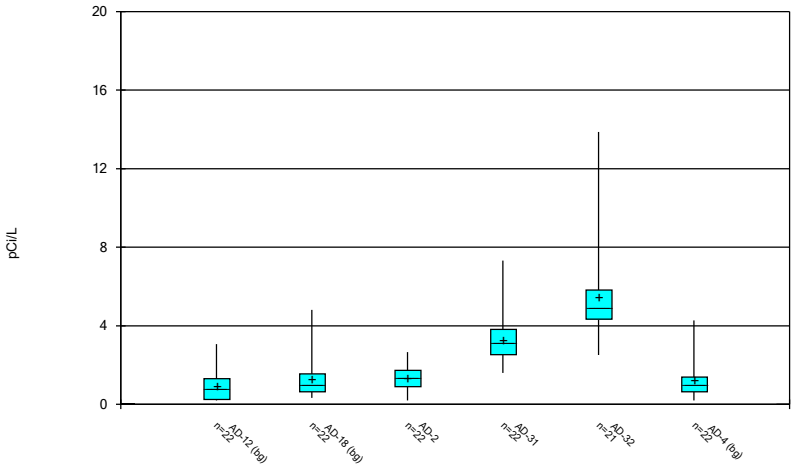
Box & Whiskers Plot



Constituent: Cobalt, total Analysis Run 2/20/2023 2:22 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

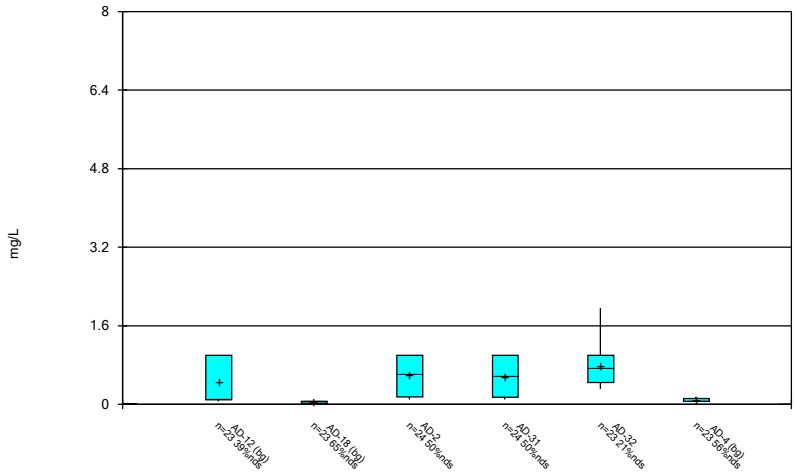
Box & Whiskers Plot



Constituent: Combined Radium 226 + 228 Analysis Run 2/20/2023 2:22 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

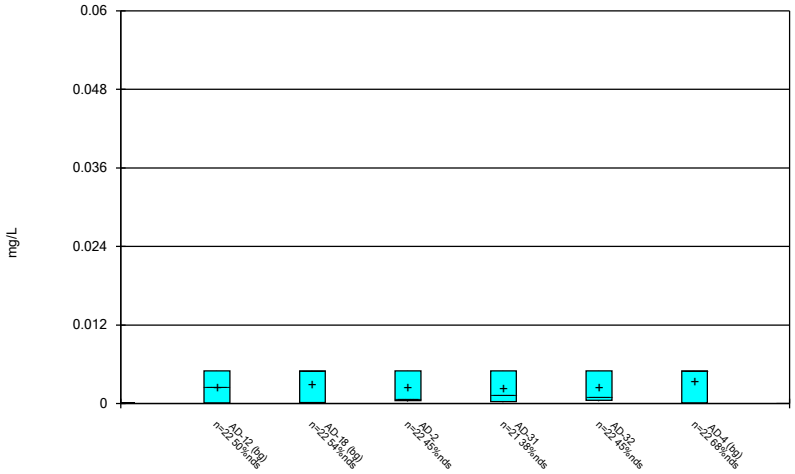
Box & Whiskers Plot



Constituent: Fluoride, total Analysis Run 2/20/2023 2:22 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

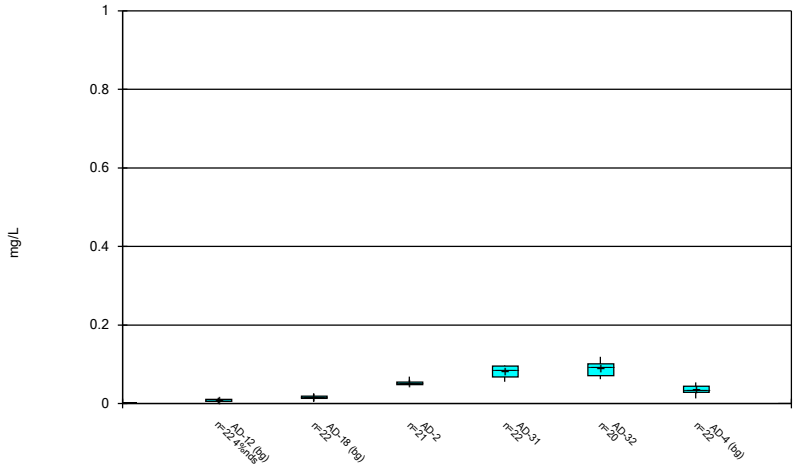
Box & Whiskers Plot



Constituent: Lead, total Analysis Run 2/20/2023 2:22 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

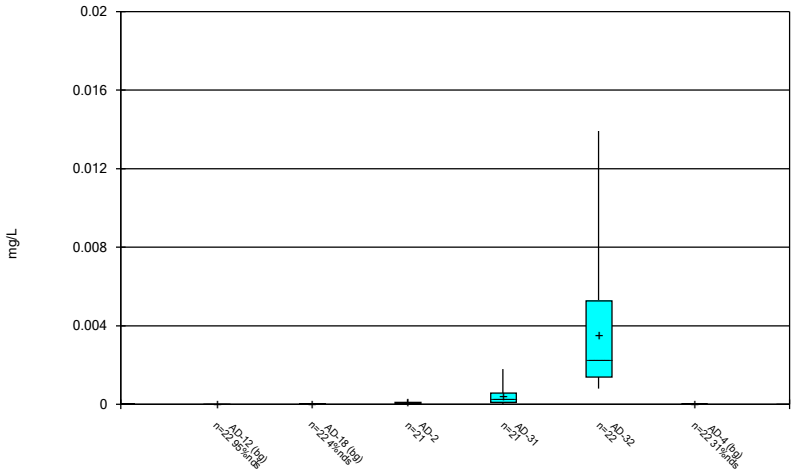
Box & Whiskers Plot



Constituent: Lithium, total Analysis Run 2/20/2023 2:22 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

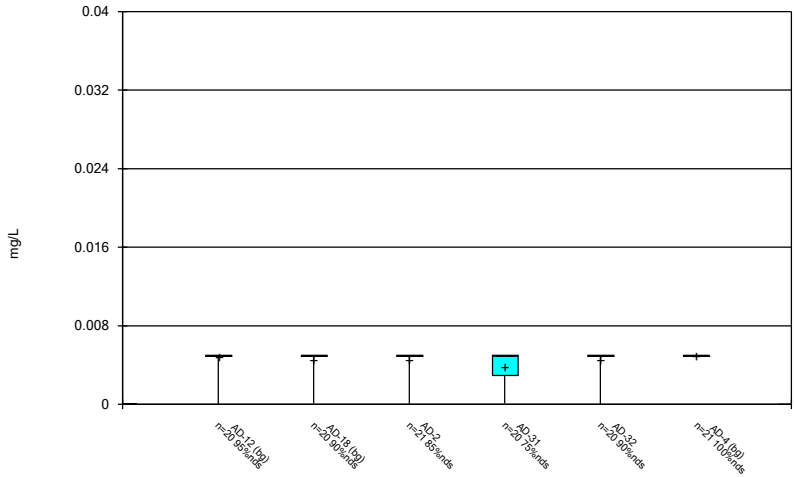
Box & Whiskers Plot



Constituent: Mercury, total Analysis Run 2/20/2023 2:22 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

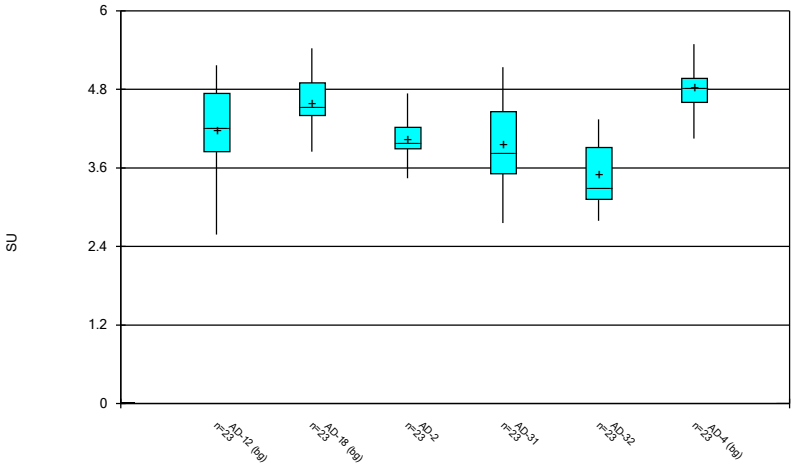
Box & Whiskers Plot



Constituent: Molybdenum, total Analysis Run 2/20/2023 2:22 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

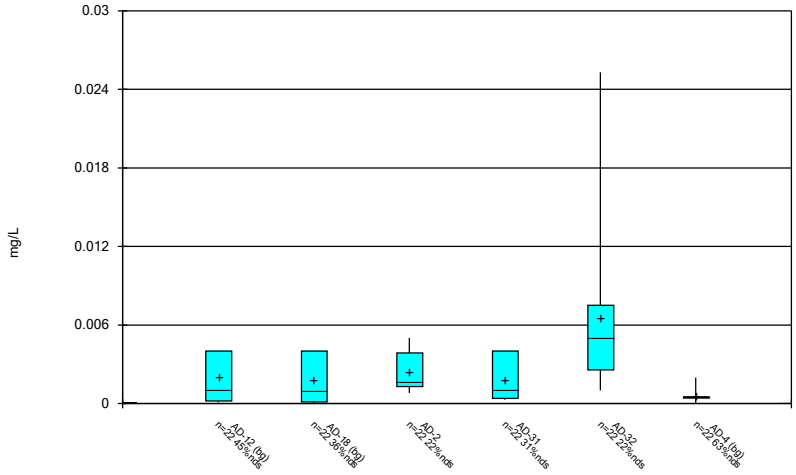
Box & Whiskers Plot



Constituent: pH, field Analysis Run 2/20/2023 2:22 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

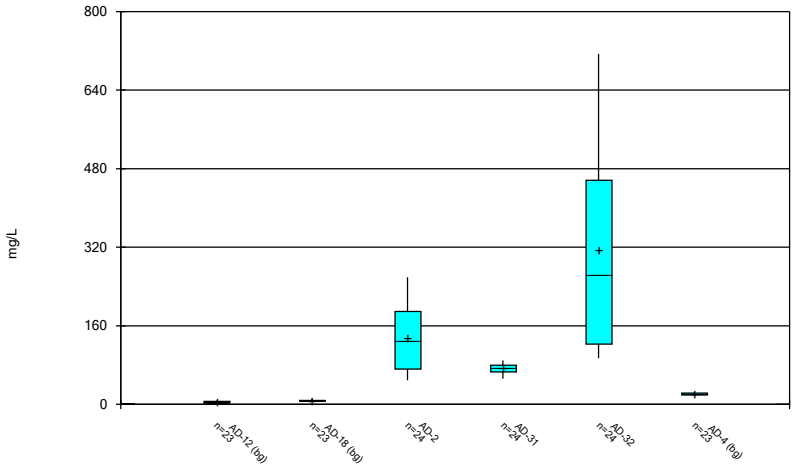
Box & Whiskers Plot



Constituent: Selenium, total Analysis Run 2/20/2023 2:22 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

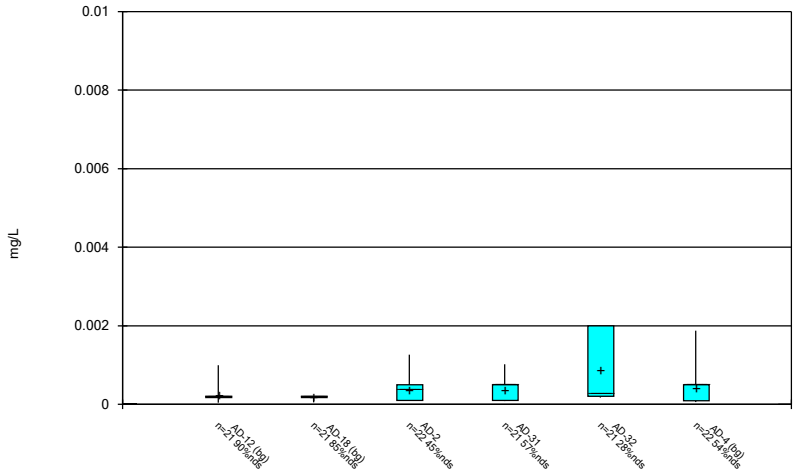
Box & Whiskers Plot



Constituent: Sulfate, total Analysis Run 2/20/2023 2:22 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

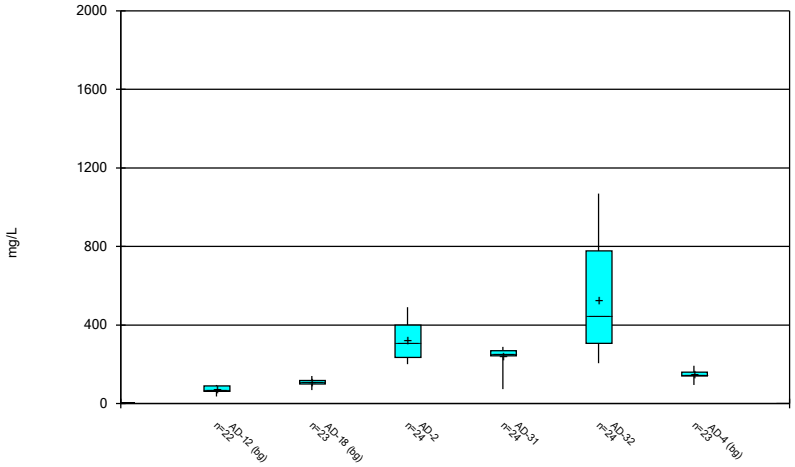
Sanitas™ v.9.6.36 . UG

Box & Whiskers Plot



Constituent: Thallium, total Analysis Run 2/20/2023 2:22 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Box & Whiskers Plot



Constituent: Total Dissolved Solids Analysis Run 2/20/2023 2:22 PM View: Descriptive
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

FIGURE C

Outlier Summary and Tukey's Outlier Test

Outlier Summary

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP Printed 2/20/2023, 2:28 PM

	AD-31 Arsenic, total (mg/L)	AD-31 Barium, total (mg/L)	AD-31 Beryllium, total (mg/L)	AD-31 Calcium, total (mg/L)	AD-31 Chromium, total (mg/L)	AD-31 Cobalt, total (mg/L)	AD-32 Combined Radium 226 + 228 (pCi/L)	AD-32 Fluoride, total (mg/L)	AD-31 Lead, total (mg/L)	AD-2 Lithium, total (mg/L)
5/11/2016	0.093 (o)	0.712 (o)	0.01 (o)	10.4 (o)	0.212 (o)	0.05 (o)			0.057 (o)	<0.001 (o)
9/7/2016										
10/12/2016							17.32 (o)			
11/14/2016					0.03 (o)					
3/21/2018								7.2 (o)		
2/27/2019										
2/28/2019										
5/21/2019										
5/22/2019										
5/23/2019										

	AD-32 Lithium, total (mg/L)	AD-2 Mercury, total (mg/L)	AD-31 Mercury, total (mg/L)	AD-12 Molybdenum, total (mg/L)	AD-18 Molybdenum, total (mg/L)	AD-2 Molybdenum, total (mg/L)	AD-31 Molybdenum, total (mg/L)	AD-32 Molybdenum, total (mg/L)	AD-4 Molybdenum, total (mg/L)	AD-12 Thallium, total (mg/L)
5/11/2016	0.016 (o)		0.001797 (o)							
9/7/2016		0.000675 (o)								
10/12/2016	0.972 (o)									
11/14/2016										
3/21/2018										
2/27/2019				<0.04 (o)						<0.01 (o)
2/28/2019					<0.04 (o)		<0.04 (o)	<0.04 (o)		
5/21/2019				<0.04 (o)				<0.04 (o)		
5/22/2019						<0.04 (o)				
5/23/2019					<0.04 (o)		<0.04 (o)		<0.04 (o)	

	AD-18 Thallium, total (mg/L)	AD-31 Thallium, total (mg/L)	AD-32 Thallium, total (mg/L)	AD-12 Total Dissolved Solids (mg/L)
5/11/2016				
9/7/2016				
10/12/2016				
11/14/2016				
3/21/2018				<5 (o)
2/27/2019				
2/28/2019	<0.01 (o)	<0.01 (o)	<0.01 (o)	
5/21/2019				
5/22/2019				
5/23/2019				

Tukey's Outlier Test - All Results (No Significant)

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP Printed 2/20/2023, 9:15 AM

Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distrib...	Normality Test
pH, field (SU)	AD-12 (bg)	No	n/a	n/a	NP	NaN	22	4.145	0.6423	x^2	ShapiroWilk
pH, field (SU)	AD-18 (bg)	No	n/a	n/a	NP	NaN	22	4.6	0.4076	ln(x)	ShapiroWilk
pH, field (SU)	AD-2	No	n/a	n/a	NP	NaN	22	4.036	0.3423	normal	ShapiroWilk
pH, field (SU)	AD-31	No	n/a	n/a	NP	NaN	22	3.95	0.6207	ln(x)	ShapiroWilk
pH, field (SU)	AD-32	No	n/a	n/a	NP	NaN	22	3.488	0.4512	ln(x)	ShapiroWilk
pH, field (SU)	AD-4 (bg)	No	n/a	n/a	NP	NaN	22	4.826	0.3907	normal	ShapiroWilk

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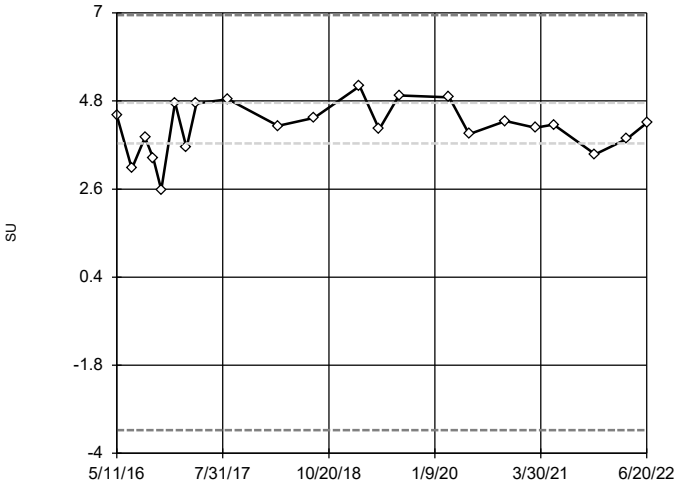
Tukey's Outlier Screening

AD-12 (bg)



n = 22

No outliers found. Tukey's method selected by user.

Data were square transformed to achieve best W statistic (graph shown in original units).

High cutoff = 6.946, low cutoff = -3.419, based on IQR multiplier of 3.

Constituent: pH, field Analysis Run 2/20/2023 9:14 AM View: Outlier Testing
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Tukey's Outlier Screening

AD-18 (bg)

n = 22

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

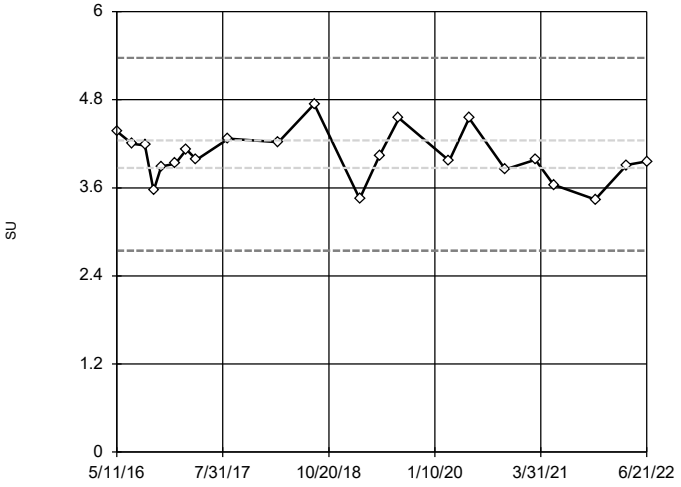
High cutoff = 7.127, low cutoff = 3.058, based on IQR multiplier of 3.

Constituent: pH, field Analysis Run 2/20/2023 9:14 AM View: Outlier Testing
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Tukey's Outlier Screening

AD-2



n = 22

No outliers found. Tukey's method selected by user.

Ladder of Powers transformations did not improve normality; analysis run on raw data.

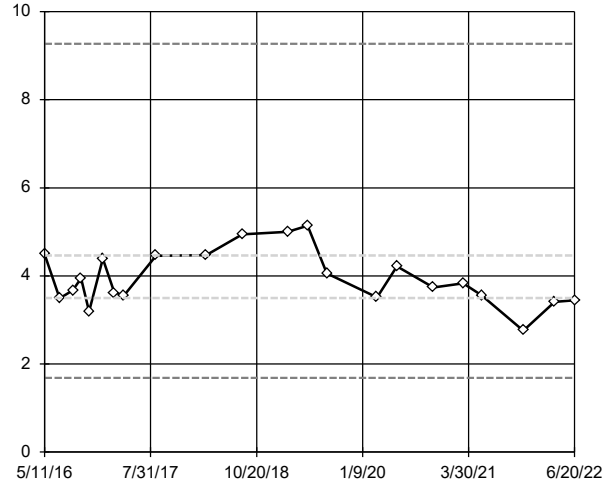
High cutoff = 5.37, low cutoff = 2.745, based on IQR multiplier of 3.

Constituent: pH, field Analysis Run 2/20/2023 9:14 AM View: Outlier Testing
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Tukey's Outlier Screening

AD-31



n = 22

No outliers found. Tukey's method selected by user.

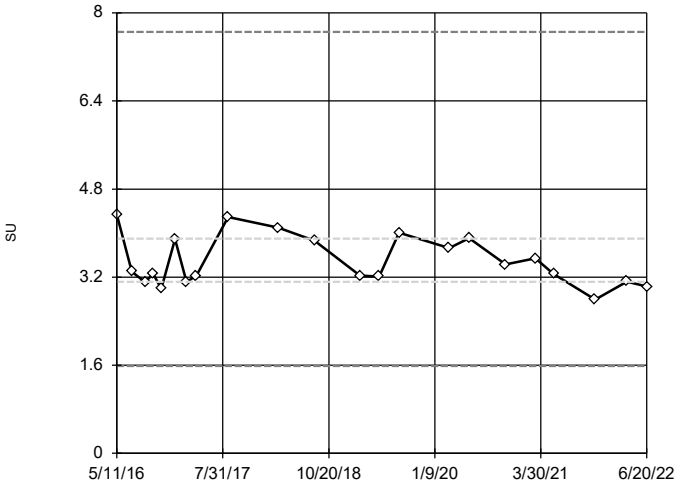
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 9.27, low cutoff = 1.686, based on IQR multiplier of 3.

Constituent: pH, field Analysis Run 2/20/2023 9:14 AM View: Outlier Testing
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Tukey's Outlier Screening

AD-32



n = 22

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

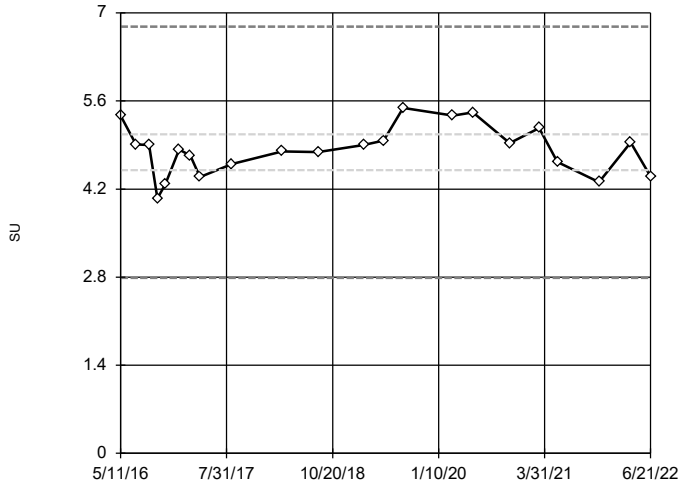
High cutoff = 7.654, low cutoff = 1.587, based on IQR multiplier of 3.

Constituent: pH, field Analysis Run 2/20/2023 9:14 AM View: Outlier Testing
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Tukey's Outlier Screening

AD-4 (bg)



n = 22

No outliers found. Tukey's method selected by user.

Ladder of Powers transformations did not improve normality; analysis run on raw data.

High cutoff = 6.78, low cutoff = 2.79, based on IQR multiplier of 3.

Constituent: pH, field Analysis Run 2/20/2023 9:14 AM View: Outlier Testing
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Tukey's Outlier Analysis - Upgradient Wells - Significant Results

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP Printed 2/20/2023, 9:21 AM

Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distrib...	Normality Test
Fluoride, total (mg/L)	**AD-12,AD-18,AD-4**	**Yes**	**0.2565,0.213,0.02,0.02,0.02,0.02,0.02,0.02,0.01**	**n/a w/combined bg**	**NP**	**NaN**	**69**	**0.07246**	**0.04084**	**x^(1/3)**	**ShapiroFrancia**

Interwell and AIV Constituent Outlier Analysis - All Results

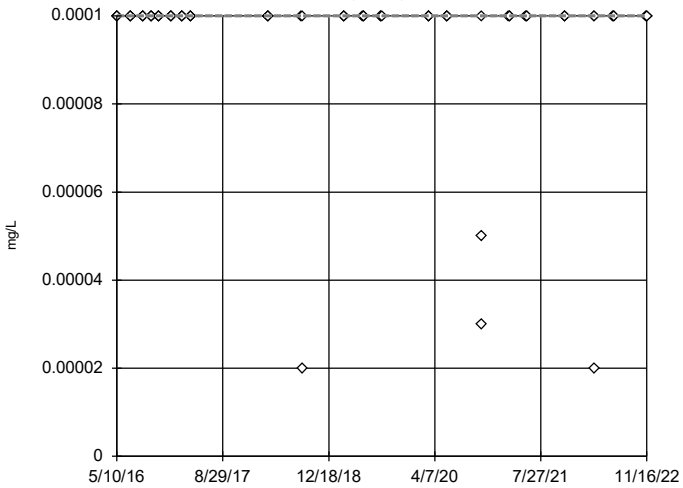
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP Printed 2/20/2023, 9:21 AM

Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distrib...	Normality Test
Antimony, total (mg/L)	AD-12,AD-18,AD-4	n/a	n/a	n/a w/combined bg	NP	NaN	66	0.00009576	0.0000171	unknown	ShapiroFrancia
Arsenic, total (mg/L)	AD-12,AD-18,AD-4	No	n/a	n/a w/combined bg	NP	NaN	66	0.001555	0.001863	ln(x)	ShapiroFrancia
Barium, total (mg/L)	AD-12,AD-18,AD-4	No	n/a	n/a w/combined bg	NP	NaN	66	0.07702	0.04315	normal	ShapiroFrancia
Beryllium, total (mg/L)	AD-12,AD-18,AD-4	No	n/a	n/a w/combined bg	NP	NaN	66	0.0003754	0.0003455	ln(x)	ShapiroFrancia
Boron, total (mg/L)	AD-12,AD-18,AD-4	No	n/a	n/a w/combined bg	NP	NaN	69	0.02358	0.01105	x^(1/3)	ShapiroFrancia
Cadmium, total (mg/L)	AD-12,AD-18,AD-4	No	n/a	n/a w/combined bg	NP	NaN	66	0.0000409	0.00003793	ln(x)	ShapiroFrancia
Calcium, total (mg/L)	AD-12,AD-18,AD-4	No	n/a	n/a w/combined bg	NP	NaN	69	0.9382	0.8872	ln(x)	ShapiroFrancia
Chloride, total (mg/L)	AD-12,AD-18,AD-4	No	n/a	n/a w/combined bg	NP	NaN	69	5.988	1.681	sqrt(x)	ShapiroFrancia
Chromium, total (mg/L)	AD-12,AD-18,AD-4	No	n/a	n/a w/combined bg	NP	NaN	66	0.0008007	0.001047	ln(x)	ShapiroFrancia
Cobalt, total (mg/L)	AD-12,AD-18,AD-4	No	n/a	n/a w/combined bg	NP	NaN	66	0.002953	0.002642	ln(x)	ShapiroFrancia
Combined Radium 226 + 228 (pCi/L)	AD-12,AD-18,AD-4	No	n/a	n/a w/combined bg	NP	NaN	66	1.122	0.9215	ln(x)	ShapiroFrancia
Fluoride, total (mg/L)	**AD-12,AD-18,AD-4**	**Yes**	**0.2565,0.213,0.02,0.02,0.02,0.02,0.02,0.02,0.01**	**n/a w/combined bg**	**NP**	**NaN**	**69**	**0.07246**	**0.04084**	**x^(1/3)**	**ShapiroFrancia**
Lead, total (mg/L)	AD-12,AD-18,AD-4	No	n/a	n/a w/combined bg	NP	NaN	66	0.002939	0.002421	ln(x)	ShapiroFrancia
Lithium, total (mg/L)	AD-12,AD-18,AD-4	No	n/a	n/a w/combined bg	NP	NaN	66	0.01992	0.01362	x^(1/3)	ShapiroFrancia
Mercury, total (mg/L)	AD-12,AD-18,AD-4	No	n/a	n/a w/combined bg	NP	NaN	66	0.00001066	0.00001016	ln(x)	ShapiroFrancia
Molybdenum, total (mg/L)	AD-12,AD-18,AD-4	n/a	n/a	n/a w/combined bg	NP	NaN	66	0.004781	0.001013	unknown	ShapiroFrancia
Selenium, total (mg/L)	AD-12,AD-18,AD-4	No	n/a	n/a w/combined bg	NP	NaN	66	0.0005273	0.0005209	ln(x)	ShapiroFrancia
Sulfate, total (mg/L)	AD-12,AD-18,AD-4	No	n/a	n/a w/combined bg	NP	NaN	69	10.9	7.382	ln(x)	ShapiroFrancia
Thallium, total (mg/L)	AD-12,AD-18,AD-4	n/a	n/a	n/a w/combined bg	NP	NaN	66	0.0002241	0.0002495	unknown	ShapiroFrancia
Total Dissolved Solids (mg/L)	AD-12,AD-18,AD-4	No	n/a	n/a w/combined bg	NP	NaN	69	108.6	37.13	normal	ShapiroFrancia

Sanitas™ v.9.6.36 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 66

No outliers found. Tukey's method selected by user.

Data were square transformed to achieve best W statistic (graph shown in original units).

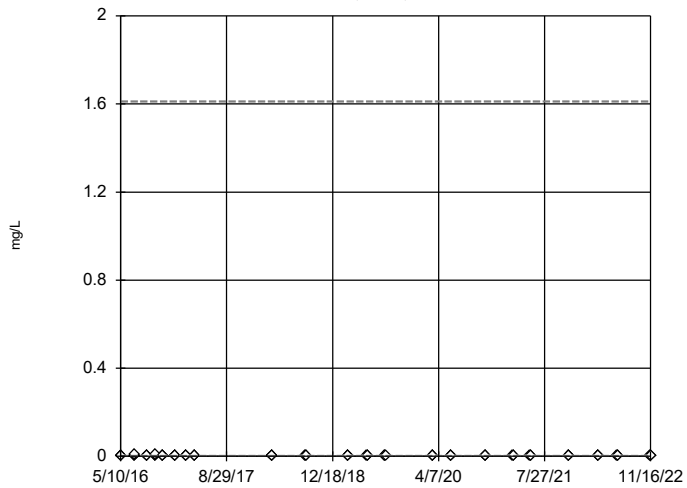
The results were invalidated, because the lower and upper quartiles are equal.

Constituent: Antimony, total Analysis Run 2/20/2023 9:16 AM View: Outlier Testing
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 66

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

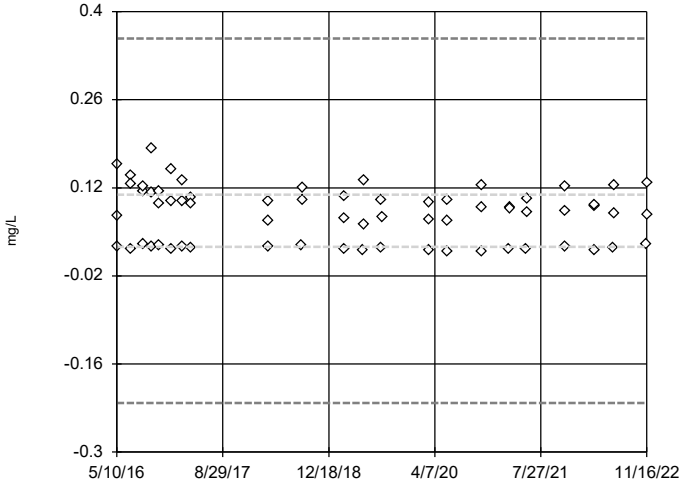
High cutoff = 1.611, low cutoff = 2.7e-7, based on IQR multiplier of 3.

Constituent: Arsenic, total Analysis Run 2/20/2023 9:16 AM View: Outlier Testing
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 66

No outliers found. Tukey's method selected by user.

Ladder of Powers transformations did not improve normality; analysis run on raw data.

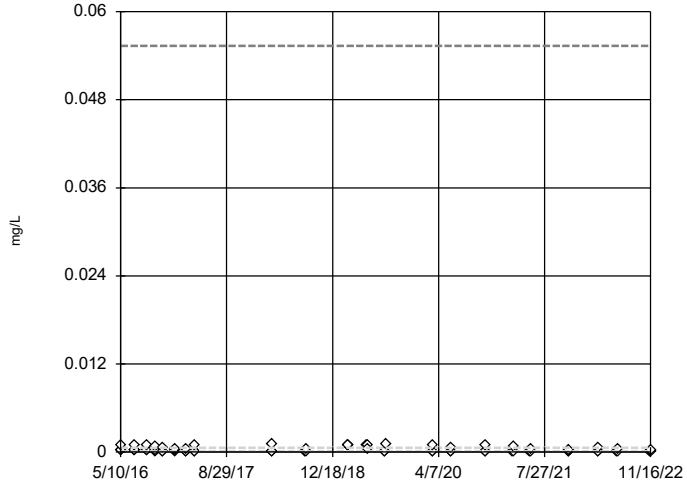
High cutoff = 0.3573, low cutoff = -0.222, based on IQR multiplier of 3.

Constituent: Barium, total Analysis Run 2/20/2023 9:16 AM View: Outlier Testing
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 66

No outliers found. Tukey's method selected by user.

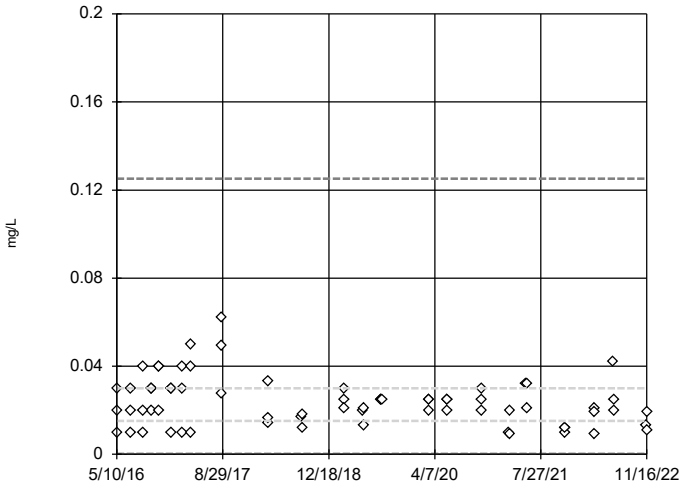
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.05534, low cutoff = 0.00000135, based on IQR multiplier of 3.

Constituent: Beryllium, total Analysis Run 2/20/2023 9:16 AM View: Outlier Testing
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 69

No outliers found. Tukey's method selected by user.

Data were cube root transformed to achieve best W statistic (graph shown in original units).

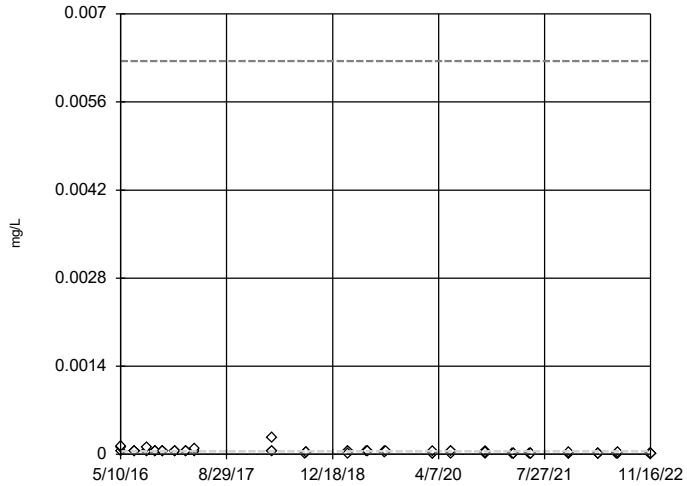
High cutoff = 0.1252, low cutoff = 0.000195, based on IQR multiplier of 3.

Constituent: Boron, total Analysis Run 2/20/2023 9:16 AM View: Outlier Testing
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 66

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

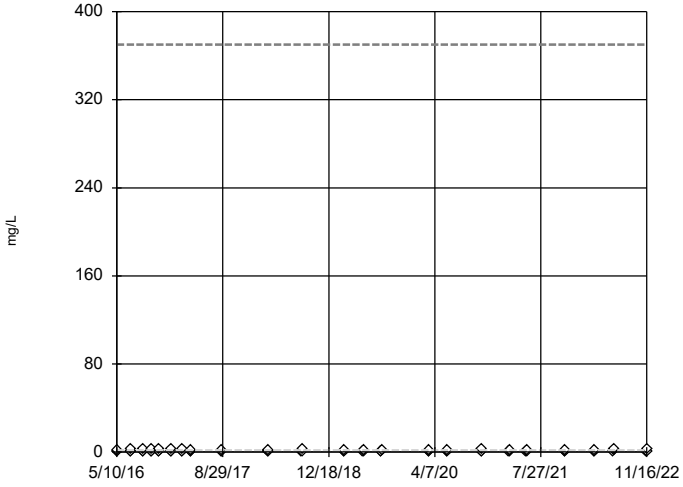
High cutoff = 0.00625, low cutoff = 8.0e-8, based on IQR multiplier of 3.

Constituent: Cadmium, total Analysis Run 2/20/2023 9:16 AM View: Outlier Testing
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 69

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

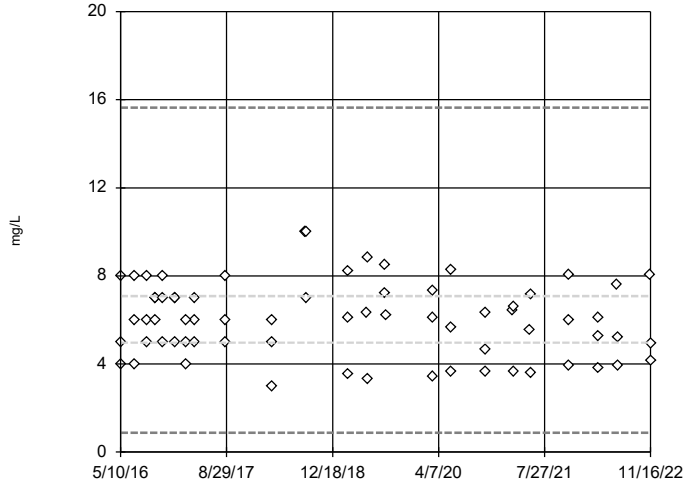
High cutoff = 370, low cutoff = 0.001325, based on IQR multiplier of 3.

Constituent: Calcium, total Analysis Run 2/20/2023 9:16 AM View: Outlier Testing
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 69

No outliers found. Tukey's method selected by user.

Data were square root transformed to achieve best W statistic (graph shown in original units).

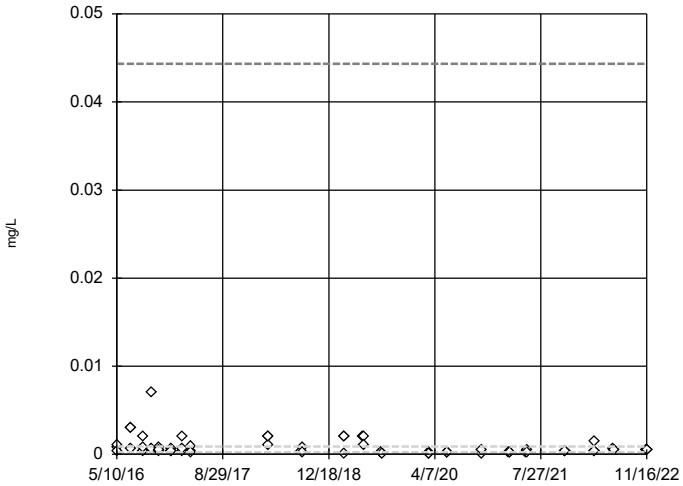
High cutoff = 15.64, low cutoff = 0.8742, based on IQR multiplier of 3.

Constituent: Chloride, total Analysis Run 2/20/2023 9:16 AM View: Outlier Testing
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 66

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.04433, low cutoff = 0.00000479, based on IQR multiplier of 3.

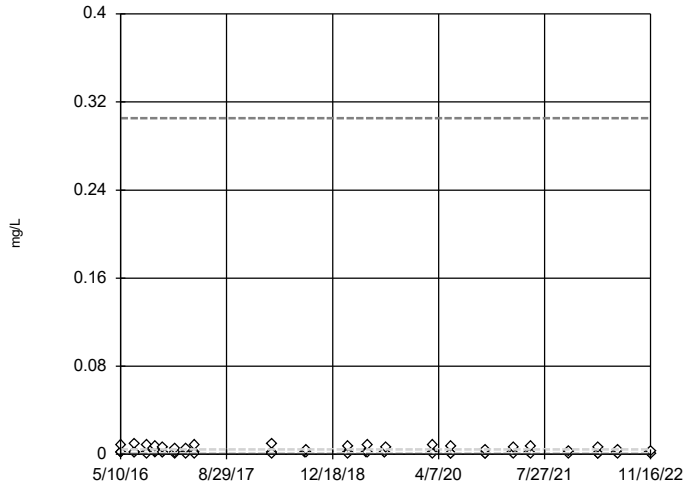
Constituent: Chromium, total Analysis Run 2/20/2023 9:16 AM View: Outlier Testing

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 66

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.3054, low cutoff = 0.0000161, based on IQR multiplier of 3.

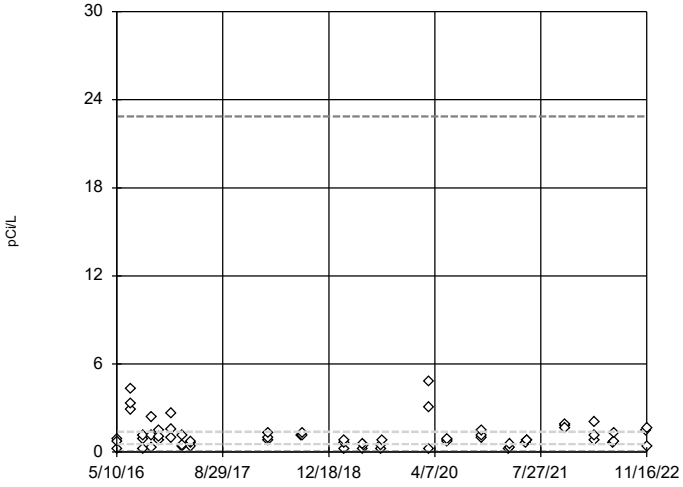
Constituent: Cobalt, total Analysis Run 2/20/2023 9:16 AM View: Outlier Testing

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 66

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 22.87, low cutoff = 0.03315, based on IQR multiplier of 3.

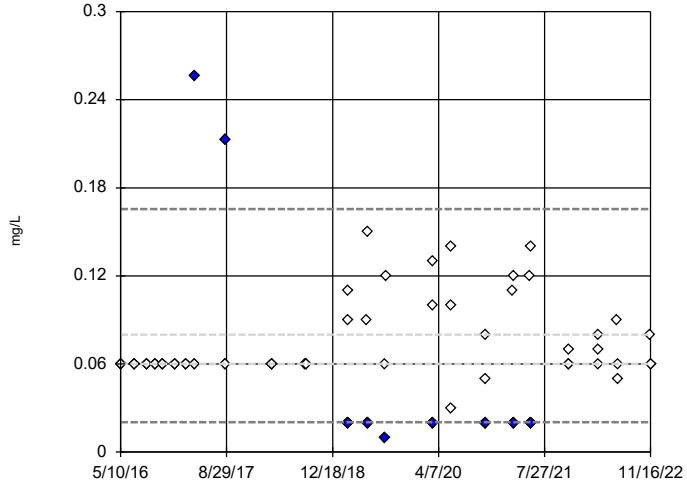
Constituent: Combined Radium 226 + 228 Analysis Run 2/20/2023 9:16 AM View: Outlier Testing

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 69

Outliers are drawn as solid.
Tukey's method selected by user.

Data were cube root transformed to achieve best W statistic (graph shown in original units).

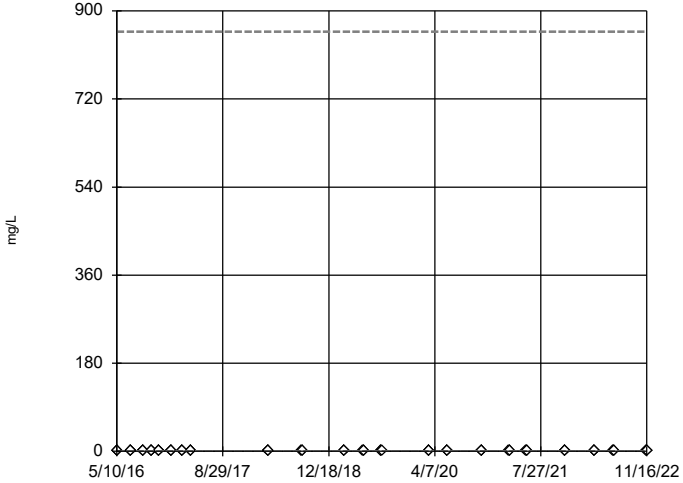
High cutoff = 0.1655, low cutoff = 0.02041, based on IQR multiplier of 3.

Constituent: Fluoride, total Analysis Run 2/20/2023 9:16 AM View: Outlier Testing

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 66

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 857.3, low cutoff = 5.2e-10, based on IQR multiplier of 3.

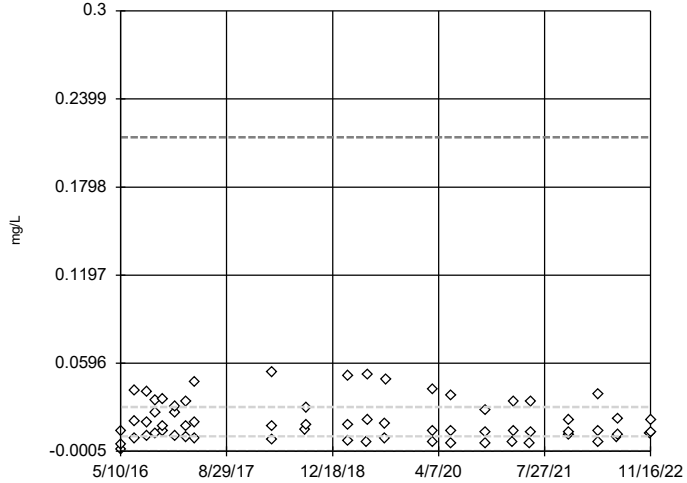
Constituent: Lead, total Analysis Run 2/20/2023 9:16 AM View: Outlier Testing

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 66

No outliers found. Tukey's method selected by user.

Data were cube root transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.2138, low cutoff = -0.0004172, based on IQR multiplier of 3.

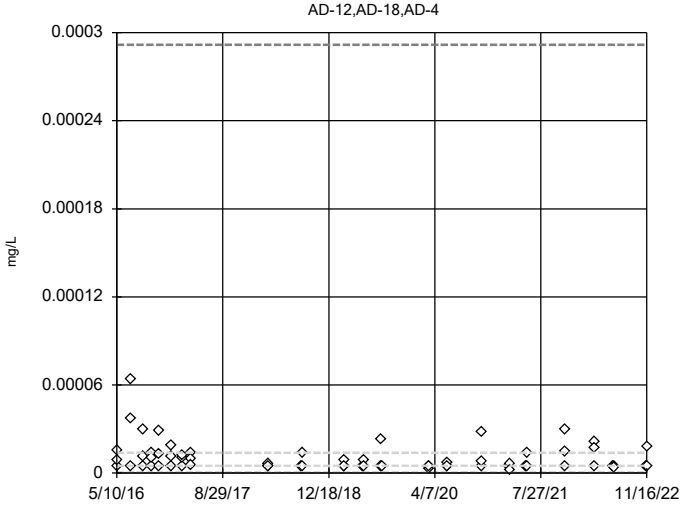
Constituent: Lithium, total Analysis Run 2/20/2023 9:17 AM View: Outlier Testing

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 66

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.0002917, low cutoff = 2.4e-7, based on IQR multiplier of 3.

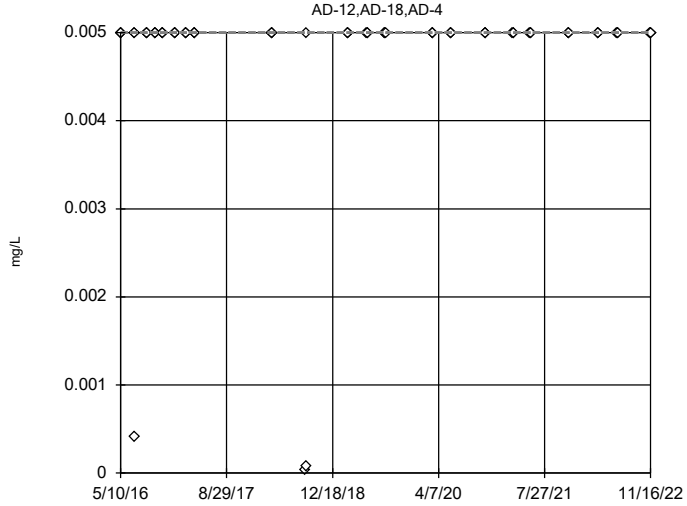
Constituent: Mercury, total Analysis Run 2/20/2023 9:17 AM View: Outlier Testing

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 66

No outliers found. Tukey's method selected by user.

Data were square root transformed to achieve best W statistic (graph shown in original units).

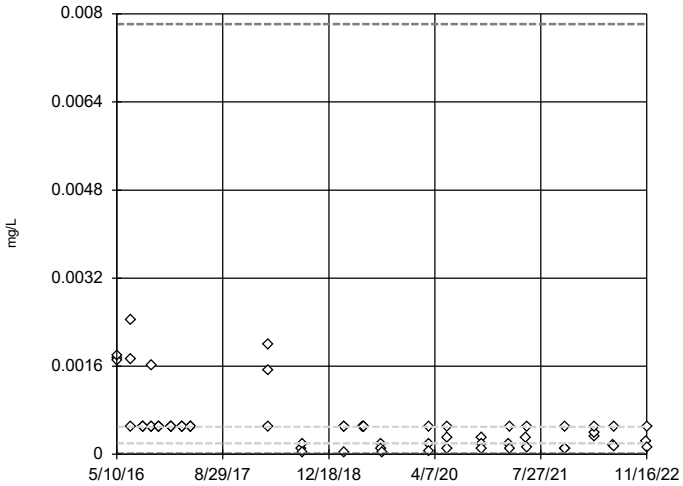
The results were invalidated, because the lower and upper quartiles are equal.

Constituent: Molybdenum, total Analysis Run 2/20/2023 9:17 AM View: Outlier Testing

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 66

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.007813, low cutoff = 0.0000128, based on IQR multiplier of 3.

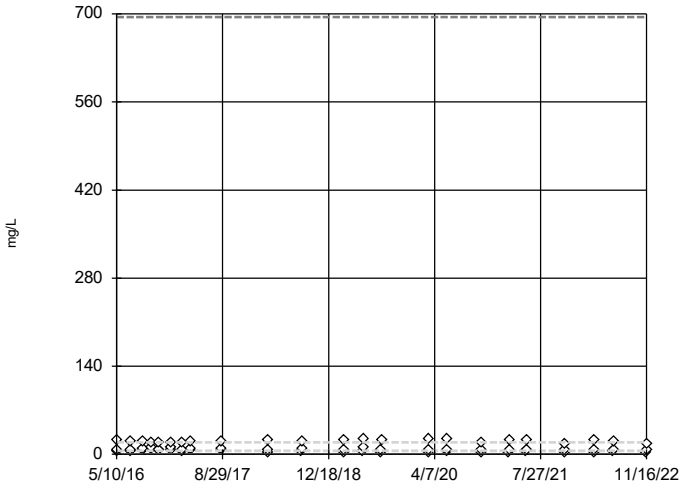
Constituent: Selenium, total Analysis Run 2/20/2023 9:17 AM View: Outlier Testing

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 69

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 695, low cutoff = 0.1565, based on IQR multiplier of 3.

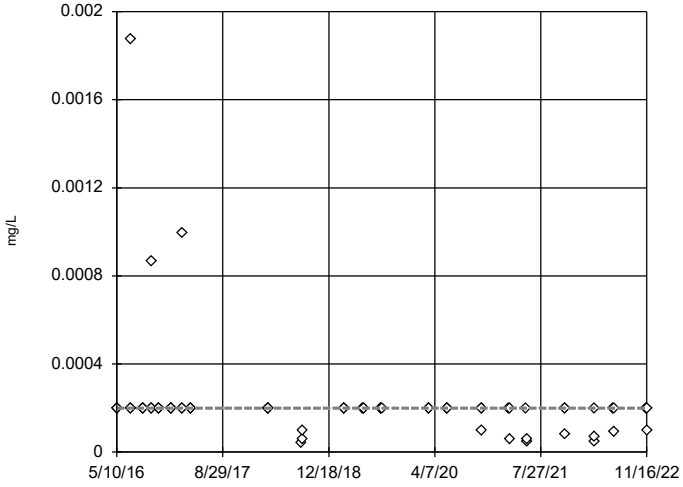
Constituent: Sulfate, total Analysis Run 2/20/2023 9:17 AM View: Outlier Testing

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 66

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

The results were invalidated, because the lower and upper quartiles are equal.

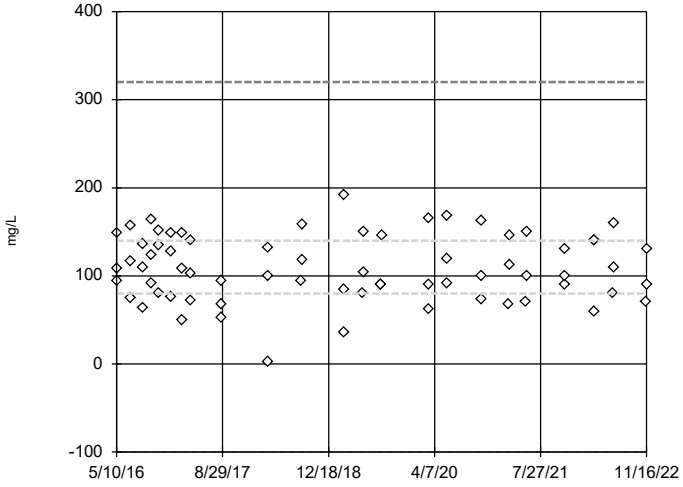
Constituent: Thallium, total Analysis Run 2/20/2023 9:17 AM View: Outlier Testing

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 69

No outliers found. Tukey's method selected by user.

Ladder of Powers transformations did not improve normality; analysis run on raw data.

High cutoff = 320, low cutoff = -100, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids Analysis Run 2/20/2023 9:17 AM View: Outlier Testing

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

FIGURE D

Mann-Whitney

Mann Whitney - All Results (No Significant)

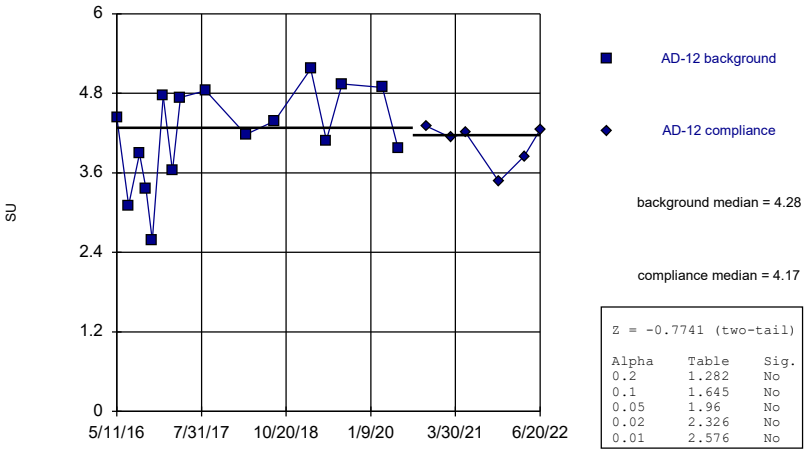
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP Printed 2/14/2023, 12:57 PM

Constituent	Well	Calc.	0.01	Sig.	Method
pH, field (SU)	AD-12 (bg)	-0.7741	No	No	Mann-W
pH, field (SU)	AD-18 (bg)	-1.771	No	No	Mann-W
pH, field (SU)	AD-2	-2.36	No	No	Mann-W
pH, field (SU)	AD-31	-2.286	No	No	Mann-W
pH, field (SU)	AD-32	-1.623	No	No	Mann-W
pH, field (SU)	AD-4 (bg)	-0.4057	No	No	Mann-W

Sanitas™ v.9.6.36 . UG

Mann-Whitney (Wilcoxon Rank Sum)

AD-12 (bg)



background median = 4.28

compliance median = 4.17

Z = -0.7741 (two-tail)

Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

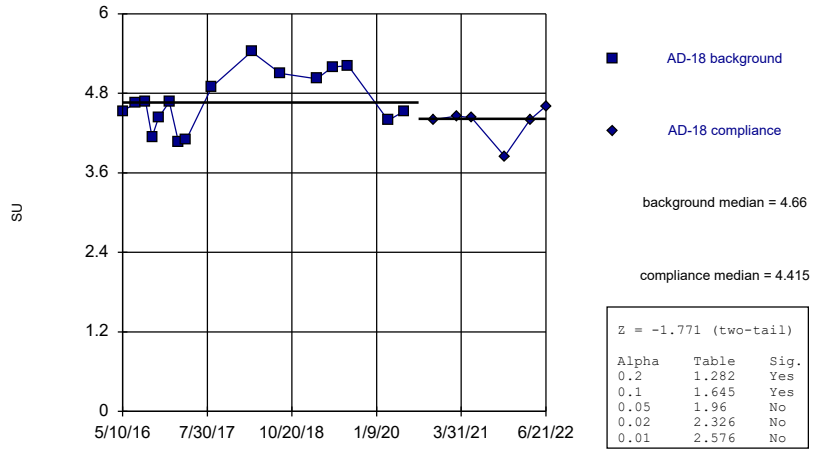
Constituent: pH, field Analysis Run 2/14/2023 12:56 PM View: AIII

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Mann-Whitney (Wilcoxon Rank Sum)

AD-18 (bg)



background median = 4.66

compliance median = 4.415

Z = -1.771 (two-tail)

Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

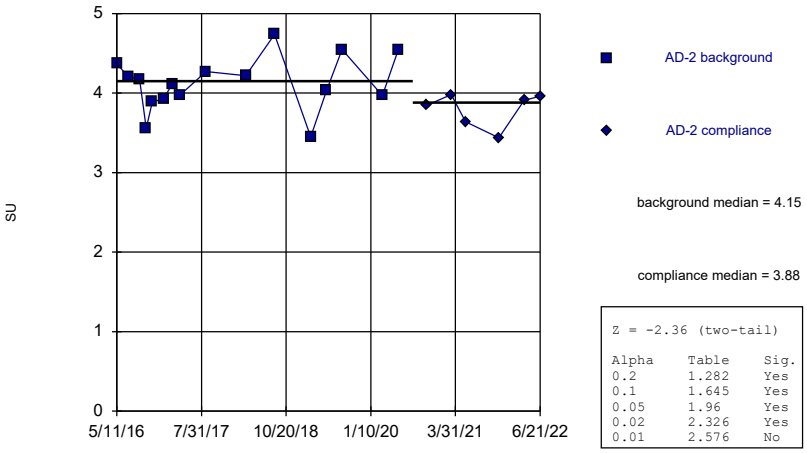
Constituent: pH, field Analysis Run 2/14/2023 12:56 PM View: AIII

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Mann-Whitney (Wilcoxon Rank Sum)

AD-2



background median = 4.15

compliance median = 3.88

Z = -2.36 (two-tail)

Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	Yes
0.01	2.576	No

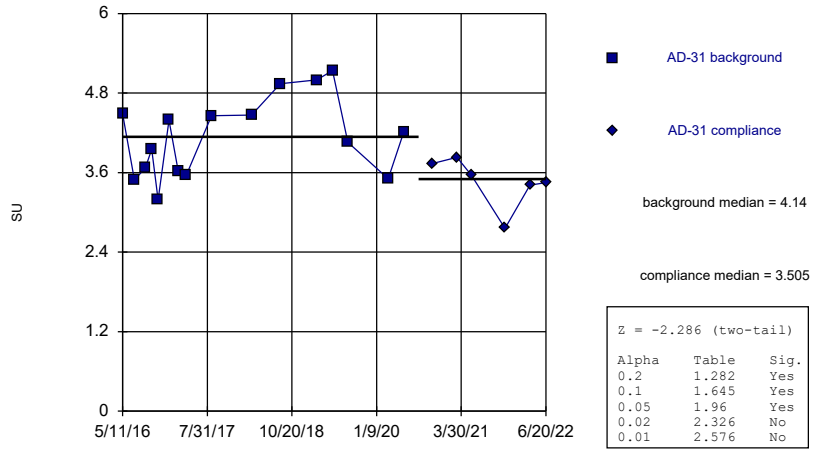
Constituent: pH, field Analysis Run 2/14/2023 12:56 PM View: AIII

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Mann-Whitney (Wilcoxon Rank Sum)

AD-31



background median = 4.14

compliance median = 3.505

Z = -2.286 (two-tail)

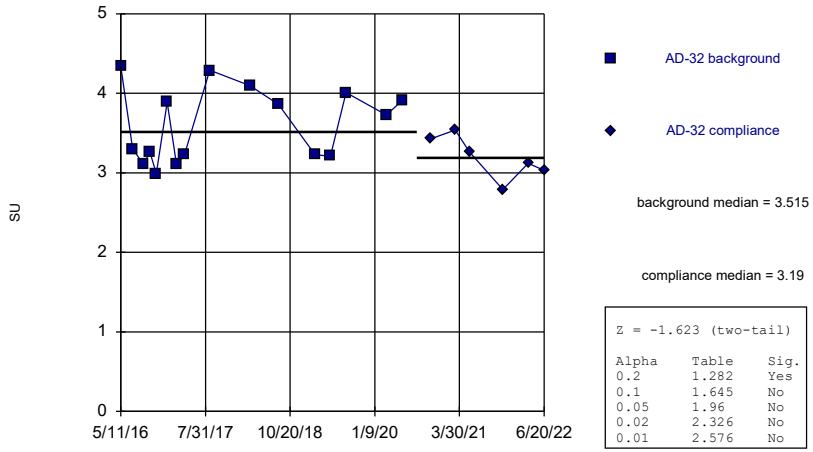
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	No
0.01	2.576	No

Constituent: pH, field Analysis Run 2/14/2023 12:56 PM View: AIII

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Mann-Whitney (Wilcoxon Rank Sum)

AD-32



background median = 3.515

compliance median = 3.19

Z = -1.623 (two-tail)

Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

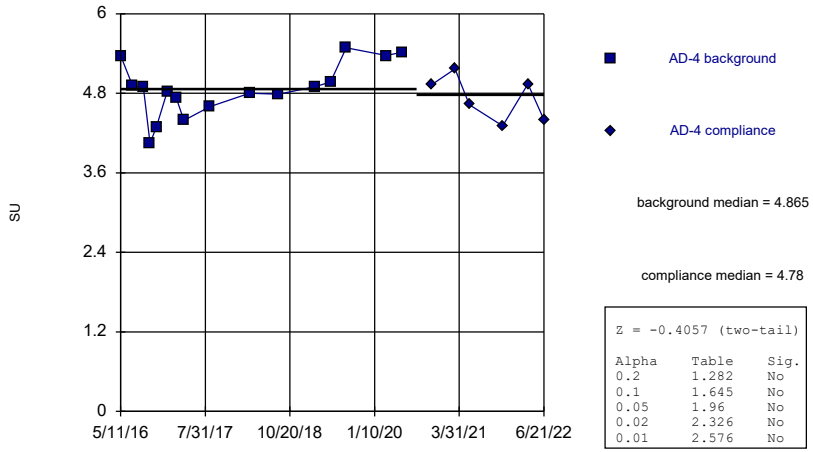
Constituent: pH, field Analysis Run 2/14/2023 12:56 PM View: AIII

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Mann-Whitney (Wilcoxon Rank Sum)

AD-4 (bg)



background median = 4.865

compliance median = 4.78

Z = -0.4057 (two-tail)

Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: pH, field Analysis Run 2/14/2023 12:56 PM View: AIII

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

FIGURE E

Intrawell PL

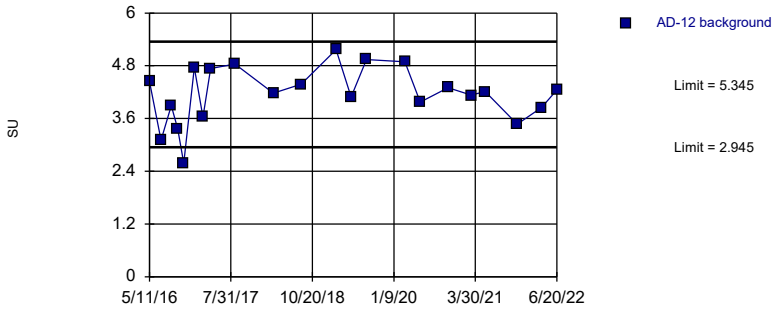
Intrawell Prediction Limits

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP Printed 2/20/2023, 9:53 AM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Wells	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
pH, field (SU)	AD-12	5.345	2.945	n/a	1 future	n/a	22	n/a	4.145	0.6423	0	None	No	0.001253	Param Intra 1 of 2
pH, field (SU)	AD-18	5.361	3.838	n/a	1 future	n/a	22	n/a	4.6	0.4076	0	None	No	0.001253	Param Intra 1 of 2
pH, field (SU)	AD-2	4.676	3.397	n/a	1 future	n/a	22	n/a	4.036	0.3423	0	None	No	0.001253	Param Intra 1 of 2
pH, field (SU)	AD-31	5.11	2.791	n/a	1 future	n/a	22	n/a	3.95	0.6207	0	None	No	0.001253	Param Intra 1 of 2
pH, field (SU)	AD-32	4.331	2.645	n/a	1 future	n/a	22	n/a	3.488	0.4512	0	None	No	0.001253	Param Intra 1 of 2
pH, field (SU)	AD-4	5.556	4.096	n/a	1 future	n/a	22	n/a	4.826	0.3907	0	None	No	0.001253	Param Intra 1 of 2

Prediction Limit

Intrawell Parametric, AD-12 (bg)



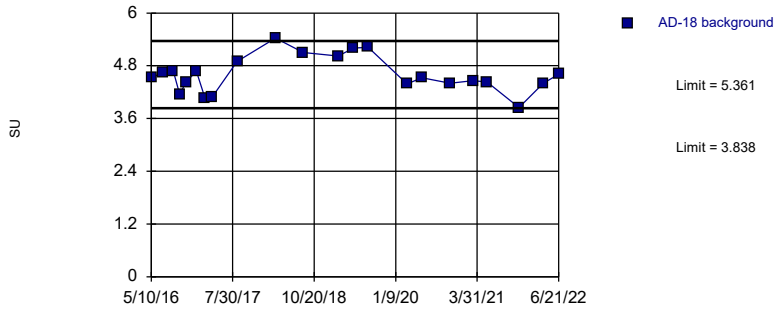
Background Data Summary: Mean=4.145, Std. Dev.=0.6423, n=22. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9666, critical = 0.878. Kappa = 1.869 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: pH, field Analysis Run 2/20/2023 9:52 AM View: AIII
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Prediction Limit

Intrawell Parametric, AD-18 (bg)



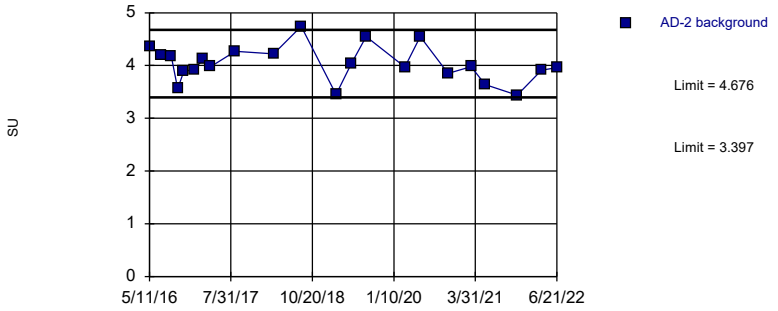
Background Data Summary: Mean=4.6, Std. Dev.=0.4076, n=22. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9632, critical = 0.878. Kappa = 1.869 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: pH, field Analysis Run 2/20/2023 9:52 AM View: AIII
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Prediction Limit

Intrawell Parametric, AD-2



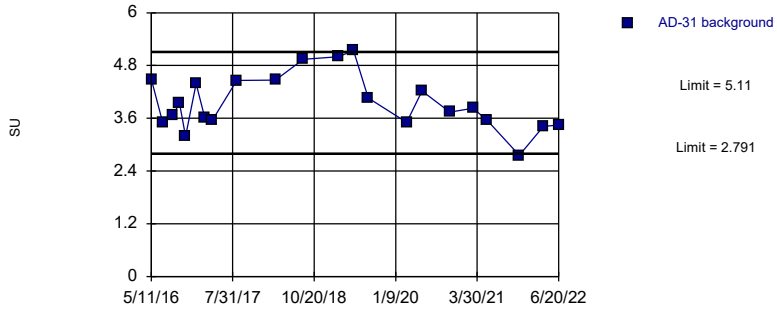
Background Data Summary: Mean=4.036, Std. Dev.=0.3423, n=22. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9682, critical = 0.878. Kappa = 1.869 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: pH, field Analysis Run 2/20/2023 9:52 AM View: AIII
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Prediction Limit

Intrawell Parametric, AD-31

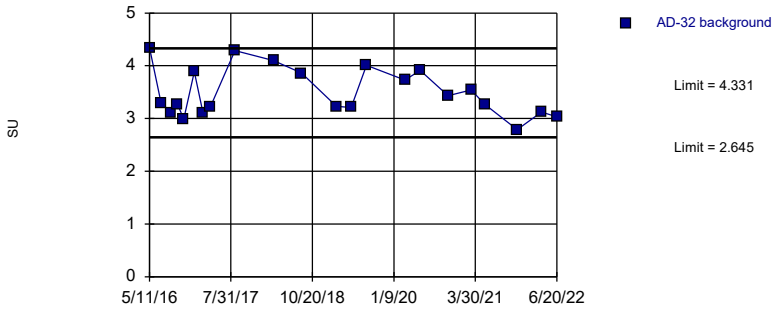


Background Data Summary: Mean=3.95, Std. Dev.=0.6207, n=22. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9557, critical = 0.878. Kappa = 1.869 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: pH, field Analysis Run 2/20/2023 9:52 AM View: AIII
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Prediction Limit

Intrawell Parametric, AD-32



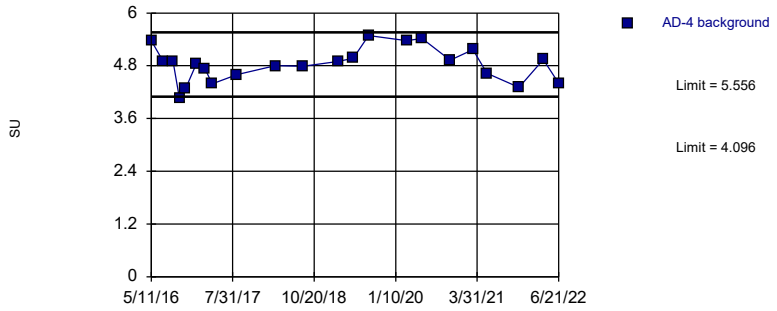
Background Data Summary: Mean=3.488, Std. Dev.=0.4512, n=22. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9221, critical = 0.878. Kappa = 1.869 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: pH, field Analysis Run 2/20/2023 9:52 AM View: AIII
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Prediction Limit

Intrawell Parametric, AD-4 (bg)



Background Data Summary: Mean=4.826, Std. Dev.=0.3907, n=22. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9625, critical = 0.878. Kappa = 1.869 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: pH, field Analysis Run 2/20/2023 9:52 AM View: AIII
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

FIGURE F
Intrawell Trend Test

Trend Tests - Upgradient Wells - Significant Results

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP Printed 2/20/2023, 2:25 PM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Fluoride, total (mg/L)	**AD-12 (bg)**	**-0.08408**	**-145**	**-98**	**Yes**	**23**	**39.13**	**n/a**	**n/a**	**0.01**	**NP**

Trend Tests - Upgradient Wells - All Results

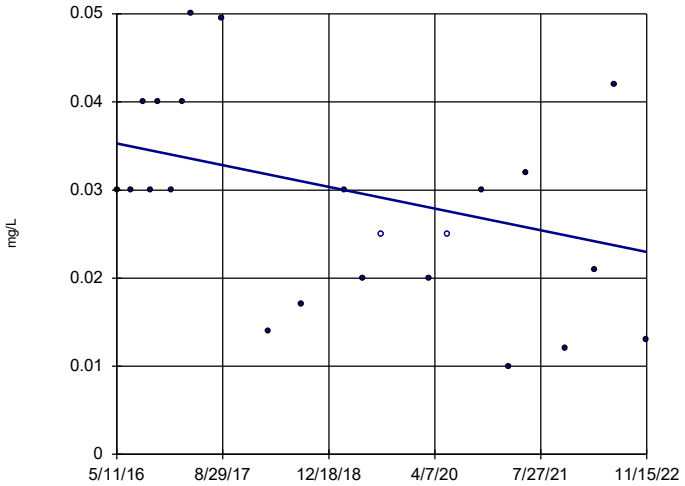
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP Printed 2/20/2023, 2:25 PM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Boron, total (mg/L)	AD-12 (bg)	-0.001889	-65	-98	No	23	8.696	n/a	n/a	0.01	NP
Boron, total (mg/L)	AD-18 (bg)	0.000171	45	98	No	23	26.09	n/a	n/a	0.01	NP
Boron, total (mg/L)	AD-4 (bg)	-0.0007157	-71	-98	No	23	8.696	n/a	n/a	0.01	NP
Calcium, total (mg/L)	AD-12 (bg)	-0.01054	-50	-98	No	23	0	n/a	n/a	0.01	NP
Calcium, total (mg/L)	AD-18 (bg)	-0.02978	-78	-98	No	23	0	n/a	n/a	0.01	NP
Calcium, total (mg/L)	AD-4 (bg)	-0.04432	-32	-98	No	23	0	n/a	n/a	0.01	NP
Chloride, total (mg/L)	AD-12 (bg)	0.09882	51	98	No	23	0	n/a	n/a	0.01	NP
Chloride, total (mg/L)	AD-18 (bg)	-0.3088	-82	-98	No	23	0	n/a	n/a	0.01	NP
Chloride, total (mg/L)	AD-4 (bg)	-0.07949	-46	-98	No	23	0	n/a	n/a	0.01	NP
Fluoride, total (mg/L)	**AD-12 (bg)**	**-0.08408**	**-145**	**-98**	**Yes**	**23**	**39.13**	**n/a**	**n/a**	**0.01**	**NP**
Fluoride, total (mg/L)	AD-18 (bg)	0	-53	-98	No	23	65.22	n/a	n/a	0.01	NP
Fluoride, total (mg/L)	AD-4 (bg)	0	42	98	No	23	56.52	n/a	n/a	0.01	NP
Sulfate, total (mg/L)	AD-12 (bg)	-0.2003	-94	-98	No	23	0	n/a	n/a	0.01	NP
Sulfate, total (mg/L)	AD-18 (bg)	-0.1309	-61	-98	No	23	0	n/a	n/a	0.01	NP
Sulfate, total (mg/L)	AD-4 (bg)	0.09682	12	98	No	23	0	n/a	n/a	0.01	NP
Total Dissolved Solids (mg/L)	AD-12 (bg)	-0.7249	-27	-92	No	22	0	n/a	n/a	0.01	NP
Total Dissolved Solids (mg/L)	AD-18 (bg)	-1.992	-44	-98	No	23	0	n/a	n/a	0.01	NP
Total Dissolved Solids (mg/L)	AD-4 (bg)	-0.4922	-16	-98	No	23	0	n/a	n/a	0.01	NP

Sanitas™ v.9.6.36 . UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

AD-12 (bg)



n = 23

Slope = -0.001889 units per year.

Mann-Kendall statistic = -65
critical = -98

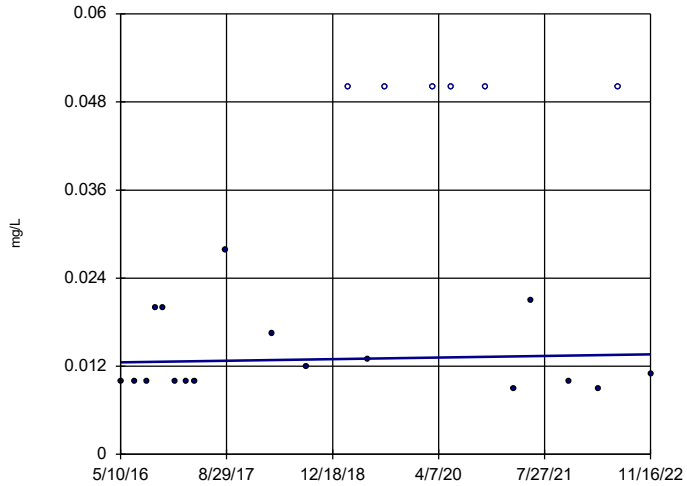
Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Boron, total Analysis Run 2/20/2023 2:23 PM View: AIII
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

AD-18 (bg)



n = 23

Slope = 0.000171 units per year.

Mann-Kendall statistic = 45
critical = 98

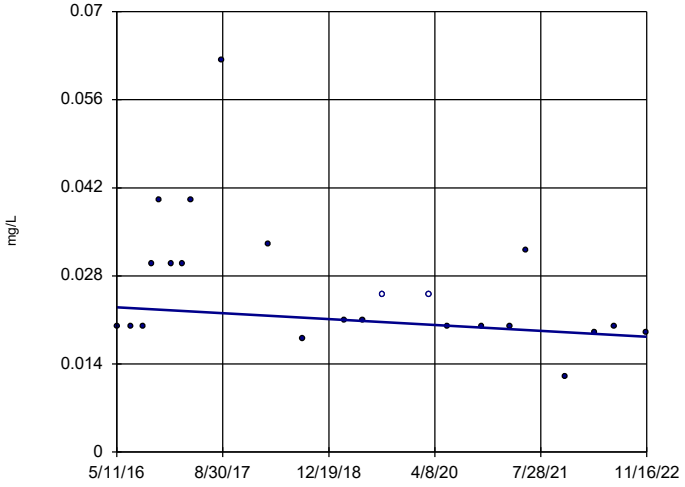
Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Boron, total Analysis Run 2/20/2023 2:23 PM View: AIII
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG
Hollow symbols indicate censored values.

Sen's Slope Estimator

AD-4 (bg)



n = 23

Slope = -0.0007157 units per year.

Mann-Kendall statistic = -71
critical = -98

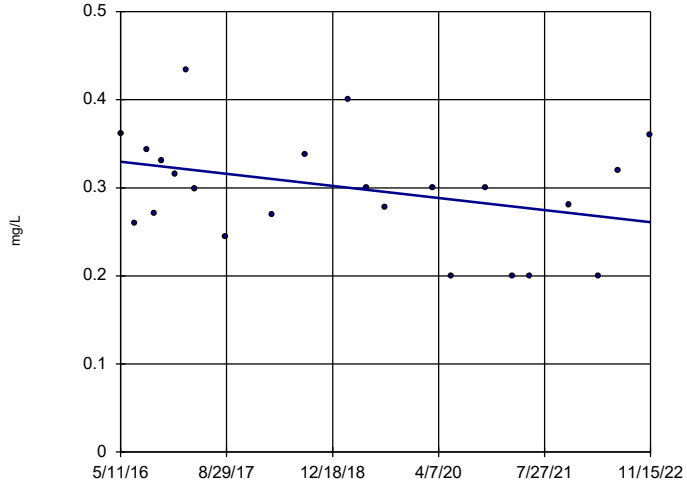
Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Boron, total Analysis Run 2/20/2023 2:23 PM View: AIII
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Sen's Slope Estimator

AD-12 (bg)



n = 23

Slope = -0.01054 units per year.

Mann-Kendall statistic = -50
critical = -98

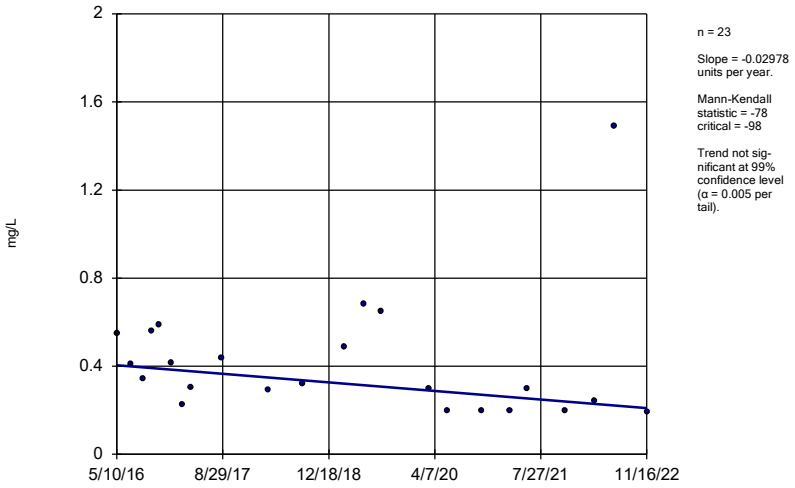
Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Calcium, total Analysis Run 2/20/2023 2:23 PM View: AIII
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Sen's Slope Estimator

AD-18 (bg)



n = 23

Slope = -0.02978 units per year.

Mann-Kendall statistic = -78
critical = -98

Trend not significant at 99% confidence level (α = 0.005 per tail).

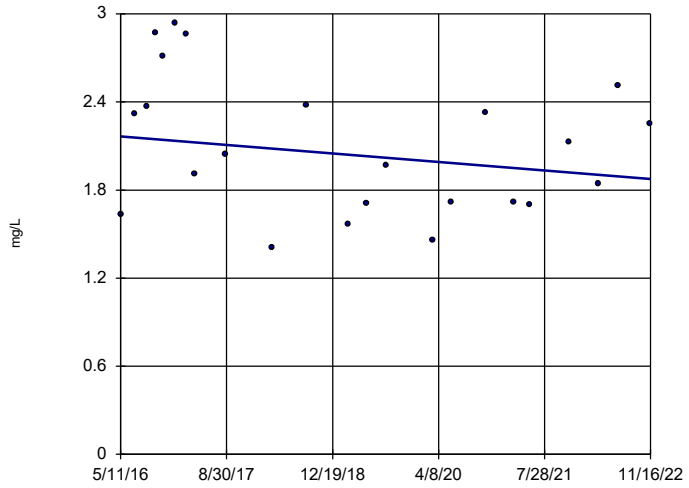
Constituent: Calcium, total Analysis Run 2/20/2023 2:23 PM View: AIII

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Sen's Slope Estimator

AD-4 (bg)



n = 23

Slope = -0.04432 units per year.

Mann-Kendall statistic = -32
critical = -98

Trend not significant at 99% confidence level (α = 0.005 per tail).

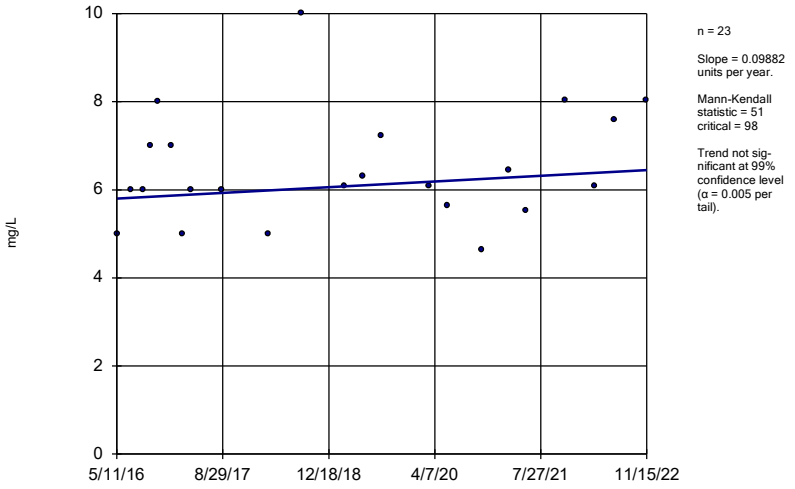
Constituent: Calcium, total Analysis Run 2/20/2023 2:23 PM View: AIII

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Sen's Slope Estimator

AD-12 (bg)



n = 23

Slope = 0.09882 units per year.

Mann-Kendall statistic = 51
critical = 98

Trend not significant at 99% confidence level (α = 0.005 per tail).

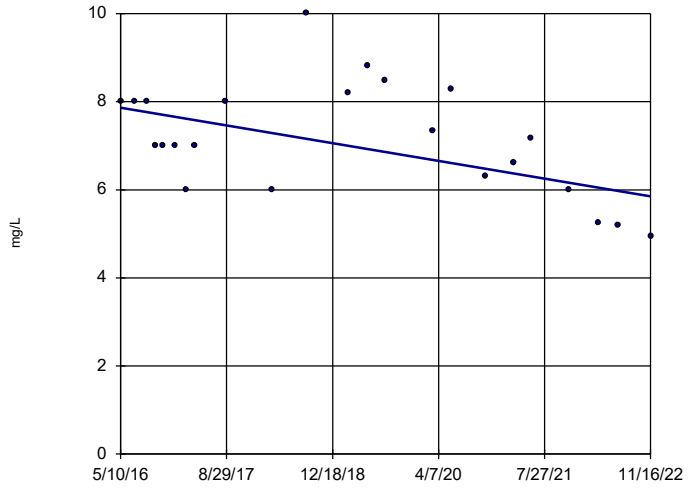
Constituent: Chloride, total Analysis Run 2/20/2023 2:23 PM View: AIII

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Sen's Slope Estimator

AD-18 (bg)



n = 23

Slope = -0.3088 units per year.

Mann-Kendall statistic = -82
critical = -98

Trend not significant at 99% confidence level (α = 0.005 per tail).

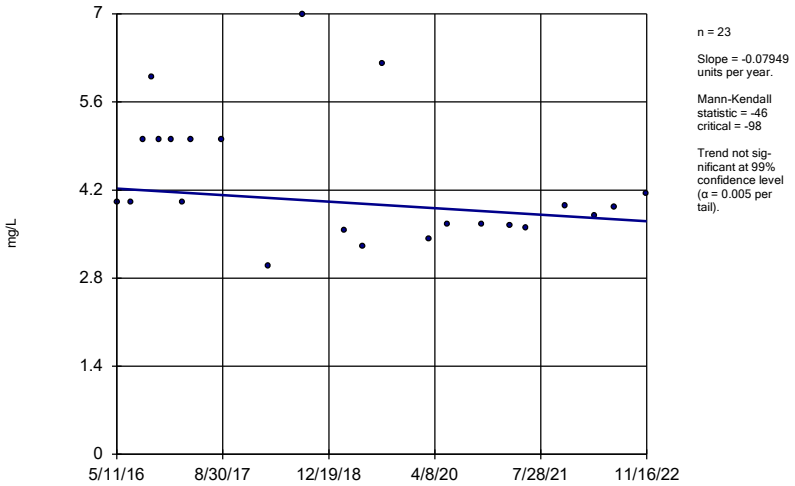
Constituent: Chloride, total Analysis Run 2/20/2023 2:23 PM View: AIII

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Sen's Slope Estimator

AD-4 (bg)



n = 23

Slope = -0.07949 units per year.

Mann-Kendall statistic = -46
critical = -98

Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Chloride, total Analysis Run 2/20/2023 2:23 PM View: AIII

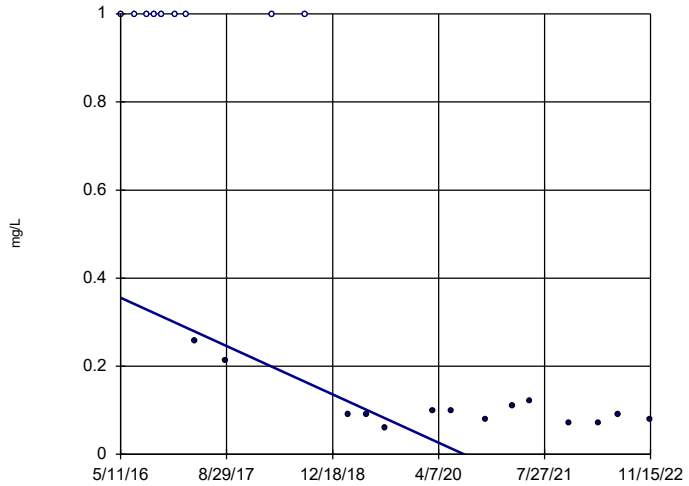
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

AD-12 (bg)



n = 23

Slope = -0.08408 units per year.

Mann-Kendall statistic = -145
critical = -98

Decreasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Fluoride, total Analysis Run 2/20/2023 2:23 PM View: AIII

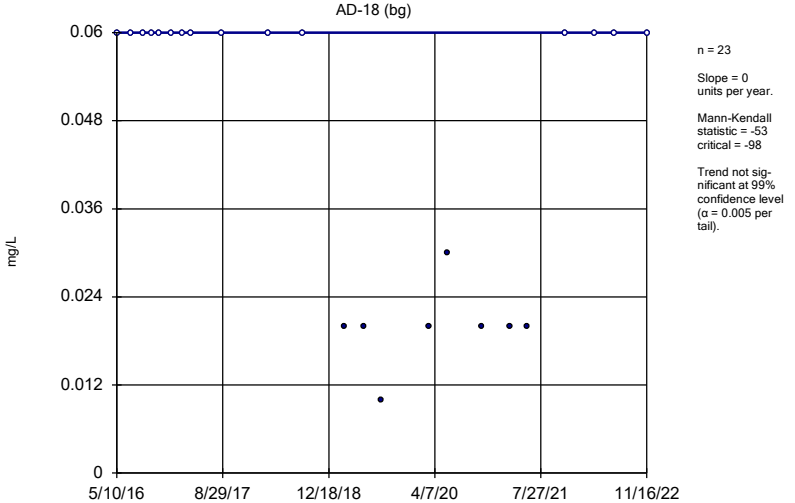
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

AD-18 (bg)



n = 23

Slope = 0 units per year.

Mann-Kendall statistic = -53
critical = -98

Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Fluoride, total Analysis Run 2/20/2023 2:23 PM View: AIII

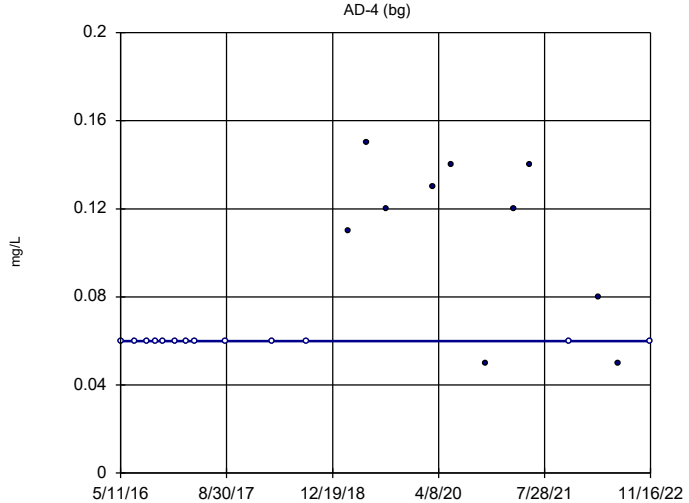
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

AD-4 (bg)



n = 23

Slope = 0 units per year.

Mann-Kendall statistic = 42
critical = 98

Trend not significant at 99% confidence level (α = 0.005 per tail).

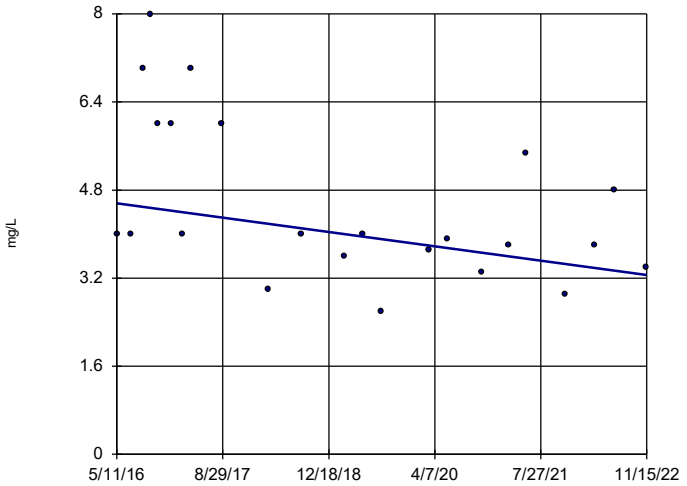
Constituent: Fluoride, total Analysis Run 2/20/2023 2:23 PM View: AIII

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Sen's Slope Estimator

AD-12 (bg)



n = 23

Slope = -0.2003 units per year.

Mann-Kendall statistic = -94
critical = -98

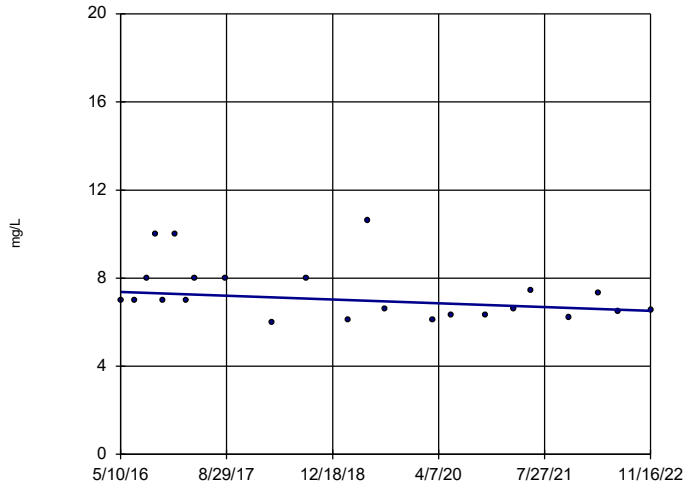
Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Sulfate, total Analysis Run 2/20/2023 2:23 PM View: AIII
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Sen's Slope Estimator

AD-18 (bg)



n = 23

Slope = -0.1309 units per year.

Mann-Kendall statistic = -61
critical = -98

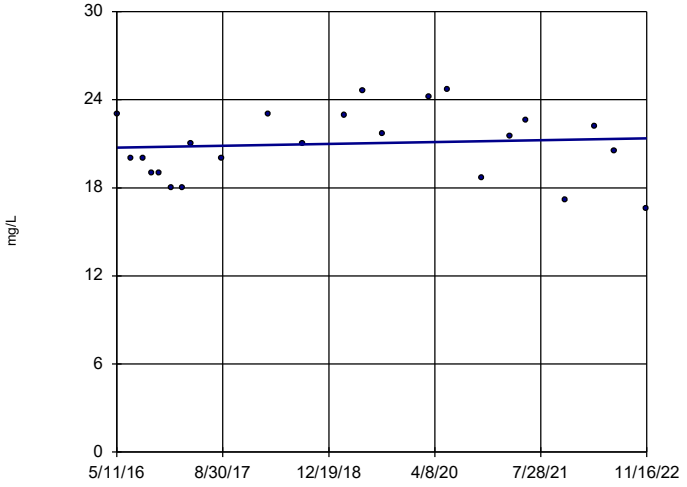
Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Sulfate, total Analysis Run 2/20/2023 2:24 PM View: AIII
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Sen's Slope Estimator

AD-4 (bg)



n = 23

Slope = 0.09682 units per year.

Mann-Kendall statistic = 12
critical = 98

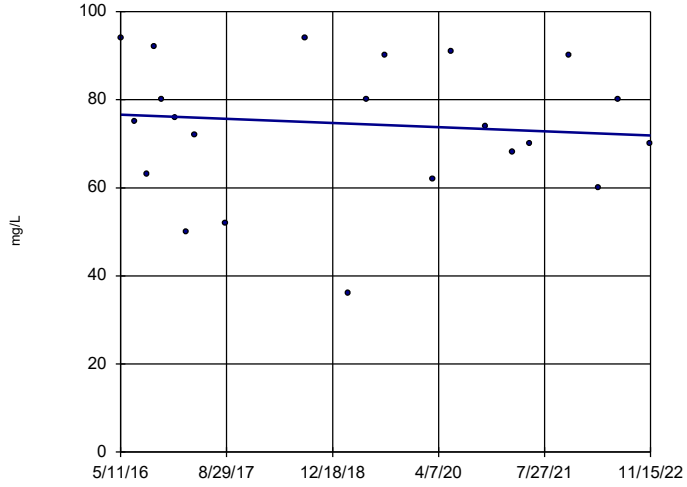
Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Sulfate, total Analysis Run 2/20/2023 2:24 PM View: AIII
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Sen's Slope Estimator

AD-12 (bg)



n = 22

Slope = -0.7249 units per year.

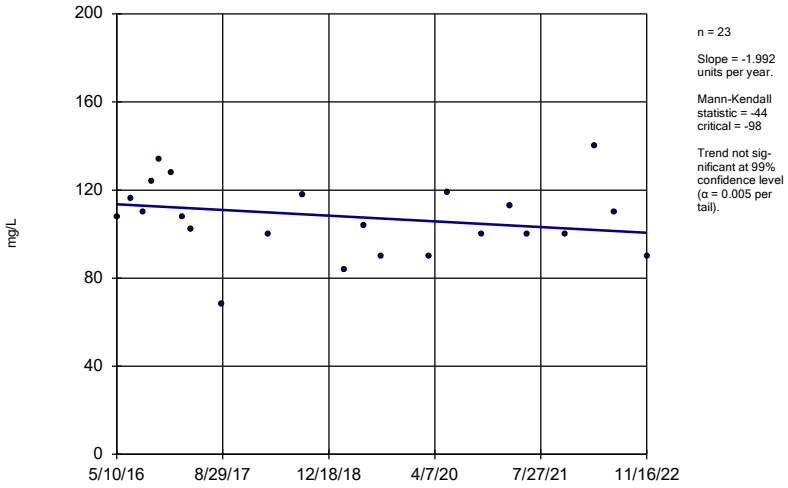
Mann-Kendall statistic = -27
critical = -92

Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Total Dissolved Solids Analysis Run 2/20/2023 2:24 PM View: AIII
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sen's Slope Estimator

AD-18 (bg)



n = 23

Slope = -1.992 units per year.

Mann-Kendall statistic = -44
critical = -98

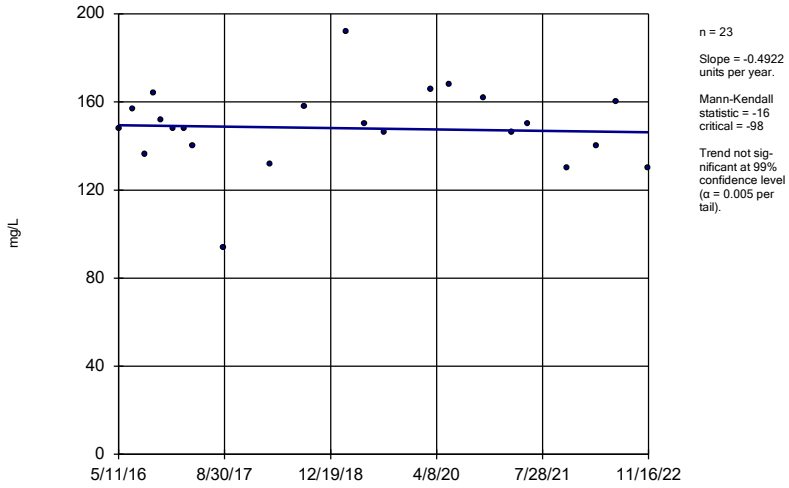
Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Total Dissolved Solids Analysis Run 2/20/2023 2:24 PM View: AIII
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Sen's Slope Estimator

AD-4 (bg)



n = 23

Slope = -0.4922 units per year.

Mann-Kendall statistic = -16
critical = -98

Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Total Dissolved Solids Analysis Run 2/20/2023 2:24 PM View: AIII
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

FIGURE G
Interwell PL

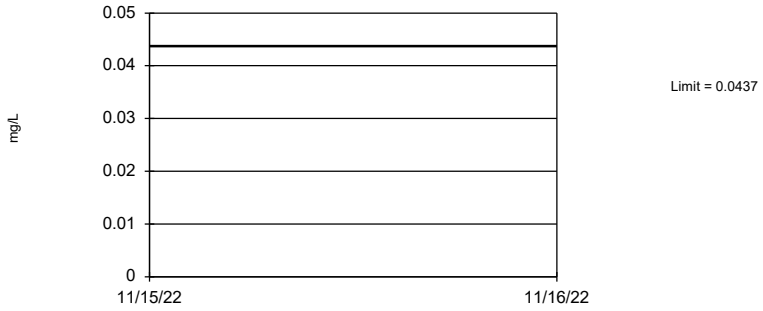
Interwell Prediction Limits

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP Printed 2/20/2023, 9:34 AM

Constituent	Well	Upper Lim.	Date	Observ.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Boron, total (mg/L)	n/a	0.0437	n/a	3 future	n/a	69	0.1496	0.03504	14.49	None	sqrt(x)	0.002505	Param Inter 1 of 2
Calcium, total (mg/L)	n/a	2.94	n/a	3 future	n/a	69	n/a	n/a	0	n/a	n/a	0.000403	NP Inter (normality) 1 of 2
Chloride, total (mg/L)	n/a	8.84	n/a	3 future	n/a	69	5.988	1.681	0	None	No	0.002505	Param Inter 1 of 2
Fluoride, total (mg/L)	n/a	0.2565	n/a	3 future	n/a	69	n/a	n/a	53.62	n/a	n/a	0.000403	NP Inter (NDs) 1 of 2
Sulfate, total (mg/L)	n/a	24.7	n/a	3 future	n/a	69	n/a	n/a	0	n/a	n/a	0.000403	NP Inter (normality) 1 of 2
Total Dissolved Solids (mg/L)	n/a	169.7	n/a	3 future	n/a	68	110.2	35.05	0	None	No	0.002505	Param Inter 1 of 2

Prediction Limit

Interwell Parametric

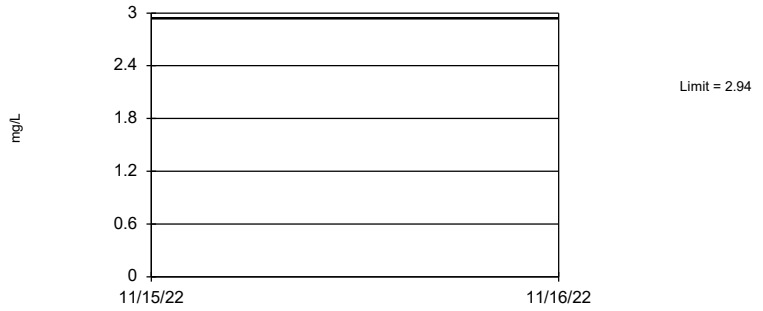


Background Data Summary (based on square root transformation): Mean=0.1496, Std. Dev.=0.03504, n=69, 14.49% NDs. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9598, critical = 0.951. Kappa = 1.697 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.002505. Assumes 3 future values.

Constituent: Boron, total Analysis Run 2/20/2023 2:26 PM View: AIII
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Prediction Limit

Interwell Non-parametric

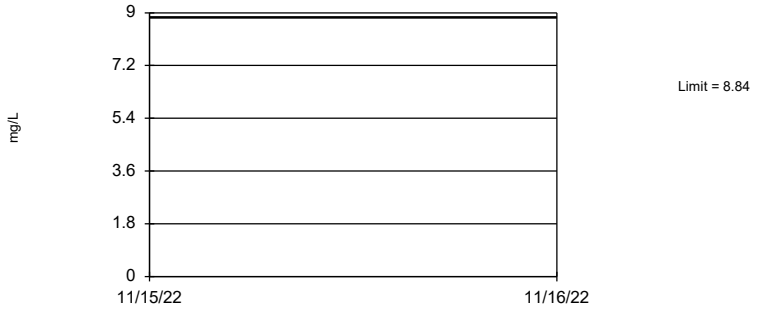


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 69 background values. Annual per-constituent alpha = 0.002415. Individual comparison alpha = 0.000403 (1 of 2). Assumes 3 future values.

Constituent: Calcium, total Analysis Run 2/20/2023 2:26 PM View: AIII
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Prediction Limit

Interwell Parametric

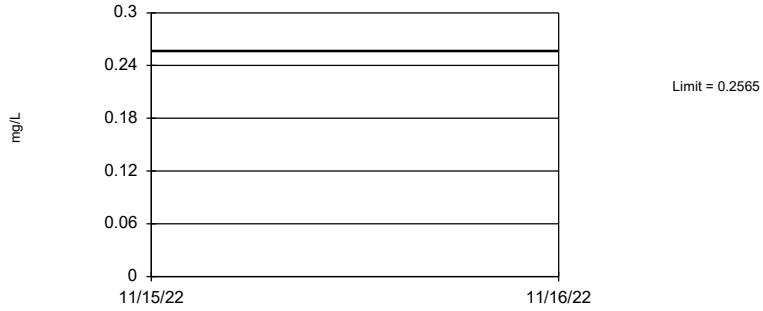


Background Data Summary: Mean=5.988, Std. Dev.=1.681, n=69. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9754, critical = 0.951. Kappa = 1.697 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.002505. Assumes 3 future values.

Constituent: Chloride, total Analysis Run 2/20/2023 2:26 PM View: AIII
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Prediction Limit

Interwell Non-parametric

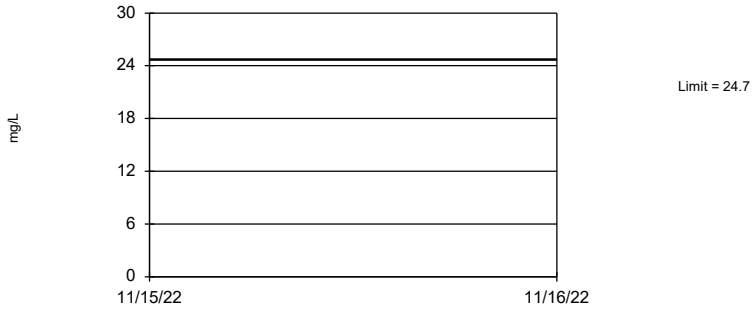


Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 50%. Limit is highest of 69 background values. 53.62% NDs. Annual per-constituent alpha = 0.002415. Individual comparison alpha = 0.000403 (1 of 2). Assumes 3 future values.

Constituent: Fluoride, total Analysis Run 2/20/2023 2:26 PM View: AIII
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Prediction Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 69 background values. Annual per-constituent alpha = 0.002415. Individual comparison alpha = 0.000403 (1 of 2). Assumes 3 future values.

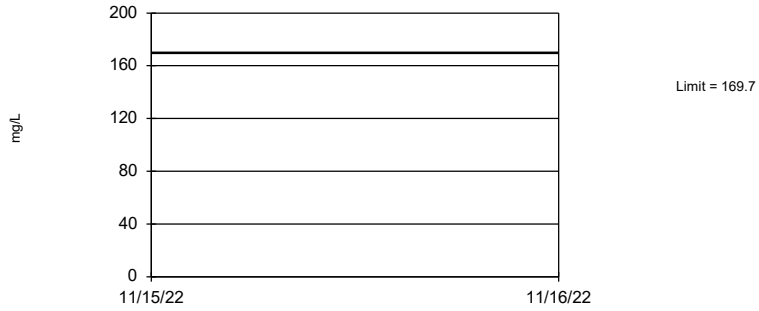
Constituent: Sulfate, total Analysis Run 2/20/2023 2:26 PM View: AIII

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Prediction Limit

Interwell Parametric



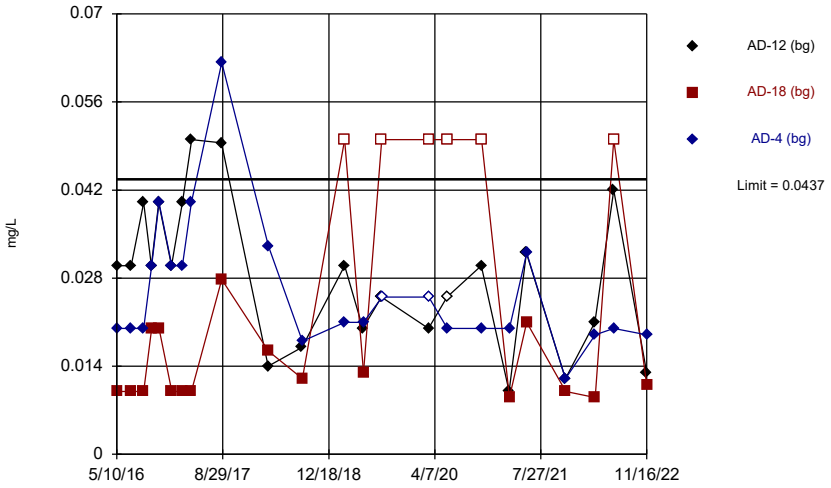
Background Data Summary: Mean=110.2, Std. Dev.=35.05, n=68. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9816, critical = 0.95. Kappa = 1.698 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.002505. Assumes 3 future values.

Constituent: Total Dissolved Solids Analysis Run 2/20/2023 2:26 PM View: AIII

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG
Hollow symbols indicate censored values.

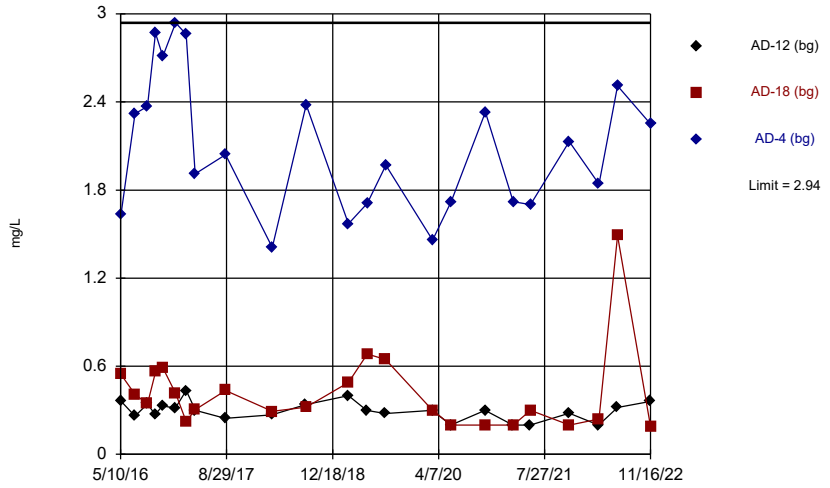
Time Series



Constituent: Boron, total Analysis Run 2/20/2023 9:35 AM View: AIII
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

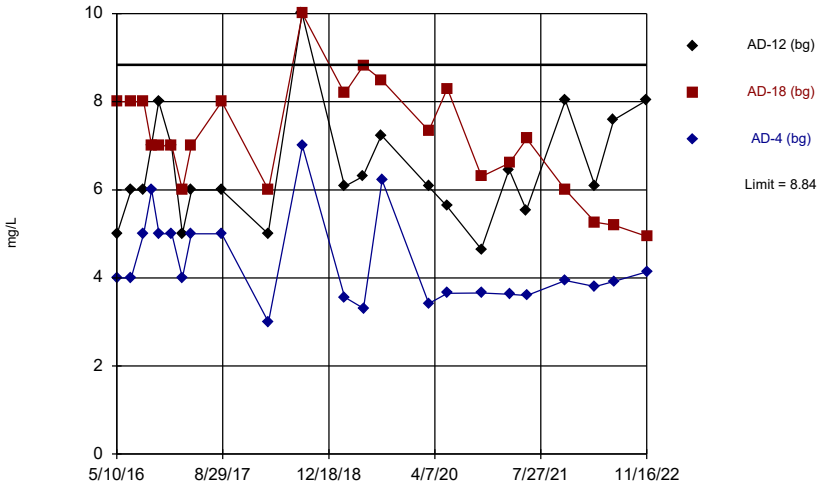
Time Series



Constituent: Calcium, total Analysis Run 2/20/2023 9:35 AM View: AIII
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

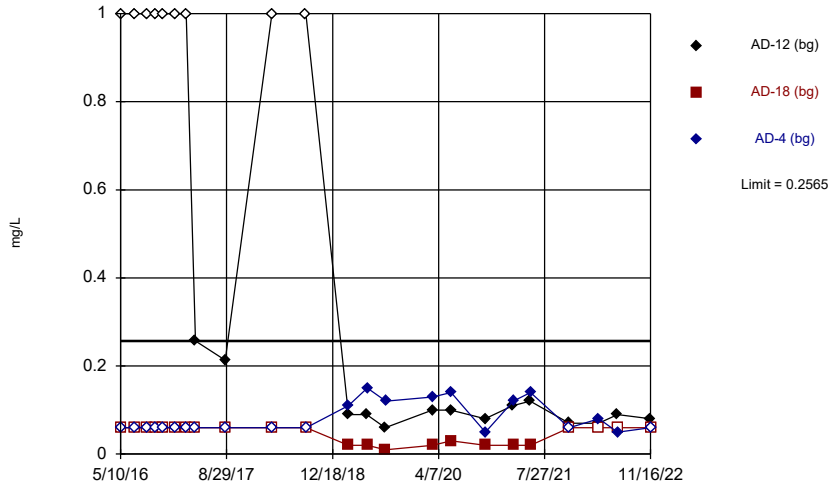
Time Series



Constituent: Chloride, total Analysis Run 2/20/2023 9:35 AM View: AIII
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG
Hollow symbols indicate censored values.

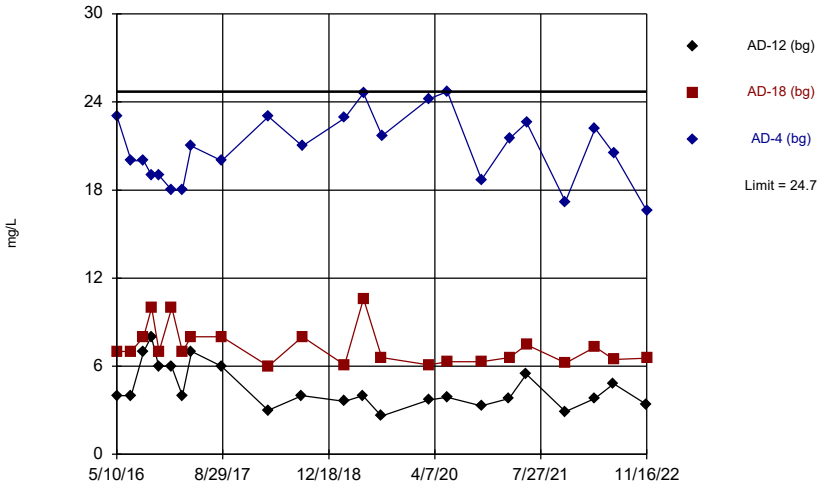
Time Series



Constituent: Fluoride, total Analysis Run 2/20/2023 9:35 AM View: AIII
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

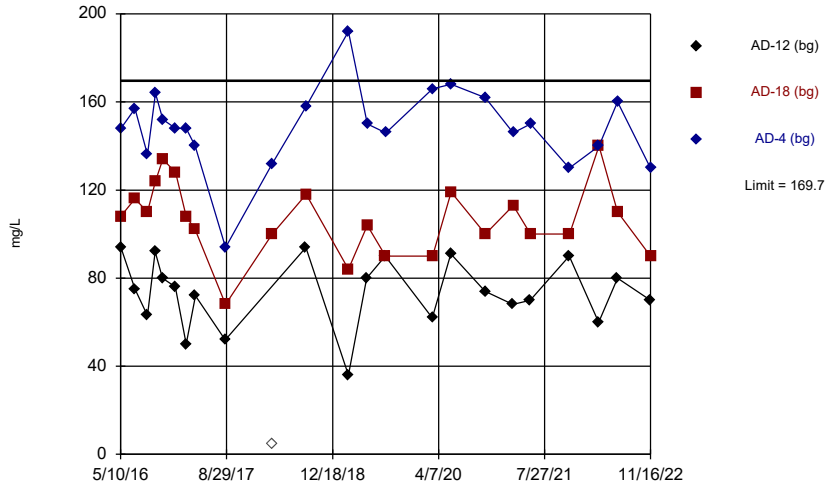
Time Series



Constituent: Sulfate, total Analysis Run 2/20/2023 9:35 AM View: AIII
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG
Hollow symbols indicate censored values.

Time Series



Constituent: Total Dissolved Solids Analysis Run 2/20/2023 9:35 AM View: AIII
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

FIGURE H
UTL

Upper Tolerance Limits

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP Printed 2/20/2023, 9:43 AM

Constituent	Upper Lim.	Bg N	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Antimony, total (mg/L)	0.0001	66	n/a	93.94	n/a	n/a	0.03387	NP Inter(NDs)
Arsenic, total (mg/L)	0.011	66	n/a	40.91	n/a	n/a	0.03387	NP Inter(normality)
Barium, total (mg/L)	0.183	66	n/a	0	n/a	n/a	0.03387	NP Inter(normality)
Beryllium, total (mg/L)	0.00115	66	n/a	6.061	n/a	n/a	0.03387	NP Inter(normality)
Cadmium, total (mg/L)	0.00026	66	n/a	50	n/a	n/a	0.03387	NP Inter(normality)
Chromium, total (mg/L)	0.003262	66	0.9517	10.61	None	ln(x)	0.05	Inter
Cobalt, total (mg/L)	0.00939	66	n/a	0	n/a	n/a	0.03387	NP Inter(normality)
Combined Radium 226 + 228 (pCi/L)	3.197	66	0.2481	0	None	x^(1/3)	0.05	Inter
Fluoride, total (mg/L)	0.2565	69	n/a	53.62	n/a	n/a	0.02904	NP Inter(normality)
Lead, total (mg/L)	0.005	66	n/a	57.58	n/a	n/a	0.03387	NP Inter(normality)
Lithium, total (mg/L)	0.05199	66	0.04756	1.515	None	sqrt(x)	0.05	Inter
Mercury, total (mg/L)	0.000064	66	n/a	43.94	n/a	n/a	0.03387	NP Inter(normality)
Molybdenum, total (mg/L)	0.005	61	n/a	95.08	n/a	n/a	0.04377	NP Inter(NDs)
Selenium, total (mg/L)	0.00245	66	n/a	48.48	n/a	n/a	0.03387	NP Inter(normality)
Thallium, total (mg/L)	0.001874	64	n/a	76.56	n/a	n/a	0.03752	NP Inter(NDs)

FIGURE I

GWPS

PIRKEY EBAP GWPS			
Constituent Name	**MCL**	**Background Limit**	**GWPS**
Antimony, Total (mg/L)	0.006	0.0001	0.006
Arsenic, Total (mg/L)	0.01	0.011	0.011
Barium, Total (mg/L)	2	0.18	2
Beryllium, Total (mg/L)	0.004	0.0012	0.004
Cadmium, Total (mg/L)	0.005	0.00026	0.005
Chromium, Total (mg/L)	0.1	0.0033	0.1
Cobalt, Total (mg/L)	n/a	0.0094	0.0094
Combined Radium, Total (pCi/L)	5	3.2	5
Fluoride, Total (mg/L)	4	0.26	4
Lead, Total (mg/L)	n/a	0.005	0.005
Lithium, Total (mg/L)	n/a	0.052	0.052
Mercury, Total (mg/L)	0.002	0.000064	0.002
Molybdenum, Total (mg/L)	n/a	0.005	0.005
Selenium, Total (mg/L)	0.05	0.0025	0.05
Thallium, Total (mg/L)	0.002	0.0019	0.002

**Grey cell indicates Background Limit is higher than MCL*

**MCL = Maximum Contaminant Level*

**GWPS = Groundwater Protection Standard*

FIGURE J
Confidence Intervals

Confidence Interval Summary Table - Significant Results

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP Printed 2/20/2023, 9:49 AM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	%NDs	ND Adj.	Transform	Alpha	Method
Cobalt, total (mg/L)	**AD-2**	**0.0178**	**0.01253**	**0.0094**	**Yes**	**22**	**0**	**None**	**No**	**0.01**	**Param.**
Cobalt, total (mg/L)	**AD-31**	**0.01077**	**0.009523**	**0.0094**	**Yes**	**21**	**0**	**None**	**x^(1/3)**	**0.01**	**Param.**
Cobalt, total (mg/L)	**AD-32**	**0.05284**	**0.03244**	**0.0094**	**Yes**	**22**	**0**	**None**	**sqrt(x)**	**0.01**	**Param.**
Lithium, total (mg/L)	**AD-31**	**0.094**	**0.0681**	**0.052**	**Yes**	**22**	**0**	**None**	**No**	**0.01**	**NP (normality)**
Lithium, total (mg/L)	**AD-32**	**0.09933**	**0.07861**	**0.052**	**Yes**	**20**	**0**	**None**	**No**	**0.01**	**Param.**

Confidence Interval Summary Table - All Results

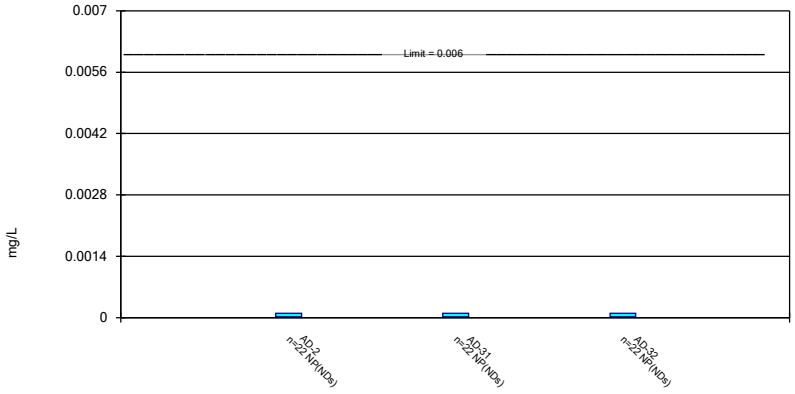
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP Printed 2/20/2023, 9:49 AM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	%NDs	ND Adj.	Transform	Alpha	Method
Antimony, total (mg/L)	AD-2	0.0001	0.00002	0.006	No	22	95.45	None	No	0.01	NP (NDs)
Antimony, total (mg/L)	AD-31	0.0001	0.00002	0.006	No	22	95.45	None	No	0.01	NP (NDs)
Antimony, total (mg/L)	AD-32	0.0001	0.00002	0.006	No	22	90.91	None	No	0.01	NP (NDs)
Arsenic, total (mg/L)	AD-2	0.002	0.00052	0.011	No	22	45.45	None	No	0.01	NP (normality)
Arsenic, total (mg/L)	AD-31	0.001937	0.0004562	0.011	No	21	14.29	None	ln(x)	0.01	Param.
Arsenic, total (mg/L)	AD-32	0.004998	0.002171	0.011	No	22	4.545	None	sqrt(x)	0.01	Param.
Barium, total (mg/L)	AD-2	0.037	0.0196	2	No	22	0	None	No	0.01	NP (normality)
Barium, total (mg/L)	AD-31	0.073	0.0332	2	No	21	0	None	No	0.01	NP (normality)
Barium, total (mg/L)	AD-32	0.0371	0.02624	2	No	22	0	None	No	0.01	Param.
Beryllium, total (mg/L)	AD-2	0.000561	0.000428	0.004	No	22	4.545	None	No	0.01	NP (normality)
Beryllium, total (mg/L)	AD-31	0.00103	0.00085	0.004	No	21	0	None	No	0.01	NP (normality)
Beryllium, total (mg/L)	AD-32	0.005714	0.003525	0.004	No	22	0	None	sqrt(x)	0.01	Param.
Cadmium, total (mg/L)	AD-2	0.001	0.000078	0.005	No	22	45.45	None	No	0.01	NP (normality)
Cadmium, total (mg/L)	AD-31	0.001	0.000066	0.005	No	22	31.82	None	No	0.01	NP (normality)
Cadmium, total (mg/L)	AD-32	0.0005653	0.0003782	0.005	No	22	0	None	No	0.01	Param.
Chromium, total (mg/L)	AD-2	0.0009	0.00028	0.1	No	22	27.27	None	No	0.01	NP (normality)
Chromium, total (mg/L)	AD-31	0.01	0.000365	0.1	No	20	10	None	No	0.01	NP (normality)
Chromium, total (mg/L)	AD-32	0.003778	0.001058	0.1	No	22	0	None	ln(x)	0.01	Param.
Cobalt, total (mg/L)	**AD-2**	**0.0178**	**0.01253**	**0.0094**	**Yes**	**22**	**0**	**None**	**No**	**0.01**	**Param.**
Cobalt, total (mg/L)	**AD-31**	**0.01077**	**0.009523**	**0.0094**	**Yes**	**21**	**0**	**None**	**x^(1/3)**	**0.01**	**Param.**
Cobalt, total (mg/L)	**AD-32**	**0.05284**	**0.03244**	**0.0094**	**Yes**	**22**	**0**	**None**	**sqrt(x)**	**0.01**	**Param.**
Combined Radium 226 + 228 (pCi/L)	AD-2	1.626	1.038	5	No	22	0	None	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	AD-31	3.787	2.627	5	No	22	0	None	sqrt(x)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	AD-32	6.189	4.256	5	No	21	0	None	ln(x)	0.01	Param.
Fluoride, total (mg/L)	AD-2	1	0.15	4	No	24	50	None	No	0.01	NP (normality)
Fluoride, total (mg/L)	AD-31	1	0.14	4	No	24	50	None	No	0.01	NP (normality)
Fluoride, total (mg/L)	AD-32	0.8906	0.4763	4	No	23	21.74	Kaplan-Meier	No	0.01	Param.
Lead, total (mg/L)	AD-2	0.005	0.00046	0.005	No	22	45.45	None	No	0.01	NP (normality)
Lead, total (mg/L)	AD-31	0.005	0.00026	0.005	No	21	38.1	None	No	0.01	NP (normality)
Lead, total (mg/L)	AD-32	0.005	0.00043	0.005	No	22	45.45	None	No	0.01	NP (normality)
Lithium, total (mg/L)	AD-2	0.05555	0.0495	0.052	No	21	0	None	ln(x)	0.01	Param.
Lithium, total (mg/L)	**AD-31**	**0.094**	**0.0681**	**0.052**	**Yes**	**22**	**0**	**None**	**No**	**0.01**	**NP (normality)**
Lithium, total (mg/L)	**AD-32**	**0.09933**	**0.07861**	**0.052**	**Yes**	**20**	**0**	**None**	**No**	**0.01**	**Param.**
Mercury, total (mg/L)	AD-2	0.00008849	0.00004345	0.002	No	21	0	None	sqrt(x)	0.01	Param.
Mercury, total (mg/L)	AD-31	0.000568	0.0001424	0.002	No	21	0	None	sqrt(x)	0.01	Param.
Mercury, total (mg/L)	AD-32	0.004313	0.00173	0.002	No	22	0	None	x^(1/3)	0.01	Param.
Molybdenum, total (mg/L)	AD-2	0.005	0.00437	0.005	No	21	85.71	None	No	0.01	NP (NDs)
Molybdenum, total (mg/L)	AD-31	0.005	0.000894	0.005	No	20	75	None	No	0.01	NP (normality)
Molybdenum, total (mg/L)	AD-32	0.005	0.0007621	0.005	No	20	90	None	No	0.01	NP (NDs)
Selenium, total (mg/L)	AD-2	0.001681	0.001186	0.05	No	22	22.73	Kaplan-Meier	ln(x)	0.01	Param.
Selenium, total (mg/L)	AD-31	0.004	0.00038	0.05	No	22	31.82	None	No	0.01	NP (normality)
Selenium, total (mg/L)	AD-32	0.007128	0.002603	0.05	No	22	22.73	Kaplan-Meier	x^(1/3)	0.01	Param.
Thallium, total (mg/L)	AD-2	0.0005	0.0001	0.002	No	22	45.45	None	No	0.01	NP (normality)
Thallium, total (mg/L)	AD-31	0.0005	0.00009	0.002	No	21	57.14	None	No	0.01	NP (normality)
Thallium, total (mg/L)	AD-32	0.002	0.0002	0.002	No	21	28.57	None	No	0.01	NP (normality)

Sanitas™ v.9.6.36 . UG

Non-Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01.

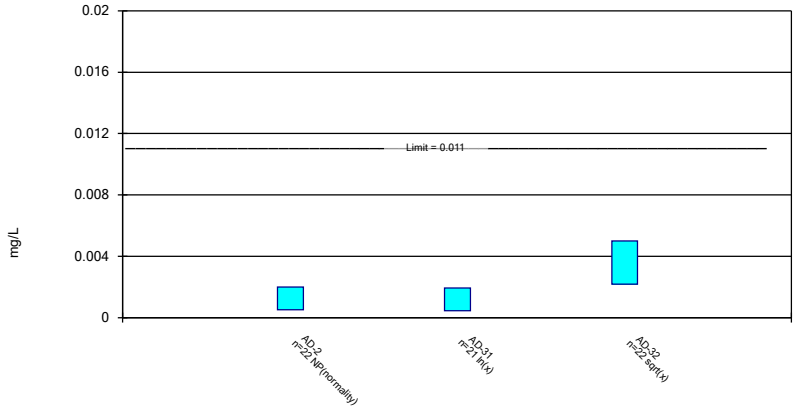


Constituent: Antimony, total Analysis Run 2/20/2023 9:47 AM View: AIV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

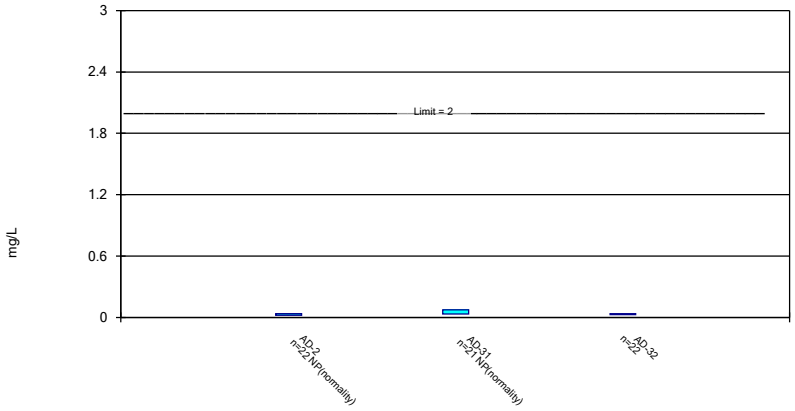


Constituent: Arsenic, total Analysis Run 2/20/2023 9:47 AM View: AIV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

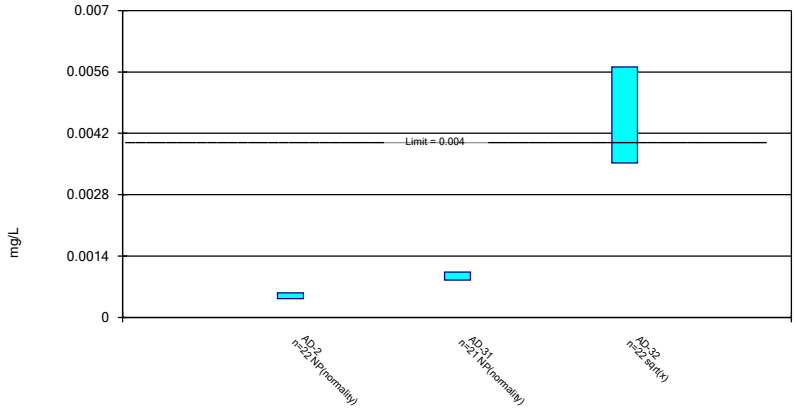


Constituent: Barium, total Analysis Run 2/20/2023 9:47 AM View: AIV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

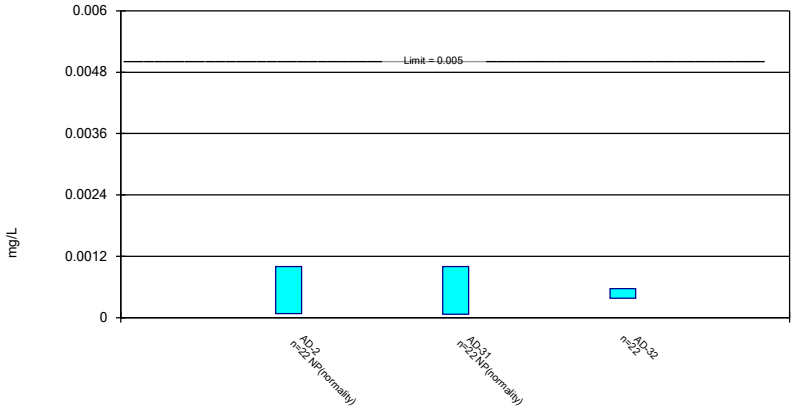


Constituent: Beryllium, total Analysis Run 2/20/2023 9:47 AM View: AIV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

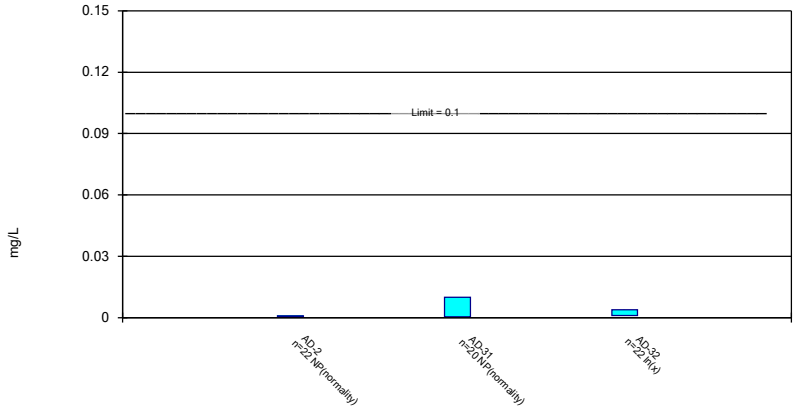


Constituent: Cadmium, total Analysis Run 2/20/2023 9:48 AM View: AIV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

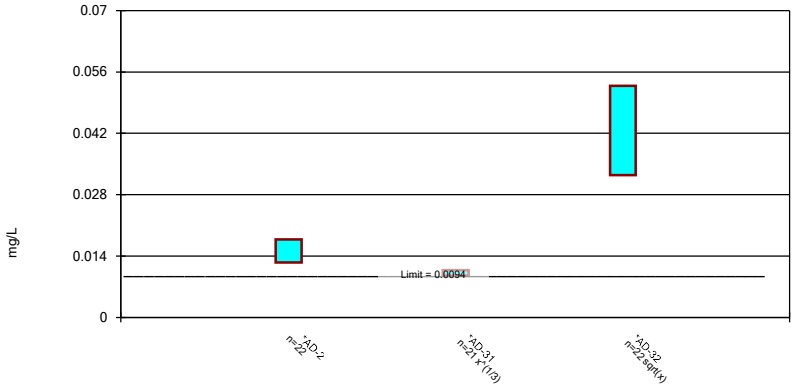


Constituent: Chromium, total Analysis Run 2/20/2023 9:48 AM View: AIV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Parametric Confidence Interval

Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

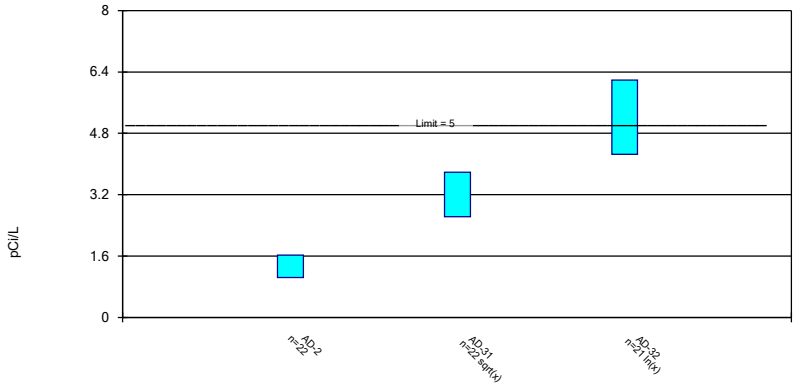


Constituent: Cobalt, total Analysis Run 2/20/2023 9:48 AM View: AIV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

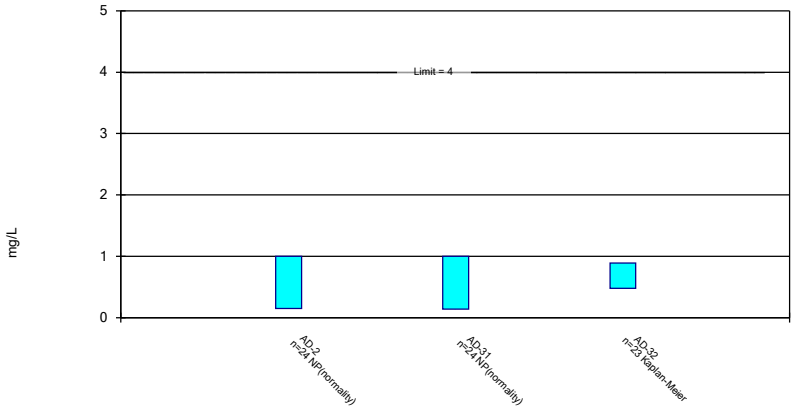


Constituent: Combined Radium 226 + 228 Analysis Run 2/20/2023 9:48 AM View: AIV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

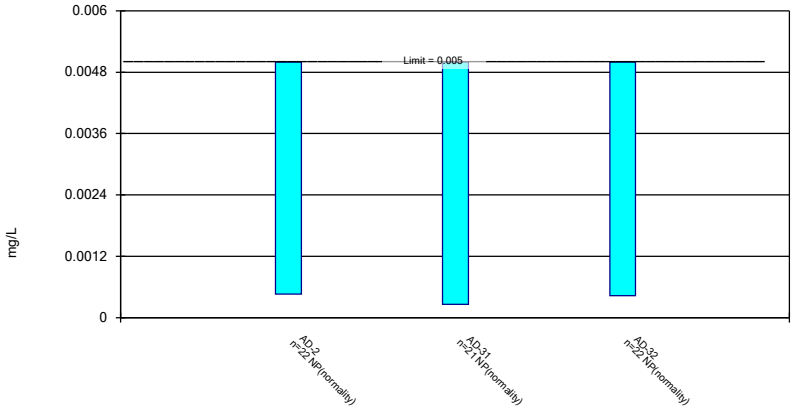


Constituent: Fluoride, total Analysis Run 2/20/2023 9:48 AM View: AIV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Non-Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01.

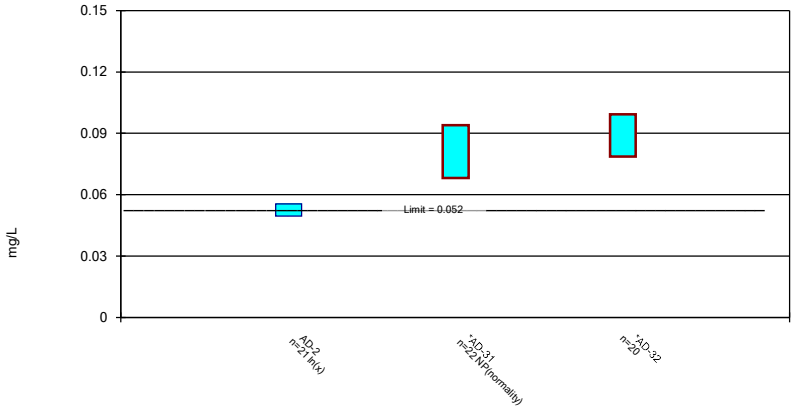


Constituent: Lead, total Analysis Run 2/20/2023 9:48 AM View: AIV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Parametric and Non-Parametric (NP) Confidence Interval

Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

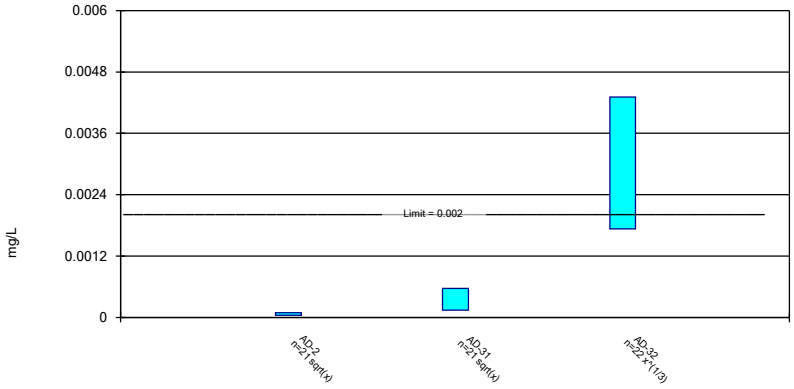


Constituent: Lithium, total Analysis Run 2/20/2023 9:48 AM View: AIV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

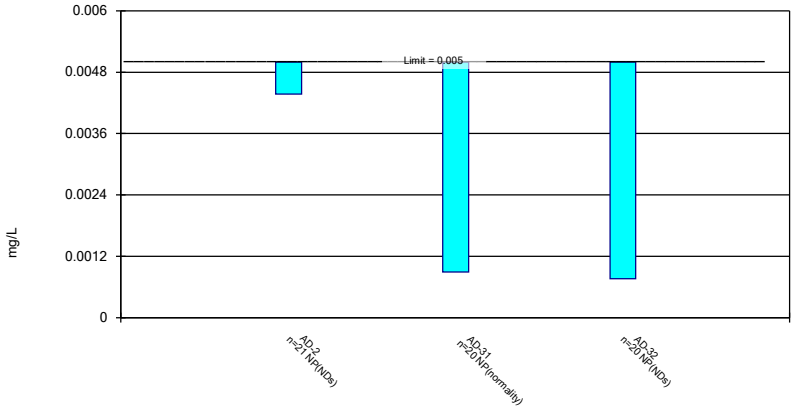


Constituent: Mercury, total Analysis Run 2/20/2023 9:48 AM View: AIV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Non-Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01.

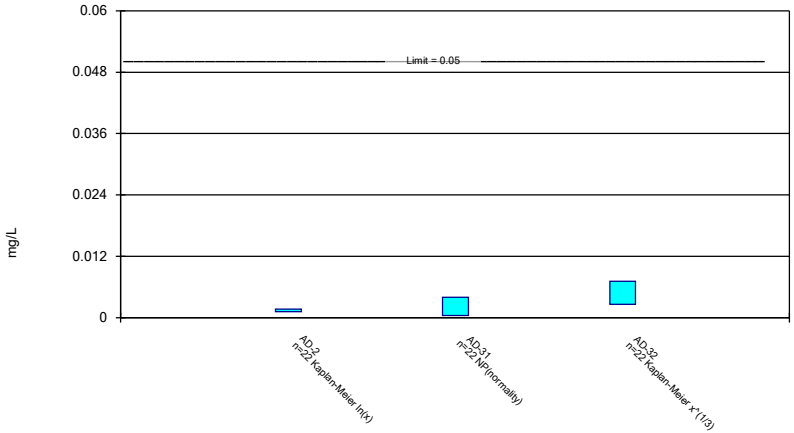


Constituent: Molybdenum, total Analysis Run 2/20/2023 9:48 AM View: AIV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

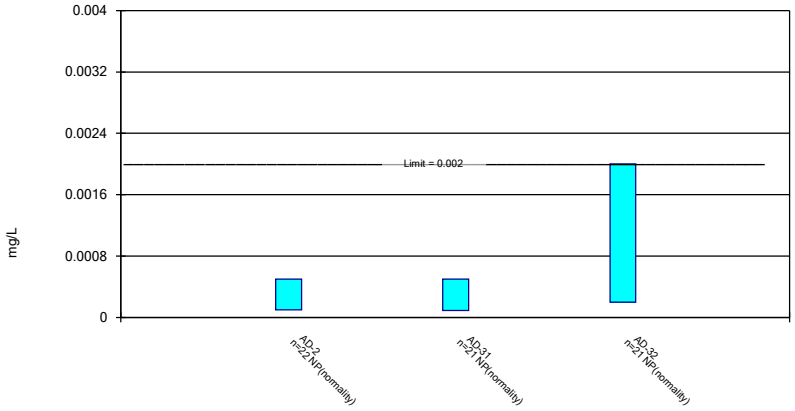


Constituent: Selenium, total Analysis Run 2/20/2023 9:48 AM View: AIV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.36 . UG

Non-Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Thallium, total Analysis Run 2/20/2023 9:48 AM View: AIV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Geosyntec consultants

500 W. Wilson Bridge Road, Suite 250
Worthington, Ohio 43085
PH 614.468.0415
www.geosyntec.com

Memorandum

Date:	January 25, 2024
To:	Leslie Fuerschbach (AEP)
Copies to:	Brian Newton (AEP)
From:	Allison Kreinberg (Geosyntec)
Subject:	Evaluation of 2023 Reissued Analytical Laboratory Data for H.W. Pirkey Power Plant's East Bottom Ash Pond

In accordance with Texas Commission on Environmental Quality (TCEQ) regulations regarding the disposal of coal combustion residuals (CCRs) in landfills and surface impoundments (Title 30 Chapter 352, "CCR rule") groundwater sampling was completed in 2023 to support assessment monitoring at the East Bottom Ash Pond, an existing CCR unit at the H.W. Pirkey Power Plant in Hallsville, Texas. After statistical evaluations were completed using data from the first and second semiannual assessment monitoring event,[1,2] select analytical laboratory reports were reissued to correct an inconsistent number of significant figures in electronic data deliverables and the published laboratory reports.

A review of the reissued analytical laboratory reports identified reported lithium results that had the number of significant figures changed (Table 1). The site-specific background value for lithium was updated as part of the second semiannual assessment monitoring event; therefore, the lithium result at background location AD-12 was used in the statistical evaluation prior to reissuance of the analytical laboratory reports. The upper tolerance limit (UTL) was recalculated using the revised lithium value at AD-12 to evaluate whether the change in the reported lithium result would affect the statistical outcome of the second semiannual assessment monitoring event (Attachment 1). The recalculated UTL of 0.0497 milligrams per liter (mg/L) was identical to the previously calculated UTL of 0.0497 mg/L using the initial AD-12 lithium value and no changes to the statistical outcomes of the second semiannual assessment monitoring event would occur.

[1] Geosyntec. 2023. *Statistical Analysis Summary – East Bottom Ash Pond. H.W. Pirkey Power Plant, Hallsville, Texas*. Geosyntec Consultants, Inc. October 7, 2023.
[2] Geosyntec. 2023. *Statistical Analysis Summary – East Bottom Ash Pond. H.W. Pirkey Power Plant, Hallsville, Texas*. Geosyntec Consultants, Inc. October 16, 2023.

Both the initial reported lithium value and the revised lithium value at downgradient location AD-31 were above the site-specific groundwater protection standard and statistically significant levels of lithium were identified during the both first and second semiannual assessment monitoring event at AD-31.[1,2] Therefore, no changes to the statistical outcome of the first or second semiannual assessment monitoring event would occur.

The revised lithium values in the reissued laboratory analytical reports will be used in future reporting and statistical evaluations.

Table 1. 2023 Revised Analytical Results
H.W. Pirkey Plant - East Bottom Ash Pond

Geosyntec Consultants, Inc.

Sample Date	Well ID	Well Location	Constituent	Units	Initial Reported Value	Revised Value
6/26/2023	AD-12	Background	Lithium	mg/L	0.0049	0.00487
6/26/2023	AD-31	Downgradient	Lithium	mg/L	0.089	0.0889

Notes:
1. All results are reported in milligrams per liter (mg/L).

ATTACHMENT A

Recalculated Lithium Upper Tolerance Limit

Upper Tolerance Limits Summary Table - Lithium

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP Printed 12/11/2023, 10:16 AM

Constituent	Upper Lim.	Date	Observ.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Lithium, total (mg/L)	0.04972	n/a	n/a	n/a	75	0.1312	0.04656	1.333	None	sqrt(x)	0.05	Inter

Geosyntec consultants

engineers | scientists | innovators

STATISTICAL ANALYSIS SUMMARY EAST BOTTOM ASH POND

H.W. Pirkey Power Plant

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 Number: CHA8500B

October 7, 2023

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ACRONYMS AND ABBREVIATIONS

ASD	alternative source demonstration
CCR	coal combustion residuals
CFR	code of federal regulations
EBAP	East Bottom Ash Pond
GWPS	groundwater protection standard
LCL	lower confidence limit
mg/L	milligrams per liter
QA/QC	quality assurance and quality control
SSI	statistically significant increase
SSL	statistically significant level
SU	standard units
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TDS	total dissolved solids
UPL	upper prediction limit

1. INTRODUCTION

In accordance with Texas Commission on Environmental Quality (TCEQ) regulations regarding the disposal of coal combustion residuals (CCRs) in landfills and surface impoundments (Texas Administrative Code [TAC] Title 30, Chapter 352), groundwater monitoring has been conducted at the East Bottom Ash Pond (EBAP), an existing CCR unit at the Pirkey Power Plant in Hallsville, Texas. Recent groundwater monitoring results were used to identify concentrations of Appendix IV constituents that are above site-specific groundwater protection standards (GWPSs).

Based on detection monitoring conducted in 2017 and 2018, statistically significant increases (SSIs) over background were concluded for boron, calcium, chloride, total dissolved solids (TDS), and sulfate at the EBAP. An alternative source was not identified at the time, so assessment monitoring was initiated and GWPSs were set in accordance with § 352.951(b). Two assessment monitoring events were conducted at the EBAP in February and June 2023 in accordance with § 352.951(a). The results of these annual and semiannual assessment events are documented in this report.

Prior to conducting the statistical analyses, the groundwater data underwent several validation tests, including those for completeness, sample tracking accuracy, transcription errors, and consistent use of measurement units. No data quality issues were identified which would impact data usability.

The monitoring data were submitted to Groundwater Stats Consulting, LLC for statistical analysis. Confidence intervals were calculated for Appendix IV parameters at the compliance wells to assess whether Appendix IV parameters were present at SSLs above previously established GWPS. SSLs were identified for cobalt and lithium. Therefore, either the unit will move to an assessment of corrective measures or an alternative source demonstration (ASD) will be conducted to evaluate if the unit can remain in assessment monitoring. Certification of the selected statistical methods by a qualified professional engineer is documented in Attachment A.

2. EAST BOTTOM ASH POND EVALUATION

2.1 Data Validation and QA/QC

During the assessment monitoring program, two sets of samples (February and June 2023) were collected for analysis from each background and compliance well to meet the requirements of § 352.951(a). Samples from both sampling events were analyzed for all Appendix III and Appendix IV parameters. A summary of data collected during these assessment monitoring events are presented in Table 1.

Chemical analysis was completed by a National Environmental Laboratory Accreditation Program–certified analytical laboratory. The laboratory completed analysis of quality assurance and quality control (QA/QC) samples such as laboratory reagent blanks, continuing calibration verification samples, and laboratory fortified blanks.

A data quality review was completed to assess if the data met the objectives outlined in TCEQ Draft Technical Guidance No. 32 related to groundwater sampling and analysis (TCEQ 2020). The data were determined usable for supporting project objectives, as documented in the review memorandum provided in Attachment B. The analytical data were imported into a Microsoft Access database, where checks were completed to assess the accuracy of sample location identification and analyte identification. Where necessary, unit conversions were applied to standardize reported units across all sampling events. Exported data files were created for use with the Sanitas™ v.9.6.36 statistics software. The export file was checked against the analytical data for transcription errors and completeness.

2.2 Statistical Analysis

Statistical analyses for the EBAP were conducted in accordance with the November 2021 *Statistical Analysis Plan* (Geosyntec 2021). Time series plots and results for all completed statistical tests are provided in Attachment C. The data obtained in February and June 2023 were screened for potential outliers. No outliers were identified for these events.

2.2.1 Evaluation of Potential Appendix IV SSLs

A confidence interval was constructed for each Appendix IV parameter at each compliance well. Confidence limits were generally calculated parametrically ($\alpha = 0.01$); however, nonparametric confidence limits were calculated in some cases (e.g., when the data did not appear to be normally distributed or when the nondetect frequency was too high). An SSL was concluded if the lower confidence limit (LCL) was above the GWPS (i.e., if the entire confidence interval was above the GWPS). The calculated confidence limits (Attachment C) were compared to the GWPSs provided in Table 2. The GWPSs were established during a previous statistical analysis as either the greater value of the background concentration or the maximum contaminant level (Geosyntec 2023).

The following SSLs were identified at the Pirkey EBAP:

- The LCL for cobalt was above the GWPS of 0.00939 mg/L at AD-2 (0.0132 mg/L), AD-31 (0.00959 mg/L), and AD-32 (0.0310 mg/L).

- The LCL for lithium exceeded the GWPS of 0.0520 mg/L at AD-31 (0.0760 mg/L) and AD-32 (0.0766 mg/L).

As a result, the Pirkey EBAP will either move to an assessment of corrective measures or an alternative source demonstration will be conducted to evaluate if the unit can remain in assessment monitoring.

2.2.2 Evaluation of Potential Appendix III SSIs

While SSLs were identified, a review of the Appendix III results were also completed to assess whether concentrations of Appendix III parameters at the compliance wells were above background concentrations. Data collected during the June 2023 assessment monitoring event from each compliance well were compared to previously established prediction limits to assess whether the results are above background values (Table 3). The following concentrations were above the upper prediction limits (UPLs):

- Boron concentrations were above the interwell UPL of 0.0437 mg/L at AD-2 (3.06 mg/L) and AD-32 (0.595 mg/L).

- Calcium concentrations were above the interwell UPL of 2.94 mg/L at AD-2 (3.53 mg/L) and AD-32 (5.26 mg/L).

- Chloride concentrations were above the interwell UPL of 8.84 mg/L at AD-2 (30.8 mg/L), AD-31 (21.2 mg/L), and AD-32 (14.5 mg/L).

- Sulfate concentrations were above the interwell UPL of 24.7 mg/L at AD-2 (271 mg/L), AD-31 (82.1 mg/L), and AD-32 (119 mg/L).

- TDS concentrations were above the interwell UPL of 170 mg/L at AD-2 (530 mg/L), AD-31 (280 mg/L), and AD-32 (260 mg/L).

While the prediction limits were calculated for a one-of-two retesting procedure, SSIs were conservatively assumed if the June 2023 sample was above the UPL or below the lower prediction limit in the case of pH. Based on these results, concentrations of Appendix III constituents appear to be above background concentrations.

2.3 Conclusions

An annual and semiannual assessment monitoring event were conducted in accordance with the CCR Rule. The laboratory and field data were reviewed prior to statistical analysis, and no QA/QC issues that impacted data usability were identified. A review of outliers identified no potential outliers in the February and June 2023 data. A confidence interval was constructed at each compliance well for each Appendix IV parameter; SSLs were concluded if the entire confidence interval was above the GWPS. SSLs were identified for cobalt, and lithium. Appendix III parameters were compared to calculated prediction limits, with exceedances identified for boron, calcium, chloride, sulfate, and TDS.

Based on this evaluation, the Pirkey EBAP CCR unit will either move to an assessment of corrective measures or an ASD will be conducted to evaluate if the unit can remain in assessment monitoring.

3. REFERENCES

Geosyntec. 2021. Statistical Analysis Plan – H.W. Pirkey Power Plant. Geosyntec Consultants, Inc. November.

Geosyntec. 2023. Statistical Analysis Summary – East Bottom Ash Pond, Pirkey, Hallsville, Texas. Geosyntec Consultants, Inc. March.

TCEQ. 2020. Topic: Coal Combustion Residuals (CCR) Groundwater Monitoring and Corrective Action Draft Technical Guidance No. 32. May.

TABLES

Table 1. Groundwater Data Summary
Statistical Analysis Summary
Pirkey Plant - East Bottom Ash Pond

Parameter	Unit	AD-2		AD-4		AD-12		AD-18		AD-31		AD-32	
		2/27/2023	6/26/2023	2/28/2023	6/27/2023	2/27/2023	6/26/2023	2/28/2023	6/27/2023	2/27/2023	6/26/2023	2/27/2023	6/26/2023
Antimony	µg/L	0.1 U1	0.009 J1	0.1 U1	0.018 J1	0.1 U1	0.015 J1	0.1 U1	0.009 J1	0.1 U1	0.009 J1	0.1 U1	0.012 J1
Arsenic	µg/L	0.90	1.14	0.26	1.23	0.07 J1	0.11	0.26	0.55	0.30	0.36	0.89	1.53
Barium	µg/L	15.9	13.5	115	132	27.5	16.3	77.9	89	35.6	32.9	26.3	23.4
Beryllium	µg/L	0.787	0.744	0.594	0.376	0.155	0.11	0.085	0.132	0.935	1.08	3.19	0.905
Boron	mg/L	3.22	3.06	0.028 J1	0.018 J1	0.021 J1	0.019 J1	0.05 U1	0.009 J1	0.017 J1	0.025 J1	0.767	0.595
Cadmium	µg/L	0.128	0.119	0.015 J1	0.021	0.013 J1	0.007 J1	0.01 J1	0.013 J1	0.079	0.064	0.360	0.042
Calcium	mg/L	3.53	3.53	2.22	2.90	0.34	0.21	0.18	0.23	2.70	2.69	7.69	5.26
Chloride	mg/L	31.4	30.8	4.08	3.97	6.51	4.68	5.49	5.28	23.4	21.2	25.1	14.5
Chromium	µg/L	0.52	0.49	0.41	0.56	0.36	0.45	0.38	0.57	0.62	0.63	0.44	0.61
Cobalt	µg/L	28.9	27.3	5.60	3.89	1.50	0.932	0.750	0.933	10.5	10.1	29.4	15.9
Combined Radium	pCi/L	1.03	1.36	1.9	1.72	1.17	0.45	1.1	2.53	4.05	4.29	5.83	3.93
Fluoride	mg/L	0.22	0.19	0.05 J1	0.02 J1	0.07	0.06	0.06 U1	0.06 U1	0.13	0.1	0.44	0.13
Lead	µg/L	0.68	0.60	0.2 U1	0.15 J1	0.1 J1	0.11 J1	0.18 J1	0.13 J1	0.31	0.33	0.40	0.17 J1
Lithium	mg/L	0.0636	0.0595	0.0311	0.0240	0.00885	0.0049	0.0123	0.0138	0.0737	0.089	0.0837	0.0500
Mercury	µg/L	0.051	0.157	0.004 J1	0.003 J1	0.005 U1	0.005 U1	0.006	0.010	0.130 J1	0.077	2.200	0.760
Molybdenum	µg/L	0.5 U1	0.5 U1	0.5 U1	0.5 U1	0.5 U1	0.7	0.5 U1	0.5 U1	0.5 U1	0.5 U1	0.5 U1	0.5 U1
Selenium	µg/L	2.65	4.32	0.5 U1	0.14 J1	0.35 J1	0.23 J1	0.5 U1	0.15 J1	0.27 J1	0.78	2.68	1.59
Sulfate	mg/L	268	271	19.9	18.9	3.90	2.9	7.52	8.2	82.2	82.1	151	119
Thallium	µg/L	0.12 J1	0.11 J1	0.09 J1	0.09 J1	0.2 U1	0.2 U1	0.2 U1	0.04 J1	0.09 J1	0.09 J1	0.18 J1	0.11 J1
Total Dissolved Solids	mg/L	510	530	140	150	70	80	100	110	260	280	340	260
pH	SU	3.78	3.85	4.89	4.53	3.77	4.6	4.35	4.4	3.48	4.2	3.32	3.79

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
SU: standard unit
U1: Non-detect value. For statistical analysis, parameters which were not detected were replaced with the reporting limit.
J1: Estimated value. Parameter was detected in concentrations below the reporting limit.
M1: The associated matrix spike (MS) or matrix spike duplicate (MSD) recovery was outside acceptance limits.

Table 2. Appendix IV Groundwater Protection Standards
Statistical Analysis Summary
Pirkey Plant - East Bottom Ash Pond

Geosyntec Consultants, Inc.

Constituent Name	MCL	Calculated UTL	GWPS
Antimony, Total (mg/L)	0.00600	0.000100	0.00600
Arsenic, Total (mg/L)	0.0100	0.0110	0.0110
Barium, Total (mg/L)	2.00	0.183	2.00
Beryllium, Total (mg/L)	0.00400	0.00115	0.00400
Cadmium, Total (mg/L)	0.00500	0.000260	0.00500
Chromium, Total (mg/L)	0.100	0.00326	0.100
Cobalt, Total (mg/L)	n/a	0.00939	0.00939
Combined Radium, Total (pCi/L)	5.00	3.20	5.00
Fluoride, Total (mg/L)	4.00	0.257	4.00
Lead, Total (mg/L)	n/a	0.00500	0.00500
Lithium, Total (mg/L)	n/a	0.0520	0.0520
Mercury, Total (mg/L)	0.00200	0.0000640	0.00200
Molybdenum, Total (mg/L)	n/a	0.00500	0.00500
Selenium, Total (mg/L)	0.0500	0.00245	0.0500
Thallium, Total (mg/L)	0.00200	0.00187	0.00200

Notes:
1. Calculated UTL (upper tolerance limit) represents site-specific background values.
2. Grey cells indicate the GWPS is based on the calculated UTL. Either the UTL is higher than the MCL or an MCL does not exist.
GWPS: groundwater protection standard
MCL: maximum contaminant level
mg/L: milligrams per liter
pCi/L: picocuries per liter
n/a: not applicable

Table 3. Appendix III Data Summary
Statistical Analysis Summary
Pirkey - East Bottom Ash Pond

Geosyntec Consultants, Inc.

Analyte	Unit	Description	AD-2	AD-31	AD-32
			6/26/2023	6/26/2023	6/26/2023
Boron	mg/L	Interwell Background Value (UPL)	0.0437		
		Analytical Result	**3.06**	0.025	**0.595**
Calcium	mg/L	Interwell Background Value (UPL)	2.94		
		Analytical Result	**3.53**	2.69	**5.26**
Chloride	mg/L	Interwell Background Value (UPL)	8.84		
		Analytical Result	**30.8**	**21.2**	**14.5**
Fluoride	mg/L	Interwell Background Value (UPL)	0.257		
		Analytical Result	0.19	0.1	0.13
pH	SU	Intrawell Background Value (UPL)	4.7	5.1	4.3
		Intrawell Background Value (LPL)	3.4	2.8	2.6
		Analytical Result	3.9	4.2	3.8
Sulfate	mg/L	Interwell Background Value (UPL)	24.7		
		Analytical Result	**271**	**82.1**	**119**
Total Dissolved Solids	mg/L	Interwell Background Value (UPL)	170		
		Analytical Result	**530**	**280**	**260**

Notes:
1. Bold values exceed the background value.
2. Background values are shaded gray.
LPL: Lower prediction limit
mg/L: milligrams per liter
SU: standard units
UPL: Upper prediction limit

ATTACHMENT A
Certification by Qualified Professional Engineer

Certification by Qualified Professional Engineer

I certify that selected and above described statistical method is appropriate for evaluating the groundwater monitoring data for the Pirkey East Bottom Ash Pond CCR management area and that the requirements of § 352.931(a) have been met.

David Anthony Miller

Printed Name of Licensed Professional Engineer

David Anthony Miller

Signature

112498	Texas	10.08.2023
License Number	Licensing State	Date

ATTACHMENT B
Data Quality Review Memoranda

Geosyntec consultants

500 W. Wilson Bridge Road, Suite 250
Worthington, Ohio 43085
PH 614.468.0415
FAX 614.468.0416
www.geosyntec.com

Memorandum

Date:	April 28, 2023
To:	David Miller (AEP)
Copies to:	Jill Parker-Witt (AEP)
From:	Allison Kreinberg (Geosyntec)
Subject:	Data Quality Review – Pirkey Power Plant February 2023 Sampling Event

This memorandum summarizes the findings of a data quality review for groundwater samples collected at the Pirkey Power Plant, located in Hallsville, Texas in February 2023. The groundwater samples were collected to comply with the Texas Commission on Environmental Quality's (TCEQ's) regulations regarding the disposal of coal combustion residuals (CCRs) in landfills and surface impoundments (Title 30 Chapter 352, "CCR Rule"). 40 CFR 257 Appendix III and IV constituents were analyzed.

The following sample data groups (SDGs) were associated with the groundwater samples collected during the February 2023 sampling event and are reviewed in this memorandum:

- Dolan Chemical Laboratory (Groveport, Ohio) Job ID # 230658
- Dolan Chemical Laboratory (Groveport, Ohio) Job ID # 230698

The data included in these SDGs were reviewed to assess if they met the objectives outlined in TCEQ Draft Technical Guideline No. 32[1] prior to submittal of this data to TCEQ.

The following data quality issues were identified:

- Mercury data for SDG 230698 had an inconsistent number of significant figures reported between the electronic data deliverables and the published laboratory reports. The

[1] TCEQ. Topic: Coal Combustion Residuals (CCR) Groundwater Monitoring and Corrective Action: Technical Guidance No. 32. May 2020.

published laboratory report for SDG 230698 will be reissued with the appropriate number of significant figures for mercury.

- As reported in SDG 230698, antimony, beryllium, chromium, cobalt, and lead were detected in the field blank sample "FIELD BLANK" collected on 2/27/23. The estimated detected beryllium concentration in the field blank (0.033 µg/L) was more than 10% of the detected values for beryllium in samples AD-12 (0.155 µg/L), AD-18 (0.085 µg/L), and "Duplicate 1" (0.155 µg/L), which could result in high bias in the AD-12, AD-18, and "Duplicate 1" beryllium results. The detected chromium concentration in the field blank (0.23 µg/L) was more than 10% of the detected values for chromium in all groundwater samples, which could result in high bias in the chromium results for all groundwater samples. The detected lead concentration in the field blank (2.57 µg/L) was more than 10% of the detected values for lead in all groundwater samples, which could result in high bias in the lead results for all groundwater samples

- As reported in SDG 230698, beryllium, chromium, cobalt, and lead were detected in the equipment blank sample "EQUIPMENT BLANK" collected on 2/27/23. The detected beryllium concentration in the equipment blank (0.034 µg/L) was more than 10% of the detected values for beryllium in samples AD-12 (0.155 µg/L), AD-18 (0.085 µg/L), and "Duplicate 1" (0.155 µg/L), which could result in high bias in the AD-12, AD-18, and "Duplicate 1" beryllium results. The detected chromium concentration in the equipment blank (0.44 µg/L) was more than 10% of the detected values for chromium in all groundwater samples, which could result in high bias in the chromium results for all groundwater samples. The detected lead concentration in the equipment blank (0.38 µg/L) was more than 10% of the detected values for lead in all groundwater samples, which could result in high bias in the lead results for all groundwater samples

- As reported in SDG 230698, the RPD for boron concentrations from parent sample "AD-12" and duplicate sample "Duplicate 1" was 55%. The RPD for selenium concentrations was 22%. The AD-12 results for boron and selenium should be considered estimated.

- As reported in SDG 230698, the RPD for boron concentrations from parent sample "AD-4" and duplicate sample "Duplicate 2" was 49%. The RPD for chromium concentrations was 52%. The RPD for mercury concentrations was 29%. The RPD for thallium concentrations was 20%. The AD-4 results for boron, chromium, mercury, and thallium should be considered estimated.

- As reported in SDG 230698, the matrix spike duplicate (MSD) for sodium was below the acceptable limit of 75%. The associated sample (AD-2) was flagged M1 for sodium: the

associated matrix spike (MS) or MSD recovery outside acceptance limits. The AD-2 sodium result should be considered estimated. Sodium is not a regulated Appendix III or IV constituent.

- As reported in SDG 230698, the RPD for the laboratory duplicate for radium-226 was above the acceptable limit of 25%. The associated sample (AD-12) was flagged P1 for radium-226: the precision between duplicate results was above the acceptance limits. The AD-12 radium-226 result should be considered estimated.

- As reported in SDG 230698, the MSD RPD for radium-228 was above the acceptable limit of 25%. The associated sample (AD-12) was flagged P3 for radium-228: the precision on the MSD was above acceptance limits. The AD-12 radium-228 result should be considered estimated.

Based on these findings, the majority of the data reported in these SDGs are considered accurate and complete. Although the QC failures mentioned above will result in some limitations of data use since the affected results are considered estimated or have elevated reporting limits, the data are considered usable for supporting project objectives.

Geosyntec consultants

500 W. Wilson Bridge Road, Suite 250
Worthington, Ohio 43085
PH 614.468.0415
FAX 614.468.0416
www.geosyntec.com

Memorandum

Date:	September 19, 2023
To:	David Miller (AEP)
Copies to:	Leslie Fuerschbach (AEP)
From:	Allison Kreinberg (Geosyntec)
Subject:	Data Quality Review – Pirkey Power Plant June 2023 Sampling Event

This memorandum summarizes the findings of a data quality review for groundwater samples collected at the Pirkey Power Plant in Hallsville, Texas in June 2023. The groundwater samples were collected to comply with the Texas Commission on Environmental Quality's (TCEQ's) regulations regarding the disposal of coal combustion residuals (CCRs) in landfills and surface impoundments (Title 30 Chapter 352, "CCR Rule"). 40 CFR 257 Appendix III and IV constituents were analyzed.

The following sample data groups (SDGs) were associated with the groundwater samples collected during the June 2023 sampling event and are reviewed in this memorandum:

- Dolan Chemical Laboratory (Groveport, Ohio) Job ID # 231960
- Dolan Chemical Laboratory (Groveport, Ohio) Job ID # 231985

The data included in these SDGs were reviewed to assess if they met the objectives outlined in TCEQ Draft Technical Guideline No. 32[1] prior to submittal of this data to TCEQ.

The following data quality issues were identified:

- The chains of custody listed a sample collection date of 6/23/2023 for sample "AD-33", but a review of the sample bottles and the field forms noted that the sample was collected on 6/26/2023. The laboratory report used a sample collection date of 6/26/2023.

[1] TCEQ. Topic: Coal Combustion Residuals (CCR) Groundwater Monitoring and Corrective Action: Technical Guidance No. 32. May 2020.

- Mercury data for SDG 231985 had an inconsistent number of significant figures reported between the electronic data deliverables and the published laboratory reports. The published laboratory report for SDG 231985 was reissued with the appropriate number of significant figures for mercury.

- As reported in SDG 231960, chloride was detected in the field blank sample "FIELD BLANK" collected on 6/26/23. The detected chloride concentration in the field blank (0.27 mg/L) was less than 10% of the detected values for chloride in all groundwater samples.

- As reported in SDG 231985, beryllium, chromium, and cobalt were detected in the field blank sample "FIELD BLANK" collected on 6/26/23. The estimated detected beryllium concentration in the field blank (0.015 µg/L) was more than 10% of the detected values for beryllium in samples AD-12 (0.11 µg/L), AD-18 (0.132 µg/L), and AD-30 (0.086 µg/L), which could result in high bias in the AD-12, AD-18, and AD-30 beryllium results. The detected chromium concentration in the field blank (0.53 µg/L) was more than 10% of the detected values for chromium in all groundwater samples, which could result in high bias in the chromium results for all groundwater samples.

- As reported in SDG 231985, beryllium, chromium, and cobalt were detected in the equipment blank sample "EQUIPMENT BLANK" collected on 6/26/23. The estimated detected beryllium concentration in the equipment blank (0.027 µg/L) was more than 10% of the detected values for beryllium in samples AD-3 (0.2 µg/L), AD-12 (0.11 µg/L), AD-13 (0.234 µg/L), AD-18 (0.132 µg/L), AD-30 (0.086 µg/L) and "Duplicate 1" (0.223 µg/L), which could result in high bias in the AD-3, AD-12, AD-13, AD-18, AD-30, and "Duplicate 1" beryllium results. The detected chromium concentration in the equipment blank blank (0.32 µg/L) was more than 10% of the detected values for chromium in all groundwater samples, which could result in high bias in the chromium results for all groundwater samples.

Based on these findings, the majority of the data reported in these SDGs are considered accurate and complete. Although the QC failures mentioned above will result in some limitations of data use since the affected results are considered estimated or have elevated reporting limits, the data are considered usable for supporting project objectives.

ATTACHMENT C
Statistical Analysis Output

GROUNDWATER STATS CONSULTING

September 21, 2023

Geosyntec Consultants
Attn: Ms. Allison Kreinberg
500 W. Wilson Bridge Road, Ste. #250
Worthington, OH 43085

Re: Pirkey East Bottom Ash Pond
Assessment Monitoring Event – February & June 2023

Dear Ms. Kreinberg,

Groundwater Stats Consulting (GSC), formerly the statistical consulting division of Sanitas Technologies, is pleased to provide the evaluation of groundwater data from the February and June 2023 sample events for American Electric Power Company's Pirkey East Bottom Ash Pond (EBAP). The analysis complies with the Texas Commission of Environmental Quality rule 30 TAC 352 as well as with the United States Environmental Protection Agency (USEPA) Unified Guidance (2009).

Sampling at each of the wells below began at Pirkey EBAP for the Coal Combustion Residual (CCR) program in 2016. The monitoring well network, as provided by Geosyntec Consultants, consists of the following:

- **Upgradient wells:** AD-4, AD-12, and AD-18
- **Downgradient wells:** AD-2, AD-31, and AD-32

Data were sent electronically, and the statistical analysis was conducted according to the Statistical Analysis Plan and screening evaluation prepared by GSC and approved by Dr. Kirk Cameron, PhD Statistician with MacStat Consulting, primary author of the USEPA Unified Guidance, and Senior Advisor to GSC. The statistical analysis was reviewed by Andrew Collins, Project Manager of Groundwater Stats Consulting.

The CCR program consists of the following Assessment monitoring constituents:

- **Appendix IV** (Assessment Monitoring) **–** antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, combined radium 226 + 228, fluoride, lead, lithium, mercury, molybdenum, selenium, and thallium

Time series graphs for Appendix IV parameters are provided for all wells and are used to evaluate concentrations over the entire record (Figure A). Additionally, box plots are included for all constituents at upgradient and downgradient wells (Figure B). The time series plots are used to initially screen for suspected outliers and trends, while the box plots provide visual representation of variation within individual wells and between all wells. Values in background, which have previously been flagged as outliers, may be seen in a lighter font and disconnected symbol on the graphs. Additionally, a summary of flagged values follows this letter (Figure C).

Summary of Statistical Methods

Assessment monitoring for Appendix IV parameters involves the comparison of a confidence interval for each parameter at downgradient wells against the corresponding Groundwater Protection Standard (GWPS). The GWPS is determined for each parameter as the highest limit of the Maximum Contaminant Levels (MCLs) or background limits determined from tolerance limits constructed from pooled upgradient well data.

Prior to computing tolerance limits on upgradient well data or confidence intervals on downgradient well data, the distribution of data is tested using the Shapiro-Wilk/Shapiro-Francia test for normality. After testing for normality and performing any adjustments as discussed below (US EPA, 2009), data are analyzed using either parametric or non-parametric tolerance limits and confidence intervals as appropriate, based on the following criteria.

- No statistical analyses are required on wells and analytes containing 100% non-detects (USEPA Unified Guidance, 2009, Chapter 6).
- When data contain <15% non-detects, simple substitution of one-half the reporting limit is utilized in the statistical analysis. The reporting limit utilized for non-detects is the most practical quantification limit (PQL) as reported by the laboratory.
- When data contain between 15-50% non-detects, the Kaplan-Meier non-detect adjustment is applied to the background data for parametric limits. This technique adjusts the mean and standard deviation of the historical concentrations to account for concentrations below the reporting limit.

- Nonparametric tolerance limits are used on data containing greater than 50% non-detects.

Note that while the most recent PQL is used for non-detect values, the historic reporting limit of 0.005 mg/L was used for lead and molybdenum in order to maintain statistical limits that are conservative from a regulatory perspective.

Summary of Background Update – Conducted in February 2023

Outlier Analysis

Prior to evaluating Appendix IV parameters, upgradient well data were screened through visual screening and Tukey's outlier test for potential outliers and extreme trending patterns that would lead to artificially elevated statistical limits. A discussion of those findings is provided below.

Tukey's outlier test on pooled upgradient well data did not identify any outliers through November 2022; however, high non-detect values of 0.04 mg/L for molybdenum in upgradient and downgradient wells were flagged in order to construct statistical limits that are conservative (i.e., lower) from a regulatory perspective and represent present-day groundwater quality at this facility.

Additionally, downgradient well data through November 2022 were screened through visual screening using time series graphs. Since the downgradient well data are used to construct confidence intervals, a regulatory conservative approach is taken in that values that are marginally high relative to the rest of the data are retained unless there is particular justification for excluding them. No changes were to previously flagged data were made. All flagged values may be seen on the Outlier Summary following this letter (Figure C).

Interwell Upper Tolerance Limits

Interwell upper tolerance limits were established in February 2023 using all available pooled upgradient well data for each Appendix IV parameter through November 2022 (Figure D). GWPS will be updated during the Fall 2023 analysis. When data followed a normal or transformed-normal distribution, parametric tolerance limits were used to calculate background limits for Appendix IV parameters with a target of 95% confidence and 95% coverage. Nonparametric tolerance limits are constructed when data do not follow a normal or transformed-normal distribution or when there are greater than 50%

non-detects. The confidence and coverage levels for nonparametric tolerance limits are dependent upon the number of background samples.

Groundwater Protection Standards

Background limits were compared to the MCLs in the GWPS table following this letter to determine the highest limit for use as the GWPS in the Confidence Interval comparisons (Figure E).

Evaluation of Appendix IV Parameters – February and June 2023

Time series plots were used to visually identify potential outliers in downgradient wells through the February and June 2023 sample events. When suspected outliers are identified, Tukey's outlier test is used to formally test whether measurements are statistically significant. As mentioned above, high outliers are 'cautiously' flagged in the downgradient wells when measurements are clearly much different from remaining data within a given well. This is intended to be a regulatory conservative approach in that it will reduce the variance and thus reduce the width of parametric confidence intervals; although it will also reduce the mean and thus lower the entire interval. The intent is to better represent the actual downgradient mean. No additional suspected outliers were identified.

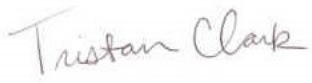
Confidence intervals were then constructed on downgradient wells with data through June 2023 for each of the Appendix IV parameters using either parametric or nonparametric intervals depending on the data distribution and percentage of non-detects (Figure F). When data followed a normal or transformed-normal distribution, parametric confidence intervals were used for Appendix IV parameters. Nonparametric confidence intervals, which use the largest and smallest order statistics depending on the sample size as interval limits, were constructed when data did not follow a normal or transformed-normal distribution or when there were greater than 50% non-detects. The lower confidence limit, which is constructed with 99% confidence for parametric confidence intervals, is compared to the GWPS prepared as described above. The confidence level associated with nonparametric confidence intervals is dependent upon the number samples available.

Only when the entire confidence interval is above the GWPS is the well/constituent pair considered to exceed its respective standard. Both a tabular summary and graphical presentation of the confidence interval results follow this letter. Exceedances were noted for the following well/constituent pairs:

- Cobalt: AD-2, AD-31, and AD-32
- Lithium: AD-31 and AD-32

Thank you for the opportunity to assist you in the statistical analysis of groundwater quality for the Pirkey EBAP. If you have any questions or comments, please feel free to contact us.

For Groundwater Stats Consulting,



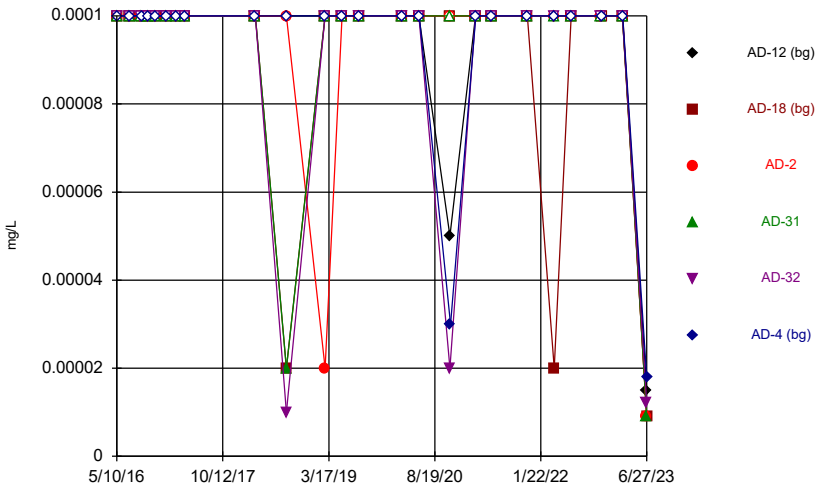
Tristan Clark
Groundwater Analyst

Andrew Collins
Project Manager

FIGURE A
Time Series

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

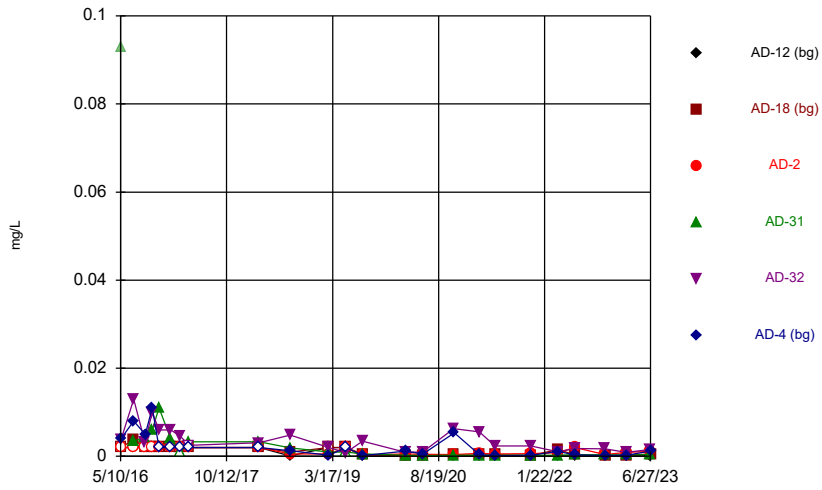
Time Series



Constituent: Antimony, total Analysis Run 9/19/2023 2:52 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series



Constituent: Arsenic, total Analysis Run 9/19/2023 2:52 PM View: Appendix IV
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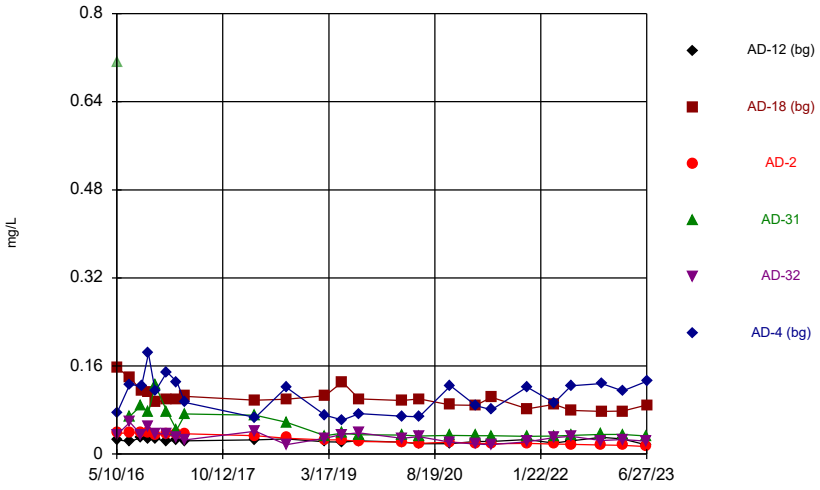
Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG

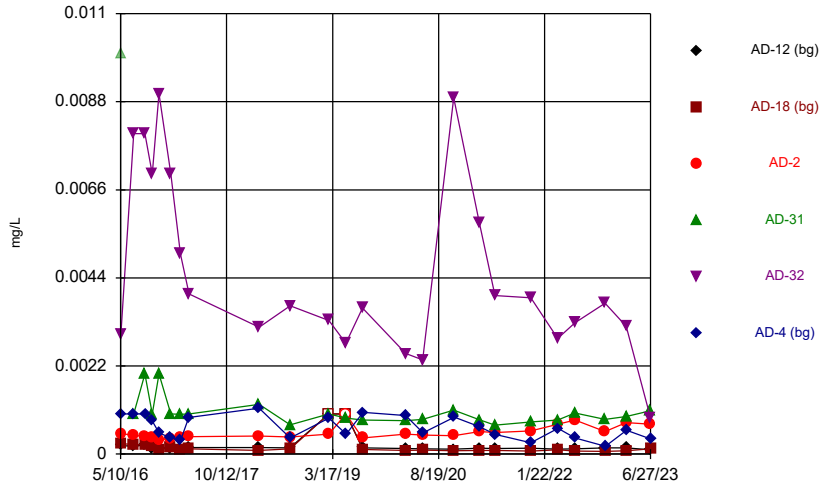
Time Series



Constituent: Barium, total Analysis Run 9/19/2023 2:53 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

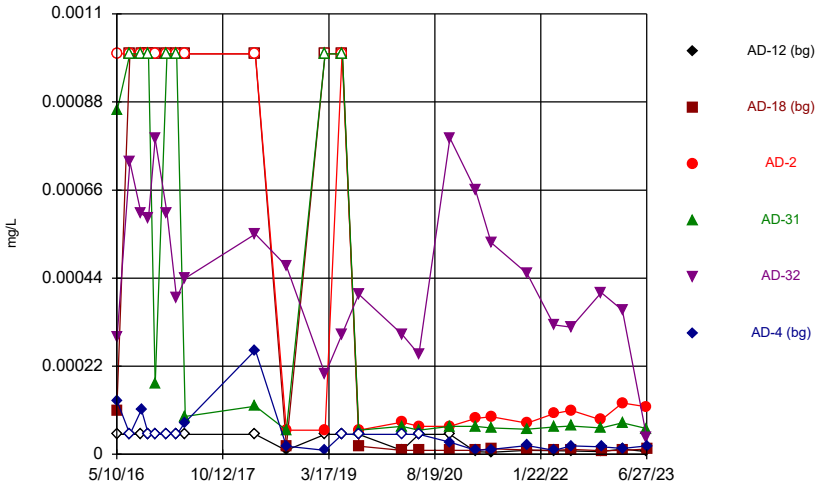
Time Series



Constituent: Beryllium, total Analysis Run 9/19/2023 2:53 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series



Constituent: Cadmium, total Analysis Run 9/19/2023 2:53 PM View: Appendix IV
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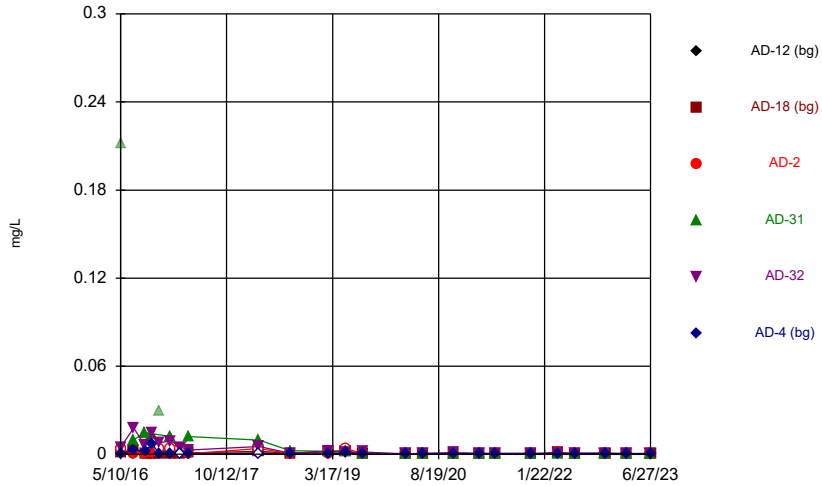
Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

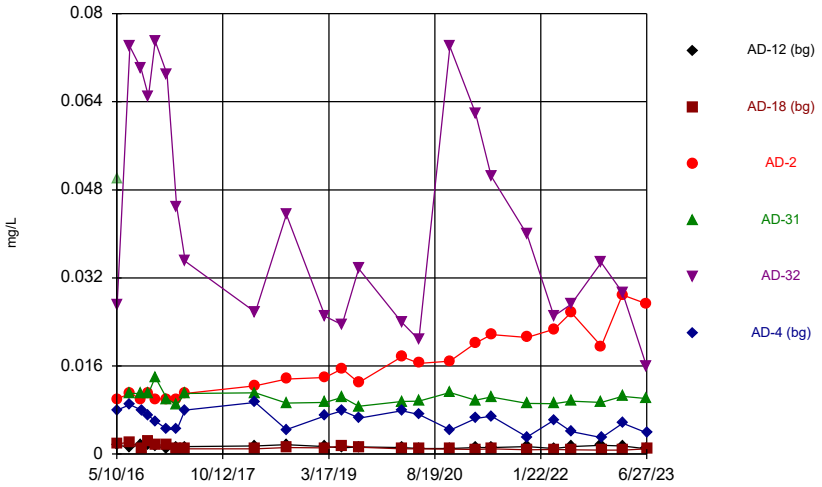
Time Series



Constituent: Chromium, total Analysis Run 9/19/2023 2:53 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG

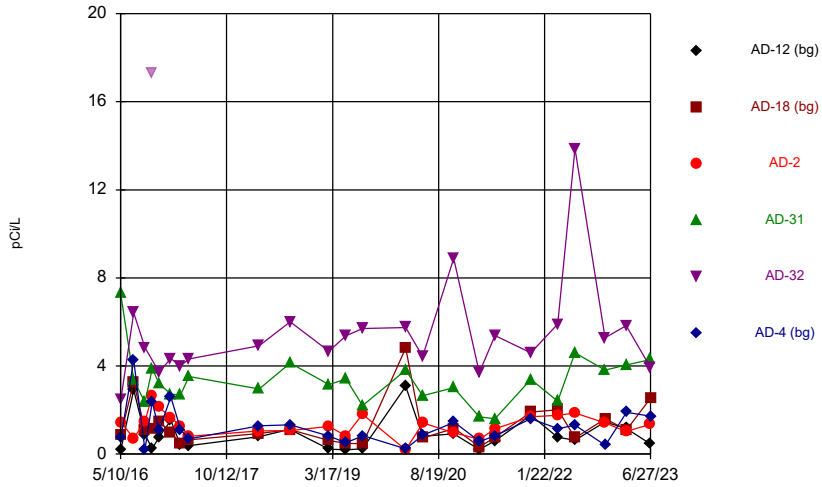
Time Series



Constituent: Cobalt, total Analysis Run 9/19/2023 2:53 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG

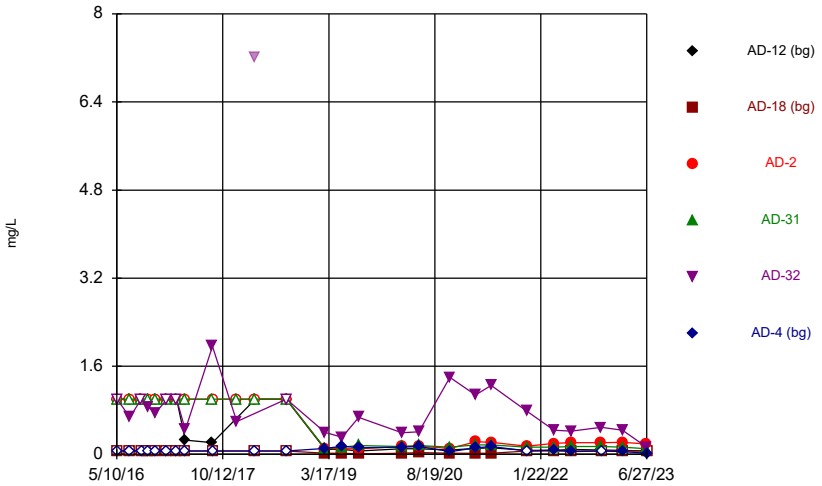
Time Series



Constituent: Combined Radium 226 + 228 Analysis Run 9/19/2023 2:53 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

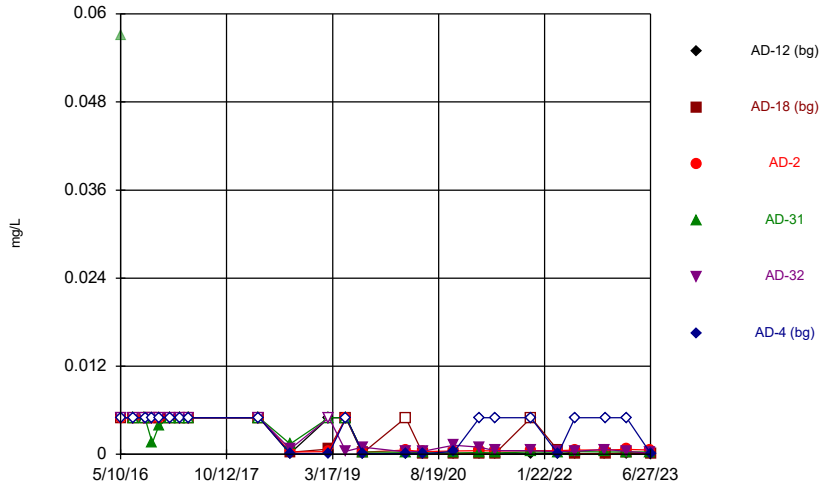
Time Series



Constituent: Fluoride, total Analysis Run 9/19/2023 2:53 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

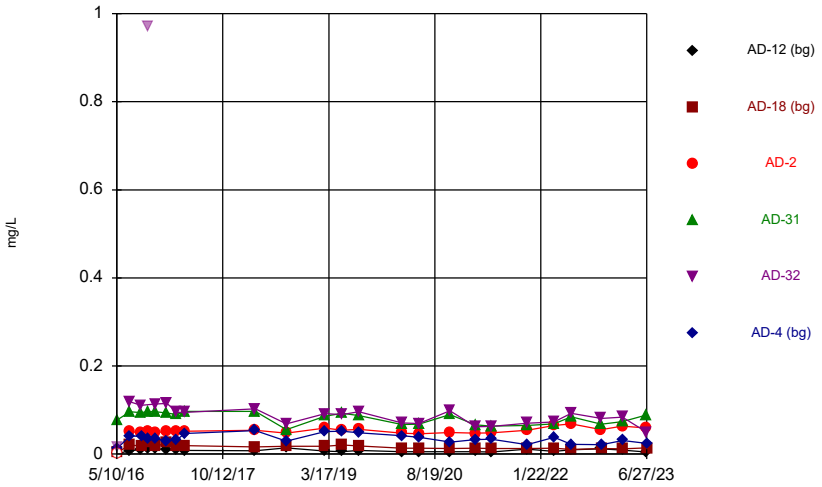
Time Series



Constituent: Lead, total Analysis Run 9/19/2023 2:53 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

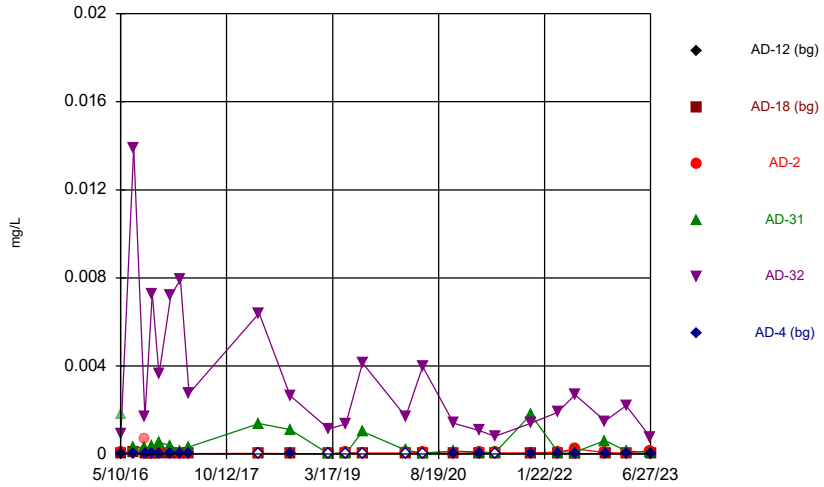
Time Series



Constituent: Lithium, total Analysis Run 9/19/2023 2:53 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

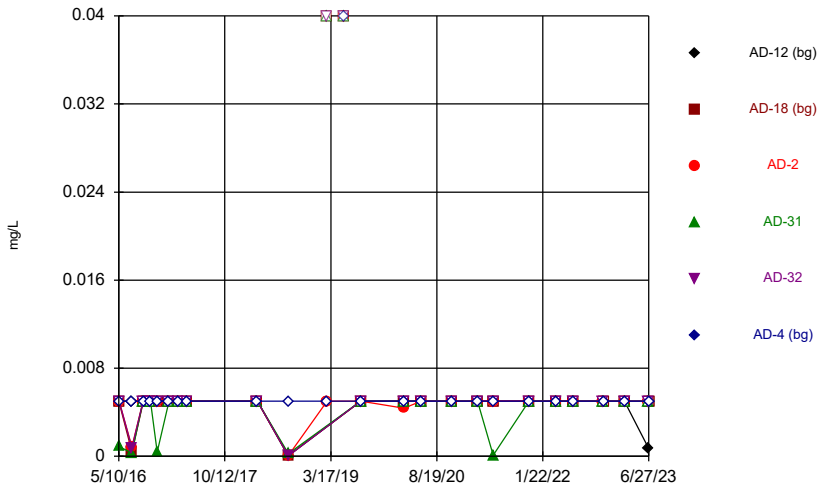
Time Series



Constituent: Mercury, total Analysis Run 9/19/2023 2:53 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series



Constituent: Molybdenum, total Analysis Run 9/19/2023 2:53 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

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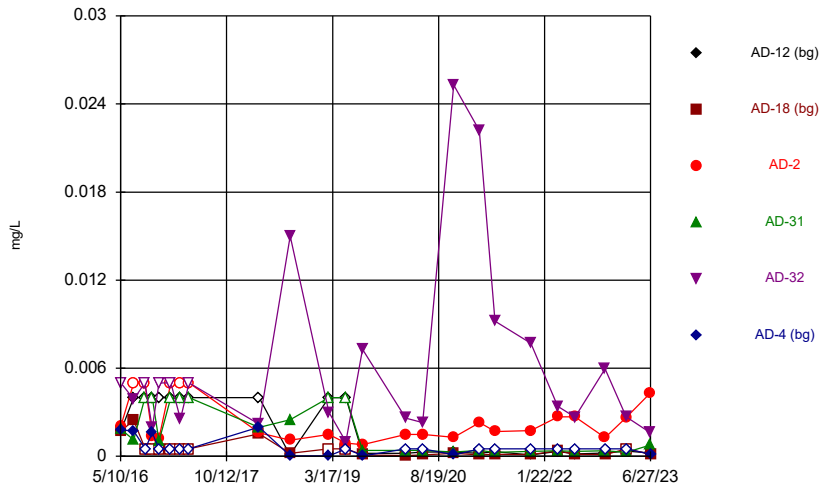
Hollow symbols indicate censored values.

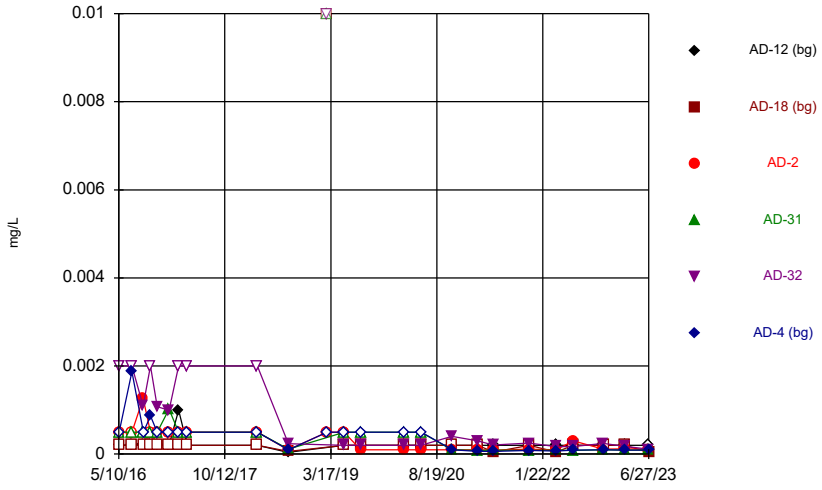
Time Series



Constituent: Selenium, total Analysis Run 9/19/2023 2:53 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

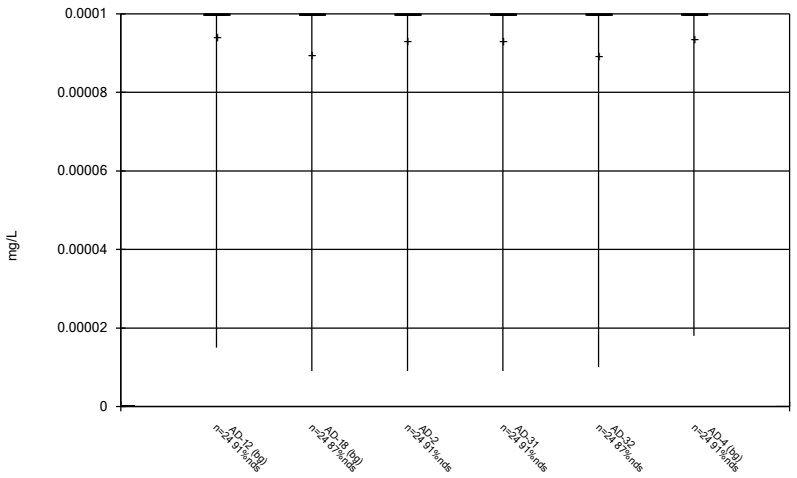
Time Series



Constituent: Thallium, total Analysis Run 9/19/2023 2:53 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

FIGURE B
Box Plots

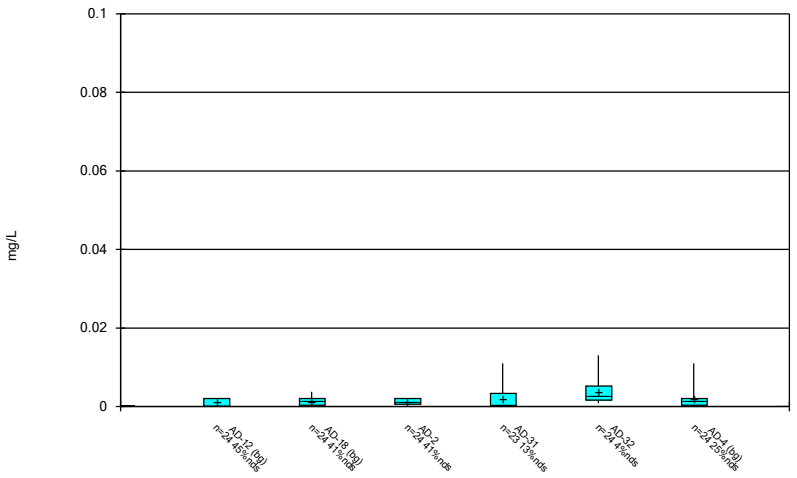
Box & Whiskers Plot



Constituent: Antimony, total Analysis Run 9/19/2023 2:53 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG

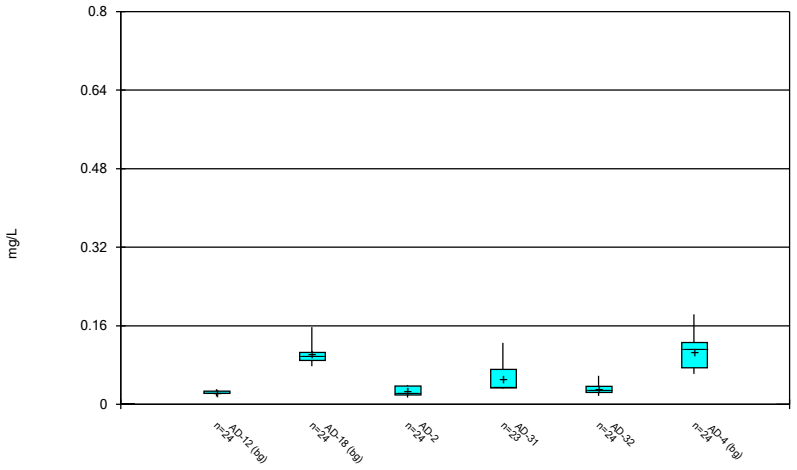
Box & Whiskers Plot



Constituent: Arsenic, total Analysis Run 9/19/2023 2:53 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG

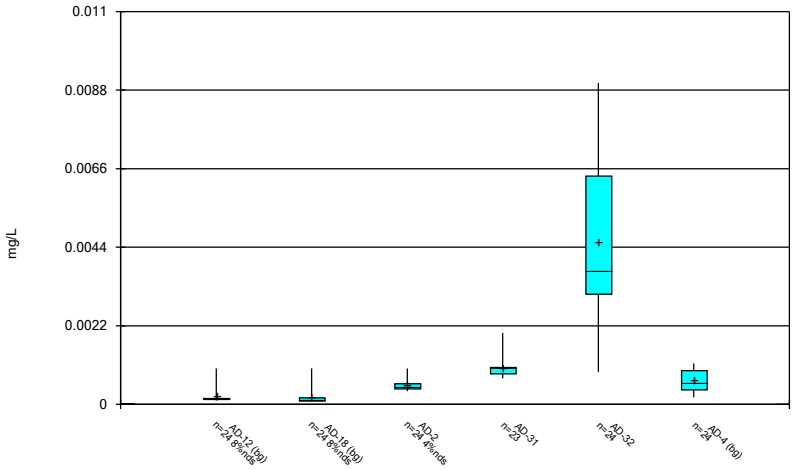
Box & Whiskers Plot



Constituent: Barium, total Analysis Run 9/19/2023 2:53 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

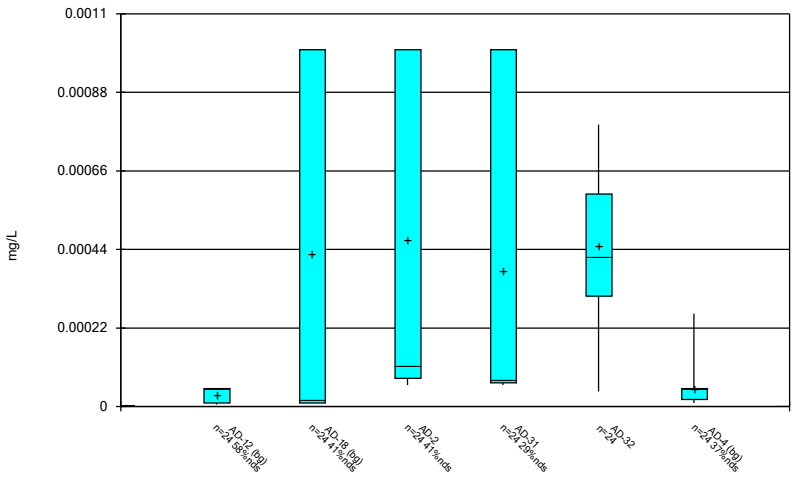
Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Beryllium, total Analysis Run 9/19/2023 2:53 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

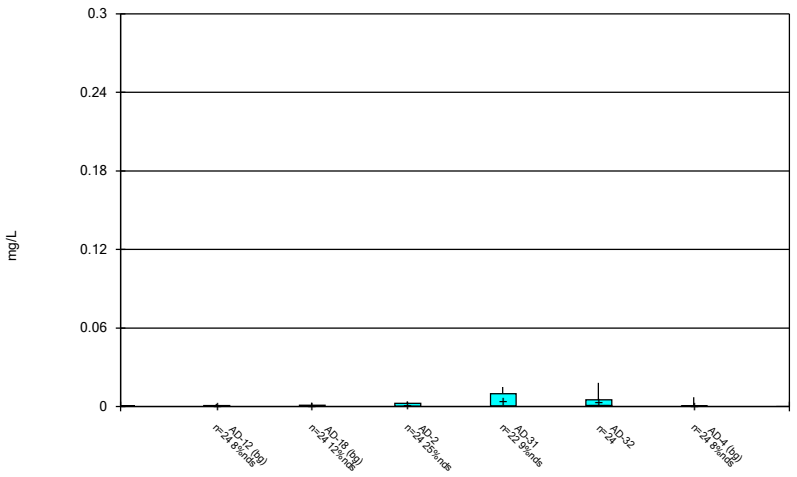
Box & Whiskers Plot



Constituent: Cadmium, total Analysis Run 9/19/2023 2:53 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG

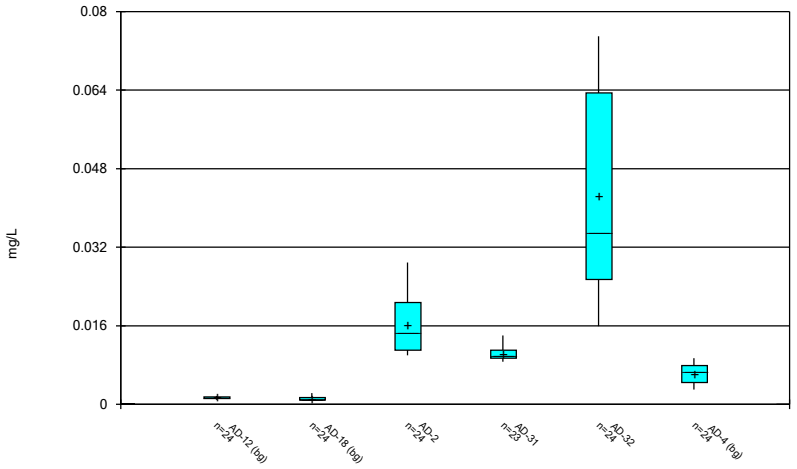
Box & Whiskers Plot



Constituent: Chromium, total Analysis Run 9/19/2023 2:53 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG

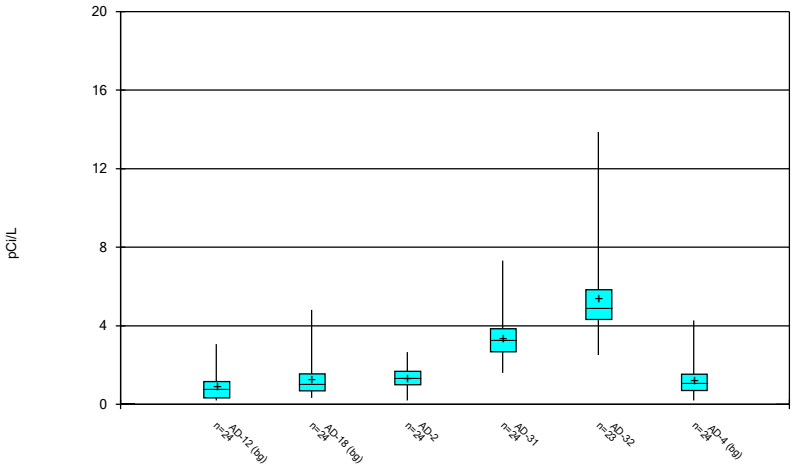
Box & Whiskers Plot



Constituent: Cobalt, total Analysis Run 9/19/2023 2:53 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

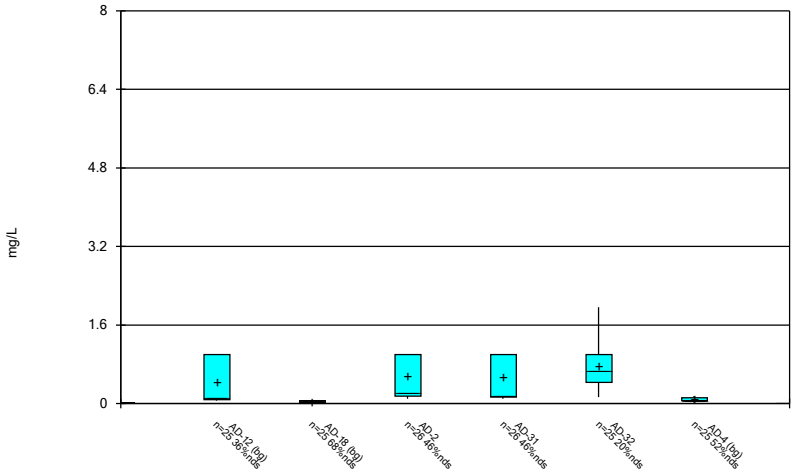
Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG

Box & Whiskers Plot



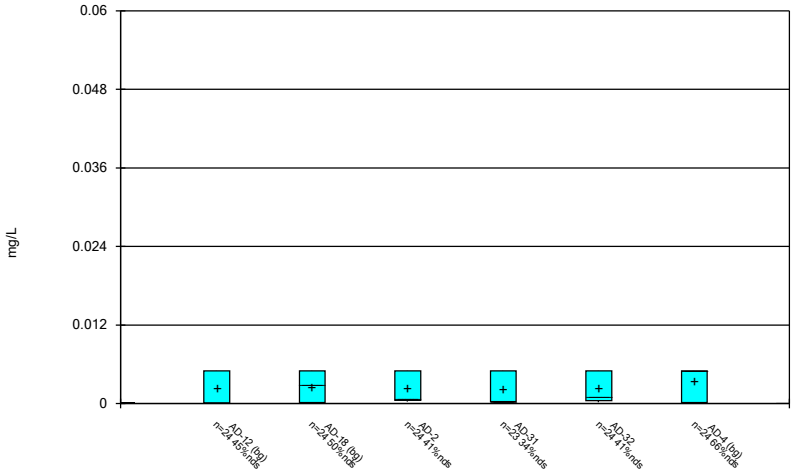
Constituent: Combined Radium 226 + 228 Analysis Run 9/19/2023 2:53 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Box & Whiskers Plot



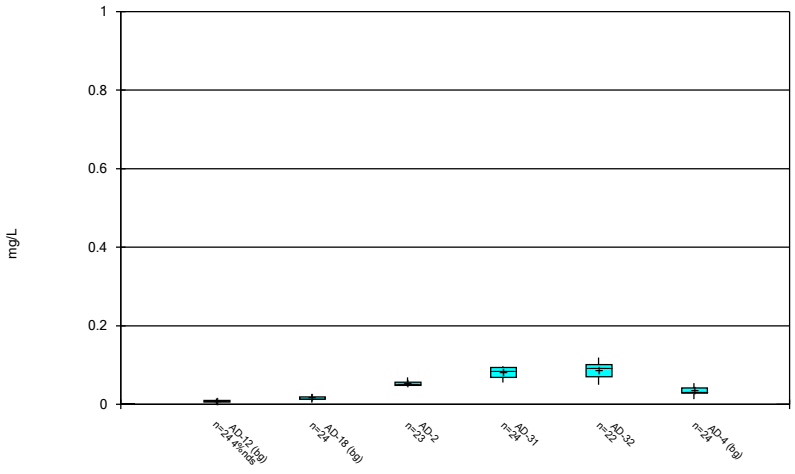
Constituent: Fluoride, total Analysis Run 9/19/2023 2:53 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Box & Whiskers Plot



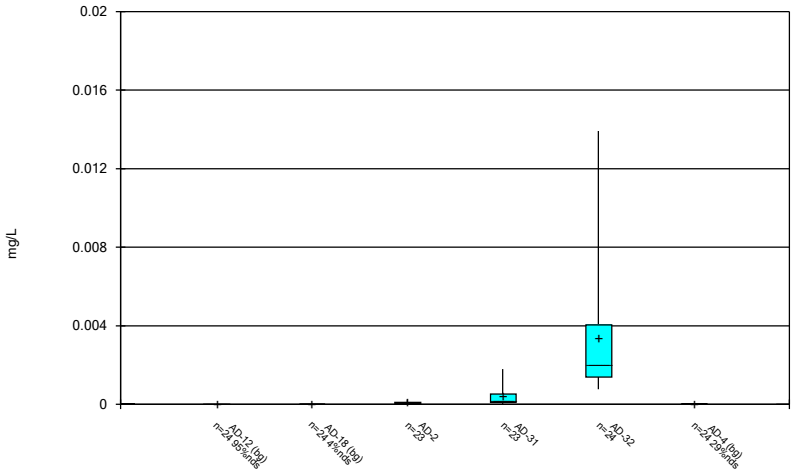
Constituent: Lead, total Analysis Run 9/19/2023 2:53 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Box & Whiskers Plot



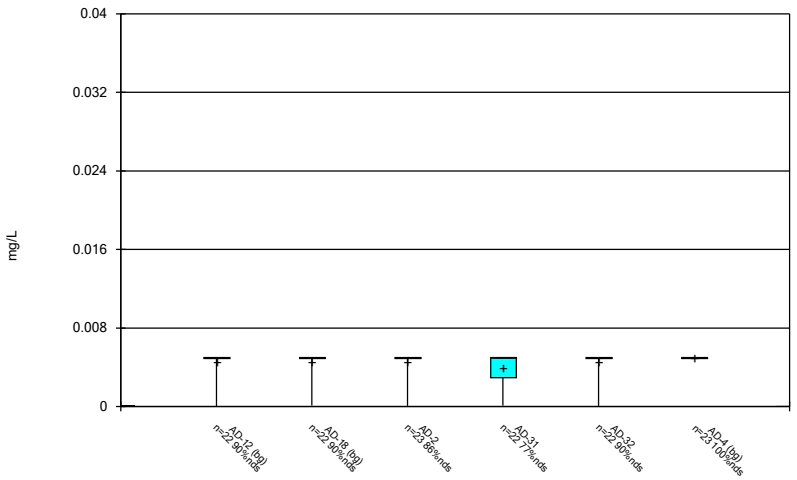
Constituent: Lithium, total Analysis Run 9/19/2023 2:53 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Box & Whiskers Plot



Constituent: Mercury, total Analysis Run 9/19/2023 2:53 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

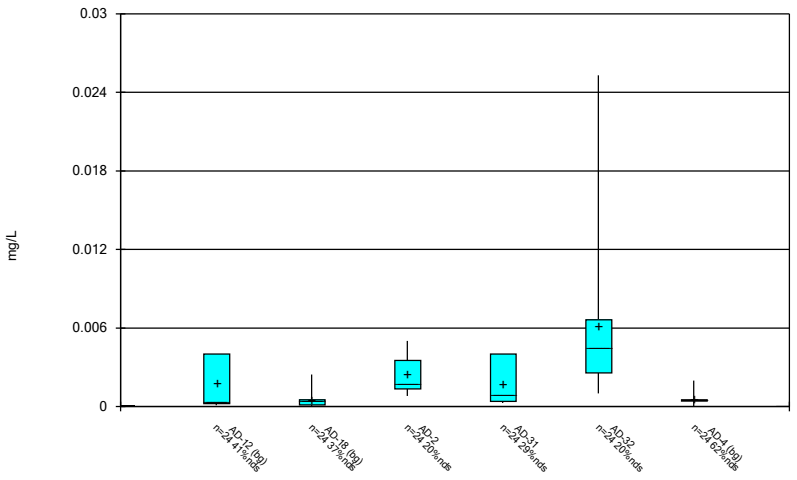
Box & Whiskers Plot



Constituent: Molybdenum, total Analysis Run 9/19/2023 2:53 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG

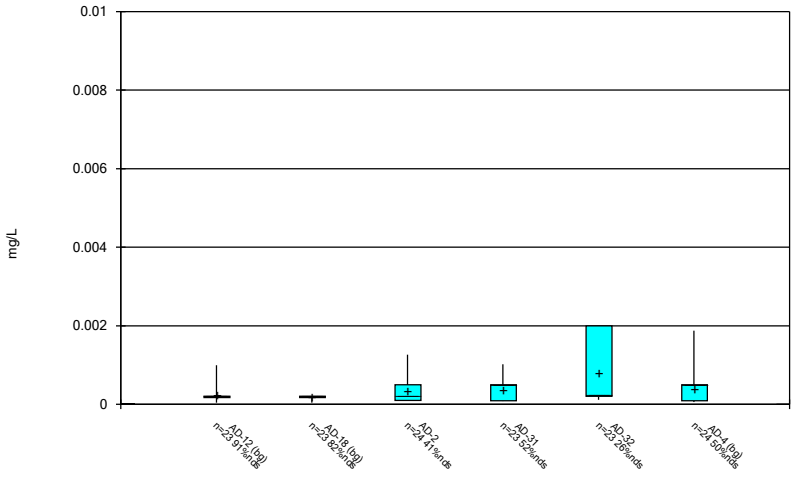
Box & Whiskers Plot



Constituent: Selenium, total Analysis Run 9/19/2023 2:53 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Thallium, total Analysis Run 9/19/2023 2:53 PM View: Appendix IV
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

FIGURE C
Outlier Summary

Outlier Summary

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP Printed 9/19/2023, 2:56 PM

	AD-31 Arsenic, total (mg/L)	AD-31 Barium, total (mg/L)	AD-31 Beryllium, total (mg/L)	AD-31 Chromium, total (mg/L)	AD-31 Cobalt, total (mg/L)	AD-32 Combined Radium 226 + 228 (pCi/L)	AD-32 Fluoride, total (mg/L)	AD-31 Lead, total (mg/L)	AD-2 Lithium, total (mg/L)	AD-32 Lithium, total (mg/L)
5/11/2016	0.093 (o)	0.712 (o)	0.01 (o)	0.212 (o)	0.05 (o)			0.057 (o)	<0.001 (o)	0.016 (o)
9/7/2016										
10/12/2016						17.32 (o)				0.972 (o)
11/14/2016				0.03 (o)						
3/21/2018							7.2 (o)			
2/27/2019										
2/28/2019										
5/21/2019										
5/22/2019										
5/23/2019										

	AD-2 Mercury, total (mg/L)	AD-31 Mercury, total (mg/L)	AD-12 Molybdenum, total (mg/L)	AD-18 Molybdenum, total (mg/L)	AD-2 Molybdenum, total (mg/L)	AD-31 Molybdenum, total (mg/L)	AD-32 Molybdenum, total (mg/L)	AD-4 Molybdenum, total (mg/L)	AD-12 Thallium, total (mg/L)	AD-18 Thallium, total (mg/L)
5/11/2016		0.001797 (o)								
9/7/2016	0.000675 (o)									
10/12/2016										
11/14/2016										
3/21/2018										
2/27/2019			<0.04 (o)						<0.01 (o)	
2/28/2019				<0.04 (o)		<0.04 (o)	<0.04 (o)			<0.01 (o)
5/21/2019			<0.04 (o)				<0.04 (o)			
5/22/2019					<0.04 (o)					
5/23/2019				<0.04 (o)		<0.04 (o)		<0.04 (o)		

	AD-31 Thallium, total (mg/L)	AD-32 Thallium, total (mg/L)
5/11/2016		
9/7/2016		
10/12/2016		
11/14/2016		
3/21/2018		
2/27/2019		
2/28/2019	<0.01 (o)	<0.01 (o)
5/21/2019		
5/22/2019		
5/23/2019		

FIGURE D

UTLs

Upper Tolerance Limits

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP Printed 2/20/2023, 9:43 AM

Constituent	Upper Lim.	Bg N	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Antimony, total (mg/L)	0.0001	66	n/a	93.94	n/a	n/a	0.03387	NP Inter(NDs)
Arsenic, total (mg/L)	0.011	66	n/a	40.91	n/a	n/a	0.03387	NP Inter(normality)
Barium, total (mg/L)	0.183	66	n/a	0	n/a	n/a	0.03387	NP Inter(normality)
Beryllium, total (mg/L)	0.00115	66	n/a	6.061	n/a	n/a	0.03387	NP Inter(normality)
Cadmium, total (mg/L)	0.00026	66	n/a	50	n/a	n/a	0.03387	NP Inter(normality)
Chromium, total (mg/L)	0.003262	66	0.9517	10.61	None	ln(x)	0.05	Inter
Cobalt, total (mg/L)	0.00939	66	n/a	0	n/a	n/a	0.03387	NP Inter(normality)
Combined Radium 226 + 228 (pCi/L)	3.197	66	0.2481	0	None	x^(1/3)	0.05	Inter
Fluoride, total (mg/L)	0.2565	69	n/a	53.62	n/a	n/a	0.02904	NP Inter(normality)
Lead, total (mg/L)	0.005	66	n/a	57.58	n/a	n/a	0.03387	NP Inter(normality)
Lithium, total (mg/L)	0.05199	66	0.04756	1.515	None	sqrt(x)	0.05	Inter
Mercury, total (mg/L)	0.000064	66	n/a	43.94	n/a	n/a	0.03387	NP Inter(normality)
Molybdenum, total (mg/L)	0.005	61	n/a	95.08	n/a	n/a	0.04377	NP Inter(NDs)
Selenium, total (mg/L)	0.00245	66	n/a	48.48	n/a	n/a	0.03387	NP Inter(normality)
Thallium, total (mg/L)	0.001874	64	n/a	76.56	n/a	n/a	0.03752	NP Inter(NDs)

FIGURE E

GWPS

PIRKEY EBAP GWPS			
Constituent Name	**MCL**	**Background Limit**	**GWPS**
Antimony, Total (mg/L)	0.006	0.0001	0.006
Arsenic, Total (mg/L)	0.01	0.011	0.011
Barium, Total (mg/L)	2	0.18	2
Beryllium, Total (mg/L)	0.004	0.0012	0.004
Cadmium, Total (mg/L)	0.005	0.00026	0.005
Chromium, Total (mg/L)	0.1	0.0033	0.1
Cobalt, Total (mg/L)	n/a	0.0094	0.0094
Combined Radium, Total (pCi/L)	5	3.2	5
Fluoride, Total (mg/L)	4	0.26	4
Lead, Total (mg/L)	n/a	0.005	0.005
Lithium, Total (mg/L)	n/a	0.052	0.052
Mercury, Total (mg/L)	0.002	0.000064	0.002
Molybdenum, Total (mg/L)	n/a	0.005	0.005
Selenium, Total (mg/L)	0.05	0.0025	0.05
Thallium, Total (mg/L)	0.002	0.0019	0.002

**Grey cell indicates Background Limit is higher than MCL*

**MCL = Maximum Contaminant Level*

**GWPS = Groundwater Protection Standard*

FIGURE F

Confidence Interval

Confidence Intervals - Significant Results

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP Printed 9/19/2023, 2:55 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	%NDs	ND Adj.	Transform	Alpha	Method
Cobalt, total (mg/L)	**AD-2**	**0.01928**	**0.01321**	**0.0094**	**Yes**	**24**	**0**	**None**	**No**	**0.01**	**Param.**
Cobalt, total (mg/L)	**AD-31**	**0.01072**	**0.009593**	**0.0094**	**Yes**	**23**	**0**	**None**	**x^(1/3)**	**0.01**	**Param.**
Cobalt, total (mg/L)	**AD-32**	**0.05043**	**0.031**	**0.0094**	**Yes**	**24**	**0**	**None**	**sqrt(x)**	**0.01**	**Param.**
Lithium, total (mg/L)	**AD-31**	**0.08916**	**0.076**	**0.052**	**Yes**	**24**	**0**	**None**	**x^2**	**0.01**	**Param.**
Lithium, total (mg/L)	**AD-32**	**0.09729**	**0.07663**	**0.052**	**Yes**	**22**	**0**	**None**	**No**	**0.01**	**Param.**

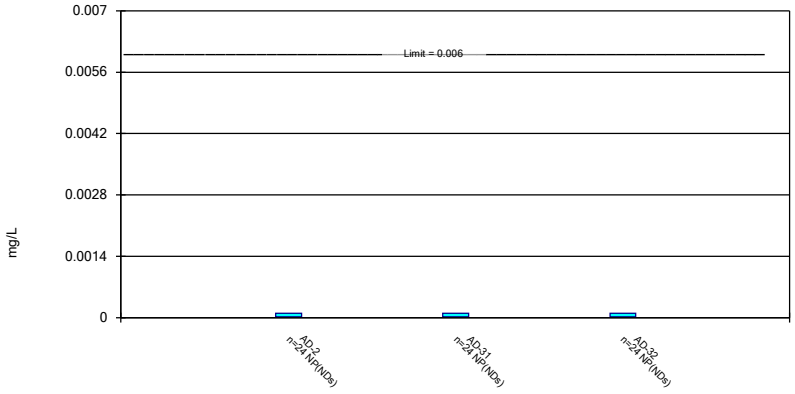
Confidence Intervals - All Results

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP Printed 9/19/2023, 2:55 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	%NDs	ND Adj.	Transform	Alpha	Method
Antimony, total (mg/L)	AD-2	0.0001	0.00002	0.006	No	24	91.67	None	No	0.01	NP (NDs)
Antimony, total (mg/L)	AD-31	0.0001	0.00002	0.006	No	24	91.67	None	No	0.01	NP (NDs)
Antimony, total (mg/L)	AD-32	0.0001	0.00002	0.006	No	24	87.5	None	No	0.01	NP (NDs)
Arsenic, total (mg/L)	AD-2	0.002	0.00053	0.011	No	24	41.67	None	No	0.01	NP (normality)
Arsenic, total (mg/L)	AD-31	0.00332	0.00026	0.011	No	23	13.04	None	No	0.01	NP (normality)
Arsenic, total (mg/L)	AD-32	0.004643	0.002036	0.011	No	24	4.167	None	sqrt(x)	0.01	Param.
Barium, total (mg/L)	AD-2	0.03057	0.0216	2	No	24	0	None	sqrt(x)	0.01	Param.
Barium, total (mg/L)	AD-31	0.0708	0.0332	2	No	23	0	None	No	0.01	NP (normality)
Barium, total (mg/L)	AD-32	0.03613	0.02607	2	No	24	0	None	No	0.01	Param.
Beryllium, total (mg/L)	AD-2	0.000599	0.0004541	0.004	No	24	4.167	None	ln(x)	0.01	Param.
Beryllium, total (mg/L)	AD-31	0.00103	0.000854	0.004	No	23	0	None	No	0.01	NP (normality)
Beryllium, total (mg/L)	AD-32	0.005454	0.003257	0.004	No	24	0	None	sqrt(x)	0.01	Param.
Cadmium, total (mg/L)	AD-2	0.001	0.000078	0.005	No	24	41.67	None	No	0.01	NP (normality)
Cadmium, total (mg/L)	AD-31	0.0008589	0.000066	0.005	No	24	29.17	None	No	0.01	NP (normality)
Cadmium, total (mg/L)	AD-32	0.0005457	0.0003527	0.005	No	24	0	None	No	0.01	Param.
Chromium, total (mg/L)	AD-2	0.0009	0.00028	0.1	No	24	25	None	No	0.01	NP (normality)
Chromium, total (mg/L)	AD-31	0.00962	0.00039	0.1	No	22	9.091	None	No	0.01	NP (normality)
Chromium, total (mg/L)	AD-32	0.003289	0.0009703	0.1	No	24	0	None	ln(x)	0.01	Param.
Cobalt, total (mg/L)	**AD-2**	**0.01928**	**0.01321**	**0.0094**	**Yes**	**24**	**0**	**None**	**No**	**0.01**	**Param.**
Cobalt, total (mg/L)	**AD-31**	**0.01072**	**0.009593**	**0.0094**	**Yes**	**23**	**0**	**None**	**x^(1/3)**	**0.01**	**Param.**
Cobalt, total (mg/L)	**AD-32**	**0.05043**	**0.031**	**0.0094**	**Yes**	**24**	**0**	**None**	**sqrt(x)**	**0.01**	**Param.**
Combined Radium 226 + 228 (pCi/L)	AD-2	1.59	1.052	5	No	24	0	None	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	AD-31	3.831	2.731	5	No	24	0	None	sqrt(x)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	AD-32	6.061	4.293	5	No	23	0	None	ln(x)	0.01	Param.
Fluoride, total (mg/L)	AD-2	1	0.15	4	No	26	46.15	None	No	0.01	NP (normality)
Fluoride, total (mg/L)	AD-31	1	0.14	4	No	26	46.15	None	No	0.01	NP (normality)
Fluoride, total (mg/L)	AD-32	0.8411	0.436	4	No	25	20	Kaplan-Meier	No	0.01	Param.
Lead, total (mg/L)	AD-2	0.005	0.00046	0.005	No	24	41.67	None	No	0.01	NP (normality)
Lead, total (mg/L)	AD-31	0.005	0.00029	0.005	No	23	34.78	None	No	0.01	NP (normality)
Lead, total (mg/L)	AD-32	0.005	0.000405	0.005	No	24	41.67	None	No	0.01	NP (normality)
Lithium, total (mg/L)	AD-2	0.05672	0.05027	0.052	No	23	0	None	No	0.01	Param.
Lithium, total (mg/L)	**AD-31**	**0.08916**	**0.076**	**0.052**	**Yes**	**24**	**0**	**None**	**x^2**	**0.01**	**Param.**
Lithium, total (mg/L)	**AD-32**	**0.09729**	**0.07663**	**0.052**	**Yes**	**22**	**0**	**None**	**No**	**0.01**	**Param.**
Mercury, total (mg/L)	AD-2	0.0000908	0.00004609	0.002	No	23	0	None	sqrt(x)	0.01	Param.
Mercury, total (mg/L)	AD-31	0.0005159	0.0001368	0.002	No	23	0	None	sqrt(x)	0.01	Param.
Mercury, total (mg/L)	AD-32	0.004017	0.001674	0.002	No	24	0	None	x^(1/3)	0.01	Param.
Molybdenum, total (mg/L)	AD-2	0.005	0.00437	0.005	No	23	86.96	None	No	0.01	NP (NDs)
Molybdenum, total (mg/L)	AD-31	0.005	0.000894	0.005	No	22	77.27	None	No	0.01	NP (NDs)
Molybdenum, total (mg/L)	AD-32	0.005	0.0007621	0.005	No	22	90.91	None	No	0.01	NP (NDs)
Selenium, total (mg/L)	AD-2	0.001918	0.001254	0.05	No	24	20.83	Kaplan-Meier	ln(x)	0.01	Param.
Selenium, total (mg/L)	AD-31	0.0025	0.00038	0.05	No	24	29.17	None	No	0.01	NP (normality)
Selenium, total (mg/L)	AD-32	0.00657	0.002516	0.05	No	24	20.83	Kaplan-Meier	x^(1/3)	0.01	Param.
Thallium, total (mg/L)	AD-2	0.0005	0.0001	0.002	No	24	41.67	None	No	0.01	NP (normality)
Thallium, total (mg/L)	AD-31	0.0005	0.00009	0.002	No	23	52.17	None	No	0.01	NP (normality)
Thallium, total (mg/L)	AD-32	0.001093	0.0002	0.002	No	23	26.09	None	No	0.01	NP (normality)

Non-Parametric Confidence Interval

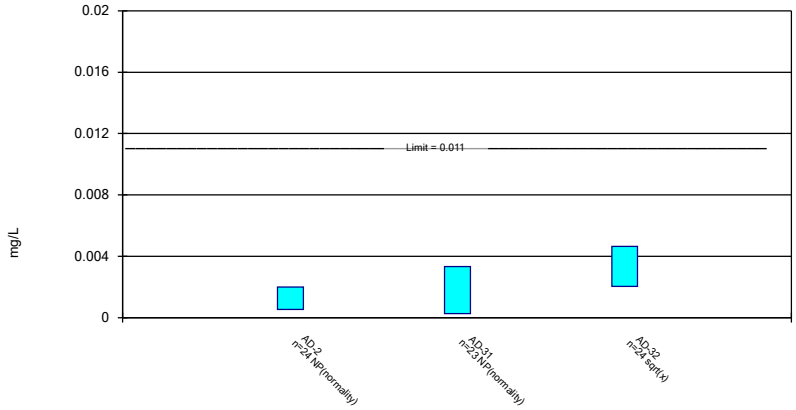
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Antimony, total Analysis Run 9/19/2023 2:54 PM View: Confidence Interval
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Arsenic, total Analysis Run 9/19/2023 2:54 PM View: Confidence Interval
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Parametric and Non-Parametric (NP) Confidence Interval

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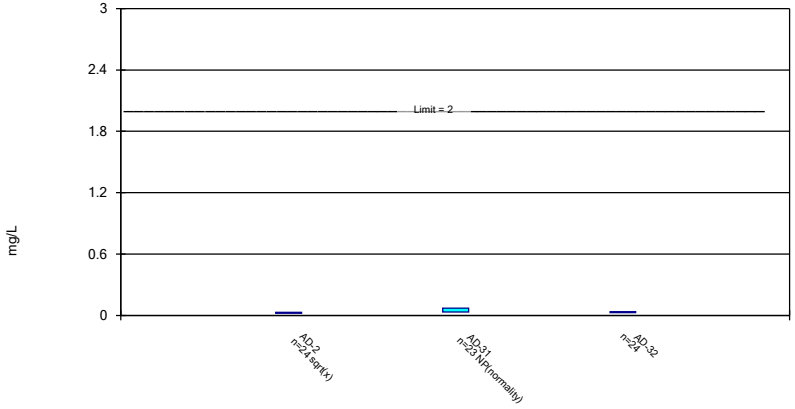

Constituent: Barium, total Analysis Run 9/19/2023 2:54 PM View: Confidence Interval
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Parametric and Non-Parametric (NP) Confidence Interval

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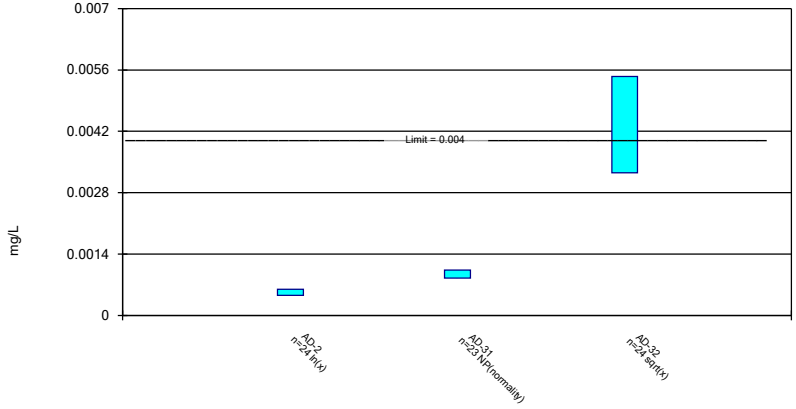

Constituent: Beryllium, total Analysis Run 9/19/2023 2:54 PM View: Confidence Interval
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Parametric and Non-Parametric (NP) Confidence Interval

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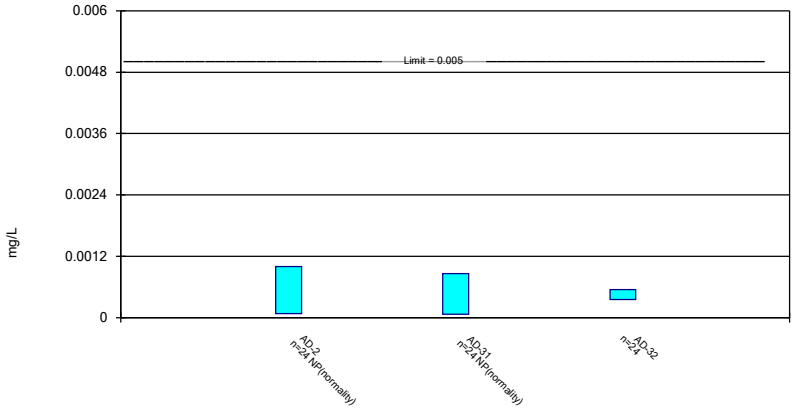

Constituent: Cadmium, total Analysis Run 9/19/2023 2:54 PM View: Confidence Interval
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Parametric and Non-Parametric (NP) Confidence Interval

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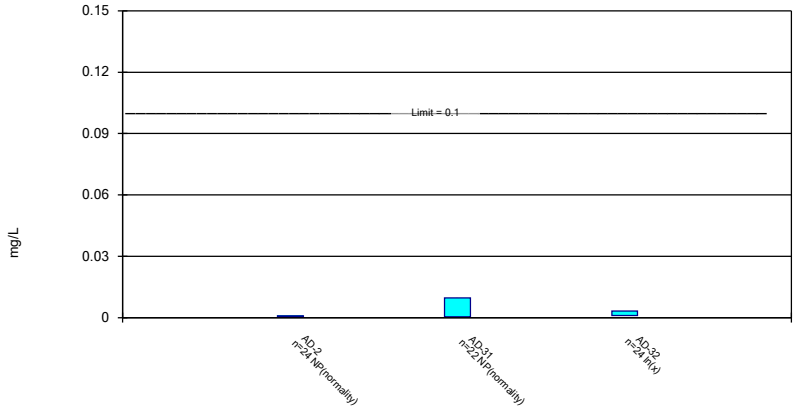
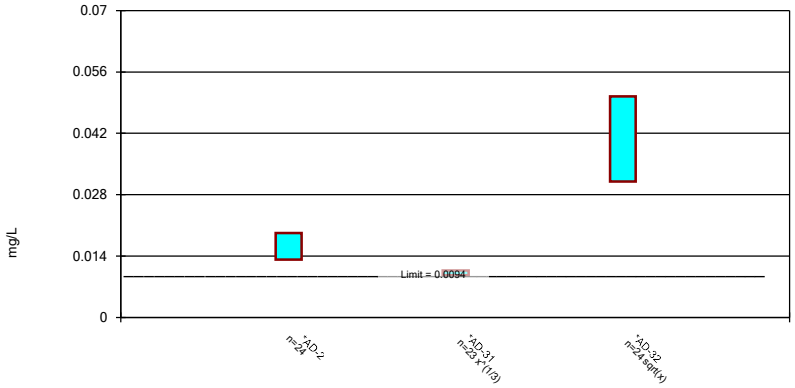


Constituent: Chromium, total Analysis Run 9/19/2023 2:54 PM View: Confidence Interval
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Parametric Confidence Interval

Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Cobalt, total Analysis Run 9/19/2023 2:54 PM View: Confidence Interval
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Parametric Confidence Interval

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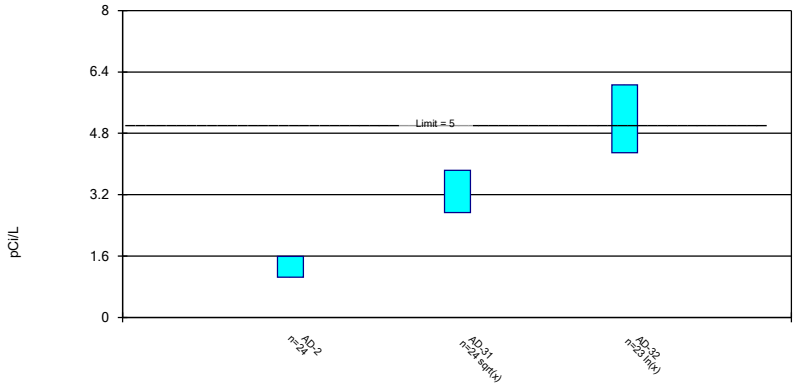

Constituent: Combined Radium 226 + 228 Analysis Run 9/19/2023 2:54 PM View: Confidence Interval
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Parametric and Non-Parametric (NP) Confidence Interval

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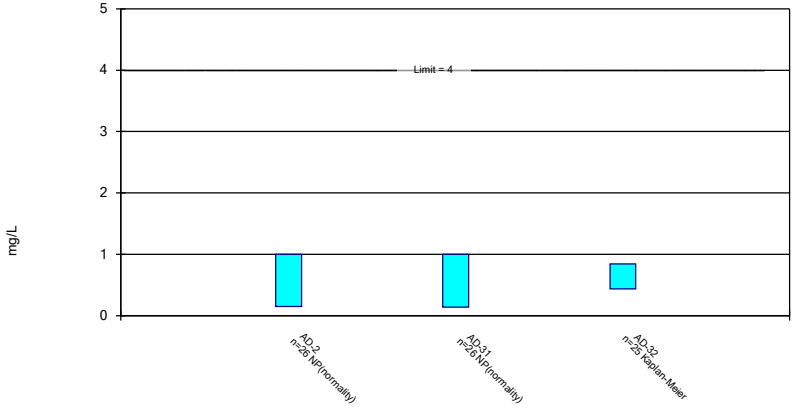

Constituent: Fluoride, total Analysis Run 9/19/2023 2:54 PM View: Confidence Interval
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Non-Parametric Confidence Interval

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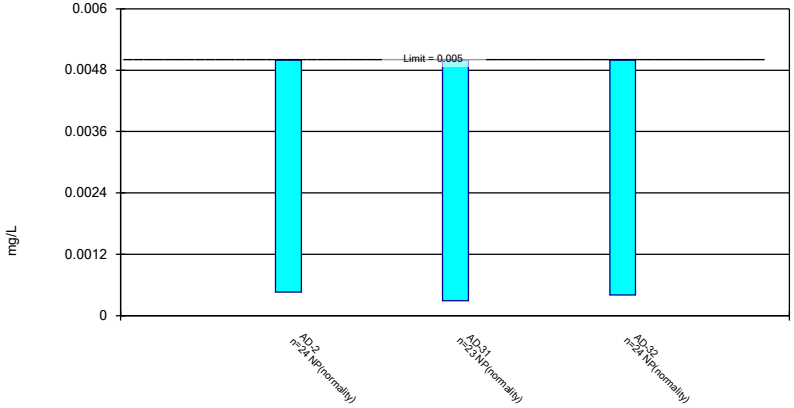
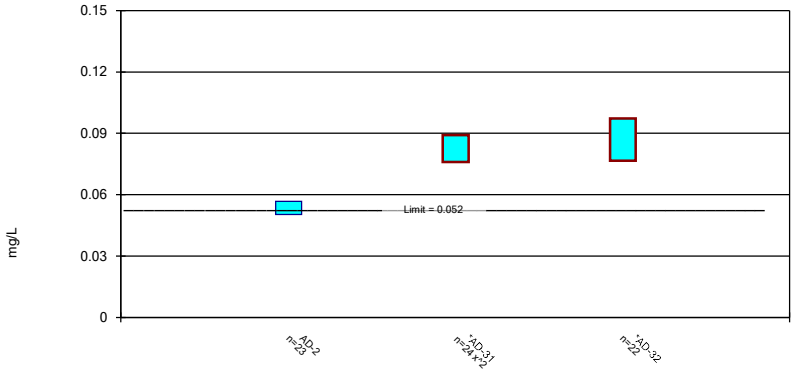


Constituent: Lead, total Analysis Run 9/19/2023 2:54 PM View: Confidence Interval
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Parametric Confidence Interval

Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Lithium, total Analysis Run 9/19/2023 2:54 PM View: Confidence Interval
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Parametric Confidence Interval

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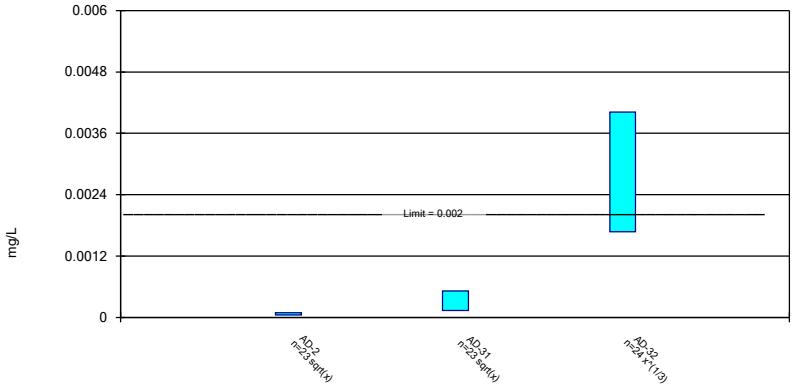
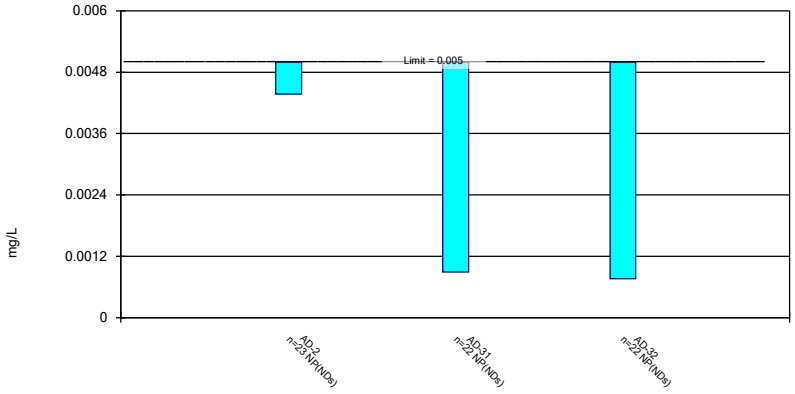


Constituent: Mercury, total Analysis Run 9/19/2023 2:54 PM View: Confidence Interval
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Non-Parametric Confidence Interval

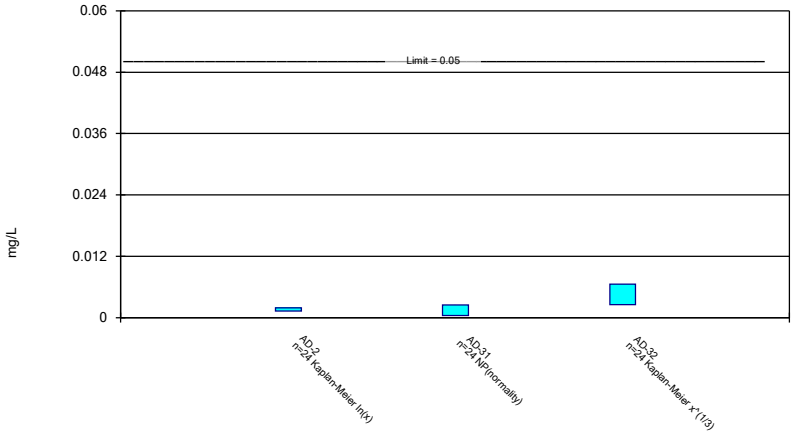
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Molybdenum, total Analysis Run 9/19/2023 2:54 PM View: Confidence Interval
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Parametric and Non-Parametric (NP) Confidence Interval

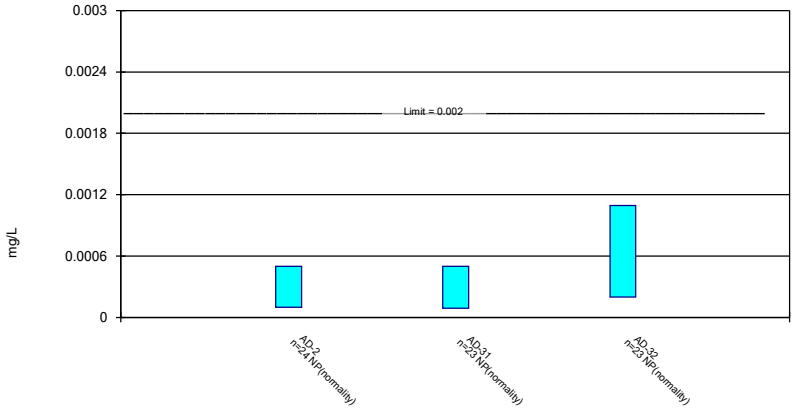
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Selenium, total Analysis Run 9/19/2023 2:54 PM View: Confidence Interval
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Non-Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Thallium, total Analysis Run 9/19/2023 2:54 PM View: Confidence Interval
Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP

Geosyntec consultants

engineers | scientists | innovators

STATISTICAL ANALYSIS SUMMARY EAST BOTTOM ASH POND

H.W. Pirkey Power Plant

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 Number: CHA8500B

October 16, 2023

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ATTACHMENTS

ACRONYMS AND ABBREVIATIONS

ASD	alternative source demonstration
CCR	coal combustion residuals
CFR	code of federal regulations
EBAP	East Bottom Ash Pond
GWPS	groundwater protection standard
LCL	lower confidence limit
mg/L	milligrams per liter
QA/QC	quality assurance and quality control
SSI	statistically significant increase
SSL	statistically significant level
SU	standard units
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TDS	total dissolved solids
UPL	upper prediction limit

1. INTRODUCTION

In accordance with Texas Commission on Environmental Quality (TCEQ) regulations regarding the disposal of coal combustion residuals (CCRs) in landfills and surface impoundments (Texas Administrative Code [TAC] Title 30, Chapter 352), groundwater monitoring has been conducted at the East Bottom Ash Pond (EBAP), an existing CCR unit at the Pirkey Power Plant in Hallsville, Texas. Recent groundwater monitoring results were used to identify concentrations of Appendix IV constituents that are above site-specific groundwater protection standards (GWPSs).

Based on detection monitoring conducted in 2017 and 2018, statistically significant increases (SSIs) over background were concluded for boron, calcium, chloride, total dissolved solids (TDS), and sulfate at the EBAP. An alternative source was not identified at the time, so assessment monitoring was initiated and GWPSs were set in accordance with § 352.951(b). During 2023, sampling events for both Appendix III parameters and Appendix IV parameters, as required by § 352.951(a), were completed in February and June. During the June 2023 assessment monitoring event, statistically significant levels (SSLs) were observed for cobalt and lithium (Geosyntec 2023a). In accordance with § 352.951(e), an alternative source demonstration (ASD) was successfully completed (Geosyntec 2023b). Therefore, the unit remained in assessment monitoring. One assessment monitoring event was conducted at the EBAP in August 2023 in accordance with § 352.951(a). The results of the August 2023 assessment event are documented in this report.

Prior to conducting the statistical analyses, the groundwater data underwent several validation tests, including those for completeness, sample tracking accuracy, transcription errors, and consistent use of measurement units. No data quality issues were identified which would impact data usability.

The monitoring data were submitted to Groundwater Stats Consulting, LLC for statistical analysis. GWPSs were reestablished for the Appendix IV parameters. Confidence intervals were calculated for Appendix IV parameters at the compliance wells to assess whether SSLs of Appendix IV parameters were present above the GWPS. SSLs were identified for cobalt and lithium. Therefore, either the unit will move to an assessment of corrective measures, or an ASD will be conducted to evaluate if the unit can remain in assessment monitoring. Certification of the selected statistical methods by a qualified professional engineer is documented in Attachment A.

2. EAST BOTTOM ASH POND EVALUATION

2.1 Data Validation and QA/QC

During the August 2023 assessment monitoring event, one set of samples was collected for analysis from each background and compliance well to meet the requirements of § 352.951(a). Samples from the August 2023 sampling event were analyzed for all Appendix III and Appendix IV parameters. A summary of data collected during this assessment monitoring event are presented in Table 1.

Chemical analysis was completed by a National Environmental Laboratory Accreditation Program–certified analytical laboratory. The laboratory completed analysis of quality assurance and quality control (QA/QC) samples such as laboratory reagent blanks, continuing calibration verification samples, and laboratory fortified blanks.

A data quality review was completed to assess if the data met the objectives outlined in TCEQ Draft Technical Guidance No. 32 related to groundwater sampling and analysis (TCEQ 2020). The data were determined usable for supporting project objectives, as documented in the review memorandum provided in Attachment B. The analytical data were imported into a Microsoft Access database, where checks were completed to assess the accuracy of sample location identification and analyte identification. Where necessary, unit conversions were applied to standardize reported units across all sampling events. Exported data files were created for use with the Sanitas™ v.10.0.12 statistics software. The export file was checked against the analytical data for transcription errors and completeness.

2.2 Statistical Analysis

Statistical analyses for the EBAP were conducted in accordance with the November 2021 *Statistical Analysis Plan* (Geosyntec 2021). Time series plots and results for all completed statistical tests are provided in Attachment C. The data obtained in August 2023 were screened for potential outliers. No outliers were identified for these events.

2.2.1 Establishment of GWPSs

A GWPS was established for each Appendix IV parameter in accordance with the Statistical Analysis Plan (Geosyntec 2021). The established GWPS was set to whichever was greater of the background concentration and the maximum contaminant level for each Appendix IV parameter. To determine background concentrations, an upper tolerance limit was calculated using data that were pooled from the background wells collected during the background monitoring and assessment monitoring events. Tolerance limits were calculated parametrically with 95% coverage and 95% confidence for chromium, combined radium, and lithium. Nonparametric tolerance limits were calculated for arsenic, barium, beryllium, cadmium, cobalt, fluoride, mercury, and selenium due to apparent nonnormal distributions, and for antimony, lead, molybdenum, and thallium due to a high nondetect frequency. Upper tolerance limits and the final GWPSs are summarized in Table 2.

2.2.2 Evaluation of Potential Appendix IV SSLs

A confidence interval was constructed for each Appendix IV parameter at each compliance well. Confidence limits were generally calculated parametrically ($\alpha = 0.01$). However, nonparametric confidence limits were calculated in some cases (e.g., when the data did not appear to be normally distributed or when the nondetect frequency was too high). An SSL was concluded if the lower confidence limit (LCL) exceeded the GWPS (i.e., if the entire confidence interval was above the GWPS). Calculated confidence limits are shown in Attachment C.

The following SSLs were identified at the Pirkey EBAP:

- The LCL for cobalt was above the GWPS of 0.00939 mg/L at AD-2 (0.0136 mg/L), AD-31 (0.00950 mg/L), and AD-32 (0.0309 mg/L).

- The LCL for lithium exceeded the GWPS of 0.0497 mg/L at AD-2 (0.0506 mg/L), AD-31 (0.0681 mg/L) and AD-32 (0.0746 mg/L).

As a result, the Pirkey EBAP will either move to an assessment of corrective measures or an alternative source demonstration will be conducted to evaluate if the unit can remain in assessment monitoring.

2.2.3 Evaluation of Potential Appendix III SSIs

While SSLs were identified, a review of the Appendix III results were also completed to assess whether concentrations of Appendix III parameters at the compliance wells were above background concentrations. Data collected during the August 2023 assessment monitoring event from each compliance well were compared to previously established prediction limits to assess whether the results are above background values (Table 3). The following concentrations were above the upper prediction limits (UPLs):

- Boron concentrations were above the interwell UPL of 0.0437 mg/L at AD-2 (3.05 mg/L) and AD-32 (0.418 mg/L).

- Calcium concentrations were above the interwell UPL of 2.94 mg/L at AD-2 (3.37 mg/L) and AD-32 (3.71 mg/L).

- Chloride concentrations were above the interwell UPL of 8.84 mg/L at AD-2 (30.9 mg/L), AD-31 (21.9 mg/L), and AD-32 (12.7 mg/L).

- Sulfate concentrations were above the interwell UPL of 24.7 mg/L at AD-2 (271 mg/L), AD-31 (69.4 mg/L), and AD-32 (73.0 mg/L).

- TDS concentrations were above the interwell UPL of 170 mg/L at AD-2 (490 mg/L), AD-31 (240 mg/L), and AD-32 (190 mg/L).

While the prediction limits were calculated for a one-of-two retesting procedure, SSIs were conservatively assumed if the August 2023 sample was above the UPL or below the lower

prediction limit in the case of pH. Based on these results, concentrations of Appendix III constituents appear to be above background concentrations.

2.3 Conclusions

A semiannual assessment monitoring event was conducted in accordance with the CCR Rule. The laboratory and field data were reviewed prior to statistical analysis, and no QA/QC issues that impacted data usability were identified. A review of outliers identified no potential outliers in the August 2023 data. GWPSs were reestablished for the Appendix IV parameters. A confidence interval was constructed at each compliance well for each Appendix IV parameter; SSLs were concluded if the entire confidence interval was above the GWPS. SSLs were identified for cobalt and lithium. Appendix III parameters were compared to calculated prediction limits, with exceedances identified for boron, calcium, chloride, sulfate, and TDS.

Based on this evaluation, the Pirkey EBAP CCR unit will either move to an assessment of corrective measures or an ASD will be conducted to evaluate if the unit can remain in assessment monitoring.

3. REFERENCES

Geosyntec. 2021. Statistical Analysis Plan – H.W. Pirkey Power Plant. Geosyntec Consultants, Inc. November.

Geosyntec. 2023a. Statistical Analysis Summary – East Bottom Ash Pond, Pirkey, Hallsville, Texas. Geosyntec Consultants, Inc. October

Geosyntec. 2023b. Alternative source Demonstration Report – Texas State CCR Rule. H.W. Pirkey Power Plant, East Bottom Ash Pond, Hallsville, Texas. Geosyntec Consultants, Inc. October.

TCEQ. 2020. Topic: Coal Combustion Residuals (CCR) Groundwater Monitoring and Corrective Action Draft Technical Guidance No. 32. May.

TABLES

Table 1. Groundwater Data Summary
Statistical Analysis Summary
Pirkey Plant - East Bottom Ash Pond

Geosyntec Consultants, Inc.

Parameter	Unit	AD-2	AD-4	AD-12	AD-18	AD-31	AD-32
		8/23/2023	8/23/2023	8/23/2023	8/23/2023	8/23/2023	8/23/2023
Antimony	µg/L	0.008 J1	0.011 J1	0.013 J1	0.056 J1	0.1 U1	0.013 J1
Arsenic	µg/L	0.78	0.36	0.1	0.54	0.32	2.19
Barium	µg/L	13.8	117	15.6	70.6	31.7	22.7
Beryllium	µg/L	0.715	0.246	0.129	0.115	0.818	0.921
Boron	mg/L	3.05	0.027 J1	0.017 J1	0.012 J1	0.021 J1	0.418
Cadmium	µg/L	0.116	0.021	0.007 J1	0.015 J1	0.052	0.071
Calcium	mg/L	3.37	2.18	0.22	3.17	2.10	3.71
Chloride	mg/L	30.9	3.88	4.74	5.02	21.9	12.7
Chromium	µg/L	0.48	0.40	0.45	1.15	0.56	0.83
Cobalt	µg/L	25.8	3.63	0.855	0.731	8.14	11.3
Combined Radium	pCi/L	2.49	2.24	1.34	1.27	5.5	5.16
Fluoride	mg/L	0.20	0.04 J1	0.07	0.02 J1	0.1	0.07
Lead	µg/L	0.64	0.07 J1	0.11 J1	0.43	0.32	0.26
Lithium	mg/L	0.0601	0.0243	0.00494	0.0119	0.0644	0.0482
Mercury	µg/L	0.270	0.003 J1	0.005 U1	0.005	0.890	0.950
Molybdenum	µg/L	0.5 U1	0.5 U1	0.5	0.1 J1	0.5 U1	0.5 U1
Selenium	µg/L	2.72	0.04 J1	0.23 J1	0.18 J1	0.33 J1	1.04
Sulfate	mg/L	271	18.5	3.5	6.9	69.4	73.0
Thallium	µg/L	0.11 J1	0.08 J1	0.2 U1	0.03 J1	0.08 J1	0.10 J1
Total Dissolved Solids	mg/L	490	130	75	88	240	190
pH	SU	3.77	4.61	3.84	4.37	4.01	3.61

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
SU: standard unit
U1: Non-detect value. For statistical analysis, parameters which were not detected were replaced with the reporting limit.
J1: Estimated value. Parameter was detected in concentrations below the reporting limit.

Table 2. Appendix IV Groundwater Protection Standards
Statistical Analysis Summary
Pirkey Plant - East Bottom Ash Pond

Constituent Name	MCL	Calculated UTL	GWPS
Antimony, Total (mg/L)	0.00600	0.000100	0.00600
Arsenic, Total (mg/L)	0.0100	0.0110	0.0110
Barium, Total (mg/L)	2.00	0.183	2.00
Beryllium, Total (mg/L)	0.00400	0.00115	0.00400
Cadmium, Total (mg/L)	0.00500	0.000260	0.00500
Chromium, Total (mg/L)	0.100	0.00288	0.100
Cobalt, Total (mg/L)	n/a	0.00939	0.00939
Combined Radium, Total (pCi/L)	5.00	3.23	5.00
Fluoride, Total (mg/L)	4.00	0.257	4.00
Lead, Total (mg/L)	n/a	0.00070	0.00070
Lithium, Total (mg/L)	n/a	0.0497	0.0497
Mercury, Total (mg/L)	0.00200	0.0000640	0.00200
Molybdenum, Total (mg/L)	n/a	0.00070	0.00070
Selenium, Total (mg/L)	0.0500	0.00245	0.0500
Thallium, Total (mg/L)	0.00200	0.00187	0.00200

Notes:
1. Calculated UTL (upper tolerance limit) represents site-specific background values.
2. Grey cells indicate the GWPS is based on the calculated UTL. Either the UTL is higher than the MCL or an MCL does not exist.
GWPS: groundwater protection standard
MCL: maximum contaminant level
mg/L: milligrams per liter
pCi/L: picocuries per liter
n/a: not applicable

Table 3. Appendix III Data Summary
Statistical Analysis Report
Pirkey - East Bottom Ash Pond

Geosyntec Consultants, Inc.

Analyte	Unit	Description	AD-2	AD-31	AD-32
			8/23/2023	8/23/2023	8/23/2023
Boron	mg/L	Interwell Background Value (UPL)	0.0437		
		Analytical Result	**3.05**	0.021	**0.418**
Calcium	mg/L	Interwell Background Value (UPL)	2.94		
		Analytical Result	**3.37**	2.10	**3.71**
Chloride	mg/L	Interwell Background Value (UPL)	8.84		
		Analytical Result	**30.9**	**21.9**	**12.7**
Fluoride	mg/L	Interwell Background Value (UPL)	0.257		
		Analytical Result	0.20	0.1	0.07
pH	SU	Intrawell Background Value (UPL)	4.7	5.1	4.3
		Intrawell Background Value (LPL)	3.4	2.8	2.6
		Analytical Result	3.8	4.0	3.6
Sulfate	mg/L	Interwell Background Value (UPL)	24.7		
		Analytical Result	**271**	**69.4**	**73.0**
Total Dissolved Solids	mg/L	Interwell Background Value (UPL)	170		
		Analytical Result	**490**	**240**	**190**

Notes:
1. Bold values exceed the background value.
2. Background values are shaded gray.
LPL: lower prediction limit
mg/L: milligrams per liter
SU: standard units
UPL: upper prediction limit

ATTACHMENT A
Certification by Qualified Professional Engineer

Certification by Qualified Professional Engineer

I certify that selected and above described statistical method is appropriate for evaluating the groundwater monitoring data for the Pirkey East Bottom Ash Pond CCR management area and that the requirements of § 352.931(a) have been met.

David Anthony Miller

Printed Name of Licensed Professional Engineer

David Anthony Miller

Signature

112498	Texas	10.16.2023
License Number	Licensing State	Date

ATTACHMENT B
Data Quality Review Memorandum

Geosyntec consultants

500 W. Wilson Bridge Road, Suite 250
Worthington, Ohio 43085
PH 614.468.0415
FAX 614.468.0416
www.geosyntec.com

Memorandum

Date:	October 8, 2023
To:	David Miller (AEP)
Copies to:	Leslie Fuerschbach (AEP)
From:	Allison Kreinberg (Geosyntec)
Subject:	Data Quality Review – Pirkey Power Plant August 2023 Sampling Event - EBAP

This memorandum summarizes the findings of a data quality review for groundwater samples collected at the Pirkey Power Plant in Hallsville, Texas in August 2023. The groundwater samples were collected to comply with the Texas Commission on Environmental Quality's (TCEQ's) regulations regarding the disposal of coal combustion residuals (CCRs) in landfills and surface impoundments (Title 30 Chapter 352, "CCR Rule") for the East Bottom Ash Pond (EBAP) regulated unit. 40 CFR 257 Appendix III and IV constituents were analyzed.

The following sample data groups (SDGs) were associated with the groundwater samples collected during the August 2023 sampling event and are reviewed in this memorandum:

- Dolan Chemical Laboratory (Groveport, Ohio) Job ID # 232660
- Dolan Chemical Laboratory (Groveport, Ohio) Job ID # 232672

The data included in these SDGs were reviewed to assess if they met the objectives outlined in TCEQ Draft Technical Guideline No. 32[1] prior to submittal of this data to TCEQ.

The following data quality issues were identified:

- As reported in SDG 232672, radium-228 was detected in the method blank at levels above the method criteria. All radium-228 samples associated with this SDG were flagged B1: Analyte detected in method blank (MB) at or above the method criteria. The detected

[1] TCEQ. Topic: Coal Combustion Residuals (CCR) Groundwater Monitoring and Corrective Action: Technical Guidance No. 32. May 2020.

radium-228 concentration in the method blank was more than 10% of the detected values for radium-228 in all groundwater samples, which could result in high bias in the radium-228 results for all groundwater samples.

Based on these findings, the majority of the data reported in these SDGs are considered accurate and complete. Although the QC failures mentioned above will result in some limitations of data use since the affected results are considered estimated or have elevated reporting limits, the data are considered usable for supporting project objectives.

ATTACHMENT C
Statistical Analysis Output

GROUNDWATER STATS CONSULTING

October 16, 2023

Geosyntec Consultants
Attn: Ms. Allison Kreinberg
500 W. Wilson Bridge Road, Suite 250
Worthington, OH 43085

Re: Pirkey EBAP - Assessment Monitoring Event & Background Update 2023

Dear Ms. Kreinberg,

Groundwater Stats Consulting (GSC), formerly the statistical consulting division of Sanitas Technologies, is pleased to provide the evaluation of groundwater data and the background update through 2023 for American Electric Power Company's Pirkey East Bottom Ash Pond (EBAP). The analysis complies with the Texas Commission of Environmental Quality rule 30 TAC 352 as well as with the United States Environmental Protection Agency (USEPA) Unified Guidance (2009).

Sampling at each of the wells below began at Pirkey EBAP for the Coal Combustion Residuals (CCR) program in 2016. The monitoring well network, as provided by Geosyntec Consultants, consists of the following:

- **Upgradient wells:** AD-4, AD-12, and AD-18
- **Downgradient wells:** AD-2, AD-31, and AD-32

Data were sent electronically, and the statistical analysis was reviewed by Kristina Rayner, Senior Statistician and Founder of Groundwater Stats Consulting. The analysis was conducted according to the Statistical Analysis Plan and initial screening evaluation prepared in November 2017 by GSC and approved by Dr. Kirk Cameron, PhD Statistician with MacStat Consulting, primary author of the USEPA Unified Guidance, and Senior Advisor to GSC.

The CCR program consists of the following constituents listed below. The terms "constituent" and "parameter" are interchangeable.

- **Appendix III** (Detection Monitoring) **-** boron, calcium, chloride, fluoride, pH, sulfate, and TDS
- **Appendix IV** (Assessment Monitoring) **–** antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, combined radium 226 + 228, fluoride, lead, lithium, mercury, molybdenum, selenium, and thallium

Time series and box plots for Appendix IV parameters are provided for all wells and constituents and are used to evaluate concentrations over the entire record (Figures A & B, respectively). A summary of the values identified as outliers in this report and through previous screenings follows this letter. These values are deselected prior to the statistical analysis. All flagged values may also be seen in a lighter font and disconnected symbol on the time series graphs (Figure C).

Statistical limits for Appendix IV constituents are updated annually with the last update performed in February 2023 using data through November 2022. During this analysis, pooled upgradient well data were screened, as described below, through August 2023 for the purpose of updating background limits. Due to recent pond closure activities, statistical limits for Appendix III constituents will be updated during the Fall 2024.

Summary of Statistical Methods

Assessment monitoring for Appendix IV parameters involves the comparison of a confidence interval for each parameter at downgradient wells against the corresponding Groundwater Protection Standard (GWPS). The GWPS is determined for each parameter as the highest limit of the Maximum Contaminant Levels (MCLs) or background limits determined from tolerance limits constructed from pooled upgradient well data.

Prior to computing tolerance limits on upgradient well data or confidence intervals on downgradient well data, the distribution of data is tested using the Shapiro-Wilk/Shapiro-Francia test for normality. After testing for normality and performing any adjustments as discussed below (US EPA, 2009), data are analyzed using either parametric or non-parametric tolerance limits and confidence intervals as appropriate, based on the following criteria.

- No statistical analyses are required on wells and analytes containing 100% non-detects (USEPA Unified Guidance, 2009, Chapter 6).

- When data contain <15% non-detects, simple substitution of one-half the reporting limit is utilized in the statistical analysis. The reporting limit utilized for non-detects is the most practical quantification limit (PQL) as reported by the laboratory.
- When data contain between 15-50% non-detects, the Kaplan-Meier non-detect adjustment is applied to the background data for parametric limits. This technique adjusts the mean and standard deviation of the historical concentrations to account for concentrations below the reporting limit.
- Nonparametric tolerance limits are used on data containing greater than 50% non-detects.

Evaluation of Appendix IV Parameters – Conducted in October 2023

Prior to evaluating Appendix IV parameters, background data are screened through visual screening and Tukey's outlier test on pooled upgradient wells for potential outliers and extreme trending patterns that would lead to artificially elevated statistical limits.

For the current analysis, Tukey's outlier test on pooled upgradient well data through August 2023 identified outliers for fluoride; however, these low-level measurements were similar to remaining concentrations among upgradient wells; therefore, these values were not flagged as outliers. No additional values were flagged as outliers as they were similar to concentrations at neighboring upgradient wells or were below the MCL.

Additionally, downgradient well data through August 2023 were screened through visual screening using time series graphs. Since the downgradient well data are used to construct confidence intervals, a regulatory conservative approach is taken in that values that are marginally high relative to the rest of the data are retained unless there is particular justification for excluding them. No changes were to previously flagged data were made.

Interwell Upper Tolerance Limits

Interwell upper tolerance limits were used to calculate background limits from all available pooled upgradient well data through August 2023 for Appendix IV parameters to determine the background limit for each constituent (Figure D). For parametric limits a target of 95% confidence and 95% coverage is used. The confidence and coverage levels for nonparametric tolerance limits are dependent upon the number of background samples.

Groundwater Protection Standards

Background limits were compared to the Maximum Contaminant Levels (MCLs) in the Groundwater Protection Standard (GWPS) table following this letter to determine the highest limit for use as the GWPS in the Confidence Interval comparisons (Figure E).

Confidence Intervals

Confidence intervals were then constructed on downgradient wells with data through August 2023 for each of the Appendix IV parameters using either parametric or nonparametric intervals depending on the data distribution and percentage of non-detects (Figure F). When data followed a normal or transformed-normal distribution, parametric confidence intervals were used for Appendix IV parameters. Nonparametric confidence intervals, which use the largest and smallest order statistics depending on the sample size as interval limits, were constructed when data did not follow a normal or transformed-normal distribution or when there were greater than 50% non-detects. The lower confidence limit, which is constructed with 99% confidence for parametric confidence intervals, is compared to the GWPS prepared as described above. The confidence level associated with nonparametric confidence intervals is dependent upon the number samples available.

Only when the entire confidence interval is above the GWPS is the well/constituent pair considered to exceed its respective standard. Both a tabular summary and graphical presentation of the confidence interval results follow this letter. Exceedances were noted for the following well/constituent pairs:

- Cobalt: AD-2, AD-31, and AD-32
- Lithium: AD-2, AD-31, and AD-32

Trend Test Evaluation – Appendix IV

When confidence interval exceedances are identified in downgradient wells, data are further evaluated using the Sen's Slope/Mann Kendall trend test to determine whether concentrations are statistically increasing, decreasing, or stable at the 95% confidence level (Figure G). Utilizing the 95% confidence level for trend tests readily identifies significant trends and is more sensitive than the 99% confidence level without drastically increasing the false negative rate. Upgradient wells are included in the trend analyses for all parameters found to exceed their prediction limit in downgradient wells. When similar patterns exist upgradient of the site, it is an indication of variability in groundwater which

may be unrelated to practices at the site. Statistically significant trends were identified for the following well/constituent pairs:

Increasing

- Cobalt: AD-2
- Lithium: AD-2

Decreasing

- Cobalt: AD-12, AD-18, AD-4 (all three upgradient), and AD-32
- Lithium: AD-18 (upgradient), AD-31, and AD-32

Thank you for the opportunity to assist you in the statistical analysis of groundwater quality for the Pirkey EBAP. If you have any questions or comments, please feel free to contact me.

For Groundwater Stats Consulting,

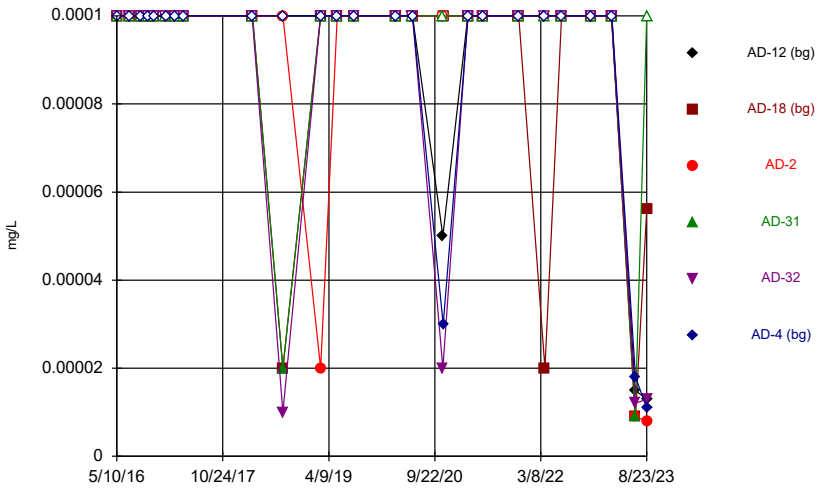
Andrew T. Collins
Project Manager

Kristina L. Rayner
Senior Statistician

FIGURE A
Time Series

Sanitas™ v.10.0.12 Software licensed to . UG
Hollow symbols indicate censored values.

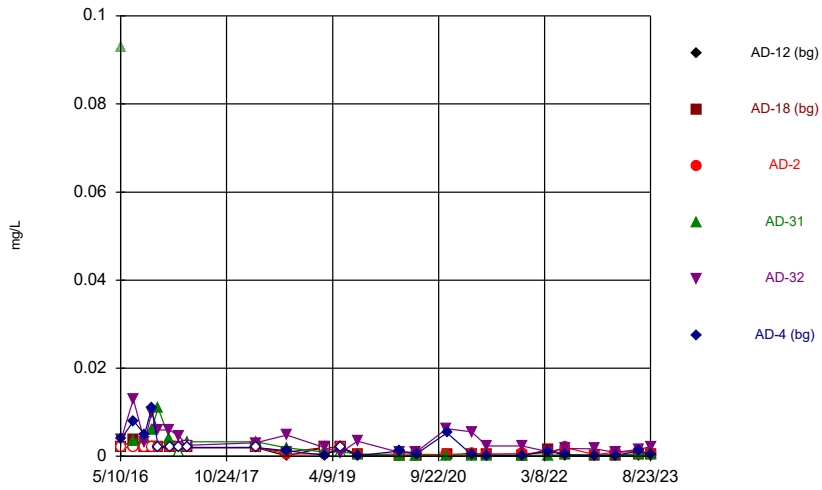
Time Series



Constituent: Antimony, total Analysis Run 10/10/2023 10:05 AM
Pirkey EBAP Data: Pirkey EBAP

Sanitas™ v.10.0.12 Software licensed to . UG
Hollow symbols indicate censored values.

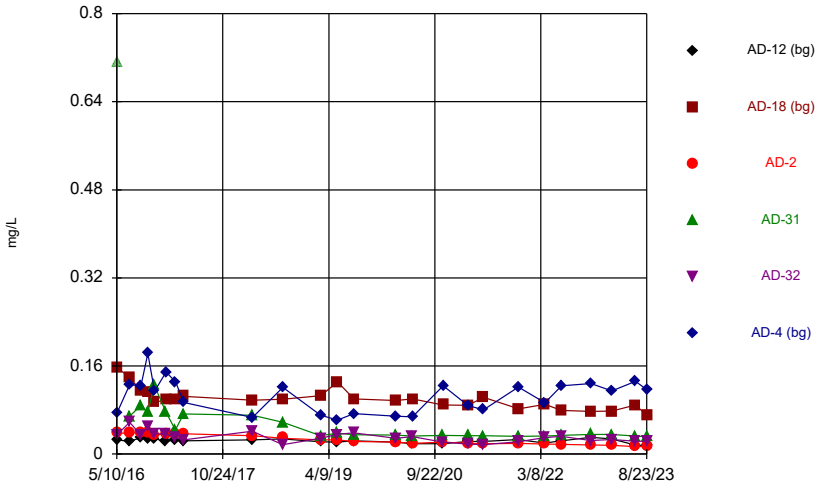
Time Series



Constituent: Arsenic, total Analysis Run 10/10/2023 10:05 AM
Pirkey EBAP Data: Pirkey EBAP

Sanitas™ v.10.0.12 Software licensed to . UG

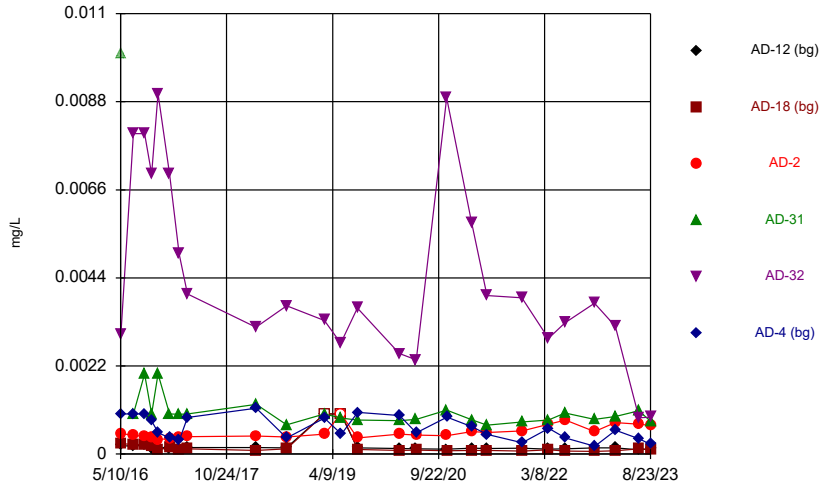
Time Series



Constituent: Barium, total Analysis Run 10/10/2023 10:05 AM
Pirkey EBAP Data: Pirkey EBAP

Sanitas™ v.10.0.12 Software licensed to . UG
Hollow symbols indicate censored values.

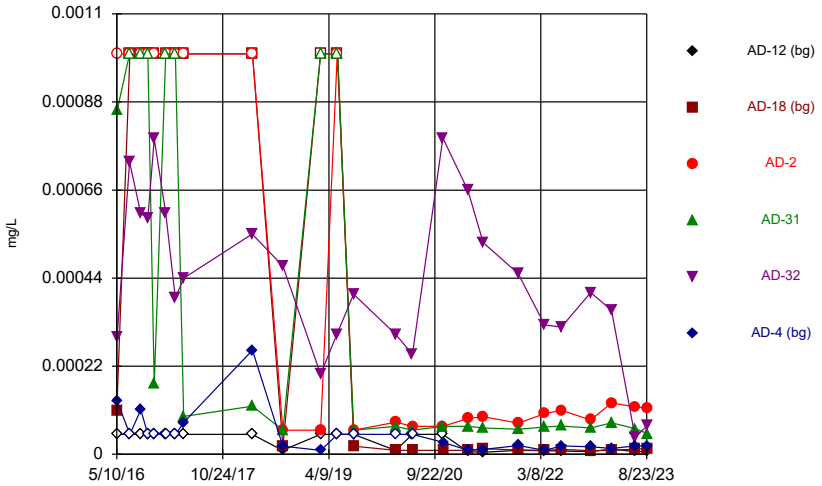
Time Series



Constituent: Beryllium, total Analysis Run 10/10/2023 10:05 AM
Pirkey EBAP Data: Pirkey EBAP

Sanitas™ v.10.0.12 Software licensed to . UG
Hollow symbols indicate censored values.

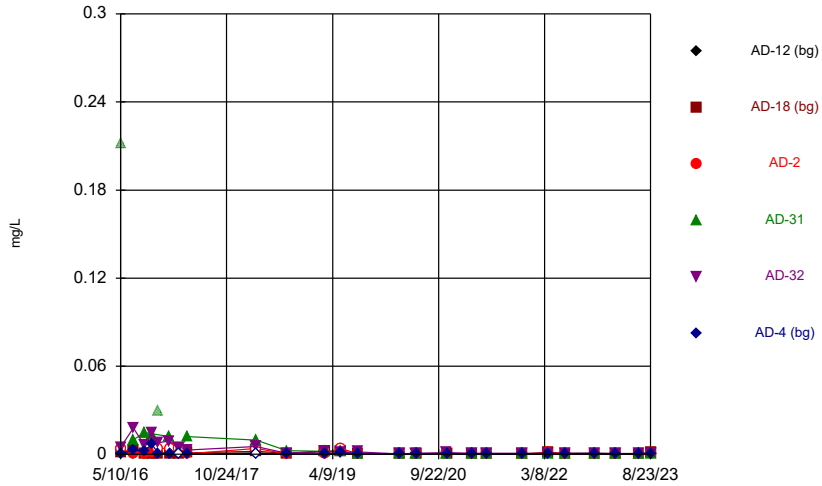
Time Series



Constituent: Cadmium, total Analysis Run 10/10/2023 10:05 AM
Pirkey EBAP Data: Pirkey EBAP

Sanitas™ v.10.0.12 Software licensed to . UG
Hollow symbols indicate censored values.

Time Series



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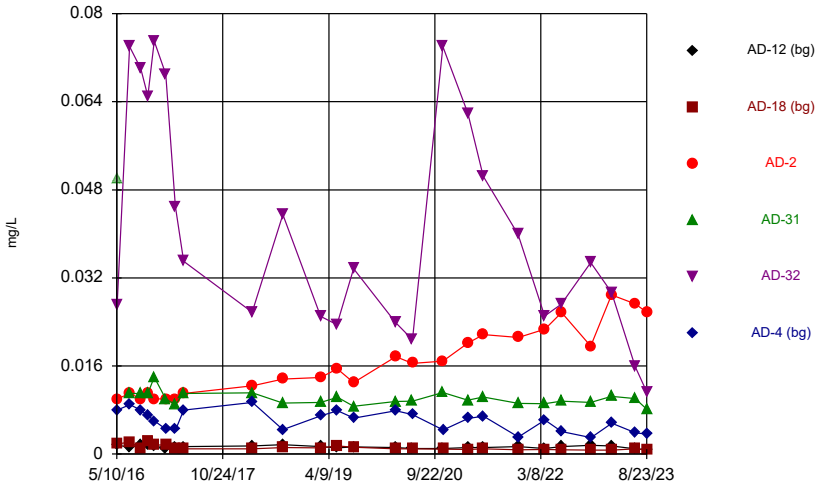
Pirkey EBAP Data: Pirkey EBAP

Sanitas™ v.10.0.12 Software licensed to . UG

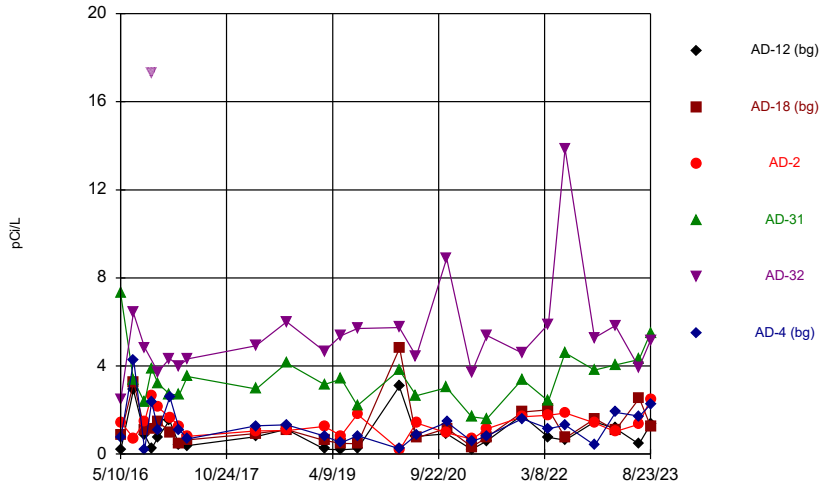
Time Series



Constituent: Cobalt, total Analysis Run 10/10/2023 10:05 AM
Pirkey EBAP Data: Pirkey EBAP

Sanitas™ v.10.0.12 Software licensed to . UG

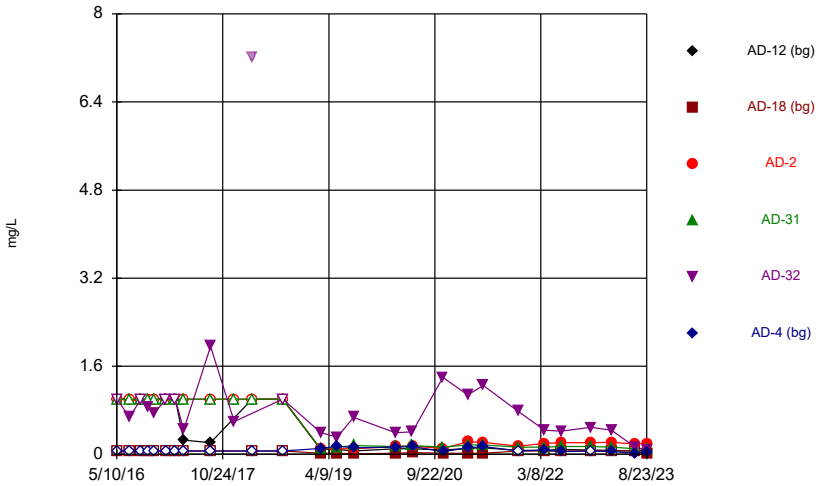
Time Series



Constituent: Combined Radium 226 + 228 Analysis Run 10/10/2023 10:05 AM
Pirkey EBAP Data: Pirkey EBAP

Sanitas™ v.10.0.12 Software licensed to . UG
Hollow symbols indicate censored values.

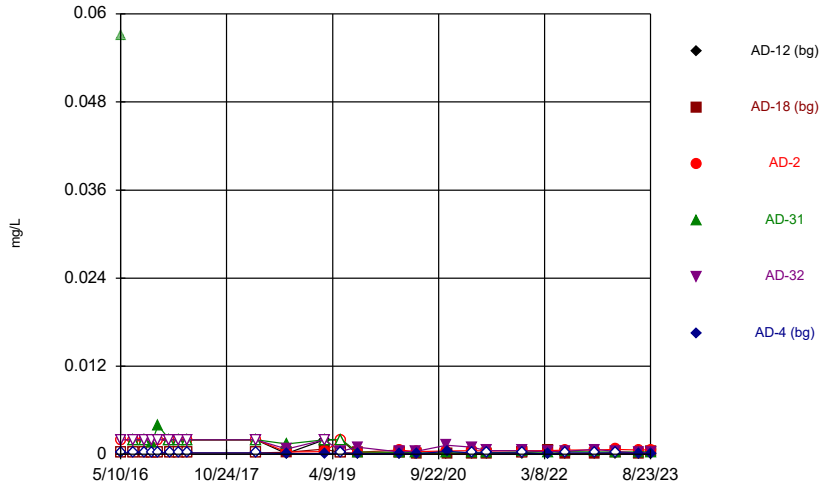
Time Series



Constituent: Fluoride, total Analysis Run 10/10/2023 10:05 AM
Pirkey EBAP Data: Pirkey EBAP

Sanitas™ v.10.0.12 Software licensed to . UG
Hollow symbols indicate censored values.

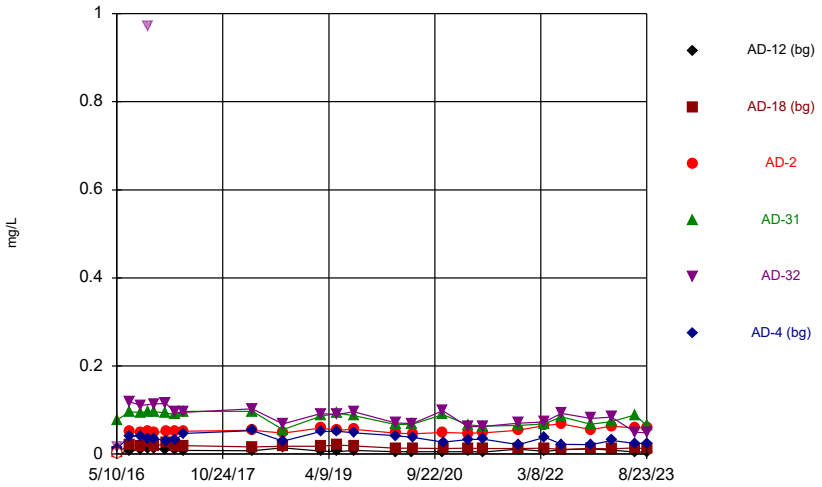
Time Series



Constituent: Lead, total Analysis Run 10/10/2023 10:05 AM
Pirkey EBAP Data: Pirkey EBAP

Sanitas™ v.10.0.12 Software licensed to . UG
Hollow symbols indicate censored values.

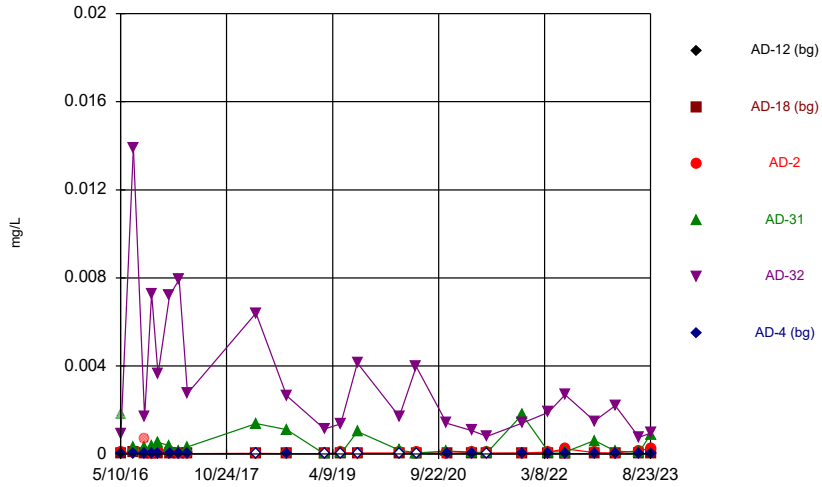
Time Series



Constituent: Lithium, total Analysis Run 10/10/2023 10:05 AM
Pirkey EBAP Data: Pirkey EBAP

Sanitas™ v.10.0.12 Software licensed to . UG
Hollow symbols indicate censored values.

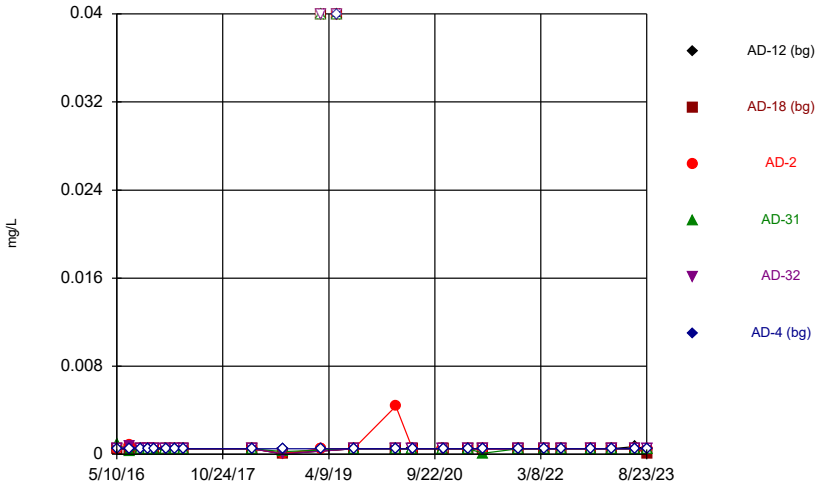
Time Series



Constituent: Mercury, total Analysis Run 10/10/2023 10:05 AM
Pirkey EBAP Data: Pirkey EBAP

Sanitas™ v.10.0.12 Software licensed to . UG
Hollow symbols indicate censored values.

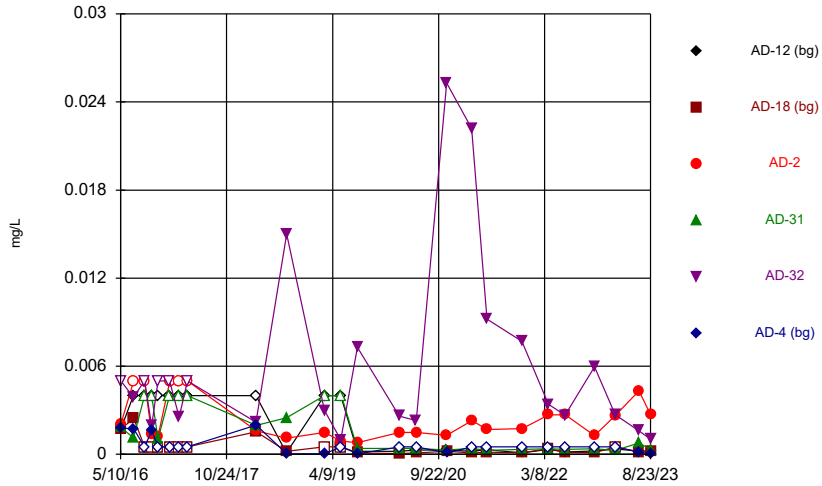
Time Series



Constituent: Molybdenum, total Analysis Run 10/10/2023 10:05 AM
Pirkey EBAP Data: Pirkey EBAP

Sanitas™ v.10.0.12 Software licensed to . UG
Hollow symbols indicate censored values.

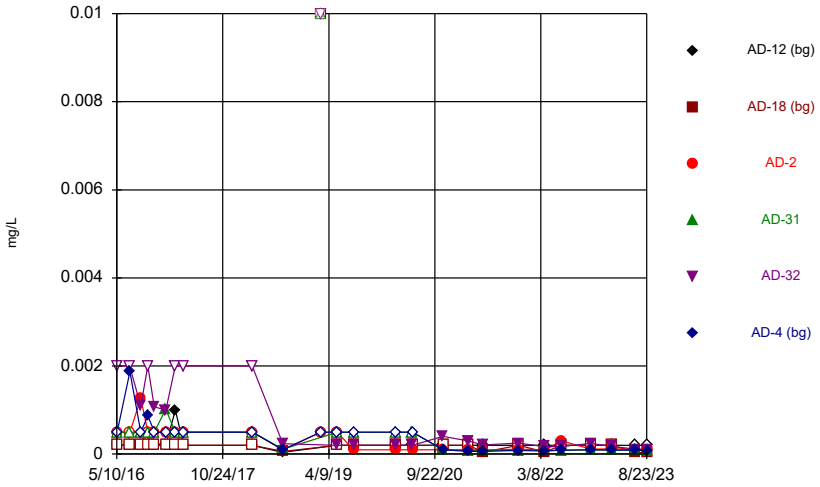
Time Series



Constituent: Selenium, total Analysis Run 10/10/2023 10:05 AM
Pirkey EBAP Data: Pirkey EBAP

Sanitas™ v.10.0.12 Software licensed to . UG
Hollow symbols indicate censored values.

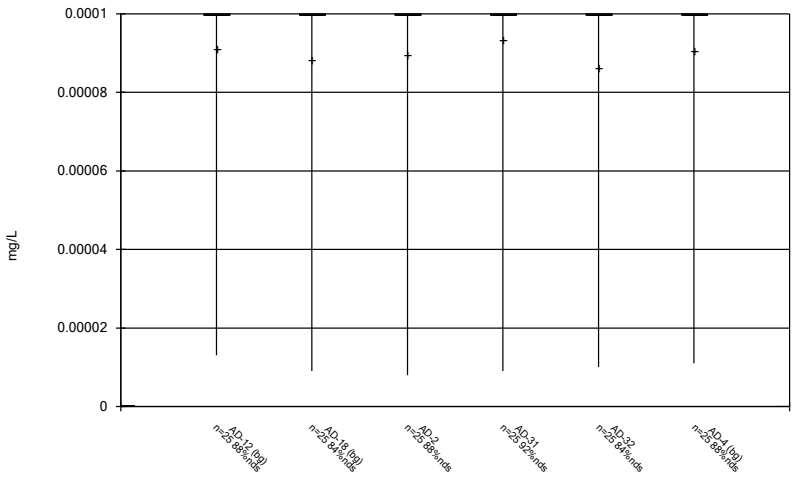
Time Series



Constituent: Thallium, total Analysis Run 10/10/2023 10:05 AM
Pirkey EBAP Data: Pirkey EBAP

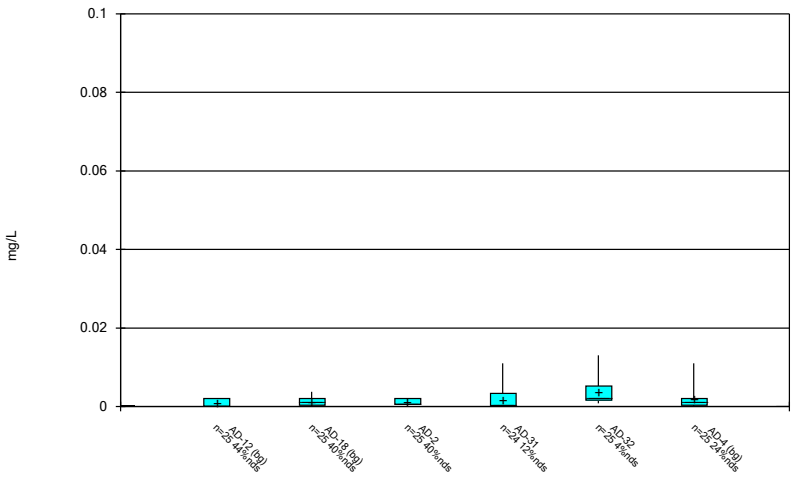
FIGURE B
Box Plots

Box & Whiskers Plot



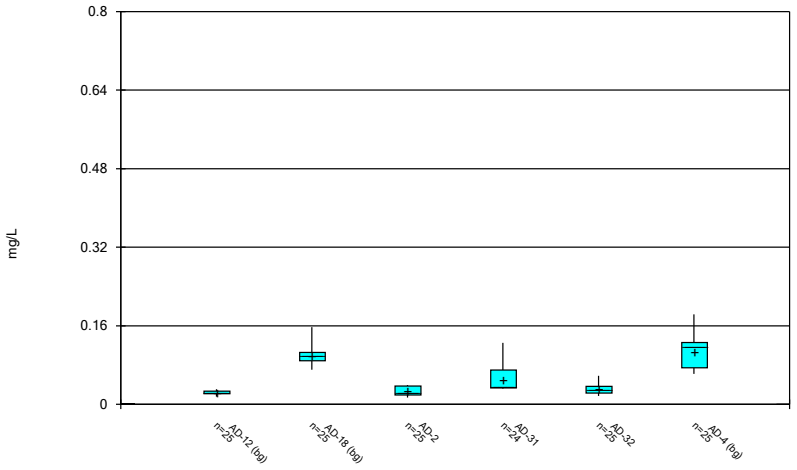
Constituent: Antimony, total Analysis Run 10/10/2023 10:08 AM
Pirkey EBAP Data: Pirkey EBAP

Box & Whiskers Plot



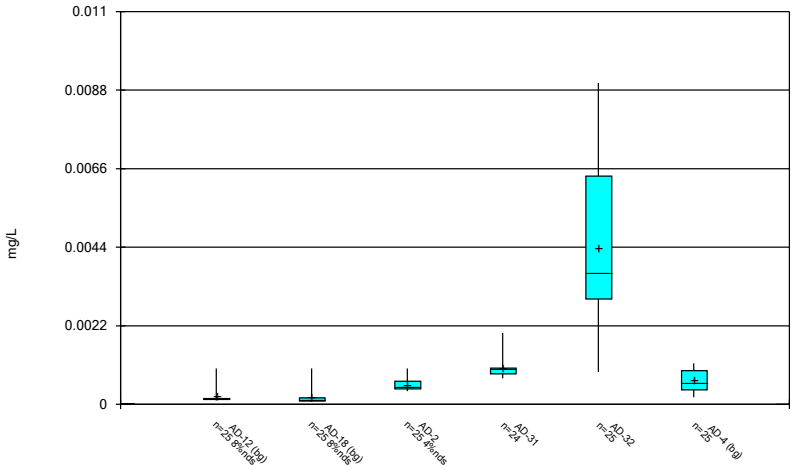
Constituent: Arsenic, total Analysis Run 10/10/2023 10:08 AM
Pirkey EBAP Data: Pirkey EBAP

Box & Whiskers Plot



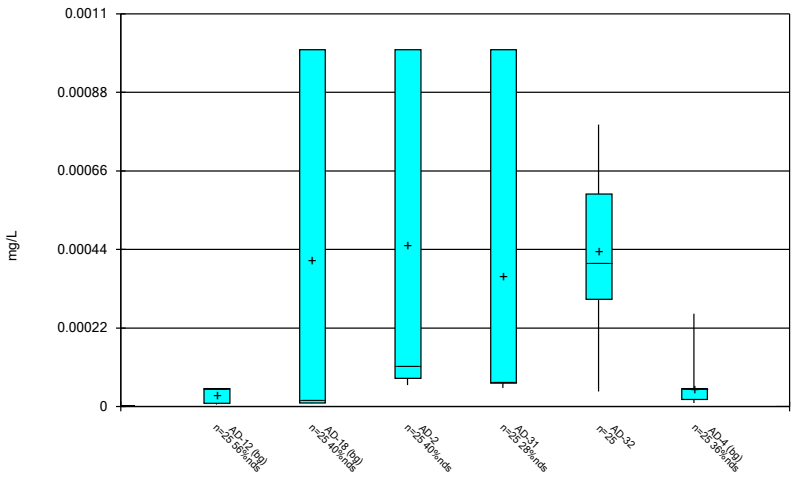
Constituent: Barium, total Analysis Run 10/10/2023 10:08 AM
Pirkey EBAP Data: Pirkey EBAP

Box & Whiskers Plot



Constituent: Beryllium, total Analysis Run 10/10/2023 10:08 AM
Pirkey EBAP Data: Pirkey EBAP

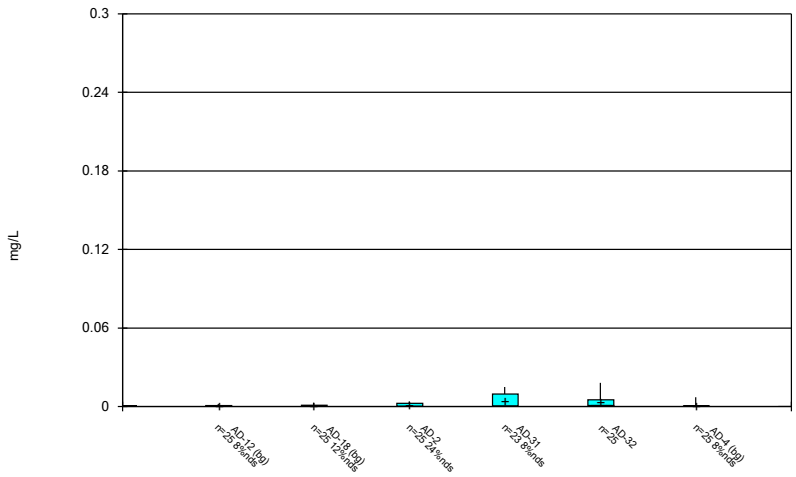
Box & Whiskers Plot



Constituent: Cadmium, total Analysis Run 10/10/2023 10:08 AM
Pirkey EBAP Data: Pirkey EBAP

Sanitas™ v.10.0.12 Software licensed to . UG

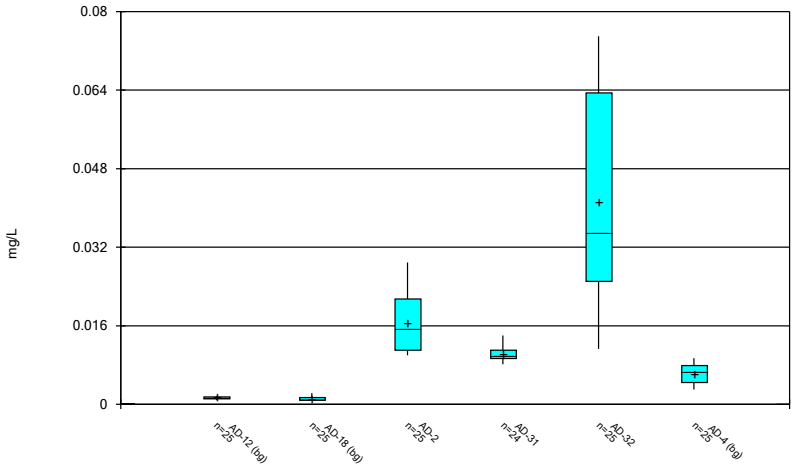
Box & Whiskers Plot



Constituent: Chromium, total Analysis Run 10/10/2023 10:08 AM
Pirkey EBAP Data: Pirkey EBAP

Sanitas™ v.10.0.12 Software licensed to . UG

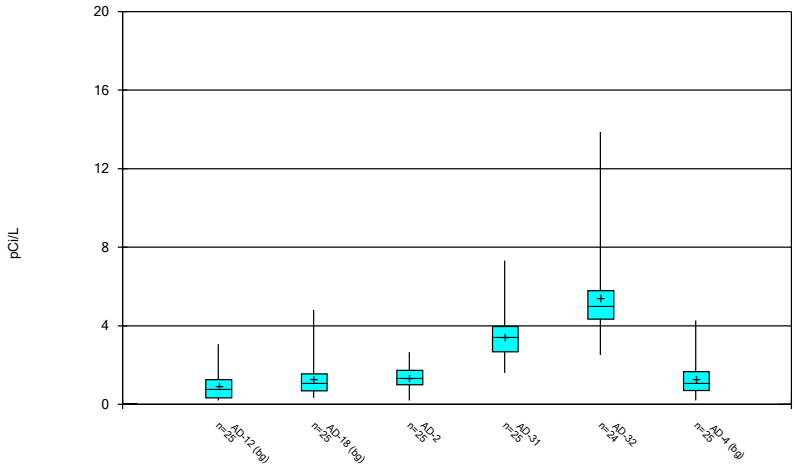
Box & Whiskers Plot



Constituent: Cobalt, total Analysis Run 10/10/2023 10:09 AM
Pirkey EBAP Data: Pirkey EBAP

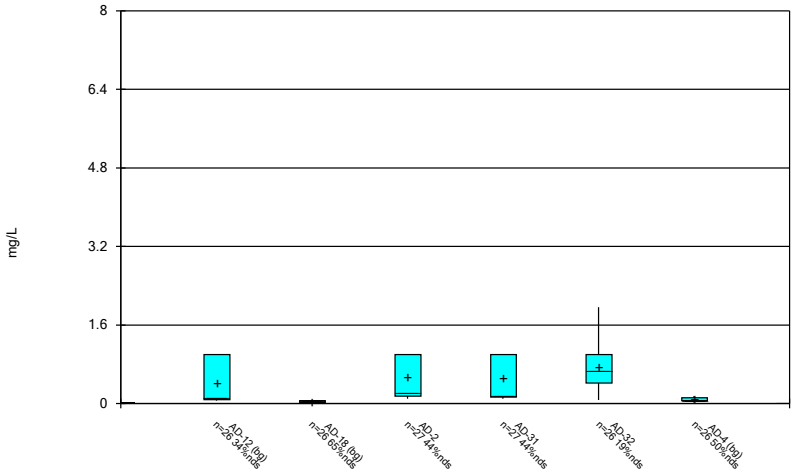
Sanitas™ v.10.0.12 Software licensed to . UG

Box & Whiskers Plot



Constituent: Combined Radium 226 + 228 Analysis Run 10/10/2023 10:09 AM
Pirkey EBAP Data: Pirkey EBAP

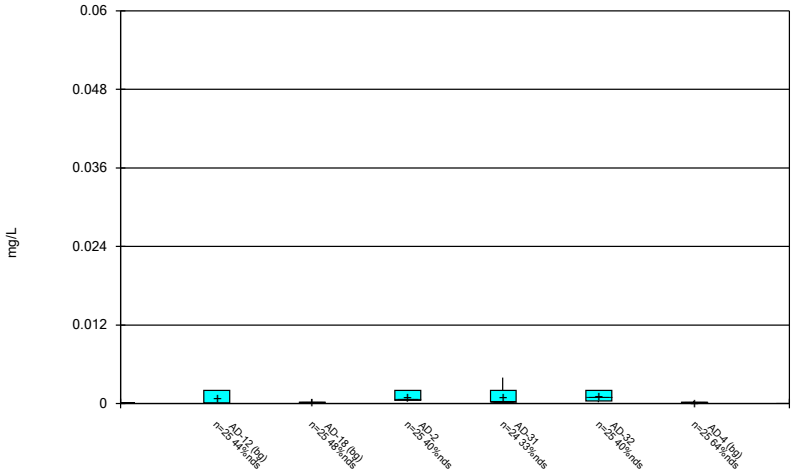
Box & Whiskers Plot



Constituent: Fluoride, total Analysis Run 10/10/2023 10:09 AM
Pirkey EBAP Data: Pirkey EBAP

Sanitas™ v.10.0.12 Software licensed to . UG

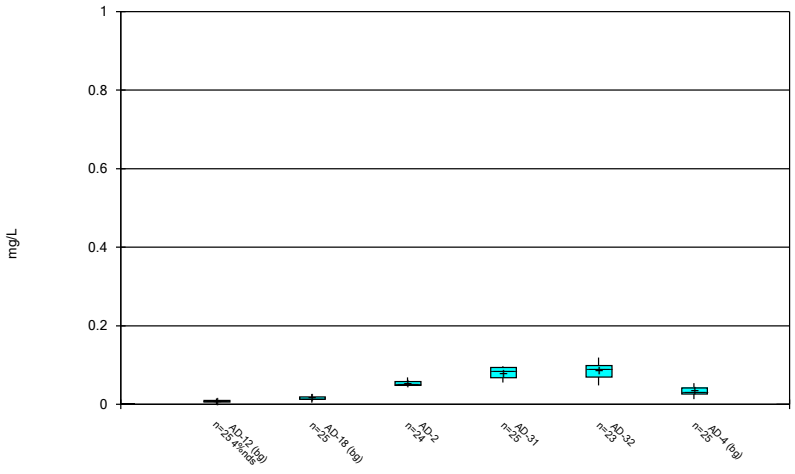
Box & Whiskers Plot



Constituent: Lead, total Analysis Run 10/10/2023 10:09 AM
Pirkey EBAP Data: Pirkey EBAP

Sanitas™ v.10.0.12 Software licensed to . UG

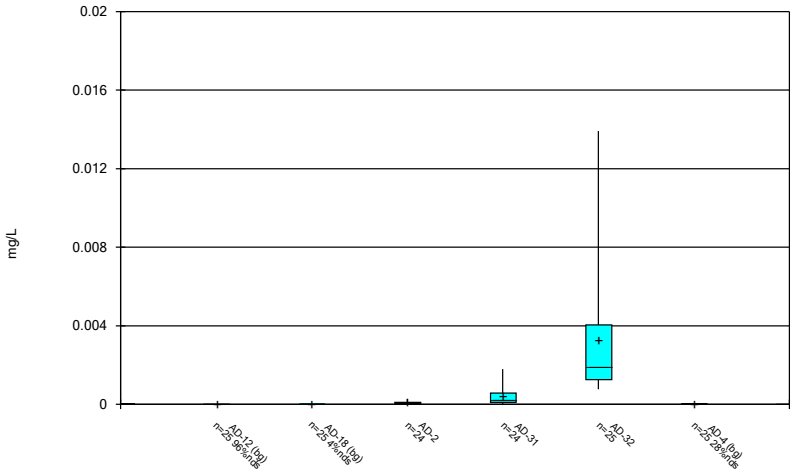
Box & Whiskers Plot



Constituent: Lithium, total Analysis Run 10/10/2023 10:09 AM
Pirkey EBAP Data: Pirkey EBAP

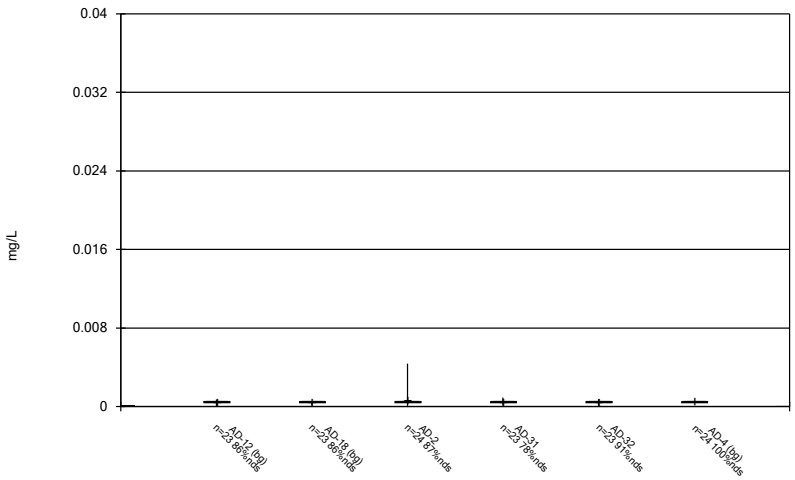
Sanitas™ v.10.0.12 Software licensed to . UG

Box & Whiskers Plot



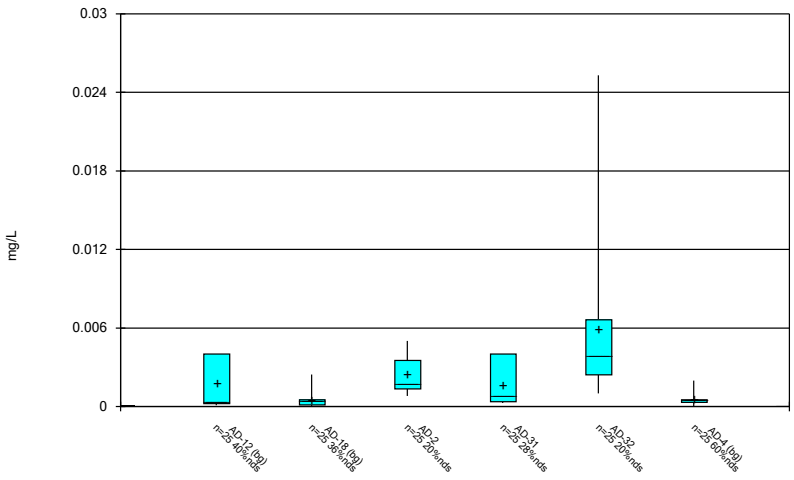
Constituent: Mercury, total Analysis Run 10/10/2023 10:09 AM
Pirkey EBAP Data: Pirkey EBAP

Box & Whiskers Plot



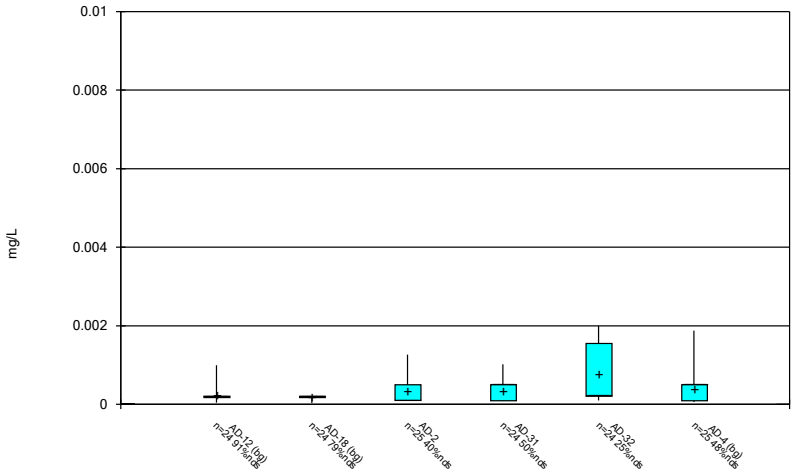
Constituent: Molybdenum, total Analysis Run 10/10/2023 10:09 AM
Pirkey EBAP Data: Pirkey EBAP

Box & Whiskers Plot



Constituent: Selenium, total Analysis Run 10/10/2023 10:09 AM
Pirkey EBAP Data: Pirkey EBAP

Box & Whiskers Plot



Constituent: Thallium, total Analysis Run 10/10/2023 10:09 AM
Pirkey EBAP Data: Pirkey EBAP

FIGURE C
Outlier Summary

Outlier Summary

Pirkey EBAP Data: Pirkey EBAP Printed 10/10/2023, 10:13 AM

	AD-31 Arsenic, total (mg/L)	AD-31 Barium, total (mg/L)	AD-31 Beryllium, total (mg/L)	AD-31 Chromium, total (mg/L)	AD-31 Cobalt, total (mg/L)	AD-32 Combined Radium 226 + 228 (pCi/L)	AD-32 Fluoride, total (mg/L)	AD-31 Lead, total (mg/L)	AD-2 Lithium, total (mg/L)	AD-32 Lithium, total (mg/L)
5/11/2016	0.093 (o)	0.712 (o)	0.01 (o)	0.212 (o)	0.05 (o)			0.057 (o)	<0.001 (o)	0.016 (o)
9/7/2016										
10/12/2016						17.32 (o)				0.972 (o)
11/14/2016				0.03 (o)						
3/21/2018							7.2 (o)			
2/27/2019										
2/28/2019										
5/21/2019										
5/22/2019										
5/23/2019										

	AD-2 Mercury, total (mg/L)	AD-31 Mercury, total (mg/L)	AD-12 Molybdenum, total (mg/L)	AD-18 Molybdenum, total (mg/L)	AD-2 Molybdenum, total (mg/L)	AD-31 Molybdenum, total (mg/L)	AD-32 Molybdenum, total (mg/L)	AD-4 Molybdenum, total (mg/L)	AD-12 Thallium, total (mg/L)	AD-18 Thallium, total (mg/L)
5/11/2016		0.001797 (o)								
9/7/2016	0.000675 (o)									
10/12/2016										
11/14/2016										
3/21/2018										
2/27/2019			<0.04 (o)						<0.01 (o)	
2/28/2019				<0.04 (o)		<0.04 (o)	<0.04 (o)			<0.01 (o)
5/21/2019			<0.04 (o)				<0.04 (o)			
5/22/2019					<0.04 (o)					
5/23/2019				<0.04 (o)		<0.04 (o)		<0.04 (o)		

	AD-31 Thallium, total (mg/L)	AD-32 Thallium, total (mg/L)
5/11/2016		
9/7/2016		
10/12/2016		
11/14/2016		
3/21/2018		
2/27/2019		
2/28/2019	<0.01 (o)	<0.01 (o)
5/21/2019		
5/22/2019		
5/23/2019		

Tukey's Outlier Test - Upgradient Wells - Significant Results

Pirkey EBAP Data: Pirkey EBAP Printed 10/10/2023, 10:11 AM

Constituent	Well	Outlier	Value(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Fluoride, total (mg/L)	**AD-12,AD-18,AD-4**	**Yes**	**0.2565,0.213,0.02,0.02,0.02,0.02,0.02,0.02,0.02,0**	**NP**	**NaN**	**78**	**0.06987**	**0.03955**	**x^(1/3)**	**ShapiroFrancia**

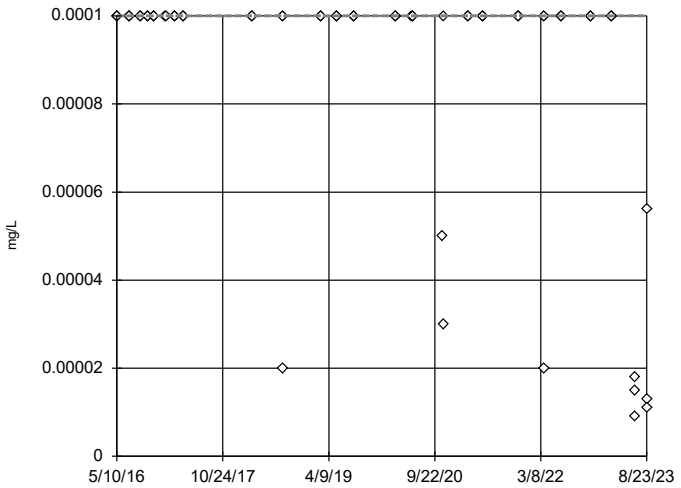
Tukey's Outlier Test - Upgradient Wells - All Results

Pirkey EBAP Data: Pirkey EBAP Printed 10/10/2023, 10:11 AM

Constituent	Well	Outlier	Value(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Antimony, total (mg/L)	AD-12,AD-18,AD-4	n/a	n/a	NP	NaN	75	0.00008989	0.00002656	unknown	ShapiroFrancia
Arsenic, total (mg/L)	AD-12,AD-18,AD-4	No	n/a	NP	NaN	75	0.001415	0.001791	ln(x)	ShapiroFrancia
Barium, total (mg/L)	AD-12,AD-18,AD-4	No	n/a	NP	NaN	75	0.07659	0.04305	normal	ShapiroFrancia
Beryllium, total (mg/L)	AD-12,AD-18,AD-4	No	n/a	NP	NaN	75	0.0003563	0.0003327	ln(x)	ShapiroFrancia
Cadmium, total (mg/L)	AD-12,AD-18,AD-4	No	n/a	NP	NaN	75	0.00003762	0.0000367	ln(x)	ShapiroFrancia
Chromium, total (mg/L)	AD-12,AD-18,AD-4	No	n/a	NP	NaN	75	0.0007677	0.0009891	ln(x)	ShapiroFrancia
Cobalt, total (mg/L)	AD-12,AD-18,AD-4	No	n/a	NP	NaN	75	0.002849	0.002562	ln(x)	ShapiroFrancia
Combined Radium 226 + 228 (pCi/L)	AD-12,AD-18,AD-4	No	n/a	NP	NaN	75	1.17	0.8985	ln(x)	ShapiroFrancia
Fluoride, total (mg/L)	**AD-12,AD-18,AD-4**	**Yes**	**0.2565,0.213,0.02,0.02,0.02,0.02,0.02,0.02,0.02,0**	**NP**	**NaN**	**78**	**0.06987**	**0.03955**	**x^(1/3)**	**ShapiroFrancia**
Lead, total (mg/L)	AD-12,AD-18,AD-4	No	n/a	NP	NaN	75	0.0001745	0.0001033	ln(x)	ShapiroFrancia
Lithium, total (mg/L)	AD-12,AD-18,AD-4	No	n/a	NP	NaN	75	0.01934	0.01322	x^(1/3)	ShapiroFrancia
Mercury, total (mg/L)	AD-12,AD-18,AD-4	No	n/a	NP	NaN	75	0.000009998	0.000009717	ln(x)	ShapiroFrancia
Molybdenum, total (mg/L)	AD-12,AD-18,AD-4	n/a	n/a	NP	NaN	75	0.0004844	0.00008833	unknown	ShapiroFrancia
Selenium, total (mg/L)	AD-12,AD-18,AD-4	No	n/a	NP	NaN	75	0.000495	0.0004989	ln(x)	ShapiroFrancia
Thallium, total (mg/L)	AD-12,AD-18,AD-4	n/a	n/a	NP	NaN	75	0.0002123	0.0002372	unknown	ShapiroFrancia

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 75

No outliers found. Tukey's method selected by user.

Ladder of Powers transformations did not improve normality; analysis run on raw data.

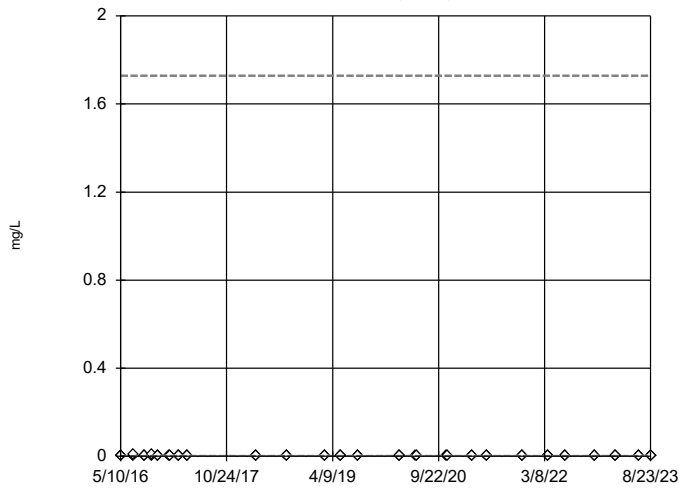
The results were invalidated, because the lower and upper quartiles are equal.

Constituent: Antimony, total Analysis Run 10/10/2023 10:10 AM View: Outliers - Upgradient Wells
Pirkey EBAP Data: Pirkey EBAP

Sanitas™ v.10.0.12 Software licensed to . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 75

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

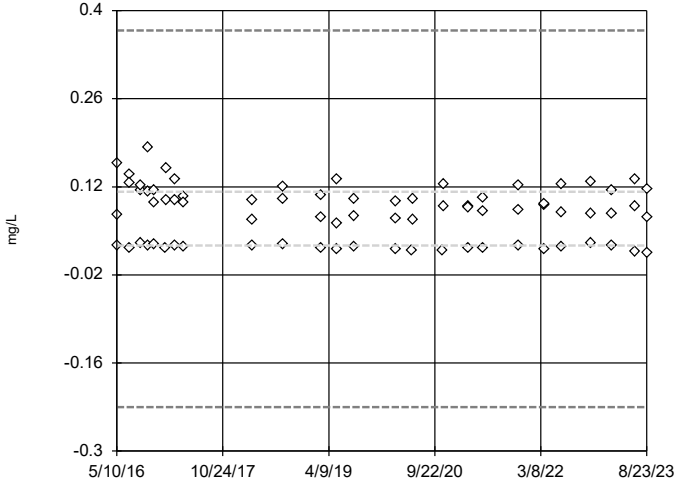
High cutoff = 1.728, low cutoff = 2.4e-7, based on IQR multiplier of 3.

Constituent: Arsenic, total Analysis Run 10/10/2023 10:10 AM View: Outliers - Upgradient Wells
Pirkey EBAP Data: Pirkey EBAP

Sanitas™ v.10.0.12 Software licensed to . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 75

No outliers found. Tukey's method selected by user.

Ladder of Powers transformations did not improve normality; analysis run on raw data.

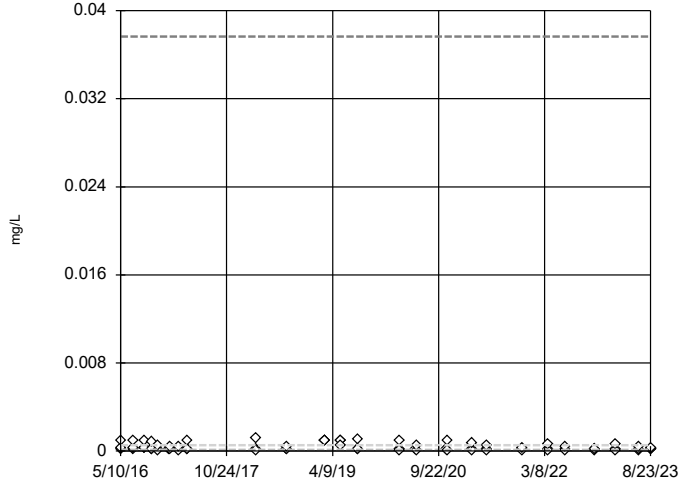
High cutoff = 0.3685, low cutoff = -0.23, based on IQR multiplier of 3.

Constituent: Barium, total Analysis Run 10/10/2023 10:10 AM View: Outliers - Upgradient Wells
Pirkey EBAP Data: Pirkey EBAP

Sanitas™ v.10.0.12 Software licensed to . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 75

No outliers found. Tukey's method selected by user.

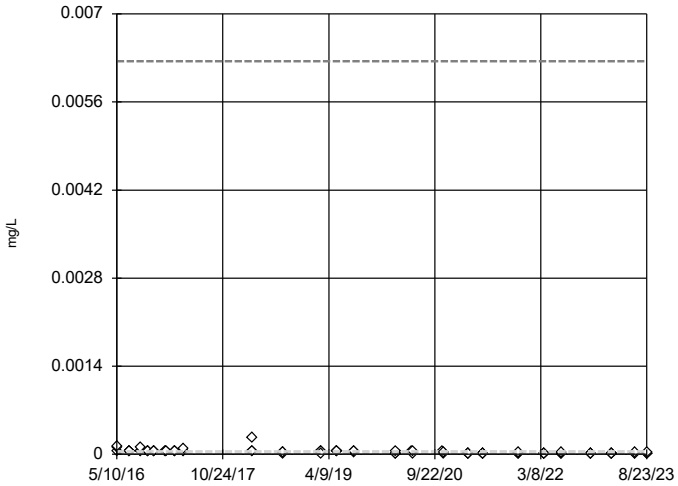
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.03766, low cutoff = 0.000001777, based on IQR multiplier of 3.

Constituent: Beryllium, total Analysis Run 10/10/2023 10:10 AM View: Outliers - Upgradient Wells
Pirkey EBAP Data: Pirkey EBAP

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 75

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

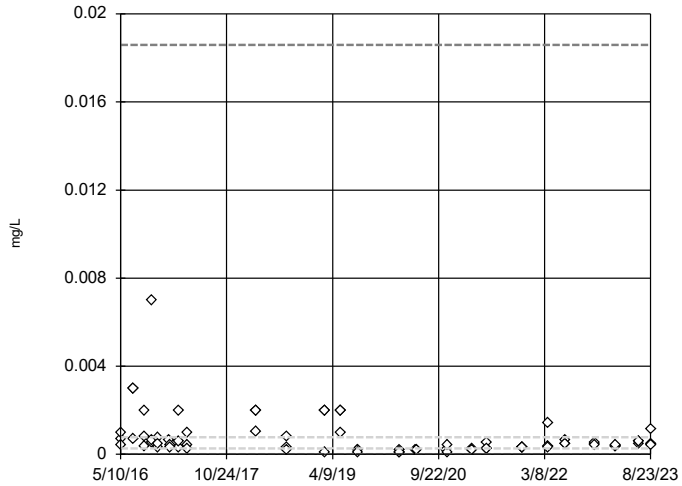
High cutoff = 0.00625, low cutoff = 8.0e-8, based on IQR multiplier of 3.

Constituent: Cadmium, total Analysis Run 10/10/2023 10:10 AM View: Outliers - Upgradient Wells
Pirkey EBAP Data: Pirkey EBAP

Sanitas™ v.10.0.12 Software licensed to . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 75

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

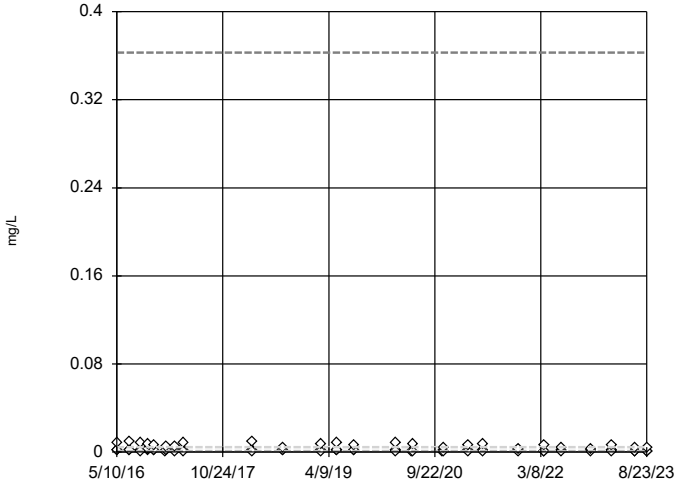
High cutoff = 0.01859, low cutoff = 0.00001137, based on IQR multiplier of 3.

Constituent: Chromium, total Analysis Run 10/10/2023 10:10 AM View: Outliers - Upgradient Wells
Pirkey EBAP Data: Pirkey EBAP

Sanitas™ v.10.0.12 Software licensed to . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 75

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.3629, low cutoff = 0.00001245, based on IQR multiplier of 3.

Constituent: Cobalt, total Analysis Run 10/10/2023 10:10 AM View: Outliers - Upgradient Wells
Pirkey EBAP Data: Pirkey EBAP

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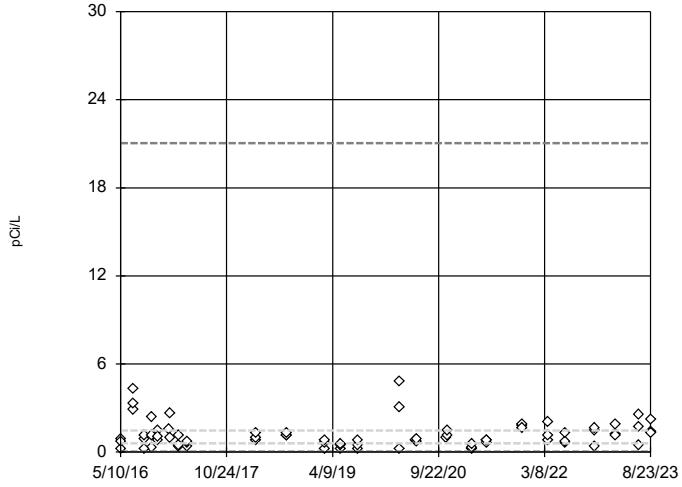
Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 75

No outliers found. Tukey's method selected by user.

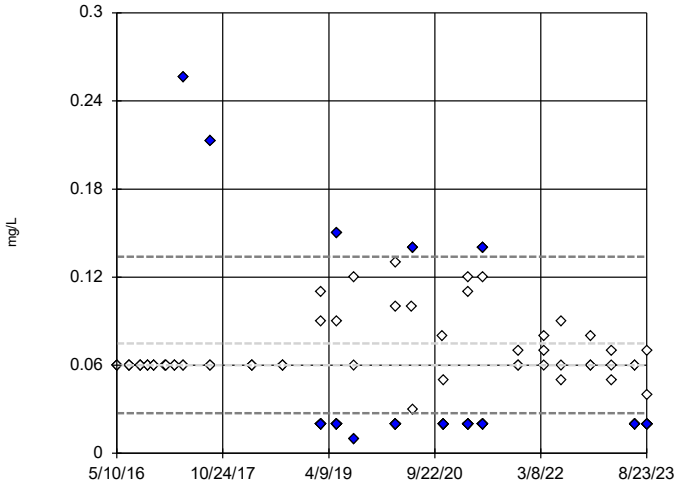
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 21.04, low cutoff = 0.04164, based on IQR multiplier of 3.

Constituent: Combined Radium 226 + 228 Analysis Run 10/10/2023 10:10 AM View: Outliers - Upgradient
Pirkey EBAP Data: Pirkey EBAP

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 78

Outliers are drawn as solid.
Tukey's method selected by user.

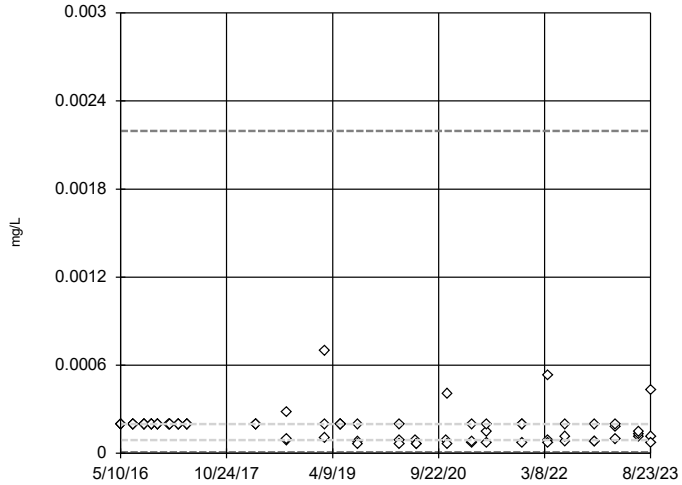
Data were cube root transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.1339, low cutoff = 0.02739, based on IQR multiplier of 3.

Constituent: Fluoride, total Analysis Run 10/10/2023 10:10 AM View: Outliers - Upgradient Wells
Pirkey EBAP Data: Pirkey EBAP

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 75

No outliers found.
Tukey's method selected by user.

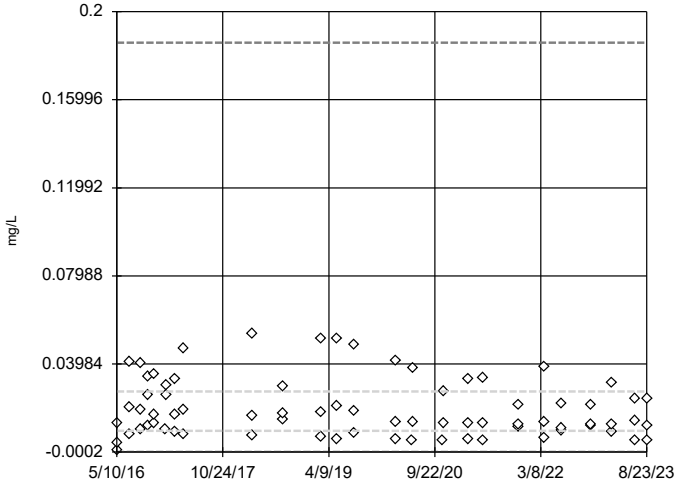
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.002195, low cutoff = 0.000008201, based on IQR multiplier of 3.

Constituent: Lead, total Analysis Run 10/10/2023 10:10 AM View: Outliers - Upgradient Wells
Pirkey EBAP Data: Pirkey EBAP

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 75

No outliers found.
Tukey's method selected by user.

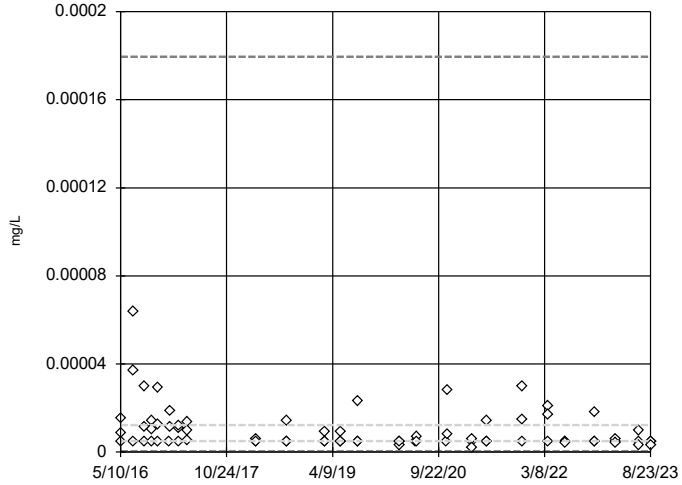
Data were cube root transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.1859, low cutoff = -0.0001907, based on IQR multiplier of 3.

Constituent: Lithium, total Analysis Run 10/10/2023 10:10 AM View: Outliers - Upgradient Wells
Pirkey EBAP Data: Pirkey EBAP

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 75

No outliers found.
Tukey's method selected by user.

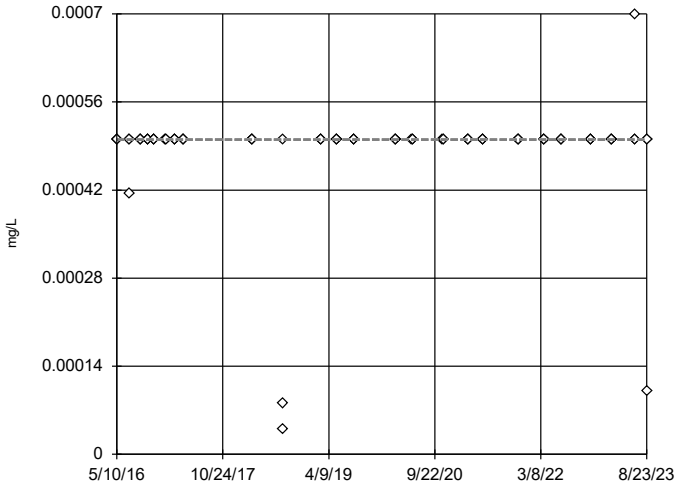
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.0001796, low cutoff = 3.4e-7, based on IQR multiplier of 3.

Constituent: Mercury, total Analysis Run 10/10/2023 10:10 AM View: Outliers - Upgradient Wells
Pirkey EBAP Data: Pirkey EBAP

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 75

No outliers found. Tukey's method selected by user.

Data were square transformed to achieve best W statistic (graph shown in original units).

The results were invalidated, because the lower and upper quartiles are equal.

Constituent: Molybdenum, total Analysis Run 10/10/2023 10:10 AM View: Outliers - Upgradient Wells
Pirkey EBAP Data: Pirkey EBAP

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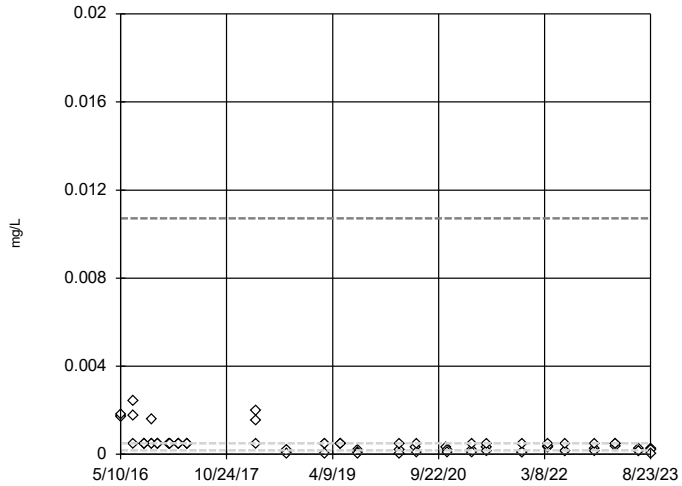
Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 75

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.01072, low cutoff = 0.000008398, based on IQR multiplier of 3.

Constituent: Selenium, total Analysis Run 10/10/2023 10:10 AM View: Outliers - Upgradient Wells
Pirkey EBAP Data: Pirkey EBAP

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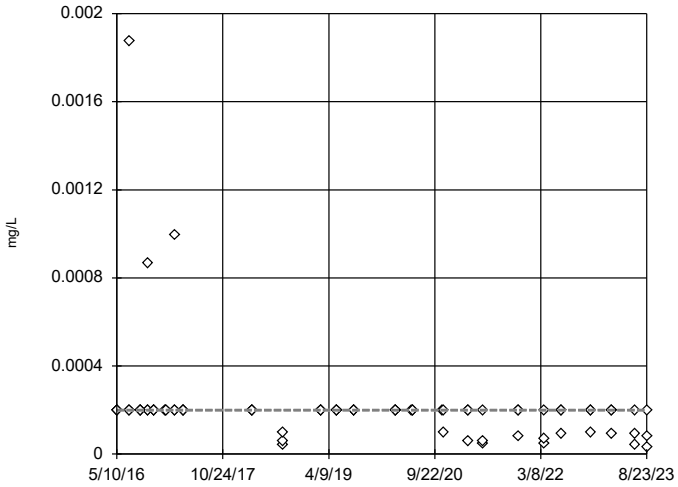
Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-4



n = 75

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

The results were invalidated, because the lower and upper quartiles are equal.

Constituent: Thallium, total Analysis Run 10/10/2023 10:10 AM View: Outliers - Upgradient Wells
Pirkey EBAP Data: Pirkey EBAP

FIGURE D

UTLs

Upper Tolerance Limits - Summary Table

Pirkey EBAP Data: Pirkey EBAP Printed 10/10/2023, 10:19 AM

Constituent	Well	Upper Lim.	Date	Observ.	Sig.	Bg N	%NDs	ND Adj.	Transform	Alpha	Method
Antimony, total (mg/L)	n/a	0.0001	n/a	n/a	n/a	75	86.67	n/a	n/a	0.02134	NP Inter(NDs)
Arsenic, total (mg/L)	n/a	0.011	n/a	n/a	n/a	75	36	n/a	n/a	0.02134	NP Inter(normality)
Barium, total (mg/L)	n/a	0.183	n/a	n/a	n/a	75	0	n/a	n/a	0.02134	NP Inter(normality)
Beryllium, total (mg/L)	n/a	0.00115	n/a	n/a	n/a	75	5.333	n/a	n/a	0.02134	NP Inter(normality)
Cadmium, total (mg/L)	n/a	0.00026	n/a	n/a	n/a	75	44	n/a	n/a	0.02134	NP Inter(normality)
Chromium, total (mg/L)	n/a	0.002876	n/a	n/a	n/a	75	9.333	None	ln(x)	0.05	Inter
Cobalt, total (mg/L)	n/a	0.00939	n/a	n/a	n/a	75	0	n/a	n/a	0.02134	NP Inter(normality)
Combined Radium 226 + 228 (pCi/L)	n/a	3.23	n/a	n/a	n/a	75	0	None	x^(1/3)	0.05	Inter
Fluoride, total (mg/L)	n/a	0.2565	n/a	n/a	n/a	78	50	n/a	n/a	0.0183	NP Inter(normality)
Lead, total (mg/L)	n/a	0.0007	n/a	n/a	n/a	75	52	n/a	n/a	0.02134	NP Inter(NDs)
Lithium, total (mg/L)	n/a	0.04972	n/a	n/a	n/a	75	1.333	None	sqrt(x)	0.05	Inter
Mercury, total (mg/L)	n/a	0.000064	n/a	n/a	n/a	75	42.67	n/a	n/a	0.02134	NP Inter(normality)
Molybdenum, total (mg/L)	n/a	0.0007	n/a	n/a	n/a	70	91.43	n/a	n/a	0.02758	NP Inter(NDs)
Selenium, total (mg/L)	n/a	0.00245	n/a	n/a	n/a	75	45.33	n/a	n/a	0.02134	NP Inter(normality)
Thallium, total (mg/L)	n/a	0.001874	n/a	n/a	n/a	73	72.6	n/a	n/a	0.02365	NP Inter(NDs)

FIGURE E

GWPS

PIRKEY EBAP GWPS			
Constituent Name	**MCL**	**Background Limit**	**GWPS**
Antimony, Total (mg/L)	0.006	0.0001	0.006
Arsenic, Total (mg/L)	0.01	0.011	0.011
Barium, Total (mg/L)	2	0.18	2
Beryllium, Total (mg/L)	0.004	0.0012	0.004
Cadmium, Total (mg/L)	0.005	0.00026	0.005
Chromium, Total (mg/L)	0.1	0.0029	0.1
Cobalt, Total (mg/L)	n/a	0.0094	0.0094
Combined Radium, Total (pCi/L)	5	3.2	5
Fluoride, Total (mg/L)	4	0.26	4
Lead, Total (mg/L)	n/a	0.0007	0.0007
Lithium, Total (mg/L)	n/a	0.05	0.05
Mercury, Total (mg/L)	0.002	0.000064	0.002
Molybdenum, Total (mg/L)	n/a	0.0007	0.0007
Selenium, Total (mg/L)	0.05	0.0025	0.05
Thallium, Total (mg/L)	0.002	0.0019	0.002

**Grey cell indicates Background Limit is higher than MCL*

**MCL = Maximum Contaminant Level*

**GWPS = Groundwater Protection Standard*

FIGURE F

Confidence Interval

Appendix IV Confidence Intervals - Significant Results

Pirkey EBAP Data: Pirkey EBAP Printed 10/10/2023, 10:27 AM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	%NDs	ND Adj.	Transform	Alpha	Method
Cobalt, total (mg/L)	**AD-2**	**0.01968**	**0.01357**	**0.0094**	**Yes**	**25**	**0**	**None**	**No**	**0.01**	**Param.**
Cobalt, total (mg/L)	**AD-31**	**0.0107**	**0.009495**	**0.0094**	**Yes**	**24**	**0**	**None**	**No**	**0.01**	**Param.**
Cobalt, total (mg/L)	**AD-32**	**0.05122**	**0.03088**	**0.0094**	**Yes**	**25**	**0**	**None**	**No**	**0.01**	**Param.**
Lithium, total (mg/L)	**AD-2**	**0.05692**	**0.05061**	**0.05**	**Yes**	**24**	**0**	**None**	**No**	**0.01**	**Param.**
Lithium, total (mg/L)	**AD-31**	**0.093**	**0.0681**	**0.05**	**Yes**	**25**	**0**	**None**	**No**	**0.01**	**NP (normality)**
Lithium, total (mg/L)	**AD-32**	**0.09598**	**0.07457**	**0.05**	**Yes**	**23**	**0**	**None**	**No**	**0.01**	**Param.**

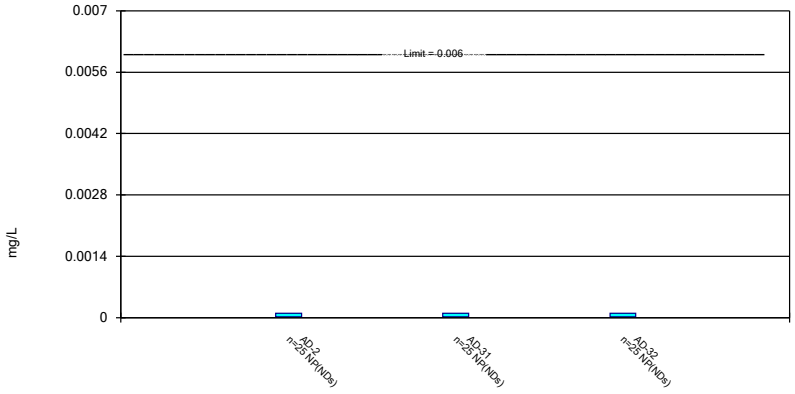
Appendix IV Confidence Intervals - All Results

Pirkey EBAP Data: Pirkey EBAP Printed 10/10/2023, 10:27 AM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	%NDs	ND Adj.	Transform	Alpha	Method
Antimony, total (mg/L)	AD-2	0.0001	0.00002	0.006	No	25	88	None	No	0.01	NP (NDs)
Antimony, total (mg/L)	AD-31	0.0001	0.00002	0.006	No	25	92	None	No	0.01	NP (NDs)
Antimony, total (mg/L)	AD-32	0.0001	0.00002	0.006	No	25	84	None	No	0.01	NP (NDs)
Arsenic, total (mg/L)	AD-2	0.002	0.00053	0.011	No	25	40	None	No	0.01	NP (normality)
Arsenic, total (mg/L)	AD-31	0.00332	0.00027	0.011	No	24	12.5	None	No	0.01	NP (normality)
Arsenic, total (mg/L)	AD-32	0.004527	0.002042	0.011	No	25	4	None	sqrt(x)	0.01	Param.
Barium, total (mg/L)	AD-2	0.02999	0.02107	2	No	25	0	None	sqrt(x)	0.01	Param.
Barium, total (mg/L)	AD-31	0.0708	0.0331	2	No	24	0	None	No	0.01	NP (normality)
Barium, total (mg/L)	AD-32	0.03565	0.02588	2	No	25	0	None	No	0.01	Param.
Beryllium, total (mg/L)	AD-2	0.0006178	0.0004637	0.004	No	25	4	None	sqrt(x)	0.01	Param.
Beryllium, total (mg/L)	AD-31	0.00103	0.00085	0.004	No	24	0	None	No	0.01	NP (normality)
Beryllium, total (mg/L)	AD-32	0.005557	0.003242	0.004	No	25	0	None	No	0.01	Param.
Cadmium, total (mg/L)	AD-2	0.001	0.00008	0.005	No	25	40	None	No	0.01	NP (normality)
Cadmium, total (mg/L)	AD-31	0.0008589	0.000064	0.005	No	25	28	None	No	0.01	NP (normality)
Cadmium, total (mg/L)	AD-32	0.0005338	0.0003344	0.005	No	25	0	None	No	0.01	Param.
Chromium, total (mg/L)	AD-2	0.0009	0.000292	0.1	No	25	24	None	No	0.01	NP (normality)
Chromium, total (mg/L)	AD-31	0.00962	0.00039	0.1	No	23	8.696	None	No	0.01	NP (normality)
Chromium, total (mg/L)	AD-32	0.00538	0.00068	0.1	No	25	0	None	No	0.01	NP (normality)
Cobalt, total (mg/L)	**AD-2**	**0.01968**	**0.01357**	**0.0094**	**Yes**	**25**	**0**	**None**	**No**	**0.01**	**Param.**
Cobalt, total (mg/L)	**AD-31**	**0.0107**	**0.009495**	**0.0094**	**Yes**	**24**	**0**	**None**	**No**	**0.01**	**Param.**
Cobalt, total (mg/L)	**AD-32**	**0.05122**	**0.03088**	**0.0094**	**Yes**	**25**	**0**	**None**	**No**	**0.01**	**Param.**
Combined Radium 226 + 228 (pCi/L)	AD-2	1.65	1.085	5	No	25	0	None	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	AD-31	4.033	2.826	5	No	25	0	None	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	AD-32	6.016	4.329	5	No	24	0	None	ln(x)	0.01	Param.
Fluoride, total (mg/L)	AD-2	1	0.19	4	No	27	44.44	None	No	0.01	NP (normality)
Fluoride, total (mg/L)	AD-31	1	0.13	4	No	27	44.44	None	No	0.01	NP (normality)
Fluoride, total (mg/L)	AD-32	0.813	0.404	4	No	26	19.23	Kaplan-Meier	No	0.01	Param.
Lead, total (mg/L)	AD-2	0.002	0.0005	0.0007	No	25	40	None	No	0.01	NP (normality)
Lead, total (mg/L)	AD-31	0.002	0.00029	0.0007	No	24	33.33	None	No	0.01	NP (normality)
Lead, total (mg/L)	AD-32	0.002	0.000405	0.0007	No	25	40	None	No	0.01	NP (normality)
Lithium, total (mg/L)	**AD-2**	**0.05692**	**0.05061**	**0.05**	**Yes**	**24**	**0**	**None**	**No**	**0.01**	**Param.**
Lithium, total (mg/L)	**AD-31**	**0.093**	**0.0681**	**0.05**	**Yes**	**25**	**0**	**None**	**No**	**0.01**	**NP (normality)**
Lithium, total (mg/L)	**AD-32**	**0.09598**	**0.07457**	**0.05**	**Yes**	**23**	**0**	**None**	**No**	**0.01**	**Param.**
Mercury, total (mg/L)	AD-2	0.00009754	0.00004766	0.002	No	24	0	None	x^(1/3)	0.01	Param.
Mercury, total (mg/L)	AD-31	0.0005359	0.0001516	0.002	No	24	0	None	sqrt(x)	0.01	Param.
Mercury, total (mg/L)	AD-32	0.003861	0.001625	0.002	No	25	0	None	x^(1/3)	0.01	Param.
Molybdenum, total (mg/L)	AD-2	0.0008627	0.00006	0.0007	No	24	87.5	None	No	0.01	NP (NDs)
Molybdenum, total (mg/L)	AD-31	0.0005	0.0004016	0.0007	No	23	78.26	None	No	0.01	NP (NDs)
Molybdenum, total (mg/L)	AD-32	0.0007621	0.00004	0.0007	No	23	91.3	None	No	0.01	NP (NDs)
Selenium, total (mg/L)	AD-2	0.001971	0.001292	0.05	No	25	20	Kaplan-Meier	ln(x)	0.01	Param.
Selenium, total (mg/L)	AD-31	0.0025	0.00038	0.05	No	25	28	None	No	0.01	NP (normality)
Selenium, total (mg/L)	AD-32	0.006246	0.002369	0.05	No	25	20	Kaplan-Meier	x^(1/3)	0.01	Param.
Thallium, total (mg/L)	AD-2	0.0005	0.0001	0.002	No	25	40	None	No	0.01	NP (normality)
Thallium, total (mg/L)	AD-31	0.0005	0.00009	0.002	No	24	50	None	No	0.01	NP (normality)
Thallium, total (mg/L)	AD-32	0.001093	0.0002	0.002	No	24	25	None	No	0.01	NP (normality)

Non-Parametric Confidence Interval

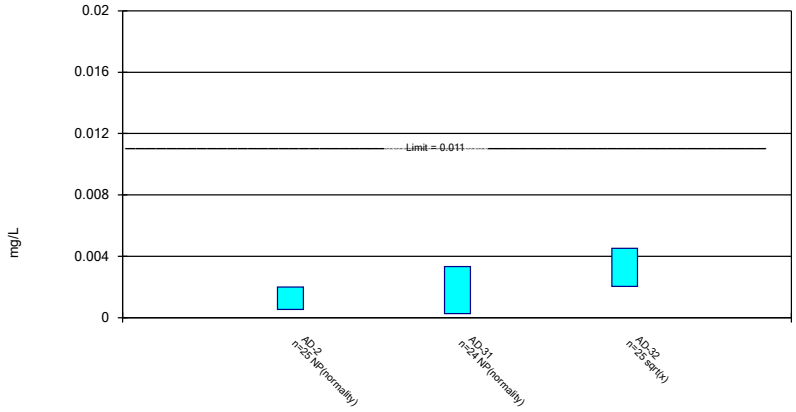
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Antimony, total Analysis Run 10/10/2023 10:26 AM View: Confidence Intervals
Pirkey EBAP Data: Pirkey EBAP

Parametric and Non-Parametric (NP) Confidence Interval

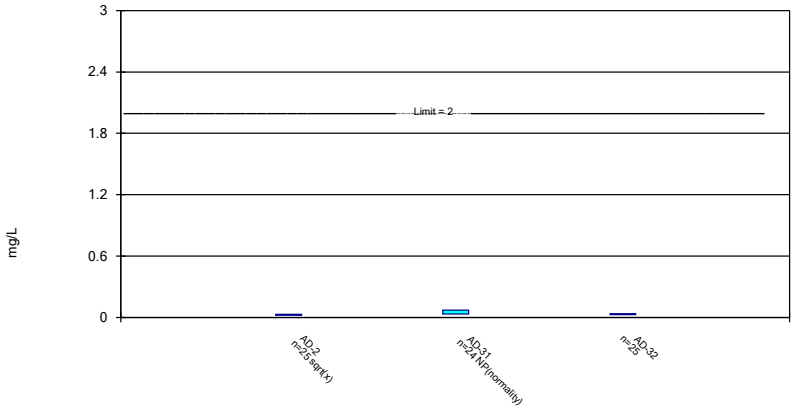
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Arsenic, total Analysis Run 10/10/2023 10:26 AM View: Confidence Intervals
Pirkey EBAP Data: Pirkey EBAP

Parametric and Non-Parametric (NP) Confidence Interval

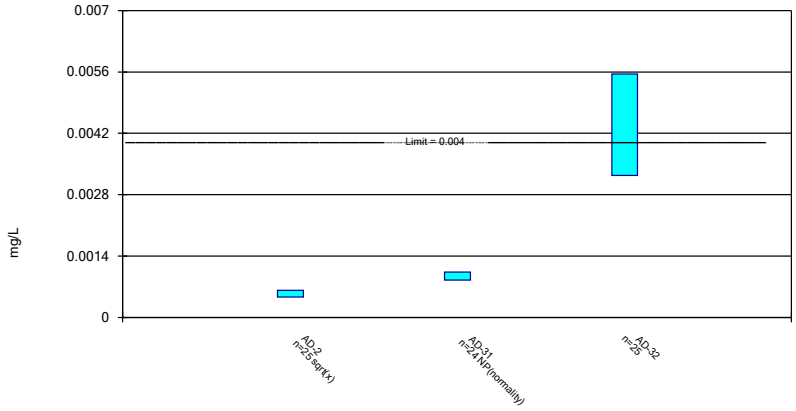
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Barium, total Analysis Run 10/10/2023 10:26 AM View: Confidence Intervals
Pirkey EBAP Data: Pirkey EBAP

Parametric and Non-Parametric (NP) Confidence Interval

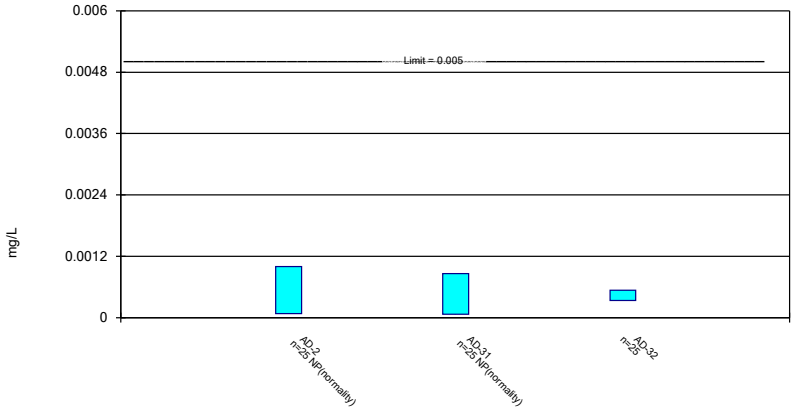
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Beryllium, total Analysis Run 10/10/2023 10:26 AM View: Confidence Intervals
Pirkey EBAP Data: Pirkey EBAP

Parametric and Non-Parametric (NP) Confidence Interval

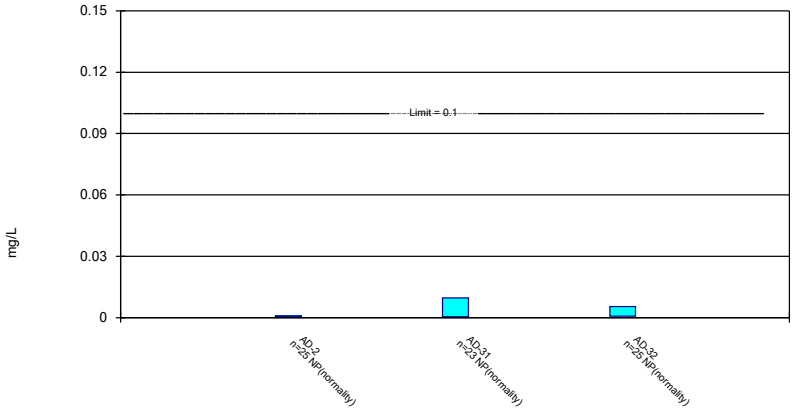
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Cadmium, total Analysis Run 10/10/2023 10:26 AM View: Confidence Intervals
Pirkey EBAP Data: Pirkey EBAP

Non-Parametric Confidence Interval

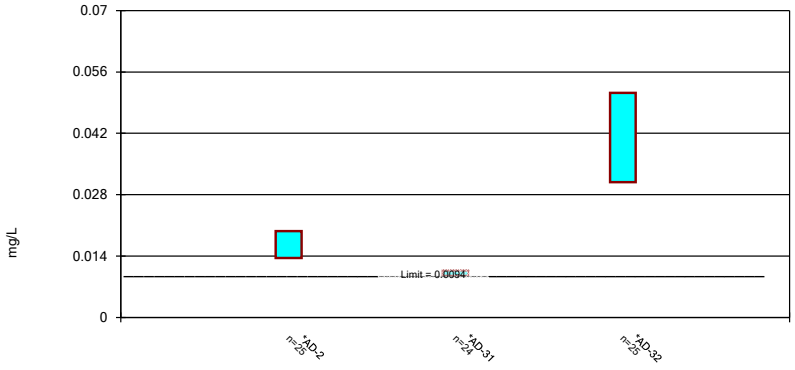
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Chromium, total Analysis Run 10/10/2023 10:26 AM View: Confidence Intervals
Pirkey EBAP Data: Pirkey EBAP

Parametric Confidence Interval

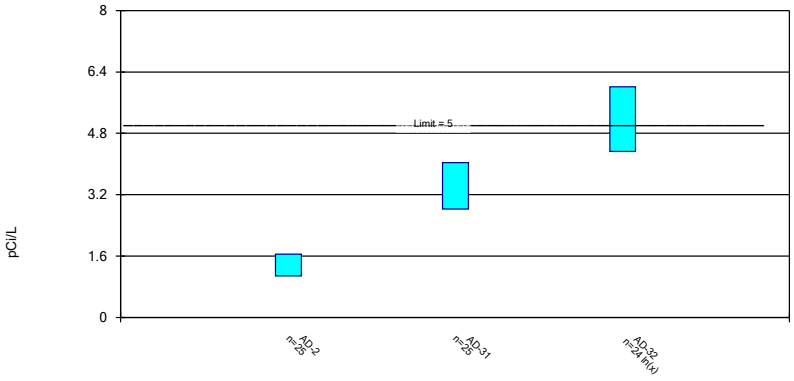
Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Cobalt, total Analysis Run 10/10/2023 10:26 AM View: Confidence Intervals
Pirkey EBAP Data: Pirkey EBAP

Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Combined Radium 226 + 228 Analysis Run 10/10/2023 10:26 AM View: Confidence Intervals
Pirkey EBAP Data: Pirkey EBAP

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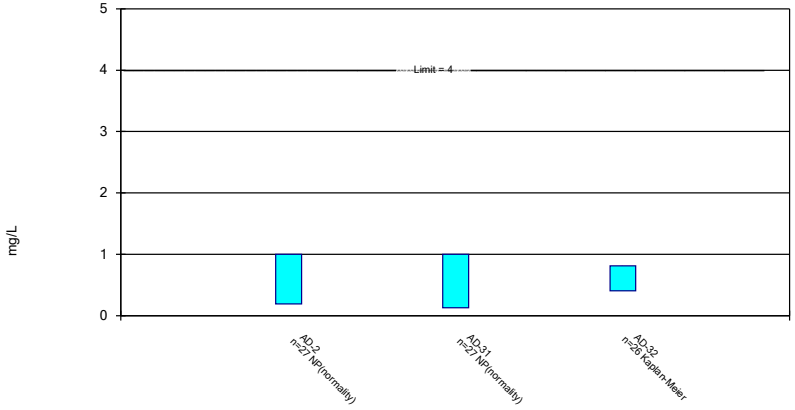
Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Fluoride, total Analysis Run 10/10/2023 10:26 AM View: Confidence Intervals
Pirkey EBAP Data: Pirkey EBAP

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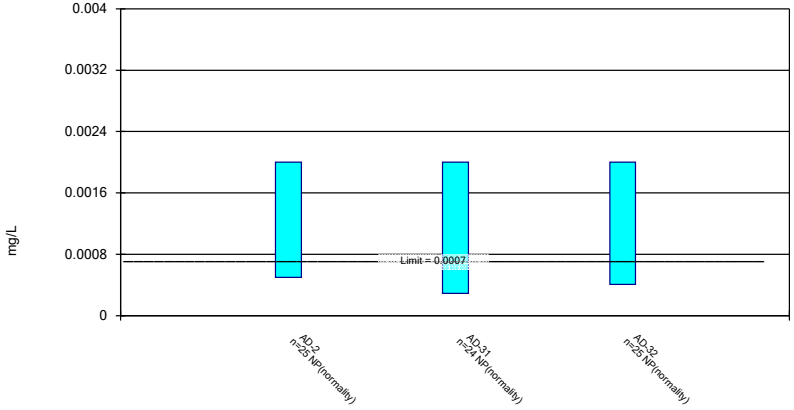
Non-Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Lead, total Analysis Run 10/10/2023 10:26 AM View: Confidence Intervals
Pirkey EBAP Data: Pirkey EBAP

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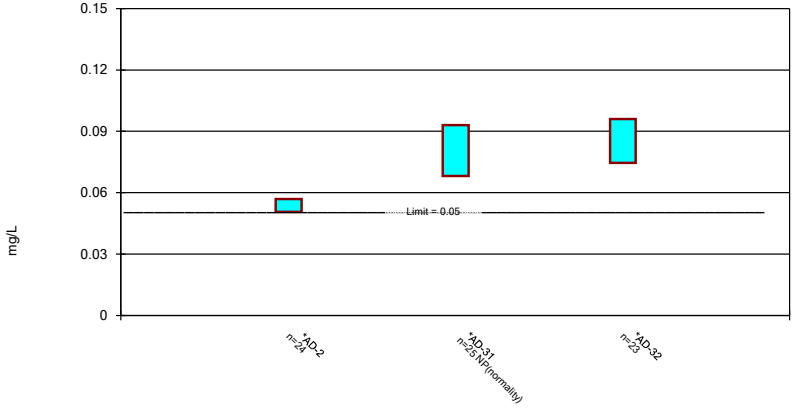
Parametric and Non-Parametric (NP) Confidence Interval

Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

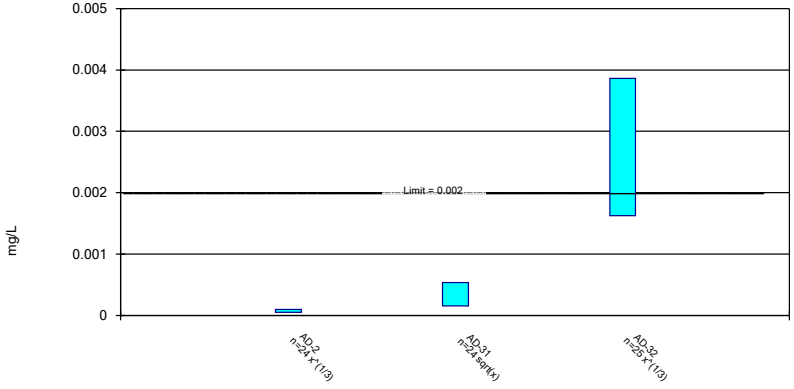


Constituent: Lithium, total Analysis Run 10/10/2023 10:26 AM View: Confidence Intervals
Pirkey EBAP Data: Pirkey EBAP

Sanitas™ v.10.0.12 Software licensed to . UG

Parametric Confidence Interval

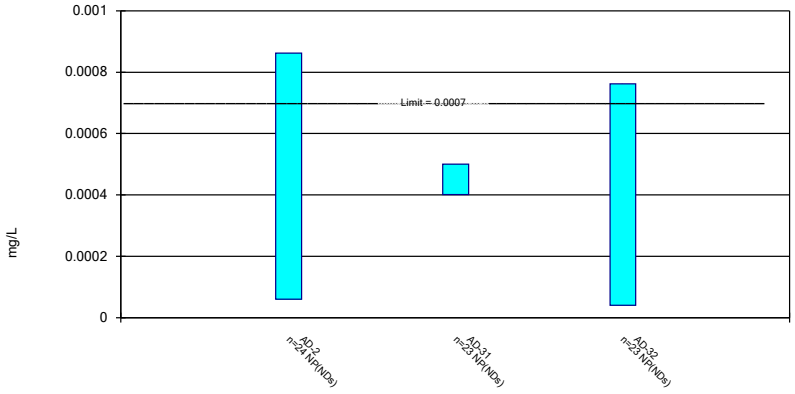
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Mercury, total Analysis Run 10/10/2023 10:26 AM View: Confidence Intervals
Pirkey EBAP Data: Pirkey EBAP

Non-Parametric Confidence Interval

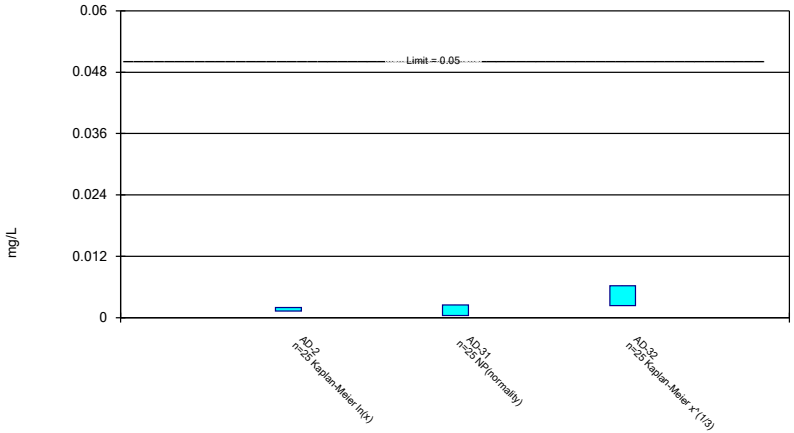
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Molybdenum, total Analysis Run 10/10/2023 10:26 AM View: Confidence Intervals
Pirkey EBAP Data: Pirkey EBAP

Parametric and Non-Parametric (NP) Confidence Interval

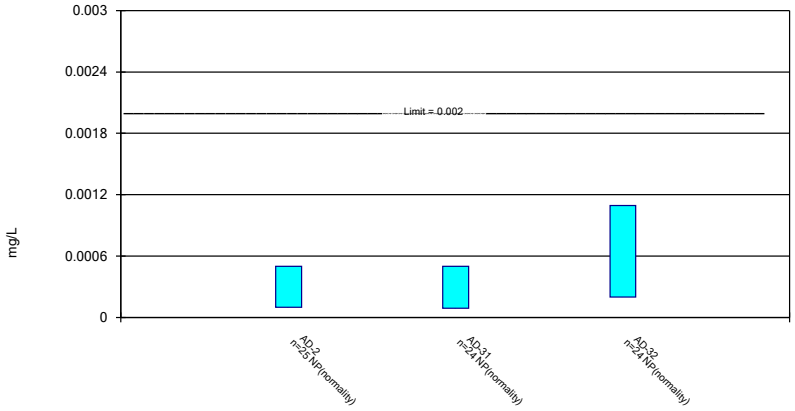
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Selenium, total Analysis Run 10/10/2023 10:26 AM View: Confidence Intervals
Pirkey EBAP Data: Pirkey EBAP

Non-Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Thallium, total Analysis Run 10/10/2023 10:26 AM View: Confidence Intervals
Pirkey EBAP Data: Pirkey EBAP

FIGURE G

Trend Tests

Appendix IV Trend Tests - Confidence Interval Exceedances - Significant Results

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP Printed 10/10/2023, 1:35 PM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Alpha	Method
Cobalt, total (mg/L)	**AD-12 (bg)**	**-0.00005311**	**-93**	**-85**	**Yes**	**25**	**0**	**n/a**	**0.05**	**NP**
Cobalt, total (mg/L)	**AD-18 (bg)**	**-0.000111**	**-214**	**-85**	**Yes**	**25**	**0**	**n/a**	**0.05**	**NP**
Cobalt, total (mg/L)	**AD-2**	**0.002304**	**245**	**85**	**Yes**	**25**	**0**	**n/a**	**0.05**	**NP**
Cobalt, total (mg/L)	**AD-32**	**-0.004719**	**-123**	**-85**	**Yes**	**25**	**0**	**n/a**	**0.05**	**NP**
Cobalt, total (mg/L)	**AD-4 (bg)**	**-0.0004597**	**-153**	**-85**	**Yes**	**25**	**0**	**n/a**	**0.05**	**NP**
Lithium, total (mg/L)	**AD-18 (bg)**	**-0.001068**	**-153**	**-85**	**Yes**	**25**	**0**	**n/a**	**0.05**	**NP**
Lithium, total (mg/L)	**AD-2**	**0.001276**	**95**	**81**	**Yes**	**24**	**0**	**n/a**	**0.05**	**NP**
Lithium, total (mg/L)	**AD-31**	**-0.002827**	**-124**	**-85**	**Yes**	**25**	**0**	**n/a**	**0.05**	**NP**
Lithium, total (mg/L)	**AD-32**	**-0.007217**	**-138**	**-76**	**Yes**	**23**	**0**	**n/a**	**0.05**	**NP**

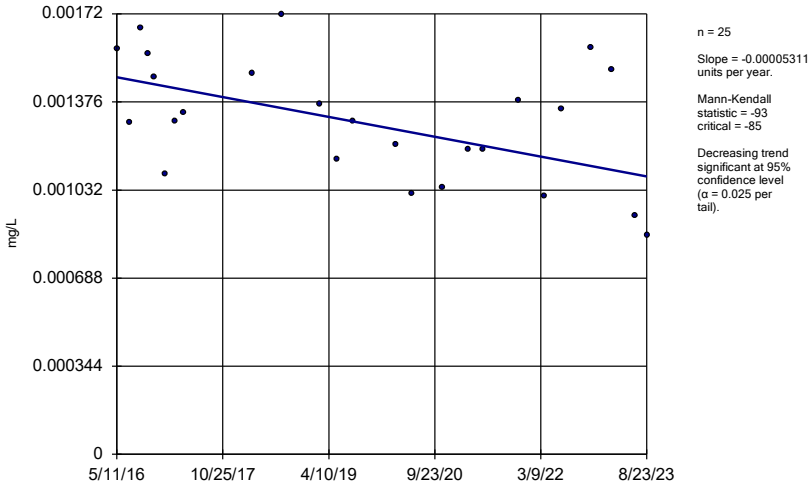
Appendix IV Trend Tests - Confidence Interval Exceedances - All Results

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP Printed 10/10/2023, 1:35 PM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Alpha	Method
Cobalt, total (mg/L)	**AD-12 (bg)**	**-0.00005311**	**-93**	**-85**	**Yes**	**25**	**0**	**n/a**	**0.05**	**NP**
Cobalt, total (mg/L)	**AD-18 (bg)**	**-0.000111**	**-214**	**-85**	**Yes**	**25**	**0**	**n/a**	**0.05**	**NP**
Cobalt, total (mg/L)	**AD-2**	**0.002304**	**245**	**85**	**Yes**	**25**	**0**	**n/a**	**0.05**	**NP**
Cobalt, total (mg/L)	AD-31	-0.0001795	-74	-81	No	24	0	n/a	0.05	NP
Cobalt, total (mg/L)	**AD-32**	**-0.004719**	**-123**	**-85**	**Yes**	**25**	**0**	**n/a**	**0.05**	**NP**
Cobalt, total (mg/L)	**AD-4 (bg)**	**-0.0004597**	**-153**	**-85**	**Yes**	**25**	**0**	**n/a**	**0.05**	**NP**
Lithium, total (mg/L)	AD-12 (bg)	-0.0004312	-74	-85	No	25	4	n/a	0.05	NP
Lithium, total (mg/L)	**AD-18 (bg)**	**-0.001068**	**-153**	**-85**	**Yes**	**25**	**0**	**n/a**	**0.05**	**NP**
Lithium, total (mg/L)	**AD-2**	**0.001276**	**95**	**81**	**Yes**	**24**	**0**	**n/a**	**0.05**	**NP**
Lithium, total (mg/L)	**AD-31**	**-0.002827**	**-124**	**-85**	**Yes**	**25**	**0**	**n/a**	**0.05**	**NP**
Lithium, total (mg/L)	**AD-32**	**-0.007217**	**-138**	**-76**	**Yes**	**23**	**0**	**n/a**	**0.05**	**NP**
Lithium, total (mg/L)	AD-4 (bg)	-0.001773	-80	-85	No	25	0	n/a	0.05	NP

Sen's Slope Estimator

AD-12 (bg)



n = 25

Slope = -0.00005311 units per year.

Mann-Kendall statistic = -93
critical = -85

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Cobalt, total Analysis Run 10/10/2023 10:33 AM View: Trend Tests
Pirkey EBAP Data: Pirkey EBAP

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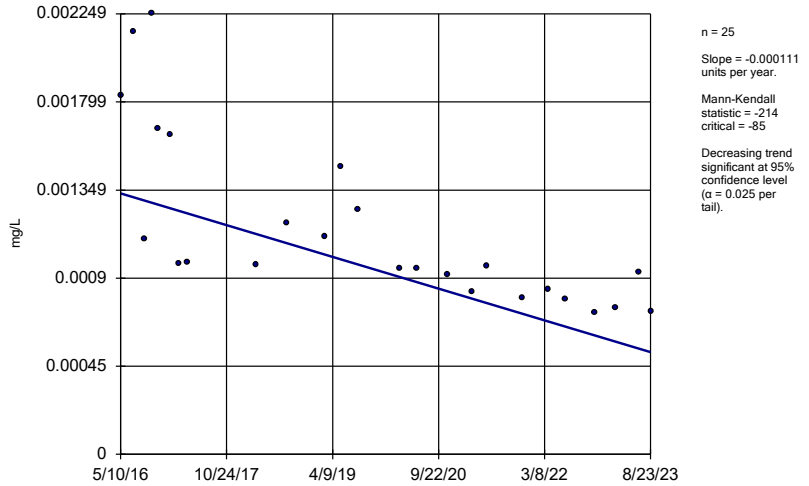
Sen's Slope Estimator

AD-18 (bg)



n = 25

Slope = -0.000111 units per year.

Mann-Kendall statistic = -214
critical = -85

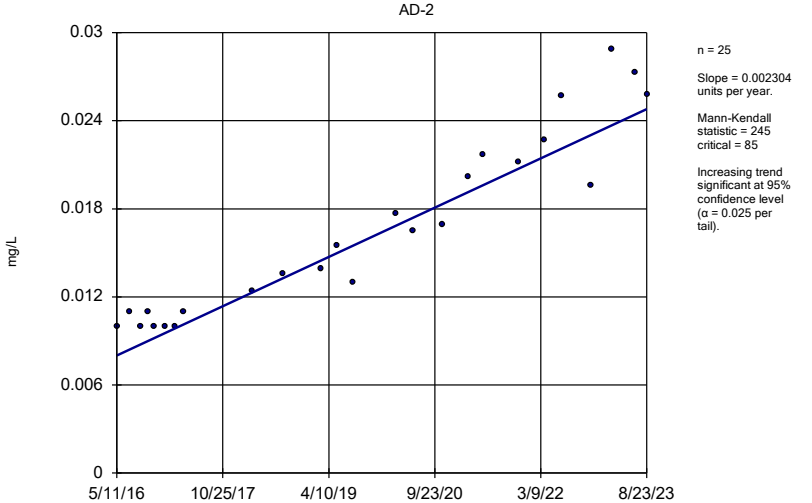
Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Cobalt, total Analysis Run 10/10/2023 10:33 AM View: Trend Tests
Pirkey EBAP Data: Pirkey EBAP

Sanitas™ v.10.0.12 Software licensed to . UG

Sen's Slope Estimator

AD-2



n = 25

Slope = 0.002304 units per year.

Mann-Kendall statistic = 245
critical = 85

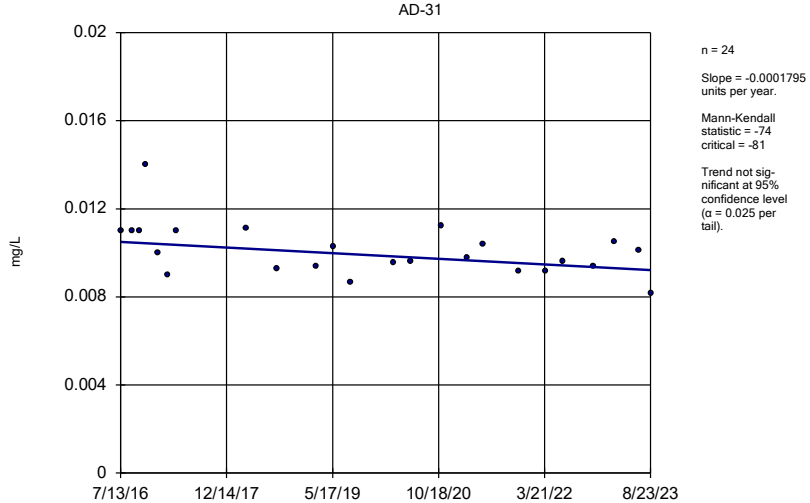
Increasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Cobalt, total Analysis Run 10/10/2023 10:33 AM View: Trend Tests
Pirkey EBAP Data: Pirkey EBAP

Sanitas™ v.10.0.12 Software licensed to . UG

Sen's Slope Estimator

AD-31



n = 24

Slope = -0.0001795 units per year.

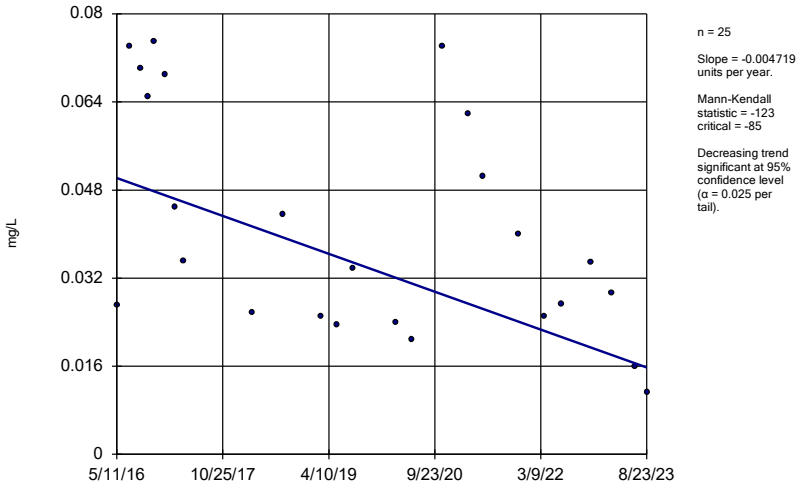
Mann-Kendall statistic = -74
critical = -81

Trend not significant at 95% confidence level (α = 0.025 per tail).

Constituent: Cobalt, total Analysis Run 10/10/2023 10:33 AM View: Trend Tests
Pirkey EBAP Data: Pirkey EBAP

Sen's Slope Estimator

AD-32



n = 25

Slope = -0.004719 units per year.

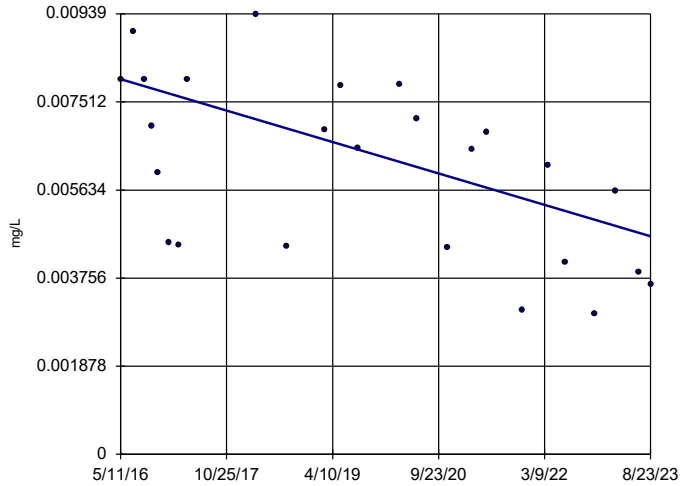
Mann-Kendall statistic = -123
critical = -85

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Cobalt, total Analysis Run 10/10/2023 10:33 AM View: Trend Tests
Pirkey EBAP Data: Pirkey EBAP

Sen's Slope Estimator

AD-4 (bg)



n = 25

Slope = -0.0004597 units per year.

Mann-Kendall statistic = -153
critical = -85

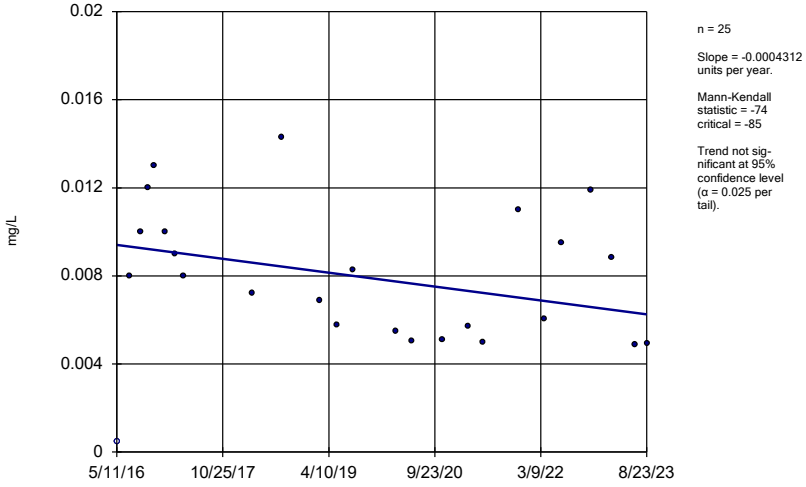
Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Cobalt, total Analysis Run 10/10/2023 10:33 AM View: Trend Tests
Pirkey EBAP Data: Pirkey EBAP

Hollow symbols indicate censored values.

Sen's Slope Estimator

AD-12 (bg)



n = 25

Slope = -0.0004312 units per year.

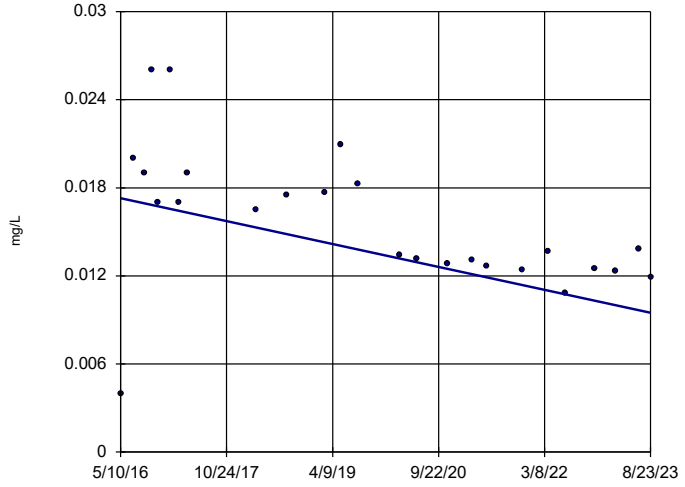
Mann-Kendall statistic = -74
critical = -85

Trend not significant at 95% confidence level (α = 0.025 per tail).

Constituent: Lithium, total Analysis Run 10/10/2023 10:33 AM View: Trend Tests
Pirkey EBAP Data: Pirkey EBAP

Sen's Slope Estimator

AD-18 (bg)



n = 25

Slope = -0.001068 units per year.

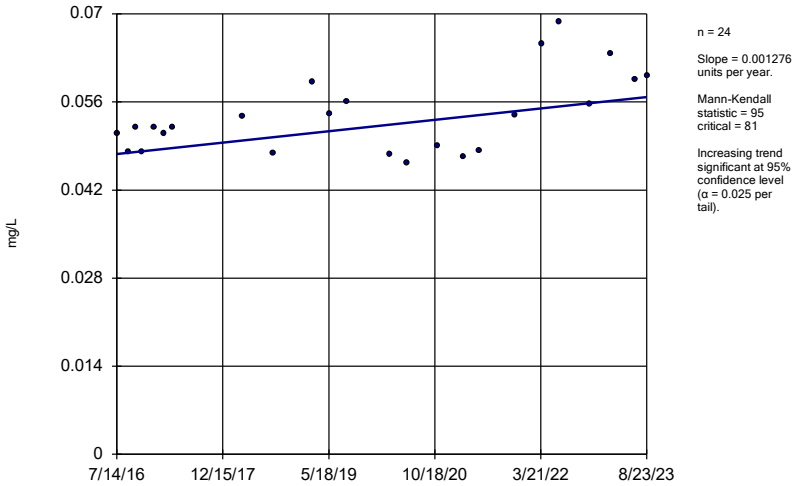
Mann-Kendall statistic = -153
critical = -85

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Lithium, total Analysis Run 10/10/2023 10:33 AM View: Trend Tests
Pirkey EBAP Data: Pirkey EBAP

Sen's Slope Estimator

AD-2



n = 24

Slope = 0.001276 units per year.

Mann-Kendall statistic = 95
critical = 81

Increasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Lithium, total Analysis Run 10/10/2023 10:33 AM View: Trend Tests
Pirkey EBAP Data: Pirkey EBAP

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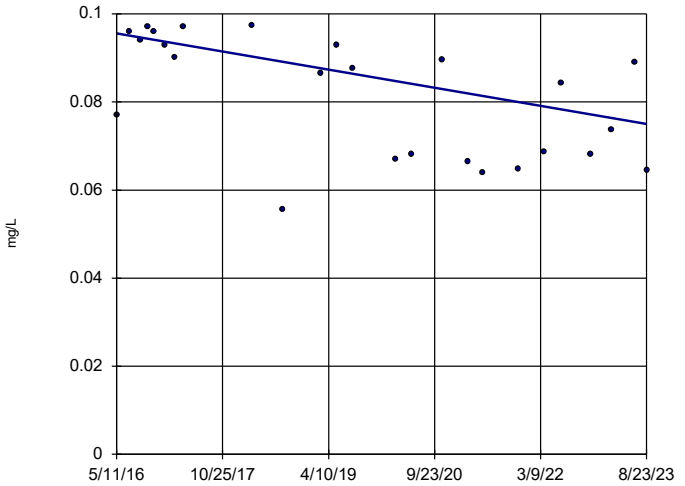
Sen's Slope Estimator

AD-31



n = 25

Slope = -0.002827 units per year.

Mann-Kendall statistic = -124
critical = -85

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Lithium, total Analysis Run 10/10/2023 10:33 AM View: Trend Tests
Pirkey EBAP Data: Pirkey EBAP

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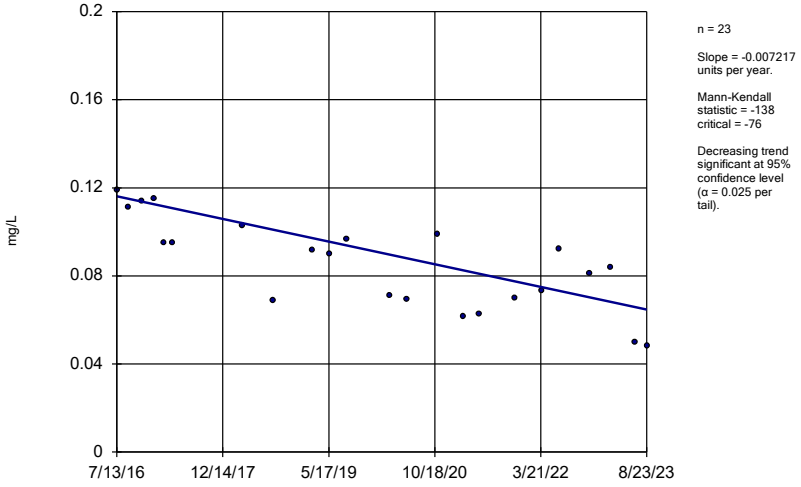
Sen's Slope Estimator

AD-32



n = 23

Slope = -0.007217 units per year.

Mann-Kendall statistic = -138
critical = -76

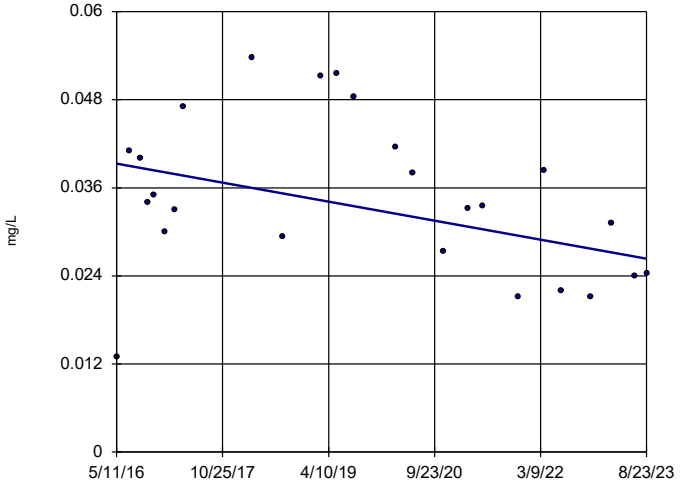
Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Lithium, total Analysis Run 10/10/2023 10:33 AM View: Trend Tests
Pirkey EBAP Data: Pirkey EBAP

Sanitas™ v.10.0.12 Software licensed to . UG

Sen's Slope Estimator

AD-4 (bg)



n = 25

Slope = -0.001773 units per year.

Mann-Kendall statistic = -80
critical = -85

Trend not significant at 95% confidence level (α = 0.025 per tail).

Constituent: Lithium, total Analysis Run 10/10/2023 10:33 AM View: Trend Tests
Pirkey EBAP Data: Pirkey EBAP

APPENDIX 3- Alternate Source Demonstrations

Alternate source demonstrations are included in this appendix. Alternate sources are sources or reasons that explain that statistically significant increases over background or statistically significant levels above the groundwater protection standard are not attributable to the CCR unit.

Geosyntec consultants

engineers | scientists | innovators

ALTERNATIVE SOURCE DEMONSTRATION REPORT

TEXAS STATE CCR RULE

H.W. Pirkey Power Plant

East Bottom Ash Pond

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 CHA8495

June 2023

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LIST OF ACRONYMS

Å	angstrom
ASD	alternative source demonstration
bgs	below ground surface
CCR	coal combustion residuals
EBAP	East Bottom Ash Pond
EDS	energy-dispersive spectroscopy
EPRI	Electric Power Research Institute
GWPS	groundwater protection standard
LCL	lower confidence limit
MCL	maximum contaminant level
mg/kg	milligram per kilogram
mg/L	milligram per liter
SEM	scanning electron microscopy
SPLP	Synthetic Precipitation Leaching Procedure
SSL	statistically significant level
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
USEPA	United States Environmental Protection Agency
VAP	vertical aquifer profiling
WBAP	West Bottom Ash Pond
XRD	X-ray diffraction

1. INTRODUCTION AND SUMMARY

This alternative source demonstration (ASD) report has been prepared to address statistically significant levels (SSLs) for cobalt and lithium in the groundwater monitoring network at the H.W. Pirkey Plant East Bottom Ash Pond (EBAP) in Hallsville, Texas, following the second semiannual assessment monitoring event of 2022. The H.W. Pirkey Plant has four coal combustion residuals (CCR) storage units, including the EBAP, regulated by the Texas Commission on Environmental Quality (TCEQ) under Registration No. CCR104 (**Figure 1**).

In November 2022, a semiannual assessment monitoring event was conducted at the EBAP in accordance with the Title 30, §352.951(a) of the Texas Administrative Code (TAC). The monitoring data were submitted to Groundwater Stats Consulting, LLC for statistical analysis. Groundwater protection standards (GWPSs) were established for each Appendix IV parameter in accordance with the statistical analysis plan developed for the unit (Geosyntec 2020a) and the United States Environmental Protection Agency (USEPA) document *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities: Unified Guidance* (USEPA 2009). The GWPS for each parameter was established as the greater of either the background concentration or the maximum contaminant level (MCL). To determine background concentrations, an upper tolerance limit was calculated using pooled data from the background wells collected during the background monitoring and assessment monitoring events.

Confidence intervals were recalculated for the Appendix IV parameters at the compliance wells to assess whether these parameters were present at SSLs above the GWPSs. 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 EBAP (Geosyntec 2023a):

- The LCLs for cobalt exceeded the GWPS of 0.00939 milligrams per liter (mg/L) at AD-2 (0.0125 mg/L), AD-31 (0.00952 mg/L), and AD-32 (0.0324 mg/L).
- The LCL for lithium exceeded the GWPS of 0.0519 mg/L at AD-31 (0.0681 mg/L) and AD-32 (0.0786 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 cobalt and lithium in the groundwater monitoring network for the EBAP are from a source other than the EBAP.

1.2 Demonstration of Alternative Sources

An evaluation was completed to assess possible alternative sources to which the identified SSLs 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 cobalt and lithium were based on a Type IV cause and not by a release from the Pirkey EBAP.

2. SUMMARY OF SITE CONDITIONS

The EBAP design and construction, regional geology and site hydrogeology, and groundwater monitoring system and flow conditions are described below.

2.1 EBAP Design and Construction

The EBAP is a 31.5-acre CCR surface impoundment located at the north end of the Pirkey Plant, immediately east of the West Bottom Ash Pond (WBAP) (**Figure 1**). It was constructed while the Pirkey Plant was being developed in 1983 and 1984 and placed into operation in 1985 to receive bottom ash and economizer ash sluiced from the plant boiler. Bottom ash and economizer ash are periodically excavated from the EBAP and either removed via truck to the on-site landfill or sold for off-site beneficial reuse.

The EBAP was developed by excavating part of its perimeter into native soils to create an embankment height of approximately 4 feet, constructing compacted clay perimeter embankments, and constructing a compacted clay liner over the base of the pond (Arcadis 2016). Multiple lithological borings advanced after the installation of the clay liner confirm that at least 6 feet of clay is present below the base of the EBAP (Arcadis 2016). The bottom elevation of the EBAP is approximately 347 feet above mean sea level, and the elevation of the top of the pond embankment is approximately 357 feet above mean sea level. The unit was designed to have a maximum storage capacity of 188 acre-feet.

2.2 Regional Geology / Site Hydrogeology

The EBAP is positioned on an outcrop of the Eocene-age 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. Regionally, 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 found beneath an upper silty to silty sandy clay layer in the vicinity of the EBAP is considered to be the Uppermost Aquifer below this CCR unit (Arcadis, 2016). Here it is approximately 15-feet thick and located between an elevation of 325 and 340 feet mean sea level.

2.3 Groundwater Monitoring History and Flow Conditions

The EBAP monitoring well network monitors groundwater within the Uppermost Aquifer.. Geologic cross section A-A' from the EBAP Groundwater Monitoring Well Network Report (Arcadis 2016), provided herein as **Attachment A,** shows the subsurface geometry of the Uppermost Aquifer (indicated on the figure as clayey silty sand, tan to gray) underlying the EBAP and the WBAP and demonstrates lateral continuity of the Uppermost Aquifer spanning the entire length of the EBAP.

Groundwater flow direction in the area of the EBAP is west-southwesterly (**Figure 1**). Seasonal variability in groundwater flow has not been observed since the monitoring well network was installed. Groundwater flow velocities in the uppermost aquifer in the vicinity of the Stackout Area have been reported as approximately 9 to 36 feet per year. The EBAP monitoring well network

consists of upgradient monitoring wells AD-4, AD-12, and AD-18 and compliance wells AD-2, AD-3, AD-31, and AD-32, all of which are screened within the Uppermost Aquifer.

3. ALTERNATIVE SOURCE DEMONSTRATION

The ASD evaluation method and proposed alternative source of cobalt or lithium in AD-2, AD-31, and AD-32 and the 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 cobalt and lithium due to Type I (sampling), Type II (laboratory), Type III (statistical evaluation), or Type V (anthropologic) 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 have been attributed to natural variation associated with the underlying geology, which is a Type IV (natural variation) issue.

3.1.1 Cobalt

Previous ASDs for cobalt at the EBAP provided evidence that cobalt is present in the aquifer geologic media at the site and that the observed cobalt concentrations in groundwater were due to natural variation of native geogenic sources (Geosyntec 2019a, Geosyntec 2019b, Geosyntec 2020b, Geosyntec 2020c, Geosyntec 2021, Geosyntec 2021b, Geosyntec 2022, Geosyntec 2023b). The previous ASDs demonstrated how the EBAP was not a source for cobalt in downgradient groundwater, based on observed concentrations of cobalt both in the ash material and in leachate from Synthetic Precipitation Leaching Procedure (SPLP) analysis (SW-846 Test Method 1312 [USEPA 1994]) of the ash material. Cobalt was not detected in the most recent SPLP ash leachate sample, collected in 2019, above the reporting limit of 0.01 mg/L, which is lower than the average concentrations observed at the wells of interest (**Table 1**). No changes to material handling or plant operations have occurred that would change the anticipated cobalt concentrations in the pond since this sample was collected.

In a June 2022 surface water sample collected from the EBAP to characterize the total cobalt concentrations, cobalt was detected at a concentration of 0.00128 mg/L (**Table 1**). This concentration is lower than the reported cobalt concentrations for multiple in-network wells from the November 2022 sampling event, including the upgradient monitoring wells AD-4 (0.00300 mg/L; **Figure 2**) and AD-12 (0.00159 mg/L; **Figure 2**). The EBAP sample was also found to be approximately an order of magnitude lower than the average concentration in groundwater at the wells of interest (**Table 1**). Therefore, the EBAP is not the likely source of cobalt at AD-2, AD-31, or AD-32.

As noted in the previous ASDs, soil samples collected across the site, including from locations near the EBAP, identified cobalt in the aquifer solids at concentrations ranging from 0.59–23.5 milligrams per kilogram (mg/kg), with the highest value reported at AD-41, which is upgradient of the EBAP (**Figure 3**). SB-2 was advanced in the vicinity of AD-2 in April 2020 to re-log the geology at AD-2 and collect samples for laboratory analysis of total metals and mineralogy. The SB-2 field boring log, which was generated by Auckland Consulting LLC, is provided as **Attachment B**. Cobalt was detected at SB-2 at concentrations of 9.45 mg/kg at 25–27 feet below ground surface (bgs) and 19.2 mg/kg at 31–33 feet bgs (**Table 2**). These cobalt concentrations are greater than the concentration of cobalt present in the bottom ash (6.1 mg/kg; **Table 1**). Both

samples correlate to the depth of the monitoring well screen of AD-2 (20–40 feet bgs), indicating that naturally occurring cobalt is present in aquifer solids within the AD-2 screened interval.

In addition to the analysis of total cobalt, soil samples were submitted for mineralogical analysis to determine the mineral composition of soils near the EBAP. X-ray diffraction (XRD) analysis of soils from SB-2 identified pyrite (an iron sulfide) in samples collected at 25–27 feet bgs and 31–33 feet bgs at concentrations up to 7% by weight (**Figure 3**). Cobalt is known to undergo isomorphic substitution for iron in crystalline iron minerals such as pyrite due to their similar ionic radii of approximately 1.56 angstroms (Å) for iron and 1.52 Å for cobalt (Clementi and Raimondi 1963, Krupka and Serne 2002, Hitzman et al. 2017). The presence of iron-bearing minerals in soil near the EBAP constitutes a potential source of naturally occurring cobalt.

The aquifer solids at SB-2 are distinctly red in color at shallow depths, as illustrated in the photolog of soil cores provided in **Attachment C**. While shallow samples were not collected for mineralogical analysis, red color in soils is often associated with the presence of oxidized iron-bearing minerals such as hematite and goethite. The red color of the soil suggests the presence of iron oxide and hydroxide minerals within the shallow depth interval. The alteration of pyrite to these iron oxide and hydroxide minerals under oxidizing conditions is also a well-understood phenomenon, including in formations in East Texas (Senkayi et al. 1986, Dixon et al. 1982). It is likely that the pyrite weathering process is resulting in the release of isomorphically substituted cobalt from the pyrite crystal structure as it undergoes oxidative transformation to iron oxide/hydroxide minerals.

As described in the previous ASDs, vertical aquifer profiling (VAP) was used to collect groundwater samples from upgradient locations B-2 and B-3 during the soil boring and sample collection process (Geosyntec 2019b). A groundwater sample was also collected from AD-32, one of the existing compliance wells within the EBAP groundwater monitoring network where a cobalt SSL was identified. Solid-phase materials within these groundwater samples were separated and submitted for analysis of chemical composition. For the VAP samples, because of the high abundance of suspended solids, separation was completed using a centrifuge. For the groundwater sample at AD-32, the sample was filtered using a 1.5-micron filter. Based on total metals analysis, cobalt was identified both in the centrifuged solid material collected from upgradient VAP location B-3 (VAP-B3-[40-45]) and in the material retained on the filter after processing groundwater from permanent monitoring wells B-2 and B-3 (**Table 2**). The concentrations of cobalt in the solid material retained after filtration were comparable to concentrations in the bulk soil samples collected from the same locations.

The solid sample VAP-B3-(40-45) was submitted for mineralogical analysis via XRD and scanning electron microscopy (SEM) using an energy-dispersive spectroscopy (EDS) analyzer. The XRD results identified pyrite as approximately 3% of the solid phase (**Table 3**). Pyrite was identified during SEM/EDS analysis of lignite, which is mined immediately adjacent to the site. Logging completed while the VAP boring was advanced identified coal at several intervals, including 45 and 48 feet bgs (**Figure 4**). Furthermore, SEM/EDS of both centrifuged solid samples VAP-B3-(40-45) and VAP-B3-(50-55) identified pyrite in backscattered electron micrographs by the distinctive framboidal morphology (Harris et al. 1981, Sawlowicz 2000). Major peaks representing iron and sulfur were identified in the EDS spectrum, which further support the identification of pyrite (**Attachment D**). While cobalt was not identified in the EDS spectrum, it is likely present at concentrations below the detection limit.

The EBAP was not identified as the source of cobalt at wells in the EBAP network based on the low concentrations of cobalt in the pond itself and the ubiquity of naturally occurring cobalt, especially in soil and groundwater samples upgradient from the EBAP. Cobalt in the EBAP network groundwater is believed to be a result of natural variability within the aquifer. Naturally occurring cobalt is known to substitute for iron in iron-bearing minerals. The presence of iron sulfide (as pyrite) and iron oxides/hydroxides hematite and goethite has been confirmed at AD-2 and across the site. The weathering of pyritic minerals to iron oxide/hydroxide minerals may be resulting in the release of cobalt into groundwater from the crystal structure of these aquifer minerals.

3.1.2 Lithium

Previous ASDs for lithium at the EBAP attributed the observed lithium exceedances to variations in lithium associated with the suspended native aquifer solids that likely originate from naturally occurring lignite present in these soils. These native lithium-containing aquifer solids are ubiquitous in the aquifer based on the presence of both solid-phase and dissolved lithium at upgradient locations (Geosyntec 2019b, Geosyntec 2020b, Geosyntec 2020c, Geosyntec 2021a, Geosyntec 2021b, Geosyntec 2022, Geosyntec 2023b). Data gathered in support of the prior ASDs and recent results provide additional evidence that the observed lithium groundwater concentrations at AD-31 and AD-32 are naturally occurring and are due to natural variation in the aquifer (Type IV ASD).

As discussed in Section 3.1.1, a surface water sample was collected directly from the EBAP in June 2022. Lithium was detected in the June 2022 EBAP sample at a concentration of 0.0463 mg/L (**Figure 5, Table 4**). The labile fraction identified in the bottom ash by SPLP from a February 2019 sample was even lower, with an estimated (J-flagged) lithium concentration of 0.011 mg/L. These concentrations are below the average lithium concentrations at AD-31 (0.0818 mg/L) and AD-32 (0.125 mg/L) (**Table 4**). Therefore, the EBAP is not the likely source of lithium at AD-31 and AD-32.

Groundwater samples collected from upgradient wells B-2 and B-3 in November 2022 had total lithium concentrations of 0.0545 mg/L and 0.0814 mg/L, respectively. The reported concentration at B-3 is greater than the GWPS of 0.0590 mg/L and the concentrations of lithium observed at AD-31 and AD-32 (**Figure 5**). Because B-2 and B-3 were installed at locations upgradient to and unimpacted by site activities, these lithium concentrations suggest that dissolved lithium is naturally present at concentrations above the GWPS across the site at variable concentrations and not limited to AD-31 and AD-32. It is noted that B-2 and B-3 are not part of the monitoring network for the EBAP, and as such the lithium concentrations in groundwater from these wells are not considered in calculating the GWPS for the CCR unit.

As described in Section 3.1.1, groundwater samples were collected from B-2, B-3, and AD-32 and filtered to separate solids. Groundwater was also collected from a VAP boring (VAP-B3-[40-45]) and centrifuged to separate solids. Lithium was detected in the solid material separated from these groundwater samples at concentrations comparable to bulk soil at all locations, providing evidence that the particulates captured during groundwater sampling contain lithium (**Table 5**).

3.1.2.1 Calculated Partition Coefficients

A previous ASD for lithium at the EBAP discussed lithium mobility in groundwater due to desorption from cation exchange complexes associated with clay minerals within naturally

occurring lignite material. This mechanism was posited as the source of lithium in both upgradient and downgradient wells at the EBAP (Geosyntec 2019b). Previously completed XRD analysis of centrifuged solid material samples (VAP-B3-[40-45]) found that clay minerals, including kaolinite, smectite, and illite/mica, made up at least 60% of the aquifer solid (**Table 3**). SEM/EDS analysis also identified the presence of silicon, aluminum, and oxygen, all of which are components of clay minerals (**Attachment D**). The backscattered electron micrographs of these samples also identified clay particles by morphology. The largest clay particles (greater than 5 micrometers) are likely kaolinite, while smectite and illite dominate the smaller fraction. These clay minerals, particularly smectite and illite, are known to retain cations such as lithium via incorporation into the octahedral layer of the mineral structure and through cation exchange processes.

Partition coefficients values (K_d) for lithium, potassium, and sodium were calculated using mass measurements and total metal concentrations in the solid materials separated from the groundwater samples during filtration and the filtered groundwater concentrations. Details about the K_d calculation are provided in the previous ASD (Geosyntec 2019b). K_d values for groundwater and particulates collected from wells B-2, B-3, and AD-32 were comparable to literature K_d values reported for organic-rich media such as bogs and peat beds (Sheppard et al. 2009, Sheppard et al. 2011), providing further evidence that lithium mobility in site groundwater is similar to other sites with organic-rich soils (**Table 6**). Additionally, the calculated K_d values for Pirkey soils were consistent with the literature, with potassium having the highest K_d (greatest affinity for sorption) and sodium the lowest K_d (least affinity for sorption). Furthermore, the values are similar for groundwater from all three wells, suggesting a universal mechanism controlling lithium, sodium, and potassium mobility in groundwater.

These multiple lines of evidence show that elevated lithium concentrations at AD-31 and AD-32 are likely not due to a release from the EBAP but can instead be attributed to natural variation (Type IV ASD). This variation appears related to the distribution of clay fractions associated with lignite materials in the soil aquifer material.

3.2 Sampling Requirements

As the ASD presented above supports the position that the identified SSLs are not due to a release from the Pirkey EBAP, 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 for cobalt and lithium identified during assessment monitoring in November 2022 were not due to a release from the EBAP. The identified SSLs should instead be attributed to natural variation in the underlying geology. Therefore, no further action is warranted, and the Pirkey EBAP will remain in the assessment monitoring program. Certification of this ASD by a qualified professional engineer is provided in **Attachment E.**

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TABLES

Table 1. Summary of Key Cobalt Analytical Data
Alternative Source Demonstration Report: Texas State CCR Rule
East Bottom Ash Pond, H.W. Pirkey Plant

Sample	Sample Date	Unit	Cobalt Concentration
Bottom Ash (Solid Material)	2/11/2019	mg/kg	6.1
SPLP Leachate of Bottom Ash	2/11/2019	mg/L	<0.01
EBAP Pond Water	6/24/2022	mg/L	0.00128
AD-2 - Average	May 2016—November 2022	mg/L	0.0152
AD-31 - Average	May 2016—November 2022	mg/L	0.0120
AD-32 - Average	May 2016—November 2022	mg/L	0.0439

Notes:
1. Average values were calculated using all cobalt data collected under 40 CFR 257 Subpart D, excluding any identified outliers.
CCR: coal combustion residuals
EBAP: East Bottom Ash Pond
mg/kg: milligram per kilogram
mg/L: milligram per liter
SPLP: Synthetic Precipitation Leaching Procedure

Table 2. Soil Cobalt Data
Alternative Source Demonstration Report
East Bottom Ash Pond, H.W. Pirkey Plant

Location ID	Location	Sample Depth (ft bgs)	Cobalt (mg/kg)
Bulk Soil Samples			
AD-2	EBAP Network	25–27	9.45
		31–33	19.2
AD-18	EBAP Network	8	3.60
		22	2.90
AD-31	EBAP Network	12	1.90
		26	0.83
AD-32	EBAP Network	11	1.70
		20–25	9.10
AD-41	Upgradient	15	< 1.0
		35	23.5
		95	1.90
B-2	Upgradient	10	2.36
		16	3.62
		71	10.30
		82	7.21
		87	3.11
B-3	Upgradient	10	1.30
		20	0.59
		97	1.11
Solid Material Retained After Filtration			
AD-32	EBAP Network	13–33	5.4
B-2	Upgradient	38–48	4.3
B-3	Upgradient	29–34	12.0
		VAP 40–45	18.0

Notes:

1. For AD-XX locations, samples were collected from additional boreholes advanced in the immediate area of the location identified by the well ID. Samples were not collected from the cuttings of the borings advanced for well installation. Samples for B-2 and B-3 locations were collected from cores removed from the borehole during well lithology logging.

2. Depths for samples collected after filtration represent the screened interval for the permanent well where the sample was collected.

EBAP: East Bottom Ash Pond
ft bgs: feet below ground surface
mg/kg: milligram per kilogram

Table 3. X-Ray Diffraction Results
Alternative Source Demonstration Report
East Bottom Ash Pond, H.W. Pirkey Plant

Constituent	VAP-B3-(40-45)
Quartz	15
Plagioclase Feldspar	0.5
Orthoclase	ND
Calcite	ND
Dolomite	ND
Siderite	0.5
Goethite	ND
Hematite	2
Pyrite	3
Kaolinte	42
Chlorite	4
Illite/Mica	6
Smectite	12
Amorphous	15

Notes:
1. Results given in units of relative % abundance.
2. VAP-B3-(40-45) is the centrifuged solid material from the groundwater sample collected at that interval.
ND: Not detected

Table 4. Summary of Key Lithium Analytical Data
Alternative Source Demonstration Report: Texas State CCR Rule
East Bottom Ash Pond, H.W. Pirkey Plant

Sample	Sample Date	Unit	Lithium Concentration
Bottom Ash (Solid Material)	2/11/2019	mg/kg	0.82 J
SPLP Leachate of Bottom Ash	2/11/2019	mg/L	0.011 J
EBAP Pond Water	6/24/2022	mg/L	0.0463
AD-31 - Average	May 2016–November 2022	mg/L	0.0818
AD-32 - Average	May 2016–November 2022	mg/L	0.0863

Notes:
1. Average lithium values for monitoring wells AD-31 and AD-32 were calculated using all lithium data collected under 40 CFR 257 Subpart D, excluding statistically identified outliers.
CCR: coal combustion residuals
EBAP: East Bottom Ash Pond
J: Estimated value. Result is less than the reporting limit but greater than or equal to the method detection limit.
mg/kg: milligram per kilogram
mg/L: milligram per liter
SPLP: Synthetic Precipitation Leaching Procedure

Table 5. Soil Lithium Data
Alternative Source Demonstration Report
East Bottom Ash Pond, H.W. Pirkey Plant

Location ID	Sample Depth (ft bgs)	Lithium (mg/kg)
Bulk Soil Sample		
AD-32*	11	0.53
	20–25	1.60
B-2	10	5.30
	16	3.97
	71	7.42
	87	13.10
B-3	10	3.64
	20	2.59
	97	11.10
Lignite	N/A	2.9 J
Solid Material Retained After Filtration		
AD-32*	13–33	9.8 J
B-2	38–48	6.5 J
B-3	29–34	7.8 J
	VAP 40–45	13.0

Notes:

1. Depths for samples collected after filtration represent the screened interval for the permanent well where the sample was collected.

*: AD-32 samples were collected from a seperate borehole advanced near monitoring well AD-32

ft bgs: feet below ground surface

J: estimated value

mg/kg: milligram per kilogram

VAP: vertical aquifer profiling

Table 6. Calculated Site-Specific Partition Coefficients
Alternative Source Demonstration Report
East Bottom Ash Pond, H.W. Pirkey Plant

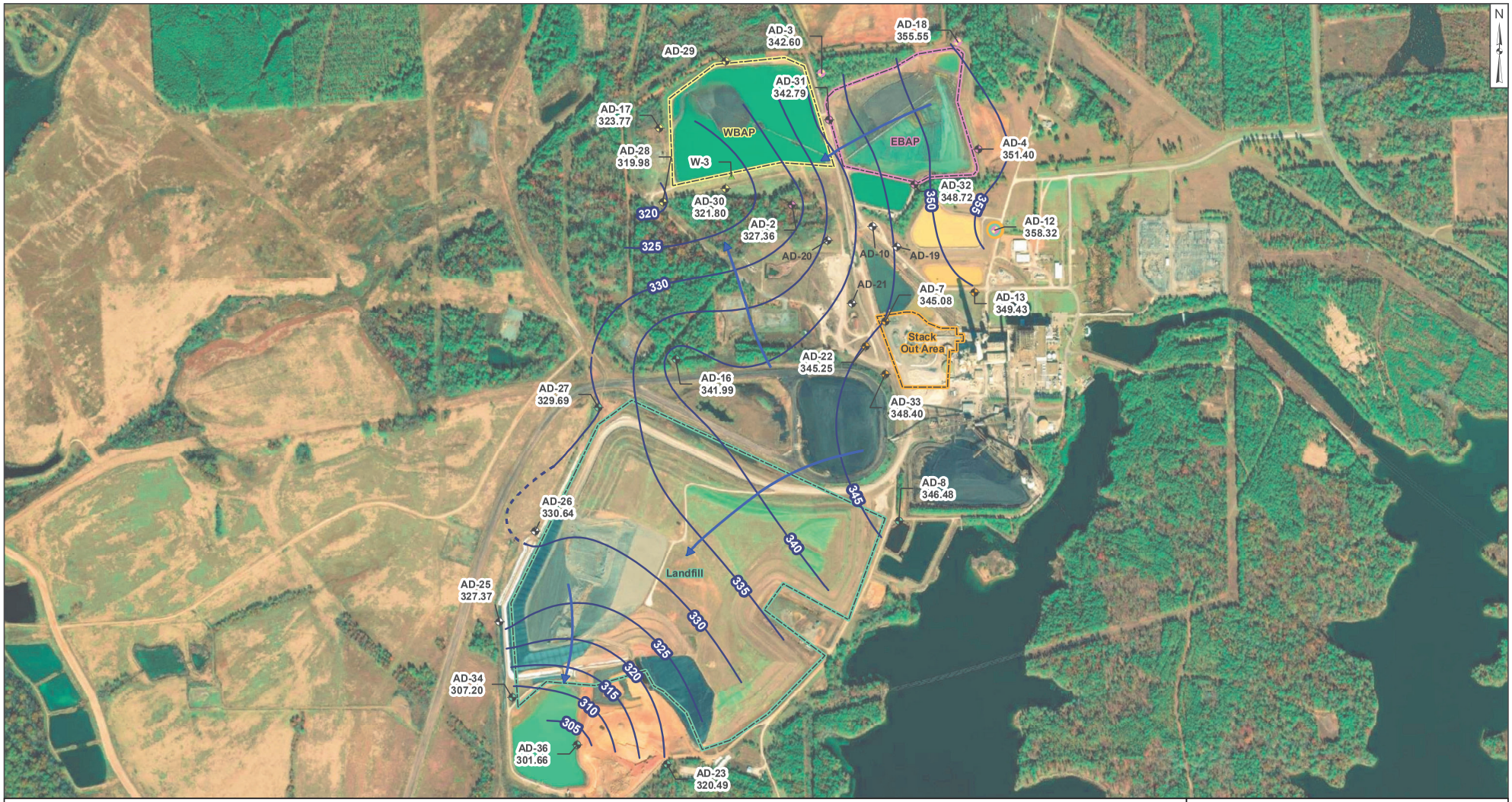
Source	B-2			Literature Value
Unit	mg/L	mg/kg	L/kg	L/kg
Element	**Aqueous Phase**	**Adsorbed**	**Kd**	**Kd**
Li	0.081	6.5	80	43–370
K	2.6	1100	423	42–1200
Na	14	130	9	5.2–82

Source	B-3			Literature Value
Unit	mg/L	mg/kg	L/kg	L/kg
Element	**Aqueous Phase**	**Adsorbed**	**Kd**	**Kd**
Li	0.097	7.8	80	43–370
K	2.9	1100	379	42–1200
Na	32	240	8	5.2–82

Source	AD-32*			Literature Value
Unit	mg/L	mg/kg	L/kg	L/kg
Element	**Aqueous Phase**	**Adsorbed**	**Kd**	**Kd**
Li	0.11	9.8	89	43–370
K	3.9	1800	462	42–1200
Na	57	220	4	5.2–82

Notes:
1. Adsorbed values are total metals concentrations reported by USEPA Method 6010B.
2. Literature values represent maximum and minimum values for the parameter as reported in Sheppard et al. (2009) (Table 4-1, all sites) and Sheppard et al. (2011) (Table 3-3 cultivated peat and wetland peat only).
*: AD-32 samples were collected from a separate borehole advanced near monitoring well AD-32
Kd: partition coefficient
L/kg: liters per kilogram
mg/kg: milligrams per kilogram
mg/L: milligrams per liter
USEPA: United States Environmental Protection Agency

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

- Monitoring well coordinates and water level data (collected on November 15 - 17, 2021) provided by AEP.
- Site features based on information available in CCR Groundwater Monitoring Well Network Evaluation (Arcadis, 2016) provided by AEP.
- Groundwater elevation units are feet above mean sea level.
- East and West Bottom Ash Ponds have compacted cohesive soil from elevation 344 to 347 ft. msl (Sargent and Lundy, 1984; AMEC, 2011).
- Clearwater pond base elevation is 344 ft. msl (Sargent and Lundy, 1983).
- AD-10, AD-19, AD-20, AD-21, AD-29, AD-35, and W-3 were not gauged during the May 2021 event.

1,000 500 0 1,000 Feet

STATE OF TEXAS
BETH ANN GROSS
79864
LICENSED
PROFESSIONAL ENGINEER

Beth Ann Gross

Jan 14, 2022

Geosyntec Consultants, Inc.
Texas Firm
Registration No. 1182

Potentiometric Contours - Uppermost Aquifer
November 2021

AEP Pirkey Power Plant
Hallsville, Texas

Geosyntec consultants

Columbus, Ohio | 01/13/2022

Figure 1

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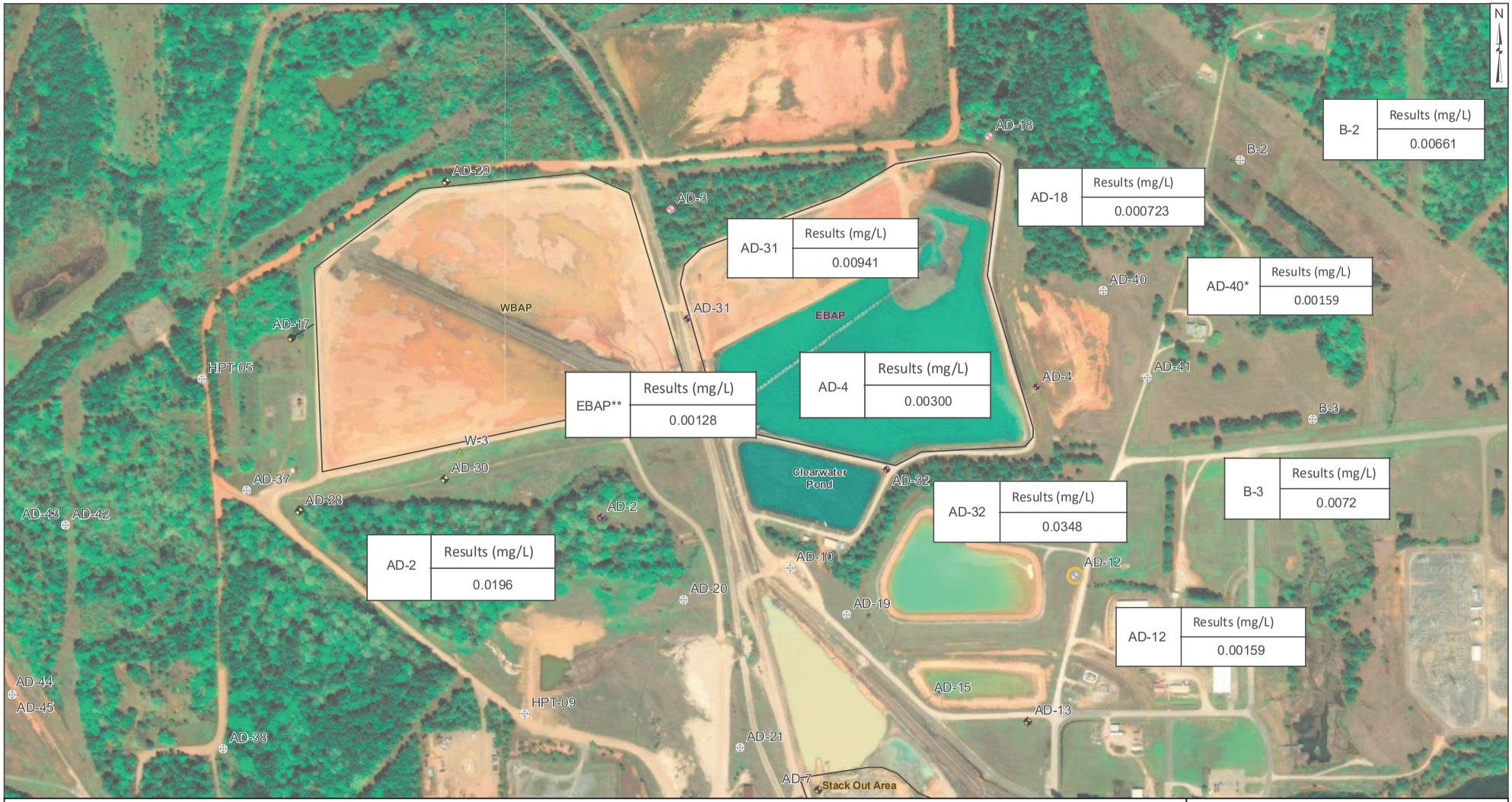

Legend

- Out of Network
- EBAP
- WBAP
- Landfill
- Stackout Area
- EBAP and WBAP
- All CCR Unit Networks
- Piezometer
- EBAP
- Stack Out Area
- WBAP

Notes

1. Monitoring well coordinates, site features, and data provided by AEP.
2. AD-15 location is approximated
3. Samples collected in November 2022

*: Well most recently sampled August 2019
**: Well most recently sampled June 2022
AEP: American Electric Power
CCR: coal combustion residuals
EBAP: East Bottom Ash Pond
mg/L: milligrams per liter
WBAP: West Bottom Ash Pond

200 100 0 200 400 600 Feet

Aqueous Cobalt Distribution

AEP Pirkey Power Plant
Hallsville, Texas

Geosyntec consultants

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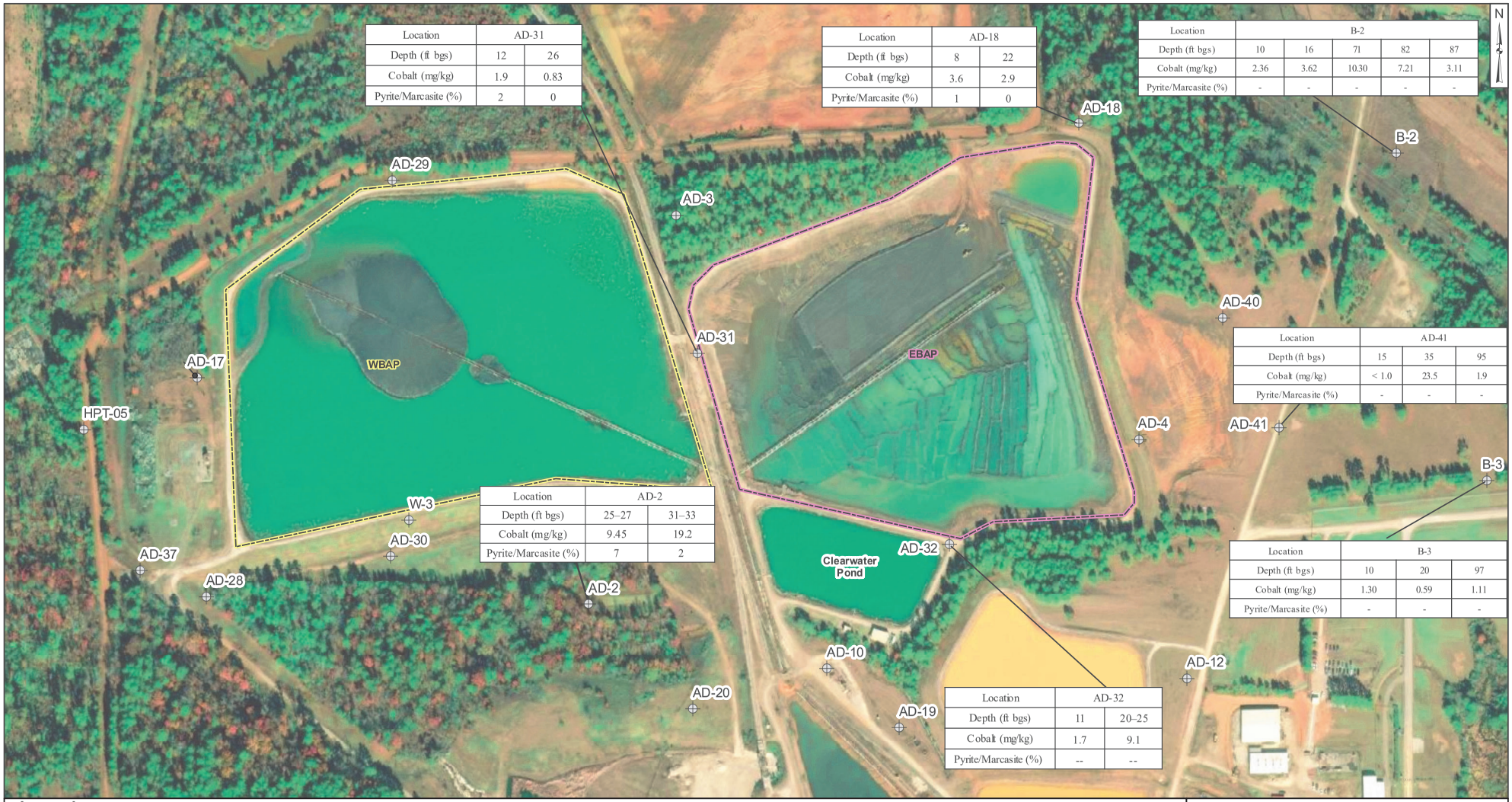
Figure 2

Q:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Pirkey\2022\Pirkey_11-2022\Pirkey_11-2022.aprx. Jennifer.Souza. . Project/Phase/Task.



Location	AD-31	
Depth (ft bgs)	12	26
Cobalt (mg/kg)	1.9	0.83
Pyrite/Marcasite (%)	2	0

Location	AD-18	
Depth (ft bgs)	8	22
Cobalt (mg/kg)	3.6	2.9
Pyrite/Marcasite (%)	1	0

Location	B-2				
Depth (ft bgs)	10	16	71	82	87
Cobalt (mg/kg)	2.36	3.62	10.30	7.21	3.11
Pyrite/Marcasite (%)	-	-	-	-	-

Location	AD-41		
Depth (ft bgs)	15	35	95
Cobalt (mg/kg)	< 1.0	23.5	1.9
Pyrite/Marcasite (%)	-	-	-

Location	AD-2	
Depth (ft bgs)	25–27	31–33
Cobalt (mg/kg)	9.45	19.2
Pyrite/Marcasite (%)	7	2

Location	B-3		
Depth (ft bgs)	10	20	97
Cobalt (mg/kg)	1.30	0.59	1.11
Pyrite/Marcasite (%)	-	-	-

Location	AD-32	
Depth (ft bgs)	11	20–25
Cobalt (mg/kg)	1.7	9.1
Pyrite/Marcasite (%)	--	--

Legend

- Monitoring Wells
- EBAP
- WBAP

Notes

1. Monitoring well coordinates provided by AEP.
2. AD-2 sample collected on April 20, 2020
3. All other data provided by AEP, 2019.

--: not analyzed.
AEP: American Electric Power
EBAP: East Bottom Ash Pond
ft bgs: feet below ground surface.
mg/kg: milligrams per kilogram.
WBAP: West Bottom Ash Pond

300 150 0 300 Feet

Cobalt Distribution in Soil

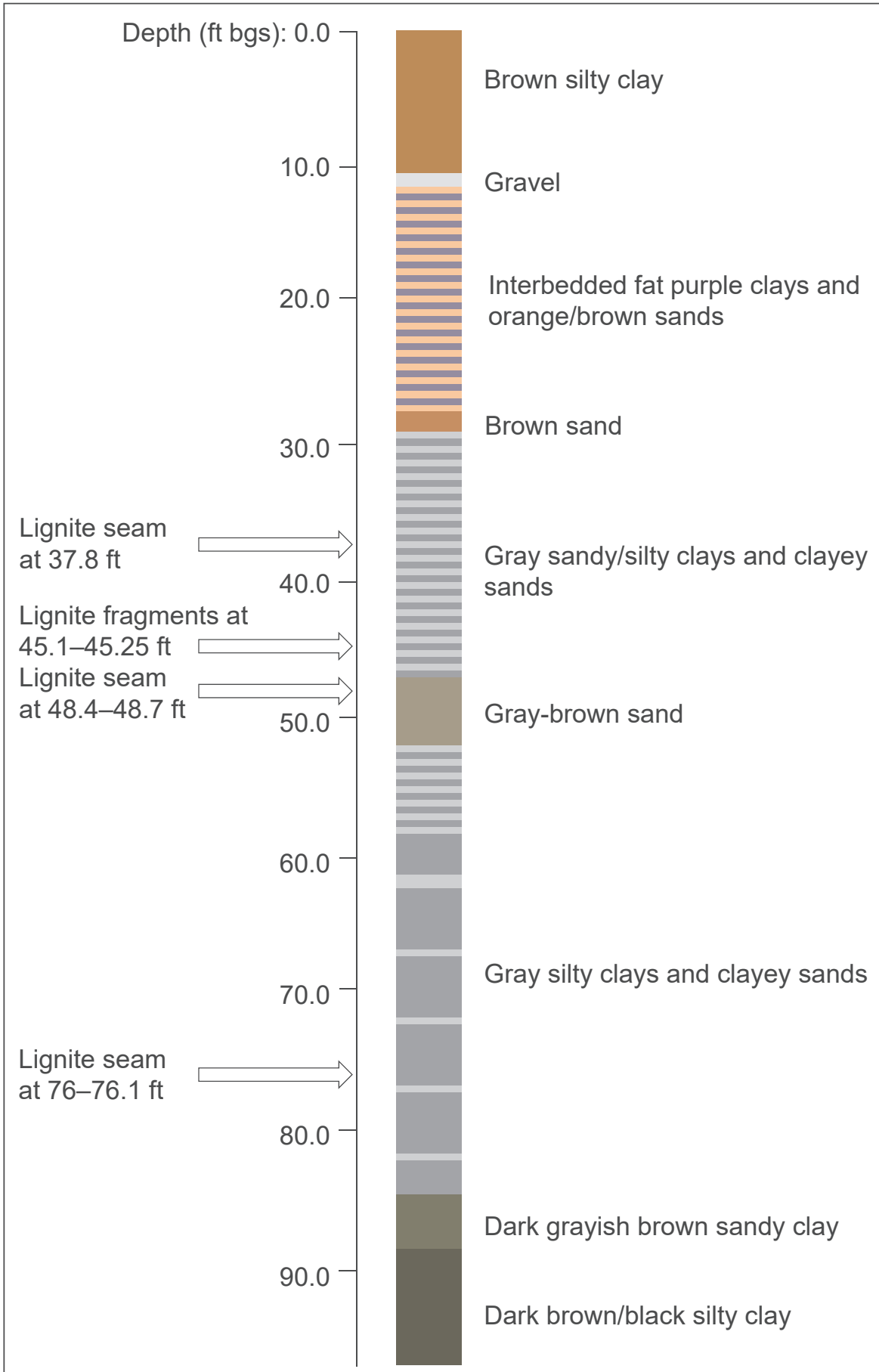
AEP Pirkey Power Plant
Hallsville, Texas

Geosyntec consultants

Columbus, Ohio | 2023/05/17

Figure 3

\\annarbor-01\data\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Pirkey\2019\20201218 Pirkey_SoilChem_minerals_March2019_new.mxd. CChristenson. 12/22/2020. Project/Phase/Task.



Notes:
1. Well installed in offset boring screened at 29-34 ft bgs
2. Boring completed May 2019
3. Total depth of 97.5 ft bgs

AEP: American Electric Power
bgs: below ground surface
ft: feet

B-3 Visual Boring Log

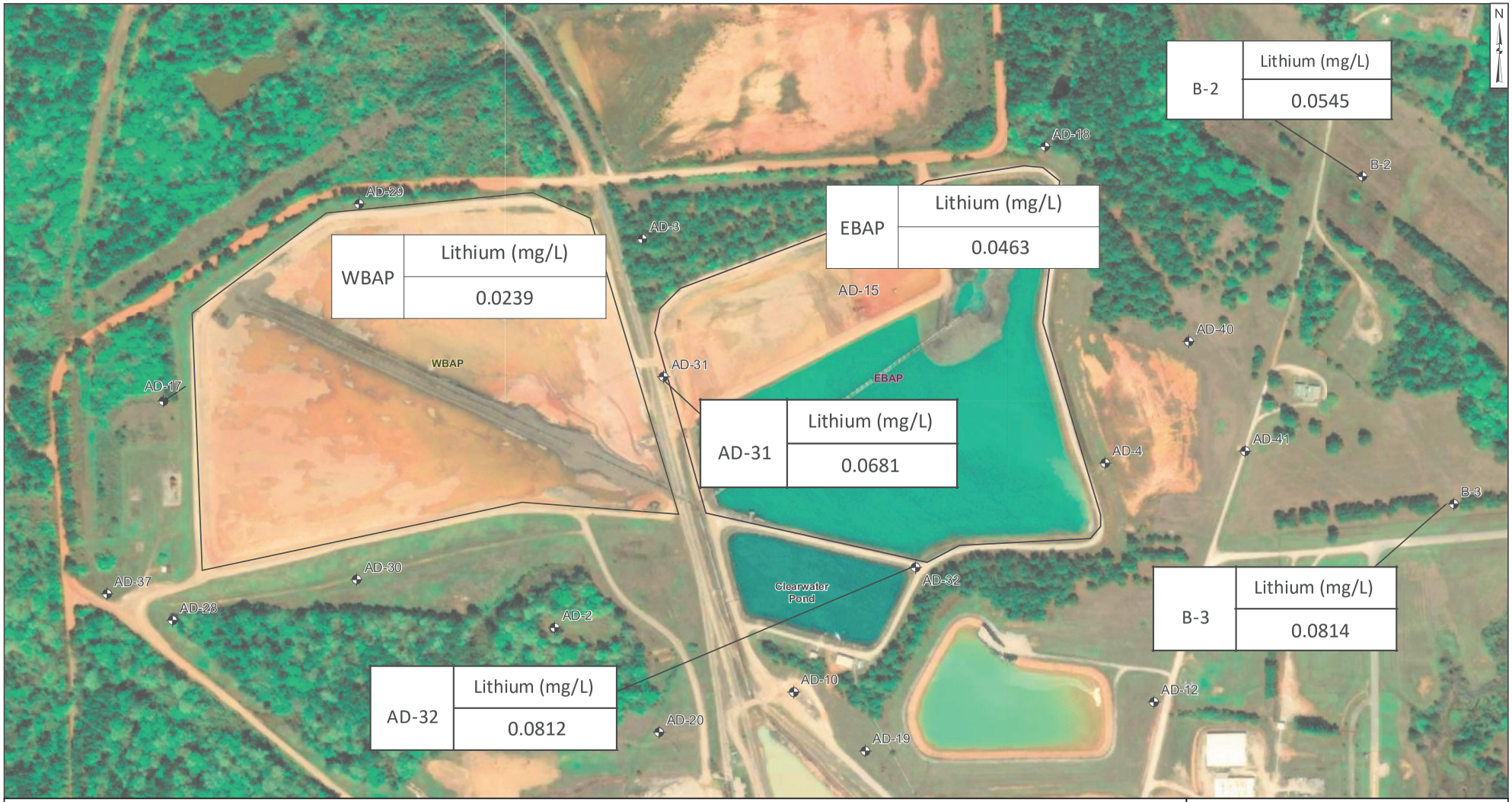
AEP Pirkey Powerplant
Hallsville, Texas

Geosyntec consultants

Columbus, Ohio | May 2023

Figure 4

\\annarbor-01\data\Projects\AEP\Legal Department - ASD Review\Pirkey\2019-05 Field Investigation\Field Forms\Compiled Boring Logs\Visual boring logs



Legend

- Monitoring Well
- EBAP
- Landfill
- Stack Out Area
- WBAP

Notes

1. Lithium concentrations in milligrams per liter (mg/L).
2. Monitoring well coordinates, site features, and data provided by AEP.
3. Groundwater samples were collected in November 2022.
4. Porewater sample from West Bottom Ash Pond (WBAP) was collected in June 2020.
5. Porewater sample from East Bottom Ash Pond (EBAP) was collected in June 2022.

AEP: American Electric Power

150 75 0 150 300 450
Feet

Aqueous Lithium Distribution

AEP Pirkey Power Plant
Hallsville, Texas

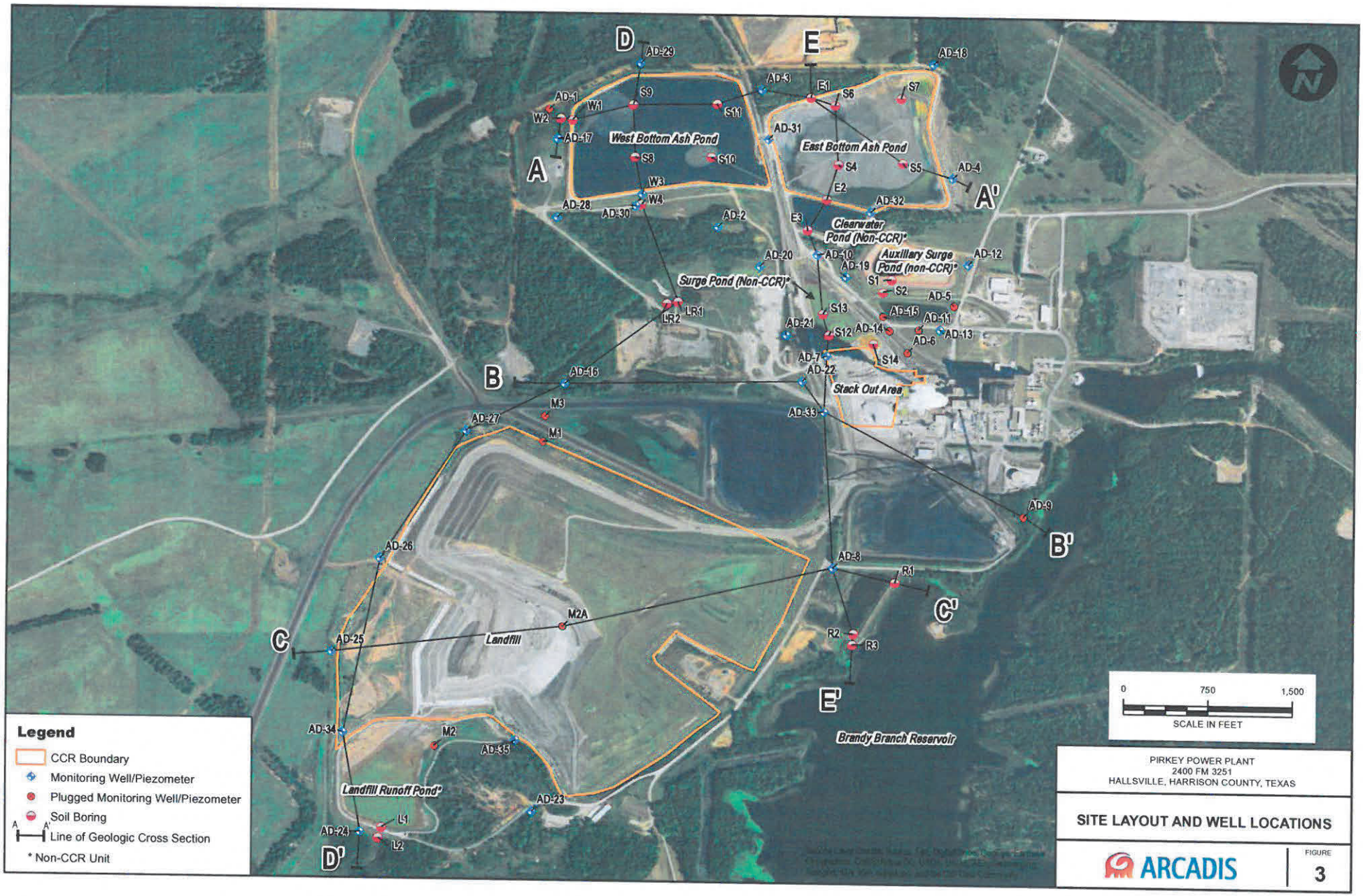
Geosyntec consultants

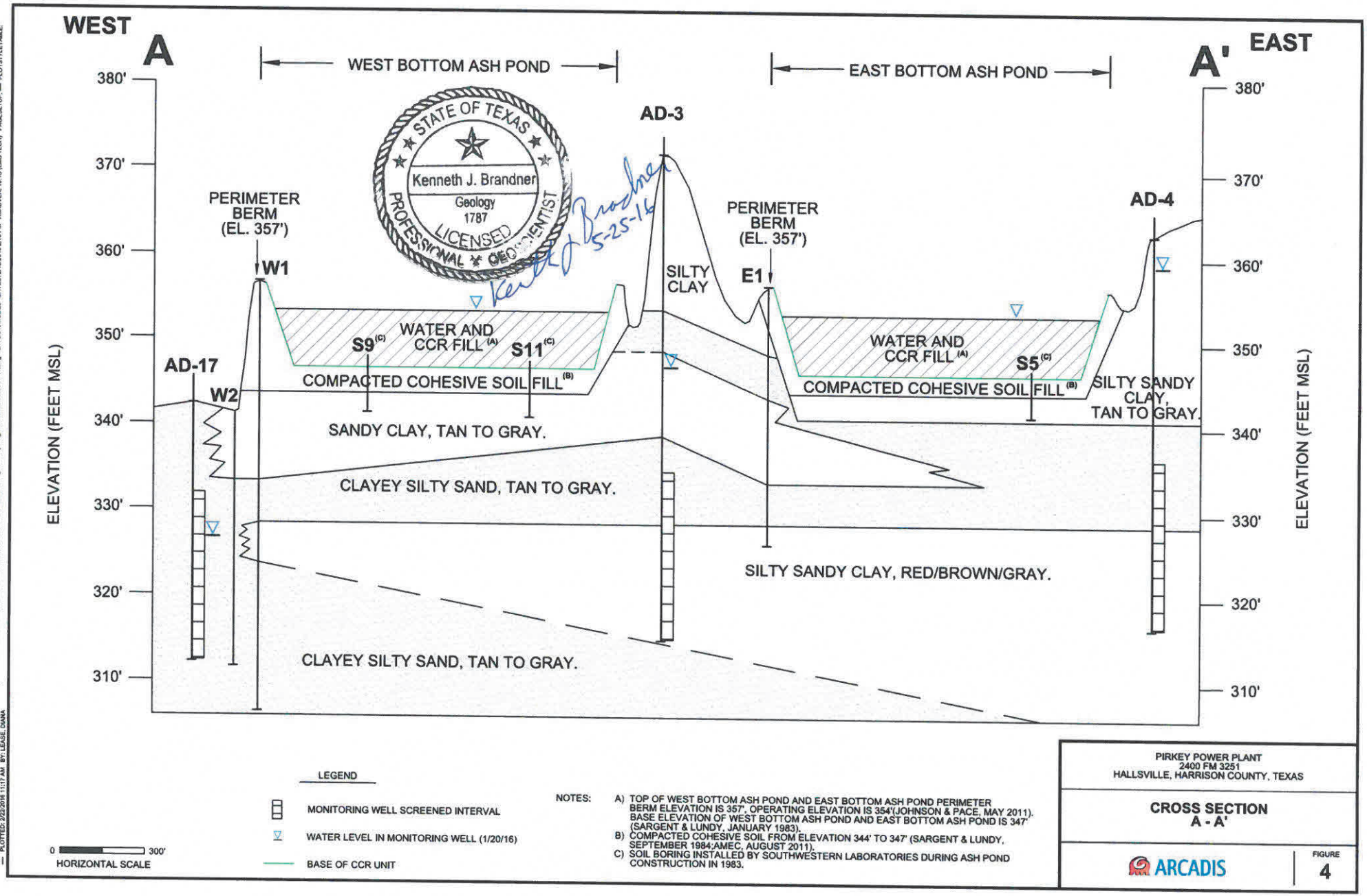
Columbus, Ohio | 2023/05/17

Figure 5

C:\Users\Jennifer.Souza\AppData\Local\Temp\ArcGISProTemp22852\fdc693a6-eefc-40e0-94d1-d98d6e45f6f0\Untitled.aprx. Jennifer.Souza. . CHA8462/12/02.

ATTACHMENT A
Geologic Cross Section A-A’


D
E
A
A'
B
B'
C
C'
D'
E'
AD-29
AD-18
AD-3
AD-1
E1
S6
S7
S9
W1
S11
W2
AD-17
West Bottom Ash Pond
AD-31
East Bottom Ash Pond
S8
S10
S4
S5
AD-4
W3
E2
W4
AD-28
AD-30
AD-32
AD-2
E3
Clearwater Pond (Non-CCR)*
AD-20
AD-10
AD-19
Auxiliary Surge Pond (non-CCR)*
AD-12
S1
Surge Pond (Non-CCR)*
S2
AD-5
LR2
LR1
S13
AD-15
AD-11
AD-21
S12
AD-14
AD-13
AD-6
AD-7
S14
AD-16
AD-22
Stack Out Area
M3
AD-33
AD-27
M1
AD-9
AD-26
AD-8
R1
M2A
AD-25
Landfill
R2
R3
AD-34
M2
AD-35
Brandy Branch Reservoir
Landfill Runoff Pond*
AD-23
L1
AD-24
L2
0
750
1,500
SCALE IN FEET
Legend
CCR Boundary
Monitoring Well/Piezometer
Plugged Monitoring Well/Piezometer
Soil Boring
Line of Geologic Cross Section
* Non-CCR Unit
PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE, HARRISON COUNTY, TEXAS
SITE LAYOUT AND WELL LOCATIONS
ARCADIS
FIGURE
3
Document Path: Z:\GIS\PROJECTS_ENV\AEP\Pirkey Plant\MXD\Figure 3 - Site Layout and Well Locations.mxd



LEGEND

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

0 300'
HORIZONTAL SCALE

NOTES:

A) TOP OF WEST BOTTOM ASH POND AND EAST BOTTOM ASH POND PERIMETER BERM ELEVATION IS 357', OPERATING ELEVATION IS 354'(JOHNSON & PACE, MAY 2011). BASE ELEVATION OF WEST BOTTOM ASH POND AND EAST BOTTOM ASH POND IS 347' (SARGENT & LUNDY, JANUARY 1983).
B) COMPACTED COHESIVE SOIL FROM ELEVATION 344' TO 347' (SARGENT & LUNDY, SEPTEMBER 1984;AMEC, AUGUST 2011).
C) SOIL BORING INSTALLED BY SOUTHWESTERN LABORATORIES DURING ASH POND CONSTRUCTION IN 1983.

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

CROSS SECTION
A - A'

ARCADIS

FIGURE
4

ATTACHMENT B
SB-2 Boring Log

PROJECT NO. _____ PROJ. _____ BOR. NO. SB-2

LOCATION AD-2/MW-2 - Pitkin Power Plant ELEV. _____ DATE 4/20/20

SILTS & SANDS		COHESIVE SOILS - CLAYS			COLORS	MATERIALS	SAND ADJ.	CHARACTERTICS
CONDITION		CONSISTENCY	PENETROMETER	N - VALUE	Li .... Light .....Br ....Brown	Cl ..... Clay, Clayer	F.....Fine	Calc ..... Calcareous
VLo ..... Very Loose	0-4	Vso.. Very Soft	0 - 0.25	<2	Dk ... Dark .....Bk ....Black	Si ..... Silt, Silty	M ....Medium	Lig ..... Lignite
Lo ..... Loose	4-10	So.... Soft	0.25 - 0.5	2 - 4	G ..... Grey ....Bl ....Blue	Sa .... Sand, Sandy	Co....Coarse	Org ..... Organic
MDe ..... Med. Dense	10-30	Mst.. Stiff	0.5 - 1.0	4 - 8	T ..... Tan .....Gr ....Grenn	Ls .... Limestone	Si.....Silty	Lam ..... Laminate
De ..... Dense	30-50	St..... Stiff	1.0 - 2.0	8 - 15	R ..... Red .....Y .....Yellow	Gr .... Gravel		Sls ..... Slickensided
VDe ..... Very Dense	>50	VSt.. Very Stiff	2.0 - 4.0	15 - 30	Rdish.Reddish.Wh ...White	SiS ... Siltstone		SL ..... Slightly
		H..... Hard	> 4.0	>30		SS .... Sandstone		Sm(s) ... Seam (s)
						Sh..... Shale, Shaley		Nod ..... Nodules

Sample Interval TEST ASSIGNMENT	SAMPLE NO. Recovery	DEPTH FT.	SAMPLES	STRATUM DESCRIPTION: CONDITION OR CONSISTENCY	COLOR	MINOR MATERIALS OR ADJECTIVES	PREDOMINATE MATERIAL	CHARACTERISTICS OR MODIFICATIONS	STANDARD PENETROMETER: SEAT - 6"	1st - 6"	2nd - 6"	UNIFIED SOIL CLASSIFICATION	N - VALUE OR HAND PENETROMETER
SM	0-5 2' Rec	0		0-8'	Br, Lt. Rd Br	Si	Sa	Silty Sand - trace clay, trace root hairs, moist.					
8'	5-10 2.5' Rec				Lt. Rd Br			- thin lenses (less than 1/4") at 7.5', trace iron staining				moist	(0-5')
Cl	10-15 4' Rec	8		8-14.5	Lt. Rd Br, Rd Br, Gray	Sa, Si	Cl	Clay - some silty sand and silty clayey sand in interbeds to 14.5', trace iron oxide gravel in sand seams @ 10.5', 12', 12.5'				moist	(10-15')
14.5'	15-20 2' Rec	14.5		14.5-39'	Rd Br, Yllw. Br, Gray	Si, Cl	Sa	silty sand - some sandy clay, iron cemented sand @ 16.5' and ironstone				v. moist to moist	(15-20')
	20-25 * No Rec.							(17.5') - cemented sand seams in silty sand @ 20-25'				v. moist	(20-25')
SC	25-30 2.5' Rec				Gray - DK Gray SR. Br			- gravel & cemented sand seam @ 25' (6")				sat. @ 25'-25.5'	
				(25-39')				- cemented sand, part. clay cemented					
								clayey silty sand @ 25.5'				moist	25.5 27
								- dark gray silty sat sand seam (2") @ 27'				sat. @ 27.0' (2")	
	30-35 3' Rec							- sat. silty sand seam @ 30.5' (1")				sat @ 30.5' (1")	
								- sat. silty sand seam @ 32' (3")					32.0 (3")
39'								* some v.f. gypsum, dry stalk in clayey sand between sat. sand seams (25-40')				v. moist	(to 39')
ML	35-40 4' Rec	39		39-40	Lt. Gray, Gray (39-40')	Cl, Si	Si	Clayey sandy silt, - interbedded silt & clay @ 39' to 40'				moist	(39-40')
								B.T. @ 40'					
								* 25-27' collected @ 1015					
								* 31-33' collected @ 1035					

Type Boring HSA Dry Auger ☒ Rotary Wash ☐

SEEPAGE @ 25' FT. WHILE DRILLING, W.L. @ ___ FT. ON COMPL.
(OR) BAILED TO ___ FT. UPON COMPLETION.
W.L. @ ___ FT AND CAVED TO ___ FT. ON _____.

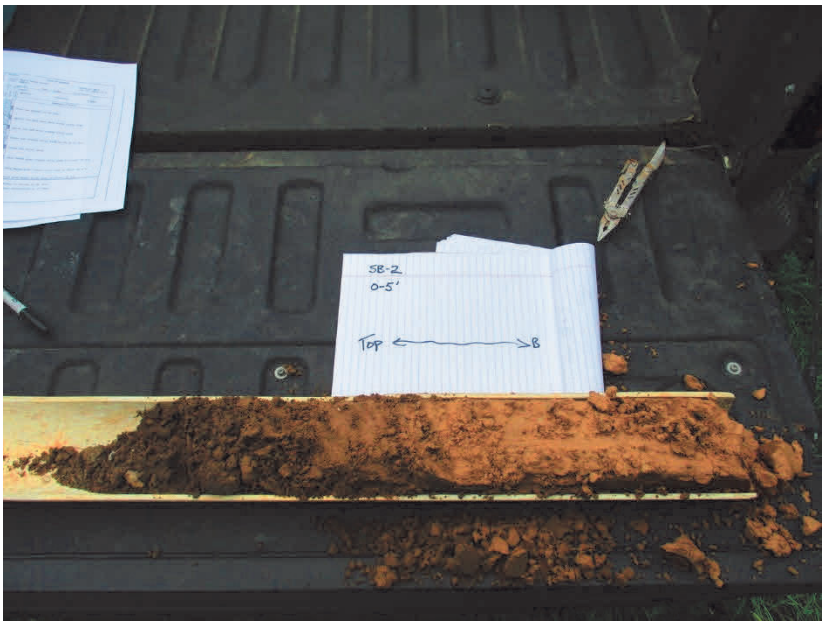
* GPS: 32.46522, -94.49032 (12' E, 3.5' N of AD-2/MW-2)

ATTACHMENT C
SB-2 Boring Photographic Log

GEOSYNTEC CONSULTANTS
Photographic Record

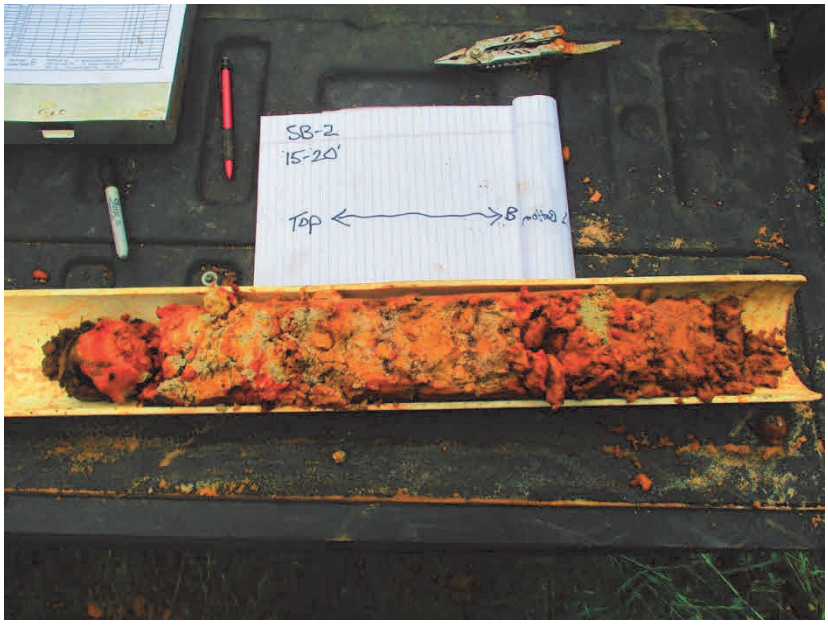
Geosyntec consultants

Client: AEP	**Project Number: CHA8495**
Site Name: Pirkey East Bottom Ash Pond	**Site Location: Hallsville, Texas**

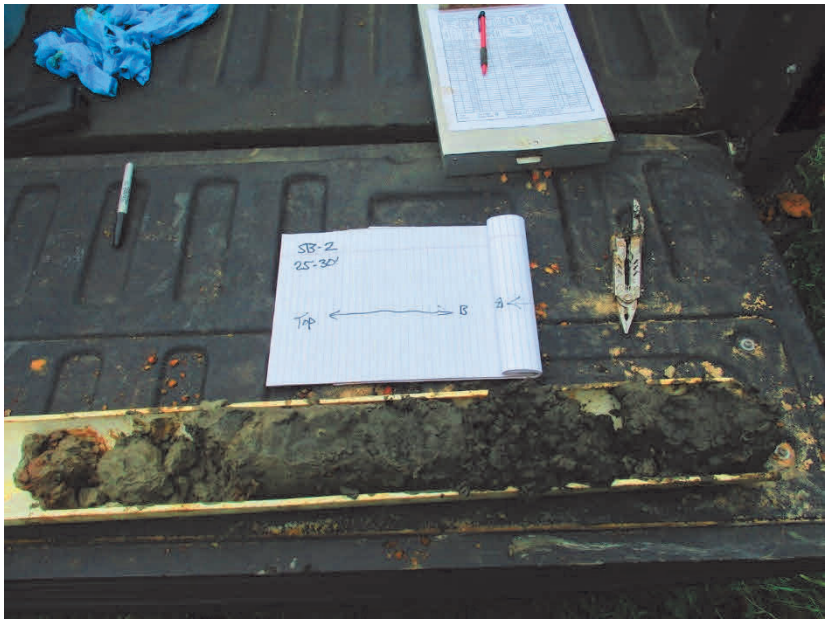
Photograph 1 **Date: 4/21/2020** **Direction: N/A** **Comments:** 0-5 foot interval of SB-2.	

Photograph 2 **Date: 4/21/2020** **Direction: N/A** **Comments:** 5-10 foot interval of SB-2.	

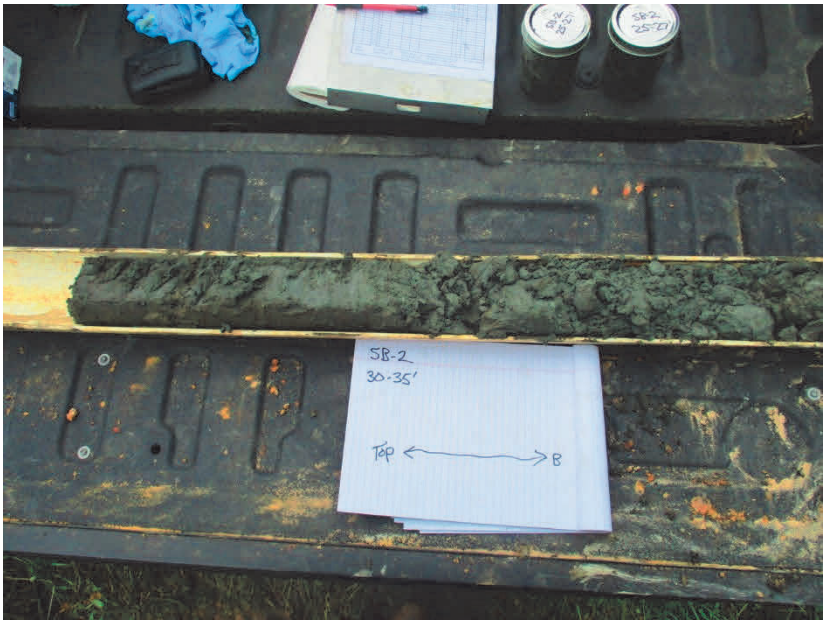
GEOSYNTEC CONSULTANTS Photographic Record	Geosyntec consultants
Client: AEP	**Project Number: CHA8495**
Site Name: Pirkey East Bottom Ash Pond	**Site Location: Hallsville, Texas**

Photograph 3 **Date: 4/21/2020** **Direction: N/A** **Comments:** 10-15 foot interval of SB-2.	
Photograph 4 **Date: 4/21/2020** **Direction: N/A** **Comments:** 15-20 foot interval of SB-2. Recovery of this interval was limited.	

GEOSYNTEC CONSULTANTS Photographic Record	Geosyntec consultants
Client: AEP	**Project Number: CHA8495**
Site Name: Pirkey East Bottom Ash Pond	**Site Location: Hallsville, Texas**

Photograph 5 **Date: 4/21/2020** **Direction: N/A** **Comments:** 20-25 foot interval of SB-2. Recovery of this interval was limited.	
Photograph 6 **Date: 4/21/2020** **Direction: N/A** **Comments:** 25-30 foot interval of SB-2. Very little of this interval was recovered. A color change was observed from red to dark brown/black. A sample was collected from this interval.	

GEOSYNTEC CONSULTANTS Photographic Record	Geosyntec consultants
Client: AEP	**Project Number: CHA8495**
Site Name: Pirkey East Bottom Ash Pond	**Site Location: Hallsville, Texas**

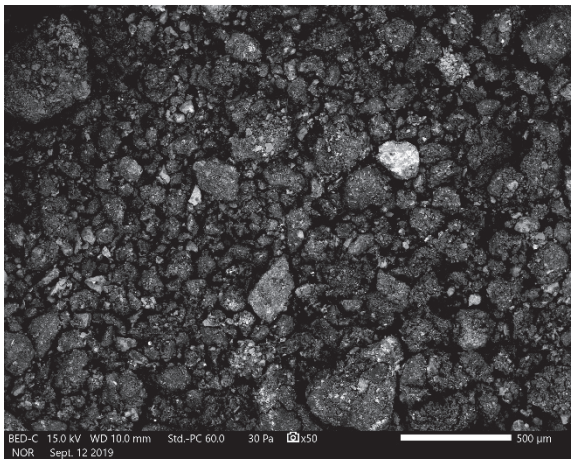
Photograph 9 **Date: 4/21/2020** **Direction: N/A** **Comments:** 30-35 foot interval of SB-2. Very little of this interval was recovered.. A sample was collected from this interval.	
Photograph 10 **Date: 4/21/2020** **Direction: N/A** **Comments:** 35-40 foot interval of SB-2	

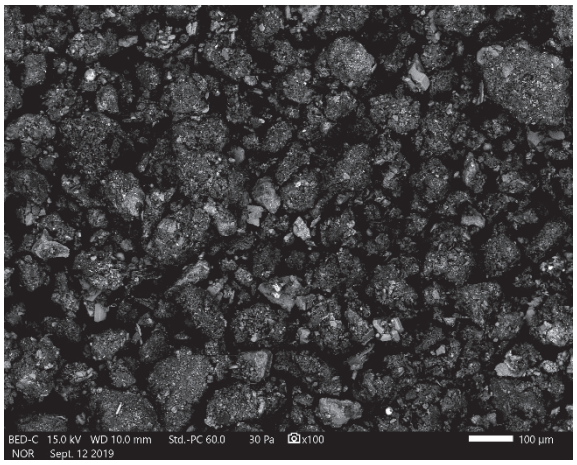
ATTACHMENT D
SEM/EDS Analysis

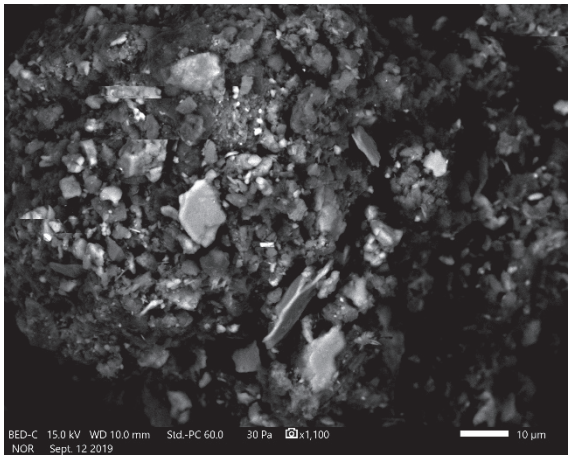
September 16, 2019

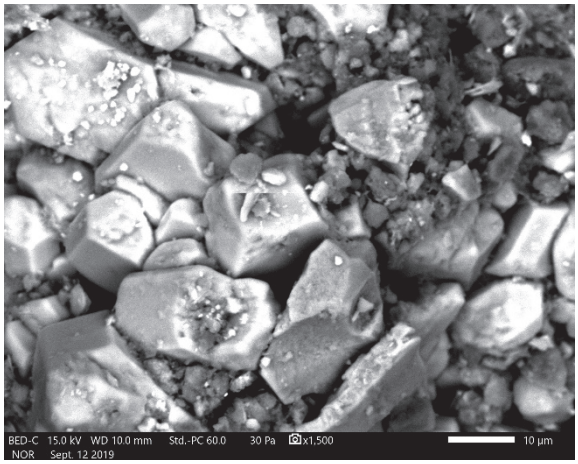
Dr. Bruce Sass
941 Chatham Lane, Suite 103, Columbus, OH 43221

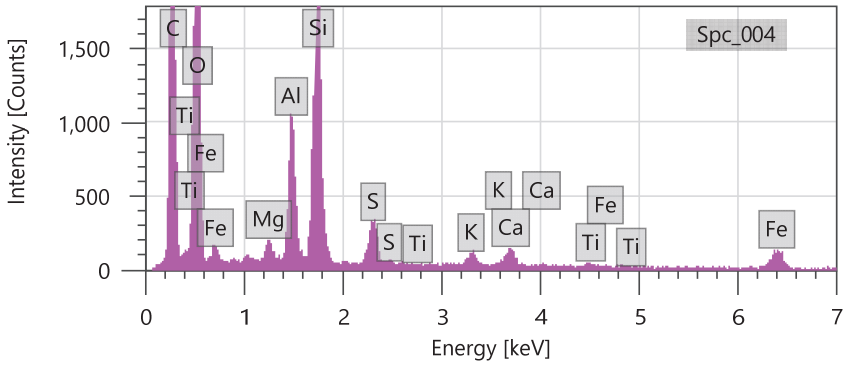
via Email: BSass@geosyntec.com





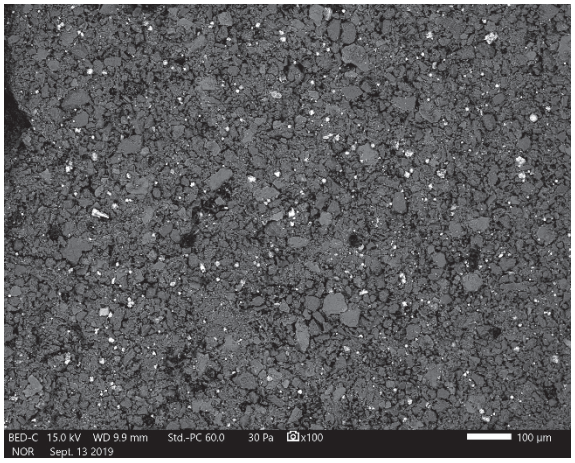


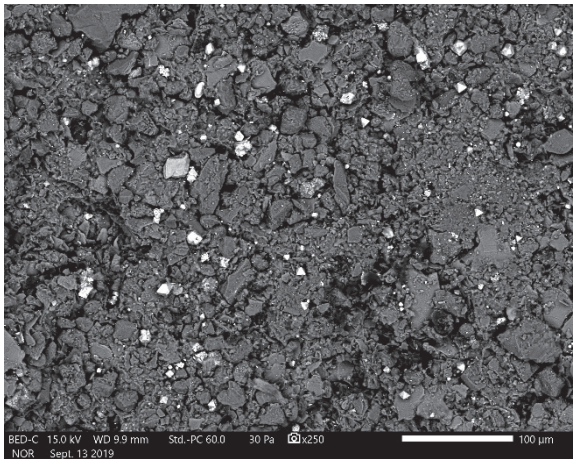


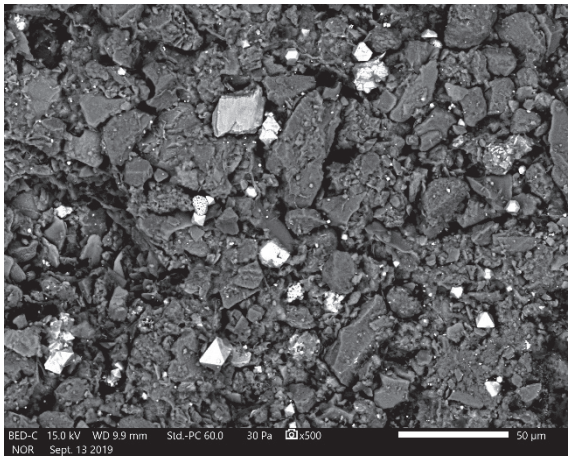


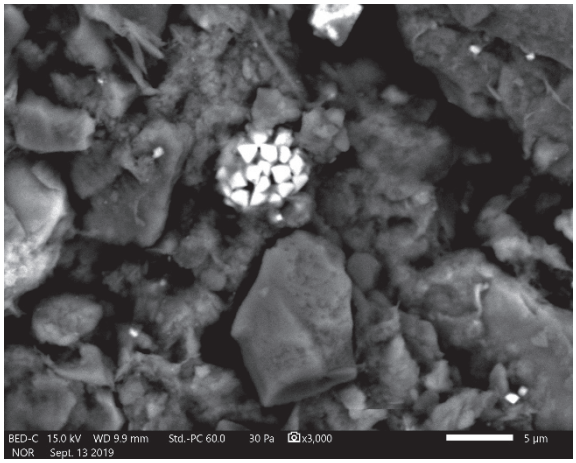
Lignite. Backscattered electron micrographs show the sample at 100X, 1,100X, and 1,500X. EDS spectrum at bottom is an area scan of the region shown in top right micrograph. Bright particles are mostly quartz and feldspar. Major peaks for carbon, oxygen, silicon, and aluminum suggest coal and clay.

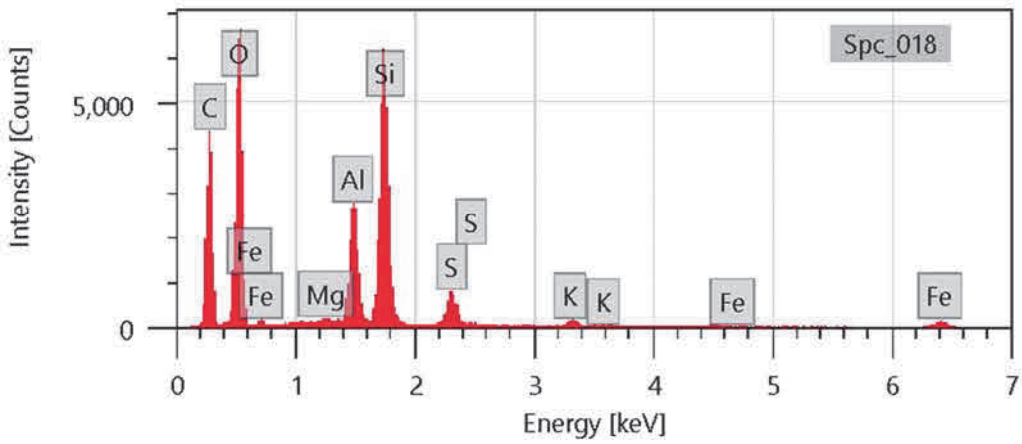
Geosyntec
CTLGroup 150350





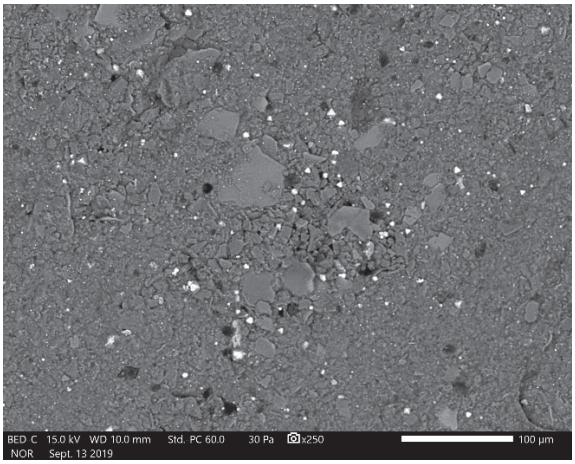


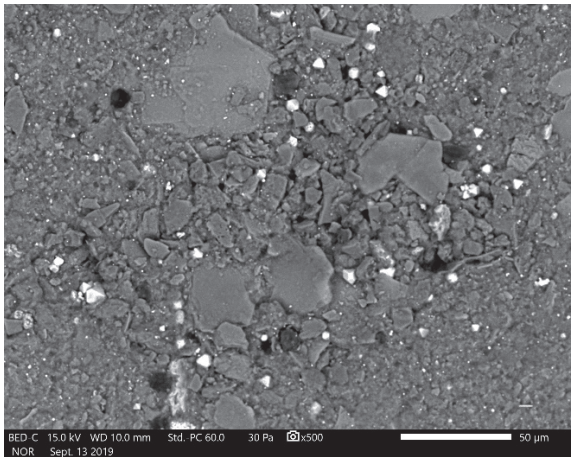


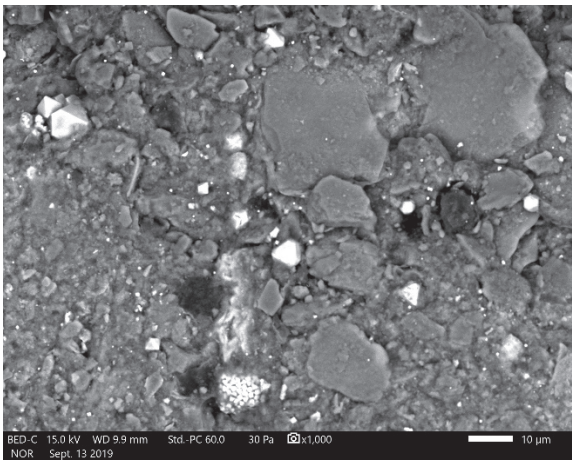


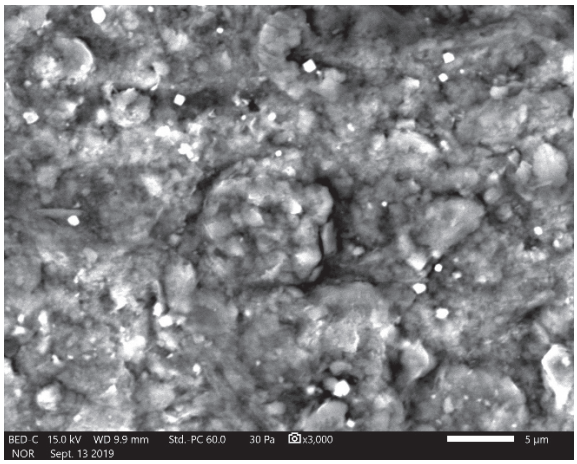
Sample VAP B3 40-45. Backscattered electron micrographs show the sample at 100X, 250X, 500X, and 3000X. EDS spectrum at bottom is an area scan of the region shown at 500X. Bright particles are pyrite (framboid in bottom right micrograph). Major peaks for carbon, oxygen, silicon, and aluminum suggest coal and clay.

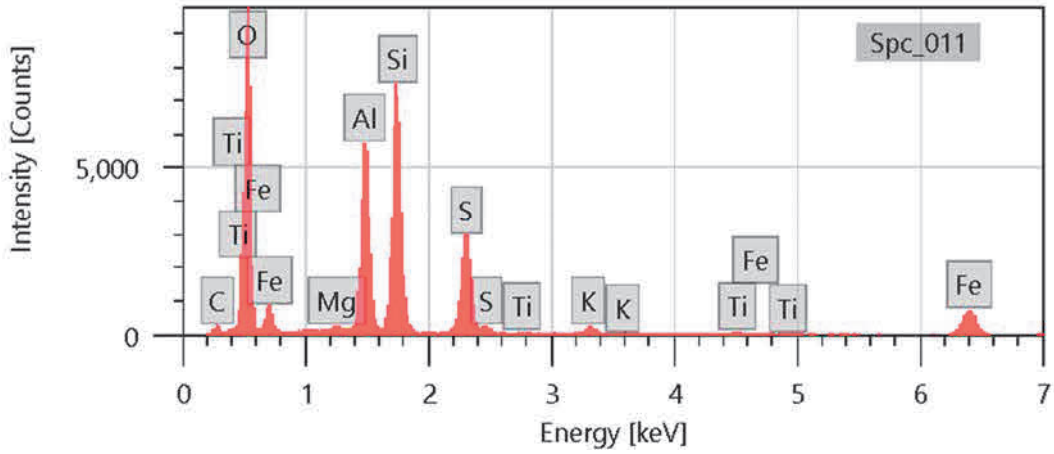
Geosyntec
CTLGroup 150350











Sample VAP B3 50-55. Backscattered electron micrographs show the sample at 250X, 500X, 1000X, and 3000X. EDS spectrum at bottom is an area scan of the region shown at 3000X. Bright particles are mostly pyrite (framboid in bottom left micrograph); occasional particles of Fe-Ti oxide are detected. Major peaks for oxygen, silicon, and aluminum suggest clay. Large blocky particles are mostly quartz, feldspar, and clay.

ATTACHMENT E
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 East Bottom Ash Pond 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	June 27, 2023
License Number	Licensing State	Date

Geosyntec consultants

engineers | scientists | innovators

ALTERNATIVE SOURCE DEMONSTRATION REPORT TEXAS STATE CCR RULE

H.W. Pirkey Power Plant East Bottom Ash Pond

Registration No. CCR104

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

October 2023

Geosyntec consultants

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ATTACHMENTS

LIST OF ACRONYMS

Å	angstrom
ASD	alternative source demonstration
bgs	below ground surface
CCR	coal combustion residuals
EBAP	East Bottom Ash Pond
EDS	energy-dispersive spectroscopy
EPRI	Electric Power Research Institute
GWPS	groundwater protection standard
LCL	lower confidence limit
mg/kg	milligram per kilogram
mg/L	milligram per liter
SEM	scanning electron microscopy
SPLP	Synthetic Precipitation Leaching Procedure
SSL	statistically significant level
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
USEPA	United States Environmental Protection Agency
VAP	vertical aquifer profiling
WBAP	West Bottom Ash Pond
XRD	X-ray diffraction

1. INTRODUCTION AND SUMMARY

This Alternative Source Demonstration (ASD) report has been prepared to address statistically significant levels (SSLs) for cobalt and lithium in the groundwater monitoring network at the H.W. Pirkey Plant East Bottom Ash Pond (EBAP) 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, including the EBAP, regulated by the Texas Commission on Environmental Quality (TCEQ) under Registration No. CCR104 (**Figure 1**).

In June 2023, a semiannual assessment monitoring event was conducted at the EBAP in accordance with Title 30 §352.951(a) of the Texas Administrative Code (TAC). The monitoring data were submitted to Groundwater Stats Consulting, LLC for statistical analysis. Confidence intervals were recalculated for the Appendix IV parameters at the compliance wells to assess whether these parameters were present at an SSL above previously calculated groundwater protection standards (GWPSs). An SSL was concluded if the lower confidence limit (LCL) of a parameter exceeded the GWPS (i.e., if the entire confidence interval exceeded the GWPS). The following SSLs were identified at the Pirkey EBAP (Geosyntec 2023a):

- The LCLs for cobalt exceeded the GWPS of 0.00939 mg/L at AD-2 (0.0132 mg/L), AD-31 (0.00959 mg/L), and AD-32 (0.0310 mg/L).
- The LCL for lithium exceeded the GWPS of 0.0520 mg/L at AD-31 (0.0760 mg/L) and AD-32 (0.0766 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 cobalt and lithium in the groundwater monitoring network for the EBAP are from a source other than the EBAP.

1.2 Demonstration of Alternative Sources

An evaluation was completed to assess possible alternative sources to which the identified SSLs 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 cobalt and lithium were based on a Type IV cause and not by a release from the Pirkey EBAP.

2. SUMMARY OF SITE CONDITIONS

The EBAP design and construction, regional geology and site hydrogeology, and groundwater monitoring system and flow conditions are described below.

2.1 EBAP Design and Construction

The EBAP is a 31.5-acre CCR surface impoundment located at the north end of the Pirkey Plant, immediately east of the West Bottom Ash Pond (WBAP) (**Figure 1**). It was constructed while the Pirkey Plant was being developed in 1983 and 1984 and placed into operation in 1985 to receive bottom ash and economizer ash sluiced from the plant boiler. Bottom ash and economizer ash were periodically excavated from the EBAP and either removed via truck to the on-site landfill or sold for off-site beneficial reuse.

The EBAP was developed by excavating part of its perimeter into native soils to create an embankment height of approximately 4 feet, constructing compacted clay perimeter embankments, and constructing a compacted clay liner over the base of the pond (Arcadis 2016). Multiple lithological borings advanced after the installation of the clay liner confirm that at least 6 feet of clay was present below the base of the EBAP (Arcadis 2016). The bottom elevation of the EBAP was approximately 347 feet above mean sea level, and the elevation of the top of the pond embankment was approximately 357 feet above mean sea level. The unit was designed to have a maximum storage capacity of 188 acre-feet.

A Closure Plan was developed in October 2016 and revised in December 2021 (AEP 2021). This document detailed the closure activities which were to take place throughout the closure of the EBAP. AEP submitted a certified notification that the receival of CCR materials had ceased as of April 25, 2023 and the closure activities had been initiated (AEP 2023). As of October 2023, the EBAP has been dewatered and CCR materials plus one foot of underlying soil have been removed.

2.2 Regional Geology / Site Hydrogeology

The EBAP is positioned on an outcrop of the Eocene-age 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 found beneath an upper silty to silty sandy clay layer in the vicinity of the EBAP is considered to be the Uppermost Aquifer below this CCR unit (Arcadis, 2016). Here it is approximately 15-feet thick and located between an elevation of 325 and 340 feet mean sea level.

2.3 Groundwater Monitoring History and Flow Conditions

The EBAP monitoring well network monitors groundwater within the Uppermost Aquifer. Geologic cross section A-A' from the EBAP Groundwater Monitoring Well Network Report (Arcadis 2016), provided herein as **Attachment A,** shows the subsurface geometry of the

Uppermost Aquifer (indicated on the figure as clayey silty sand, tan to gray) underlying the EBAP and the WBAP and demonstrates lateral continuity of the Uppermost Aquifer spanning the entire length of the EBAP.

Groundwater flow direction in the area of the EBAP is west-southwesterly (**Figure 1**). Seasonal variability in groundwater flow has not been observed since the monitoring well network was installed. Groundwater flow velocities in the uppermost aquifer in the vicinity of the EBAP have been reported as approximately 10 to 44 feet per year. The EBAP monitoring well network consists of upgradient monitoring wells AD-4, AD-12, and AD-18 and compliance wells AD-2, AD-3, AD-31, and AD-32, all of which are screened within the Uppermost Aquifer.

3. ALTERNATIVE SOURCE DEMONSTRATION

The ASD evaluation method and proposed alternative source of cobalt or lithium in AD-2, AD-31, and AD-32 and the 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 cobalt and lithium due to Type I (sampling), Type II (laboratory), Type III (statistical evaluation), or Type V (anthropologic) 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 have been attributed to natural variation associated with the underlying geology, which is a Type IV (natural variation) issue.

3.1.1 Cobalt

Previous ASDs for cobalt at the EBAP provided evidence that cobalt is present in the aquifer geologic media at the site and that the observed cobalt concentrations in groundwater were due to natural variation of native geogenic sources (Geosyntec 2019a, Geosyntec 2019b, Geosyntec 2020a, Geosyntec 2020b, Geosyntec 2021a, Geosyntec 2021b, Geosyntec 2022b, Geosyntec 2023b, Geosyntec 2023c). The previous ASDs demonstrated how the EBAP was not a source for cobalt in downgradient groundwater, based on observed concentrations of cobalt both in the ash material and in leachate from Synthetic Precipitation Leaching Procedure (SPLP) analysis (SW-846 Test Method 1312 [USEPA, 1994]) of the ash material. Cobalt was not detected in the most recent SPLP ash leachate sample, collected in 2019, above the reporting limit of 0.01 mg/L, which is lower than the average concentrations observed at the wells of interest (**Table 1**). No changes to material handling or plant operations have occurred which would have changed the anticipated cobalt concentrations in CCR ash since this sample was collected.

In a February 2023 surface water sample collected from the EBAP to characterize the total cobalt concentrations, cobalt was detected at a concentration of 0.00350 mg/L (**Table 1**). The surface water sample data from the February 2023 sampling event was used during this evaluation as the EBAP had been dewatered prior to the June 2023 sampling event. This concentration is lower than the reported cobalt concentrations for multiple in-network wells from the June 2023 sampling event, including the upgradient monitoring well AD-4 (0.00389 mg/L; **Figure 2**). The EBAP sample was also found to be lower than the average concentration in groundwater at the wells of interest, including almost an order of magnitude lower than the average concentration at AD-32 (**Table 1**). Therefore, the EBAP is not the likely source of cobalt at AD-2, AD-31, or AD-32.

As noted in the previous ASDs, soil samples collected across the site, including from locations near the EBAP, identified cobalt in the aquifer solids at concentrations ranging from 0.59 – 23.5 milligrams per kilogram (mg/kg) with the highest value reported at AD-41, which is upgradient of the EBAP (**Figure 3**). SB-2 was advanced in the vicinity of AD-2 in April 2020 to re-log the

geology at AD-2 and collect samples for laboratory analysis of total metals and mineralogy. The SB-2 field boring log, which was generated by Auckland Consulting LLC, is provided as **Attachment B**. Cobalt was detected at SB-2 at concentrations of 9.45 mg/kg at 25-27 feet below ground surface (bgs) and 19.2 mg/kg at 31-33 feet bgs (**Table 2**). These cobalt concentrations are greater than the concentration of cobalt present in the bottom ash (6.1 mg/kg; **Table 1**). Both samples correlate to the depth of the monitoring well screen of AD-2 (20-40 feet bgs), indicating that naturally occurring cobalt is present in aquifer solids within the AD-2 screened interval.

In addition to the analysis of total cobalt, soil samples were submitted for mineralogical analysis to determine the mineral composition of soils near the EBAP. X-ray diffraction (XRD) analysis of soils from SB-2 identified pyrite (an iron sulfide) in samples collected at 25-27 feet bgs and 31-33 feet bgs at concentrations up to 7% by weight (**Figure 3**). Cobalt is known to undergo isomorphic substitution for iron in crystalline iron minerals such as pyrite due to their similar ionic radii of approximately 1.56 angstroms (Å) for iron vs. 1.52 Å for cobalt (Clementi and Raimondi 1963; Krupka and Serne 2002; Hitzman et al. 2017). The presence of iron-bearing minerals in soil near the EBAP constitutes a potential source of naturally occurring cobalt.

The aquifer solids at SB-2 are distinctly red in color at shallow depths, as illustrated in the photolog of soil cores provided in **Attachment C**. While shallow samples were not collected for mineralogical analysis, red color in soils is often associated with the presence of oxidized iron-bearing minerals such as hematite and goethite. The red color of the soil suggests the presence of iron oxide and hydroxide minerals within the shallow depth interval. The alteration of pyrite to these iron oxide and hydroxide minerals under oxidizing conditions is also a well-understood phenomenon, including in formations in east Texas (Senkayi et al. 1986, Dixon et al. 1982). It is likely that the pyrite weathering process is resulting in the release of isomorphically substituted cobalt from the pyrite crystal structure as it undergoes oxidative transformation to iron oxide/hydroxide minerals.

As described in the previous ASDs, vertical aquifer profiling (VAP) was used to collect groundwater samples from upgradient locations B-2 and B-3 during the soil boring and sample collection process (Geosyntec 2019b). A groundwater sample was also collected from AD-32, one of the existing compliance-wells within the EBAP groundwater monitoring network where a cobalt SSL was identified. Solid phase materials within these groundwater samples were separated and submitted for analysis of chemical composition. For the VAP samples, separation was completed using a centrifuge due to the high abundance of suspended solids. For the groundwater sample at AD-32, the sample was filtered using a 1.5-micron filter. Based on total metals analysis, cobalt was identified both in the centrifuged solid material collected from upgradient VAP location B-3 [VAP-B3-(40-45)] and in the material retained on the filter after processing groundwater from permanent monitoring wells B-2 and B-3 (**Table 2**). The concentrations of cobalt in the solid material retained after filtration were comparable to the bulk soil samples collected from the same locations.

The solid sample [VAP-B3-(40-45)] was submitted for mineralogical analysis via XRD and scanning electron microscopy (SEM) using an energy dispersive spectroscopic analyzer (EDS). The XRD results identified pyrite as approximately 3% of the solid phase (**Table 3**). Pyrite was identified during SEM/EDS analysis of lignite which is mined immediately adjacent to the site. Logging completed while the VAP boring was advanced identified coal at several intervals, including 45 and 48 feet bgs (**Figure 4**). Furthermore, SEM/EDS of both centrifuged solid samples [VAP-B3-(40-45) and VAP-B3-(50-55)] identified pyrite in backscattered electron micrographs by the distinctive framboidal morphology (Harris et al. 1981; Sawlowicz 2000). Major peaks representing iron and sulfur were identified in the EDS spectrum, which further support the identification of pyrite (**Attachment D**). While cobalt was not identified in the EDS spectrum, it is likely present at concentrations below the detection limit.

The EBAP was not identified as the source of cobalt at wells in the EBAP network based on the low concentrations of cobalt in the pond itself and the ubiquity of naturally occurring cobalt, especially in soil and groundwater samples upgradient from the EBAP. Cobalt in the EBAP network groundwater is believed to be a result of natural variability within the aquifer. Naturally occurring cobalt is known to substitute for iron in iron-bearing minerals. The presence of iron sulfide (as pyrite) and iron oxides/hydroxides hematite and goethite have been confirmed at AD-2 and across the Site. The weathering of pyritic minerals to iron oxide/hydroxide minerals may be resulting in the release of cobalt into groundwater from the crystal structure of these aquifer minerals.

3.1.2 Lithium

Previous ASDs for lithium at the EBAP attributed the observed lithium exceedances to variations in lithium associated with the suspended native aquifer solids that likely originate from naturally occurring lignite present in these soils. These native lithium-containing aquifer solids are ubiquitous in the aquifer based on the presence of both solid-phase and dissolved lithium at upgradient locations (Geosyntec 2019b, Geosyntec 2020a, Geosyntec 2020b, Geosyntec 2021a, Geosyntec 2021b, Geosyntec 2022a, Geosyntec 2022b, Geosyntec 2023b, Geosyntec 2023c). Data gathered in support of the prior ASDs and recent results provide additional evidence that the observed lithium groundwater concentrations at AD-31 and AD-32 are naturally occurring and are due to natural variation in the aquifer (Type IV ASD).

As discussed in Section 3.3.1, a surface water sample was collected directly from the EBAP in February 2023. Lithium was detected in the February 2023 EBAP sample at a concentration of 0.0653 mg/L (**Figure 5, Table 4**). The labile fraction identified in the bottom ash by SPLP from a February 2019 sample was even lower, with an estimated (J-flagged) lithium concentration of 0.011 mg/L. These concentrations are below the average lithium concentrations at AD-31 (0.0818 mg/L) and AD-32 (0.0843 mg/L) (**Table 4**). Thus, the EBAP is not the likely source of lithium at AD-31 and AD-32.

Groundwater samples collected from upgradient wells B-2 and B-3 in June 2023 had total lithium concentrations of 0.0485 mg/L and 0.0641 mg/L, respectively. The reported concentration at B-3

is greater than the GWPS of 0.0520 mg/L and only slightly lower than the concentration of lithium observed at AD-31 (0.089 mg/L). Furthermore, the lithium concentration detected at B-3 is greater than the value found at AD-32 (0.0500 mg/L) (**Figure 5**). Because B-2 and B-3 were installed at locations upgradient to and unimpacted by site activities, these lithium concentrations suggest that aqueous lithium is naturally present at concentrations above the GWPS across the site at variable concentrations and not limited to AD-31 and AD-32. It is noted that B-2 and B-3 are not part of the monitoring network for the EBAP, and as such the lithium concentrations in groundwater from these wells are not considered in calculating the GWPS for the CCR unit.

As described in Section 3.3.1, groundwater samples were collected from B-2, B-3, and AD-32 and filtered to separate solids. Groundwater was also collected from a VAP boring (VAP-B3-(40-45)) and centrifuged to separate solids. Lithium was detected in the solid material separated from these groundwater samples at concentrations comparable to bulk soil at all locations, providing evidence that the particulates captured during groundwater sampling contain lithium (**Table 5**).

3.1.2.1 Calculated Partition Coefficients

A previous ASD for lithium at the EBAP discussed lithium mobility in groundwater due to desorption from cation exchange complexes associated with clay minerals within naturally occurring lignite material. This mechanism was posited as the source of lithium in both upgradient and downgradient wells at the EBAP (Geosyntec 2019b). Previously completed XRD analysis of centrifuged solid material samples (VAP-B3-(40-45)) found that clay minerals, including kaolinite, smectite, and illite/mica, made up at least 60% of the aquifer solid (**Table 3**). SEM/EDS analysis also identified the presence of silicon, aluminum, and oxygen, all of which are components of clay minerals (**Attachment D**). The backscattered electron micrographs of these samples also identified clay particles by morphology. The largest clay particles (> 5 µm) are likely kaolinite, while smectite and illite dominate the smaller size fraction. These clay minerals, particularly smectite and illite, are known to retain cations such as lithium via incorporation into the octahedral layer of the mineral structure and through cation exchange processes.

Partition coefficients values (K_d) for lithium, potassium, and sodium were calculated using mass measurements and total metal concentrations in the solid materials separated from the groundwater samples during filtration and the filtered groundwater concentrations. Details about the K_d calculation are provided in the previous ASD (Geosyntec 2019b). K_d values for groundwater and particulates collected from wells B-2, B-3, and AD-32 were comparable to literature K_d values reported for organic-rich media such as bogs and peat beds (Sheppard et al. 2009, Sheppard et al. 2011), providing further evidence that lithium mobility in site groundwater is similar to other sites with organic-rich soils (**Table 6**). Additionally, the calculated K_d values for Pirkey soils were consistent with the literature, with potassium having the highest K_d (greatest affinity for sorption) and sodium the lowest K_d (least affinity for sorption). Furthermore, the values are similar for groundwater from all three wells, suggesting a universal mechanism controlling lithium, sodium, and potassium mobility in groundwater.

These multiple lines of evidence show that elevated lithium concentrations at AD-31 and AD-32 are likely not due to a release from the EBAP, and instead can be attributed to natural variation (Type IV ASD). This variation appears related to the distribution of clay fractions associated with lignite materials in the soil aquifer material.

3.2 Sampling Requirements

As the ASD presented above supports the position that the identified SSLs are not due to a release from the Pirkey EBAP, 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 for cobalt and lithium identified during assessment monitoring in June 2023 were not due to a release from the EBAP. The identified SSLs should instead be attributed to natural variation in the underlying geology. Therefore, no further action is warranted, and the Pirkey EBAP will remain in the assessment monitoring program. Certification of this ASD by a qualified professional engineer is provided in **Attachment E.**

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TABLES

Table 1: Summary of Key Cobalt Analytical Data
East Bottom Ash Pond - H.W. Pirkey Plant

Geosyntec Consultants, Inc.

Sample	Sample Date	Unit	Cobalt Concentration
Bottom Ash (Solid Material)	2/11/2019	mg/kg	6.1
SPLP Leachate of Bottom Ash	2/11/2019	mg/L	<0.01
EBAP Pond Water	2/28/2023	mg/L	0.0035
AD-2 - Average	May 2016 - June 2023	mg/L	0.0155
AD-31 - Average	May 2016 - June 2023	mg/L	0.0121
AD-32 - Average	May 2016 - June 2023	mg/L	0.0413

Notes:
1. Average values were calculated using all cobalt data collected under 40 CFR 257 Subpart D, excluding any identified outliers.
mg/kg : milligram per kilogram
mg/L : milligram per liter
SPLP : synthetic precipitation leaching procedure

Table 2: Soil Cobalt Data *Geosyntec Consultants, Inc.*
East Bottom Ash Pond - H.W. Pirkey Plant

Location ID	Location	Sample Depth (ft bgs)	Cobalt (mg/kg)
Bulk Soil Samples			
AD-2	EBAP Network	25-27	9.45
		31-33	19.2
AD-18	EBAP Network	8	3.60
		22	2.90
AD-31	EBAP Network	12	1.90
		26	0.83
AD-32	EBAP Network	11	1.70
		20-25	9.10
AD-41	Upgradient	15	< 1.0
		35	23.5
		95	1.90
B-2	Upgradient	10	2.36
		16	3.62
		71	10.30
		82	7.21
		87	3.11
B-3	Upgradient	10	1.30
		20	0.59
		97	1.11
Solid Material Retained After Filtration			
AD-32	EBAP Network	13-33	5.4
B-2	Upgradient	38-48	4.3
B-3	Upgradient	29-34	12.0
		VAP 40-45	18.0

Notes:

1. For AD-XX locations, samples were collected from additional boreholes advanced in the immediate area of the location identified by the well ID. Samples were not collected from the cuttings of the borings advanced for well installation. Samples for B-2 and B-3 locations were collected from cores removed from the borehole during well lithology logging.

2. Depths for samples collected after filtration represent the screened interval for the permanent well where the sample was collected.

ft bgs: feet below ground surface
mg/kg: milligram per kilogram

Table 3: X-Ray Diffraction Results
East Bottom Ash Pond - H. W. Pirkey Plant

Constituent	VAP-B3-(40-45)
Quartz	15
Plagioclase Feldspar	0.5
Orthoclase	ND
Calcite	ND
Dolomite	ND
Siderite	0.5
Goethite	ND
Hematite	2
Pyrite	3
Kaolinite	42
Chlorite	4
Illite/Mica	6
Smectite	12
Amorphous	15

Notes:
1. Results given in units of relative % abundance
2. VAP-B3-(40-45) is the centrifuged solid material from the groundwater sample collected at that interval.
ND: Not detected

Table 4: Summary of Key Lithium Analytical Data
East Bottom Ash Pond - H.W. Pirkey Plant

Sample	Sample Date	Unit	Lithium Concentration
Bottom Ash (Solid Material)	2/11/2019	mg/kg	0.82 J
SPLP Leachate of Bottom Ash	2/11/2019	mg/L	0.011 J
EBAP Pond Water	2/28/2023	mg/L	0.0653
AD-31 - Average	May 2016 - June 2023	mg/L	0.0818
AD-32 - Average	May 2016 - June 2023	mg/L	0.0843

Notes:
1. Average lithium values for monitoring wells AD-31 and AD-32 were calculated using all lithium data collected under 40 CFR 257 Subpart D, excluding statistically identified outliers.
J : Estimated value. Result is less than the reporting limit but greater than or equal to the method detection limit.
mg/kg : milligram per kilogram
mg/L : milligram per liter

Table 5: Soil Lithium Data
East Bottom Ash Pond - H.W. Pirkey Plant

Geosyntec Consultants, Inc.

Location ID	Sample Depth (ft bgs)	Lithium (mg/kg)
Bulk Soil Sample		
AD-32*	11	0.53
	20-25	1.60
B-2	10	5.30
	16	3.97
	71	7.42
	87	13.10
B-3	10	3.64
	20	2.59
	97	11.10
Lignite	N/A	2.9 J
Solid Material Retained After Filtration		
AD-32*	13-33	9.8 J
B-2	38-48	6.5 J
B-3	29-34	7.8 J
	VAP 40-45	13.0

Notes:

1. Depths for samples collected after filtration represent the screened interval for the permanent well where the sample was collected.

* : AD-32 samples were collected from a seperate borehole advanced near monitoring well AD-32

ft bgs : feet below ground surface

J : estimated value

mg/kg : milligram per kilogram

VAP : vertical aquifer profiling

Table 6: Calculated Site-Specific Partition Coefficients
Pirkey Plant - East Bottom Ash Pond

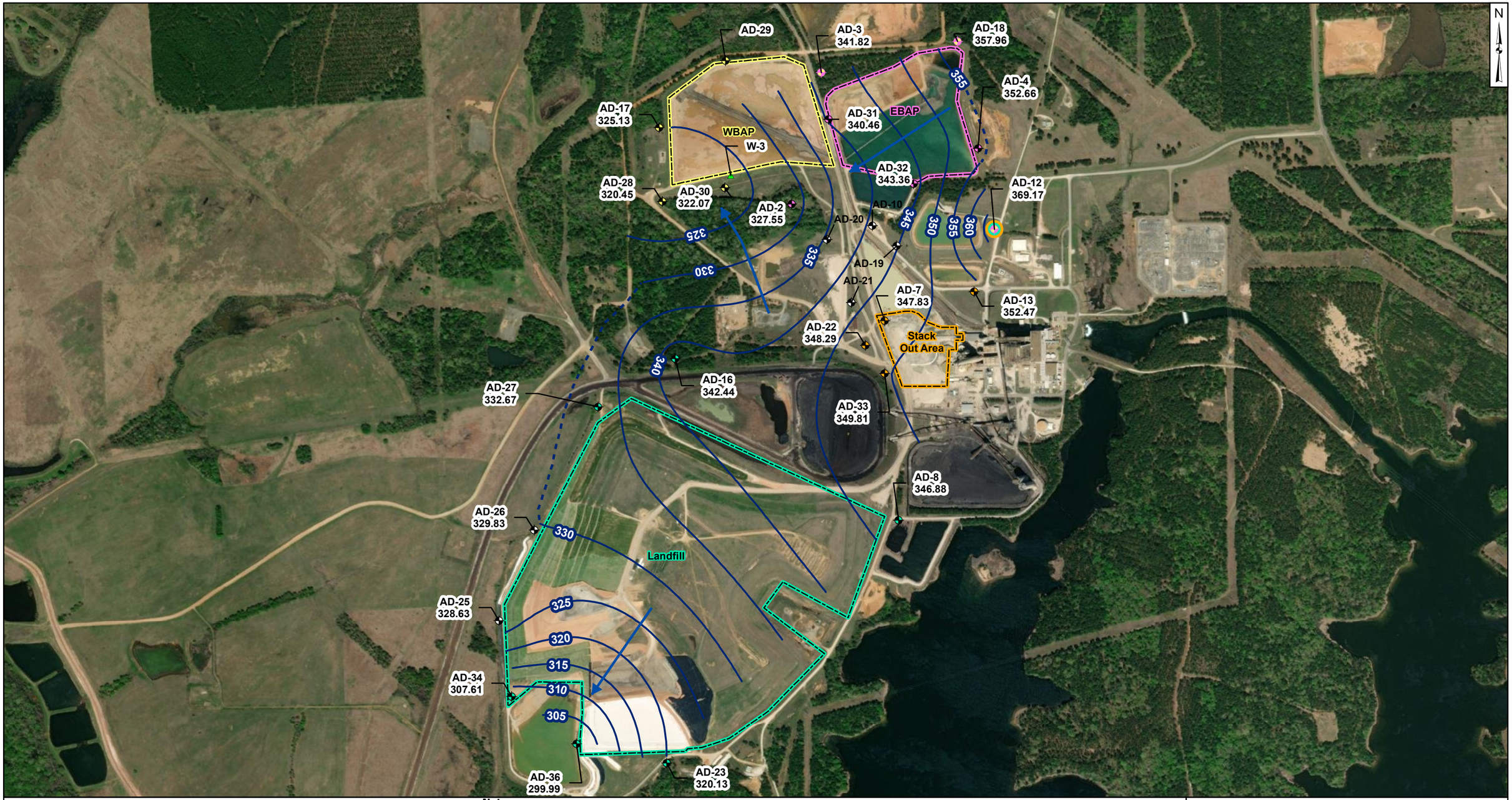
Source	B-2			Literature Value
Unit	mg/L	mg/kg	L/kg	L/kg
Element	**Aqueous Phase**	**Adsorbed**	**Kd**	**Kd**
Li	0.081	6.5	80	43-370
K	2.6	1100	423	42-1200
Na	14	130	9	5.2-82

Source	B-3			Literature Value
Unit	mg/L	mg/kg	L/kg	L/kg
Element	**Aqueous Phase**	**Adsorbed**	**Kd**	**Kd**
Li	0.097	7.8	80	43-370
K	2.9	1100	379	42-1200
Na	32	240	8	5.2-82

Source	AD-32*			Literature Value
Unit	mg/L	mg/kg	L/kg	L/kg
Element	**Aqueous Phase**	**Adsorbed**	**Kd**	**Kd**
Li	0.11	9.8	89	43-370
K	3.9	1800	462	42-1200
Na	57	220	4	5.2-82

Notes:
1. Adsorbed values are total metals concentrations reported by USEPA Method 6010B.
2. Literature values represent maximum and minimum values for the parameter as reported in Sheppard et al, 2009 (Table 4-1, all sites) and Sheppard et al, 2011 (Table 3-3 cultivated peat and wetland peat only).
* : AD-32 samples were collected from a separate borehole advanced near monitoring well AD-32
Kd : partition coefficient
L/kg : liters per kilogram
mg/kg : milligrams per kilogram
mg/L : milligrams per liter

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 AEP.
2. Site features based on information available in 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 WBAP

- AEP: American Electric Power
- CCR: coal combustion residuals
- EBAP: East Bottom Ash Pond
- WBAP: West Bottom Ash Pond

1,000 500 0 1,000 Feet

STATE OF TEXAS
BETH ANN GROSS
79864
LICENSED PROFESSIONAL ENGINEER

10/16/2023

Geosyntec Consultants. Inc.
Texas Firm
Registration No. 1182

Potentiometric Contours: Uppermost Aquifer
June 2023

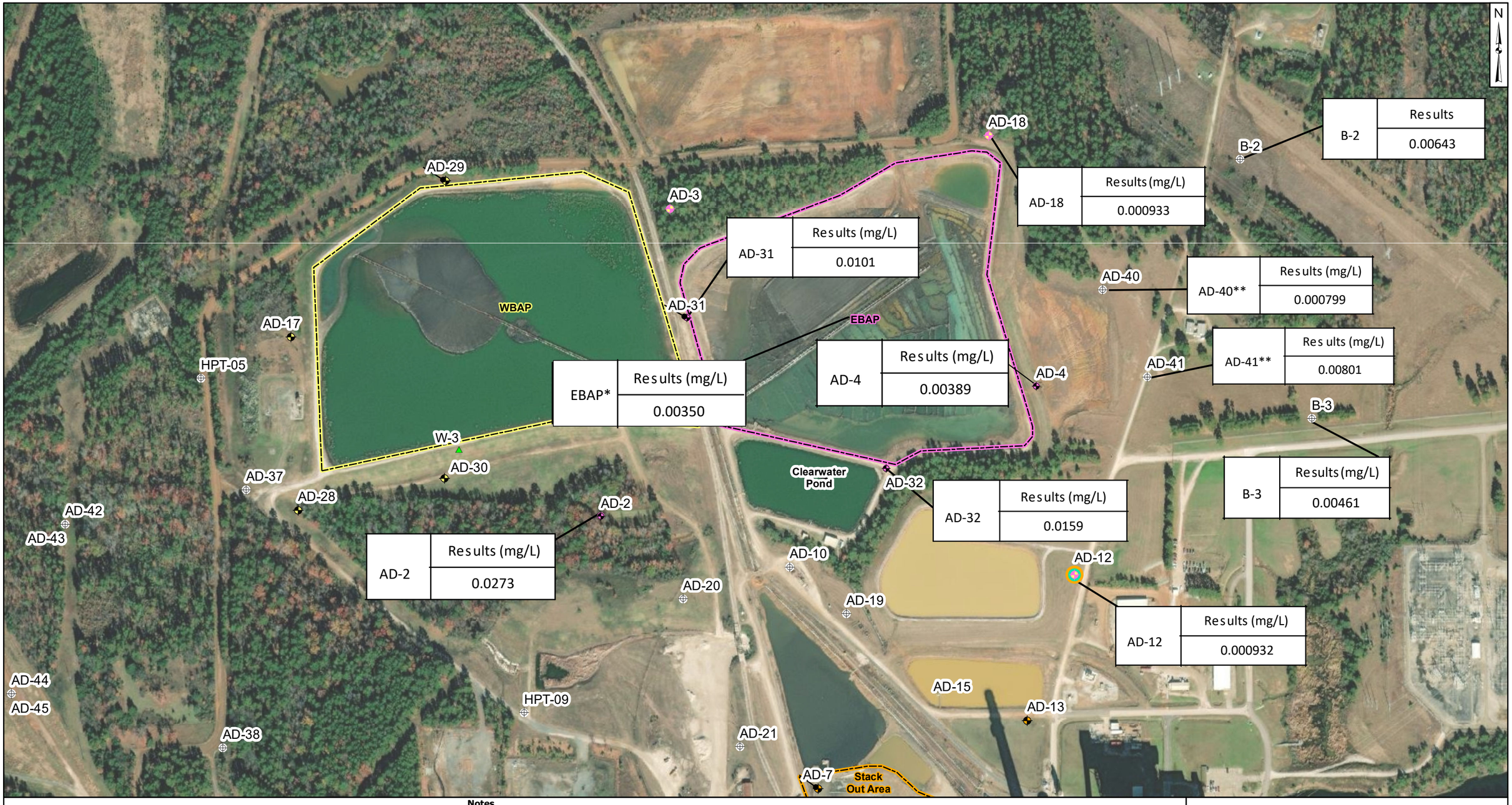
AEP Pirkey Power Plant
Hallsville, Texas

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.



Legend

- Out of Network
- EBAP
- WBAP
- Landfill
- Stackout Area
- EBAP and WBAP
- All CCR Unit Networks
- Piezometer
- EBAP
- WBAP

Notes

1. Monitoring well coordinates, site features, and data provided by AEP.
2. AD-15 location is approximated.
3. Samples collected in June 2023.
4. *: Porewater sample from East Bottom Ash Pond (EBAP) was collected in February 2023.
5. ** : Well most recently sampled August 2019.
6. Samples show in milligrams per liter (mg/L)

AEP: American Electric Power
CCR: coal combustion residuals
EBAP: East Bottom Ash Pond
mg/L: milligrams per liter
WBAP: West Bottom Ash Pond

400 200 0 400 Feet

Aqueous Cobalt Distribution

AEP Pirkey Power Plant
Hallsville, Texas

Geosyntec consultants

Columbus, Ohio | 2023/10/02

Figure **2**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Pirkey\2021\AEP_Pirkey_Cobalt_GW_20210429.mxd. HDuff. 4/29/2021. Project/Phase/Task.

Location	AD-31	
Depth (ft bgs)	12	26
Cobalt (mg/kg)	1.9	0.83
Pyrite/Marcasite (%)	2	0

Location	AD-18	
Depth (ft bgs)	8	22
Cobalt (mg/kg)	3.6	2.9
Pyrite/Marcasite (%)	1	0

Location	B-2				
Depth (ft bgs)	10	16	71	82	87
Cobalt (mg/kg)	2.36	3.62	10.30	7.21	3.11
Pyrite/Marcasite (%)	-	-	-	-	-

Location	AD-41		
Depth (ft bgs)	15	35	95
Cobalt (mg/kg)	< 1.0	23.5	1.9
Pyrite/Marcasite (%)	-	-	-

Location	AD-2	
Depth (ft bgs)	25–27	31–33
Cobalt (mg/kg)	9.45	19.2
Pyrite/Marcasite (%)	7	2

Location	B-3		
Depth (ft bgs)	10	20	97
Cobalt (mg/kg)	1.30	0.59	1.11
Pyrite/Marcasite (%)	-	-	-

Location	AD-32	
Depth (ft bgs)	11	20–25
Cobalt (mg/kg)	1.7	9.1
Pyrite/Marcasite (%)	--	--

AD-29, AD-3, AD-18, B-2, AD-40, AD-31, AD-17, WBAP, EBAP, HPT-05, AD-4, AD-41, B-3, W-3, AD-30, AD-37, AD-28, AD-2, Clearwater Pond, AD-32, AD-10, AD-12, AD-20, AD-19

N

Legend

- Monitoring Wells
- EBAP
- WBAP

Notes

1. Monitoring well coordinates provided by AEP.
2. AD-2 sample collected on April 20, 2020
3. All other data provided by AEP, 2019.

--: not analyzed.
AEP: American Electric Power
EBAP: East Bottom Ash Pond
ft bgs: feet below ground surface.
mg/kg: milligrams per kilogram.
WBAP: West Bottom Ash Pond

300 150 0 300
Feet

Cobalt Distribution in Soil

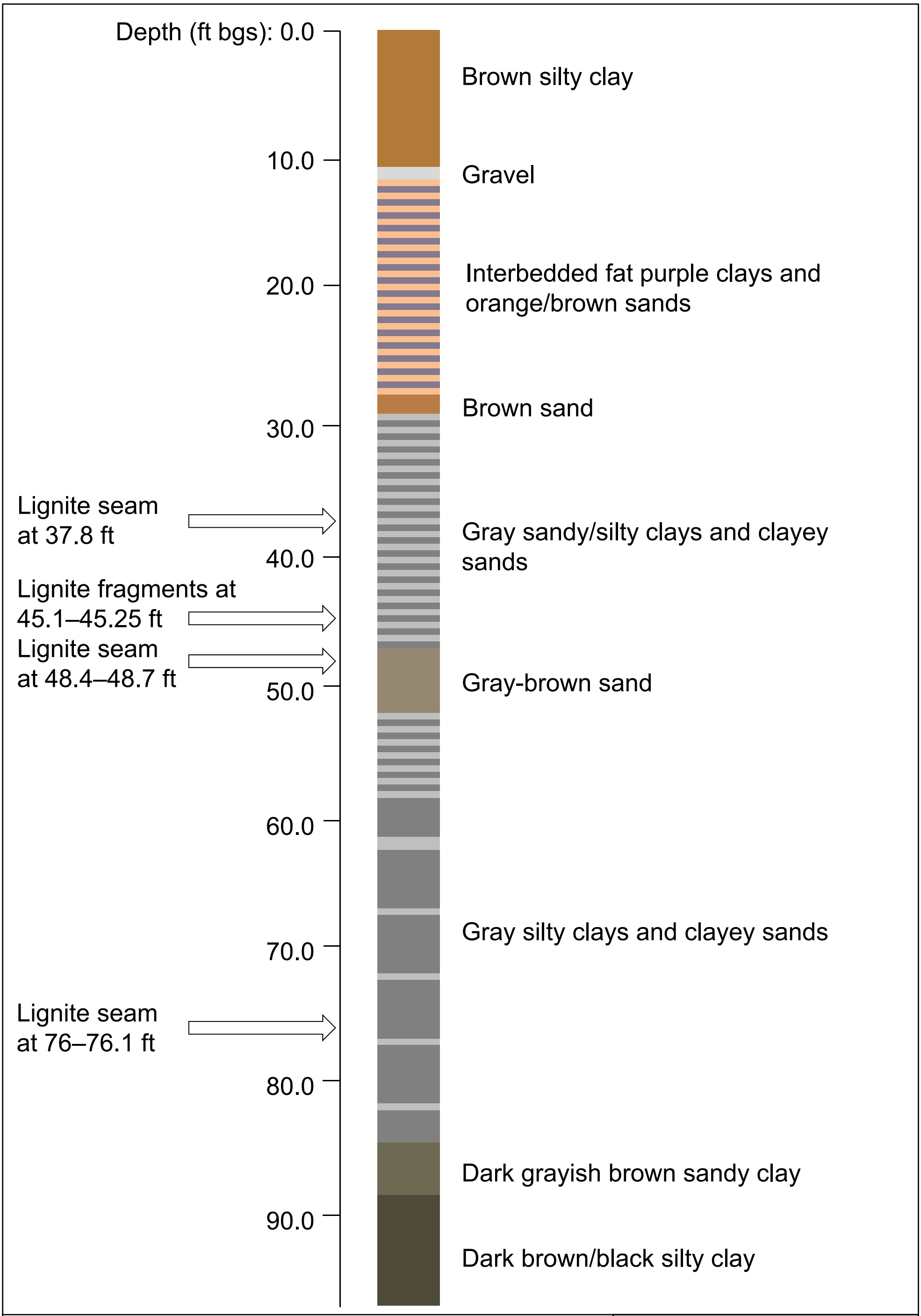
AEP Pirkey Power Plant
Hallsville, Texas

Geosyntec consultants

Columbus, Ohio | 2023/10/13

Figure 3

\\annarbor-01\data\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Pirkey\2019\20201218 Pirkey_SoilChem_minerals_March2019_new.mxd. CChristenson. 12/22/2020. Project/Phase/Task.



Notes:
1. Well installed in offset boring screened at 29-34 ft bgs
2. Boring completed May 2019
3. Total depth of 97.5 ft bgs

AEP: American Electric Power
bgs: below ground surface
ft: feet

B-3 Visual Boring Log

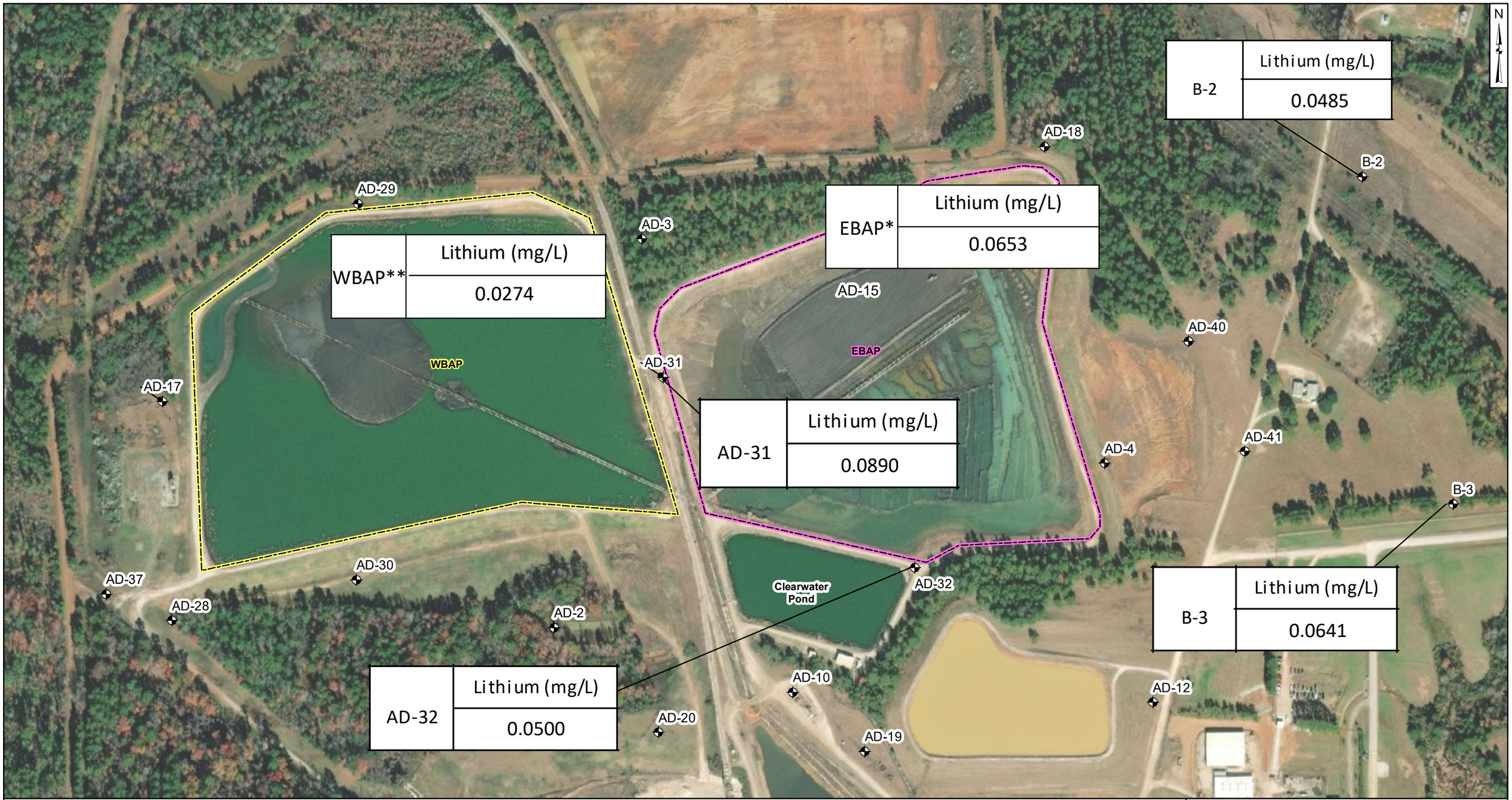
AEP Pirkey Powerplant
Hallsville, Texas

Geosyntec consultants

Columbus, Ohio | October 2023

Figure 4

\\annarbor-01\data\Projects\AEP\Legal Department - ASD Review\Pirkey\2019-05 Field Investigation\Field Forms\Compiled Boring Logs\Visual boring logs



Legend

- Monitoring Well
- EBAP
- WBAP

Notes

1. Lithium concentrations in milligrams per liter (mg/L).
2. Monitoring well coordinates, site features, and data provided by AEP.
3. Groundwater samples were collected in June 2023.
4. *: Porewater sample from East Bottom Ash Pond (EBAP) was collected in February 2023.
5. **: Porewater sample from West Bottom Ash Pond (WBAP) was collected in 2022.

AEP: American Electric Power

300 150 0 300
Feet

Aqueous Lithium Distribution

AEP Pirkey Power Plant
Hallsville, Texas

Geosyntec consultants

Columbus, Ohio | 2023/10/02

Figure **5**

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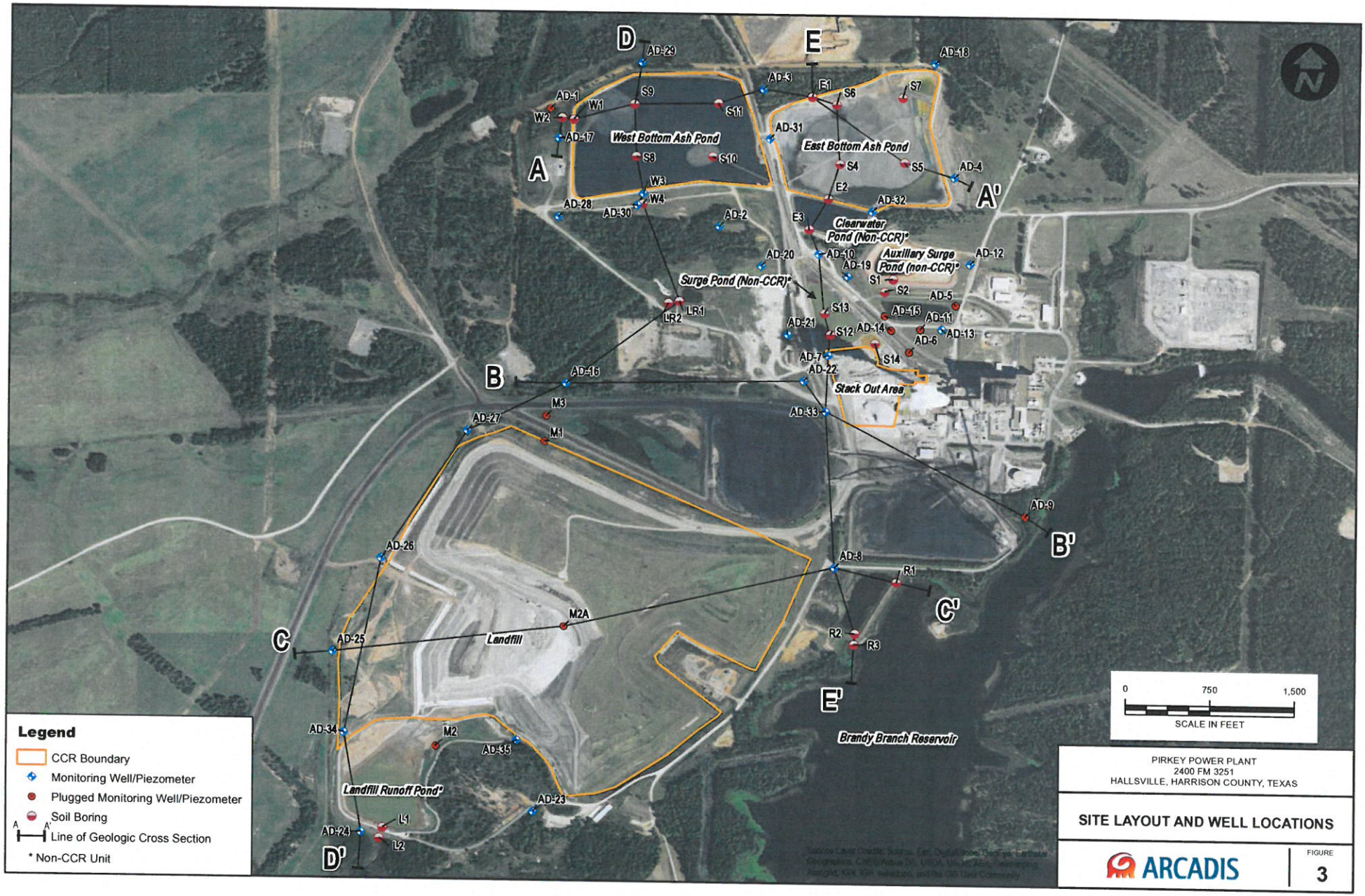
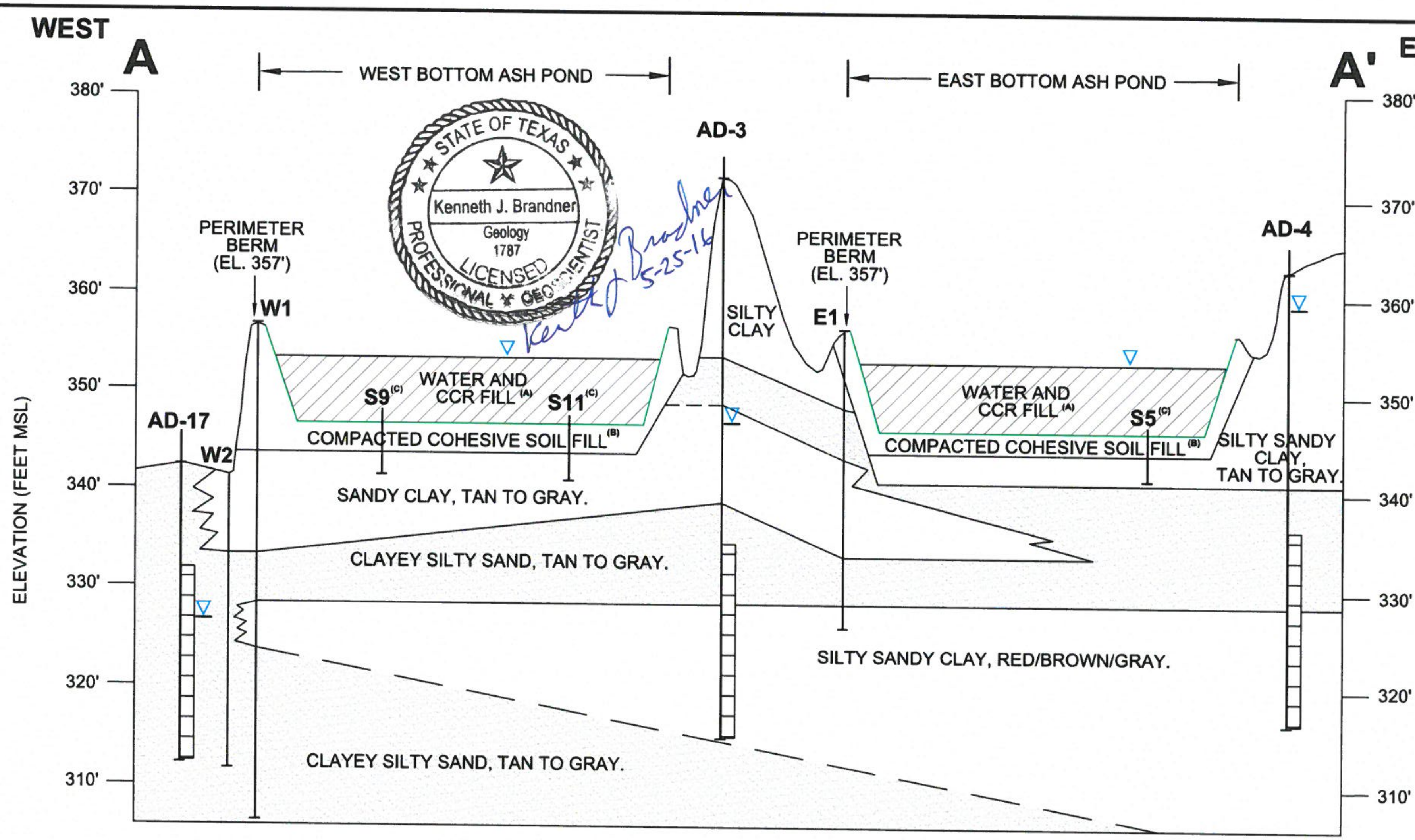
ATTACHMENT A
Geologic Cross Section A-A’


D
E
A
A'
B
B'
C
C'
D'
E'
AD-29
AD-18
AD-3
AD-1
E1
S6
S7
S9
W1
S11
W2
AD-17
West Bottom Ash Pond
AD-31
East Bottom Ash Pond
S8
S10
S4
S5
AD-4
W3
E2
W4
AD-28
AD-30
AD-2
AD-32
E3
Clearwater Pond (Non-CCR)*
AD-20
AD-10
Auxiliary Surge Pond (non-CCR)*
AD-12
AD-19
S1
Surge Pond (Non-CCR)*
S2
AD-5
LR1
LR2
S13
AD-15
AD-11
AD-21
S12
AD-14
AD-13
AD-6
AD-7
S14
AD-16
AD-22
Stack Out Area
M3
AD-27
AD-33
M1
AD-9
AD-26
AD-8
R1
M2A
AD-25
Landfill
R2
R3
AD-34
M2
AD-35
Landfill Runoff Pond*
AD-23
AD-24
L1
L2
Brandy Branch Reservoir
0
750
1,500
SCALE IN FEET
Legend
CCR Boundary
Monitoring Well/Piezometer
Plugged Monitoring Well/Piezometer
Soil Boring
Line of Geologic Cross Section
* Non-CCR Unit
PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE, HARRISON COUNTY, TEXAS
SITE LAYOUT AND WELL LOCATIONS
ARCADIS
FIGURE
3
Document Path: Z:\GIS\PROJECTS_ENVAEP\Pirkey Plant\MXD\Figure 3 - Site Layout and Well Locations.mxd



LEGEND

MONITORING WELL SCREENED INTERVAL

WATER LEVEL IN MONITORING WELL (1/20/16)

BASE OF CCR UNIT

0 300'
HORIZONTAL SCALE

NOTES:

A) TOP OF WEST BOTTOM ASH POND AND EAST BOTTOM ASH POND PERIMETER BERM ELEVATION IS 357', OPERATING ELEVATION IS 354'(JOHNSON & PACE, MAY 2011). BASE ELEVATION OF WEST BOTTOM ASH POND AND EAST BOTTOM ASH POND IS 347' (SARGENT & LUNDY, JANUARY 1983).

B) COMPACTED COHESIVE SOIL FROM ELEVATION 344' TO 347' (SARGENT & LUNDY, SEPTEMBER 1984;AMEC, AUGUST 2011).

C) SOIL BORING INSTALLED BY SOUTHWESTERN LABORATORIES DURING ASH POND CONSTRUCTION IN 1983.

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

CROSS SECTION
A - A'

ARCADIS

FIGURE
4

ATTACHMENT B
SB-2 Boring Log

PROJECT NO. _____ PROJ. _____ BOR. NO. SB-2

LOCATION AD-2/MW-2 - Pirkey Power Plant ELEV. _____ DATE 4/20/20

SILTS & SANDS		COHESIVE SOILS - CLAYS			COLORS	MATERIALS	SAND ADJ.	CHARACTERTICS
CONDITION		CONSISTENCY	PENETROMETER	N - VALUE	Li .... Light .....Br ....Brown	Cl ..... Clay, Clayer	F.....Fine	Calc ..... Calcareous
VLo ..... Very Loose	0- 4	Vso.. Very Soft	0 - 0.25	<2	Dk ... Dark .....Bk ....Black	Si ..... Silt, Silty	M ....Medium	Lig ..... Lignite
Lo ..... Loose	4-10	So.... Soft	0.25 - 0. 5	2 - 4	G ..... Grey .....Bl ....Blue	Sa .... Sand, Sandy	Co....Coarse	Org ..... Organic
MDe ..... Med. Dense	10-30	Mst.. Stiff	0.5 - 1.0	4 - 8	T ..... Tan .....Gr ....Grenn	Ls .... Limestone	Si.....Silty	Lam ..... Laminate
De ..... Dense	30-50	St..... Stiff	1.0 - 2.0	8 - 15	R ..... Red .....Y .....Yellow	Gr .... Gravel		Sls ..... Slickensided
VDe ..... Very Dense	>50	VSt.. Very Stiff	2.0 - 4.0	15 - 30	Rdish.Reddish.Wh ...White	SiS ... Siltstone		SL ..... Slightly
		H..... Hard	> 4.0	>30		SS .... Sandstone		Sm(s) ... Seam (s)
						Sh..... Shale, Shaley		Nod ..... Nodules

Sample Interval TEST ASSIGNMENT	SAMPLE NO. Recovery	DEPTH FT.	SAMPLES	STRATUM DESCRIPTION: CONDITION OR CONSISTENCY	COLOR	MINOR MATERIALS OR ADJECTIVES	PREDOMINATE MATERIAL	CHARACTERISTICS OR MODIFICATIONS	STANDARD PENETROMETER: SEAT - 6"	1st - 6"	2nd - 6"	UNIFIED SOIL CLASSIFICATION	N - VALUE OR HAND PENETROMETER
SM	0-5 2' Rec	0		0-8'	Br, Lt. Rd Br	Si	Sa	Silty Sand - trace clay, trace root hairs, moist.					
												moist	(0-5')
8'	5-10 2.5' Rec				Lt. Rd. Br			- thin lenses (less than 1/4")				moist	(5-10')
								at 7.5', trace iron staining					
Cl	10-15 4' Rec	8		8-14.5	Lt. Rd Br, Rd Br, Gray	Sa, Si	Cl	Clay - some silty sand and silty clayey sand in interbeds to 14.5', trace iron oxide gravel in sand seams @ 10.5', 12', 12.5'				moist	(10-15')
14.5'													
	15-20 2' Rec	14.5		14.5-39'	Rd Br, Yllw. Br, Gray	Si, Cl	Sa	silty/clayey Sand - some sandy clay, iron cemented sand @ 16.5' and ironstone (1.5")				v. moist to moist	(15-20')
	20-25' * No Rec.							- cemented sand seams in silty sand @ 20-25'				v. moist	(20-25')
SC	25-30' 2.5' Rec				Gray - DK Gray DK. Br			- gravel & cemented sand seam @ 25'	(6")			sat. @ 25'-25.5'	
								- cemented sand, partially cemented					
					(25-39')			clayey silty sand @ 25.5'				moist	25.5-27
								- dark gray silty sat sand seam @ 27'	(2")			sat. @ 27.0'	(2")
	30-35 3' Rec							- sat. silty sand seam @ 30.5'	(1")			sat. @ 30.5'	(1")
								- sat. silty sand seam @ 32'	(3")				32.0 (3")
39'								* some v.f. gypsum, dry stalk in clayey sand between sat. sand seams (25-40')				v. moist (to 39')	
ML	35-40 4' Rec	39		39-46	Lt. Gray, Gray (39-46')	Cl, Si	Si	Clayey sandy silt, - interbedded silt + clay @ 39' to 40'				moist	(39-40')
								B.T. @ 40'					
								* 25-27' collected @ 1015					
								* 31-33' collected @ 1035					

Type Boring HSA Dry Auger [X] Rotary Wash [ ]

SEEPAGE @ 25' FT. WHILE DRILLING, W.L. @ ___ FT. ON COMPL.
(OR) BAILED TO ___ FT. UPON COMPLETION.
W.L. @ ___ FT AND CAVED TO ___ FT. ON _____.

* GPS: 32.46522, -94.49032 (12' E, 3.5' N of AD-2/MW-2)

ATTACHMENT C
SB-2 Boring Photographic Log

GEOSYNTEC CONSULTANTS
Photographic Record

Geosyntec consultants

Client: AEP **Project Number: CHA8495**

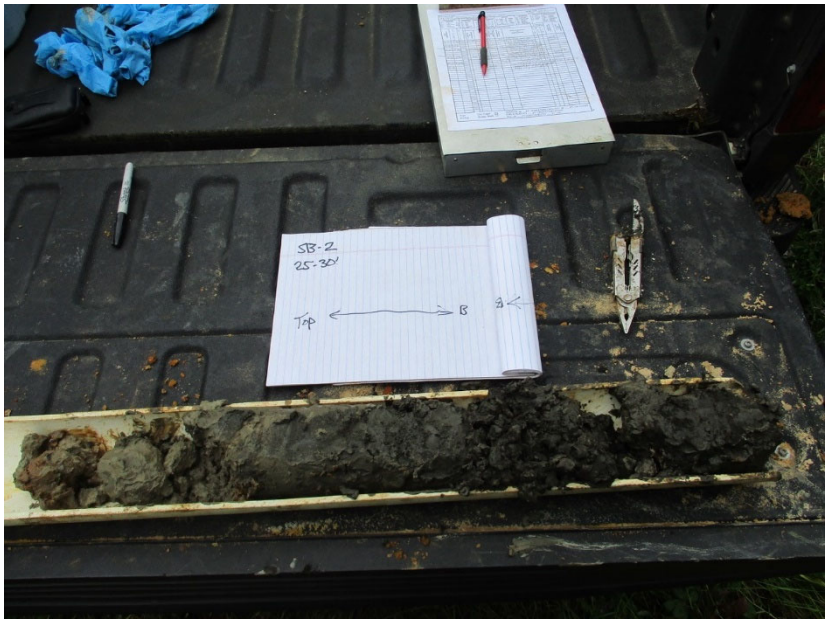
Site Name: Pirkey East Bottom Ash Pond **Site Location: Hallsville, Texas**

Photograph 1 **Date: 4/21/2020** **Direction: N/A** **Comments:** 0-5 foot interval of SB-2.	
Photograph 2 **Date: 4/21/2020** **Direction: N/A** **Comments:** 5-10 foot interval of SB-2.	

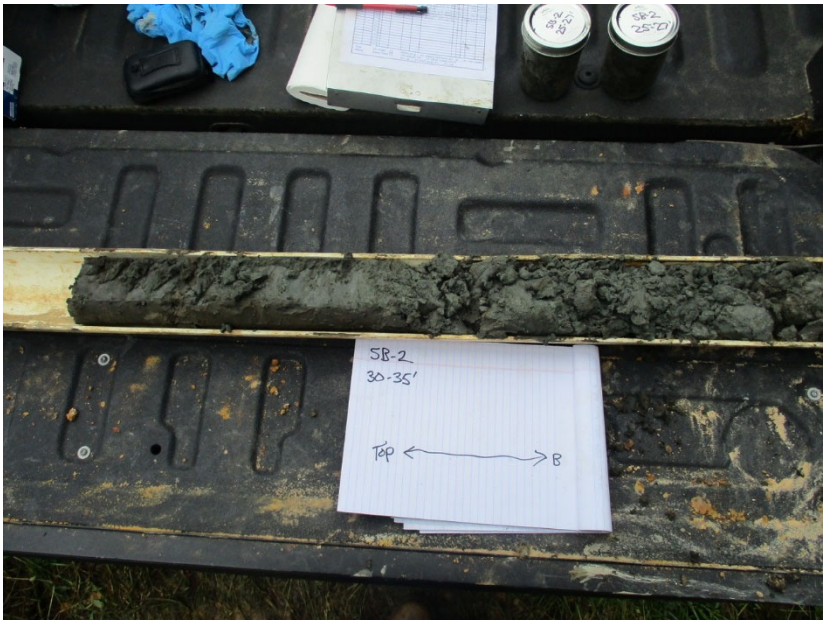
GEOSYNTEC CONSULTANTS Photographic Record	Geosyntec consultants
Client: AEP	**Project Number: CHA8495**
Site Name: Pirkey East Bottom Ash Pond	**Site Location: Hallsville, Texas**

Photograph 3 **Date: 4/21/2020** **Direction: N/A** **Comments:** 10-15 foot interval of SB-2.	
Photograph 4 **Date: 4/21/2020** **Direction: N/A** **Comments:** 15-20 foot interval of SB-2. Recovery of this interval was limited.	

GEOSYNTEC CONSULTANTS Photographic Record	Geosyntec consultants
Client: AEP	**Project Number: CHA8495**
Site Name: Pirkey East Bottom Ash Pond	**Site Location: Hallsville, Texas**

Photograph 5 **Date: 4/21/2020** **Direction: N/A** **Comments:** 20-25 foot interval of SB-2. Recovery of this interval was limited.	
Photograph 6 **Date: 4/21/2020** **Direction: N/A** **Comments:** 25-30 foot interval of SB-2. Very little of this interval was recovered. A color change was observed from red to dark brown/black. A sample was collected from this interval.	

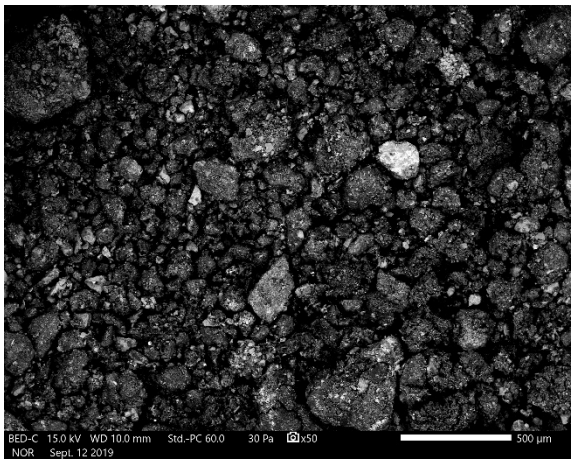
GEOSYNTEC CONSULTANTS Photographic Record	Geosyntec consultants
Client: AEP	**Project Number: CHA8495**
Site Name: Pirkey East Bottom Ash Pond	**Site Location: Hallsville, Texas**

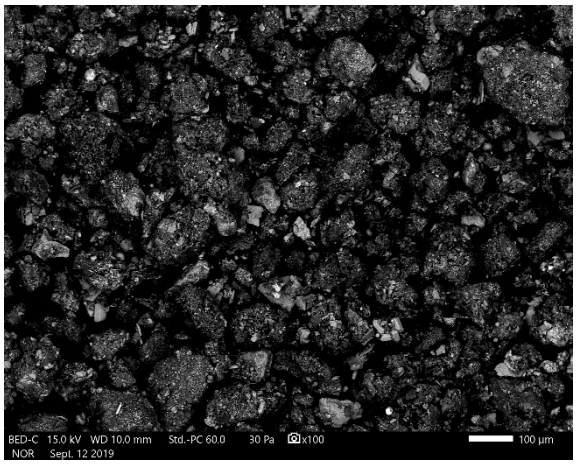
Photograph 9 **Date: 4/21/2020** **Direction: N/A** **Comments:** 30-35 foot interval of SB-2. Very little of this interval was recovered.. A sample was collected from this interval.	
Photograph 10 **Date: 4/21/2020** **Direction: N/A** **Comments:** 35-40 foot interval of SB-2	

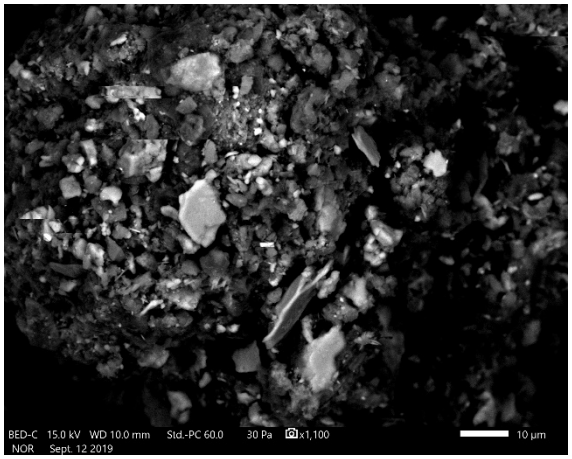
ATTACHMENT D
SEM/EDS Analysis

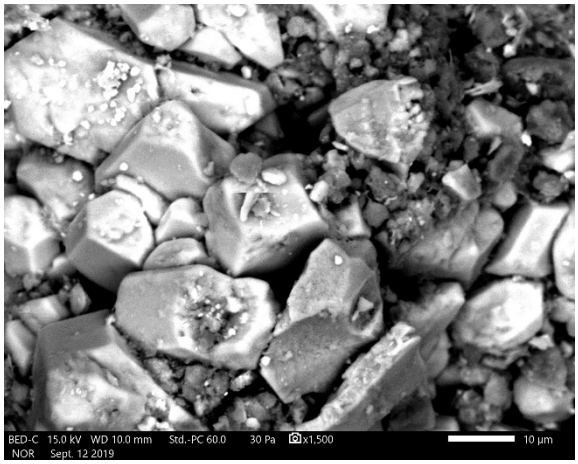
September 16, 2019

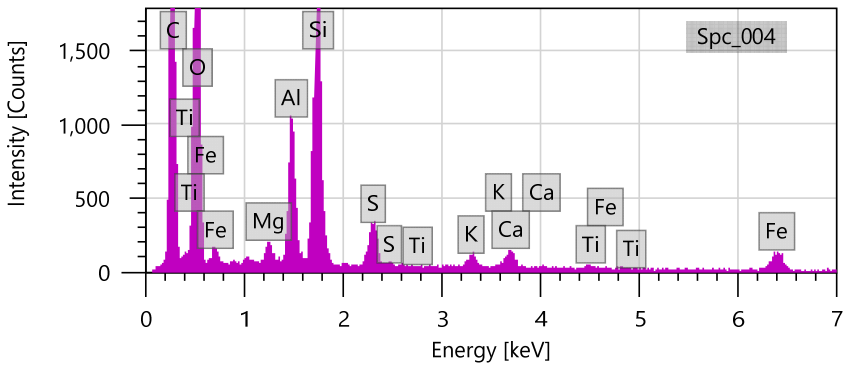
Dr. Bruce Sass
941 Chatham Lane, Suite 103, Columbus, OH 43221
via Email: BSass@geosyntec.com





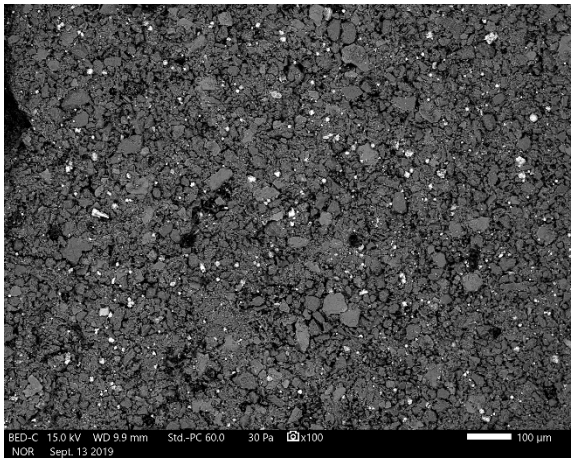


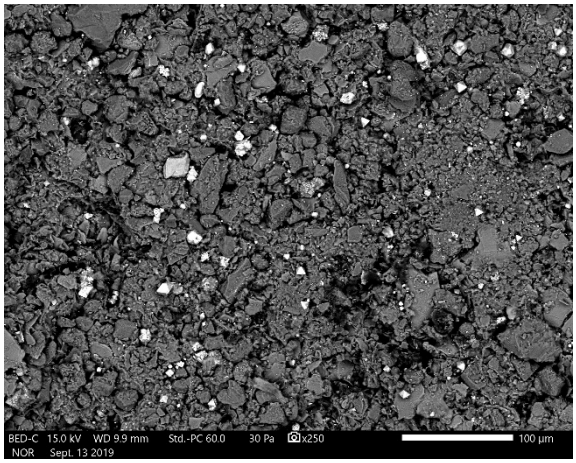


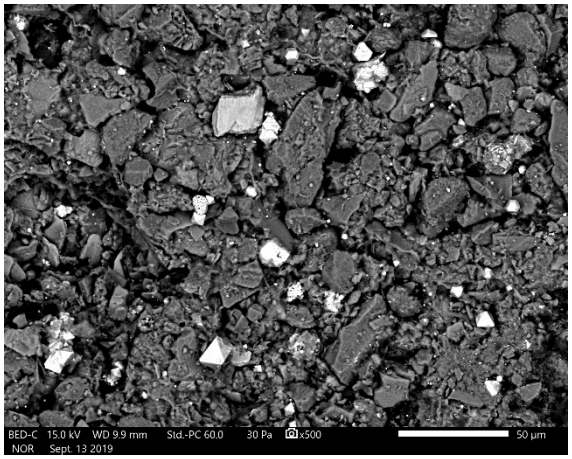


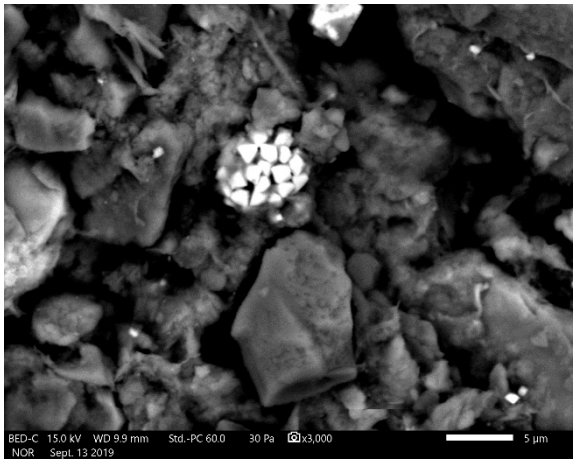
Lignite. Backscattered electron micrographs show the sample at 100X, 1,100X, and 1,500X. EDS spectrum at bottom is an area scan of the region shown in top right micrograph. Bright particles are mostly quartz and feldspar. Major peaks for carbon, oxygen, silicon, and aluminum suggest coal and clay.

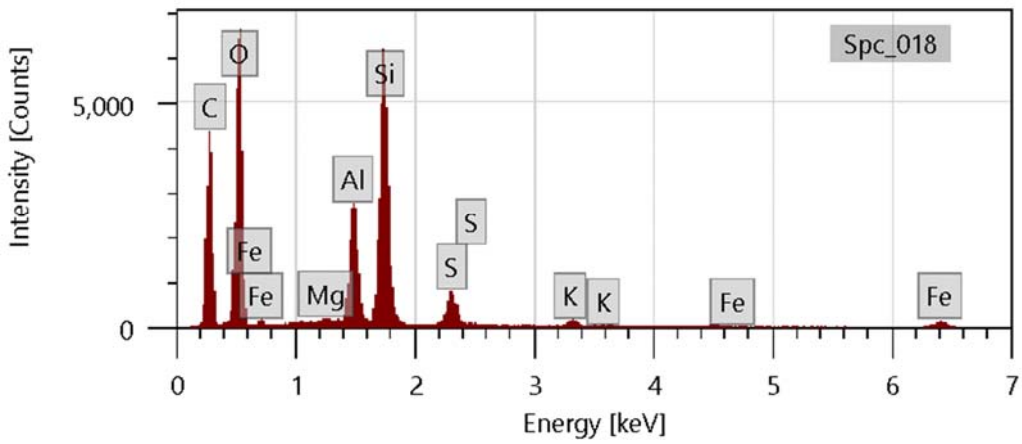
Geosyntec
CTLGroup 150350



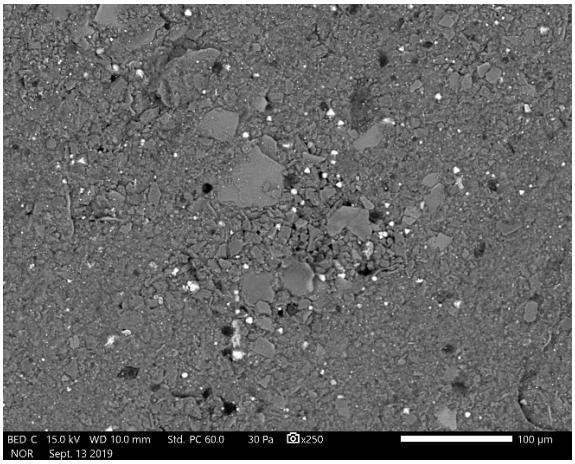


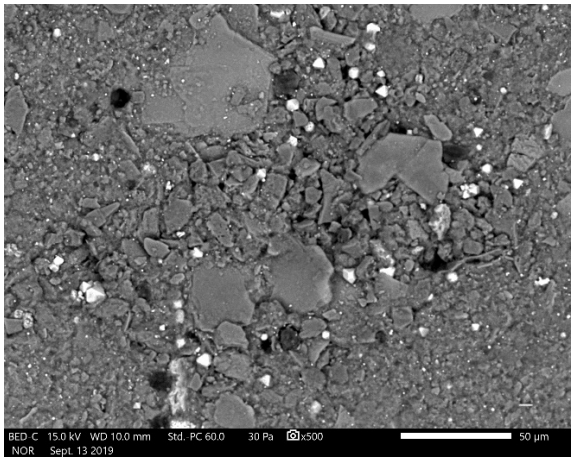


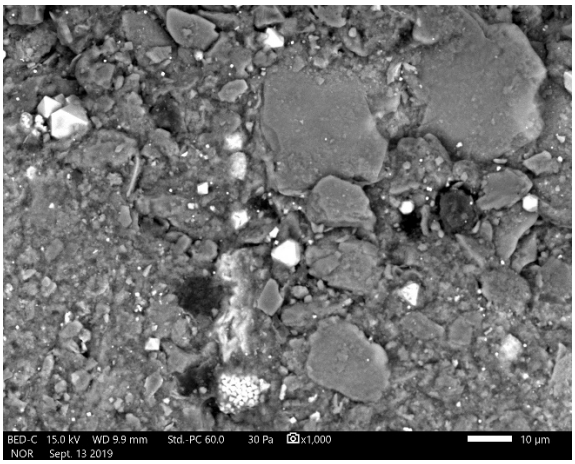


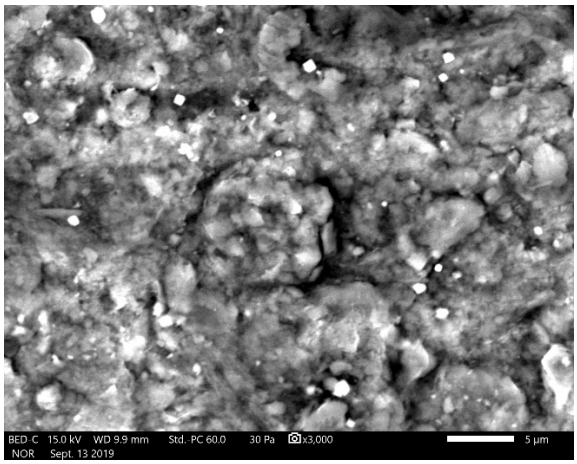


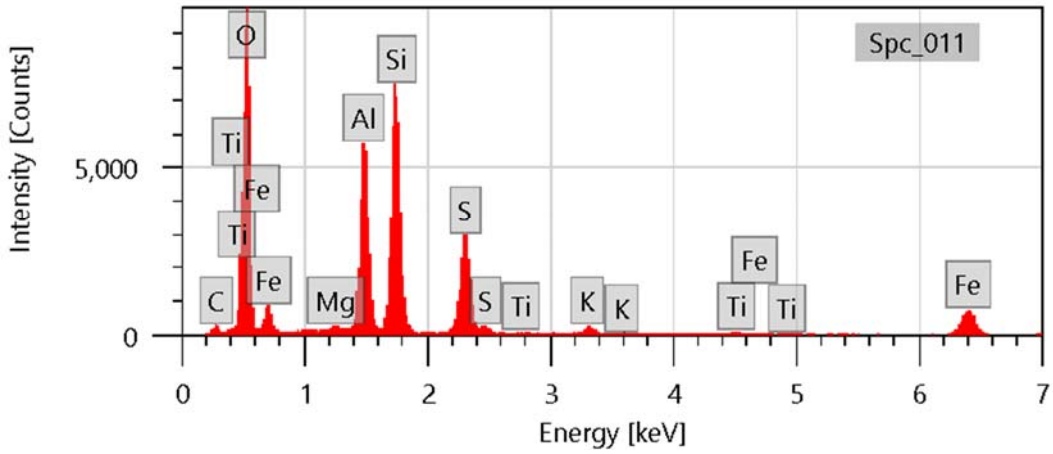
Sample VAP B3 40-45. Backscattered electron micrographs show the sample at 100X, 250X, 500X, and 3000X. EDS spectrum at bottom is an area scan of the region shown at 500X. Bright particles are pyrite (framboid in bottom right micrograph). Major peaks for carbon, oxygen, silicon, and aluminum suggest coal and clay.











Sample VAP B3 50-55. Backscattered electron micrographs show the sample at 250X, 500X, 1000X, and 3000X. EDS spectrum at bottom is an area scan of the region shown at 3000X. Bright particles are mostly pyrite (framboid in bottom left micrograph); occasional particles of Fe-Ti oxide are detected. Major peaks for oxygen, silicon, and aluminum suggest clay. Large blocky particles are mostly quartz, feldspar, and clay.

ATTACHMENT E
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 East Bottom Ash Pond 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	October 16, 2023
License Number	Licensing State	Date

Geosyntec consultants

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ALTERNATIVE SOURCE DEMONSTRATION REPORT TEXAS STATE CCR RULE

H.W. Pirkey Power Plant
East Bottom Ash Pond
Registration No. CCR104
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

October 2023

Geosyntec consultants

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LIST OF ACRONYMS

Å	angstrom
ASD	alternative source demonstration
bgs	below ground surface
CCR	coal combustion residuals
EBAP	East Bottom Ash Pond
EDS	energy-dispersive spectroscopy
EPRI	Electric Power Research Institute
GWPS	groundwater protection standard
LCL	lower confidence limit
mg/kg	milligram per kilogram
mg/L	milligram per liter
SEM	scanning electron microscopy
SPLP	Synthetic Precipitation Leaching Procedure
SSL	statistically significant level
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
USEPA	United States Environmental Protection Agency
VAP	vertical aquifer profiling
WBAP	West Bottom Ash Pond
XRD	X-ray diffraction

1. INTRODUCTION AND SUMMARY

This alternative source demonstration (ASD) report has been prepared to address statistically significant levels (SSLs) for cobalt and lithium in the groundwater monitoring network at the H.W. Pirkey Plant East Bottom Ash Pond (EBAP) in Hallsville, Texas, following the second semiannual assessment monitoring event of 2023. The H.W. Pirkey Plant has four coal combustion residuals (CCR) storage units, including the EBAP, regulated by the Texas Commission on Environmental Quality (TCEQ) under Registration No. CCR104 (**Figure 1**).

In August 2023, a semiannual assessment monitoring event was conducted at the EBAP in accordance with the Title 30 §352.951(a) of the Texas Administrative Code (TAC). The monitoring data were submitted to Groundwater Stats Consulting, LLC for statistical analysis. Groundwater protection standards (GWPSs) were established for each Appendix IV parameter in accordance with the statistical analysis plan developed for the unit (Geosyntec 2020a) and the United States Environmental Protection Agency (USEPA) document *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities: Unified Guidance* (USEPA 2009). The GWPS for each parameter was established as the greater of either the background concentration or the maximum contaminant level. To determine background concentrations, an upper tolerance limit was calculated using pooled data from the background wells collected during the background monitoring and assessment monitoring events.

Confidence intervals were recalculated for the Appendix IV parameters at the compliance wells to assess whether these parameters were present at an SSL above the GWPSs. An SSL was concluded if the lower confidence limit (LCL) of a parameter exceeded the GWPS (i.e., if the entire confidence interval exceeded the GWPS). The following SSLs were identified at the Pirkey EBAP (Geosyntec 2023a):

- The LCLs for cobalt exceeded the GWPS of 0.00939 milligrams per liter (mg/L) at AD-2 (0.0136 mg/L), AD-31 (0.00950 mg/L), and AD-32 (0.0309 mg/L).
- The LCL for lithium exceeded the GWPS of 0.0497 mg/L at AD-2 (0.0506 mg/L), AD-31 (0.0681 mg/L), and AD-32 (0.0746 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 cobalt and lithium in the groundwater monitoring network for the EBAP are from a source other than the EBAP.

1.2 Demonstration of Alternative Sources

An evaluation was completed to assess possible alternative sources to which the identified SSLs 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 cobalt and lithium were based on a Type IV cause and not by a release from the Pirkey EBAP.

2. SUMMARY OF SITE CONDITIONS

The EBAP design and construction, regional geology and site hydrogeology, and groundwater monitoring system and flow conditions are described below.

2.1 EBAP Design and Construction

The EBAP is a 31.5-acre CCR surface impoundment located at the north end of the Pirkey Plant, immediately east of the West Bottom Ash Pond (WBAP) (**Figure 1**). It was constructed while the Pirkey Plant was being developed in 1983 and 1984 and placed into operation in 1985 to receive bottom ash and economizer ash sluiced from the plant boiler. Bottom ash and economizer ash were periodically excavated from the EBAP and either removed via truck to the on-site landfill or sold for off-site beneficial reuse.

The EBAP was developed by excavating part of its perimeter into native soils to create an embankment height of approximately 4 feet, constructing compacted clay perimeter embankments, and constructing a compacted clay liner over the base of the pond (Arcadis 2016). Multiple lithological borings advanced after the installation of the clay liner confirm that at least 6 feet of clay was present below the base of the EBAP (Arcadis 2016). The bottom elevation of the EBAP was approximately 347 feet above mean sea level, and the elevation of the top of the pond embankment was approximately 357 feet above mean sea level. The unit was designed to have a maximum storage capacity of 188 acre-feet.

A Closure Plan was developed in October 2016 and revised in December 2021 (AEP 2021). This document detailed the closure activities which were to take place throughout the closure of the EBAP. AEP submitted a certified notification that the receival of CCR materials had ceased as of April 25, 2023 and the closure activities had been initiated (AEP 2023). As of October 2023, the EBAP has been dewatered and CCR materials plus one foot of underlying soil have been removed.

2.2 Regional Geology / Site Hydrogeology

The EBAP is positioned on an outcrop of the Eocene-age 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. Regionally, 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 found beneath an upper silty to silty sandy clay layer in the vicinity of the EBAP is considered to be the Uppermost Aquifer below this CCR unit (Arcadis, 2016). Here it is approximately 15-feet thick and located between an elevation of 325 and 340 feet mean sea level.

2.3 Groundwater Monitoring History and Flow Conditions

The EBAP monitoring well network monitors groundwater within the Uppermost Aquifer. Geologic cross section A-A' from the EBAP Groundwater Monitoring Well Network Report (Arcadis 2016), provided herein as **Attachment A,** shows the subsurface geometry of the Uppermost Aquifer (indicated on the figure as clayey silty sand, tan to gray) underlying the EBAP

and the WBAP and demonstrates lateral continuity of the Uppermost Aquifer spanning the entire length of the EBAP.

Groundwater flow direction in the area of the EBAP is west-southwesterly (**Figure 1**). Seasonal variability in groundwater flow has not been observed since the monitoring well network was installed. Groundwater flow velocities in the uppermost aquifer in the vicinity of the EBAP have been reported as approximately 6 to 44 feet per year. The EBAP monitoring well network consists of upgradient monitoring wells AD-4, AD-12, and AD-18 and compliance wells AD-2, AD-3, AD-31, and AD-32, all of which are screened within the Uppermost Aquifer.

3. ALTERNATIVE SOURCE DEMONSTRATION

The ASD evaluation method and proposed alternative source of cobalt or lithium in AD-2, AD-31, and AD-32 and the 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 cobalt and lithium due to Type I (sampling), Type II (laboratory), Type III (statistical evaluation), or Type V (anthropologic) 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 have been attributed to natural variation associated with the underlying geology, which is a Type IV (natural variation) issue.

3.1.1 Cobalt

Previous ASDs for cobalt at the EBAP provided evidence that cobalt is present in the aquifer geologic media at the site and that the observed cobalt concentrations in groundwater were due to natural variation of native geogenic sources (Geosyntec 2019a, Geosyntec 2019b, Geosyntec 2020b, Geosyntec 2020c, Geosyntec 2021a, Geosyntec 2021b, Geosyntec 2022a, Geosyntec 2022b, Geosyntec 2023b, Geosyntec 2023c, 2023d). The previous ASDs demonstrated how the EBAP was not a source for cobalt in downgradient groundwater, based on observed concentrations of cobalt both in the ash material and in leachate from Synthetic Precipitation Leaching Procedure (SPLP) analysis (SW-846 Test Method 1312 [USEPA 1994]) of the ash material. Cobalt was not detected in the most recent SPLP ash leachate sample, collected in 2019, above the reporting limit of 0.01 mg/L, which is lower than the average concentrations observed at the wells of interest (**Table 1**). No changes to material handling or plant operations have occurred that would change the anticipated cobalt concentrations in the pond since this sample was collected.

In a February 2023 surface water sample collected from the EBAP to characterize the total cobalt concentrations, cobalt was detected at a concentration of 0.00350 mg/L (**Table 1**). This concentration is lower than the reported cobalt concentrations for multiple in-network wells from the August 2023 sampling event, including the upgradient monitoring well AD-4 (0.00363 mg/L; **Figure 2**). The EBAP sample was also found to be approximately an order of magnitude lower than the average concentration in groundwater at the wells of interest (**Table 1**). Therefore, the EBAP is not the likely source of cobalt at AD-2, AD-31, or AD-32.

As noted in the previous ASDs, soil samples collected across the site, including from locations near the EBAP, identified cobalt in the aquifer solids at concentrations ranging from 0.59–23.5 milligrams per kilogram (mg/kg), with the highest value reported at AD-41, which is upgradient of the EBAP (**Figure 3**). SB-2 was advanced in the vicinity of AD-2 in April 2020 to re-log the geology at AD-2 and collect samples for laboratory analysis of total metals and mineralogy. The SB-2 field boring log, which was generated by Auckland Consulting LLC, is provided as **Attachment B**. Cobalt was detected at SB-2 at concentrations of 9.45 mg/kg at 25–27 feet below ground surface (bgs) and 19.2 mg/kg at 31–33 feet bgs (**Table 2**). These cobalt concentrations are greater than the concentration of cobalt present in the bottom ash (6.1 mg/kg; **Table 1**). Both samples correlate to the depth of the monitoring well screen of AD-2 (20–40 feet bgs), indicating that naturally occurring cobalt is present in aquifer solids within the AD-2 screened interval.

In addition to the analysis of total cobalt, soil samples were submitted for mineralogical analysis to determine the mineral composition of soils near the EBAP. X-ray diffraction (XRD) analysis of soils from SB-2 identified pyrite (an iron sulfide) in samples collected at 25–27 feet bgs and 31–33 feet bgs at concentrations up to 7% by weight (**Figure 3**). Cobalt is known to undergo isomorphic substitution for iron in crystalline iron minerals such as pyrite due to their similar ionic radii of approximately 1.56 angstroms (Å) for iron and 1.52 Å for cobalt (Clementi and Raimondi 1963, Krupka and Serne 2002, Hitzman et al. 2017). The presence of iron-bearing minerals in soil near the EBAP constitutes a potential source of naturally occurring cobalt.

The aquifer solids at SB-2 are distinctly red in color at shallow depths, as illustrated in the photolog of soil cores provided in **Attachment C**. While shallow samples were not collected for mineralogical analysis, red color in soils is often associated with the presence of oxidized iron-bearing minerals such as hematite and goethite. The red color of the soil suggests the presence of iron oxide and hydroxide minerals within the shallow depth interval. The alteration of pyrite to these iron oxide and hydroxide minerals under oxidizing conditions is also a well-understood phenomenon, including in formations in East Texas (Senkayi et al. 1986, Dixon et al. 1982). It is likely that the pyrite weathering process is resulting in the release of isomorphically substituted cobalt from the pyrite crystal structure as it undergoes oxidative transformation to iron oxide/hydroxide minerals.

As described in the previous ASDs, vertical aquifer profiling (VAP) was used to collect groundwater samples from upgradient locations B-2 and B-3 during the soil boring and sample collection process (Geosyntec 2019b). A groundwater sample was also collected from AD-32, one of the existing compliance wells within the EBAP groundwater monitoring network where a cobalt SSL was identified. Solid-phase materials within these groundwater samples were separated and submitted for analysis of chemical composition. For the VAP samples, because of the high abundance of suspended solids, separation was completed using a centrifuge. For the groundwater sample at AD-32, the sample was filtered using a 1.5-micron filter. Based on total metals analysis, cobalt was identified both in the centrifuged solid material collected from upgradient VAP location B-3 (VAP-B3-[40-45]) and in the material retained on the filter after processing groundwater from permanent monitoring wells B-2 and B-3 (**Table 2**). The concentrations of cobalt in the solid material retained after filtration were comparable to concentrations in the bulk soil samples collected from the same locations.

The solid sample VAP-B3-(40-45) was submitted for mineralogical analysis via XRD and scanning electron microscopy (SEM) using an energy-dispersive spectroscopy (EDS) analyzer. The XRD results identified pyrite as approximately 3% of the solid phase (**Table 3**). Pyrite was identified during SEM/EDS analysis of lignite, which is mined immediately adjacent to the site. Logging completed while the VAP boring was advanced identified coal at several intervals, including 45 and 48 feet bgs (**Figure 4**). Furthermore, SEM/EDS of both centrifuged solid samples VAP-B3-(40-45) and VAP-B3-(50-55) identified pyrite in backscattered electron micrographs by the distinctive framboidal morphology (Harris et al. 1981, Sawlowicz 2000). Major peaks representing iron and sulfur were identified in the EDS spectrum, which further support the identification of pyrite (**Attachment D**). While cobalt was not identified in the EDS spectrum, it is likely present at concentrations below the detection limit.

The EBAP was not identified as the source of cobalt at wells in the EBAP network based on the low concentrations of cobalt in the pond itself and the ubiquity of naturally occurring cobalt,

especially in soil and groundwater samples upgradient from the EBAP. Cobalt in the EBAP network groundwater is believed to be a result of natural variability within the aquifer. Naturally occurring cobalt is known to substitute for iron in iron-bearing minerals. The presence of iron sulfide (as pyrite) and iron oxides/hydroxides hematite and goethite has been confirmed at AD-2 and across the site. The weathering of pyritic minerals to iron oxide/hydroxide minerals may be resulting in the release of cobalt into groundwater from the crystal structure of these aquifer minerals.

3.1.2 Lithium

Previous ASDs for lithium at the EBAP attributed the observed lithium exceedances at AD-31 and AD-32 to variations in lithium associated with the suspended native aquifer solids that likely originate from naturally occurring lignite present in these soils. These native lithium-containing aquifer solids are ubiquitous in the aquifer based on the presence of both solid-phase and dissolved lithium at upgradient locations (Geosyntec 2019b, Geosyntec 2020b, Geosyntec 2020c, Geosyntec 2021a, Geosyntec 2021b, Geosyntec 2022, Geosyntec 2023b, Geosyntec 2023c). Data gathered in support of the prior ASDs and recent results provide additional evidence that the observed lithium groundwater concentrations at AD-2, AD-31, and AD-32 are naturally occurring and are due to natural variation in the aquifer (Type IV ASD).

As discussed in Section 3.1.1, a surface water sample was collected directly from the EBAP in February 2023. Lithium was detected in the February 2023 EBAP sample at a concentration of 0.0653 mg/L) (**Figure 5, Table 4**). This concentration is below the reported lithium values at AD-31 and AD-32 and comparable to the reported value at AD-2 (**Figure 5**). The labile fraction identified in the bottom ash by SPLP from a February 2019 sample was even lower, with an estimated (J-flagged) lithium concentration of 0.011 mg/L. This labile concentration is below the average lithium concentrations at AD-2 (0.0601 mg/L), AD-31 (0.0811 mg/L) and AD-32 (0.0829 mg/L) (**Table 4**). Therefore, the EBAP is not the likely source of lithium at AD-2, AD-31 and AD-32.

Groundwater samples collected from upgradient wells B-2 and B-3 in June 2023 had total lithium concentrations of 0.0485 mg/L and 0.0641 mg/L, respectively. The reported concentration at B-3 is greater than the GWPS of 0.0497 mg/L and the concentration of lithium observed at AD-2 (0.0601 mg/L) (**Figure 5**). Upgradient location B-3 has consistently had reported lithium concentrations comparable to or higher than those observed at the wells of interest, including AD-2 (**Figure 6**). Because B-2 and B-3 were installed at locations upgradient to and unimpacted by site activities, these lithium concentrations suggest that aqueous lithium is naturally present at concentrations above the GWPS across the site at variable concentrations and not limited to AD-2, AD-31, and AD-32.

B-2 and B-3 are not part of the monitoring network for the EBAP, and as such the lithium concentrations in groundwater from these wells were not considered in calculating the GWPS for the CCR unit. An upper tolerance limit calculated using the existing background wells (AD-4, AD-12, and AD-18). Addition of B-2 and B-3 as background locations to the monitoring network would result in a site-specific GWPS of 0.0871 mg/L (**Attachment E**). This is higher than the lower confidence limits at the wells of concern (Section 1), suggesting that concentrations of lithium within the observed ranges at AD-2, AD-31, and AD-32 are naturally occurring across the site.

As described in Section 3.1.1, groundwater samples were collected from B-2, B-3, and AD-32 and filtered to separate solids. Groundwater was also collected from a VAP boring (VAP-B3-[40-45]) and centrifuged to separate solids. Lithium was detected in the solid material separated from these groundwater samples at concentrations comparable to bulk soil at all locations, providing evidence that the particulates captured during groundwater sampling contain lithium (**Table 5**).

3.1.2.1 Calculated Partition Coefficients

A previous ASD for lithium at the EBAP discussed lithium mobility in groundwater due to desorption from cation exchange complexes associated with clay minerals within naturally occurring lignite material. This mechanism was posited as the source of lithium in both upgradient and downgradient wells at the EBAP (Geosyntec 2019b). Previously completed XRD analysis of centrifuged solid material samples (VAP-B3-[40-45]) found that clay minerals, including kaolinite, smectite, and illite/mica, made up at least 60% of the aquifer solid (**Table 3**). SEM/EDS analysis also identified the presence of silicon, aluminum, and oxygen, all of which are components of clay minerals (**Attachment D**). The backscattered electron micrographs of these samples also identified clay particles by morphology. The largest clay particles (≥ 5 micrometers) are likely kaolinite, while smectite and illite dominate the smaller fraction. These clay minerals, particularly smectite and illite, are known to retain cations such as lithium via incorporation into the octahedral layer of the mineral structure and through cation exchange processes.

Partition coefficients values (K_d) for lithium, potassium, and sodium were calculated using mass measurements and total metal concentrations in the solid materials separated from the groundwater samples during filtration and the filtered groundwater concentrations. Details about the K_d calculation are provided in the previous ASD (Geosyntec 2019b). K_d values for groundwater and particulates collected from wells B-2, B-3, and AD-32 were comparable to literature K_d values reported for organic-rich media such as bogs and peat beds (Sheppard et al. 2009, Sheppard et al. 2011), providing further evidence that lithium mobility in site groundwater is similar to other sites with organic-rich soils (**Table 6**). Additionally, the calculated K_d values for Pirkey soils were consistent with the literature, with potassium having the highest K_d (greatest affinity for sorption) and sodium the lowest K_d (least affinity for sorption). Furthermore, the values are similar for groundwater from all three wells, suggesting a universal mechanism controlling lithium, sodium, and potassium mobility in groundwater.

These multiple lines of evidence show that elevated lithium concentrations at AD-2, AD-31, and AD-32 are likely not due to a release from the EBAP and can instead be attributed to natural variation (Type IV ASD). This variation appears related to the distribution of clay fractions associated with lignite materials in the soil aquifer material.

3.2 Sampling Requirements

As the ASD presented above supports the position that the identified SSLs are not due to a release from the Pirkey EBAP, 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 for cobalt and lithium identified during assessment monitoring in August 2023 were not due to a release from the EBAP. The identified SSLs should instead be attributed to natural variation in the underlying geology. Therefore, no further action is warranted, and the Pirkey EBAP will remain in the assessment monitoring program. Certification of this ASD by a qualified professional engineer is provided in **Attachment F.**

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TABLES

Table 1: Summary of Key Cobalt Analytical Data
East Bottom Ash Pond - H.W. Pirkey Plant

Geosyntec Consultants, Inc.

Sample	Sample Date	Unit	Cobalt Concentration
Bottom Ash (Solid Material)	2/11/2019	mg/kg	6.1
SPLP Leachate of Bottom Ash	2/11/2019	mg/L	<0.01
EBAP Pond Water	2/28/2023	mg/L	0.0035
AD-2 - Average	May 2016 - August 2023	mg/L	0.0160
AD-31 - Average	May 2016 - August 2023	mg/L	0.0119
AD-32 - Average	May 2016 - August 2023	mg/L	0.0400

Notes:

1. Average values were calculated using all cobalt data collected under 40 CFR 257 Subpart D, excluding any identified outliers.

mg/kg : milligram per kilogram

mg/L : milligram per liter

SPLP : synthetic precipitation leaching procedure

Table 2: Soil Cobalt Data *Geosyntec Consultants, Inc.*
East Bottom Ash Pond - H.W. Pirkey Plant

Location ID	Location	Sample Depth (ft bgs)	Cobalt (mg/kg)
Bulk Soil Samples			
AD-2	EBAP Network	25-27	9.45
		31-33	19.2
AD-18	EBAP Network	8	3.60
		22	2.90
AD-31	EBAP Network	12	1.90
		26	0.83
AD-32	EBAP Network	11	1.70
		20-25	9.10
AD-41	Upgradient	15	< 1.0
		35	23.5
		95	1.90
B-2	Upgradient	10	2.36
		16	3.62
		71	10.30
		82	7.21
		87	3.11
B-3	Upgradient	10	1.30
		20	0.59
		97	1.11
Solid Material Retained After Filtration			
AD-32	EBAP Network	13-33	5.4
B-2	Upgradient	38-48	4.3
B-3	Upgradient	29-34	12.0
		VAP 40-45	18.0

Notes:

1. For AD-XX locations, samples were collected from additional boreholes advanced in the immediate area of the location identified by the well ID. Samples were not collected from the cuttings of the borings advanced for well installation. Samples for B-2 and B-3 locations were collected from cores removed from the borehole during well lithology logging.

2. Depths for samples collected after filtration represent the screened interval for the permanent well where the sample was collected.

ft bgs : feet below ground surface
mg/kg : milligram per kilogram

Table 3: X-Ray Diffraction Results
East Bottom Ash Pond - H. W. Pirkey Plant

Constituent	VAP-B3-(40-45)
Quartz	15
Plagioclase Feldspar	0.5
Orthoclase	ND
Calcite	ND
Dolomite	ND
Siderite	0.5
Goethite	ND
Hematite	2
Pyrite	3
Kaolinite	42
Chlorite	4
Illite/Mica	6
Smectite	12
Amorphous	15

Notes:
1. Results given in units of relative % abundance
2. VAP-B3-(40-45) is the centrifuged solid material from the groundwater sample collected at that interval.
ND : Not detected

Table 4: Summary of Key Lithium Analytical Data
East Bottom Ash Pond - H.W. Pirkey Plant

Geosyntec Consultants, Inc.

Sample	Sample Date	Unit	Lithium Concentration
Bottom Ash (Solid Material)	2/11/2019	mg/kg	0.82 J
SPLP Leachate of Bottom Ash	2/11/2019	mg/L	0.011 J
EBAP Pond Water	2/28/2023	mg/L	0.0653
AD-2	8/23/2023	mg/L	0.0601
AD-31 - Average	May 2016 - August 2023	mg/L	0.0811
AD-32 - Average	May 2016 - August 2023	mg/L	0.0829

Notes:

1. Average lithium values for monitoring wells AD-31 and AD-32 were calculated using all lithium data collected under 40 CFR 257 Subpart D, excluding statistically identified outliers.

J : Estimated value. Result is less than the reporting limit but greater than or equal to the method detection limit.

mg/kg : milligram per kilogram

mg/L : milligram per liter

Table 5: Soil Lithium Data
East Bottom Ash Pond - H.W. Pirkey Plant

Geosyntec Consultants, Inc.

Location ID	Sample Depth (ft bgs)	Lithium (mg/kg)
Bulk Soil Sample		
AD-32*	11	0.53
	20-25	1.60
B-2	10	5.30
	16	3.97
	71	7.42
	87	13.10
B-3	10	3.64
	20	2.59
	97	11.10
Lignite	N/A	2.9 J
Solid Material Retained After Filtration		
AD-32*	13-33	9.8 J
B-2	38-48	6.5 J
B-3	29-34	7.8 J
	VAP 40-45	13.0

Notes:

1. Depths for samples collected after filtration represent the screened interval for the permanent well where the sample was collected.

* : AD-32 samples were collected from a seperate borehole advanced near monitoring well AD-32

ft bgs : feet below ground surface

J : estimated value

mg/kg : milligram per kilogram

VAP : vertical aquifer profiling

Table 6: Calculated Site-Specific Partition Coefficients
Pirkey Plant - East Bottom Ash Pond

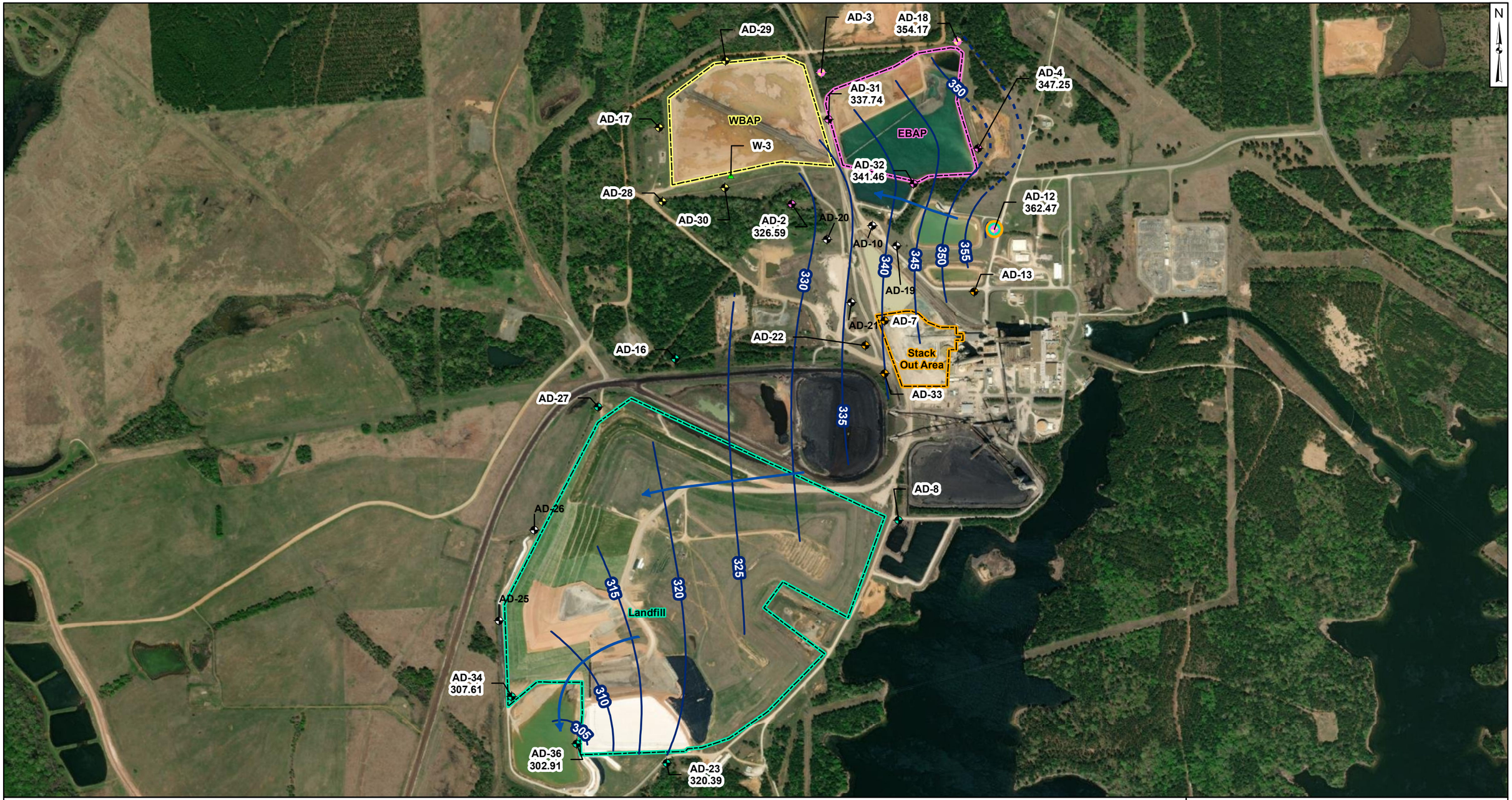
Source	B-2			Literature Value
Unit	mg/L	mg/kg	L/kg	L/kg
Element	**Aqueous Phase**	**Adsorbed**	**Kd**	**Kd**
Li	0.081	6.5	80	43-370
K	2.6	1100	423	42-1200
Na	14	130	9	5.2-82

Source	B-3			Literature Value
Unit	mg/L	mg/kg	L/kg	L/kg
Element	**Aqueous Phase**	**Adsorbed**	**Kd**	**Kd**
Li	0.097	7.8	80	43-370
K	2.9	1100	379	42-1200
Na	32	240	8	5.2-82

Source	AD-32*			Literature Value
Unit	mg/L	mg/kg	L/kg	L/kg
Element	**Aqueous Phase**	**Adsorbed**	**Kd**	**Kd**
Li	0.11	9.8	89	43-370
K	3.9	1800	462	42-1200
Na	57	220	4	5.2-82

Notes:
1. Adsorbed values are total metals concentrations reported by USEPA Method 6010B.
2. Literature values represent maximum and minimum values for the parameter as reported in Sheppard et al, 2009 (Table 4-1, all sites) and Sheppard et al, 2011 (Table 3-3 cultivated peat and wetland peat only).
* : AD-32 samples were collected from a separate borehole advanced near monitoring well AD-32
Kd : partition coefficient
L/kg : liters per kilogram
mg/kg : milligrams per kilogram
mg/L : milligrams per liter

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 August 23, 2023) provided by AEP.
2. Site features based on information available in CCR Groundwater Monitoring Well Network Evaluation Update (Arcadis 2022) provided by AEP.
3. Groundwater elevation units are feet above mean sea level.
4. AD-03, AD-07, AD-08, AD-13, AD-16, AD-17, AD-22, AD-25, AD-26, AD-27, AD-28, AD-29, AD-30, AD-33 and W-3 were not gauged during the August 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 WBAP.
7. Removal of CCR plus one foot of material was completed on July 20, 2023, for the EBAP.
8. AEP: American Electric Power
9. EBAP: East Bottom Ash Pond
10. WBAP: West Bottom Ash Pond

1,000 500 0 1,000 Feet

STATE OF TEXAS
BETH ANN GROSS
79864
LICENSED
PROFESSIONAL ENGINEER

10/17/2023

Geosyntec Consultants, Inc.
Texas Firm
Registration No. 1182

Potentiometric Contours: Uppermost Aquifer
August 2023

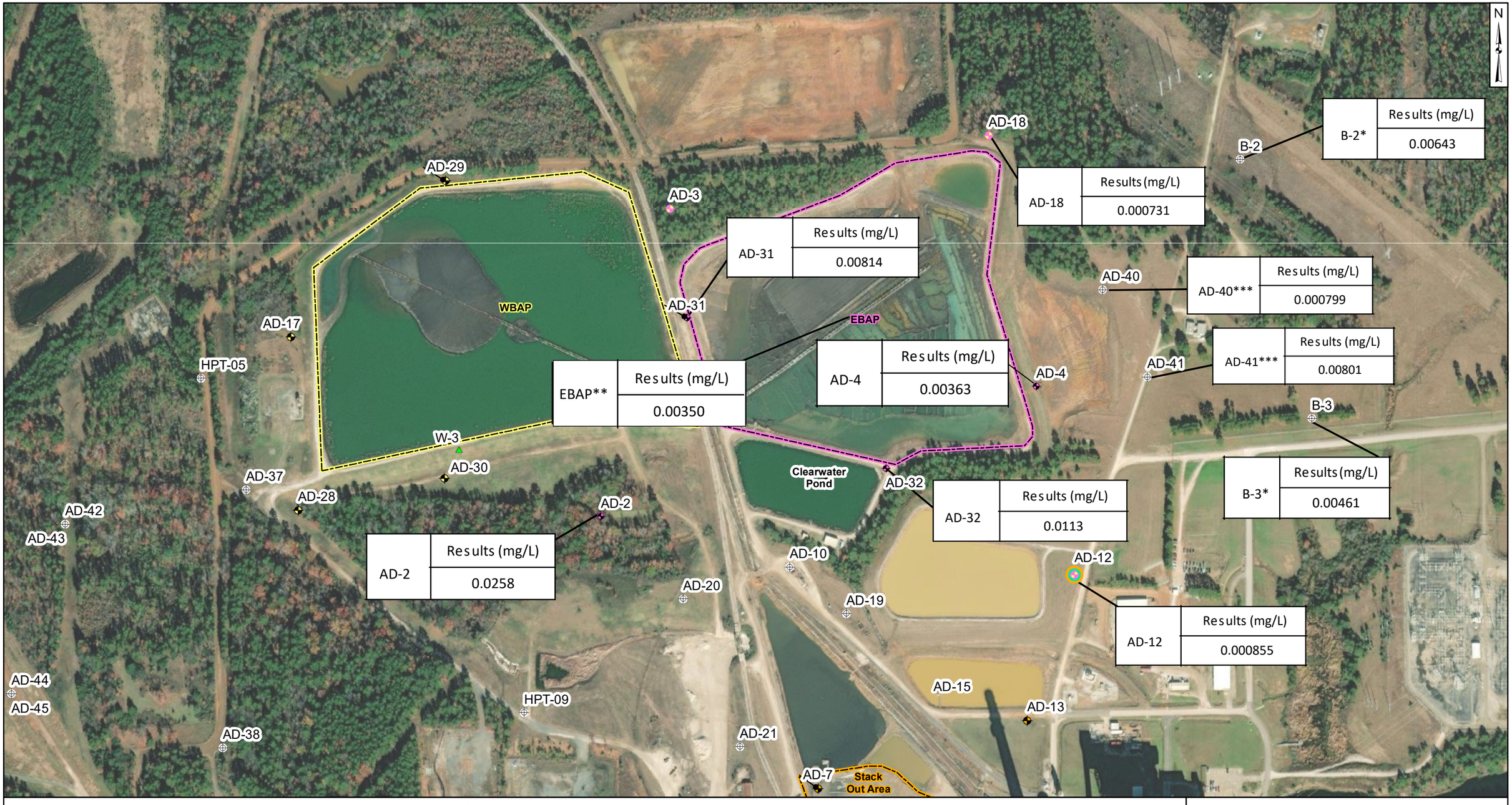
AEP Pirkey Power Plant
Hallsville, Texas

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_2023-08Pirkey.mxd. ASoltero. 10/6/2023. Project/Phase/Task.



Legend

- Out of Network
- EBAP
- WBAP
- Landfill
- Stackout Area
- EBAP and WBAP
- All CCR Unit Networks
- Piezometer
- EBAP
- WBAP

Notes

1. Monitoring well coordinates, site features, and data provided by AEP.
2. AD-15 location is approximated.
3. Samples collected in August 2023.
4. *: Well most recently sampled June 2023.
5. **: Porewater sample from East Bottom Ash Pond (EBAP) was collected in February 2023
6. ***: Well most recently sampled in August 2019.
7. Samples show in milligrams per liter (mg/L)

400 200 0 400 Feet

AEP: American Electric Power
CCR: coal combustion residuals
EBAP: East Bottom Ash Pond
mg/L: milligrams per liter
WBAP: West Bottom Ash Pond

Aqueous Cobalt Distribution

AEP Pirkey Power Plant
Hallsville, Texas

Geosyntec consultants

Columbus, Ohio | 2023/10/02

Figure **2**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Pirkey\2021\AEP_Pirkey_Cobalt_GW_20210429.mxd. HDuff. 4/29/2021. Project/Phase/Task.

Location	AD-31	
Depth (ft bgs)	12	26
Cobalt (mg/kg)	1.9	0.83
Pyrite/Marcasite (%)	2	0

Location	AD-18	
Depth (ft bgs)	8	22
Cobalt (mg/kg)	3.6	2.9
Pyrite/Marcasite (%)	1	0

Location	B-2				
Depth (ft bgs)	10	16	71	82	87
Cobalt (mg/kg)	2.36	3.62	10.30	7.21	3.11
Pyrite/Marcasite (%)	-	-	-	-	-

Location	AD-41		
Depth (ft bgs)	15	35	95
Cobalt (mg/kg)	< 1.0	23.5	1.9
Pyrite/Marcasite (%)	-	-	-

Location	AD-2	
Depth (ft bgs)	25–27	31–33
Cobalt (mg/kg)	9.45	19.2
Pyrite/Marcasite (%)	7	2

Location	B-3		
Depth (ft bgs)	10	20	97
Cobalt (mg/kg)	1.30	0.59	1.11
Pyrite/Marcasite (%)	-	-	-

Location	AD-32	
Depth (ft bgs)	11	20–25
Cobalt (mg/kg)	1.7	9.1
Pyrite/Marcasite (%)	--	--

AD-29, AD-3, AD-18, B-2, AD-40, AD-31, AD-17, WBAP, EBAP, HPT-05, AD-4, AD-41, B-3, W-3, AD-30, AD-37, AD-28, AD-2, Clearwater Pond, AD-32, AD-10, AD-12, AD-20, AD-19

N

Legend

- Monitoring Wells
- EBAP
- WBAP

Notes

1. Monitoring well coordinates provided by AEP.
2. AD-2 sample collected on April 20, 2020
3. All other data provided by AEP, 2019.

--: not analyzed.
AEP: American Electric Power
EBAP: East Bottom Ash Pond
ft bgs: feet below ground surface.
mg/kg: milligrams per kilogram.
WBAP: West Bottom Ash Pond

300 150 0 300
Feet

Cobalt Distribution in Soil

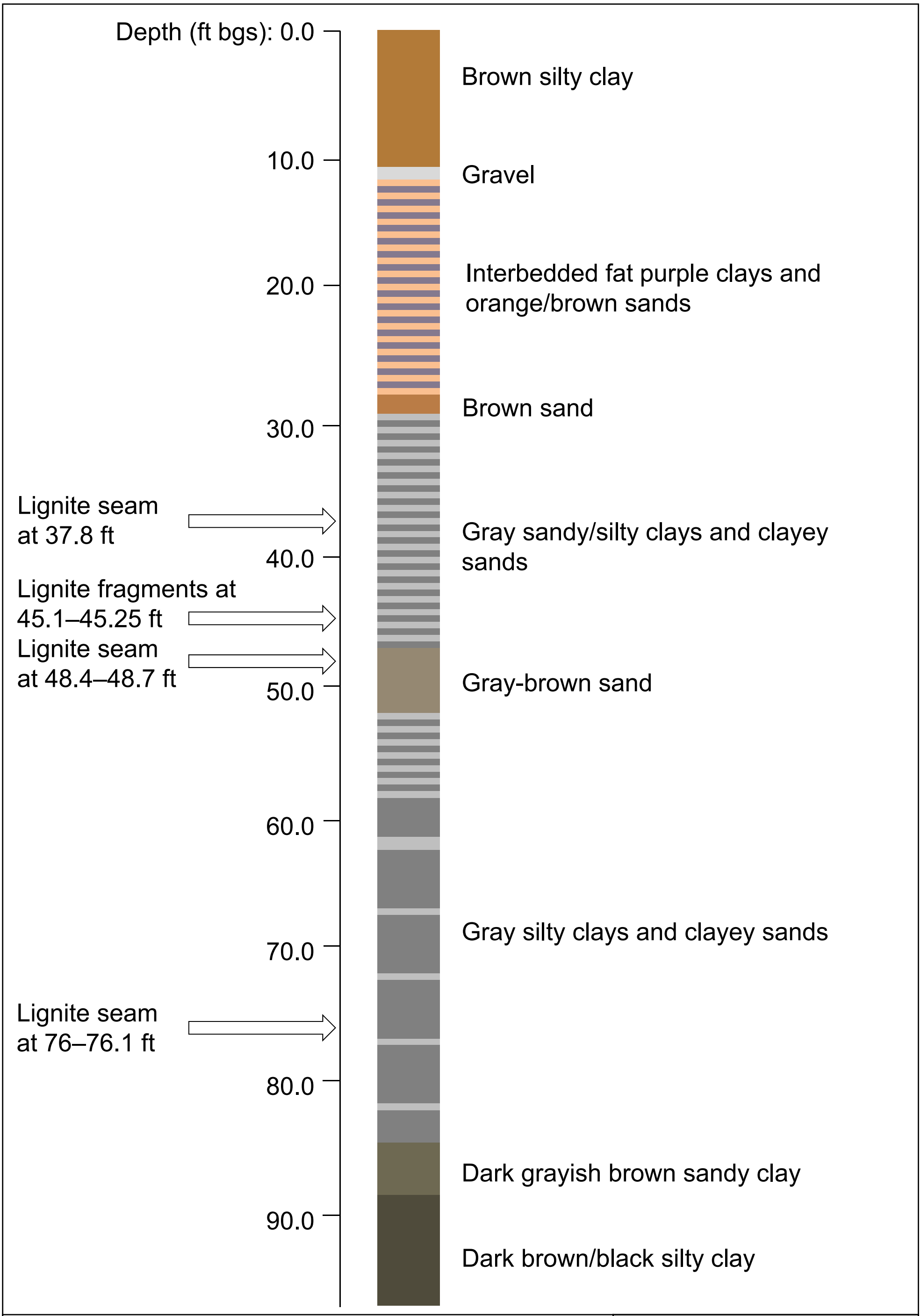
AEP Pirkey Power Plant
Hallsville, Texas

Geosyntec consultants

Columbus, Ohio | 2023/10/13

Figure 3

\\annarbor-01\data\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Pirkey\2019\20201218 Pirkey_SoilChem_minerals_March2019_new.mxd. CChristenson. 12/22/2020. Project/Phase/Task.



Notes:
1. Well installed in offset boring screened at 29-34 ft bgs
2. Boring completed May 2019
3. Total depth of 97.5 ft bgs

AEP: American Electric Power
bgs: below ground surface
ft: feet

B-3 Visual Boring Log

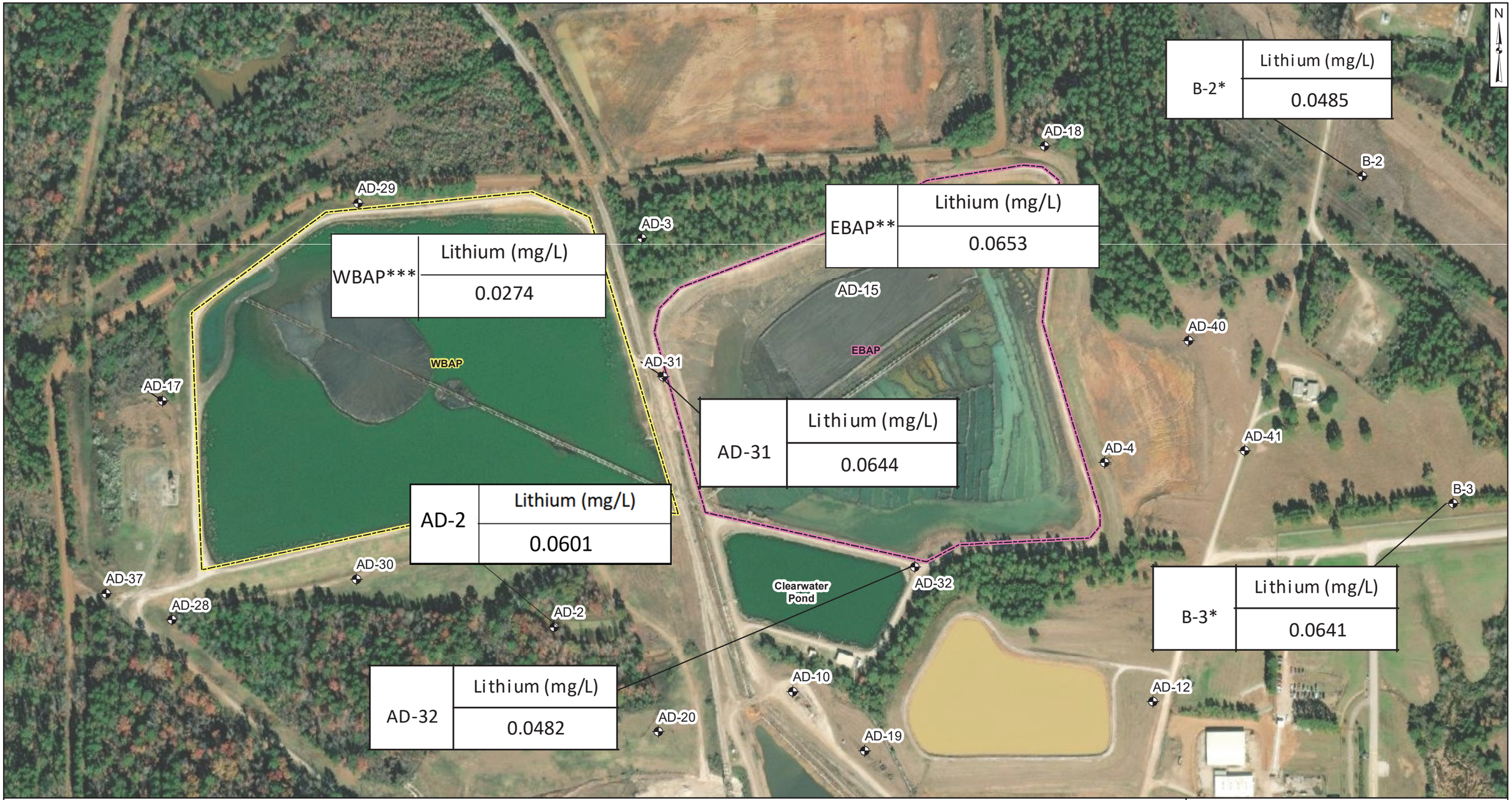
AEP Pirkey Powerplant
Hallsville, Texas

Geosyntec consultants

Columbus, Ohio | October 2023

Figure 4

\\annarbor-01\data\Projects\AEP\Legal Department - ASD Review\Pirkey\2019-05 Field Investigation\Field Forms\Compiled Boring Logs\Visual boring logs



Legend

- Monitoring Well
- EBAP
- WBAP

Notes

1. Lithium concentrations in milligrams per liter (mg/L).
2. Monitoring well coordinates, site features, and data provided by AEP.
3. Groundwater samples were collected in August 2023.
4. *: Well most recently sampled in June 2023
5. **: Porewater sample from East Bottom Ash Pond (EBAP) was collected in February 2023.
6. ***: Porewater sample from West Bottom Ash Pond (WBAP) was collected in 2022.

AEP: American Electric Power

300 150 0 300
Feet

Aqueous Lithium Distribution

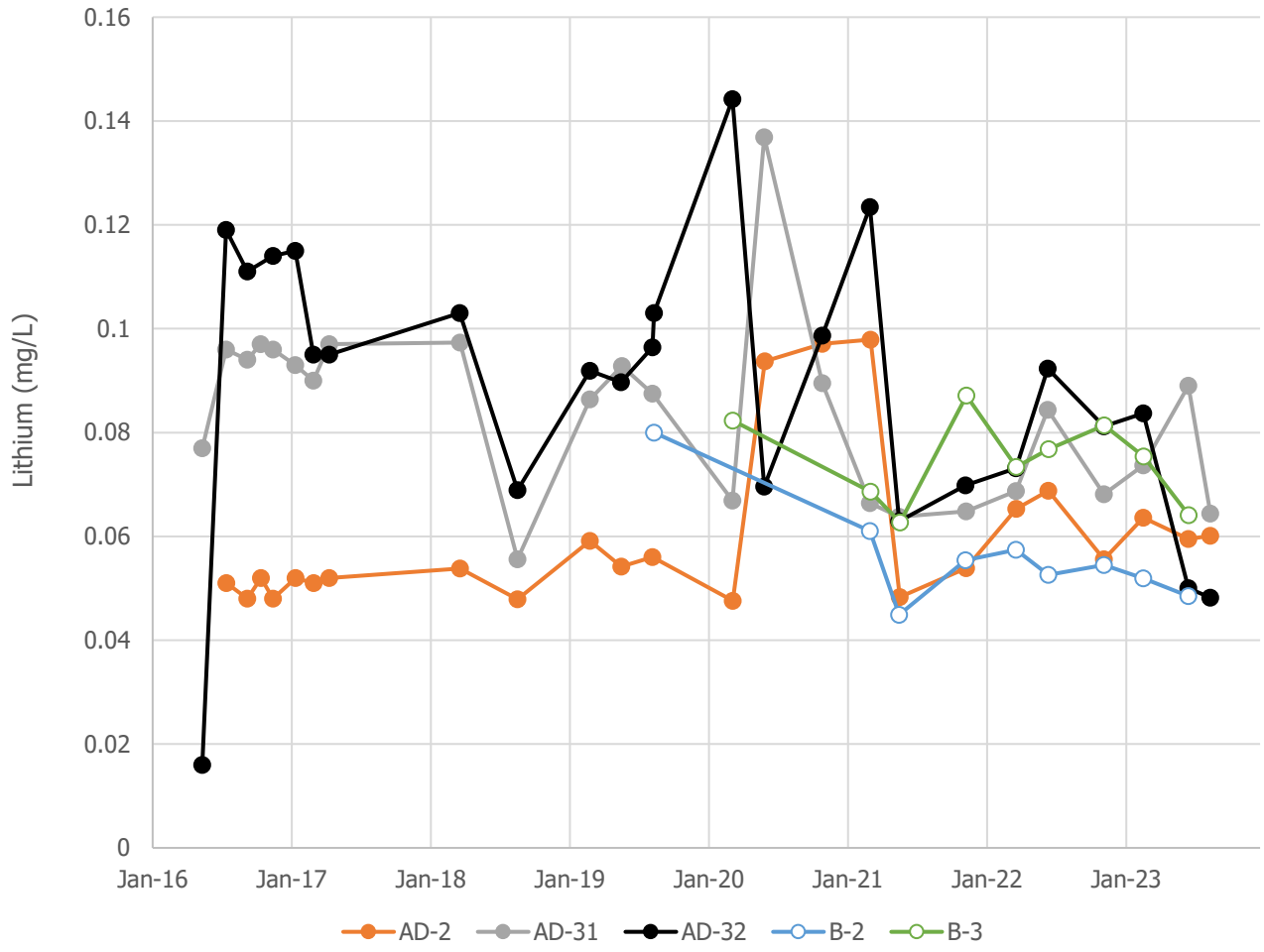
AEP Pirkey Power Plant
Hallsville, Texas

Geosyntec consultants

Columbus, Ohio | 2023/10/02

Figure **5**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Pirkey\2021\AEP-Pirkey_ASD_Li_20220601.mxd. BAres. 6/1/2022. CHA8462/12/02.



Notes:
Total lithium concentrations are shown for compliance wells AD-2, AD-31, and AD-32 and upgradient wells B-2 and B-3. An outlier value of 0.972 mg/L lithium from well AD-32 collected on October 12, 2016, was removed from the time series plot to allow adjustment of the Y-axis.

mg/L: milligrams per liter

Lithium Comparison to Upgradient Monitoring Wells
Pirkey Plant East Bottom Ash Pond

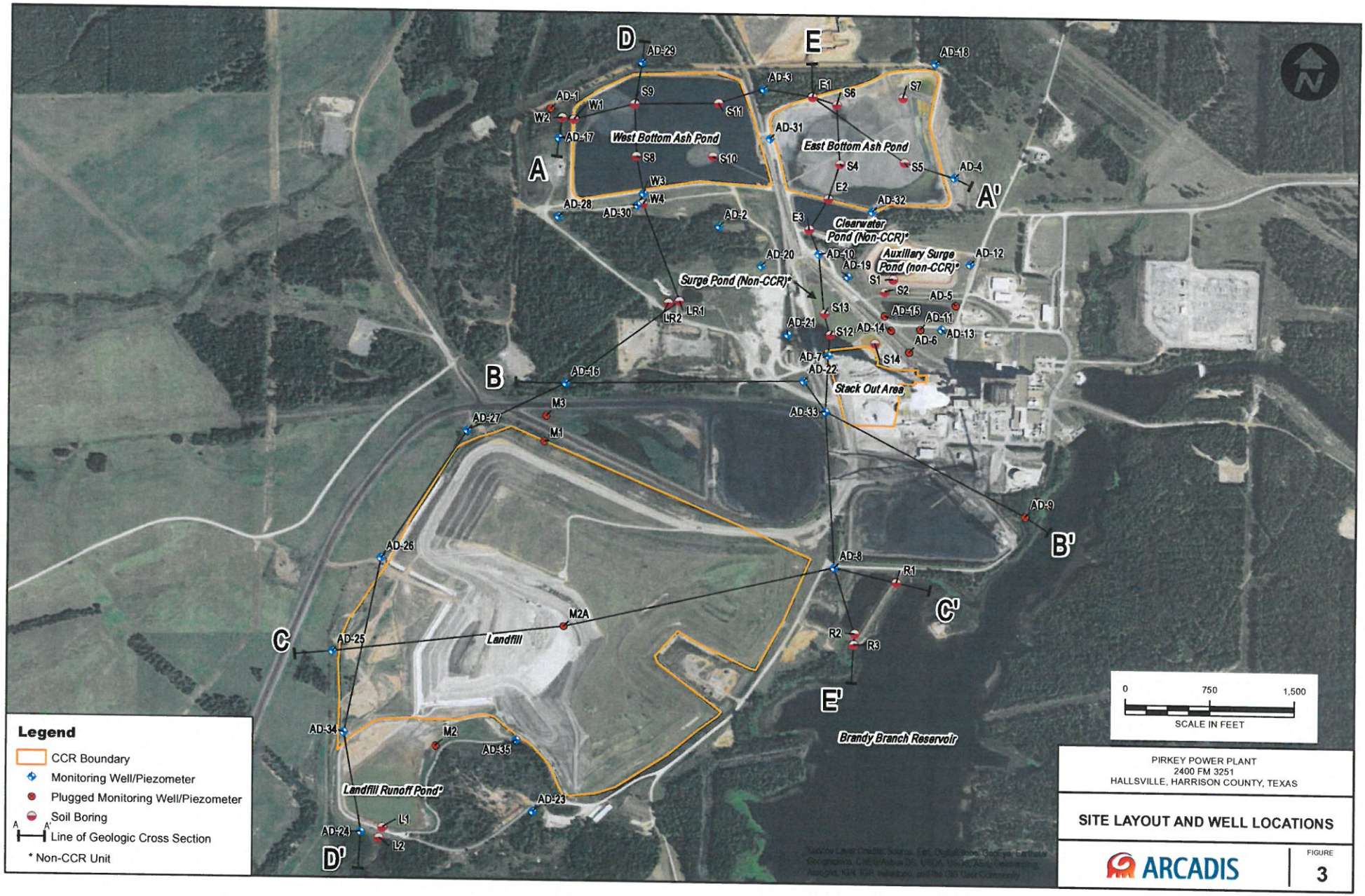
Geosyntec consultants | AMERICAN ELECTRIC POWER

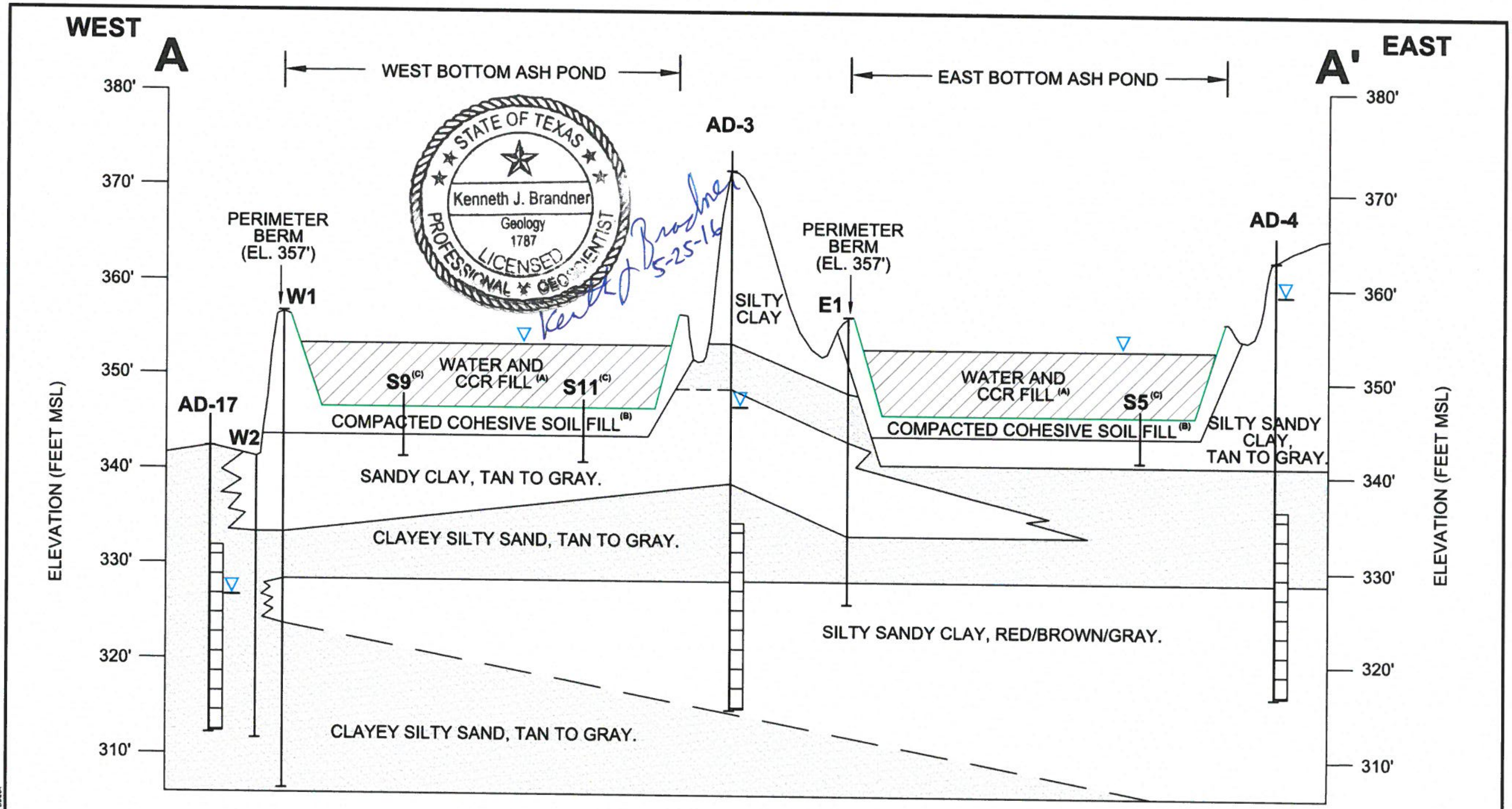
Columbus, Ohio | October 2023

Figure 6

internal info: path, date revised, author

ATTACHMENT A
Geologic Cross Section A-A’


D
E
A
A'
B
B'
C
C'
D'
E'
AD-29
AD-18
AD-3
AD-1
E1
S6
S7
S9
W1
S11
W2
AD-17
West Bottom Ash Pond
AD-31
East Bottom Ash Pond
S8
S10
S4
S5
AD-4
W3
E2
W4
AD-28
AD-30
AD-2
AD-32
E3
Clearwater Pond (Non-CCR)*
AD-20
AD-10
Auxiliary Surge Pond (non-CCR)*
AD-12
AD-19
S1
Surge Pond (Non-CCR)*
S2
AD-5
LR1
LR2
S13
AD-15
AD-11
AD-21
S12
AD-14
AD-13
AD-6
AD-7
S14
AD-16
AD-22
Stack Out Area
M3
AD-27
AD-33
M1
AD-9
AD-26
AD-8
R1
M2A
AD-25
Landfill
R2
R3
AD-34
M2
AD-35
Landfill Runoff Pond*
AD-23
AD-24
L1
L2
Brandy Branch Reservoir
0
750
1,500
SCALE IN FEET
Legend
CCR Boundary
Monitoring Well/Piezometer
Plugged Monitoring Well/Piezometer
Soil Boring
Line of Geologic Cross Section
* Non-CCR Unit
PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE, HARRISON COUNTY, TEXAS
SITE LAYOUT AND WELL LOCATIONS
ARCADIS
FIGURE
3
Document Path: Z:\GIS\PROJECTS_ENVAEP\Pirkey Plant\MXD\Figure 3 - Site Layout and Well Locations.mxd



LEGEND

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

0 — 300'
HORIZONTAL SCALE

NOTES:

A) TOP OF WEST BOTTOM ASH POND AND EAST BOTTOM ASH POND PERIMETER BERM ELEVATION IS 357', OPERATING ELEVATION IS 354'(JOHNSON & PACE, MAY 2011). BASE ELEVATION OF WEST BOTTOM ASH POND AND EAST BOTTOM ASH POND IS 347' (SARGENT & LUNDY, JANUARY 1983).

B) COMPACTED COHESIVE SOIL FROM ELEVATION 344' TO 347' (SARGENT & LUNDY, SEPTEMBER 1984;AMEC, AUGUST 2011).

C) SOIL BORING INSTALLED BY SOUTHWESTERN LABORATORIES DURING ASH POND CONSTRUCTION IN 1983.

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

CROSS SECTION
A - A'

ARCADIS

FIGURE
4

ATTACHMENT B
SB-2 Boring Log

PROJECT NO. _____ PROJ. _____ BOR. NO. SB-2

LOCATION AD-2/MW-2 - Pirkey Power Plant ELEV. _____ DATE 4/20/20

SILTS & SANDS		COHESIVE SOILS - CLAYS			COLORS	MATERIALS	SAND ADJ.	CHARACTERTICS
CONDITION		CONSISTENCY	PENETROMETER	N - VALUE	Li .... Light .....Br ....Brown	Cl ..... Clay, Clayer	F.....Fine	Calc ..... Calcareous
VLo ..... Very Loose	0- 4	Vso.. Very Soft	0 - 0.25	<2	Dk ... Dark .....Bk ....Black	Si ..... Silt, Silty	M ....Medium	Lig ..... Lignite
Lo ..... Loose	4-10	So.... Soft	0.25 - 0. 5	2 - 4	G ..... Grey .....Bl ....Blue	Sa .... Sand, Sandy	Co....Coarse	Org ..... Organic
MDe ..... Med. Dense	10-30	Mst.. Stiff	0.5 - 1.0	4 - 8	T ..... Tan .....Gr ....Grenn	Ls .... Limestone	Si.....Silty	Lam ..... Laminate
De ..... Dense	30-50	St..... Stiff	1.0 - 2.0	8 - 15	R ..... Red .....Y .....Yellow	Gr .... Gravel		Sls ..... Slickensided
VDe ..... Very Dense	>50	VSt.. Very Stiff	2.0 - 4.0	15 - 30	Rdish.Reddish.Wh ...White	SiS ... Siltstone		SL ..... Slightly
		H..... Hard	> 4.0	>30		SS .... Sandstone		Sm(s) ... Seam (s)
						Sh..... Shale, Shaley		Nod ..... Nodules

Sample Interval TEST ASSIGNMENT	SAMPLE NO. Recovery	DEPTH FT.	SAMPLES	STRATUM DESCRIPTION: CONDITION OR CONSISTENCY	COLOR	MINOR MATERIALS OR ADJECTIVES	PREDOMINATE MATERIAL	CHARACTERISTICS OR MODIFICATIONS	STANDARD PENETROMETER: SEAT - 6"	1st - 6"	2nd - 6"	UNIFIED SOIL CLASSIFICATION	N - VALUE OR HAND PENETROMETER
SM	0-5 2' Rec	0		0-8'	Br, Lt. Rd Br	Si	Sa	Silty Sand - trace clay, trace root hairs, moist.					
												moist	(0-5')
8'	5-10 2.5' Rec				Lt. Rd. Br			- thin lenses (less than 1/4")				moist	(5-10')
								at 7.5', trace iron staining					
Cl	10-15 4' Rec	8		8-14.5	Lt. Rd Br, Rd Br, Gray	Sa, Si	Cl	Clay - some silty sand and silty clayey sand in interbeds to 14.5', trace iron oxide gravel in sand seams @ 10.5', 12', 12.5'				moist	(10-15')
14.5'													
	15-20 2' Rec	14.5		14.5-39'	Rd Br, Yllw. Br, Gray	Si, Cl	Sa	silty/clayey Sand - some sandy clay, iron cemented sand @ 16.5' and ironstone (1.5")				v. moist to moist	(15-20')
	20-25' * No Rec.							- cemented sand seams in silty sand @ 20-25'				v. moist	(20-25')
SC	25-30' 2.5' Rec				Gray - DK Gray DK. Br			- gravel & cemented sand seam @ 25'	(6")			sat. @ 25'-25.5'	
								- cemented sand, partially cemented					
					(25-39')			clayey silty sand @ 25.5'				moist	25.5-27
								- dark gray silty sat sand seam @ 27'	(2")			sat. @ 27.0'	(2")
	30-35 3' Rec							- sat. silty sand seam @ 30.5'	(1")			sat. @ 30.5'	(1")
								- sat. silty sand seam @ 32'	(3")				32.0 (3")
39'								* some v.f. gypsum, dry stalk in clayey sand between sat. sand seams (25-40')				v. moist (to 39')	
ML	35-40 4' Rec	39		39-46	Lt. Gray, Gray (39-46')	Cl, Si	Si	Clayey sandy silt, - interbedded silt + clay @ 39' to 40'				moist	(39-40')
								B.T. @ 40'					
								* 25-27' collected @ 1015					
								* 31-33' collected @ 1035					

Type Boring HSA Dry Auger [X] Rotary Wash [ ]

SEEPAGE @ 25' FT. WHILE DRILLING, W.L. @ ___ FT. ON COMPL.
(OR) BAILED TO ___ FT. UPON COMPLETION.
W.L. @ ___ FT AND CAVED TO ___ FT. ON _____.

* GPS: 32.46522, -94.49032 (12' E, 3.5' N of AD-2/MW-2)

ATTACHMENT C
SB-2 Boring Photographic Log

GEOSYNTEC CONSULTANTS
Photographic Record

Geosyntec consultants

Client: AEP **Project Number: CHA8495**

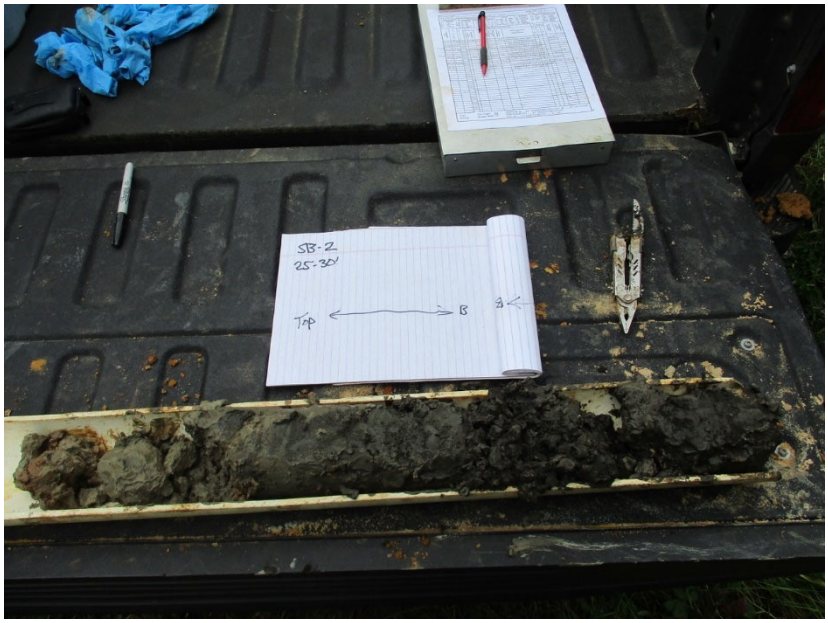
Site Name: Pirkey East Bottom Ash Pond **Site Location: Hallsville, Texas**

Photograph 1 **Date: 4/21/2020** **Direction: N/A** **Comments:** 0-5 foot interval of SB-2.	
Photograph 2 **Date: 4/21/2020** **Direction: N/A** **Comments:** 5-10 foot interval of SB-2.	

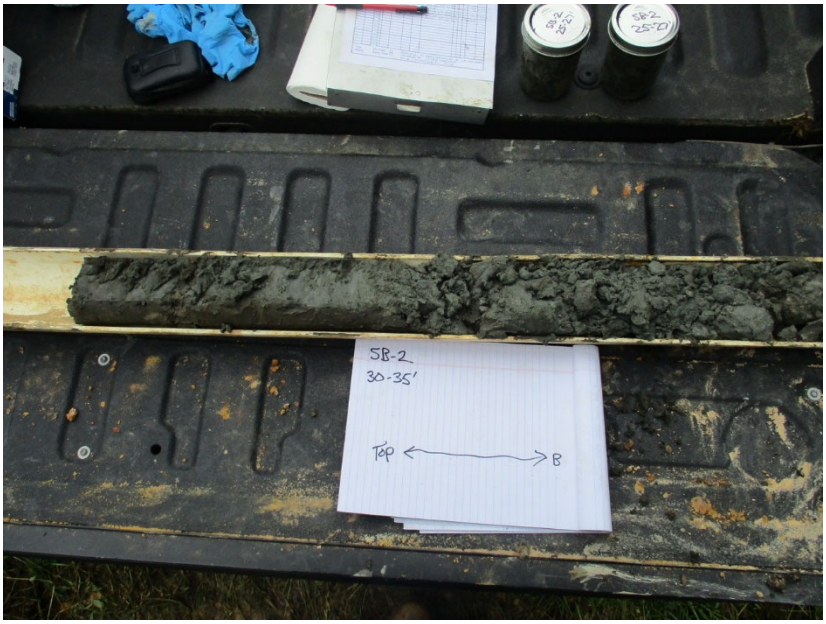
GEOSYNTEC CONSULTANTS Photographic Record	Geosyntec consultants
Client: AEP	**Project Number: CHA8495**
Site Name: Pirkey East Bottom Ash Pond	**Site Location: Hallsville, Texas**

Photograph 3 **Date: 4/21/2020** **Direction: N/A** **Comments:** 10-15 foot interval of SB-2.	
Photograph 4 **Date: 4/21/2020** **Direction: N/A** **Comments:** 15-20 foot interval of SB-2. Recovery of this interval was limited.	

GEOSYNTEC CONSULTANTS Photographic Record	Geosyntec consultants
Client: AEP	**Project Number: CHA8495**
Site Name: Pirkey East Bottom Ash Pond	**Site Location: Hallsville, Texas**

Photograph 5 **Date: 4/21/2020** **Direction: N/A** **Comments:** 20-25 foot interval of SB-2. Recovery of this interval was limited.	
Photograph 6 **Date: 4/21/2020** **Direction: N/A** **Comments:** 25-30 foot interval of SB-2. Very little of this interval was recovered. A color change was observed from red to dark brown/black. A sample was collected from this interval.	

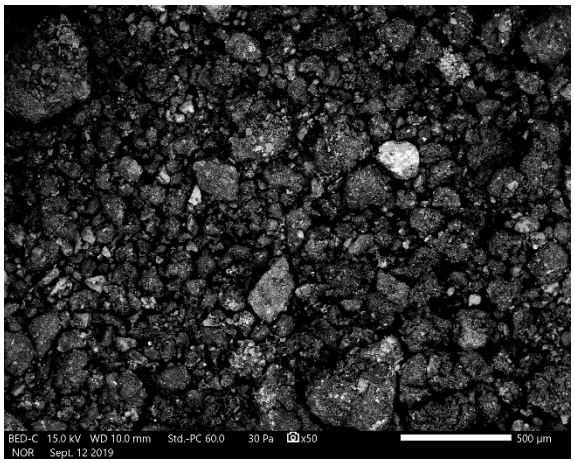
GEOSYNTEC CONSULTANTS Photographic Record	Geosyntec consultants
Client: AEP	**Project Number: CHA8495**
Site Name: Pirkey East Bottom Ash Pond	**Site Location: Hallsville, Texas**

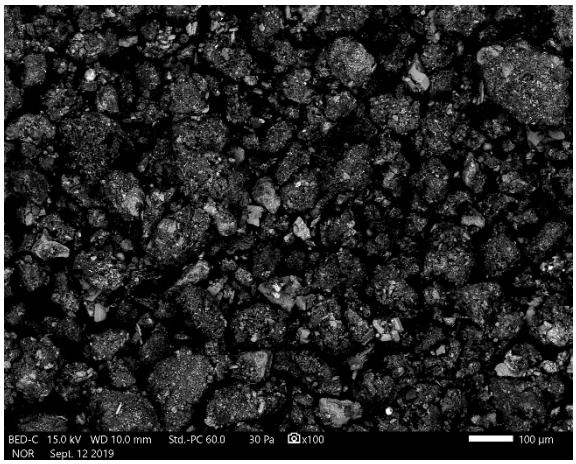
Photograph 9 **Date: 4/21/2020** **Direction: N/A** **Comments:** 30-35 foot interval of SB-2. Very little of this interval was recovered.. A sample was collected from this interval.	
Photograph 10 **Date: 4/21/2020** **Direction: N/A** **Comments:** 35-40 foot interval of SB-2	

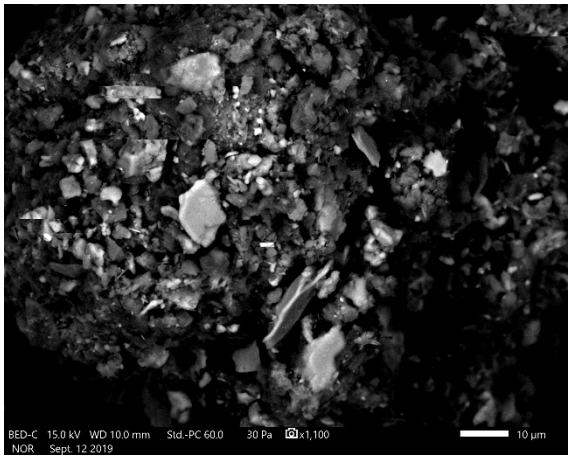
ATTACHMENT D
SEM/EDS Analysis

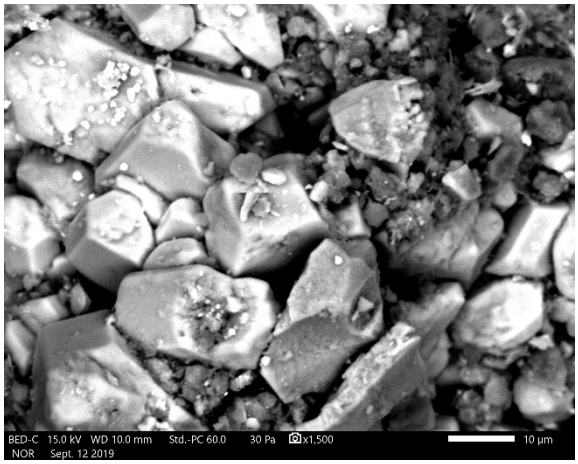
September 16, 2019

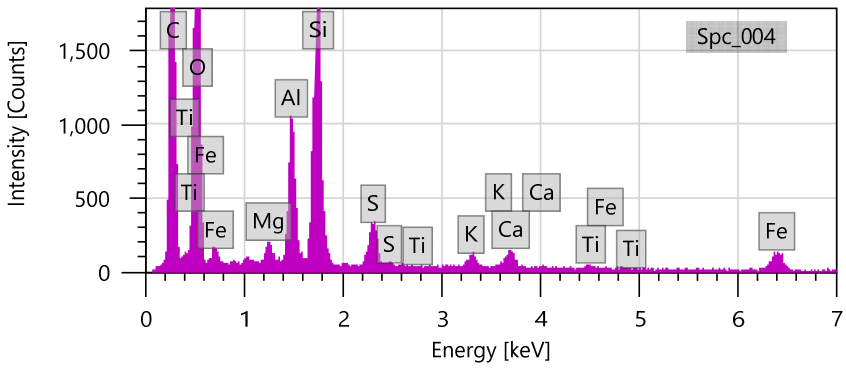
Dr. Bruce Sass
941 Chatham Lane, Suite 103, Columbus, OH 43221
via Email: BSass@geosyntec.com





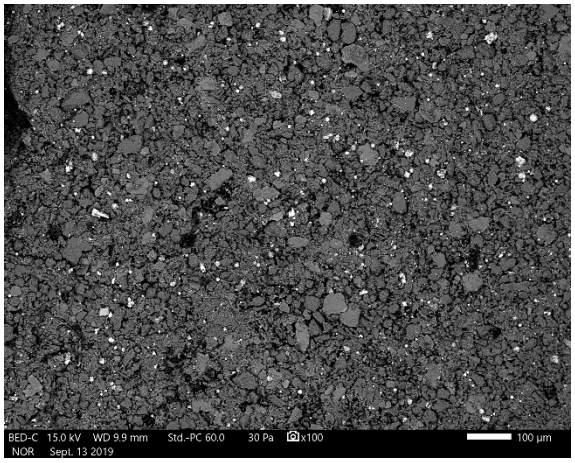


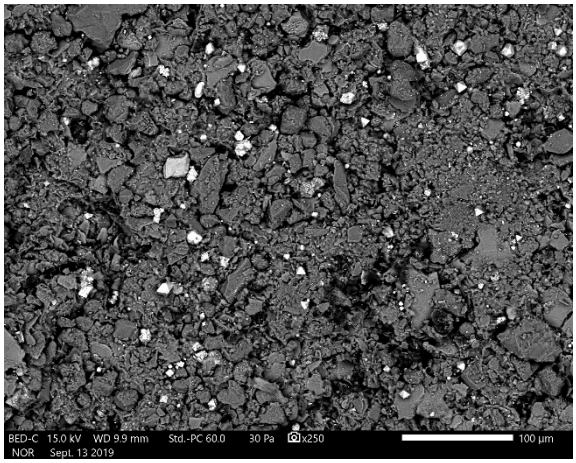


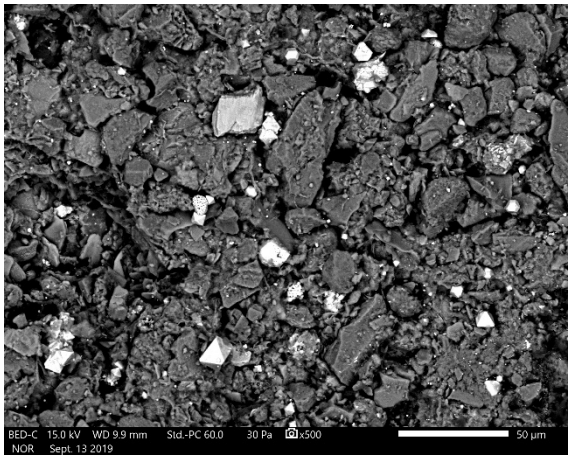


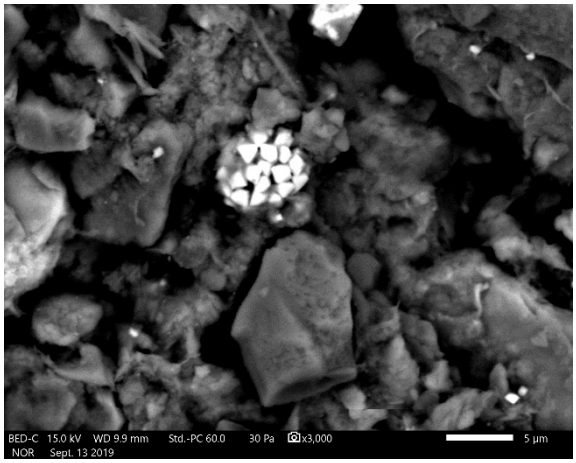
Lignite. Backscattered electron micrographs show the sample at 100X, 1,100X, and 1,500X. EDS spectrum at bottom is an area scan of the region shown in top right micrograph. Bright particles are mostly quartz and feldspar. Major peaks for carbon, oxygen, silicon, and aluminum suggest coal and clay.

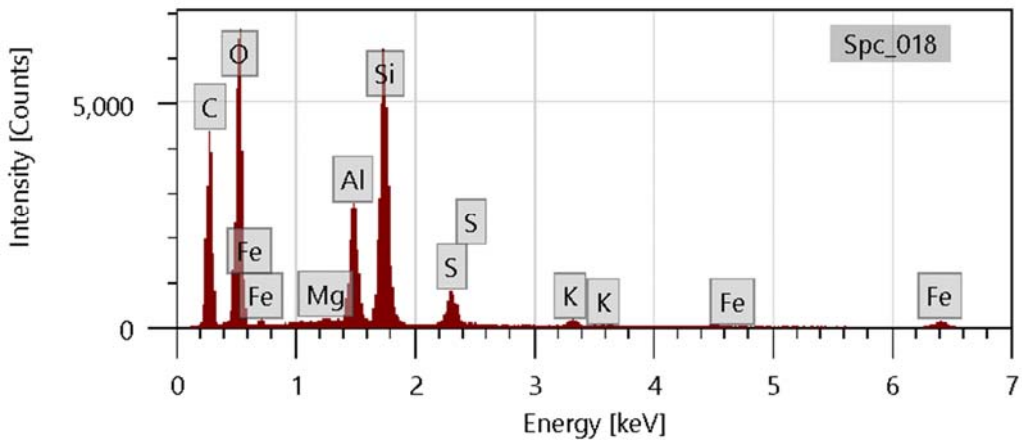
Geosyntec
CTLGroup 150350



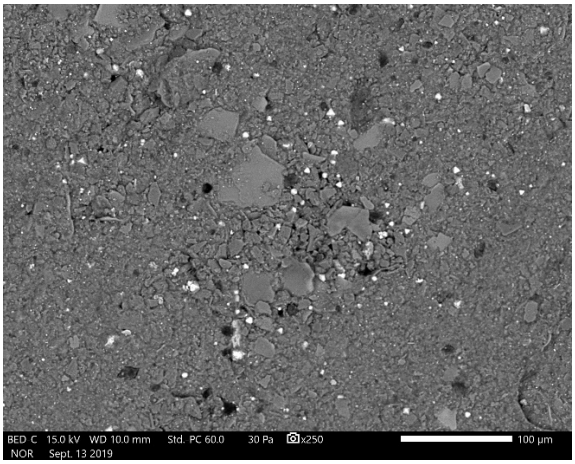


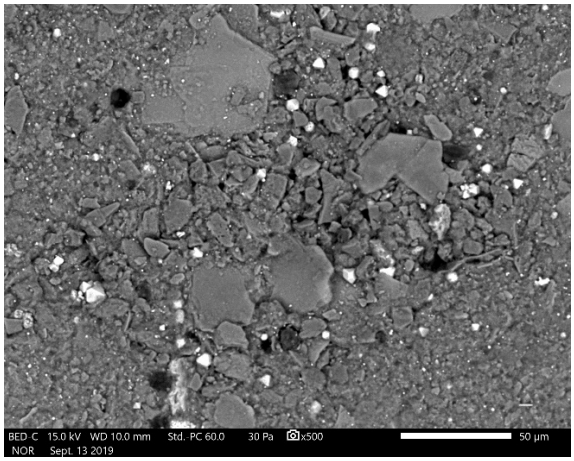


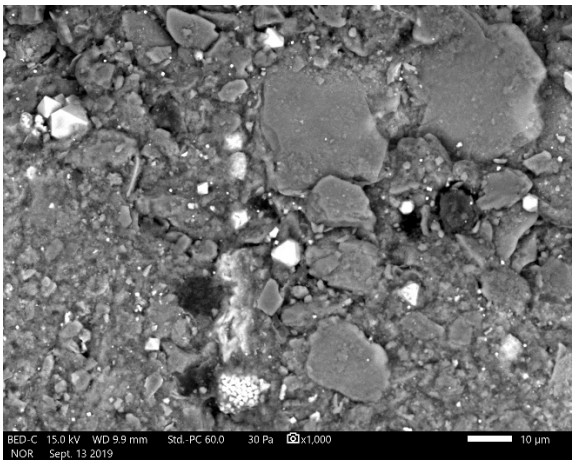


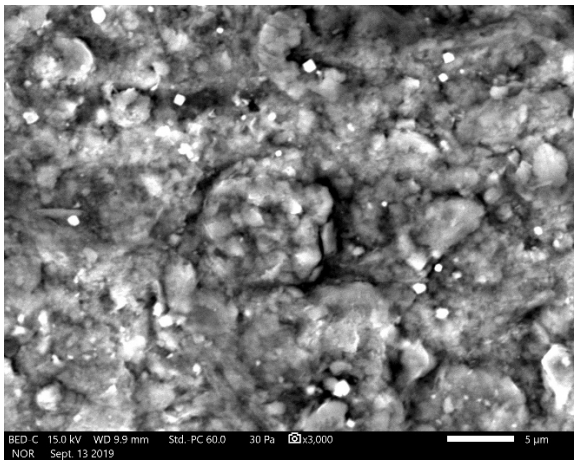


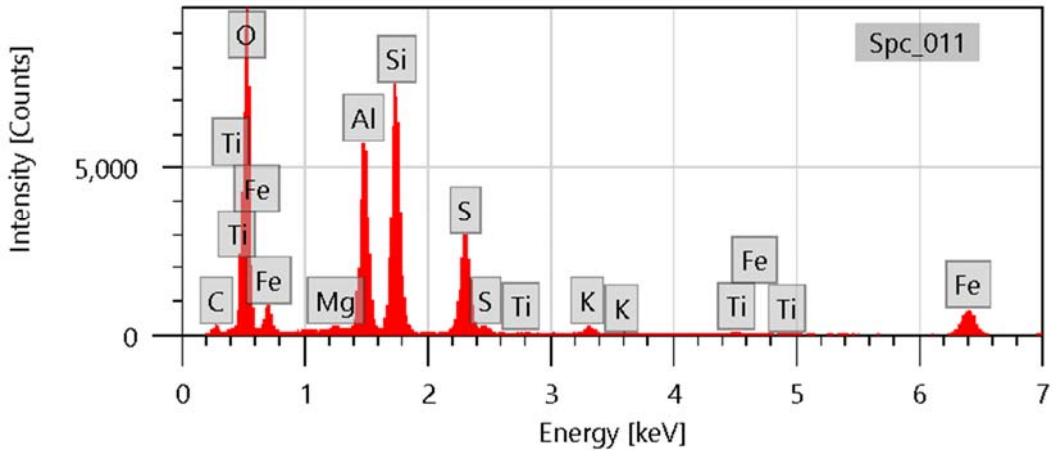
Sample VAP B3 40-45. Backscattered electron micrographs show the sample at 100X, 250X, 500X, and 3000X. EDS spectrum at bottom is an area scan of the region shown at 500X. Bright particles are pyrite (framboid in bottom right micrograph). Major peaks for carbon, oxygen, silicon, and aluminum suggest coal and clay.











Sample VAP B3 50-55. Backscattered electron micrographs show the sample at 250X, 500X, 1000X, and 3000X. EDS spectrum at bottom is an area scan of the region shown at 3000X. Bright particles are mostly pyrite (framboid in bottom left micrograph); occasional particles of Fe-Ti oxide are detected. Major peaks for oxygen, silicon, and aluminum suggest clay. Large blocky particles are mostly quartz, feldspar, and clay.

ATTACHMENT E
Tolerance Limit Calculation Using B-Series Data

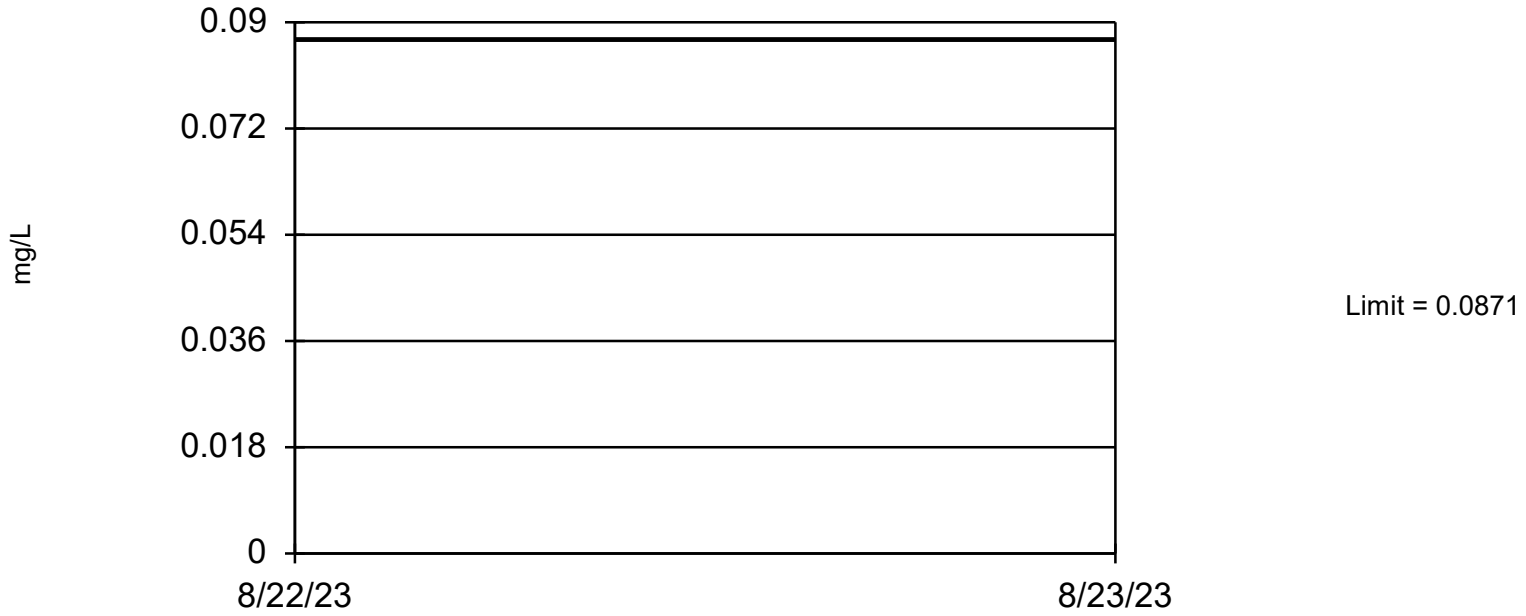
Upper Tolerance Limits

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP Data Printed 10/11/2023, 11:17 AM

Constituent	Upper Lim.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Lithium, total (mg/L)	0.0871	93	n/a	n/a	1.075	n/a	n/a	0.008478	NP Inter(normality)

Tolerance Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.05 alpha level. Limit is highest of 93 background values. 1.075% NDs. 95.12% coverage at alpha=0.01; 96.68% coverage at alpha=0.05; 99.41% coverage at alpha=0.5. Report alpha = 0.008478.

Constituent: Lithium, total Analysis Run 10/11/2023 11:16 AM View: UTL

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP Data

Tolerance Limit

Constituent: Lithium, total (mg/L) Analysis Run 10/11/2023 11:17 AM View: UTL

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP Data

	AD-18 (bg)	AD-12 (bg)	AD-4 (bg)	B-2 (bg)	B-3 (bg)
5/10/2016	0.004				
5/11/2016		<0.001	0.013		
7/13/2016		0.008			
7/14/2016	0.02		0.041		
9/7/2016		0.01			
9/8/2016	0.019		0.04		
10/12/2016		0.012			
10/13/2016	0.026		0.034		
11/14/2016		0.013			
11/15/2016	0.017		0.035		
1/11/2017		0.01			
1/12/2017	0.026		0.03		
2/28/2017		0.009			
3/1/2017	0.017		0.033		
4/10/2017	0.019		0.047		
4/11/2017		0.008			
3/21/2018		0.00722			
3/22/2018	0.0165		0.0537		
8/20/2018		0.0143			
8/21/2018	0.0175		0.0294		
2/27/2019		0.00688			
2/28/2019	0.0177		0.0513		
5/21/2019		0.00576			
5/23/2019	0.0209		0.0516		
8/12/2019		0.00829			
8/13/2019	0.0183				
8/14/2019			0.0484		
8/16/2019				0.08 (J)	
3/10/2020		0.00547			
3/11/2020	0.0134		0.0415		0.0823
6/2/2020		0.00505			
6/3/2020	0.0132		0.038		
11/2/2020		0.0051			
11/4/2020	0.0128		0.0274		
3/8/2021		0.0057		0.061	
3/9/2021	0.0131		0.0331		0.0686
5/24/2021		0.005		0.0449	
5/25/2021	0.0127		0.0335		
5/26/2021					0.0627
11/15/2021		0.011		0.0554	
11/16/2021			0.0211		
11/17/2021	0.0124				0.0871
3/28/2022		0.00604		0.0574	
3/29/2022	0.0137		0.0383		0.0734
6/20/2022		0.00949			
6/21/2022	0.0108		0.022	0.0526	
6/22/2022					0.0768
11/15/2022		0.0119		0.0545	
11/16/2022	0.0125		0.0212		0.0814
2/27/2023		0.00885		0.0519	
2/28/2023	0.0123		0.0311		0.0754
6/26/2023		0.0049		0.0485	

ND substitution: RL or RL/2 if <15% NDs.

Tolerance Limit

Constituent: Lithium, total (mg/L) Analysis Run 10/11/2023 11:17 AM View: UTL

Pirkey EBAP Client: Geosyntec Data: Pirkey EBAP Data

	AD-18 (bg)	AD-12 (bg)	AD-4 (bg)	B-2 (bg)	B-3 (bg)
6/27/2023	0.0138		0.024		0.0641
8/23/2023	0.0119	0.00494	0.0243		

ATTACHMENT F
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 East Bottom Ash Pond 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	October 17, 2023
License Number	Licensing State	Date

APPENDIX 4- Field Reports

CCR Groundwater Monitoring Well Inspection Form

Facility: AEP PIKE PP

Sampling Period: FEBRUARY 27-28, 2023

Sampling Contractor: EAGLE

Signature: [signature]

Well No.	Well Locked	Lock Functioning	Well Locked After Sampling	Access to Well Maintained	Well Casing, Housing, and Pad in Good Shape	Well Properly Labeled	Well cap present	Comments
AD-13	✓	✓	✓	✓	✓	✓	✓	
AD-22	✓	✓	✓	✓	✓	✓	✓	
AD-33	✓	✓	✓	✓	✓	✓	✓	
AD-2	✓	✓	✓	✓	✓	✓	✓	
B-3				✓	✓		✓	NO LOCK NO WATEL
AD-18	✓	✓	✓	✓	✓	✓	✓	
AD-4					✓	✓	✓	NO LOCK, NEEDS BETTER ACCESS
AD-7	✓	✓	✓	✓		✓	✓	HOUSING SEVERLY RUSTED HARD TO OPEN
AD-34	✓	✓	✓	✓		✓	✓	HINGE RUSTED + BROKEN

ACCESS IS ALONG STEEP SLOPE ON ACROSS DITCH SOMETIMES WATER

WELL HOUSING CAN BE OPENED WITH OUT UNLOCKING

Instructions: Complete form and submit to AEP Environmental Services with Field Data. Place check mark for items that are satisfactory. Unsatisfactory items should be left blank with a note in the comments section on what needs to be remedied.

Facility Name	AEP PIRKEY PP
Sample by	Kerry McDonald

Sample Location ID	AD-2

Depth to water, feet (TOC)	15.92
Measured Total Depth, feet (TOC)	40.36

Depth to water date	02/27/23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
1038	15.98	200	3.86	772	1.2	2.13	399	20.76		
1043	16.21	200	3.81	751	0.0	1.97	398	20.69		
1048	16.28	200	3.78	752	0.0	1.91	398	20.68		
1053	16.30	200	3.78	752	0.0	1.84	397	20.72		

Total volume purged	
Sample appearance	CLEAR
Sample time	1055
Sample date	02/27/23

Facility Name	ACP PIANO PP
Sample by	Kerry McDonald

Sample Location ID	AO-4

Depth to water, feet (TOC)	10.75
Measured Total Depth, feet (TOC)	47.29

Depth to water date	02/28/23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
0856	10.79	180	4.84	84	18.3	4.21	414	18.80		
0901	10.82	180	4.87	84	16.8	2.89	408	19.63		
0906	10.86	180	4.87	84	16.5	2.85	402	19.87		
0910	10.90	180	4.89	84	17.2	2.81	396	19.91		

Total volume purged	
Sample appearance	Clear
Sample time	0913
Sample date	02/28/23

DUP-2 WQ Metals 1300

Facility Name	Pinson PP
Sample by	Kelly McDonald

Sample Location ID	AD-7

Depth to water, feet (TOC)	14.11
Measured Total Depth, feet (TOC)	41.98

Depth to water date	02/28/23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
1001	14.51	170	3.48	337	1.3	2.87	446	23.21		
1006	14.53	170	3.58	360	2.4	1.34	439	23.39		
1011	14.58	170	3.62	368	2.8	1.29	431	23.42		
1016	14.63	170	3.63	374	2.2	1.25	427	23.47		

Total volume purged	
Sample appearance	Clear
Sample time	1018
Sample date	02/28/23

Facility Name	Pivkey
Sample by	Matt Hamilton

Sample Location ID	AD-12
Depth to water date	2-27-23

Depth to water, feet (TOC)	13.25
Measured Total Depth, feet (TOC)	52.00

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
939	13.64	300	3.68	57	0	6.42	208	19.86		
944	14.03	300	3.96	50	0	5.38	241	20.64		
949	14.00	300	3.80	50	3.8	5.33	264	20.84		
954	14.14	300	3.77	50	2.1	5.27	273	20.63		

Total volume purged	
Sample appearance	clear
Sample time	956
Sample date	2-27-23

Dup-1

922

Facility Name	AEP Pinnon PP
Sample by	Kenny McDonald

Sample Location ID	AD-13

Depth to water, feet (TOC)	11.40
Measured Total Depth, feet (TOC)	40.70

Depth to water date	02/27/23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
0755	12.02	200	5.30	426	202	6.24	301	20.31		
0800	12.15	200	4.91	423	178	2.49	284	20.25		
0805	12.23	200	4.83	421	101	2.42	242	20.19		
0810	12.33	200	4.80	419	97.4	2.39	238	20.12		
0815	12.41	200	4.78	419	89.1	2.34	231	20.26		

Total volume purged	
Sample appearance	
Sample time	0817
Sample date	02/27/23

Facility Name	PIPKIN PP
Sample by	Kenny McDonald

Sample Location ID	MD-18

Depth to water, feet (TOC)	3.85
Measured Total Depth, feet (TOC)	28.42

Depth to water date	02/27/23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
1207	5.01	110	4.08	58	7.3	3.41	431	16.02		
1212	5.97	110	4.35	52	4.2	2.73	418	17.53		
				won't hold water level						

Total volume purged	
Sample appearance	CLEAR
Sample time	0825
Sample date	02/28/23

Facility Name	AFP Pitman PP
Sample by	Kenny McDonald

Sample Location ID	AO-22

Depth to water, feet (TOC)	9.04
Measured Total Depth, feet (TOC)	32.70

Depth to water date	02/27/23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
0850	9.10	180	4.05	949	8.2	3.16	335	20.20		
0855	9.11	180	4.05	967	4.1	1.47	334	20.34		
0900	9.15	180	4.05	974	1.3	1.42	328	20.38		
0905	9.17	180	4.06	977	1.6	1.38	325	20.41		

Total volume purged	
Sample appearance	Clear
Sample time	0907
Sample date	02/27/23

Facility Name	P.View
Sample by	17-17 / Hamilton

Depth to water, feet (TOC)	30.54
Measured Total Depth, feet (TOC)	38.50

Sample Location ID	AD-23
Depth to water date	2-28-23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
1038	3-.72	220	4.47	72	0	2.86	239	21.88		
1043	30.72	220	4.17	71	0	3.15	230	21.76		
1048	30.73	220	4.21	71	2.1	3.25	227	21.64		
1053	30.74	220	4.33	70	3.9	3.37	228	21.65		
1058	30.74	220	4.39	69	4.5	3.33	227	21.63		
1103	30.74	220	4.42	70	4.4	3.34	226	21.64		

Total volume purged	
Sample appearance	Clear
Sample time	1105
Sample date	2-28-23

Facility Name	Pillow
Sample by	Matt Hemi Hur

Depth to water, feet (TOC)	8.83
Measured Total Depth, feet (TOC)	27.38

Sample Location ID	MD-23
Depth to water date	2-28-23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
916	9.03	120	4.71	1,190	20.7	1.76	184	20.35		
921	9.15	120	3.65	1,176	35.3	0.72	221	20.64		
926	9.23	120	3.51	1,166	23.7	0.58	234	20.34		
931	9.30	120	3.50	1,176	21.6	0.47	235	20.51		
936	9.37	120	3.44	1,176	21.5	0.43	236	20.92		

Total volume purged	
Sample appearance	Clear
Sample time	938
Sample date	2-28-23

Facility Name	Pinney
Sample by	Matt Hamill

Depth-to water, feet (TOC)	15.95
Measured Total Depth, feet (TOC)	42.79

Sample Location ID	AD-26
Depth to water date	2-28-23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
823	16.24	300	5.76	2,130	24.1	2.17	145	17.56		
828	16.54	300	4.27	2,080	69.8	0.96	221	14.24		
833	16.65	300	3.50	2,100	84.6	0.91	276	14.64		
838	16.71	300	3.10	2,080	68.5	1.14	306	14.73		
843	16.78	300	2.97	2,080	46.4	1.20	312	14.79		
848	16.84	300	2.97	2,070	31.5	1.11	307	14.76		
853	16.90	300	2.99	2,080	27.7	1.02	303	2.08		
858	16.95	300	3.00	2,080	27.5	1.00	302	20.06		

Total volume purged	
Sample appearance	clear
Sample time	900
Sample date	2-28-23

Landfill duplicate

1104

Facility Name	Pixley
Sample by	Matt Hamilton

Depth to water, feet (TOC)	16.41
Measured Total Depth, feet (TOC)	37.32

Sample Location ID	AD-31
Depth to water date	2-27-23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
1125	16.76	220	3.88	247	69.7	1.71	291	23.18		
1130	16.80	220	3.58	290	41.0	0.55	316	23.28		
1135	16.83	220	3.50	296	24.4	0.37	325	23.34		
1140	16.84	220	3.48	299	18.7	0.35	329	23.46		
1145	16.85	220	3.48	301	18.5	0.34	330	23.52		

Total volume purged	
Sample appearance	clear
Sample time	1147
Sample date	2-27-23

Facility Name	Pilkey
Sample by	Matt Hamilton

Depth to water, feet (TOC)	9.70
Measured Total Depth, feet (TOC)	34.61

Sample Location ID	AD-32
Depth to water date	2.27.23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
1041	10.22	220	3.24	421	65.6	1.53	318	21.31		
1046	10.27	220	3.23	425	43.5	0.78	334	21.82		
1051	10.31	220	3.22	435	27.6	0.55	345	22.19		
1056	10.33	220	3.28	434	9.5	0.49	347	22.34		
1101	10.34	220	3.32	433	9.4	0.46	348	22.42		

Total volume purged	
Sample appearance	clear
Sample time	1103
Sample date	2.27.23

Facility Name	PIMM PP
Sample by	Kinny McDonald

Sample Location ID	AD-33

Depth to water, feet (TOC)	12.19
Measured Total Depth, feet (TOC)	32.50

Depth to water date	02/27/23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
0941	12.24	200	3.95	264	1.3	2.13	365	20.97		
0946	12.21	200	4.07	252	4.6	1.50	356	21.33		
0951	12.21	200	4.07	250	2.8	1.49	354	21.40		
0956	12.22	200	4.07	248	2.2	1.46	353	21.48		

Total volume purged	
Sample appearance	Clear
Sample time	0958
Sample date	02/27/23

Facility Name	AEP Pirkey PP
Sample by	Kenny McDonald

Sample Location ID	AO-34

Depth to water, feet (TOC)	TOC
Measured Total Depth, feet (TOC)	26.05

Depth to water date	02/28/23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
1056	0.74	120	3.87	1610	2.6	2.87	373	24.40		
1101	0.81	120	3.82	1610	3.4	1.36	364	24.42		
1106	0.90	120	3.81	1610	5.7	1.28	358	24.46		
1111	0.95	120	3.78	1630	7.2	1.24	353	24.46		

Total volume purged	
Sample appearance	CLEAR
Sample time	1113
Sample date	02/28/23

Facility Name	Pixley
Sample by	Matt Hamilton

Depth to water, feet (TOC)	7.69
Measured Total Depth, feet (TOC)	17.10

Sample Location ID	AD-36
Depth to water date	2-28-23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
1011	8.01	220	4.60	97	17.3	2.01	93	21.76		
1016	8.06	220	4.56	70	4.9	0.51	158	21.18		
1021	8.08	220	4.53	64	4.2	0.45	173	21.34		

Total volume purged	
Sample appearance	clear
Sample time	1023
Sample date	2-28-36

Facility Name	Pilkey
Sample by	Matt Hamilton

Depth to water, feet (TOC)	16.55
Measured Total Depth, feet (TOC)	51.44

Sample Location ID	B-2
Depth to water date	2-27-23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
839	16.91	300	4.46	230	0	1.70	123	14.52		
844	17.03	300	5.08	145	0	0.65	57	14.66		
849	17.16	300	5.01	134	0	0.59	53	14.59		

Total volume purged	
Sample appearance	clear
Sample time	852
Sample date	2-27-23

Dup - B

1159

Facility Name	ACP Pinhook PP
Sample by	Kenny McDonald

Sample Location ID	B-3

Depth to water, feet (TOC)	12.50
Measured Total Depth, feet (TOC)	37.49

Depth to water date	02/17/23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
1141	13.63	102	4.55	228	6.7	2.83	366	20.47		
1146	15.02	102	4.80	197	2.8	1.91	370	20.56		
			WON'T HOLD WATER LEVEL							

Total volume purged	
Sample appearance	Clear
Sample time	0755
Sample date	02/28/23

Facility Name	Pitney
Sample by	Matt Hamlin

Depth to water, feet (TOC)	—
Measured Total Depth, feet (TOC)	—

Sample Location ID	EBAP
Depth to water date	2-28-23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
1123	—	—	4.47	4,576	6.7	5.30	335	24.61		

Total volume purged	
Sample appearance	clear
Sample time	1123
Sample date	2-28-23

Facility Name	
Sample by	P. Tilley Hunt / Hamilton

Depth to water, feet (TOC)	—
Measured Total Depth, feet (TOC)	—

Sample Location ID	Touchette
Depth to water date	2-28-23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
955	—	—	4.4	695	5.4	0.30	176	22.7c		

Total volume purged	
Sample appearance	clear
Sample time	955
Sample date	2-28-23

CCR Groundwater Monitoring Well Inspection Form

Facility: Pirkey

Sampling Period: June 2023

Sampling Contractor: Eagle

Signature: Matt Tannitos

Well No.	Well Locked	Fastener and Lock Functioning	Well Locked After Sampling	Access to Well Maintained	Well Casing, Protective Cover, Barriers and Pad in Good Shape	Well Properly Labeled	Well Cap Present and Vented*	Comments
B-2				✓	✓		✓	no label, top won't close
AD-31	✓	✓	✓	✓	✓		✓	no label
AD-30	✓	✓	✓	✓	✓	✓	✓	
AD-17	✓	✓	✓		✓	✓	✓	overgrown
AD-27	✓	✓	✓		✓	✓	✓	overgrown
AD-28	✓	✓	✓	✓	✓	✓	✓	
AD-23	✓	✓	✓	✓	✓	✓	✓	
AD-3	✓	✓	✓		✓	✓	✓	overgrown

*Not all wells will be vented, especially flush mounted wells. If that is the case, please note "flush mount well" in the comments.

CCR Groundwater Monitoring Well Inspection Form

Facility: AEP Pirkey PP Sampling Period: June 2023

Sampling Contractor: EAGLE Signature: [signature]

Well No.	Well Locked	Lock Functioning	Well Locked After Sampling	Access to Well Maintained	Well Casing, Housing, and Pad in Good Shape	Well Properly Labeled	Well cap present	Comments
AD-13	✓	✓	✓	✓	✓	✓	✓	
AD-22	✓	✓	✓	✓	✓	✓	✓	
AD-33	✓	✓	✓	✓	✓	✓	✓	
AD-7R	✓	✓	✓	✓	✓		✓	NO LABEL
B-3	✓	✓	✓	✓	✓		✓	NO LABEL
AD-18	✓	✓	✓		✓	✓	✓	TRAIL TO WELL + AREA AROUND WELL NEEDS CLEARING
AD-16	✓		✓		✓	✓	✓	TRAIL TO WELL NEEDS CLEARING NEEDS NEW LOCK
AD-07	✓	✓	✓	✓	✓	✓	✓	
AD-04					✓	✓	✓	NEEDS LOCK NEEDS WEED EATING LIMITED ACCESS TO WELL

Instructions: Complete form and submit to AEP Environmental Services with Field Data. Place check mark for items that are satisfactory. Unsatisfactory items should be left blank with a note in the comments section on what needs to be remedied.

CCR Groundwater Monitoring Well Inspection Form

Facility: Pirkey

Sampling Period: June 2023

Sampling Contractor: Eagle

Signature:

Well No.	Well Locked	Fastener and Lock Functioning	Well Locked After Sampling	Access to Well Maintained	Well Casing, Protective Cover, Barriers and Pad in Good Shape	Well Properly Labeled	Well Cap Present and Vented*	Comments
AD-12	S	S	S	S	S	S	S	
AD-32	S	S	S	S	S	S	S	
AD-2	S	S	S	S	S	S	S	
AD-28	S	S	S	S	S	S	S	
AD-26	S	S	S	S	S	S	S	
AD-34	S	S	S	S	4	S	S	Hinge Broken
AD-8	S	S	S	S	S	S	S	
AD-36	S	S	S	S	S	S	S	

*Not all wells will be vented, especially flush mounted wells. If that is the case, please note "flush mount well" in the comments.

Facility Name	AEP Pirtey
Sample by	BEB

Depth to water, feet (TOC)	16.49
Measured Total Depth, feet (TOC)	40.36

Sample Location ID	AD-2
Depth to water date	6/26/23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
1024	17.03	200	3.69	706	2.8	9.10	382	26.36		
1029	17.06	200	3.84	714	1.6	1.29	384	24.93		
1034	17.10	200	3.85	716	1.4	1.25	380	24.92		
1039	17.13	200	3.85	718	1.3	1.24	379	24.86		

Total volume purged	
Sample appearance	clear
Sample time	1042
Sample date	6/26/23

Facility Name	Pikey
Sample by	M.N / Hamilton

Depth to water, feet (TOC)	33.48
Measured Total Depth, feet (TOC)	57.49

Sample Location ID	AD-3
Depth to water date	6-27-23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
1044	33.72	220	6.01	206	348	1.53	197	26.55		
1046	33.86	220	5.99	185	12.1	1.11	186	25.98		
1054	33.95	220	5.92	173	6.9	1.01	173	25.61		
1059	34.07	220	5.84	171	6.8	1.08	170	25.55		

Total volume purged	
Sample appearance	clear
Sample time	1101
Sample date	6-27-23

Facility Name	AEP PIRKEY PP
Sample by	KENNY MIDDLETON

Sample Location ID	AD-04

Depth to water, feet (TOC)	14.13
Measured Total Depth, feet (TOC)	47.29

Depth to water date	06/27/23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
1053	14.19	164	4.47	98	42.3	4.28	377	24.68		
1058	14.23	164	4.51	98	37.6	3.74	362	24.59		
1103	14.25	164	4.53	95	36.5	3.69	360	24.55		
1108	14.41	164	4.53	92	34.9	3.63	366	24.51		

Total volume purged	
Sample appearance	TURBID
Sample time	1110
Sample date	06/27/23

Facility Name	AFP Pinkney PP
Sample by	Kerry McDonald

Sample Location ID	AD-07

Depth to water, feet (TOC)	14.96
Measured Total Depth, feet (TOC)	41.98

Depth to water date	06/27/23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
0934	15.13	174	3.84	316	1.1	2.13	321	24.91		
0939	15.20	174	3.80	321	0	1.84	321	24.83		
0944	15.24	174	3.77	334	0.8	1.80	321	24.77		
0949	15.26	174	3.76	338	0.4	1.77	322	24.75		

Total volume purged	
Sample appearance	CLEAR
Sample time	0951
Sample date	06/27/23

Facility Name	AEP Dirkey
Sample by	BEB

Depth to water, feet (TOC)	12.96
Measured Total Depth, feet (TOC)	31.33

Sample Location ID	AD-8
Depth to water date	6/27/23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
1005	13.28	168	5.68	565	14.0	2.42	120	26.20		
1010	13.33	168	5.73	578	7.6	2.11	166	26.11		
1015	13.35	168	5.78	582	7.2	2.08	162	26.10		
1020	13.38	168	5.79	583	7.1	2.04	158	26.04		

Total volume purged	
Sample appearance	clear
Sample time	1024
Sample date	6/27/23

Duplicate
900

Facility Name	AEP PIRKEY PP
Sample by	KENNY McDONALD

Sample Location ID	AD-7R

Depth to water, feet (TOC)	8.48
Measured Total Depth, feet (TOC)	33.03

Depth to water date	06/26/23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
1025	8.48	120	4.67	241	6.4	2.04	273	28.92		
1030	8.50	120	4.76	240	2.1	1.98	265	28.08		
1035	8.50	120	4.81	246	1.7	1.94	257	27.13		
1040	8.51	120	4.83	247	1.5	1.91	253	27.04		
1045	8.50	120	4.88	250	1.3	1.87	249	26.92		

Total volume purged	
Sample appearance	CLEAR
Sample time	1047
Sample date	06/26/23

Facility Name	AEP Pinkey
Sample by	BES

Depth to water, feet (TOC)	12.82
Measured Total Depth, feet (TOC)	52.00

Sample Location ID	AD-12
Depth to water date	6/26/23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
0738	13.21	300	4.36	55	12.0	2.36	288	26.63		
0743	13.55	300	4.44	40	8.6	1.94	320	24.93		
0748	13.58	300	4.56	40	8.4	1.90	324	24.84		
0753	13.54	300	4.60	42	8.0	1.88	328	24.86		

Total volume purged	
Sample appearance	clear
Sample time	0755
Sample date	6/26/23

Facility Name	APP Plant PD
Sample by	Kenny McDonald

Sample Location ID	AP-13

Depth to water, feet (TOC)	12.29
Measured Total Depth, feet (TOC)	40.70

Depth to water date	06/26/23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
0711	12.36	174	5.52	702	128	5.27	194	25.49		
0716	12.40	174	5.50	580	40.3	4.14	182	25.57		
0721	12.45	174	5.48	571	36.8	4.10	173	25.61		
0726	12.48	174	5.47	564	31.2	4.07	170	25.65		

Total volume purged	
Sample appearance	SLIGHTLY TURBID
Sample time	0728
Sample date	06/26/23

DUPLICATE-1 1200

Facility Name	AEP Pinney PP
Sample by	Kerry McDonald

Sample Location ID	AO-16

Depth to water, feet (TOC)	17.61
Measured Total Depth, feet (TOC)	38.24

Depth to water date	06/27/23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
0837	17.65	192	4.30	159	41.2	1.47	308	25.21		
0842	17.67	192	4.33	159	33.6	1.15	316	25.07		
0847	17.72	192	4.37	160	35.7	1.12	319	24.93		
0852	17.76	192	4.38	159	37.9	1.09	322	24.91		
0857	17.77	192	4.38	159	38.2	1.06	325	24.88		

Total volume purged	
Sample appearance	CLEAR
Sample time	0859
Sample date	06/27/23

Facility Name	
Sample by	P. Ickey, Matt Hamilton

Depth to water, feet (TOC)	20.96
Measured Total Depth, feet (TOC)	33.05

Sample Location ID	AD-17
Depth to water date	6-26-23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
1130	21.11	200	4.06	181	119	3.78	376	24.18		
1135	21.12	200	4.35	92	39.3	3.56	399	25.9		
1140	21.12	200	4.46	80	4.9	3.32	414	25.22		
1145	21.12	200	4.48	76	4.3	3.27	422	24.96		

Total volume purged	
Sample appearance	Clear
Sample time	1147
Sample date	6-26-23

Facility Name	AEP PIRKEY PP
Sample by	Kenny McDonald

Sample Location ID	AD-18

Depth to water, feet (TOC)	5.46
Measured Total Depth, feet (TOC)	28.42

Depth to water date	06/26/23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
1138	6.24	108	4.52	50	21.9	2.27	264	25.13		
1143	7.09	108	4.40	51	18.6	1.93	284	25.16		
				WON'T HOLD	WATER LEVEL					

Total volume purged	
Sample appearance	Clear
Sample time	0742
Sample date	06/27/23

Facility Name	AEP Pirkon PP
Sample by	Kenny McDonald

Sample Location ID	AD-22

Depth to water, feet (TOC)	10.22
Measured Total Depth, feet (TOC)	32.70

Depth to water date	06/26/23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
0826	10.42	164	4.28	810	8.4	4.12	226	25.23		
0831	10.44	164	4.13	852	0	2.37	224	25.18		
0836	10.47	164	4.09	857	1.1	2.31	218	25.07		
0841	10.50	164	4.07	861	0	2.26	216	24.91		

Total volume purged	
Sample appearance	Clear
Sample time	0843
Sample date	06/26/23

Facility Name	Pixley
Sample by	Clint Hamilton

Depth to water, feet (TOC)	25.97
Measured Total Depth, feet (TOC)	35.20

Sample Location ID	AD-23
Depth to water date	6-27-23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
944	30.25	220	4.63	314	8.3	7.15	262	25.01		
949	30.27	220	4.54	131	14.4	3.05	267	26.69		
954	30.28	220	4.53	106	7.2	2.51	274	26.16		
959	30.28	220	4.48	97	6.5	2.24	275	25.86		
1004	30.28	220	4.47	92	6.3	2.18	277	25.72		

Total volume purged	
Sample appearance	clear
Sample time	1006
Sample date	6-27-23

Facility Name	P.Ykoy
Sample by	M.tt Hamilla

Depth to water, feet (TOC)	8.46
Measured Total Depth, feet (TOC)	27.38

Sample Location ID	AD-25
Depth to water date	6-27-23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
855	8.77	120	4.42	875	37.2	2.24	275	29.33		
900	8.85	120	4.59	975	37.1	1.63	226	27.45		
905	8.93	120	4.73	1,000	37.5	1.45	183	27.05		
910	9.00	120	4.78	1,024	37.3	1.38	184	26.82		

Total volume purged	
Sample appearance	cler.
Sample time	912
Sample date	6-27-23

Facility Name	AEP Pirkey
Sample by	BOS

Depth to water, feet (TOC)	15.42
Measured Total Depth, feet (TOC)	42.73

Sample Location ID	AD-26
Depth to water date	6/27/23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
0730	15.88	300	4.76	2030	75.4	15.6	156	24.67		
0735	16.18	300	3.56	2080	48.0	2.4	243	24.14		
0740	16.25	300	3.36	2070	27.7	1.8	249	24.59		
0745	16.27	300	3.32	2060	26.8	1.7	250	24.62		

Total volume purged	
Sample appearance	clear
Sample time	0743
Sample date	6/27/23

Facility Name	
Sample by	Pilcey, Martin / Hamilton

Depth to water, feet (TOC)	19.95
Measured Total Depth, feet (TOC)	40.07

Sample Location ID	AD-27
Depth to water date	6-27-23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
8:08	20.28	300	4.25	266	113	2.41	262	27.60		
813	20.32	300	4.27	236	27.9	2.48	275	29.62		
818	20.34	300	4.26	235	12.2	2.22	280	25.31		
823	20.35	300	4.25	234	7.6	2.14	283	25.04		
828	20.36	300	4.24	233	7.4	2.11	283	24.91		

Total volume purged	
Sample appearance	clear
Sample time	830
Sample date	6-27-23

Facility Name	AEP Dirkey
Sample by	BCS

Depth to water, feet (TOC)	17.95
Measured Total Depth, feet (TOC)	38.54

Sample Location ID	AD-28
Depth to water date	6/26/23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
1108	19.28	220	4.43	119	7.3	10.69	337	26.51		
1113	19.44	220	4.32	112	5.1	2.53	345	24.61		
1118	19.56	220	4.25	111	3.7	3.15	350	24.55		
1123	19.58	220	4.23	111	3.6	3.20	355	24.53		

Total volume purged	
Sample appearance	clear
Sample time	1126
Sample date	6/26/23

Facility Name	Pixley
Sample by	N. Hamilton

Depth to water, feet (TOC)	19.95
Measured Total Depth, feet (TOC)	27.15

Sample Location ID	AD-30
Depth to water date	6-26-23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
1041	20.16	220	4.43	473	46.3	0.55	334	25.16		
1046	20.15	220	4.84	428	34.5	0.86	301	27.85		
1051	20.16	220	4.95	425	13.3	0.82	300	27.02		
1056	20.16	220	4.97	424	8.5	0.81	298	26.85		
1101	20.16	220	4.98	423	8.3	0.75	298	26.79		

Total volume purged	
Sample appearance	Clear
Sample time	1103
Sample date	6-26-23

Facility Name	Pixley
Sample by	M. Hamilton

Depth to water, feet (TOC)	20.29
Measured Total Depth, feet (TOC)	37.32

Sample Location ID	AD-31
Depth to water date	6-26-23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
939	20.60	220	3.64	285	50.7	5.43	274	26.57		
944	20.66	220	4.01	208	34.3	3.42	296	25.62		
945	20.71	220	4.12	291	15.5	4.90	307	25.30		
954	20.73	220	4.19	296	16.2	4.75	313	25.15		
959	20.74	220	4.20	299	16.2	4.71	316	25.13		

Total volume purged	
Sample appearance	clear
Sample time	1001
Sample date	6-26-23

Facility Name	AEP Pirkey
Sample by	Brad Bates

Sample Location ID	AD-32
Depth to water date	6/26/23

Depth to water, feet (TOC)	15.82
Measured Total Depth, feet (TOC)	34.65

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
0906	16.38	220	3.82	295	112	6.17	307	26.65		
0911	16.49	220	3.71	302	69.5	1.87	281	25.53		
0916	16.53	220	3.74	305	31.0	1.14	256	25.40		
0921	16.55	220	3.81	306	9.9	0.85	243	25.34		
0926	16.56	220	3.79	304	9.8	0.83	240	25.32		

Total volume purged	
Sample appearance	clear
Sample time	0930
Sample date	6/26/23

Facility Name	HEP PINON PP
Sample by	Kerry McDonald

Sample Location ID	MW-33

Depth to water, feet (TOC)	12.56
Measured Total Depth, feet (TOC)	32.50

Depth to water date	06/26/23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
0917	12.60	180	4.15	245	2.6	3.26	276	24.21		
0922	12.61	180	4.11	206	2.4	2.95	264	24.16		
0927	12.61	180	4.80	204	2.4	2.91	260	24.08		
0932	12.63	180	4.08	201	2.4	2.87	258	24.02		

Total volume purged	
Sample appearance	Clear
Sample time	0934
Sample date	06/26/23

Facility Name	AEP Pinkey
Sample by	BOB

Depth to water, feet (TOC)	TOC
Measured Total Depth, feet (TOC)	26.05

Sample Location ID	AP-34
Depth to water date	6/27/23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
0820	0.54	124	3.78	1800	6.8	2.96	96	24.33		
0825	0.62	124	3.72	1790	6.4	2.88	102	24.16		
0830	0.76	124	3.69	1788	6.0	2.72	104	24.08		
0835	0.84	124	3.67	1784	5.8	2.60	110	24.24		

Total volume purged	
Sample appearance	clear
Sample time	0839
Sample date	6/27/23

Facility Name	AEP Pirkey
Sample by	BCM

Sample Location ID	AD-36
Depth to water date	6/27/23

Depth to water, feet (TOC)	9.21
Measured Total Depth, feet (TOC)	17.10

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
0918	9.72	150	3.94	84	30.4	9.56	207	28.07		
0923	9.80	150	3.98	74	8.9	1.53	217	26.91		
0928	9.84	150	4.00	73	2.8	0.78	223	26.94		
0933	9.86	150	4.01	74	2.7	0.70	225	26.90		

Total volume purged	
Sample appearance	clear
Sample time	0936
Sample date	6/27/23

Facility Name	Piricey
Sample by	M-M / Hamilton

Sample Location ID	B-2
Depth to water date	6-26-23

Depth to water, feet (TOC)	18.05
Measured Total Depth, feet (TOC)	51.44

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
821	18.51	300	5.26	94	9.8	6.16	330	24.58		
826	18.62	300	5.58	93	0	5.30	327	23.53		
831	18.66	300	5.63	93	0	5.24	315	23.57		

Total volume purged	
Sample appearance	Clear
Sample time	833
Sample date	6-26-23

Duplicate
1245

Facility Name	ATP PIPER PP
Sample by	KENNY McDonald

Sample Location ID	B-3

Depth to water, feet (TOC)	14.60
Measured Total Depth, feet (TOC)	37.49

Depth to water date	06/26/23

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
1114	15.51	104	5.38	256	18.2	2.61	229	25.21		
1119	16.30	104	5.45	252	16.1	2.28	204	25.21		
				WOPIT HOLD WATER LOOP						

Total volume purged	
Sample appearance	Clear
Sample time	0700
Sample date	06/27/23

Facility Name	AEP Pirkey PP
Sample by	Brad Bates

Sample Location ID	AD-02

Depth to water, feet (TOC)	17.45
Measured Total Depth, feet (TOC)	40.36

Depth to water date	8/23/2023

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
946	17.72	200	3.78	734	0.8	1.78	368	24.02		
951	17.73	200	3.80	741	0	1.69	368	24.06		
956	17.75	200	3.79	744	0	1.66	364	24.13		
1001	17.75	200	3.77	745	0.3	1.64	368	24.18		

Total volume purged	
Sample appearance	Clear
Sample time	1003
Sample date	8/23/2023

Facility Name	AEP Pirkey PP
Sample by	Kenny McDonald

Sample Location ID	AD-04

Depth to water, feet (TOC)	19.54
Measured Total Depth, feet (TOC)	47.29

Depth to water date	8/23/2023

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
711	19.57	160	4.63	88	51.3	3.24	382	22.97		
716	19.58	160	4.62	89	50.6	2.89	380	23.01		
721	19.58	160	4.62	90	48.2	2.85	377	23.04		
726	19.58	160	4.61	91	52.3	2.81	384	23.10		

Total volume purged	
Sample appearance	Turbid
Sample time	728
Sample date	8/23/2023

Facility Name	AEP Pirkey PP
Sample by	Kenny McDonald

Sample Location ID	AD-12

Depth to water, feet (TOC)	19.52
Measured Total Depth, feet (TOC)	52.00

Depth to water date	8/23/2023

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
829	19.63	290	3.89	71	2.4	4.23	304	22.98		
834	19.66	290	3.88	68	0.0	4.19	311	22.87		
839	19.68	290	3.88	63	0.0	4.16	313	22.84		
844	19.71	290	3.84	63	0.0	4.11	317	22.82		

Total volume purged	
Sample appearance	Clear
Sample time	846
Sample date	8/23/2023

Facility Name	AEP Pirkey PP
Sample by	Kenny McDonald

Sample Location ID	AD-18

Depth to water, feet (TOC)	9.25
Measured Total Depth, feet (TOC)	28.42

Depth to water date	8/23/2023

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
808	10.13	104	4.41	48	11.4	2.68	311	24.21		
813	11.24	104	4.37	48	6.3	2.31	304	24.36		
			Won't hold water level							

Total volume purged	
Sample appearance	Clear
Sample time	950
Sample date	8/23/2023

Facility Name	AEP Pirkey PP
Sample by	Brad Bates

Sample Location ID	AD-23

Depth to water, feet (TOC)	29.71
Measured Total Depth, feet (TOC)	38.50

Depth to water date	8/23/2023

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
811	30.02	200	4.51	97	11.2	6.85	254	24.08		
816	30.02	200	4.47	94	6.4	4.01	241	23.84		
821	30.04	200	4.46	90	3.4	3.22	237	23.67		
826	30.05	200	4.41	88	3.9	2.97	233	23.65		
831	30.05	200	4.40	88	3.6	2.95	231	23.61		
836	30.08	200	4.40	86	3.3	2.96	229	23.58		

Total volume purged	
Sample appearance	Clear
Sample time	838
Sample date	8/23/2023

Facility Name	AEP Pirkey PP
Sample by	Kenny McDonald

Sample Location ID	AD-31

Depth to water, feet (TOC)	23.01
Measured Total Depth, feet (TOC)	37.32

Depth to water date	8/23/2023

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
906	23.58	240	4.03	294	16.4	2.81	301	24.13		
911	23.61	240	4.03	302	15.8	2.54	306	24.17		
916	23.64	240	4.00	308	15.6	2.53	314	24.12		
921	23.65	240	4.01	311	15.6	2.51	320	24.08		

Total volume purged	
Sample appearance	Clear
Sample time	923
Sample date	8/23/2023

Facility Name	AEP Pirkey PP
Sample by	Brad Bates

Sample Location ID	AD-32

Depth to water, feet (TOC)	17.72
Measured Total Depth, feet (TOC)	34.61

Depth to water date	8/23/2023

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
904	18.24	200	3.65	341	21.6	2.41	274	23.84		
909	18.26	200	3.62	338	10.2	1.05	269	23.81		
914	18.27	200	3.61	335	9.8	1.03	262	23.74		
919	18.29	200	3.61	330	9.6	1.03	258	23.76		

Total volume purged	
Sample appearance	Clear
Sample time	921
Sample date	8/23/2023

Facility Name	AEP Pirkey PP
Sample by	Brad Bates

Sample Location ID	AD-34

Depth to water, feet (TOC)	Top of Casing
Measured Total Depth, feet (TOC)	26.05

Depth to water date	8/23/2023

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
728	0.36	120	3.80	1,760	3.6	2.34	147	24.28		
733	0.41	120	3.77	1,740	2.1	2.06	154	24.19		
738	0.48	120	3.77	1740	2.4	2.01	159	24.17		
743	0.52	120	3.77	1720	2.2	1.99	163	24.13		

Total volume purged	
Sample appearance	Clear
Sample time	745
Sample date	8/23/2023

Facility Name	AEP Pirkey PP
Sample by	Brad Bates

Sample Location ID	AD-36

Depth to water, feet (TOC)	6.29
Measured Total Depth, feet (TOC)	17.10

Depth to water date	8/23/2023

Purge Stabilization Data

Time	Water Depth (from TOC)	Flow Rate (mL/min)	pH (S.U.)	Spec Cond (µS/cm)	Turbidity (N.T.U)	D.O. (mg/L)	ORP (mV)	Temperature (°C)		
649	6.35	150	4.28	92	22.7	2.13	197	24.13		
654	6.41	150	4.26	89	6.4	0.97	206	24.16		
659	6.46	150	4.26	86	5.8	0.86	211	24.19		
704	6.49	150	4.23	84	5.2	0.77	213	24.22		

Total volume purged	
Sample appearance	Clear
Sample time	706
Sample date	8/23/2023

APPENDIX 5- Analytical Laboratory Reports

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 230658 **Customer: Pirkey Power Station** **Date Reported: 03/31/2023**

Customer Sample ID: AD-2
Customer Description: TG-32
Lab Number: 230658-001
Preparation:
Date Collected: 02/27/2023 11:55 EST
Date Received: 03/02/2023 10:30 EST

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.35	mg/L	2	0.10	0.02		CRJ	03/15/2023 17:25	EPA 300.1 -1997, Rev. 1.0
Chloride	31.4	mg/L	2	0.04	0.02		CRJ	03/15/2023 17:25	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.22	mg/L	2	0.06	0.02		CRJ	03/15/2023 17:25	EPA 300.1 -1997, Rev. 1.0
Sulfate	268	mg/L	10	2.0	0.3		CRJ	03/15/2023 16:52	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	03/03/2023 11:26	SM 2320B-2011
TDS, Filterable Residue	510	mg/L	1	50	20		SDW	03/03/2023 11:13	SM 2540C-2015

Customer Sample ID: AD-4
Customer Description: TG-32
Lab Number: 230658-002
Preparation:
Date Collected: 02/28/2023 10:13 EST
Date Received: 03/02/2023 10:30 EST

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.14	mg/L	2	0.10	0.02		CRJ	03/15/2023 16:19	EPA 300.1 -1997, Rev. 1.0
Chloride	4.08	mg/L	2	0.04	0.02		CRJ	03/15/2023 16:19	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.05	mg/L	2	0.06	0.02	J1	CRJ	03/15/2023 16:19	EPA 300.1 -1997, Rev. 1.0
Sulfate	19.9	mg/L	2	0.40	0.06		CRJ	03/15/2023 16:19	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	03/03/2023 11:26	SM 2320B-2011
TDS, Filterable Residue	140	mg/L	1	50	20		SDW	03/03/2023 11:13	SM 2540C-2015

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Job ID: 230658 **Customer: Pirkey Power Station** **Date Reported: 03/31/2023**

Customer Sample ID: AD-7
Customer Description: TG-32
Lab Number: 230658-003
Preparation:
Date Collected: 02/28/2023 11:18 EST
Date Received: 03/02/2023 10:30 EST

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	2.49	mg/L	2	0.10	0.02		CRJ	03/15/2023 19:04	EPA 300.1 -1997, Rev. 1.0
Chloride	30.9	mg/L	2	0.04	0.02		CRJ	03/15/2023 19:04	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.53	mg/L	2	0.06	0.02		CRJ	03/15/2023 19:04	EPA 300.1 -1997, Rev. 1.0
Sulfate	77.5	mg/L	2	0.40	0.06		CRJ	03/15/2023 19:04	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	03/03/2023 11:26	SM 2320B-2011
TDS, Filterable Residue	270	mg/L	1	50	20		SDW	03/03/2023 11:20	SM 2540C-2015

Customer Sample ID: AD-12
Customer Description: TG-32
Lab Number: 230658-004
Preparation:
Date Collected: 02/27/2023 10:56 EST
Date Received: 03/02/2023 10:30 EST

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.08	mg/L	2	0.10	0.02	J1	CRJ	03/15/2023 20:09	EPA 300.1 -1997, Rev. 1.0
Chloride	6.51	mg/L	2	0.04	0.02		CRJ	03/15/2023 20:09	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.07	mg/L	2	0.06	0.02		CRJ	03/15/2023 20:09	EPA 300.1 -1997, Rev. 1.0
Sulfate	3.90	mg/L	2	0.40	0.06		CRJ	03/15/2023 20:09	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	03/03/2023 11:26	SM 2320B-2011
TDS, Filterable Residue	70	mg/L	1	50	20		SDW	03/03/2023 11:20	SM 2540C-2015

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Job ID: 230658 **Customer: Pirkey Power Station** **Date Reported: 03/31/2023**

Customer Sample ID: AD-13
Customer Description: TG-32
Lab Number: 230658-005
Preparation:
Date Collected: 02/27/2023 09:17 EST
Date Received: 03/02/2023 10:30 EST

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.24	mg/L	2	0.10	0.02		CRJ	03/16/2023 00:33	EPA 300.1 -1997, Rev. 1.0
Chloride	51.8	mg/L	10	0.2	0.1		CRJ	03/16/2023 00:00	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.26	mg/L	2	0.06	0.02		CRJ	03/16/2023 00:33	EPA 300.1 -1997, Rev. 1.0
Sulfate	98.5	mg/L	10	2.0	0.3		CRJ	03/16/2023 00:00	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	03/03/2023 11:26	SM 2320B-2011
TDS, Filterable Residue	250	mg/L	1	50	20		SDW	03/03/2023 11:20	SM 2540C-2015

Customer Sample ID: AD-18
Customer Description: TG-32
Lab Number: 230658-006
Preparation:
Date Collected: 02/28/2023 09:25 EST
Date Received: 03/02/2023 10:30 EST

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.04	mg/L	2	0.10	0.02	J1	CRJ	03/15/2023 23:27	EPA 300.1 -1997, Rev. 1.0
Chloride	5.49	mg/L	2	0.04	0.02		CRJ	03/15/2023 23:27	EPA 300.1 -1997, Rev. 1.0
Fluoride	<0.02	mg/L	2	0.06	0.02	U1	CRJ	03/15/2023 23:27	EPA 300.1 -1997, Rev. 1.0
Sulfate	7.52	mg/L	2	0.40	0.06		CRJ	03/15/2023 23:27	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	03/03/2023 11:26	SM 2320B-2011
TDS, Filterable Residue	100	mg/L	1	50	20		SDW	03/03/2023 11:26	SM 2540C-2015

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 230658 **Customer: Pirkey Power Station** **Date Reported: 03/31/2023**

Customer Sample ID: AD-31 Customer Description: TG-32
Lab Number: 230658-008 Preparation:
Date Collected: 02/27/2023 12:47 EST Date Received: 03/02/2023 10:30 EST

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.29	mg/L	2	0.10	0.02		CRJ	03/16/2023 02:12	EPA 300.1 -1997, Rev. 1.0
Chloride	23.4	mg/L	2	0.04	0.02		CRJ	03/16/2023 02:12	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.13	mg/L	2	0.06	0.02		CRJ	03/16/2023 02:12	EPA 300.1 -1997, Rev. 1.0
Sulfate	82.2	mg/L	2	0.40	0.06		CRJ	03/16/2023 02:12	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	03/03/2023 11:26	SM 2320B-2011
TDS, Filterable Residue	260	mg/L	1	50	20		SDW	03/03/2023 11:26	SM 2540C-2015

Customer Sample ID: AD-32 Customer Description: TG-32
Lab Number: 230658-009 Preparation:
Date Collected: 02/27/2023 12:03 EST Date Received: 03/02/2023 10:30 EST

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	4.44	mg/L	2	0.10	0.02		CRJ	03/16/2023 02:44	EPA 300.1 -1997, Rev. 1.0
Chloride	25.1	mg/L	2	0.04	0.02		CRJ	03/16/2023 02:44	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.44	mg/L	2	0.06	0.02		CRJ	03/16/2023 02:44	EPA 300.1 -1997, Rev. 1.0
Sulfate	151	mg/L	10	2.0	0.3		CRJ	03/16/2023 03:50	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	03/03/2023 11:26	SM 2320B-2011
TDS, Filterable Residue	340	mg/L	1	50	20		SDW	03/03/2023 11:26	SM 2540C-2015

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Job ID: 230658 **Customer: Pirkey Power Station** **Date Reported: 03/31/2023**

Customer Sample ID: AD-33
Customer Description: TG-32
Lab Number: 230658-010
Preparation:
Date Collected: 02/27/2023 10:58 EST
Date Received: 03/02/2023 10:30 EST

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.34	mg/L	2	0.10	0.02		CRJ	03/16/2023 04:23	EPA 300.1 -1997, Rev. 1.0
Chloride	10.9	mg/L	2	0.04	0.02		CRJ	03/16/2023 04:23	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.34	mg/L	2	0.06	0.02		CRJ	03/16/2023 04:23	EPA 300.1 -1997, Rev. 1.0
Sulfate	74.5	mg/L	2	0.40	0.06		CRJ	03/16/2023 04:23	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	03/03/2023 11:26	SM 2320B-2011
TDS, Filterable Residue	190	mg/L	1	50	20		SDW	03/03/2023 11:33	SM 2540C-2015

Customer Sample ID: DUPLICATE 1
Customer Description: TG-32
Lab Number: 230658-011
Preparation:
Date Collected: 02/27/2023 10:22 EST
Date Received: 03/02/2023 10:30 EST

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.08	mg/L	2	0.10	0.02	J1	CRJ	03/15/2023 14:40	EPA 300.1 -1997, Rev. 1.0
Chloride	6.47	mg/L	2	0.04	0.02		CRJ	03/15/2023 14:40	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.07	mg/L	2	0.06	0.02		CRJ	03/15/2023 14:40	EPA 300.1 -1997, Rev. 1.0
Sulfate	4.08	mg/L	2	0.40	0.06		CRJ	03/15/2023 14:40	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	03/03/2023 11:26	SM 2320B-2011
TDS, Filterable Residue	70	mg/L	1	50	20		SDW	03/03/2023 11:33	SM 2540C-2015

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 230658 **Customer: Pirkey Power Station** **Date Reported: 03/31/2023**

Customer Sample ID: DUPLICATE 2
Customer Description: TG-32
Lab Number: 230658-012
Preparation:
Date Collected: 02/28/2023 14:00 EST
Date Received: 03/02/2023 10:30 EST

Ion Chromatography

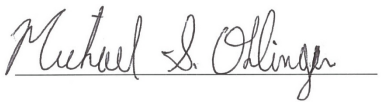
Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.15	mg/L	2	0.10	0.02		CRJ	03/15/2023 15:13	EPA 300.1 -1997, Rev. 1.0
Chloride	3.92	mg/L	2	0.04	0.02		CRJ	03/15/2023 15:13	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.05	mg/L	2	0.06	0.02	J1	CRJ	03/15/2023 15:13	EPA 300.1 -1997, Rev. 1.0
Sulfate	20.1	mg/L	2	0.40	0.06		CRJ	03/15/2023 15:13	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	03/03/2023 11:26	SM 2320B-2011
TDS, Filterable Residue	130	mg/L	1	50	20		SDW	03/03/2023 11:33	SM 2540C-2015

Report Verification

This report and the above data have been confirmed by the following analyst.



Michael Ohlinger, Chemist
Email: msohlinger@aep.com
Phone: 614-836-4184
Audinet: 8-210-4184

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 230658 **Customer: Pirkey Power Station** **Date Reported: 03/31/2023**

Data Qualifer Legend

U1 - Not detected at or above method detection limit (MDL).

J1 - Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.

Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

Dolan Chemical Laboratory (DCL)
4001 Bixby Road
Groveport, Ohio 43125
Contacts: Jonathan Barnhill (318-673-3803)
Michael Ohlinger (614-836-4184)

Project Name: Pirkey - CCR

Contact Name: Leslie Fuerschbach

Contact Phone: 318-423-3805

Sampler(s): Matt Hamilton Kenny McDonald

Analysis Turnaround Time (in Calendar Days)

Site Contact:

Date:

For Lab Use Only:
COC/Order #: 230658

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	250 mL bottle, pH<2, HNO_3 B, Ca, Li, Sb, As, Ba, Be, Cd, Cr, Co, Pb, Mo, Se, TL and Na, K, Mg, Sr	Field-filter 250 mL bottle, then pH<2, HNO_3 B, Ca, Li, Sb, As, Ba, Be, Cd, Cr, Co, Fe, Mn, Mo, Pb, Se, TL and Na, K, Mg, Sr	1 L bottle, Cool, 0-6°C TDS, F, Cl, SO_4, Br, andAlkalinity	Three (six every 10th*) 1 L bottles, pH<2, HNO_3 Ra-226, Ra-228	40 mL Glass vial or 250 mL PTFE lined bottle, HCL**, pH<2 Hg	40 mL Glass vial or 250 mL PTFE lined bottle, HCL**, pH<2 Hg	Sample Specific Notes:
AD-2	2/27/2023	1055	G	GW	1				X				
AD-4	2/28/2023	913	G	GW	1				X				
AD-7	2/28/2023	1018	G	GW	1				X				
AD-12	2/27/2023	956	G	GW	1				X				
AD-13	2/27/2023	817	G	GW	1				X				
AD-18	2/28/2023	825	G	GW	1				X				
AD-22	2/27/2023	907	G	GW	1				X				
AD-31	2/27/2023	1147	G	GW	1				X				
AD-32	2/27/2022	1103	G	GW	1				X				
AD-33	2/27/2023	958	G	GW	1				X				
DUPLICATE 1	2/27/2023	922	G	GW	1				X				
Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____; F= filter in field							4	F4	1	4	2	2	

** Six 1L Bottles must be collected for Radium for every 10th sample.*

Special Instructions/QC Requirements & Comments:

TG-32

Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Matt Hamilton	Eagle	3-1-23 1500		
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: Michael Ohlinger	Date/Time: 3/2/23 10:30 AM

Form COC-04, AEP Chain of Custody (COC) Record for Coal Combustion Residual (CCR) Sampling - Shreveport, Rev. 1, 1/10/17

Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

Dolan Chemical Laboratory (DCL)
4001 Bixby Road
Groveport, Ohio 43125
Contacts: Jonathan Barnhill (318-673-3803)
Michael Ohlinger (614-836-4184)

Project Name: Pirkey - CCR
Contact Name: Leslie Fuerschbach
Contact Phone: 318-423-3805
Sampler(s): Matt Hamilton Kenny McDonald

Analysis Turnaround Time (in Calendar Days)

Site Contact:

Date:

For Lab Use Only:
COC/Order #:

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	250 mL bottle, pH<2, HNO_3: B, Ca, Li, Sb, As, Ba, Be, Cd, Cr, Co, Pb, Mo, Se, TL and Na, K, Mg, Sr	Field-filter 250 mL bottle, then pH<2, HNO_3: B, Ca, Li, Sb, As, Ba, Be, Cd, Cr, Co, Fe, Mn, Mo, Pb, Se, TL and Na, K, Mg, Sr	1 L bottle, Cool, 0-6°C: TDS, F, Cl, SO_4, Br, and Alkalinity	Three (six every 10th*) 1 L bottles, pH<2, HNO_3: Ra-226, Ra-228	40 mL Glass vial or 250 mL PTFE lined bottle, HCL**, pH<2: Hg	40 mL Glass vial or 250 mL PTFE lined bottle, HCL**, pH<2: Hg		Sample Specific Notes:
DUPLICATE 2	2/28/2023	1300	G	GW	1				X					
Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____; F= filter in field							4	F4	1	4	2	2		

* *Six 1L Bottles must be collected for Radium for every 10th sample.*

Special Instructions/QC Requirements & Comments:

TG-32

Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
[signature]	Eagle	3-1-23 1500		
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: [signature]	Date/Time: 3/2/23 10:30 am

AEP WATER & WASTE SAMPLE RECEIPT FORM

Package Type	Delivery Type
(Cooler) Box Bag Envelope	PONY UPS (FedEX) USPS
	Other _____

Plant/Customer Pirkee Power Station **Number of Plastic Containers:** 12

Opened By Michael **Number of Glass Containers:** _____

Date/Time 03/02/23 10:30Am **Number of Mercury Containers:** _____

Were all temperatures within 0-6°C? (Y) / N or N/A **Initial:** MGC (on ice) / no ice

(IR Gun Ser# 2213689000, *Expir.* 03/24/2024) - If No, specify each deviation: _____

Was container in good condition? (Y) / N Comments _____

Was Chain of Custody received? (Y) / N Comments _____

Requested turnaround: 28 days If **RUSH**, who was notified? _____

pH (15 min)	Cr^{+6} (pres) (24 hr)	NO_2 or NO_3 (48 hr)	*ortho*-PO_4 (48 hr)	Hg-diss (pres) (48 hr)

Was COC filled out properly? (Y) / N Comments _____

Were samples labeled properly? (Y) / N Comments _____

Were correct containers used? (Y) / N Comments _____

Was pH checked & Color Coding done? (Y) / N or N/A **Initial & Date:** MGC 03/02/23

pH paper (circle one): MQuant,PN1.09535.0001,LOT#_____ [OR] Lab Rat,PN4801,LOT# X000RWDG21

- Was Add'l Preservative needed? Y / (N) If Yes: By whom & when: _____ (See Prep Book)

Is sample filtration requested? Y / (N) Comments _____ (See Prep Book)

Was the customer contacted? If Yes: Person Contacted: _____

Lab ID# 230658 Initial & Date & Time : _____

Logged by MSO Comments: Bottle AD-22 was spilled inside cooler. MGC AD-22 (230658-007) is canceled from Lim. need resampled. MGC

Reviewed by MGC

REMINDER: Document the pertinent sample integrity information and deviations in sample receipt (as noted above) in the "Notes" field in the LIMS to be included on the report to the customer.

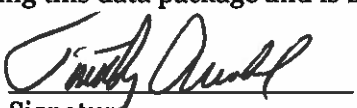
Municipal Solid Waste Laboratory Review Checklist

This data package consists of:

- [x] This signature page, and the laboratory review checklist consisting of Table 1, Reportable Data (which includes the reportable data identified on this page), Table 2, Supporting Data, and Table 3, Exception Reports.
- [x] R1 Field chain-of-custody documentation
- [x] R2 Sample identification cross-reference
- [x] R3 Test reports (analytical data sheets) for each environmental sample that includes:
  - (a) Items specified in NELAC Chapter 5 for reporting results, e.g., Section 5.5.10 in 2003 NELAC Standard
  - (b) Dilution factors
  - (c) Preparation methods
  - (d) Cleanup methods
  - (e) If required for the project, tentatively identified compounds (TICs)
- [x] R4 Surrogate recovery data including:
  - (a) Calculated recovery (%R)
  - (b) The laboratory's surrogate QC limits
- [x] R5 Test reports/summary forms for blank samples
- [x] R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  - (a) LCS spiking amounts
  - (b) Calculated %R for each analyte
  - (c) The laboratory's LCS QC limits
- [x] R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  - (a) Samples associated with the MS/MSD clearly identified
  - (b) MS/MSD spiking amounts
  - (c) Concentration of each MS/MSD analyte measured in the parent and spiked samples
  - (d) Calculated %Rs and relative percent differences (RPDs)
  - (e) The laboratory's MS/MSD QC limits
- [x] R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  - (a) The amount of analyte measured in the duplicate
  - (b) The calculated RPD
  - (c) The laboratory's QC limits for analytical duplicates
- [x] R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix
- [x] R10 Other problems or anomalies
- [x] The Exception Report for every item for which the result is "No" or "NR" (Not Reviewed)

Release Statement: I am responsible for the release of this laboratory data package. This data package as been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Check, if applicable: (●) This laboratory is an in-house laboratory controlled by the person responding to rule. The official signing the cover page of the rule-required report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Timothy Arnold		Chemist Principal	3/16/2023
Name (printed)	Signature	Official Title	Date

Ion Chromatography Laboratory Review Checklist

Table 1. Reportable Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey CCR

Reviewer Name: Timothy Arnold

LRC Date: 3/16/2023

Laboratory Job Number: 230658

Prep Batch Number(s): QC2303119

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
R1	O, I	**Chain-of-custody (COC)**		
	I	Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	Yes	
	I	Were all departures from standard conditions described in an exception report?	Yes	
R2	O, I	**Sample and quality control (QC) identification**		
	I	Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	Yes	
	I	Are all laboratory ID numbers cross-referenced to the corresponding QC data?	Yes	
R3	O, I	**Test reports**		
	I	Were all samples prepared and analyzed within holding times?	Yes	
	I	Other than those results < MQL, were all other raw values bracketed by calibration standards?	Yes	
	I	Were calculations checked by a peer or supervisor?	Yes	
	I	Were all analyte identifications checked by a peer or supervisor?	Yes	
	I	Were sample quantitation limits reported for all analytes not detected?	Yes	
	I	Were all results for soil and sediment samples reported on a dry weight basis?	NA	
	I	Was % moisture (or solids) reported for all soil and sediment samples?	NA	
	I	If required for the project, TICs reported?	NA	
R4	O	**Surrogate recovery data**		
	I	Were surrogates added prior to extraction?	Yes	
	I	Were surrogate percent recoveries in all samples within the laboratory QC limits?	Yes	
R5	O, I	**Test reports/summary forms for blank samples**		
	I	Were appropriate type(s) of blanks analyzed?	Yes	
	I	Were blanks analyzed at the appropriate frequency?	Yes	

Ion Chromatography Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
	I	Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	Yes	
	I	Were blank concentrations < MQL?	Yes	
R6	O, I	**Laboratory control samples (LCS):**		
	I	Were all COCs included in the LCS?	Yes	
	I	Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	Yes	
	I	Were LCSs analyzed at the required frequency?	Yes	
	I	Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	Yes	
	I	Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	Yes	
	I	Was the LCSD RPD within QC limits?	Yes	
R7	O, I	**Matrix spike (MS) and matrix spike duplicate (MSD) data**		
	I	Were the project/method specified analytes included in the MS and MSD?	Yes	
	I	Were MS/MSD analyzed at the appropriate frequency?	Yes	
	I	Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	Yes	
	I	Were MS/MSD RPDs within laboratory QC limits?	Yes	
R8	O, I	**Analytical duplicate data**		
	I	Were appropriate analytical duplicates analyzed for each matrix?	Yes	
	I	Were analytical duplicates analyzed at the appropriate frequency?	Yes	
	I	Were RPDs or relative standard deviations within the laboratory QC limits?	Yes	
R9	O, I	**Method quantitation limits (MQLs):**		
	I	Are the MQLs for each method analyte included in the laboratory data package?	Yes	
	I	Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	Yes	
	I	Are unadjusted MQLs included in the laboratory data package?	Yes	
R10	O, I	**Other problems/anomalies**		
	I	Are all known problems/anomalies/special conditions noted in this LRC and ER?	Yes	
	I	Were all necessary corrective actions performed for the reported data?	Yes	
	I	Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	Yes	

Table 2. Supporting Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey CCR

Reviewer Name: Timothy Arnold

LRC Date: 3/16/2023

Laboratory Job Number: 230658

Prep Batch Number(s): QC2303119

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S1	O, I	**Initial calibration (ICAL)**		
	I	Were response factors and/or relative response factors for each analyte within QC limits?	NA	
	I	Were percent RSDs or correlation coefficient criteria met?	Yes	
	I	Was the number of standards recommended in the method used for all analytes?	Yes	
	I	Were all points generated between the lowest and highest standard used to calculate the curve?	Yes	
	I	Are ICAL data available for all instruments used?	Yes	
	I	Has the initial calibration curve been verified using an appropriate second source standard?	Yes	
S2	O, I	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB):**		
	I	Was the CCV analyzed at the method-required frequency?	Yes	
	I	Were percent differences for each analyte within the method-required QC limits?	Yes	
	I	Was the ICAL curve verified for each analyte?	Yes	
	I	Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	No	ER1
S3	O	**Mass spectral tuning:**		
	I	Was the appropriate compound for the method used for tuning?	NA	
	I	Were ion abundance data within the method-required QC limits?	NA	
S4	O	**Internal standards (IS):**		
	I	Were IS area counts and retention times within the method-required QC limits?	NA	
S5	O, I	**Raw data (NELAC section 1 appendix A glossary, and section 5.)**		
	I	Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	Yes	
	I	Were data associated with manual integrations flagged on the raw data?	NA	

Ion Chromatography Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S6	O	**Dual column confirmation**		
	I	Did dual column confirmation results meet the method-required QC?	NA	
S7	O	**Tentatively identified compounds (TICs):**		
	I	If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?	NA	
S8	I	**Interference Check Sample (ICS) results:**		
	I	Were percent recoveries within method QC limits?	NA	
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**		
	I	Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	NA	
S10	O, I	**Method detection limit (MDL) studies**		
	I	Was a MDL study performed for each reported analyte?	Yes	
	I	Is the MDL either adjusted or supported by the analysis of DCSs?	Yes	
S11	O, I	**Proficiency test reports:**		
	I	Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	Yes	
S12	O, I	**Standards documentation**		
	I	Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	Yes	
S13	O, I	**Compound/analyte identification procedures**		
	I	Are the procedures for compound/analyte identification documented?	Yes	
S14	O, I	**Demonstration of analyst competency (DOC)**		
	I	Was DOC conducted consistent with NELAC Chapter 5C?	Yes	
	I	Is documentation of the analyst's competency up-to-date and on file?	Yes	
S15	O, I	**Verification/validation documentation for methods (NELAC Chap 5n 5)**		
	I	Are all the methods used to generate the data documented, verified, and validated, where applicable?	Yes	
S16	O, I	**Laboratory standard operating procedures (SOPs):**		
	I	Are laboratory SOPs current and on file for each method performed?	Yes	

Table 3. Exception Reports.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey CCR

Reviewer Name: Timothy Arnold

LRC Date: 3/16/2023

Laboratory Job Number: 230658

Prep Batch Number(s): QC2303119

Exception Report No.	Description
ER1	CCB acceptance criteria is CCB<MQL.

[1] Items identified by the letter "R" must be available as a hard copy or as a .pdf file. Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
[2] O - organic analyses; I - inorganic analyses (including general chemistry constituents, when applicable).
[3] NA - Not applicable; NR - Not reviewed.
[4] Exception Report identification number; an Exception Report should be completed for an item if the result is "No" or "NR."

Municipal Solid Waste Laboratory Review Checklist

This data package consists of:

- [x] This signature page, and the laboratory review checklist consisting of Table 1, Reportable Data (which includes the reportable data identified on this page), Table 2, Supporting Data, and Table 3, Exception Reports.
- [x] R1 Field chain-of-custody documentation
- [x] R2 Sample identification cross-reference
- [x] R3 Test reports (analytical data sheets) for each environmental sample that includes:
  - (a) Items specified in NELAC Chapter 5 for reporting results, e.g., Section 5.5.10 in 2003 NELAC Standard
  - (b) Dilution factors
  - (c) Preparation methods
  - (d) Cleanup methods
  - (e) If required for the project, tentatively identified compounds (TICs)
- [NA] R4 Surrogate recovery data including:
  - (a) Calculated recovery (%R)
  - (b) The laboratory's surrogate QC limits
- [x] R5 Test reports/summary forms for blank samples
- [x] R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  - (a) LCS spiking amounts
  - (b) Calculated %R for each analyte
  - (c) The laboratory's LCS QC limits
- [x] R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  - (a) Samples associated with the MS/MSD clearly identified
  - (b) MS/MSD spiking amounts
  - (c) Concentration of each MS/MSD analyte measured in the parent and spiked samples
  - (d) Calculated %Rs and relative percent differences (RPDs)
  - (e) The laboratory's MS/MSD QC limits
- [x] R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  - (a) The amount of analyte measured in the duplicate
  - (b) The calculated RPD
  - (c) The laboratory's QC limits for analytical duplicates
- [x] R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix
- [x] R10 Other problems or anomalies
- [x] The Exception Report for every item for which the result is "No" or "NR" (Not Reviewed)

Release Statement: I am responsible for the release of this laboratory data package. This data package as been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Check, if applicable: (●) This laboratory is an in-house laboratory controlled by the person responding to rule. The official signing the cover page of the rule-required report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Michael Ohlinger	Michael Ohlinger	Chemist	3/31/2023
Name (printed)	Signature	Official Title	Date

Alkalinity Laboratory Review Checklist

Table 1. Reportable Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey - CCR

Reviewer Name: Michael Ohlinger

LRC Date: 3/31/2023

Laboratory Job Number: 230658

Prep Batch Number(s): QC2303029

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
R1	O, I	**Chain-of-custody (COC)**		
	I	Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	Yes	
	I	Were all departures from standard conditions described in an exception report?	Yes	
R2	O, I	**Sample and quality control (QC) identification**		
	I	Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	Yes	
	I	Are all laboratory ID numbers cross-referenced to the corresponding QC data?	Yes	
R3	O, I	**Test reports**		
	I	Were all samples prepared and analyzed within holding times?	Yes	
	I	Other than those results < MQL, were all other raw values bracketed by calibration standards?	NA	
	I	Were calculations checked by a peer or supervisor?	Yes	
	I	Were all analyte identifications checked by a peer or supervisor?	Yes	
	I	Were sample quantitation limits reported for all analytes not detected?	Yes	
	I	Were all results for soil and sediment samples reported on a dry weight basis?	NA	
	I	Was % moisture (or solids) reported for all soil and sediment samples?	NA	
	I	If required for the project, TICs reported?	NA	
R4	O	**Surrogate recovery data**		
	I	Were surrogates added prior to extraction?	NA	
	I	Were surrogate percent recoveries in all samples within the laboratory QC limits?	NA	
R5	O, I	**Test reports/summary forms for blank samples**		
	I	Were appropriate type(s) of blanks analyzed?	Yes	
	I	Were blanks analyzed at the appropriate frequency?	Yes	

Alkalinity Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
	I	Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	Yes	
	I	Were blank concentrations < MQL?	Yes	
R6	O, I	**Laboratory control samples (LCS):**		
	I	Were all COCs included in the LCS?	Yes	
	I	Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	Yes	
	I	Were LCSs analyzed at the required frequency?	Yes	
	I	Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	Yes	
	I	Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	Yes	
	I	Was the LCSD RPD within QC limits?	Yes	
R7	O, I	**Matrix spike (MS) and matrix spike duplicate (MSD) data**		
	I	Were the project/method specified analytes included in the MS and MSD?	NA	
	I	Were MS/MSD analyzed at the appropriate frequency?	NA	
	I	Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	NA	
	I	Were MS/MSD RPDs within laboratory QC limits?	NA	
R8	O, I	**Analytical duplicate data**		
	I	Were appropriate analytical duplicates analyzed for each matrix?	Yes	
	I	Were analytical duplicates analyzed at the appropriate frequency?	Yes	
	I	Were RPDs or relative standard deviations within the laboratory QC limits?	Yes	
R9	O, I	**Method quantitation limits (MQLs):**		
	I	Are the MQLs for each method analyte included in the laboratory data package?	Yes	
	I	Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	Yes	
	I	Are unadjusted MQLs included in the laboratory data package?	Yes	
R10	O, I	**Other problems/anomalies**		
	I	Are all known problems/anomalies/special conditions noted in this LRC and ER?	Yes	
	I	Were all necessary corrective actions performed for the reported data?	Yes	
	I	Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	Yes	

Alkalinity Laboratory Review Checklist

Table 2. Supporting Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey - CCR

Reviewer Name: Michael Ohlinger

LRC Date: 3/31/2023

Laboratory Job Number: 230658

Prep Batch Number(s): QC2303029

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S1	O, I	**Initial calibration (ICAL)**		
	I	Were response factors and/or relative response factors for each analyte within QC limits?	NA	
	I	Were percent RSDs or correlation coefficient criteria met?	NA	
	I	Was the number of standards recommended in the method used for all analytes?	NA	
	I	Were all points generated between the lowest and highest standard used to calculate the curve?	Yes	
	I	Are ICAL data available for all instruments used?	NA	
	I	Has the initial calibration curve been verified using an appropriate second source standard?	NA	
S2	O, I	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB):**		
	I	Was the CCV analyzed at the method-required frequency?	Yes	
	I	Were percent differences for each analyte within the method-required QC limits?	Yes	
	I	Was the ICAL curve verified for each analyte?	Yes	
	I	Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	No	ER1
S3	O	**Mass spectral tuning:**		
	I	Was the appropriate compound for the method used for tuning?	NA	
	I	Were ion abundance data within the method-required QC limits?	NA	
S4	O	**Internal standards (IS):**		
	I	Were IS area counts and retention times within the method-required QC limits?	NA	
S5	O, I	**Raw data (NELAC section 1 appendix A glossary, and section 5.)**		
	I	Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	Yes	
	I	Were data associated with manual integrations flagged on the raw data?	NA	

Alkalinity Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S6	O	**Dual column confirmation**		
	I	Did dual column confirmation results meet the method-required QC?	NA	
S7	O	**Tentatively identified compounds (TICs):**		
	I	If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?	NA	
S8	I	**Interference Check Sample (ICS) results:**		
	I	Were percent recoveries within method QC limits?	NA	
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**		
	I	Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	NA	
S10	O, I	**Method detection limit (MDL) studies**		
	I	Was a MDL study performed for each reported analyte?	Yes	
	I	Is the MDL either adjusted or supported by the analysis of DCSs?	Yes	
S11	O, I	**Proficiency test reports:**		
	I	Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	Yes	
S12	O, I	**Standards documentation**		
	I	Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	Yes	
S13	O, I	**Compound/analyte identification procedures**		
	I	Are the procedures for compound/analyte identification documented?	Yes	
S14	O, I	**Demonstration of analyst competency (DOC)**		
	I	Was DOC conducted consistent with NELAC Chapter 5C?	Yes	
	I	Is documentation of the analyst's competency up-to-date and on file?	Yes	
S15	O, I	**Verification/validation documentation for methods (NELAC Chap 5n 5)**		
	I	Are all the methods used to generate the data documented, verified, and validated, where applicable?	Yes	
S16	O, I	**Laboratory standard operating procedures (SOPs):**		
	I	Are laboratory SOPs current and on file for each method performed?	Yes	

Alkalinity Laboratory Review Checklist

Table 3. Exception Reports.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey - CCR

Reviewer Name: Michael Ohlinger

LRC Date: 3/31/2023

Laboratory Job Number: 230658

Prep Batch Number(s): QC2303029

Exception Report No.	Description
ER1	CCB acceptance criteria is CCB<0.5*MQL.

[1] Items identified by the letter "R" must be available as a hard copy or as a .pdf file. Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.

[2] O - organic analyses; I - inorganic analyses (including general chemistry constituents, when applicable).

[3] NA - Not applicable; NR - Not reviewed.

[4] Exception Report identification number; an Exception Report should be completed for an item if the result is "No" or "NR."

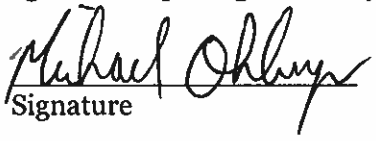
Municipal Solid Waste Laboratory Review Checklist

This data package consists of:

- [x] This signature page, and the laboratory review checklist consisting of Table 1, Reportable Data (which includes the reportable data identified on this page), Table 2, Supporting Data, and Table 3, Exception Reports.
- [x] R1 Field chain-of-custody documentation
- [x] R2 Sample identification cross-reference
- [x] R3 Test reports (analytical data sheets) for each environmental sample that includes:
  - (a) Items specified in NELAC Chapter 5 for reporting results, e.g., Section 5.5.10 in 2003 NELAC Standard
  - (b) Dilution factors
  - (c) Preparation methods
  - (d) Cleanup methods
  - (e) If required for the project, tentatively identified compounds (TICs)
- [x] R4 Surrogate recovery data including:
  - (a) Calculated recovery (%R)
  - (b) The laboratory's surrogate QC limits
- [x] R5 Test reports/summary forms for blank samples
- [x] R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  - (a) LCS spiking amounts
  - (b) Calculated %R for each analyte
  - (c) The laboratory's LCS QC limits
- [x] R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  - (a) Samples associated with the MS/MSD clearly identified
  - (b) MS/MSD spiking amounts
  - (c) Concentration of each MS/MSD analyte measured in the parent and spiked samples
  - (d) Calculated %Rs and relative percent differences (RPDs)
  - (e) The laboratory's MS/MSD QC limits
- [x] R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  - (a) The amount of analyte measured in the duplicate
  - (b) The calculated RPD
  - (c) The laboratory's QC limits for analytical duplicates
- [x] R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix
- [x] R10 Other problems or anomalies
- [x] The Exception Report for every item for which the result is "No" or "NR" (Not Reviewed)

Release Statement: I am responsible for the release of this laboratory data package. This data package as been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Check, if applicable: (●) This laboratory is an in-house laboratory controlled by the person responding to rule. The official signing the cover page of the rule-required report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Michael Ohlinger		Chemist	3/31/2023
Name (printed)	Signature	Official Title	Date

TDS Laboratory Review Checklist

Table 1. Reportable Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey - CCR

Reviewer Name: Michael Ohlinger

LRC Date: 3/31/2023

Laboratory Job Number: 230658

Prep Batch Number(s): QC2303072

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
R1	O, I	**Chain-of-custody (COC)**		
	I	Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	Yes	
	I	Were all departures from standard conditions described in an exception report?	NA	
R2	O, I	**Sample and quality control (QC) identification**		
	I	Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	Yes	
	I	Are all laboratory ID numbers cross-referenced to the corresponding QC data?	Yes	
R3	O, I	**Test reports**		
	I	Were all samples prepared and analyzed within holding times?	Yes	
	I	Other than those results < MQL, were all other raw values bracketed by calibration standards?	NA	
	I	Were calculations checked by a peer or supervisor?	Yes	
	I	Were all analyte identifications checked by a peer or supervisor?	Yes	
	I	Were sample quantitation limits reported for all analytes not detected?	Yes	
	I	Were all results for soil and sediment samples reported on a dry weight basis?	NA	
	I	Was % moisture (or solids) reported for all soil and sediment samples?	NA	
	I	If required for the project, TICs reported?	NA	
R4	O	**Surrogate recovery data**		
	I	Were surrogates added prior to extraction?	NA	
	I	Were surrogate percent recoveries in all samples within the laboratory QC limits?	NA	
R5	O, I	**Test reports/summary forms for blank samples**		
	I	Were appropriate type(s) of blanks analyzed?	Yes	
	I	Were blanks analyzed at the appropriate frequency?	Yes	

TDS Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
	I	Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	Yes	
	I	Were blank concentrations < MQL?	Yes	
R6	O, I	**Laboratory control samples (LCS):**		
	I	Were all COCs included in the LCS?	Yes	
	I	Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	Yes	
	I	Were LCSs analyzed at the required frequency?	Yes	
	I	Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	Yes	
	I	Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	Yes	
	I	Was the LCSD RPD within QC limits?	Yes	
R7	O, I	**Matrix spike (MS) and matrix spike duplicate (MSD) data**		
	I	Were the project/method specified analytes included in the MS and MSD?	NA	
	I	Were MS/MSD analyzed at the appropriate frequency?	NA	
	I	Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	NA	
	I	Were MS/MSD RPDs within laboratory QC limits?	NA	
R8	O, I	**Analytical duplicate data**		
	I	Were appropriate analytical duplicates analyzed for each matrix?	Yes	
	I	Were analytical duplicates analyzed at the appropriate frequency?	Yes	
	I	Were RPDs or relative standard deviations within the laboratory QC limits?	Yes	
R9	O, I	**Method quantitation limits (MQLs):**		
	I	Are the MQLs for each method analyte included in the laboratory data package?	Yes	
	I	Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	Yes	
	I	Are unadjusted MQLs included in the laboratory data package?	Yes	
R10	O, I	**Other problems/anomalies**		
	I	Are all known problems/anomalies/special conditions noted in this LRC and ER?	Yes	
	I	Were all necessary corrective actions performed for the reported data?	Yes	
	I	Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	Yes	

Table 2. Supporting Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey - CCR

Reviewer Name: Michael Ohlinger

LRC Date: 3/31/2023

Laboratory Job Number: 230658

Prep Batch Number(s): QC2303072

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S1	O, I	**Initial calibration (ICAL)**		
	I	Were response factors and/or relative response factors for each analyte within QC limits?	NA	
	I	Were percent RSDs or correlation coefficient criteria met?	NA	
	I	Was the number of standards recommended in the method used for all analytes?	NA	
	I	Were all points generated between the lowest and highest standard used to calculate the curve?	NA	
	I	Are ICAL data available for all instruments used?	NA	
	I	Has the initial calibration curve been verified using an appropriate second source standard?	NA	
S2	O, I	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB):**		
	I	Was the CCV analyzed at the method-required frequency?	NA	
	I	Were percent differences for each analyte within the method-required QC limits?	NA	
	I	Was the ICAL curve verified for each analyte?	NA	
	I	Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	NA	
S3	O	**Mass spectral tuning:**		
	I	Was the appropriate compound for the method used for tuning?	NA	
	I	Were ion abundance data within the method-required QC limits?	NA	
S4	O	**Internal standards (IS):**		
	I	Were IS area counts and retention times within the method-required QC limits?	NA	
S5	O, I	**Raw data (NELAC section 1 appendix A glossary, and section 5.)**		
	I	Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	Yes	
	I	Were data associated with manual integrations flagged on the raw data?	NA	

TDS Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S6	O	**Dual column confirmation**		
	I	Did dual column confirmation results meet the method-required QC?	NA	
S7	O	**Tentatively identified compounds (TICs):**		
	I	If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?	NA	
S8	I	**Interference Check Sample (ICS) results:**		
	I	Were percent recoveries within method QC limits?	NA	
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**		
	I	Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	NA	
S10	O, I	**Method detection limit (MDL) studies**		
	I	Was a MDL study performed for each reported analyte?	Yes	
	I	Is the MDL either adjusted or supported by the analysis of DCSs?	Yes	
S11	O, I	**Proficiency test reports:**		
	I	Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	Yes	
S12	O, I	**Standards documentation**		
	I	Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	Yes	
S13	O, I	**Compound/analyte identification procedures**		
	I	Are the procedures for compound/analyte identification documented?	Yes	
S14	O, I	**Demonstration of analyst competency (DOC)**		
	I	Was DOC conducted consistent with NELAC Chapter 5C?	Yes	
	I	Is documentation of the analyst's competency up-to-date and on file?	Yes	
S15	O, I	**Verification/validation documentation for methods (NELAC Chap 5n 5)**		
	I	Are all the methods used to generate the data documented, verified, and validated, where applicable?	Yes	
S16	O, I	**Laboratory standard operating procedures (SOPs):**		
	I	Are laboratory SOPs current and on file for each method performed?	Yes	

Table 3. Exception Reports.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey - CCR

Reviewer Name: Michael Ohlinger

LRC Date: 3/31/2023

Laboratory Job Number: 230658

Prep Batch Number(s): QC2303072

Exception Report No.	Description

[1] Items identified by the letter "R" must be available as a hard copy or as a .pdf file. Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
[2] O - organic analyses; I - inorganic analyses (including general chemistry constituents, when applicable).
[3] NA - Not applicable; NR - Not reviewed.
[4] Exception Report identification number; an Exception Report should be completed for an item if the result is "No" or "NR."

Water Analysis Report

Reissued

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 230698 **Customer: Pirkey Power Station** **Date Reported: 10/28/2023**

Customer Sample ID: AD-2
Lab Number: 230698-001
Date Collected: 02/27/2023 11:55 EST

Customer Description:
Preparation:
Date Received: 03/06/2023 14:20 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	03/08/2023 15:26	EPA 200.8-1994, Rev. 5.4
Arsenic	0.90	µg/L	1	0.10	0.03		GES	03/08/2023 15:26	EPA 200.8-1994, Rev. 5.4
Barium	15.9	µg/L	1	0.20	0.05		GES	03/08/2023 15:26	EPA 200.8-1994, Rev. 5.4
Beryllium	0.787	µg/L	1	0.050	0.007		GES	03/08/2023 15:26	EPA 200.8-1994, Rev. 5.4
Boron	3.22	mg/L	1	0.050	0.009		GES	03/08/2023 15:26	EPA 200.8-1994, Rev. 5.4
Cadmium	0.128	µg/L	1	0.020	0.004		GES	03/08/2023 15:26	EPA 200.8-1994, Rev. 5.4
Calcium	3.53	mg/L	1	0.05	0.02		GES	03/08/2023 15:26	EPA 200.8-1994, Rev. 5.4
Chromium	0.52	µg/L	1	0.20	0.04		GES	03/08/2023 15:26	EPA 200.8-1994, Rev. 5.4
Cobalt	28.9	µg/L	1	0.020	0.003		GES	03/08/2023 15:26	EPA 200.8-1994, Rev. 5.4
Lead	0.68	µg/L	1	0.20	0.05		GES	03/08/2023 15:26	EPA 200.8-1994, Rev. 5.4
Lithium	0.0636	mg/L	1	0.00020	0.00005		GES	03/08/2023 15:26	EPA 200.8-1994, Rev. 5.4
Magnesium	7.63	mg/L	1	0.10	0.02		GES	03/08/2023 15:26	EPA 200.8-1994, Rev. 5.4
Mercury	51	ng/L	2	10	4		JAB	03/21/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	03/08/2023 15:26	EPA 200.8-1994, Rev. 5.4
Potassium	1.45	mg/L	1	0.10	0.02		GES	03/08/2023 15:26	EPA 200.8-1994, Rev. 5.4
Selenium	2.65	µg/L	1	0.50	0.09		GES	03/08/2023 15:26	EPA 200.8-1994, Rev. 5.4
Sodium	113	mg/L	1	0.20	0.05	M1	GES	03/08/2023 15:26	EPA 200.8-1994, Rev. 5.4
Strontium	0.0551	mg/L	1	0.0020	0.0004		GES	03/08/2023 15:26	EPA 200.8-1994, Rev. 5.4
Thallium	0.12	µg/L	1	0.20	0.04	J1	GES	03/08/2023 15:26	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	1.03	pCi/L	0.24	0.36		ST	03/09/2023 15:06	SW-846 9315-1986, Rev. 0
Carrier Recovery	84.6	%						
Radium-228	-1.43	pCi/L	0.19	0.72		TTP	03/10/2023 15:27	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	70.7	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 230698 **Customer: Pirkey Power Station** **Date Reported: 10/28/2023**

Customer Sample ID: AD-2
Customer Description:
Lab Number: 230698-001-01
Preparation: Dissolved
Date Collected: 02/27/2023 12:55 EST
Date Received: 03/06/2023 14:20 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	03/08/2023 15:42	EPA 200.8-1994, Rev. 5.4
Arsenic	0.91	µg/L	1	0.10	0.03		GES	03/08/2023 15:42	EPA 200.8-1994, Rev. 5.4
Barium	15.4	µg/L	1	0.20	0.05		GES	03/08/2023 15:42	EPA 200.8-1994, Rev. 5.4
Beryllium	0.778	µg/L	1	0.050	0.007		GES	03/08/2023 15:42	EPA 200.8-1994, Rev. 5.4
Boron	3.16	mg/L	1	0.050	0.009		GES	03/08/2023 15:42	EPA 200.8-1994, Rev. 5.4
Cadmium	0.111	µg/L	1	0.020	0.004		GES	03/08/2023 15:42	EPA 200.8-1994, Rev. 5.4
Calcium	3.45	mg/L	1	0.05	0.02		GES	03/08/2023 15:42	EPA 200.8-1994, Rev. 5.4
Chromium	0.40	µg/L	1	0.20	0.04		GES	03/08/2023 15:42	EPA 200.8-1994, Rev. 5.4
Cobalt	28.2	µg/L	1	0.020	0.003		GES	03/08/2023 15:42	EPA 200.8-1994, Rev. 5.4
Iron	0.171	mg/L	1	0.020	0.006		GES	03/08/2023 15:42	EPA 200.8-1994, Rev. 5.4
Lead	0.67	µg/L	1	0.20	0.05		GES	03/08/2023 15:42	EPA 200.8-1994, Rev. 5.4
Lithium	0.0628	mg/L	1	0.00020	0.00005		GES	03/08/2023 15:42	EPA 200.8-1994, Rev. 5.4
Magnesium	7.52	mg/L	1	0.10	0.02		GES	03/08/2023 15:42	EPA 200.8-1994, Rev. 5.4
Manganese	0.103	mg/L	1	0.0010	0.0002		GES	03/08/2023 15:42	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	03/21/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	03/08/2023 15:42	EPA 200.8-1994, Rev. 5.4
Potassium	1.42	mg/L	1	0.10	0.02		GES	03/08/2023 15:42	EPA 200.8-1994, Rev. 5.4
Selenium	2.67	µg/L	1	0.50	0.09		GES	03/08/2023 15:42	EPA 200.8-1994, Rev. 5.4
Sodium	111	mg/L	1	0.20	0.05		GES	03/08/2023 15:42	EPA 200.8-1994, Rev. 5.4
Strontium	0.0533	mg/L	1	0.0020	0.0004		GES	03/08/2023 15:42	EPA 200.8-1994, Rev. 5.4
Thallium	0.14	µg/L	1	0.20	0.04	J1	GES	03/08/2023 15:42	EPA 200.8-1994, Rev. 5.4

Water Analysis Report

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Audinet: 210-4221

Job ID: 230698 **Customer: Pirkey Power Station** **Date Reported: 10/28/2023**

Customer Sample ID: AD-4	Customer Description:
Lab Number: 230698-002	Preparation:
Date Collected: 02/28/2023 10:13 EST	Date Received: 03/06/2023 14:20 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	03/08/2023 15:47	EPA 200.8-1994, Rev. 5.4
Arsenic	0.26	µg/L	1	0.10	0.03		GES	03/08/2023 15:47	EPA 200.8-1994, Rev. 5.4
Barium	115	µg/L	1	0.20	0.05		GES	03/08/2023 15:47	EPA 200.8-1994, Rev. 5.4
Beryllium	0.594	µg/L	1	0.050	0.007		GES	03/08/2023 15:47	EPA 200.8-1994, Rev. 5.4
Boron	0.028	mg/L	1	0.050	0.009	J1	GES	03/08/2023 15:47	EPA 200.8-1994, Rev. 5.4
Cadmium	0.015	µg/L	1	0.020	0.004	J1	GES	03/08/2023 15:47	EPA 200.8-1994, Rev. 5.4
Calcium	2.22	mg/L	1	0.05	0.02		GES	03/08/2023 15:47	EPA 200.8-1994, Rev. 5.4
Chromium	0.41	µg/L	1	0.20	0.04		GES	03/08/2023 15:47	EPA 200.8-1994, Rev. 5.4
Cobalt	5.60	µg/L	1	0.020	0.003		GES	03/08/2023 15:47	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	GES	03/08/2023 15:47	EPA 200.8-1994, Rev. 5.4
Lithium	0.0311	mg/L	1	0.00020	0.00005		GES	03/08/2023 15:47	EPA 200.8-1994, Rev. 5.4
Magnesium	1.02	mg/L	1	0.10	0.02		GES	03/08/2023 15:47	EPA 200.8-1994, Rev. 5.4
Mercury	4	ng/L	1	5	2	J1	JAB	03/21/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	03/08/2023 15:47	EPA 200.8-1994, Rev. 5.4
Potassium	2.43	mg/L	1	0.10	0.02		GES	03/08/2023 15:47	EPA 200.8-1994, Rev. 5.4
Selenium	<0.09	µg/L	1	0.50	0.09	U1	GES	03/08/2023 15:47	EPA 200.8-1994, Rev. 5.4
Sodium	8.15	mg/L	1	0.20	0.05		GES	03/08/2023 15:47	EPA 200.8-1994, Rev. 5.4
Strontium	0.0187	mg/L	1	0.0020	0.0004		GES	03/08/2023 15:47	EPA 200.8-1994, Rev. 5.4
Thallium	0.09	µg/L	1	0.20	0.04	J1	GES	03/08/2023 15:47	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	0.66	pCi/L	0.22	0.46		ST	03/09/2023 15:06	SW-846 9315-1986, Rev. 0
Carrier Recovery	71.9	%						
Radium-228	1.24	pCi/L	0.25	0.79		TTP	03/10/2023 15:27	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	63.4	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

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Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 230698 **Customer: Pirkey Power Station** **Date Reported: 10/28/2023**

Customer Sample ID: AD-4
Customer Description:
Lab Number: 230698-002-01
Preparation: Dissolved
Date Collected: 02/28/2023 11:13 EST
Date Received: 03/06/2023 14:20 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	03/08/2023 15:52	EPA 200.8-1994, Rev. 5.4
Arsenic	0.03	µg/L	1	0.10	0.03	J1	GES	03/08/2023 15:52	EPA 200.8-1994, Rev. 5.4
Barium	121	µg/L	1	0.20	0.05		GES	03/08/2023 15:52	EPA 200.8-1994, Rev. 5.4
Beryllium	0.571	µg/L	1	0.050	0.007		GES	03/08/2023 15:52	EPA 200.8-1994, Rev. 5.4
Boron	0.023	mg/L	1	0.050	0.009	J1	GES	03/08/2023 15:52	EPA 200.8-1994, Rev. 5.4
Cadmium	0.019	µg/L	1	0.020	0.004	J1	GES	03/08/2023 15:52	EPA 200.8-1994, Rev. 5.4
Calcium	2.36	mg/L	1	0.05	0.02		GES	03/08/2023 15:52	EPA 200.8-1994, Rev. 5.4
Chromium	0.22	µg/L	1	0.20	0.04		GES	03/08/2023 15:52	EPA 200.8-1994, Rev. 5.4
Cobalt	5.75	µg/L	1	0.020	0.003		GES	03/08/2023 15:52	EPA 200.8-1994, Rev. 5.4
Iron	0.043	mg/L	1	0.020	0.006		GES	03/08/2023 15:52	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	GES	03/08/2023 15:52	EPA 200.8-1994, Rev. 5.4
Lithium	0.0310	mg/L	1	0.00020	0.00005		GES	03/08/2023 15:52	EPA 200.8-1994, Rev. 5.4
Magnesium	1.07	mg/L	1	0.10	0.02		GES	03/08/2023 15:52	EPA 200.8-1994, Rev. 5.4
Manganese	0.0507	mg/L	1	0.0010	0.0002		GES	03/08/2023 15:52	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	03/21/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	03/08/2023 15:52	EPA 200.8-1994, Rev. 5.4
Potassium	2.50	mg/L	1	0.10	0.02		GES	03/08/2023 15:52	EPA 200.8-1994, Rev. 5.4
Selenium	<0.09	µg/L	1	0.50	0.09	U1	GES	03/08/2023 15:52	EPA 200.8-1994, Rev. 5.4
Sodium	8.23	mg/L	1	0.20	0.05		GES	03/08/2023 15:52	EPA 200.8-1994, Rev. 5.4
Strontium	0.0197	mg/L	1	0.0020	0.0004		GES	03/08/2023 15:52	EPA 200.8-1994, Rev. 5.4
Thallium	0.09	µg/L	1	0.20	0.04	J1	GES	03/08/2023 15:52	EPA 200.8-1994, Rev. 5.4

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Groveport, OH 43125
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Water Analysis Report

Reissued

Job ID: 230698 **Customer: Pirkey Power Station** **Date Reported: 10/28/2023**

Customer Sample ID: AD-7
Lab Number: 230698-003
Date Collected: 02/28/2023 11:18 EST

Customer Description:
Preparation:
Date Received: 03/06/2023 14:20 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	03/08/2023 15:57	EPA 200.8-1994, Rev. 5.4
Arsenic	1.09	µg/L	1	0.10	0.03		GES	03/08/2023 15:57	EPA 200.8-1994, Rev. 5.4
Barium	44.6	µg/L	1	0.20	0.05		GES	03/08/2023 15:57	EPA 200.8-1994, Rev. 5.4
Beryllium	5.41	µg/L	1	0.050	0.007		GES	03/08/2023 15:57	EPA 200.8-1994, Rev. 5.4
Boron	1.90	mg/L	1	0.050	0.009		GES	03/08/2023 15:57	EPA 200.8-1994, Rev. 5.4
Cadmium	0.704	µg/L	1	0.020	0.004		GES	03/08/2023 15:57	EPA 200.8-1994, Rev. 5.4
Calcium	5.06	mg/L	1	0.05	0.02		GES	03/08/2023 15:57	EPA 200.8-1994, Rev. 5.4
Chromium	0.37	µg/L	1	0.20	0.04		GES	03/08/2023 15:57	EPA 200.8-1994, Rev. 5.4
Cobalt	41.1	µg/L	1	0.020	0.003		GES	03/08/2023 15:57	EPA 200.8-1994, Rev. 5.4
Lead	0.85	µg/L	1	0.20	0.05		GES	03/08/2023 15:57	EPA 200.8-1994, Rev. 5.4
Lithium	0.0804	mg/L	1	0.00020	0.00005		GES	03/08/2023 15:57	EPA 200.8-1994, Rev. 5.4
Magnesium	9.64	mg/L	1	0.10	0.02		GES	03/08/2023 15:57	EPA 200.8-1994, Rev. 5.4
Mercury	1520	ng/L	50	250	90		JAB	03/21/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	03/08/2023 15:57	EPA 200.8-1994, Rev. 5.4
Potassium	1.96	mg/L	1	0.10	0.02		GES	03/08/2023 15:57	EPA 200.8-1994, Rev. 5.4
Selenium	3.46	µg/L	1	0.50	0.09		GES	03/08/2023 15:57	EPA 200.8-1994, Rev. 5.4
Sodium	17.1	mg/L	1	0.20	0.05		GES	03/08/2023 15:57	EPA 200.8-1994, Rev. 5.4
Strontium	0.0723	mg/L	1	0.0020	0.0004		GES	03/08/2023 15:57	EPA 200.8-1994, Rev. 5.4
Thallium	0.20	µg/L	1	0.20	0.04		GES	03/08/2023 15:57	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	1.32	pCi/L	0.19	0.19		ST	03/16/2023 08:55	SW-846 9315-1986, Rev. 0
Carrier Recovery	88.0	%						
Radium-228	3.61	pCi/L	0.23	0.59		TTP	03/10/2023 15:27	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	70.4	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 230698 **Customer: Pirkey Power Station** **Date Reported: 10/28/2023**

Customer Sample ID: AD-7
Customer Description:
Lab Number: 230698-003-01
Preparation: Dissolved
Date Collected: 02/28/2023 12:18 EST
Date Received: 03/06/2023 14:20 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	03/08/2023 16:02	EPA 200.8-1994, Rev. 5.4
Arsenic	1.03	µg/L	1	0.10	0.03		GES	03/08/2023 16:02	EPA 200.8-1994, Rev. 5.4
Barium	43.3	µg/L	1	0.20	0.05		GES	03/08/2023 16:02	EPA 200.8-1994, Rev. 5.4
Beryllium	5.25	µg/L	1	0.050	0.007		GES	03/08/2023 16:02	EPA 200.8-1994, Rev. 5.4
Boron	1.82	mg/L	1	0.050	0.009		GES	03/08/2023 16:02	EPA 200.8-1994, Rev. 5.4
Cadmium	0.679	µg/L	1	0.020	0.004		GES	03/08/2023 16:02	EPA 200.8-1994, Rev. 5.4
Calcium	5.00	mg/L	1	0.05	0.02		GES	03/08/2023 16:02	EPA 200.8-1994, Rev. 5.4
Chromium	0.39	µg/L	1	0.20	0.04		GES	03/08/2023 16:02	EPA 200.8-1994, Rev. 5.4
Cobalt	39.8	µg/L	1	0.020	0.003		GES	03/08/2023 16:02	EPA 200.8-1994, Rev. 5.4
Iron	0.113	mg/L	1	0.020	0.006		GES	03/08/2023 16:02	EPA 200.8-1994, Rev. 5.4
Lead	0.85	µg/L	1	0.20	0.05		GES	03/08/2023 16:02	EPA 200.8-1994, Rev. 5.4
Lithium	0.0791	mg/L	1	0.00020	0.00005		GES	03/08/2023 16:02	EPA 200.8-1994, Rev. 5.4
Magnesium	9.22	mg/L	1	0.10	0.02		GES	03/08/2023 16:02	EPA 200.8-1994, Rev. 5.4
Manganese	0.0701	mg/L	1	0.0010	0.0002		GES	03/08/2023 16:02	EPA 200.8-1994, Rev. 5.4
Mercury	<7	ng/L	4	20	7	U1	JAB	03/21/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	03/08/2023 16:02	EPA 200.8-1994, Rev. 5.4
Potassium	1.91	mg/L	1	0.10	0.02		GES	03/08/2023 16:02	EPA 200.8-1994, Rev. 5.4
Selenium	3.33	µg/L	1	0.50	0.09		GES	03/08/2023 16:02	EPA 200.8-1994, Rev. 5.4
Sodium	16.6	mg/L	1	0.20	0.05		GES	03/08/2023 16:02	EPA 200.8-1994, Rev. 5.4
Strontium	0.0700	mg/L	1	0.0020	0.0004		GES	03/08/2023 16:02	EPA 200.8-1994, Rev. 5.4
Thallium	0.18	µg/L	1	0.20	0.04	J1	GES	03/08/2023 16:02	EPA 200.8-1994, Rev. 5.4

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4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 230698 **Customer: Pirkey Power Station** **Date Reported: 10/28/2023**

Customer Sample ID: AD-12
Customer Description:
Lab Number: 230698-004
Preparation:
Date Collected: 02/27/2023 10:56 EST
Date Received: 03/06/2023 14:20 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	03/08/2023 16:07	EPA 200.8-1994, Rev. 5.4
Arsenic	0.07	µg/L	1	0.10	0.03	J1	GES	03/08/2023 16:07	EPA 200.8-1994, Rev. 5.4
Barium	27.5	µg/L	1	0.20	0.05		GES	03/08/2023 16:07	EPA 200.8-1994, Rev. 5.4
Beryllium	0.155	µg/L	1	0.050	0.007		GES	03/08/2023 16:07	EPA 200.8-1994, Rev. 5.4
Boron	0.021	mg/L	1	0.050	0.009	J1	GES	03/08/2023 16:07	EPA 200.8-1994, Rev. 5.4
Cadmium	0.013	µg/L	1	0.020	0.004	J1	GES	03/08/2023 16:07	EPA 200.8-1994, Rev. 5.4
Calcium	0.34	mg/L	1	0.05	0.02		GES	03/08/2023 16:07	EPA 200.8-1994, Rev. 5.4
Chromium	0.36	µg/L	1	0.20	0.04		GES	03/08/2023 16:07	EPA 200.8-1994, Rev. 5.4
Cobalt	1.50	µg/L	1	0.020	0.003		GES	03/08/2023 16:07	EPA 200.8-1994, Rev. 5.4
Lead	0.1	µg/L	1	0.20	0.05	J1	GES	03/08/2023 16:07	EPA 200.8-1994, Rev. 5.4
Lithium	0.00885	mg/L	1	0.00020	0.00005		GES	03/08/2023 16:07	EPA 200.8-1994, Rev. 5.4
Magnesium	0.49	mg/L	1	0.10	0.02		GES	03/08/2023 16:07	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	03/21/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	03/08/2023 16:07	EPA 200.8-1994, Rev. 5.4
Potassium	0.59	mg/L	1	0.10	0.02		GES	03/08/2023 16:07	EPA 200.8-1994, Rev. 5.4
Selenium	0.35	µg/L	1	0.50	0.09	J1	GES	03/08/2023 16:07	EPA 200.8-1994, Rev. 5.4
Sodium	4.89	mg/L	1	0.20	0.05		GES	03/08/2023 16:07	EPA 200.8-1994, Rev. 5.4
Strontium	0.0032	mg/L	1	0.0020	0.0004		GES	03/08/2023 16:07	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	03/08/2023 16:07	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	0.63	pCi/L	0.13	0.16	P1	ST	03/16/2023 08:55	SW-846 9315-1986, Rev. 0
Carrier Recovery	95.5	%						
Radium-228	0.54	pCi/L	0.17	0.56	P3	TTP	03/16/2023 15:39	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	83.6	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 230698 **Customer: Pirkey Power Station** **Date Reported: 10/28/2023**

Customer Sample ID: AD-12
Customer Description:
Lab Number: 230698-004-01
Preparation: Dissolved
Date Collected: 02/27/2023 11:56 EST
Date Received: 03/06/2023 14:20 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	03/08/2023 16:12	EPA 200.8-1994, Rev. 5.4
Arsenic	0.06	µg/L	1	0.10	0.03	J1	GES	03/08/2023 16:12	EPA 200.8-1994, Rev. 5.4
Barium	28.2	µg/L	1	0.20	0.05		GES	03/08/2023 16:12	EPA 200.8-1994, Rev. 5.4
Beryllium	0.162	µg/L	1	0.050	0.007		GES	03/08/2023 16:12	EPA 200.8-1994, Rev. 5.4
Boron	0.018	mg/L	1	0.050	0.009	J1	GES	03/08/2023 16:12	EPA 200.8-1994, Rev. 5.4
Cadmium	0.01	µg/L	1	0.020	0.004	J1	GES	03/08/2023 16:12	EPA 200.8-1994, Rev. 5.4
Calcium	0.37	mg/L	1	0.05	0.02		GES	03/08/2023 16:12	EPA 200.8-1994, Rev. 5.4
Chromium	0.25	µg/L	1	0.20	0.04		GES	03/08/2023 16:12	EPA 200.8-1994, Rev. 5.4
Cobalt	1.55	µg/L	1	0.020	0.003		GES	03/08/2023 16:12	EPA 200.8-1994, Rev. 5.4
Iron	0.011	mg/L	1	0.020	0.006	J1	GES	03/08/2023 16:12	EPA 200.8-1994, Rev. 5.4
Lead	0.08	µg/L	1	0.20	0.05	J1	GES	03/08/2023 16:12	EPA 200.8-1994, Rev. 5.4
Lithium	0.00878	mg/L	1	0.00020	0.00005		GES	03/08/2023 16:12	EPA 200.8-1994, Rev. 5.4
Magnesium	0.49	mg/L	1	0.10	0.02		GES	03/08/2023 16:12	EPA 200.8-1994, Rev. 5.4
Manganese	0.0053	mg/L	1	0.0010	0.0002		GES	03/08/2023 16:12	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	03/21/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	03/08/2023 16:12	EPA 200.8-1994, Rev. 5.4
Potassium	0.60	mg/L	1	0.10	0.02		GES	03/08/2023 16:12	EPA 200.8-1994, Rev. 5.4
Selenium	0.30	µg/L	1	0.50	0.09	J1	GES	03/08/2023 16:12	EPA 200.8-1994, Rev. 5.4
Sodium	5.18	mg/L	1	0.20	0.05		GES	03/08/2023 16:12	EPA 200.8-1994, Rev. 5.4
Strontium	0.0033	mg/L	1	0.0020	0.0004		GES	03/08/2023 16:12	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	03/08/2023 16:12	EPA 200.8-1994, Rev. 5.4

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
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Water Analysis Report

Reissued

Job ID: 230698 **Customer: Pirkey Power Station** **Date Reported: 10/28/2023**

Customer Sample ID: AD-13
Customer Description:
Lab Number: 230698-005
Preparation:
Date Collected: 02/27/2023 09:17 EST
Date Received: 03/06/2023 14:20 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	03/08/2023 16:18	EPA 200.8-1994, Rev. 5.4
Arsenic	0.39	µg/L	1	0.10	0.03		GES	03/08/2023 16:18	EPA 200.8-1994, Rev. 5.4
Barium	66.8	µg/L	1	0.20	0.05		GES	03/08/2023 16:18	EPA 200.8-1994, Rev. 5.4
Beryllium	1.23	µg/L	1	0.050	0.007		GES	03/08/2023 16:18	EPA 200.8-1994, Rev. 5.4
Boron	0.080	mg/L	1	0.050	0.009		GES	03/08/2023 16:18	EPA 200.8-1994, Rev. 5.4
Cadmium	<0.004	µg/L	1	0.020	0.004	U1	GES	03/08/2023 16:18	EPA 200.8-1994, Rev. 5.4
Calcium	15.1	mg/L	1	0.05	0.02		GES	03/08/2023 16:18	EPA 200.8-1994, Rev. 5.4
Chromium	0.26	µg/L	1	0.20	0.04		GES	03/08/2023 16:18	EPA 200.8-1994, Rev. 5.4
Cobalt	60.0	µg/L	1	0.020	0.003		GES	03/08/2023 16:18	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	GES	03/08/2023 16:18	EPA 200.8-1994, Rev. 5.4
Lithium	0.161	mg/L	1	0.00020	0.00005		GES	03/08/2023 16:18	EPA 200.8-1994, Rev. 5.4
Magnesium	15.9	mg/L	1	0.10	0.02		GES	03/08/2023 16:18	EPA 200.8-1994, Rev. 5.4
Mercury	<20	ng/L	10	50	20	U1	JAB	03/21/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	03/08/2023 16:18	EPA 200.8-1994, Rev. 5.4
Potassium	5.54	mg/L	1	0.10	0.02		GES	03/08/2023 16:18	EPA 200.8-1994, Rev. 5.4
Selenium	<0.09	µg/L	1	0.50	0.09	U1	GES	03/08/2023 16:18	EPA 200.8-1994, Rev. 5.4
Sodium	21.9	mg/L	1	0.20	0.05		GES	03/08/2023 16:18	EPA 200.8-1994, Rev. 5.4
Strontium	0.133	mg/L	1	0.0020	0.0004		GES	03/08/2023 16:18	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	03/08/2023 16:18	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	1.73	pCi/L	0.24	0.24		ST	03/16/2023 08:55	SW-846 9315-1986, Rev. 0
Carrier Recovery	72.1	%						
Radium-228	2.03	pCi/L	0.19	0.55		TTP	03/16/2023 15:39	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	70.2	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 230698 **Customer: Pirkey Power Station** **Date Reported: 10/28/2023**

Customer Sample ID: AD-13
Customer Description:
Lab Number: 230698-005-01
Preparation: Dissolved
Date Collected: 02/27/2023 10:17 EST
Date Received: 03/06/2023 14:20 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	03/08/2023 16:23	EPA 200.8-1994, Rev. 5.4
Arsenic	0.11	µg/L	1	0.10	0.03		GES	03/08/2023 16:23	EPA 200.8-1994, Rev. 5.4
Barium	64.0	µg/L	1	0.20	0.05		GES	03/08/2023 16:23	EPA 200.8-1994, Rev. 5.4
Beryllium	1.18	µg/L	1	0.050	0.007		GES	03/08/2023 16:23	EPA 200.8-1994, Rev. 5.4
Boron	0.076	mg/L	1	0.050	0.009		GES	03/08/2023 16:23	EPA 200.8-1994, Rev. 5.4
Cadmium	<0.004	µg/L	1	0.020	0.004	U1	GES	03/08/2023 16:23	EPA 200.8-1994, Rev. 5.4
Calcium	14.6	mg/L	1	0.05	0.02		GES	03/08/2023 16:23	EPA 200.8-1994, Rev. 5.4
Chromium	0.29	µg/L	1	0.20	0.04		GES	03/08/2023 16:23	EPA 200.8-1994, Rev. 5.4
Cobalt	57.9	µg/L	1	0.020	0.003		GES	03/08/2023 16:23	EPA 200.8-1994, Rev. 5.4
Iron	7.92	mg/L	1	0.020	0.006		GES	03/08/2023 16:23	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	GES	03/08/2023 16:23	EPA 200.8-1994, Rev. 5.4
Lithium	0.156	mg/L	1	0.00020	0.00005		GES	03/08/2023 16:23	EPA 200.8-1994, Rev. 5.4
Magnesium	15.4	mg/L	1	0.10	0.02		GES	03/08/2023 16:23	EPA 200.8-1994, Rev. 5.4
Manganese	0.559	mg/L	1	0.0010	0.0002		GES	03/08/2023 16:23	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	03/21/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	03/08/2023 16:23	EPA 200.8-1994, Rev. 5.4
Potassium	5.34	mg/L	1	0.10	0.02		GES	03/08/2023 16:23	EPA 200.8-1994, Rev. 5.4
Selenium	<0.09	µg/L	1	0.50	0.09	U1	GES	03/08/2023 16:23	EPA 200.8-1994, Rev. 5.4
Sodium	21.1	mg/L	1	0.20	0.05		GES	03/08/2023 16:23	EPA 200.8-1994, Rev. 5.4
Strontium	0.127	mg/L	1	0.0020	0.0004		GES	03/08/2023 16:23	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	03/08/2023 16:23	EPA 200.8-1994, Rev. 5.4

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Water Analysis Report

Reissued

Job ID: 230698 **Customer: Pirkey Power Station** **Date Reported: 10/28/2023**

Customer Sample ID: AD-18
Lab Number: 230698-006
Date Collected: 02/28/2023 09:25 EST

Customer Description:
Preparation:
Date Received: 03/06/2023 14:20 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	03/08/2023 17:19	EPA 200.8-1994, Rev. 5.4
Arsenic	0.26	µg/L	1	0.10	0.03		GES	03/08/2023 17:19	EPA 200.8-1994, Rev. 5.4
Barium	77.9	µg/L	1	0.20	0.05		GES	03/08/2023 17:19	EPA 200.8-1994, Rev. 5.4
Beryllium	0.085	µg/L	1	0.050	0.007		GES	03/08/2023 17:19	EPA 200.8-1994, Rev. 5.4
Boron	<0.009	mg/L	1	0.050	0.009	U1	GES	03/08/2023 17:19	EPA 200.8-1994, Rev. 5.4
Cadmium	0.01	µg/L	1	0.020	0.004	J1	GES	03/08/2023 17:19	EPA 200.8-1994, Rev. 5.4
Calcium	0.18	mg/L	1	0.05	0.02		GES	03/08/2023 17:19	EPA 200.8-1994, Rev. 5.4
Chromium	0.38	µg/L	1	0.20	0.04		GES	03/08/2023 17:19	EPA 200.8-1994, Rev. 5.4
Cobalt	0.750	µg/L	1	0.020	0.003		GES	03/08/2023 17:19	EPA 200.8-1994, Rev. 5.4
Lead	0.18	µg/L	1	0.20	0.05	J1	GES	03/08/2023 17:19	EPA 200.8-1994, Rev. 5.4
Lithium	0.0123	mg/L	1	0.00020	0.00005		GES	03/08/2023 17:19	EPA 200.8-1994, Rev. 5.4
Magnesium	0.27	mg/L	1	0.10	0.02		GES	03/08/2023 17:19	EPA 200.8-1994, Rev. 5.4
Mercury	6	ng/L	1	5	2		JAB	03/21/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	03/08/2023 17:19	EPA 200.8-1994, Rev. 5.4
Potassium	0.69	mg/L	1	0.10	0.02		GES	03/08/2023 17:19	EPA 200.8-1994, Rev. 5.4
Selenium	<0.09	µg/L	1	0.50	0.09	U1	GES	03/08/2023 17:19	EPA 200.8-1994, Rev. 5.4
Sodium	5.15	mg/L	1	0.20	0.05		GES	03/08/2023 17:19	EPA 200.8-1994, Rev. 5.4
Strontium	0.0039	mg/L	1	0.0020	0.0004		GES	03/08/2023 17:19	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	03/08/2023 17:19	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	0.68	pCi/L	0.13	0.19		ST	03/16/2023 08:55	SW-846 9315-1986, Rev. 0
Carrier Recovery	95.1	%						
Radium-228	0.42	pCi/L	0.18	0.59		TTP	03/16/2023 15:39	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	75.2	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

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Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 230698 **Customer: Pirkey Power Station** **Date Reported: 10/28/2023**

Customer Sample ID: AD-18
Customer Description:
Lab Number: 230698-006-01
Preparation: Dissolved
Date Collected: 02/28/2023 10:25 EST
Date Received: 03/06/2023 14:20 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	03/08/2023 17:34	EPA 200.8-1994, Rev. 5.4
Arsenic	0.05	µg/L	1	0.10	0.03	J1	GES	03/08/2023 17:34	EPA 200.8-1994, Rev. 5.4
Barium	80.7	µg/L	1	0.20	0.05		GES	03/08/2023 17:34	EPA 200.8-1994, Rev. 5.4
Beryllium	0.079	µg/L	1	0.050	0.007		GES	03/08/2023 17:34	EPA 200.8-1994, Rev. 5.4
Boron	0.010	mg/L	1	0.050	0.009	J1	GES	03/08/2023 17:34	EPA 200.8-1994, Rev. 5.4
Cadmium	0.01	µg/L	1	0.020	0.004	J1	GES	03/08/2023 17:34	EPA 200.8-1994, Rev. 5.4
Calcium	0.23	mg/L	1	0.05	0.02		GES	03/08/2023 17:34	EPA 200.8-1994, Rev. 5.4
Chromium	0.22	µg/L	1	0.20	0.04		GES	03/08/2023 17:34	EPA 200.8-1994, Rev. 5.4
Cobalt	0.774	µg/L	1	0.020	0.003		GES	03/08/2023 17:34	EPA 200.8-1994, Rev. 5.4
Iron	0.028	mg/L	1	0.020	0.006		GES	03/08/2023 17:34	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	GES	03/08/2023 17:34	EPA 200.8-1994, Rev. 5.4
Lithium	0.0128	mg/L	1	0.00020	0.00005		GES	03/08/2023 17:34	EPA 200.8-1994, Rev. 5.4
Magnesium	0.28	mg/L	1	0.10	0.02		GES	03/08/2023 17:34	EPA 200.8-1994, Rev. 5.4
Manganese	0.0029	mg/L	1	0.0010	0.0002		GES	03/08/2023 17:34	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	03/21/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	03/08/2023 17:34	EPA 200.8-1994, Rev. 5.4
Potassium	0.74	mg/L	1	0.10	0.02		GES	03/08/2023 17:34	EPA 200.8-1994, Rev. 5.4
Selenium	<0.09	µg/L	1	0.50	0.09	U1	GES	03/08/2023 17:34	EPA 200.8-1994, Rev. 5.4
Sodium	5.35	mg/L	1	0.20	0.05		GES	03/08/2023 17:34	EPA 200.8-1994, Rev. 5.4
Strontium	0.0040	mg/L	1	0.0020	0.0004		GES	03/08/2023 17:34	EPA 200.8-1994, Rev. 5.4
Thallium	0.06	µg/L	1	0.20	0.04	J1	GES	03/08/2023 17:34	EPA 200.8-1994, Rev. 5.4

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4001 Bixby Road
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Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 230698 **Customer: Pirkey Power Station** **Date Reported: 10/28/2023**

Customer Sample ID: AD-22
Lab Number: 230698-007
Date Collected: 02/27/2023 10:07 EST

Customer Description:
Preparation:
Date Received: 03/06/2023 14:20 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	03/08/2023 17:40	EPA 200.8-1994, Rev. 5.4
Arsenic	3.66	µg/L	1	0.10	0.03		GES	03/08/2023 17:40	EPA 200.8-1994, Rev. 5.4
Barium	18.0	µg/L	1	0.20	0.05		GES	03/08/2023 17:40	EPA 200.8-1994, Rev. 5.4
Beryllium	10.2	µg/L	1	0.050	0.007		GES	03/08/2023 17:40	EPA 200.8-1994, Rev. 5.4
Boron	0.068	mg/L	1	0.050	0.009		GES	03/08/2023 17:40	EPA 200.8-1994, Rev. 5.4
Cadmium	1.37	µg/L	1	0.020	0.004		GES	03/08/2023 17:40	EPA 200.8-1994, Rev. 5.4
Calcium	14.9	mg/L	1	0.05	0.02		GES	03/08/2023 17:40	EPA 200.8-1994, Rev. 5.4
Chromium	0.46	µg/L	1	0.20	0.04		GES	03/08/2023 17:40	EPA 200.8-1994, Rev. 5.4
Cobalt	113	µg/L	1	0.020	0.003		GES	03/08/2023 17:40	EPA 200.8-1994, Rev. 5.4
Lead	0.21	µg/L	1	0.20	0.05		GES	03/08/2023 17:40	EPA 200.8-1994, Rev. 5.4
Lithium	0.194	mg/L	1	0.00020	0.00005		GES	03/08/2023 17:40	EPA 200.8-1994, Rev. 5.4
Magnesium	21.1	mg/L	1	0.10	0.02		GES	03/08/2023 17:40	EPA 200.8-1994, Rev. 5.4
Mercury	40	ng/L	10	50	20	J1	JAB	03/21/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	03/08/2023 17:40	EPA 200.8-1994, Rev. 5.4
Potassium	4.48	mg/L	1	0.10	0.02		GES	03/08/2023 17:40	EPA 200.8-1994, Rev. 5.4
Selenium	7.39	µg/L	1	0.50	0.09		GES	03/08/2023 17:40	EPA 200.8-1994, Rev. 5.4
Sodium	86.9	mg/L	1	0.20	0.05		GES	03/08/2023 17:40	EPA 200.8-1994, Rev. 5.4
Strontium	0.140	mg/L	1	0.0020	0.0004		GES	03/08/2023 17:40	EPA 200.8-1994, Rev. 5.4
Thallium	0.24	µg/L	1	0.20	0.04		GES	03/08/2023 17:40	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	1.41	pCi/L	0.20	0.21		ST	03/16/2023 08:55	SW-846 9315-1986, Rev. 0
Carrier Recovery	77.0	%						
Radium-228	3.45	pCi/L	0.25	0.70		TTP	03/16/2023 15:39	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	69.3	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 230698 **Customer: Pirkey Power Station** **Date Reported: 10/28/2023**

Customer Sample ID: AD-22
Customer Description:
Lab Number: 230698-007-01
Preparation: Dissolved
Date Collected: 02/27/2023 11:07 EST
Date Received: 03/06/2023 14:20 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	03/08/2023 17:45	EPA 200.8-1994, Rev. 5.4
Arsenic	3.64	µg/L	1	0.10	0.03		GES	03/08/2023 17:45	EPA 200.8-1994, Rev. 5.4
Barium	18.3	µg/L	1	0.20	0.05		GES	03/08/2023 17:45	EPA 200.8-1994, Rev. 5.4
Beryllium	9.74	µg/L	1	0.050	0.007		GES	03/08/2023 17:45	EPA 200.8-1994, Rev. 5.4
Boron	0.069	mg/L	1	0.050	0.009		GES	03/08/2023 17:45	EPA 200.8-1994, Rev. 5.4
Cadmium	1.36	µg/L	1	0.020	0.004		GES	03/08/2023 17:45	EPA 200.8-1994, Rev. 5.4
Calcium	15.5	mg/L	1	0.05	0.02		GES	03/08/2023 17:45	EPA 200.8-1994, Rev. 5.4
Chromium	0.57	µg/L	1	0.20	0.04		GES	03/08/2023 17:45	EPA 200.8-1994, Rev. 5.4
Cobalt	115	µg/L	1	0.020	0.003		GES	03/08/2023 17:45	EPA 200.8-1994, Rev. 5.4
Iron	25.8	mg/L	1	0.020	0.006		GES	03/08/2023 17:45	EPA 200.8-1994, Rev. 5.4
Lead	0.69	µg/L	1	0.20	0.05		GES	03/08/2023 17:45	EPA 200.8-1994, Rev. 5.4
Lithium	0.186	mg/L	1	0.00020	0.00005		GES	03/08/2023 17:45	EPA 200.8-1994, Rev. 5.4
Magnesium	21.8	mg/L	1	0.10	0.02		GES	03/08/2023 17:45	EPA 200.8-1994, Rev. 5.4
Manganese	0.400	mg/L	1	0.0010	0.0002		GES	03/08/2023 17:45	EPA 200.8-1994, Rev. 5.4
Mercury	9	ng/L	1	5	2		JAB	03/21/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	03/08/2023 17:45	EPA 200.8-1994, Rev. 5.4
Potassium	4.60	mg/L	1	0.10	0.02		GES	03/08/2023 17:45	EPA 200.8-1994, Rev. 5.4
Selenium	7.50	µg/L	1	0.50	0.09		GES	03/08/2023 17:45	EPA 200.8-1994, Rev. 5.4
Sodium	90.4	mg/L	1	0.20	0.05		GES	03/08/2023 17:45	EPA 200.8-1994, Rev. 5.4
Strontium	0.143	mg/L	1	0.0020	0.0004		GES	03/08/2023 17:45	EPA 200.8-1994, Rev. 5.4
Thallium	0.24	µg/L	1	0.20	0.04		GES	03/08/2023 17:45	EPA 200.8-1994, Rev. 5.4

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 230698 **Customer: Pirkey Power Station** **Date Reported: 10/28/2023**

Customer Sample ID: AD-31
Customer Description:
Lab Number: 230698-008
Preparation:
Date Collected: 02/27/2023 12:47 EST
Date Received: 03/06/2023 14:20 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	03/08/2023 17:50	EPA 200.8-1994, Rev. 5.4
Arsenic	0.30	µg/L	1	0.10	0.03		GES	03/08/2023 17:50	EPA 200.8-1994, Rev. 5.4
Barium	35.6	µg/L	1	0.20	0.05		GES	03/08/2023 17:50	EPA 200.8-1994, Rev. 5.4
Beryllium	0.935	µg/L	1	0.050	0.007		GES	03/08/2023 17:50	EPA 200.8-1994, Rev. 5.4
Boron	0.017	mg/L	1	0.050	0.009	J1	GES	03/08/2023 17:50	EPA 200.8-1994, Rev. 5.4
Cadmium	0.079	µg/L	1	0.020	0.004		GES	03/08/2023 17:50	EPA 200.8-1994, Rev. 5.4
Calcium	2.70	mg/L	1	0.05	0.02		GES	03/08/2023 17:50	EPA 200.8-1994, Rev. 5.4
Chromium	0.62	µg/L	1	0.20	0.04		GES	03/08/2023 17:50	EPA 200.8-1994, Rev. 5.4
Cobalt	10.5	µg/L	1	0.020	0.003		GES	03/08/2023 17:50	EPA 200.8-1994, Rev. 5.4
Lead	0.31	µg/L	1	0.20	0.05		GES	03/08/2023 17:50	EPA 200.8-1994, Rev. 5.4
Lithium	0.0737	mg/L	1	0.00020	0.00005		GES	03/08/2023 17:50	EPA 200.8-1994, Rev. 5.4
Magnesium	4.10	mg/L	1	0.10	0.02		GES	03/08/2023 17:50	EPA 200.8-1994, Rev. 5.4
Mercury	130	ng/L	50	250	90	J1	JAB	03/21/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	03/08/2023 17:50	EPA 200.8-1994, Rev. 5.4
Potassium	1.60	mg/L	1	0.10	0.02		GES	03/08/2023 17:50	EPA 200.8-1994, Rev. 5.4
Selenium	0.27	µg/L	1	0.50	0.09	J1	GES	03/08/2023 17:50	EPA 200.8-1994, Rev. 5.4
Sodium	31.4	mg/L	1	0.20	0.05		GES	03/08/2023 17:50	EPA 200.8-1994, Rev. 5.4
Strontium	0.0413	mg/L	1	0.0020	0.0004		GES	03/08/2023 17:50	EPA 200.8-1994, Rev. 5.4
Thallium	0.09	µg/L	1	0.20	0.04	J1	GES	03/08/2023 17:50	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	1.58	pCi/L	0.20	0.19		ST	03/16/2023 08:55	SW-846 9315-1986, Rev. 0
Carrier Recovery	88.2	%						
Radium-228	2.47	pCi/L	0.19	0.52		TTP	03/16/2023 15:39	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	73.1	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 230698 **Customer: Pirkey Power Station** **Date Reported: 10/28/2023**

Customer Sample ID: AD-31
Customer Description:
Lab Number: 230698-008-01
Preparation: Dissolved
Date Collected: 02/27/2023 13:47 EST
Date Received: 03/06/2023 14:20 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	03/08/2023 17:55	EPA 200.8-1994, Rev. 5.4
Arsenic	0.19	µg/L	1	0.10	0.03		GES	03/08/2023 17:55	EPA 200.8-1994, Rev. 5.4
Barium	34.3	µg/L	1	0.20	0.05		GES	03/08/2023 17:55	EPA 200.8-1994, Rev. 5.4
Beryllium	0.956	µg/L	1	0.050	0.007		GES	03/08/2023 17:55	EPA 200.8-1994, Rev. 5.4
Boron	0.018	mg/L	1	0.050	0.009	J1	GES	03/08/2023 17:55	EPA 200.8-1994, Rev. 5.4
Cadmium	0.078	µg/L	1	0.020	0.004		GES	03/08/2023 17:55	EPA 200.8-1994, Rev. 5.4
Calcium	2.84	mg/L	1	0.05	0.02		GES	03/08/2023 17:55	EPA 200.8-1994, Rev. 5.4
Chromium	0.29	µg/L	1	0.20	0.04		GES	03/08/2023 17:55	EPA 200.8-1994, Rev. 5.4
Cobalt	10.5	µg/L	1	0.020	0.003		GES	03/08/2023 17:55	EPA 200.8-1994, Rev. 5.4
Iron	0.121	mg/L	1	0.020	0.006		GES	03/08/2023 17:55	EPA 200.8-1994, Rev. 5.4
Lead	0.24	µg/L	1	0.20	0.05		GES	03/08/2023 17:55	EPA 200.8-1994, Rev. 5.4
Lithium	0.0746	mg/L	1	0.00020	0.00005		GES	03/08/2023 17:55	EPA 200.8-1994, Rev. 5.4
Magnesium	4.15	mg/L	1	0.10	0.02		GES	03/08/2023 17:55	EPA 200.8-1994, Rev. 5.4
Manganese	0.0276	mg/L	1	0.0010	0.0002		GES	03/08/2023 17:55	EPA 200.8-1994, Rev. 5.4
Mercury	<7	ng/L	4	20	7	U1	JAB	03/21/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	03/08/2023 17:55	EPA 200.8-1994, Rev. 5.4
Potassium	1.60	mg/L	1	0.10	0.02		GES	03/08/2023 17:55	EPA 200.8-1994, Rev. 5.4
Selenium	0.28	µg/L	1	0.50	0.09	J1	GES	03/08/2023 17:55	EPA 200.8-1994, Rev. 5.4
Sodium	31.8	mg/L	1	0.20	0.05		GES	03/08/2023 17:55	EPA 200.8-1994, Rev. 5.4
Strontium	0.0418	mg/L	1	0.0020	0.0004		GES	03/08/2023 17:55	EPA 200.8-1994, Rev. 5.4
Thallium	0.09	µg/L	1	0.20	0.04	J1	GES	03/08/2023 17:55	EPA 200.8-1994, Rev. 5.4

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 230698 **Customer: Pirkey Power Station** **Date Reported: 10/28/2023**

Customer Sample ID: AD-32
Customer Description:
Lab Number: 230698-009
Preparation:
Date Collected: 02/27/2023 12:03 EST
Date Received: 03/06/2023 14:20 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	03/08/2023 18:00	EPA 200.8-1994, Rev. 5.4
Arsenic	0.89	µg/L	1	0.10	0.03		GES	03/08/2023 18:00	EPA 200.8-1994, Rev. 5.4
Barium	26.3	µg/L	1	0.20	0.05		GES	03/08/2023 18:00	EPA 200.8-1994, Rev. 5.4
Beryllium	3.19	µg/L	1	0.050	0.007		GES	03/08/2023 18:00	EPA 200.8-1994, Rev. 5.4
Boron	0.767	mg/L	1	0.050	0.009		GES	03/08/2023 18:00	EPA 200.8-1994, Rev. 5.4
Cadmium	0.360	µg/L	1	0.020	0.004		GES	03/08/2023 18:00	EPA 200.8-1994, Rev. 5.4
Calcium	7.69	mg/L	1	0.05	0.02		GES	03/08/2023 18:00	EPA 200.8-1994, Rev. 5.4
Chromium	0.44	µg/L	1	0.20	0.04		GES	03/08/2023 18:00	EPA 200.8-1994, Rev. 5.4
Cobalt	29.4	µg/L	1	0.020	0.003		GES	03/08/2023 18:00	EPA 200.8-1994, Rev. 5.4
Lead	0.40	µg/L	1	0.20	0.05		GES	03/08/2023 18:00	EPA 200.8-1994, Rev. 5.4
Lithium	0.0837	mg/L	1	0.00020	0.00005		GES	03/08/2023 18:00	EPA 200.8-1994, Rev. 5.4
Magnesium	9.85	mg/L	1	0.10	0.02		GES	03/08/2023 18:00	EPA 200.8-1994, Rev. 5.4
Mercury	2210	ng/L	100	500	200		JAB	03/21/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	03/08/2023 18:00	EPA 200.8-1994, Rev. 5.4
Potassium	3.00	mg/L	1	0.10	0.02		GES	03/08/2023 18:00	EPA 200.8-1994, Rev. 5.4
Selenium	2.68	µg/L	1	0.50	0.09		GES	03/08/2023 18:00	EPA 200.8-1994, Rev. 5.4
Sodium	32.8	mg/L	1	0.20	0.05		GES	03/08/2023 18:00	EPA 200.8-1994, Rev. 5.4
Strontium	0.143	mg/L	1	0.0020	0.0004		GES	03/08/2023 18:00	EPA 200.8-1994, Rev. 5.4
Thallium	0.18	µg/L	1	0.20	0.04	J1	GES	03/08/2023 18:00	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	2.29	pCi/L	0.24	0.17		ST	03/16/2023 08:55	SW-846 9315-1986, Rev. 0
Carrier Recovery	89.7	%						
Radium-228	3.54	pCi/L	0.21	0.58		TTP	03/16/2023 15:50	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	71.2	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 230698 **Customer: Pirkey Power Station** **Date Reported: 10/28/2023**

Customer Sample ID: AD-32
Customer Description:
Lab Number: 230698-009-01
Preparation: Dissolved
Date Collected: 02/27/2023 13:03 EST
Date Received: 03/06/2023 14:20 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	03/08/2023 18:05	EPA 200.8-1994, Rev. 5.4
Arsenic	0.93	µg/L	1	0.10	0.03		GES	03/08/2023 18:05	EPA 200.8-1994, Rev. 5.4
Barium	26.0	µg/L	1	0.20	0.05		GES	03/08/2023 18:05	EPA 200.8-1994, Rev. 5.4
Beryllium	3.11	µg/L	1	0.050	0.007		GES	03/08/2023 18:05	EPA 200.8-1994, Rev. 5.4
Boron	0.754	mg/L	1	0.050	0.009		GES	03/08/2023 18:05	EPA 200.8-1994, Rev. 5.4
Cadmium	0.373	µg/L	1	0.020	0.004		GES	03/08/2023 18:05	EPA 200.8-1994, Rev. 5.4
Calcium	7.37	mg/L	1	0.05	0.02		GES	03/08/2023 18:05	EPA 200.8-1994, Rev. 5.4
Chromium	0.55	µg/L	1	0.20	0.04		GES	03/08/2023 18:05	EPA 200.8-1994, Rev. 5.4
Cobalt	28.6	µg/L	1	0.020	0.003		GES	03/08/2023 18:05	EPA 200.8-1994, Rev. 5.4
Iron	1.44	mg/L	1	0.020	0.006		GES	03/08/2023 18:05	EPA 200.8-1994, Rev. 5.4
Lead	0.52	µg/L	1	0.20	0.05		GES	03/08/2023 18:05	EPA 200.8-1994, Rev. 5.4
Lithium	0.0829	mg/L	1	0.00020	0.00005		GES	03/08/2023 18:05	EPA 200.8-1994, Rev. 5.4
Magnesium	9.52	mg/L	1	0.10	0.02		GES	03/08/2023 18:05	EPA 200.8-1994, Rev. 5.4
Manganese	0.0503	mg/L	1	0.0010	0.0002		GES	03/08/2023 18:05	EPA 200.8-1994, Rev. 5.4
Mercury	<4	ng/L	2	10	4	U1	JAB	03/21/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	03/08/2023 18:05	EPA 200.8-1994, Rev. 5.4
Potassium	2.96	mg/L	1	0.10	0.02		GES	03/08/2023 18:05	EPA 200.8-1994, Rev. 5.4
Selenium	2.69	µg/L	1	0.50	0.09		GES	03/08/2023 18:05	EPA 200.8-1994, Rev. 5.4
Sodium	32.1	mg/L	1	0.20	0.05		GES	03/08/2023 18:05	EPA 200.8-1994, Rev. 5.4
Strontium	0.139	mg/L	1	0.0020	0.0004		GES	03/08/2023 18:05	EPA 200.8-1994, Rev. 5.4
Thallium	0.18	µg/L	1	0.20	0.04	J1	GES	03/08/2023 18:05	EPA 200.8-1994, Rev. 5.4

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 230698 **Customer: Pirkey Power Station** **Date Reported: 10/28/2023**

Customer Sample ID: AD-33
Customer Description:
Lab Number: 230698-010
Preparation:
Date Collected: 02/27/2023 10:58 EST
Date Received: 03/06/2023 14:20 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	03/08/2023 18:10	EPA 200.8-1994, Rev. 5.4
Arsenic	0.76	µg/L	1	0.10	0.03		GES	03/08/2023 18:10	EPA 200.8-1994, Rev. 5.4
Barium	44.4	µg/L	1	0.20	0.05		GES	03/08/2023 18:10	EPA 200.8-1994, Rev. 5.4
Beryllium	1.50	µg/L	1	0.050	0.007		GES	03/08/2023 18:10	EPA 200.8-1994, Rev. 5.4
Boron	0.179	mg/L	1	0.050	0.009		GES	03/08/2023 18:10	EPA 200.8-1994, Rev. 5.4
Cadmium	0.064	µg/L	1	0.020	0.004		GES	03/08/2023 18:10	EPA 200.8-1994, Rev. 5.4
Calcium	2.48	mg/L	1	0.05	0.02		GES	03/08/2023 18:10	EPA 200.8-1994, Rev. 5.4
Chromium	0.31	µg/L	1	0.20	0.04		GES	03/08/2023 18:10	EPA 200.8-1994, Rev. 5.4
Cobalt	12.4	µg/L	1	0.020	0.003		GES	03/08/2023 18:10	EPA 200.8-1994, Rev. 5.4
Lead	0.32	µg/L	1	0.20	0.05		GES	03/08/2023 18:10	EPA 200.8-1994, Rev. 5.4
Lithium	0.0233	mg/L	1	0.00020	0.00005		GES	03/08/2023 18:10	EPA 200.8-1994, Rev. 5.4
Magnesium	4.71	mg/L	1	0.10	0.02		GES	03/08/2023 18:10	EPA 200.8-1994, Rev. 5.4
Mercury	5980	ng/L	100	500	200		JAB	03/21/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	03/08/2023 18:10	EPA 200.8-1994, Rev. 5.4
Potassium	0.32	mg/L	1	0.10	0.02		GES	03/08/2023 18:10	EPA 200.8-1994, Rev. 5.4
Selenium	2.54	µg/L	1	0.50	0.09		GES	03/08/2023 18:10	EPA 200.8-1994, Rev. 5.4
Sodium	19.4	mg/L	1	0.20	0.05		GES	03/08/2023 18:10	EPA 200.8-1994, Rev. 5.4
Strontium	0.0397	mg/L	1	0.0020	0.0004		GES	03/08/2023 18:10	EPA 200.8-1994, Rev. 5.4
Thallium	0.04	µg/L	1	0.20	0.04	J1	GES	03/08/2023 18:10	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	1.18	pCi/L	0.18	0.20		ST	03/16/2023 08:55	SW-846 9315-1986, Rev. 0
Carrier Recovery	87.3	%						
Radium-228	1.67	pCi/L	0.17	0.50		TTP	03/16/2023 15:50	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	79.5	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 230698 **Customer: Pirkey Power Station** **Date Reported: 10/28/2023**

Customer Sample ID: AD-33
Customer Description:
Lab Number: 230698-010-01
Preparation: Dissolved
Date Collected: 02/27/2023 11:58 EST
Date Received: 03/06/2023 14:20 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	03/08/2023 18:15	EPA 200.8-1994, Rev. 5.4
Arsenic	0.79	µg/L	1	0.10	0.03		GES	03/08/2023 18:15	EPA 200.8-1994, Rev. 5.4
Barium	45.1	µg/L	1	0.20	0.05		GES	03/08/2023 18:15	EPA 200.8-1994, Rev. 5.4
Beryllium	1.55	µg/L	1	0.050	0.007		GES	03/08/2023 18:15	EPA 200.8-1994, Rev. 5.4
Boron	0.181	mg/L	1	0.050	0.009		GES	03/08/2023 18:15	EPA 200.8-1994, Rev. 5.4
Cadmium	0.069	µg/L	1	0.020	0.004		GES	03/08/2023 18:15	EPA 200.8-1994, Rev. 5.4
Calcium	2.42	mg/L	1	0.05	0.02		GES	03/08/2023 18:15	EPA 200.8-1994, Rev. 5.4
Chromium	0.29	µg/L	1	0.20	0.04		GES	03/08/2023 18:15	EPA 200.8-1994, Rev. 5.4
Cobalt	12.6	µg/L	1	0.020	0.003		GES	03/08/2023 18:15	EPA 200.8-1994, Rev. 5.4
Iron	0.040	mg/L	1	0.020	0.006		GES	03/08/2023 18:15	EPA 200.8-1994, Rev. 5.4
Lead	0.31	µg/L	1	0.20	0.05		GES	03/08/2023 18:15	EPA 200.8-1994, Rev. 5.4
Lithium	0.0234	mg/L	1	0.00020	0.00005		GES	03/08/2023 18:15	EPA 200.8-1994, Rev. 5.4
Magnesium	4.81	mg/L	1	0.10	0.02		GES	03/08/2023 18:15	EPA 200.8-1994, Rev. 5.4
Manganese	0.0085	mg/L	1	0.0010	0.0002		GES	03/08/2023 18:15	EPA 200.8-1994, Rev. 5.4
Mercury	1180	ng/L	20	100	40		JAB	03/27/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	03/08/2023 18:15	EPA 200.8-1994, Rev. 5.4
Potassium	0.31	mg/L	1	0.10	0.02		GES	03/08/2023 18:15	EPA 200.8-1994, Rev. 5.4
Selenium	2.41	µg/L	1	0.50	0.09		GES	03/08/2023 18:15	EPA 200.8-1994, Rev. 5.4
Sodium	19.7	mg/L	1	0.20	0.05		GES	03/08/2023 18:15	EPA 200.8-1994, Rev. 5.4
Strontium	0.0401	mg/L	1	0.0020	0.0004		GES	03/08/2023 18:15	EPA 200.8-1994, Rev. 5.4
Thallium	0.04	µg/L	1	0.20	0.04	J1	GES	03/08/2023 18:15	EPA 200.8-1994, Rev. 5.4

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 230698 **Customer: Pirkey Power Station** **Date Reported: 10/28/2023**

Customer Sample ID: DUPLICATE 1
Lab Number: 230698-011
Date Collected: 02/27/2023 10:22 EST

Customer Description:
Preparation:
Date Received: 03/06/2023 14:20 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	03/08/2023 10:57	EPA 200.8-1994, Rev. 5.4
Arsenic	0.08	µg/L	1	0.10	0.03	J1	GES	03/08/2023 10:57	EPA 200.8-1994, Rev. 5.4
Barium	27.9	µg/L	1	0.20	0.05		GES	03/08/2023 10:57	EPA 200.8-1994, Rev. 5.4
Beryllium	0.155	µg/L	1	0.050	0.007		GES	03/08/2023 10:57	EPA 200.8-1994, Rev. 5.4
Boron	0.012	mg/L	1	0.050	0.009	J1	GES	03/08/2023 10:57	EPA 200.8-1994, Rev. 5.4
Cadmium	0.011	µg/L	1	0.020	0.004	J1	GES	03/08/2023 10:57	EPA 200.8-1994, Rev. 5.4
Calcium	0.34	mg/L	1	0.05	0.02		GES	03/08/2023 10:57	EPA 200.8-1994, Rev. 5.4
Chromium	0.36	µg/L	1	0.20	0.04		GES	03/08/2023 10:57	EPA 200.8-1994, Rev. 5.4
Cobalt	1.52	µg/L	1	0.020	0.003		GES	03/08/2023 10:57	EPA 200.8-1994, Rev. 5.4
Lead	0.10	µg/L	1	0.20	0.05	J1	GES	03/08/2023 10:57	EPA 200.8-1994, Rev. 5.4
Lithium	0.00892	mg/L	1	0.00020	0.00005		GES	03/08/2023 10:57	EPA 200.8-1994, Rev. 5.4
Magnesium	0.49	mg/L	1	0.10	0.02		GES	03/08/2023 10:57	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	03/21/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	03/08/2023 10:57	EPA 200.8-1994, Rev. 5.4
Potassium	0.59	mg/L	1	0.10	0.02		GES	03/08/2023 10:57	EPA 200.8-1994, Rev. 5.4
Selenium	0.28	µg/L	1	0.50	0.09	J1	GES	03/15/2023 16:43	EPA 200.8-1994, Rev. 5.4
Sodium	5.26	mg/L	1	0.20	0.05		GES	03/08/2023 10:57	EPA 200.8-1994, Rev. 5.4
Strontium	0.0033	mg/L	1	0.0020	0.0004		GES	03/08/2023 10:57	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	03/08/2023 10:57	EPA 200.8-1994, Rev. 5.4

AMERICAN ELECTRIC POWER

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Water Analysis Report

Reissued

Job ID: 230698 **Customer: Pirkey Power Station** **Date Reported: 10/28/2023**

Customer Sample ID: DUPLICATE 1
Customer Description:
Lab Number: 230698-011-01
Preparation: Dissolved
Date Collected: 02/27/2023 11:22 EST
Date Received: 03/06/2023 14:20 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	03/08/2023 11:02	EPA 200.8-1994, Rev. 5.4
Arsenic	0.06	µg/L	1	0.10	0.03	J1	GES	03/08/2023 11:02	EPA 200.8-1994, Rev. 5.4
Barium	26.7	µg/L	1	0.20	0.05		GES	03/08/2023 11:02	EPA 200.8-1994, Rev. 5.4
Beryllium	0.149	µg/L	1	0.050	0.007		GES	03/08/2023 11:02	EPA 200.8-1994, Rev. 5.4
Boron	0.012	mg/L	1	0.050	0.009	J1	GES	03/08/2023 11:02	EPA 200.8-1994, Rev. 5.4
Cadmium	0.010	µg/L	1	0.020	0.004	J1	GES	03/08/2023 11:02	EPA 200.8-1994, Rev. 5.4
Calcium	0.37	mg/L	1	0.05	0.02		GES	03/08/2023 11:02	EPA 200.8-1994, Rev. 5.4
Chromium	0.27	µg/L	1	0.20	0.04		GES	03/08/2023 11:02	EPA 200.8-1994, Rev. 5.4
Cobalt	1.48	µg/L	1	0.020	0.003		GES	03/08/2023 11:02	EPA 200.8-1994, Rev. 5.4
Iron	0.012	mg/L	1	0.020	0.006	J1	GES	03/08/2023 11:02	EPA 200.8-1994, Rev. 5.4
Lead	0.15	µg/L	1	0.20	0.05	J1	GES	03/08/2023 11:02	EPA 200.8-1994, Rev. 5.4
Lithium	0.00881	mg/L	1	0.00020	0.00005		GES	03/08/2023 11:02	EPA 200.8-1994, Rev. 5.4
Magnesium	0.48	mg/L	1	0.10	0.02		GES	03/08/2023 11:02	EPA 200.8-1994, Rev. 5.4
Manganese	0.0051	mg/L	1	0.0010	0.0002		GES	03/08/2023 11:02	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	03/21/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	03/08/2023 11:02	EPA 200.8-1994, Rev. 5.4
Potassium	0.58	mg/L	1	0.10	0.02		GES	03/08/2023 11:02	EPA 200.8-1994, Rev. 5.4
Selenium	0.33	µg/L	1	0.50	0.09	J1	GES	03/15/2023 16:58	EPA 200.8-1994, Rev. 5.4
Sodium	5.13	mg/L	1	0.20	0.05		GES	03/08/2023 11:02	EPA 200.8-1994, Rev. 5.4
Strontium	0.0032	mg/L	1	0.0020	0.0004		GES	03/08/2023 11:02	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	03/08/2023 11:02	EPA 200.8-1994, Rev. 5.4

AMERICAN ELECTRIC POWER

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Water Analysis Report

Reissued

Job ID: 230698 **Customer: Pirkey Power Station** **Date Reported: 10/28/2023**

Customer Sample ID: DUPLICATE 2
Customer Description:
Lab Number: 230698-012
Preparation:
Date Collected: 02/28/2023 14:00 EST
Date Received: 03/06/2023 14:20 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	03/08/2023 11:18	EPA 200.8-1994, Rev. 5.4
Arsenic	0.27	µg/L	1	0.10	0.03		GES	03/08/2023 11:18	EPA 200.8-1994, Rev. 5.4
Barium	119	µg/L	1	0.20	0.05		GES	03/08/2023 11:18	EPA 200.8-1994, Rev. 5.4
Beryllium	0.567	µg/L	1	0.050	0.007		GES	03/08/2023 11:18	EPA 200.8-1994, Rev. 5.4
Boron	0.017	mg/L	1	0.050	0.009	J1	GES	03/08/2023 11:18	EPA 200.8-1994, Rev. 5.4
Cadmium	0.018	µg/L	1	0.020	0.004	J1	GES	03/08/2023 11:18	EPA 200.8-1994, Rev. 5.4
Calcium	2.26	mg/L	1	0.05	0.02		GES	03/08/2023 11:18	EPA 200.8-1994, Rev. 5.4
Chromium	0.24	µg/L	1	0.20	0.04		GES	03/08/2023 11:18	EPA 200.8-1994, Rev. 5.4
Cobalt	5.79	µg/L	1	0.020	0.003		GES	03/08/2023 11:18	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	GES	03/08/2023 11:18	EPA 200.8-1994, Rev. 5.4
Lithium	0.0305	mg/L	1	0.00020	0.00005		GES	03/08/2023 11:18	EPA 200.8-1994, Rev. 5.4
Magnesium	1.08	mg/L	1	0.10	0.02		GES	03/08/2023 11:18	EPA 200.8-1994, Rev. 5.4
Mercury	3	ng/L	1	5	2	J1	JAB	03/21/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	03/08/2023 11:18	EPA 200.8-1994, Rev. 5.4
Potassium	2.49	mg/L	1	0.10	0.02		GES	03/08/2023 11:18	EPA 200.8-1994, Rev. 5.4
Selenium	<0.09	µg/L	1	0.50	0.09	U1	GES	03/15/2023 17:03	EPA 200.8-1994, Rev. 5.4
Sodium	8.34	mg/L	1	0.20	0.05		GES	03/08/2023 11:18	EPA 200.8-1994, Rev. 5.4
Strontium	0.0195	mg/L	1	0.0020	0.0004		GES	03/08/2023 11:18	EPA 200.8-1994, Rev. 5.4
Thallium	0.11	µg/L	1	0.20	0.04	J1	GES	03/08/2023 11:18	EPA 200.8-1994, Rev. 5.4

AMERICAN ELECTRIC POWER

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Water Analysis Report

Reissued

Job ID: 230698 **Customer: Pirkey Power Station** **Date Reported: 10/28/2023**

Customer Sample ID: DUPLICATE 2
Customer Description:
Lab Number: 230698-012-01
Preparation: Dissolved
Date Collected: 02/28/2023 15:00 EST
Date Received: 03/06/2023 14:20 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	03/08/2023 11:23	EPA 200.8-1994, Rev. 5.4
Arsenic	0.04	µg/L	1	0.10	0.03	J1	GES	03/08/2023 11:23	EPA 200.8-1994, Rev. 5.4
Barium	118	µg/L	1	0.20	0.05		GES	03/08/2023 11:23	EPA 200.8-1994, Rev. 5.4
Beryllium	0.579	µg/L	1	0.050	0.007		GES	03/08/2023 11:23	EPA 200.8-1994, Rev. 5.4
Boron	0.016	mg/L	1	0.050	0.009	J1	GES	03/08/2023 11:23	EPA 200.8-1994, Rev. 5.4
Cadmium	0.018	µg/L	1	0.020	0.004	J1	GES	03/08/2023 11:23	EPA 200.8-1994, Rev. 5.4
Calcium	2.28	mg/L	1	0.05	0.02		GES	03/08/2023 11:23	EPA 200.8-1994, Rev. 5.4
Chromium	0.24	µg/L	1	0.20	0.04		GES	03/08/2023 11:23	EPA 200.8-1994, Rev. 5.4
Cobalt	5.76	µg/L	1	0.020	0.003		GES	03/08/2023 11:23	EPA 200.8-1994, Rev. 5.4
Iron	0.046	mg/L	1	0.020	0.006		GES	03/08/2023 11:23	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	GES	03/08/2023 11:23	EPA 200.8-1994, Rev. 5.4
Lithium	0.0309	mg/L	1	0.00020	0.00005		GES	03/08/2023 11:23	EPA 200.8-1994, Rev. 5.4
Magnesium	1.05	mg/L	1	0.10	0.02		GES	03/08/2023 11:23	EPA 200.8-1994, Rev. 5.4
Manganese	0.0509	mg/L	1	0.0010	0.0002		GES	03/08/2023 11:23	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	03/21/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	03/08/2023 11:23	EPA 200.8-1994, Rev. 5.4
Potassium	2.49	mg/L	1	0.10	0.02		GES	03/08/2023 11:23	EPA 200.8-1994, Rev. 5.4
Selenium	<0.09	µg/L	1	0.50	0.09	U1	GES	03/15/2023 17:08	EPA 200.8-1994, Rev. 5.4
Sodium	8.23	mg/L	1	0.20	0.05		GES	03/08/2023 11:23	EPA 200.8-1994, Rev. 5.4
Strontium	0.0192	mg/L	1	0.0020	0.0004		GES	03/08/2023 11:23	EPA 200.8-1994, Rev. 5.4
Thallium	0.09	µg/L	1	0.20	0.04	J1	GES	03/08/2023 11:23	EPA 200.8-1994, Rev. 5.4

AMERICAN ELECTRIC POWER

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Water Analysis Report

Reissued

Job ID: 230698 **Customer: Pirkey Power Station** **Date Reported: 10/28/2023**

Customer Sample ID: EQUIPMENT BLANK
Customer Description:
Lab Number: 230698-013
Preparation:
Date Collected: 02/27/2023 12:18 EST
Date Received: 03/06/2023 14:20 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.02	µg/L	1	0.10	0.02	U1	GES	03/08/2023 11:28	EPA 200.8-1994, Rev. 5.4
Arsenic	<0.03	µg/L	1	0.10	0.03	U1	GES	03/08/2023 11:28	EPA 200.8-1994, Rev. 5.4
Barium	<0.05	µg/L	1	0.20	0.05	U1	GES	03/08/2023 11:28	EPA 200.8-1994, Rev. 5.4
Beryllium	0.034	µg/L	1	0.050	0.007	J1	GES	03/08/2023 11:28	EPA 200.8-1994, Rev. 5.4
Boron	<0.009	mg/L	1	0.050	0.009	U1	GES	03/08/2023 11:28	EPA 200.8-1994, Rev. 5.4
Cadmium	<0.004	µg/L	1	0.020	0.004	U1	GES	03/08/2023 11:28	EPA 200.8-1994, Rev. 5.4
Calcium	<0.02	mg/L	1	0.05	0.02	U1	GES	03/08/2023 11:28	EPA 200.8-1994, Rev. 5.4
Chromium	0.44	µg/L	1	0.20	0.04		GES	03/08/2023 11:28	EPA 200.8-1994, Rev. 5.4
Cobalt	0.014	µg/L	1	0.020	0.003	J1	GES	03/08/2023 11:28	EPA 200.8-1994, Rev. 5.4
Lead	0.38	µg/L	1	0.20	0.05		GES	03/08/2023 11:28	EPA 200.8-1994, Rev. 5.4
Lithium	<0.00005	mg/L	1	0.00020	0.00005	U1	GES	03/08/2023 11:28	EPA 200.8-1994, Rev. 5.4
Magnesium	<0.02	mg/L	1	0.10	0.02	U1	GES	03/08/2023 11:28	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	03/21/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	03/08/2023 11:28	EPA 200.8-1994, Rev. 5.4
Potassium	<0.02	mg/L	1	0.10	0.02	U1	GES	03/08/2023 11:28	EPA 200.8-1994, Rev. 5.4
Selenium	<0.09	µg/L	1	0.50	0.09	U1	GES	03/15/2023 17:14	EPA 200.8-1994, Rev. 5.4
Sodium	<0.05	mg/L	1	0.20	0.05	U1	GES	03/08/2023 11:28	EPA 200.8-1994, Rev. 5.4
Strontium	<0.0004	mg/L	1	0.0020	0.0004	U1	GES	03/08/2023 11:28	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	03/08/2023 11:28	EPA 200.8-1994, Rev. 5.4

AMERICAN ELECTRIC POWER

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Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 230698 **Customer: Pirkey Power Station** **Date Reported: 10/28/2023**

Customer Sample ID: FIELD BLANK
Lab Number: 230698-014
Date Collected: 02/27/2023 12:21 EST

Customer Description:
Preparation:
Date Received: 03/06/2023 14:20 EST

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.03	µg/L	1	0.10	0.02	J1	GES	03/08/2023 11:33	EPA 200.8-1994, Rev. 5.4
Arsenic	<0.03	µg/L	1	0.10	0.03	U1	GES	03/08/2023 11:33	EPA 200.8-1994, Rev. 5.4
Barium	<0.05	µg/L	1	0.20	0.05	U1	GES	03/08/2023 11:33	EPA 200.8-1994, Rev. 5.4
Beryllium	0.033	µg/L	1	0.050	0.007	J1	GES	03/08/2023 11:33	EPA 200.8-1994, Rev. 5.4
Boron	<0.009	mg/L	1	0.050	0.009	U1	GES	03/08/2023 11:33	EPA 200.8-1994, Rev. 5.4
Cadmium	<0.004	µg/L	1	0.020	0.004	U1	GES	03/08/2023 11:33	EPA 200.8-1994, Rev. 5.4
Calcium	<0.02	mg/L	1	0.05	0.02	U1	GES	03/08/2023 11:33	EPA 200.8-1994, Rev. 5.4
Chromium	0.23	µg/L	1	0.20	0.04		GES	03/08/2023 11:33	EPA 200.8-1994, Rev. 5.4
Cobalt	0.015	µg/L	1	0.020	0.003	J1	GES	03/08/2023 11:33	EPA 200.8-1994, Rev. 5.4
Lead	2.57	µg/L	1	0.20	0.05		GES	03/08/2023 11:33	EPA 200.8-1994, Rev. 5.4
Lithium	<0.00005	mg/L	1	0.00020	0.00005	U1	GES	03/08/2023 11:33	EPA 200.8-1994, Rev. 5.4
Magnesium	<0.02	mg/L	1	0.10	0.02	U1	GES	03/08/2023 11:33	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	JAB	03/21/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	03/08/2023 11:33	EPA 200.8-1994, Rev. 5.4
Potassium	<0.02	mg/L	1	0.10	0.02	U1	GES	03/08/2023 11:33	EPA 200.8-1994, Rev. 5.4
Selenium	<0.09	µg/L	1	0.50	0.09	U1	GES	03/15/2023 17:19	EPA 200.8-1994, Rev. 5.4
Sodium	<0.05	mg/L	1	0.20	0.05	U1	GES	03/08/2023 11:33	EPA 200.8-1994, Rev. 5.4
Strontium	<0.0004	mg/L	1	0.0020	0.0004	U1	GES	03/08/2023 11:33	EPA 200.8-1994, Rev. 5.4
Thallium	<0.04	µg/L	1	0.20	0.04	U1	GES	03/08/2023 11:33	EPA 200.8-1994, Rev. 5.4

230698
Job Comments:

Report originally issued 4/10/23. Report reissued 10/28/23 to correct rounding errors on report and EDD.

Water Analysis Report

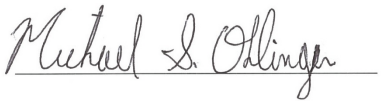
Reissued

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 230698 **Customer: Pirkey Power Station** **Date Reported: 10/28/2023**

Report Verification

This report and the above data have been confirmed by the following analyst.



Michael Ohlinger, Chemist
Email: msohlinger@aep.com
Phone: 614-836-4184
Audinet: 8-210-4184

Data Qualifer Legend

U1 - Not detected at or above method detection limit (MDL).
M1 - The associated matrix spike (MS) or matrix spike duplicate (MSD) recovery was outside acceptance limits.
J1 - Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
P1 - The precision between duplicate results was above acceptance limits.
P3 - The precision on the matrix spike duplicate (MSD) was above acceptance limits.

Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

Dolan Chemical Laboratory (DCL)
4001 Bixby Road
Groveport, Ohio 43125
Contacts: Jonathan Barnhill (318-673-3803)
Michael Ohlinger (614-836-4184)

Site Contact: | Date: | For Lab Use Only: COC/Order #: 230698

Project Name: Pirkey - CCR
Contact Name: Leslie Fuerschbach
Contact Phone: 318-423-3805
Sampler(s): Matt Hamilton Kenny McDonald

Analysis Turnaround Time (in Calendar Days)

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	250 mL bottle, pH<2, HNO_3 — B, Ca, Li, Sb, As, Ba, Be, Cd, Cr, Co, Pb, Mo, Se, TL and Na, K, Mg, Sr	Field-filter 250 mL bottle, then pH<2, HNO_3 — B, Ca, Li, Sb, As, Ba, Be, Cd, Cr, Co, Fe, Mn, Mo, Pb, Se, TL and Na, K, Mg, Sr	1 L bottle, Cool, 0-6°C — TDS, F, Cl, SO_4, and Br, Alkalinity	Three (six every 10th*) 1 L bottles, pH<2, HNO_3 — Ra-226, Ra-228	Field-Filter 250 mL PTFE lined bottle, HCL**, pH<2 — Hg	250 mL PTFE lined bottle, HCL**, pH<2 — Hg		Sample Specific Notes:
AD-2	2/27/2023	1055	G	GW	7		X	X		X	X	X		
AD-4	2/28/2023	913	G	GW	7		X	X		X	X	X		
AD-7	2/28/2023	1018	G	GW	7		X	X		X	X	X		
AD-12	2/27/2023	956	G	GW	10		X	X		X	X	X		
AD-13	2/27/2023	817	G	GW	7		X	X		X	X	X		
AD-18	2/28/2023	825	G	GW	7		X	X		X	X	X		
AD-22	2/27/2023	907	G	GW	7		X	X		X	X	X		
AD-31	2/27/2023	1147	G	GW	7		X	X		X	X	X		
AD-32	2/27/2022	1103	G	GW	7		X	X		X	X	X		
AD-33	2/27/2023	958	G	GW	7		X	X		X	X	X		
DUPLICATE 1	2/27/2023	922	G	GW	4		X	X			X	X		
Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____; F= filter in field							4	F4	1	4	2	2		

** Six 1L Bottles must be collected for Radium for every 10th sample.*

Special Instructions/QC Requirements & Comments:

TG-32

Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Matt Hamilton	Eagle	3-1-23 1500		
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: Michael Ohlinger	Date/Time: 3/6/23 2:20PM

Form COC-04, AEP Chain of Custody (COC) Record for Coal Combustion Residual (CCR) Sampling - Shreveport, Rev. 1, 1/10/17

Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

Dolan Chemical Laboratory (DCL)
4001 Bixby Road
Groveport, Ohio 43125
Contacts: Jonathan Barnhill (318-673-3803)
Michael Ohlinger (614-836-4184)

Project Name: Pirkey - CCR
Contact Name: Leslie Fuerschbach
Contact Phone: 318-423-3805
Sampler(s): Matt Hamilton Kenny McDonald

Analysis Turnaround Time (in Calendar Days)

Site Contact:

Date:

For Lab Use Only:
COC/Order #:

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	250 mL bottle, pH<2, HNO_3 — B, Ca, Li, Sb, As, Ba, Be, Cd, Cr, Co, Pb, Mo, Se, TL and Na, K, Mg, Sr	Field-filter 250 mL bottle, then pH<2, HNO_3 — B, Ca, Li, Sb, As, Ba, Be, Cd, Cr, Co, Fe, Mn, Mo, Pb, Se, TL and Na, K, Mg, Sr	1 L bottle, Cool, 0-6°C — TDS, F, Cl, SO_4, and Br, Alkalinity	Three (six every 10th*) 1 L bottles, pH<2, HNO_3 — Ra-226, Ra-228	Field-Filter 250 mL PTFE lined bottle, HCL**, pH<2 — Hg	250 mL PTFE lined bottle, HCL**, pH<2 — Hg		Sample Specific Notes:
DUPLICATE 2	2/28/2023	1300	G	GW	4		X	X			X	X		
EQUIPMENT BLANK	2/27/2023	1118	G	GW	2		X					X		
FIELD BLANK	2/27/2023	1121	G	GW	2		X					X		
Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____; F= filter in field							4	F4	1	4	2	2		

* *Six 1L Bottles must be collected for Radium for every 10th sample.*

Special Instructions/QC Requirements & Comments:

TG-32

Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Matt Hamilton	Eagle	3-1-23 1500		
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Date/Time:
			Michael Ohlinger	3/6/23 2:20pm

AEP WATER & WASTE SAMPLE RECEIPT FORM

Package Type	Delivery Type
(Cooler) Box Bag Envelope	PONY UPS (FedEX) USPS
	Other _____

Plant/Customer Pirkey **Number of Plastic Containers:** 59

Opened By WBS/TTP/MSD **Number of Glass Containers:** 26

Date/Time 3/6/23 2:20pm **Number of Mercury Containers:** –

Were all temperatures within 0-6°C? Y / N or (N/A) **Initial:** _____ on ice / (no ice)

(IR Gun Ser# 2213689000, *Expir.* 03/24/2024) - If No, specify each deviation: _____

Was container in good condition? (Y) / N Comments _____

Was Chain of Custody received? (Y) / N Comments _____

Requested turnaround: Routine If **RUSH**, who was notified? _____

pH (15 min)	Cr^{+6} (pres) (24 hr)	NO_2 or NO_3 (48 hr)	*ortho*-PO_4 (48 hr)	Hg-diss (pres) (48 hr)

Was COC filled out properly? (Y) / N Comments _____

Were samples labeled properly? (Y) / N Comments _____

Were correct containers used? (Y) / N Comments _____

Was pH checked & Color Coding done? (Y) / N or N/A **Initial & Date:** WCB / MSK / TTP

pH paper (circle one): MQuant,PN1.09535.0001,LOT#_____ [OR] Lab Rat,PN4801,LOT# X000RWDG21

- Was Add'l Preservative needed? Y / (N) If Yes: By whom & when: _____ (See Prep Book)

Is sample filtration requested? Y / (N) Comments _____ (See Prep Book)

Was the customer contacted? If Yes: Person Contacted: _____

Lab ID# 230698 Initial & Date & Time : _____

Comments: _____

Logged by MSD _____

Reviewed by TP _____

_____

_____

REMINDER: Document the pertinent sample integrity information and deviations in sample receipt (as noted above) in the "Notes" field in the LIMS to be included on the report to the customer.

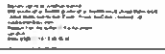
Municipal Solid Waste Laboratory Review Checklist

This data package consists of:

- [x] This signature page, and the laboratory review checklist consisting of Table 1, Reportable Data (which includes the reportable data identified on this page), Table 2, Supporting Data, and Table 3, Exception Reports.
- [x] R1 Field chain-of-custody documentation
- [x] R2 Sample identification cross-reference
- [x] R3 Test reports (analytical data sheets) for each environmental sample that includes:
  - (a) Items specified in NELAC Chapter 5 for reporting results, e.g., Section 5.5.10 in 2003 NELAC Standard
  - (b) Dilution factors
  - (c) Preparation methods
  - (d) Cleanup methods
  - (e) If required for the project, tentatively identified compounds (TICs)
- [NA] R4 Surrogate recovery data including:
  - (a) Calculated recovery (%R)
  - (b) The laboratory's surrogate QC limits
- [x] R5 Test reports/summary forms for blank samples
- [x] R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  - (a) LCS spiking amounts
  - (b) Calculated %R for each analyte
  - (c) The laboratory's LCS QC limits
- [x] R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  - (a) Samples associated with the MS/MSD clearly identified
  - (b) MS/MSD spiking amounts
  - (c) Concentration of each MS/MSD analyte measured in the parent and spiked samples
  - (d) Calculated %Rs and relative percent differences (RPDs)
  - (e) The laboratory's MS/MSD QC limits
- [x] R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  - (a) The amount of analyte measured in the duplicate
  - (b) The calculated RPD
  - (c) The laboratory's QC limits for analytical duplicates
- [x] R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix
- [x] R10 Other problems or anomalies
- [x] The Exception Report for every item for which the result is "No" or "NR" (Not Reviewed)

Release Statement: I am responsible for the release of this laboratory data package. This data package as been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Check, if applicable: (●) This laboratory is an in-house laboratory controlled by the person responding to rule. The official signing the cover page of the rule-required report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Jonathan Barnhill		Lab Supervisor	3/28/2023
Name (printed)	Signature	Official Title	Date

ICP-MS Laboratory Review Checklist

Table 1. Reportable Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey

Reviewer Name: Jonathan Barnhill

LRC Date: 3/28/2023

Laboratory Job Number: 230698

Prep Batch Number(s): PB23030703 PB23030710 PB23031501 QC2303103 QC2303137

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
R1	O, I	**Chain-of-custody (COC)**		
	I	Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	Yes	
	I	Were all departures from standard conditions described in an exception report?	Yes	
R2	O, I	**Sample and quality control (QC) identification**		
	I	Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	Yes	
	I	Are all laboratory ID numbers cross-referenced to the corresponding QC data?	Yes	
R3	O, I	**Test reports**		
	I	Were all samples prepared and analyzed within holding times?	Yes	
	I	Other than those results < MQL, were all other raw values bracketed by calibration standards?	No	ER1
	I	Were calculations checked by a peer or supervisor?	Yes	
	I	Were all analyte identifications checked by a peer or supervisor?	Yes	
	I	Were sample quantitation limits reported for all analytes not detected?	Yes	
	I	Were all results for soil and sediment samples reported on a dry weight basis?	NA	
	I	Was % moisture (or solids) reported for all soil and sediment samples?	NA	
	I	If required for the project, TICs reported?	NA	
R4	O	**Surrogate recovery data**		
	I	Were surrogates added prior to extraction?	NA	
	I	Were surrogate percent recoveries in all samples within the laboratory QC limits?	NA	
R5	O, I	**Test reports/summary forms for blank samples**		
	I	Were appropriate type(s) of blanks analyzed?	Yes	
	I	Were blanks analyzed at the appropriate frequency?	Yes	

ICP-MS Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
	I	Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	Yes	
	I	Were blank concentrations < MQL?	Yes	
R6	O, I	**Laboratory control samples (LCS):**		
	I	Were all COCs included in the LCS?	Yes	
	I	Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	Yes	
	I	Were LCSs analyzed at the required frequency?	Yes	
	I	Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	Yes	
	I	Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	Yes	
	I	Was the LCSD RPD within QC limits?	Yes	
R7	O, I	**Matrix spike (MS) and matrix spike duplicate (MSD) data**		
	I	Were the project/method specified analytes included in the MS and MSD?	Yes	
	I	Were MS/MSD analyzed at the appropriate frequency?	Yes	
	I	Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	No	ER3
	I	Were MS/MSD RPDs within laboratory QC limits?	Yes	
R8	O, I	**Analytical duplicate data**		
	I	Were appropriate analytical duplicates analyzed for each matrix?	Yes	
	I	Were analytical duplicates analyzed at the appropriate frequency?	Yes	
	I	Were RPDs or relative standard deviations within the laboratory QC limits?	Yes	
R9	O, I	**Method quantitation limits (MQLs):**		
	I	Are the MQLs for each method analyte included in the laboratory data package?	Yes	
	I	Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	Yes	
	I	Are unadjusted MQLs included in the laboratory data package?	Yes	
R10	O, I	**Other problems/anomalies**		
	I	Are all known problems/anomalies/special conditions noted in this LRC and ER?	Yes	
	I	Were all necessary corrective actions performed for the reported data?	Yes	
	I	Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	Yes	

ICP-MS Laboratory Review Checklist

Table 2. Supporting Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey

Reviewer Name: Jonathan Barnhill

LRC Date: 3/28/2023

Laboratory Job Number: 230698

Prep Batch Number(s): PB23030703 PB23030710 PB23031501 QC2303103 QC2303137

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S1	O, I	**Initial calibration (ICAL)**		
	I	Were response factors and/or relative response factors for each analyte within QC limits?	NA	
	I	Were percent RSDs or correlation coefficient criteria met?	Yes	
	I	Was the number of standards recommended in the method used for all analytes?	Yes	
	I	Were all points generated between the lowest and highest standard used to calculate the curve?	Yes	
	I	Are ICAL data available for all instruments used?	Yes	
	I	Has the initial calibration curve been verified using an appropriate second source standard?	Yes	
S2	O, I	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB):**		
	I	Was the CCV analyzed at the method-required frequency?	Yes	
	I	Were percent differences for each analyte within the method-required QC limits?	Yes	
	I	Was the ICAL curve verified for each analyte?	Yes	
	I	Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	No	ER2
S3	O	**Mass spectral tuning:**		
	I	Was the appropriate compound for the method used for tuning?	Yes	
	I	Were ion abundance data within the method-required QC limits?	Yes	
S4	O	**Internal standards (IS):**		
	I	Were IS area counts and retention times within the method-required QC limits?	Yes	
S5	O, I	**Raw data (NELAC section 1 appendix A glossary, and section 5.)**		
	I	Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	Yes	
	I	Were data associated with manual integrations flagged on the raw data?	NA	

ICP-MS Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S6	O	**Dual column confirmation**		
	I	Did dual column confirmation results meet the method-required QC?	NA	
S7	O	**Tentatively identified compounds (TICs):**		
	I	If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?	NA	
S8	I	**Interference Check Sample (ICS) results:**		
	I	Were percent recoveries within method QC limits?	NA	
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**		
	I	Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	NA	
S10	O, I	**Method detection limit (MDL) studies**		
	I	Was a MDL study performed for each reported analyte?	Yes	
	I	Is the MDL either adjusted or supported by the analysis of DCSs?	Yes	
S11	O, I	**Proficiency test reports:**		
	I	Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	Yes	
S12	O, I	**Standards documentation**		
	I	Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	Yes	
S13	O, I	**Compound/analyte identification procedures**		
	I	Are the procedures for compound/analyte identification documented?	Yes	
S14	O, I	**Demonstration of analyst competency (DOC)**		
	I	Was DOC conducted consistent with NELAC Chapter 5C?	Yes	
	I	Is documentation of the analyst's competency up-to-date and on file?	Yes	
S15	O, I	**Verification/validation documentation for methods (NELAC Chap 5n 5)**		
	I	Are all the methods used to generate the data documented, verified, and validated, where applicable?	Yes	
S16	O, I	**Laboratory standard operating procedures (SOPs):**		
	I	Are laboratory SOPs current and on file for each method performed?	Yes	

Table 3. Exception Reports.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey

Reviewer Name: Jonathan Barnhill

LRC Date: 3/28/2023

Laboratory Job Number: 230698

Prep Batch Number(s): PB23030703 PB23030710 PB23031501 QC2303103 QC2303137

Exception Report No.	Description
ER1	Linear Dynamic Range (LDR) study used to determine upper limit of analyte calibration.
ER2	CCB acceptance criteria is CCB<2.2*MDL.
ER3	Matrix Spike Failed for Na on sample 230698-001

[1] Items identified by the letter "R" must be available as a hard copy or as a .pdf file. Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.

[2] O - organic analyses; I - inorganic analyses (including general chemistry constituents, when applicable).

[3] NA - Not applicable; NR - Not reviewed.

[4] Exception Report identification number; an Exception Report should be completed for an item if the result is "No" or "NR."

Municipal Solid Waste Laboratory Review Checklist

This data package consists of:

- [x] This signature page, and the laboratory review checklist consisting of Table 1, Reportable Data (which includes the reportable data identified on this page), Table 2, Supporting Data, and Table 3, Exception Reports.
- [x] R1 Field chain-of-custody documentation
- [x] R2 Sample identification cross-reference
- [x] R3 Test reports (analytical data sheets) for each environmental sample that includes:
  - (a) Items specified in NELAC Chapter 5 for reporting results, e.g., Section 5.5.10 in 2003 NELAC Standard
  - (b) Dilution factors
  - (c) Preparation methods
  - (d) Cleanup methods
  - (e) If required for the project, tentatively identified compounds (TICs)
- [NA] R4 Surrogate recovery data including:
  - (a) Calculated recovery (%R)
  - (b) The laboratory's surrogate QC limits
- [x] R5 Test reports/summary forms for blank samples
- [x] R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  - (a) LCS spiking amounts
  - (b) Calculated %R for each analyte
  - (c) The laboratory's LCS QC limits
- [x] R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  - (a) Samples associated with the MS/MSD clearly identified
  - (b) MS/MSD spiking amounts
  - (c) Concentration of each MS/MSD analyte measured in the parent and spiked samples
  - (d) Calculated %Rs and relative percent differences (RPDs)
  - (e) The laboratory's MS/MSD QC limits
- [x] R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  - (a) The amount of analyte measured in the duplicate
  - (b) The calculated RPD
  - (c) The laboratory's QC limits for analytical duplicates
- [x] R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix
- [x] R10 Other problems or anomalies
- [x] The Exception Report for every item for which the result is "No" or "NR" (Not Reviewed)

Release Statement: I am responsible for the release of this laboratory data package. This data package as been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Check, if applicable: (●) This laboratory is an in-house laboratory controlled by the person responding to rule. The official signing the cover page of the rule-required report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Sunita Timsina	Timsina	Chemist Associate	03/21/2023
Name (printed)	Signature	Official Title	Date

Radium Laboratory Review Checklist

Table 1. Reportable Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey Power Station

Reviewer Name: Sunita Timsina

LRC Date: 03/21/2023

Laboratory Job Number: 230698

Prep Batch Number(s): PB23030704, PB23030705

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
R1	O, I	**Chain-of-custody (COC)**		
	I	Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	Yes	
	I	Were all departures from standard conditions described in an exception report?	Yes	
R2	O, I	**Sample and quality control (QC) identification**		
	I	Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	Yes	
	I	Are all laboratory ID numbers cross-referenced to the corresponding QC data?	Yes	
R3	O, I	**Test reports**		
	I	Were all samples prepared and analyzed within holding times?	Yes	
	I	Other than those results < MQL, were all other raw values bracketed by calibration standards?	NA	
	I	Were calculations checked by a peer or supervisor?	Yes	
	I	Were all analyte identifications checked by a peer or supervisor?	Yes	
	I	Were sample quantitation limits reported for all analytes not detected?	Yes	
	I	Were all results for soil and sediment samples reported on a dry weight basis?	NA	
	I	Was % moisture (or solids) reported for all soil and sediment samples?	NA	
	I	If required for the project, TICs reported?	NA	
R4	O	**Surrogate recovery data**		
	I	Were surrogates added prior to extraction?	NA	
	I	Were surrogate percent recoveries in all samples within the laboratory QC limits?	NA	
R5	O, I	**Test reports/summary forms for blank samples**		
	I	Were appropriate type(s) of blanks analyzed?	Yes	
	I	Were blanks analyzed at the appropriate frequency?	Yes	

Radium Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
	I	Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	Yes	
	I	Were blank concentrations < MQL?	Yes	
R6	O, I	**Laboratory control samples (LCS):**		
	I	Were all COCs included in the LCS?	Yes	
	I	Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	Yes	
	I	Were LCSs analyzed at the required frequency?	Yes	
	I	Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	Yes	
	I	Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	Yes	
	I	Was the LCSD RPD within QC limits?	Yes	
R7	O, I	**Matrix spike (MS) and matrix spike duplicate (MSD) data**		
	I	Were the project/method specified analytes included in the MS and MSD?	Yes	
	I	Were MS/MSD analyzed at the appropriate frequency?	Yes	
	I	Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	NA	
	I	Were MS/MSD RPDs within laboratory QC limits?	NA	
R8	O, I	**Analytical duplicate data**		
	I	Were appropriate analytical duplicates analyzed for each matrix?	Yes	
	I	Were analytical duplicates analyzed at the appropriate frequency?	Yes	
	I	Were RPDs or relative standard deviations within the laboratory QC limits?	NO	ER1
R9	O, I	**Method quantitation limits (MQLs):**		
	I	Are the MQLs for each method analyte included in the laboratory data package?	Yes	
	I	Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	Yes	
	I	Are unadjusted MQLs included in the laboratory data package?	Yes	
R10	O, I	**Other problems/anomalies**		
	I	Are all known problems/anomalies/special conditions noted in this LRC and ER?	Yes	
	I	Were all necessary corrective actions performed for the reported data?	Yes	
	I	Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	Yes	

Table 2. Supporting Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey Power Station

Reviewer Name: Sunita Timsina

LRC Date: 03/21/2023

Laboratory Job Number: 230698

Prep Batch Number(s): PB23030704, PB23030705

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S1	O, I	**Initial calibration (ICAL)**		
	I	Were response factors and/or relative response factors for each analyte within QC limits?	NA	
	I	Were percent RSDs or correlation coefficient criteria met?	Yes	
	I	Was the number of standards recommended in the method used for all analytes?	Yes	
	I	Were all points generated between the lowest and highest standard used to calculate the curve?	NA	
	I	Are ICAL data available for all instruments used?	Yes	
	I	Has the initial calibration curve been verified using an appropriate second source standard?	Yes	
S2	O, I	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB):**		
	I	Was the CCV analyzed at the method-required frequency?	NA	
	I	Were percent differences for each analyte within the method-required QC limits?	NA	
	I	Was the ICAL curve verified for each analyte?	NA	
	I	Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	NA	
S3	O	**Mass spectral tuning:**		
	I	Was the appropriate compound for the method used for tuning?	NA	
	I	Were ion abundance data within the method-required QC limits?	NA	
S4	O	**Internal standards (IS):**		
	I	Were IS area counts and retention times within the method-required QC limits?	NA	
S5	O, I	**Raw data (NELAC section 1 appendix A glossary, and section 5.)**		
	I	Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	Yes	
	I	Were data associated with manual integrations flagged on the raw data?	NA	

Radium Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S6	O	**Dual column confirmation**		
	I	Did dual column confirmation results meet the method-required QC?	NA	
S7	O	**Tentatively identified compounds (TICs):**		
	I	If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?	NA	
S8	I	**Interference Check Sample (ICS) results:**		
	I	Were percent recoveries within method QC limits?	NA	
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**		
	I	Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	NA	
S10	O, I	**Method detection limit (MDL) studies**		
	I	Was a MDL study performed for each reported analyte?	NA	
	I	Is the MDL either adjusted or supported by the analysis of DCSs?	NA	
S11	O, I	**Proficiency test reports:**		
	I	Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	Yes	
S12	O, I	**Standards documentation**		
	I	Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	Yes	
S13	O, I	**Compound/analyte identification procedures**		
	I	Are the procedures for compound/analyte identification documented?	Yes	
S14	O, I	**Demonstration of analyst competency (DOC)**		
	I	Was DOC conducted consistent with NELAC Chapter 5C?	Yes	
	I	Is documentation of the analyst's competency up-to-date and on file?	Yes	
S15	O, I	**Verification/validation documentation for methods (NELAC Chap 5n 5)**		
	I	Are all the methods used to generate the data documented, verified, and validated, where applicable?	Yes	
S16	O, I	**Laboratory standard operating procedures (SOPs):**		
	I	Are laboratory SOPs current and on file for each method performed?	Yes	

Radium Laboratory Review Checklist

Table 3. Exception Reports.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey Power Station

Reviewer Name: Sunita Timsina

LRC Date: 03/21/2023

Laboratory Job Number: 230698

Prep Batch Number(s): PB23030704, PB23030705

Exception Report No.	Description
ER1	For PB23030705, RPD between the sample and duplicate sample has exceeds the laboratory QC Limit.

[1] Items identified by the letter "R" must be available as a hard copy or as a .pdf file. Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.

[2] O - organic analyses; I - inorganic analyses (including general chemistry constituents, when applicable).

[3] NA - Not applicable; NR - Not reviewed.

[4] Exception Report identification number; an Exception Report should be completed for an item if the result is "No" or "NR."

Municipal Solid Waste Laboratory Review Checklist

This data package consists of:

- [x] This signature page, and the laboratory review checklist consisting of Table 1, Reportable Data (which includes the reportable data identified on this page), Table 2, Supporting Data, and Table 3, Exception Reports.
- [x] R1 Field chain-of-custody documentation
- [x] R2 Sample identification cross-reference
- [x] R3 Test reports (analytical data sheets) for each environmental sample that includes:
  - (a) Items specified in NELAC Chapter 5 for reporting results, e.g., Section 5.5.10 in 2003 NELAC Standard
  - (b) Dilution factors
  - (c) Preparation methods
  - (d) Cleanup methods
  - (e) If required for the project, tentatively identified compounds (TICs)
- [NA] R4 Surrogate recovery data including:
  - (a) Calculated recovery (%R)
  - (b) The laboratory's surrogate QC limits
- [x] R5 Test reports/summary forms for blank samples
- [x] R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  - (a) LCS spiking amounts
  - (b) Calculated %R for each analyte
  - (c) The laboratory's LCS QC limits
- [x] R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  - (a) Samples associated with the MS/MSD clearly identified
  - (b) MS/MSD spiking amounts
  - (c) Concentration of each MS/MSD analyte measured in the parent and spiked samples
  - (d) Calculated %Rs and relative percent differences (RPDs)
  - (e) The laboratory's MS/MSD QC limits
- [x] R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  - (a) The amount of analyte measured in the duplicate
  - (b) The calculated RPD
  - (c) The laboratory's QC limits for analytical duplicates
- [x] R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix
- [x] R10 Other problems or anomalies
- [x] The Exception Report for every item for which the result is "No" or "NR" (Not Reviewed)

Release Statement: I am responsible for the release of this laboratory data package. This data package as been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Check, if applicable: (●) This laboratory is an in-house laboratory controlled by the person responding to rule. The official signing the cover page of the rule-required report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Sunita Timsina	Sunita Timsina	Chemist Associate	04/10/2023
Name (printed)	Signature	Official Title	Date

Radium Laboratory Review Checklist

Table 1. Reportable Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey Power Station

Reviewer Name: Sunita Timsina

LRC Date: 04/10/2023

Laboratory Job Number: 230698

Prep Batch Number(s): PB23030706, PB23031302

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
R1	O, I	**Chain-of-custody (COC)**		
	I	Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	Yes	
	I	Were all departures from standard conditions described in an exception report?	Yes	
R2	O, I	**Sample and quality control (QC) identification**		
	I	Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	Yes	
	I	Are all laboratory ID numbers cross-referenced to the corresponding QC data?	Yes	
R3	O, I	**Test reports**		
	I	Were all samples prepared and analyzed within holding times?	Yes	
	I	Other than those results < MQL, were all other raw values bracketed by calibration standards?	NA	
	I	Were calculations checked by a peer or supervisor?	Yes	
	I	Were all analyte identifications checked by a peer or supervisor?	Yes	
	I	Were sample quantitation limits reported for all analytes not detected?	Yes	
	I	Were all results for soil and sediment samples reported on a dry weight basis?	NA	
	I	Was % moisture (or solids) reported for all soil and sediment samples?	NA	
	I	If required for the project, TICs reported?	NA	
R4	O	**Surrogate recovery data**		
	I	Were surrogates added prior to extraction?	NA	
	I	Were surrogate percent recoveries in all samples within the laboratory QC limits?	NA	
R5	O, I	**Test reports/summary forms for blank samples**		
	I	Were appropriate type(s) of blanks analyzed?	Yes	
	I	Were blanks analyzed at the appropriate frequency?	Yes	

Radium Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
	I	Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	Yes	
	I	Were blank concentrations < MQL?	Yes	
R6	O, I	**Laboratory control samples (LCS):**		
	I	Were all COCs included in the LCS?	Yes	
	I	Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	Yes	
	I	Were LCSs analyzed at the required frequency?	Yes	
	I	Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?		
	I	Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	Yes	
	I	Was the LCSD RPD within QC limits?	Yes	
R7	O, I	**Matrix spike (MS) and matrix spike duplicate (MSD) data**		
	I	Were the project/method specified analytes included in the MS and MSD?	Yes	
	I	Were MS/MSD analyzed at the appropriate frequency?	Yes	
	I	Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	Yes	
	I	Were MS/MSD RPDs within laboratory QC limits?	No	ER1
R8	O, I	**Analytical duplicate data**		
	I	Were appropriate analytical duplicates analyzed for each matrix?	Yes	
	I	Were analytical duplicates analyzed at the appropriate frequency?	Yes	
	I	Were RPDs or relative standard deviations within the laboratory QC limits?	N/A	
R9	O, I	**Method quantitation limits (MQLs):**		
	I	Are the MQLs for each method analyte included in the laboratory data package?	Yes	
	I	Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	Yes	
	I	Are unadjusted MQLs included in the laboratory data package?	Yes	
R10	O, I	**Other problems/anomalies**		
	I	Are all known problems/anomalies/special conditions noted in this LRC and ER?	Yes	
	I	Were all necessary corrective actions performed for the reported data?	Yes	
	I	Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	Yes	

Radium Laboratory Review Checklist

Table 2. Supporting Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey Power Station

Reviewer Name: Sunita Timsina

LRC Date: 04/10/2023

Laboratory Job Number: 230698

Prep Batch Number(s): PB23030706, PB23031302

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S1	O, I	**Initial calibration (ICAL)**		
	I	Were response factors and/or relative response factors for each analyte within QC limits?	NA	
	I	Were percent RSDs or correlation coefficient criteria met?	Yes	
	I	Was the number of standards recommended in the method used for all analytes?	Yes	
	I	Were all points generated between the lowest and highest standard used to calculate the curve?	NA	
	I	Are ICAL data available for all instruments used?	Yes	
	I	Has the initial calibration curve been verified using an appropriate second source standard?	Yes	
S2	O, I	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB):**		
	I	Was the CCV analyzed at the method-required frequency?	NA	
	I	Were percent differences for each analyte within the method-required QC limits?	NA	
	I	Was the ICAL curve verified for each analyte?	NA	
	I	Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	NA	
S3	O	**Mass spectral tuning:**		
	I	Was the appropriate compound for the method used for tuning?	NA	
	I	Were ion abundance data within the method-required QC limits?	NA	
S4	O	**Internal standards (IS):**		
	I	Were IS area counts and retention times within the method-required QC limits?	NA	
S5	O, I	**Raw data (NELAC section 1 appendix A glossary, and section 5.)**		
	I	Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	Yes	
	I	Were data associated with manual integrations flagged on the raw data?	NA	

Radium Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S6	O	**Dual column confirmation**		
	I	Did dual column confirmation results meet the method-required QC?	NA	
S7	O	**Tentatively identified compounds (TICs):**		
	I	If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?	NA	
S8	I	**Interference Check Sample (ICS) results:**		
	I	Were percent recoveries within method QC limits?	NA	
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**		
	I	Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	NA	
S10	O, I	**Method detection limit (MDL) studies**		
	I	Was a MDL study performed for each reported analyte?	NA	
	I	Is the MDL either adjusted or supported by the analysis of DCSs?	NA	
S11	O, I	**Proficiency test reports:**		
	I	Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	Yes	
S12	O, I	**Standards documentation**		
	I	Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	Yes	
S13	O, I	**Compound/analyte identification procedures**		
	I	Are the procedures for compound/analyte identification documented?	Yes	
S14	O, I	**Demonstration of analyst competency (DOC)**		
	I	Was DOC conducted consistent with NELAC Chapter 5C?	Yes	
	I	Is documentation of the analyst's competency up-to-date and on file?	Yes	
S15	O, I	**Verification/validation documentation for methods (NELAC Chap 5n 5)**		
	I	Are all the methods used to generate the data documented, verified, and validated, where applicable?	Yes	
S16	O, I	**Laboratory standard operating procedures (SOPs):**		
	I	Are laboratory SOPs current and on file for each method performed?	Yes	

Table 3. Exception Reports.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey Power Station

Reviewer Name: Sunita Timsina

LRC Date: 04/10/2023

Laboratory Job Number: 230698

Prep Batch Number(s): PB23030706, PB23031302

Exception Report No.	Description
ER1	PB23031302, RPD for MS and MSD has exceeded the laboratory QC Limits.

[1] Items identified by the letter "R" must be available as a hard copy or as a .pdf file. Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
[2] O - organic analyses; I - inorganic analyses (including general chemistry constituents, when applicable).
[3] NA - Not applicable; NR - Not reviewed.
[4] Exception Report identification number; an Exception Report should be completed for an item if the result is "No" or "NR."

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 231960 **Customer: Pirkey Power Station** **Date Reported: 08/01/2023**

Customer Sample ID: AD-2
Customer Description: TG-32
Lab Number: 231960-001
Preparation:
Date Collected: 06/26/2023 11:42 EDT
Date Received: 06/29/2023 10:45 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.35	mg/L	2	0.10	0.02		CRJ	07/12/2023 11:48	EPA 300.1 -1997, Rev. 1.0
Chloride	30.8	mg/L	2	0.04	0.01		CRJ	07/12/2023 11:48	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.19	mg/L	2	0.06	0.02		CRJ	07/12/2023 11:48	EPA 300.1 -1997, Rev. 1.0
Sulfate	271	mg/L	10	3.0	0.6		CRJ	07/12/2023 11:16	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	06/29/2023 14:54	SM 2320B-2011
TDS, Filterable Residue	530	mg/L	1	50	20		JAB	06/30/2023 10:53	SM 2540C-2015

Customer Sample ID: AD-3
Customer Description: TG-32
Lab Number: 231960-002
Preparation:
Date Collected: 06/27/2023 12:01 EDT
Date Received: 06/29/2023 10:45 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.06	mg/L	2	0.10	0.02	J1	CRJ	07/12/2023 14:33	EPA 300.1 -1997, Rev. 1.0
Chloride	5.67	mg/L	2	0.04	0.01		CRJ	07/12/2023 14:33	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.03	mg/L	2	0.06	0.02	J1	CRJ	07/12/2023 14:33	EPA 300.1 -1997, Rev. 1.0
Sulfate	22.4	mg/L	2	0.6	0.1		CRJ	07/12/2023 14:33	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	06/29/2023 14:54	SM 2320B-2011
TDS, Filterable Residue	150	mg/L	1	50	20		JAB	06/30/2023 10:56	SM 2540C-2015

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 231960 **Customer: Pirkey Power Station** **Date Reported: 08/01/2023**

Customer Sample ID: AD-4 Customer Description: TG-32
Lab Number: 231960-003 Preparation:
Date Collected: 06/27/2023 12:10 EDT Date Received: 06/29/2023 10:45 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.30	mg/L	2	0.10	0.02		CRJ	07/12/2023 15:06	EPA 300.1 -1997, Rev. 1.0
Chloride	3.97	mg/L	2	0.04	0.01		CRJ	07/12/2023 15:06	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.02	mg/L	2	0.06	0.02	J1	CRJ	07/12/2023 15:06	EPA 300.1 -1997, Rev. 1.0
Sulfate	18.9	mg/L	2	0.6	0.1		CRJ	07/12/2023 15:06	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	06/29/2023 14:54	SM 2320B-2011
TDS, Filterable Residue	150	mg/L	1	50	20		JAB	06/30/2023 11:02	SM 2540C-2015

Customer Sample ID: AD-7 Customer Description: TG-32
Lab Number: 231960-004 Preparation:
Date Collected: 06/27/2023 10:51 EDT Date Received: 06/29/2023 10:45 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	2.85	mg/L	2	0.10	0.02		CRJ	07/12/2023 19:29	EPA 300.1 -1997, Rev. 1.0
Chloride	31.2	mg/L	2	0.04	0.01		CRJ	07/12/2023 19:29	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.40	mg/L	2	0.06	0.02		CRJ	07/12/2023 19:29	EPA 300.1 -1997, Rev. 1.0
Sulfate	74.6	mg/L	2	0.6	0.1		CRJ	07/12/2023 19:29	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	06/29/2023 14:54	SM 2320B-2011
TDS, Filterable Residue	290	mg/L	1	50	20		JAB	06/30/2023 11:01	SM 2540C-2015

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Job ID: 231960 **Customer: Pirkey Power Station** **Date Reported: 08/01/2023**

Customer Sample ID: AD-12
Customer Description: TG-32
Lab Number: 231960-005
Preparation:
Date Collected: 06/26/2023 08:55 EDT
Date Received: 06/29/2023 10:45 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.05	mg/L	2	0.10	0.02	J1	CRJ	07/12/2023 18:23	EPA 300.1 -1997, Rev. 1.0
Chloride	4.68	mg/L	2	0.04	0.01		CRJ	07/12/2023 18:23	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.06	mg/L	2	0.06	0.02		CRJ	07/12/2023 18:23	EPA 300.1 -1997, Rev. 1.0
Sulfate	2.9	mg/L	2	0.6	0.1		CRJ	07/12/2023 18:23	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	06/29/2023 14:54	SM 2320B-2011
TDS, Filterable Residue	80	mg/L	1	50	20		JAB	06/30/2023 11:07	SM 2540C-2015

Customer Sample ID: AD-13
Customer Description: TG-32
Lab Number: 231960-006
Preparation:
Date Collected: 06/26/2023 08:28 EDT
Date Received: 06/29/2023 10:45 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.25	mg/L	2	0.10	0.02		CRJ	07/12/2023 21:41	EPA 300.1 -1997, Rev. 1.0
Chloride	48.7	mg/L	10	0.20	0.05		CRJ	07/12/2023 21:08	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.23	mg/L	2	0.06	0.02		CRJ	07/12/2023 21:41	EPA 300.1 -1997, Rev. 1.0
Sulfate	112	mg/L	10	3.0	0.6		CRJ	07/12/2023 21:08	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	06/29/2023 14:54	SM 2320B-2011
TDS, Filterable Residue	280	mg/L	1	50	20		JAB	06/30/2023 11:09	SM 2540C-2015

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Job ID: 231960 **Customer: Pirkey Power Station** **Date Reported: 08/01/2023**

Customer Sample ID: AD-17
Customer Description: TG-32
Lab Number: 231960-007
Preparation:
Date Collected: 06/26/2023 12:47 EDT
Date Received: 06/29/2023 10:45 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.16	mg/L	2	0.10	0.02		CRJ	07/12/2023 20:35	EPA 300.1 -1997, Rev. 1.0
Chloride	15.4	mg/L	2	0.04	0.01		CRJ	07/12/2023 20:35	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.19	mg/L	2	0.06	0.02		CRJ	07/12/2023 20:35	EPA 300.1 -1997, Rev. 1.0
Sulfate	2.4	mg/L	2	0.6	0.1		CRJ	07/12/2023 20:35	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	06/29/2023 14:54	SM 2320B-2011
TDS, Filterable Residue	60	mg/L	1	50	20		JAB	06/30/2023 11:14	SM 2540C-2015

Customer Sample ID: AD-18
Customer Description: TG-32
Lab Number: 231960-008
Preparation:
Date Collected: 06/27/2023 08:42 EDT
Date Received: 06/29/2023 10:45 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.04	mg/L	2	0.10	0.02	J1	CRJ	07/12/2023 22:47	EPA 300.1 -1997, Rev. 1.0
Chloride	5.28	mg/L	2	0.04	0.01		CRJ	07/12/2023 22:47	EPA 300.1 -1997, Rev. 1.0
Fluoride	<0.02	mg/L	2	0.06	0.02	U1	CRJ	07/12/2023 22:47	EPA 300.1 -1997, Rev. 1.0
Sulfate	8.2	mg/L	2	0.6	0.1		CRJ	07/12/2023 22:47	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	06/29/2023 14:54	SM 2320B-2011
TDS, Filterable Residue	110	mg/L	1	50	20		JAB	06/30/2023 11:16	SM 2540C-2015

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 231960 **Customer: Pirkey Power Station** **Date Reported: 08/01/2023**

Customer Sample ID: AD-22 Customer Description: TG-32
Lab Number: 231960-009 Preparation:
Date Collected: 06/26/2023 09:43 EDT Date Received: 06/29/2023 10:45 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.48	mg/L	2	0.10	0.02		CRJ	07/13/2023 03:10	EPA 300.1 -1997, Rev. 1.0
Chloride	93.9	mg/L	25	0.5	0.1		CRJ	07/13/2023 02:37	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.63	mg/L	2	0.06	0.02		CRJ	07/13/2023 03:10	EPA 300.1 -1997, Rev. 1.0
Sulfate	350	mg/L	25	8	2		CRJ	07/13/2023 02:37	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	06/29/2023 14:54	SM 2320B-2011
TDS, Filterable Residue	680	mg/L	1	50	20		JAB	06/30/2023 11:23	SM 2540C-2015

Customer Sample ID: AD-28 Customer Description: TG-32
Lab Number: 231960-010 Preparation:
Date Collected: 06/26/2023 12:26 EDT Date Received: 06/29/2023 10:45 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.06	mg/L	2	0.10	0.02	J1	CRJ	07/12/2023 23:20	EPA 300.1 -1997, Rev. 1.0
Chloride	4.14	mg/L	2	0.04	0.01		CRJ	07/12/2023 23:20	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.54	mg/L	2	0.06	0.02		CRJ	07/12/2023 23:20	EPA 300.1 -1997, Rev. 1.0
Sulfate	25.9	mg/L	2	0.6	0.1		CRJ	07/12/2023 23:20	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	06/29/2023 14:54	SM 2320B-2011
TDS, Filterable Residue	120	mg/L	1	50	20		JAB	06/30/2023 11:24	SM 2540C-2015

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Job ID: 231960 **Customer: Pirkey Power Station** **Date Reported: 08/01/2023**

Customer Sample ID: AD-30
Customer Description: TG-32
Lab Number: 231960-011
Preparation:
Date Collected: 06/26/2023 12:03 EDT
Date Received: 06/29/2023 10:45 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.20	mg/L	2	0.10	0.02		CRJ	07/13/2023 05:22	EPA 300.1 -1997, Rev. 1.0
Chloride	18.2	mg/L	2	0.04	0.01		CRJ	07/13/2023 05:22	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.04	mg/L	2	0.06	0.02	J1	CRJ	07/13/2023 05:22	EPA 300.1 -1997, Rev. 1.0
Sulfate	147	mg/L	10	3.0	0.6		CRJ	07/13/2023 04:49	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	06/29/2023 14:54	SM 2320B-2011
TDS, Filterable Residue	300	mg/L	1	50	20		JAB	06/30/2023 11:31	SM 2540C-2015

Customer Sample ID: AD-31
Customer Description: TG-32
Lab Number: 231960-012
Preparation:
Date Collected: 06/26/2023 11:01 EDT
Date Received: 06/29/2023 10:45 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.26	mg/L	2	0.10	0.02		CRJ	07/13/2023 04:16	EPA 300.1 -1997, Rev. 1.0
Chloride	21.2	mg/L	2	0.04	0.01		CRJ	07/13/2023 04:16	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.1	mg/L	2	0.06	0.02		CRJ	07/13/2023 04:16	EPA 300.1 -1997, Rev. 1.0
Sulfate	82.1	mg/L	2	0.6	0.1		CRJ	07/13/2023 04:16	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	06/29/2023 14:54	SM 2320B-2011
TDS, Filterable Residue	280	mg/L	1	50	20		JAB	06/30/2023 11:32	SM 2540C-2015

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Job ID: 231960 **Customer: Pirkey Power Station** **Date Reported: 08/01/2023**

Customer Sample ID: AD-32
Customer Description: TG-32
Lab Number: 231960-013
Preparation:
Date Collected: 06/26/2023 09:30 EDT
Date Received: 06/29/2023 10:45 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	1.17	mg/L	2	0.10	0.02		CRJ	07/13/2023 07:01	EPA 300.1 -1997, Rev. 1.0
Chloride	14.5	mg/L	2	0.04	0.01		CRJ	07/13/2023 07:01	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.13	mg/L	2	0.06	0.02		CRJ	07/13/2023 07:01	EPA 300.1 -1997, Rev. 1.0
Sulfate	119	mg/L	25	8	2		CRJ	07/13/2023 06:28	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	06/29/2023 14:54	SM 2320B-2011
TDS, Filterable Residue	260	mg/L	1	50	20		JAB	06/30/2023 11:37	SM 2540C-2015

Customer Sample ID: AD-33
Customer Description: TG-32
Lab Number: 231960-014
Preparation:
Date Collected: 06/26/2023 11:34 EDT
Date Received: 06/29/2023 10:45 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.28	mg/L	2	0.10	0.02		CRJ	07/13/2023 08:07	EPA 300.1 -1997, Rev. 1.0
Chloride	9.50	mg/L	2	0.04	0.01		CRJ	07/13/2023 08:07	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.21	mg/L	2	0.06	0.02		CRJ	07/13/2023 08:07	EPA 300.1 -1997, Rev. 1.0
Sulfate	58.4	mg/L	2	0.6	0.1		CRJ	07/13/2023 08:07	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	06/29/2023 14:54	SM 2320B-2011
TDS, Filterable Residue	200	mg/L	1	50	20		JAB	06/30/2023 11:38	SM 2540C-2015

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Job ID: 231960 **Customer: Pirkey Power Station** **Date Reported: 08/01/2023**

Customer Sample ID: Duplicate - 1
Customer Description: TG-32
Lab Number: 231960-015
Preparation:
Date Collected: 06/26/2023 13:00 EDT
Date Received: 06/29/2023 10:45 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.25	mg/L	2	0.10	0.02		CRJ	07/12/2023 12:54	EPA 300.1 -1997, Rev. 1.0
Chloride	48.3	mg/L	10	0.20	0.05		CRJ	07/12/2023 10:43	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.22	mg/L	2	0.06	0.02		CRJ	07/12/2023 12:54	EPA 300.1 -1997, Rev. 1.0
Sulfate	112	mg/L	10	3.0	0.6		CRJ	07/12/2023 10:43	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	06/29/2023 14:54	SM 2320B-2011
TDS, Filterable Residue	300	mg/L	1	50	20		JAB	06/30/2023 11:51	SM 2540C-2015

Customer Sample ID: Field Blank
Customer Description: TG-32
Lab Number: 231960-016
Preparation:
Date Collected: 06/26/2023 12:25 EDT
Date Received: 06/29/2023 10:45 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	<0.02	mg/L	2	0.10	0.02	U1	CRJ	07/12/2023 10:10	EPA 300.1 -1997, Rev. 1.0
Chloride	0.27	mg/L	2	0.04	0.01		CRJ	07/12/2023 10:10	EPA 300.1 -1997, Rev. 1.0
Fluoride	<0.02	mg/L	2	0.06	0.02	U1	CRJ	07/12/2023 10:10	EPA 300.1 -1997, Rev. 1.0
Sulfate	<0.1	mg/L	2	0.6	0.1	U1	CRJ	07/12/2023 10:10	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	06/29/2023 14:54	SM 2320B-2011
TDS, Filterable Residue	<20	mg/L	1	50	20	U1	JAB	06/30/2023 11:52	SM 2540C-2015

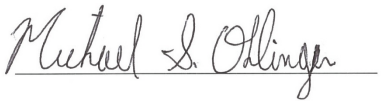
Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 231960 **Customer: Pirkey Power Station** **Date Reported: 08/01/2023**

Report Verification

This report and the above data have been confirmed by the following analyst.



Michael Ohlinger, Chemist
Email: msohlinger@aep.com
Phone: 614-836-4184
Audinet: 8-210-4184

Data Qualifer Legend

U1 - Not detected at or above method detection limit (MDL).

J1 - Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.

Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

Dolan Chemical Laboratory (DCL)
4001 Bixby Road
Groveport, Ohio 43125
Contacts: Michael Ohlinger (614-836-4184)
Dave Conover (614-836-4219)

Project Name: Pirkey PP Semi-Annual CCR
Contact Name: Leslie Fuerschbach
Contact Phone: 318-673-2744
Sampler(s): Matt Hamilton Kenny McDonald

Analysis Turnaround Time (In Calendar Days)
◉ Routine (28 days for Monitoring Wells)

Site Contact:

Date:

For Lab Use Only:
COC/Order #: 231960

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	Mercury (250 mL bottle, pH<2, HNO3)	Dissolved Mercury (Field-filter 250 mL bottle, then pH<2, HNO3)	F, Cl, SO4, Br, TDS, Alkalinity (1 L bottle, Cool, 0-6C)	Ra-226, Ra-228 (Three (six every 10th*) 1 L bottles, pH<2, HNO3)				Sample Specific Notes
AD-2	6/26/2023	1042	G	GW	1				X					
AD-3	6/27/2023	1101	G	GW	1				X					
AD-4	6/27/2023	1110	G	GW	1				X					
AD-7	6/27/2023	951	G	GW	1				X					
AD-12	6/26/2023	755	G	GW	1				X					
AD-13	6/26/2023	728	G	GW	1				X					
AD-17	6/26/2023	1147	G	GW	1				X					
AD-18	6/27/2023	742	G	GW	1				X					
AD-22	6/26/2023	843	G	GW	1				X					
AD-28	6/26/2023	1126	G	GW	1				X					
AD-30	6/26/2023	1103	G	GW	1				X					
AD-31	6/26/2023	1001	G	GW	1				X					
Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____; F= filter in field							4	F4	1	4				

* *Six 1L Bottles must be collected for Radium for every 10th sample.*

Special Instructions/QC Requirements & Comments:

TG-32 needed

Relinquished by	Company	Date/Time	Received by	Date/Time
[signature]	Eagle	6-28-23 1600		
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: [signature]	Date/Time: 6/29/23 10:45AM

Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

Dolan Chemical Laboratory (DCL)
4001 Bixby Road
Groveport, Ohio 43125
Contacts: Michael Ohlinger (614-836-4184)
Dave Conover (614-836-4219)

Project Name: Pirkey PP CCR
Contact Name: Leslie Fuerschbach
Contact Phone: 318-673-2744
Sampler(s): Matt Hamilton Kenny McDonald

Analysis Turnaround Time (in Calendar Days)
◉ Routine (28 days for Monitoring Wells)

Site Contact:

Date:

For Lab Use Only:
COC/Order #:

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	Mercury (250 mL bottle, pH<2, HNO3)	Dissolved Mercury (Field-filter 250 mL bottle, then pH<2, HNO3)	F, Cl, SO4, Br, TDS, Alkalinity (1 L bottle, Cool, 0-6C)	Ra-226, Ra-228 (Three (six every 10th*) 1 L bottles, pH<2, HNO3)				Sample Specific Notes:
AD-32	6/26/2023	830	G	GW	1				X					
AD-33	6/23/2023	934	G	GW	1				X					
Duplicate - 1	6/26/2023	1200	G	GW	1				X					
Field Blank	6/26/2023	1125	G	GW	1				X					
Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____; F= filter in field							4	F4	1	4				

* *Six 1L Bottles must be collected for Radium for every 10th sample.*

Special Instructions/QC Requirements & Comments:

TG-32 needed

Relinquished by:	Company: Eqk	Date/Time: 6-28-23 16a	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Date/Time: 6/29/23 10:45AM

AEP WATER & WASTE SAMPLE RECEIPT FORM

Package Type	Delivery Type
(Cooler) Box Bag Envelope	PONY UPS (FedEX) USPS
	Other _____

Plant/Customer Pitkey PP **Number of Plastic Containers:** 16

Opened By Misha/Michael **Number of Glass Containers:** _____

Date/Time 06/29/23 10:45AM **Number of Mercury Containers:** _____

Were all temperatures within 0-6°C? (Y) / N or N/A **Initial:** MGC (on ice) / no ice

(IR Gun Ser# 2213689000, *Expir.* 03/24/2024) - If No, specify each deviation: _____

Was container in good condition? (Y) / N Comments _____

Was Chain of Custody received? (Y) / N Comments _____

Requested turnaround: Routine If **RUSH**, who was notified? _____

pH (15 min)	Cr^{+6} (pres) (24 hr)	NO_2 or NO_3 (48 hr)	*ortho*-PO_4 (48 hr)	Hg-diss (pres) (48 hr)

Was COC filled out properly? (Y) / N Comments _____

Were samples labeled properly? (Y) / N Comments _____

Were correct containers used? (Y) / N Comments _____

Was pH checked & Color Coding done? (Y) / N or N/A **Initial & Date:** MGC 06/29/23

pH paper (circle one): MQuant,PN1.09535.0001,LOT#_____ [OR] Lab Rat,PN4801,LOT# X008RWDG21 Exp 11/15/2024

- Was Add'l Preservative needed? Y / (N) If Yes: By whom & when: _____ (See Prep Book)

Is sample filtration requested? Y / (N) Comments _____ (See Prep Book)

Was the customer contacted? If Yes: Person Contacted: _____

Lab ID# 231960 Initial & Date & Time : _____

Logged by MSO

Reviewed by JMB

Comments: AD-33 listed as taken on 6/23 @ 9:34 on COC while on bottles as 6/26 @ 9:34. Work with bottle due to all other samples being taken 6/26 & 6/27. MSO 6/29/23

REMINDER: Document the pertinent sample integrity information and deviations in sample receipt (as noted above) in the "Notes" field in the LIMS to be included on the report to the customer.

Municipal Solid Waste Laboratory Review Checklist

This data package consists of:

- [x] This signature page, and the laboratory review checklist consisting of Table 1, Reportable Data (which includes the reportable data identified on this page), Table 2, Supporting Data, and Table 3, Exception Reports.
- [x] R1 Field chain-of-custody documentation
- [x] R2 Sample identification cross-reference
- [x] R3 Test reports (analytical data sheets) for each environmental sample that includes:
  - (a) Items specified in NELAC Chapter 5 for reporting results, e.g., Section 5.5.10 in 2003 NELAC Standard
  - (b) Dilution factors
  - (c) Preparation methods
  - (d) Cleanup methods
  - (e) If required for the project, tentatively identified compounds (TICs)
- [NA] R4 Surrogate recovery data including:
  - (a) Calculated recovery (%R)
  - (b) The laboratory's surrogate QC limits
- [x] R5 Test reports/summary forms for blank samples
- [x] R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  - (a) LCS spiking amounts
  - (b) Calculated %R for each analyte
  - (c) The laboratory's LCS QC limits
- [x] R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  - (a) Samples associated with the MS/MSD clearly identified
  - (b) MS/MSD spiking amounts
  - (c) Concentration of each MS/MSD analyte measured in the parent and spiked samples
  - (d) Calculated %Rs and relative percent differences (RPDs)
  - (e) The laboratory's MS/MSD QC limits
- [x] R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  - (a) The amount of analyte measured in the duplicate
  - (b) The calculated RPD
  - (c) The laboratory's QC limits for analytical duplicates
- [x] R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix
- [x] R10 Other problems or anomalies
- [x] The Exception Report for every item for which the result is "No" or "NR" (Not Reviewed)

Release Statement: I am responsible for the release of this laboratory data package. This data package as been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Check, if applicable: (●) This laboratory is an in-house laboratory controlled by the person responding to rule. The official signing the cover page of the rule-required report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Michael Ohlinger		Chemist	8/1/2023
Name (printed)	Signature	Official Title	Date

Alkalinity Laboratory Review Checklist

Table 1. Reportable Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey PP Semi-Annual CCR

Reviewer Name: Michael Ohlinger

LRC Date: 8/1/2023

Laboratory Job Number: 231960

Prep Batch Number(s): QC2306250

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
R1	O, I	**Chain-of-custody (COC)**		
	I	Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	Yes	
	I	Were all departures from standard conditions described in an exception report?	Yes	
R2	O, I	**Sample and quality control (QC) identification**		
	I	Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	Yes	
	I	Are all laboratory ID numbers cross-referenced to the corresponding QC data?	Yes	
R3	O, I	**Test reports**		
	I	Were all samples prepared and analyzed within holding times?	Yes	
	I	Other than those results < MQL, were all other raw values bracketed by calibration standards?	NA	
	I	Were calculations checked by a peer or supervisor?	Yes	
	I	Were all analyte identifications checked by a peer or supervisor?	Yes	
	I	Were sample quantitation limits reported for all analytes not detected?	Yes	
	I	Were all results for soil and sediment samples reported on a dry weight basis?	NA	
	I	Was % moisture (or solids) reported for all soil and sediment samples?	NA	
	I	If required for the project, TICs reported?	NA	
R4	O	**Surrogate recovery data**		
	I	Were surrogates added prior to extraction?	NA	
	I	Were surrogate percent recoveries in all samples within the laboratory QC limits?	NA	
R5	O, I	**Test reports/summary forms for blank samples**		
	I	Were appropriate type(s) of blanks analyzed?	Yes	
	I	Were blanks analyzed at the appropriate frequency?	Yes	

Alkalinity Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
	I	Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	Yes	
	I	Were blank concentrations < MQL?	Yes	
R6	O, I	**Laboratory control samples (LCS):**		
	I	Were all COCs included in the LCS?	Yes	
	I	Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	Yes	
	I	Were LCSs analyzed at the required frequency?	Yes	
	I	Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	Yes	
	I	Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	Yes	
	I	Was the LCSD RPD within QC limits?	Yes	
R7	O, I	**Matrix spike (MS) and matrix spike duplicate (MSD) data**		
	I	Were the project/method specified analytes included in the MS and MSD?	NA	
	I	Were MS/MSD analyzed at the appropriate frequency?	NA	
	I	Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	NA	
	I	Were MS/MSD RPDs within laboratory QC limits?	NA	
R8	O, I	**Analytical duplicate data**		
	I	Were appropriate analytical duplicates analyzed for each matrix?	Yes	
	I	Were analytical duplicates analyzed at the appropriate frequency?	Yes	
	I	Were RPDs or relative standard deviations within the laboratory QC limits?	Yes	
R9	O, I	**Method quantitation limits (MQLs):**		
	I	Are the MQLs for each method analyte included in the laboratory data package?	Yes	
	I	Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	Yes	
	I	Are unadjusted MQLs included in the laboratory data package?	Yes	
R10	O, I	**Other problems/anomalies**		
	I	Are all known problems/anomalies/special conditions noted in this LRC and ER?	Yes	
	I	Were all necessary corrective actions performed for the reported data?	Yes	
	I	Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	Yes	

Alkalinity Laboratory Review Checklist

Table 2. Supporting Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey PP Semi-Annual CCR

Reviewer Name: Michael Ohlinger

LRC Date: 8/1/2023

Laboratory Job Number: 231960

Prep Batch Number(s): QC2306250

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S1	O, I	**Initial calibration (ICAL)**		
	I	Were response factors and/or relative response factors for each analyte within QC limits?	NA	
	I	Were percent RSDs or correlation coefficient criteria met?	NA	
	I	Was the number of standards recommended in the method used for all analytes?	NA	
	I	Were all points generated between the lowest and highest standard used to calculate the curve?	Yes	
	I	Are ICAL data available for all instruments used?	NA	
	I	Has the initial calibration curve been verified using an appropriate second source standard?	NA	
S2	O, I	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB):**		
	I	Was the CCV analyzed at the method-required frequency?	Yes	
	I	Were percent differences for each analyte within the method-required QC limits?	Yes	
	I	Was the ICAL curve verified for each analyte?	Yes	
	I	Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	No	ER1
S3	O	**Mass spectral tuning:**		
	I	Was the appropriate compound for the method used for tuning?	NA	
	I	Were ion abundance data within the method-required QC limits?	NA	
S4	O	**Internal standards (IS):**		
	I	Were IS area counts and retention times within the method-required QC limits?	NA	
S5	O, I	**Raw data (NELAC section 1 appendix A glossary, and section 5.)**		
	I	Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	Yes	
	I	Were data associated with manual integrations flagged on the raw data?	NA	

Alkalinity Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S6	O	**Dual column confirmation**		
	I	Did dual column confirmation results meet the method-required QC?	NA	
S7	O	**Tentatively identified compounds (TICs):**		
	I	If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?	NA	
S8	I	**Interference Check Sample (ICS) results:**		
	I	Were percent recoveries within method QC limits?	NA	
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**		
	I	Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	NA	
S10	O, I	**Method detection limit (MDL) studies**		
	I	Was a MDL study performed for each reported analyte?	Yes	
	I	Is the MDL either adjusted or supported by the analysis of DCSs?	Yes	
S11	O, I	**Proficiency test reports:**		
	I	Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	Yes	
S12	O, I	**Standards documentation**		
	I	Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	Yes	
S13	O, I	**Compound/analyte identification procedures**		
	I	Are the procedures for compound/analyte identification documented?	Yes	
S14	O, I	**Demonstration of analyst competency (DOC)**		
	I	Was DOC conducted consistent with NELAC Chapter 5C?	Yes	
	I	Is documentation of the analyst's competency up-to-date and on file?	Yes	
S15	O, I	**Verification/validation documentation for methods (NELAC Chap 5n 5)**		
	I	Are all the methods used to generate the data documented, verified, and validated, where applicable?	Yes	
S16	O, I	**Laboratory standard operating procedures (SOPs):**		
	I	Are laboratory SOPs current and on file for each method performed?	Yes	

Alkalinity Laboratory Review Checklist

Table 3. Exception Reports.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey PP Semi-Annual CCR

Reviewer Name: Michael Ohlinger

LRC Date: 8/1/2023

Laboratory Job Number: 231960

Prep Batch Number(s): QC2306250

Exception Report No.	Description
ER1	CCB acceptance criteria is CCB<0.5*MQL.

[1] Items identified by the letter "R" must be available as a hard copy or as a .pdf file. Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.

[2] O - organic analyses; I - inorganic analyses (including general chemistry constituents, when applicable).

[3] NA - Not applicable; NR - Not reviewed.

[4] Exception Report identification number; an Exception Report should be completed for an item if the result is "No" or "NR."

Municipal Solid Waste Laboratory Review Checklist

This data package consists of:

- [x] This signature page, and the laboratory review checklist consisting of Table 1, Reportable Data (which includes the reportable data identified on this page), Table 2, Supporting Data, and Table 3, Exception Reports.
- [x] R1 Field chain-of-custody documentation
- [x] R2 Sample identification cross-reference
- [x] R3 Test reports (analytical data sheets) for each environmental sample that includes:
  - (a) Items specified in NELAC Chapter 5 for reporting results, e.g., Section 5.5.10 in 2003 NELAC Standard
  - (b) Dilution factors
  - (c) Preparation methods
  - (d) Cleanup methods
  - (e) If required for the project, tentatively identified compounds (TICs)
- [x] R4 Surrogate recovery data including:
  - (a) Calculated recovery (%R)
  - (b) The laboratory's surrogate QC limits
- [x] R5 Test reports/summary forms for blank samples
- [x] R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  - (a) LCS spiking amounts
  - (b) Calculated %R for each analyte
  - (c) The laboratory's LCS QC limits
- [x] R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  - (a) Samples associated with the MS/MSD clearly identified
  - (b) MS/MSD spiking amounts
  - (c) Concentration of each MS/MSD analyte measured in the parent and spiked samples
  - (d) Calculated %Rs and relative percent differences (RPDs)
  - (e) The laboratory's MS/MSD QC limits
- [x] R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  - (a) The amount of analyte measured in the duplicate
  - (b) The calculated RPD
  - (c) The laboratory's QC limits for analytical duplicates
- [x] R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix
- [x] R10 Other problems or anomalies
- [x] The Exception Report for every item for which the result is "No" or "NR" (Not Reviewed)

Release Statement: I am responsible for the release of this laboratory data package. This data package as been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Check, if applicable: (●) This laboratory is an in-house laboratory controlled by the person responding to rule. The official signing the cover page of the rule-required report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Tim Arnold		Principle Chemist	07/13/23
Name (printed)	Signature	Official Title	Date

Ion Chromatography Laboratory Review Checklist

Table 1. Reportable Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey PP Semi-Annual CCR

Reviewer Name: Tim Arnold

LRC Date: 7/13/23

Laboratory Job Number: 231960

Prep Batch Number(s): QC2307086

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
R1	O, I	**Chain-of-custody (COC)**		
	I	Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	Yes	
	I	Were all departures from standard conditions described in an exception report?	Yes	
R2	O, I	**Sample and quality control (QC) identification**		
	I	Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	Yes	
	I	Are all laboratory ID numbers cross-referenced to the corresponding QC data?	Yes	
R3	O, I	**Test reports**		
	I	Were all samples prepared and analyzed within holding times?	Yes	
	I	Other than those results < MQL, were all other raw values bracketed by calibration standards?	Yes	
	I	Were calculations checked by a peer or supervisor?	Yes	
	I	Were all analyte identifications checked by a peer or supervisor?	Yes	
	I	Were sample quantitation limits reported for all analytes not detected?	Yes	
	I	Were all results for soil and sediment samples reported on a dry weight basis?	NA	
	I	Was % moisture (or solids) reported for all soil and sediment samples?	NA	
	I	If required for the project, TICs reported?	NA	
R4	O	**Surrogate recovery data**		
	I	Were surrogates added prior to extraction?	Yes	
	I	Were surrogate percent recoveries in all samples within the laboratory QC limits?	Yes	
R5	O, I	**Test reports/summary forms for blank samples**		
	I	Were appropriate type(s) of blanks analyzed?	Yes	
	I	Were blanks analyzed at the appropriate frequency?	Yes	

Ion Chromatography Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
	I	Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	Yes	
	I	Were blank concentrations < MQL?	Yes	
R6	O, I	**Laboratory control samples (LCS):**		
	I	Were all COCs included in the LCS?	Yes	
	I	Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	Yes	
	I	Were LCSs analyzed at the required frequency?	Yes	
	I	Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	Yes	
	I	Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	Yes	
	I	Was the LCSD RPD within QC limits?	Yes	
R7	O, I	**Matrix spike (MS) and matrix spike duplicate (MSD) data**		
	I	Were the project/method specified analytes included in the MS and MSD?	Yes	
	I	Were MS/MSD analyzed at the appropriate frequency?	Yes	
	I	Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	Yes	
	I	Were MS/MSD RPDs within laboratory QC limits?	Yes	
R8	O, I	**Analytical duplicate data**		
	I	Were appropriate analytical duplicates analyzed for each matrix?	Yes	
	I	Were analytical duplicates analyzed at the appropriate frequency?	Yes	
	I	Were RPDs or relative standard deviations within the laboratory QC limits?	Yes	
R9	O, I	**Method quantitation limits (MQLs):**		
	I	Are the MQLs for each method analyte included in the laboratory data package?	Yes	
	I	Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	Yes	
	I	Are unadjusted MQLs included in the laboratory data package?	Yes	
R10	O, I	**Other problems/anomalies**		
	I	Are all known problems/anomalies/special conditions noted in this LRC and ER?	Yes	
	I	Were all necessary corrective actions performed for the reported data?	Yes	
	I	Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	Yes	

Ion Chromatography Laboratory Review Checklist

Table 2. Supporting Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey PP Semi-Annual CCR

Reviewer Name: Tim Arnold

LRC Date: 7/13/23

Laboratory Job Number: 231960

Prep Batch Number(s): QC2307086

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S1	O, I	**Initial calibration (ICAL)**		
	I	Were response factors and/or relative response factors for each analyte within QC limits?	NA	
	I	Were percent RSDs or correlation coefficient criteria met?	Yes	
	I	Was the number of standards recommended in the method used for all analytes?	Yes	
	I	Were all points generated between the lowest and highest standard used to calculate the curve?	Yes	
	I	Are ICAL data available for all instruments used?	Yes	
	I	Has the initial calibration curve been verified using an appropriate second source standard?	Yes	
S2	O, I	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB):**		
	I	Was the CCV analyzed at the method-required frequency?	Yes	
	I	Were percent differences for each analyte within the method-required QC limits?	Yes	
	I	Was the ICAL curve verified for each analyte?	Yes	
	I	Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	No	ER1
S3	O	**Mass spectral tuning:**		
	I	Was the appropriate compound for the method used for tuning?	NA	
	I	Were ion abundance data within the method-required QC limits?	NA	
S4	O	**Internal standards (IS):**		
	I	Were IS area counts and retention times within the method-required QC limits?	NA	
S5	O, I	**Raw data (NELAC section 1 appendix A glossary, and section 5.)**		
	I	Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	Yes	
	I	Were data associated with manual integrations flagged on the raw data?	NA	

Ion Chromatography Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S6	O	**Dual column confirmation**		
	I	Did dual column confirmation results meet the method-required QC?	NA	
S7	O	**Tentatively identified compounds (TICs):**		
	I	If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?	NA	
S8	I	**Interference Check Sample (ICS) results:**		
	I	Were percent recoveries within method QC limits?	NA	
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**		
	I	Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	NA	
S10	O, I	**Method detection limit (MDL) studies**		
	I	Was a MDL study performed for each reported analyte?	Yes	
	I	Is the MDL either adjusted or supported by the analysis of DCSs?	Yes	
S11	O, I	**Proficiency test reports:**		
	I	Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	Yes	
S12	O, I	**Standards documentation**		
	I	Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	Yes	
S13	O, I	**Compound/analyte identification procedures**		
	I	Are the procedures for compound/analyte identification documented?	Yes	
S14	O, I	**Demonstration of analyst competency (DOC)**		
	I	Was DOC conducted consistent with NELAC Chapter 5C?	Yes	
	I	Is documentation of the analyst's competency up-to-date and on file?	Yes	
S15	O, I	**Verification/validation documentation for methods (NELAC Chap 5n 5)**		
	I	Are all the methods used to generate the data documented, verified, and validated, where applicable?	Yes	
S16	O, I	**Laboratory standard operating procedures (SOPs):**		
	I	Are laboratory SOPs current and on file for each method performed?	Yes	

Table 3. Exception Reports.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey PP Semi-Annual CCR

Reviewer Name: Tim Arnold

LRC Date: 7/13/23

Laboratory Job Number: 231960

Prep Batch Number(s): QC2307086

Exception Report No.	Description
ER1	CCB acceptance criteria is CCB<MQL.

[1] Items identified by the letter "R" must be available as a hard copy or as a .pdf file. Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
[2] O - organic analyses; I - inorganic analyses (including general chemistry constituents, when applicable).
[3] NA - Not applicable; NR - Not reviewed.
[4] Exception Report identification number; an Exception Report should be completed for an item if the result is "No" or "NR."

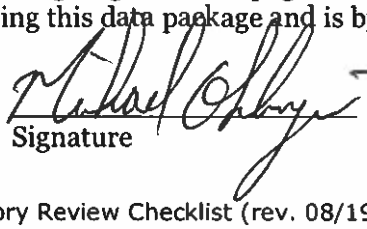
Municipal Solid Waste Laboratory Review Checklist

This data package consists of:

- [x] This signature page, and the laboratory review checklist consisting of Table 1, Reportable Data (which includes the reportable data identified on this page), Table 2, Supporting Data, and Table 3, Exception Reports.
- [x] R1 Field chain-of-custody documentation
- [x] R2 Sample identification cross-reference
- [x] R3 Test reports (analytical data sheets) for each environmental sample that includes:
  - (a) Items specified in NELAC Chapter 5 for reporting results, e.g., Section 5.5.10 in 2003 NELAC Standard
  - (b) Dilution factors
  - (c) Preparation methods
  - (d) Cleanup methods
  - (e) If required for the project, tentatively identified compounds (TICs)
- [NA] R4 Surrogate recovery data including:
  - (a) Calculated recovery (%R)
  - (b) The laboratory's surrogate QC limits
- [x] R5 Test reports/summary forms for blank samples
- [x] R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  - (a) LCS spiking amounts
  - (b) Calculated %R for each analyte
  - (c) The laboratory's LCS QC limits
- [x] R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  - (a) Samples associated with the MS/MSD clearly identified
  - (b) MS/MSD spiking amounts
  - (c) Concentration of each MS/MSD analyte measured in the parent and spiked samples
  - (d) Calculated %Rs and relative percent differences (RPDs)
  - (e) The laboratory's MS/MSD QC limits
- [x] R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  - (a) The amount of analyte measured in the duplicate
  - (b) The calculated RPD
  - (c) The laboratory's QC limits for analytical duplicates
- [x] R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix
- [x] R10 Other problems or anomalies
- [x] The Exception Report for every item for which the result is "No" or "NR" (Not Reviewed)

Release Statement: I am responsible for the release of this laboratory data package. This data package as been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Check, if applicable: (●) This laboratory is an in-house laboratory controlled by the person responding to rule. The official signing the cover page of the rule-required report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Michael Ohlinger		Chemist	8/1/2023
Name (printed)	Signature	Official Title	Date

TDS Laboratory Review Checklist

Table 1. Reportable Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey PP Semi-Annual

Reviewer Name: Michael Ohlinger

LRC Date: 8/1/2023

Laboratory Job Number: 231960

Prep Batch Number(s): QC2306244

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
R1	O, I	**Chain-of-custody (COC)**		
	I	Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	Yes	
	I	Were all departures from standard conditions described in an exception report?	NA	
R2	O, I	**Sample and quality control (QC) identification**		
	I	Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	Yes	
	I	Are all laboratory ID numbers cross-referenced to the corresponding QC data?	Yes	
R3	O, I	**Test reports**		
	I	Were all samples prepared and analyzed within holding times?	Yes	
	I	Other than those results < MQL, were all other raw values bracketed by calibration standards?	NA	
	I	Were calculations checked by a peer or supervisor?	Yes	
	I	Were all analyte identifications checked by a peer or supervisor?	Yes	
	I	Were sample quantitation limits reported for all analytes not detected?	Yes	
	I	Were all results for soil and sediment samples reported on a dry weight basis?	NA	
	I	Was % moisture (or solids) reported for all soil and sediment samples?	NA	
	I	If required for the project, TICs reported?	NA	
R4	O	**Surrogate recovery data**		
	I	Were surrogates added prior to extraction?	NA	
	I	Were surrogate percent recoveries in all samples within the laboratory QC limits?	NA	
R5	O, I	**Test reports/summary forms for blank samples**		
	I	Were appropriate type(s) of blanks analyzed?	Yes	
	I	Were blanks analyzed at the appropriate frequency?	Yes	

TDS Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
	I	Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	Yes	
	I	Were blank concentrations < MQL?	Yes	
R6	O, I	**Laboratory control samples (LCS):**		
	I	Were all COCs included in the LCS?	Yes	
	I	Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	Yes	
	I	Were LCSs analyzed at the required frequency?	Yes	
	I	Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	Yes	
	I	Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	Yes	
	I	Was the LCSD RPD within QC limits?	Yes	
R7	O, I	**Matrix spike (MS) and matrix spike duplicate (MSD) data**		
	I	Were the project/method specified analytes included in the MS and MSD?	NA	
	I	Were MS/MSD analyzed at the appropriate frequency?	NA	
	I	Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	NA	
	I	Were MS/MSD RPDs within laboratory QC limits?	NA	
R8	O, I	**Analytical duplicate data**		
	I	Were appropriate analytical duplicates analyzed for each matrix?	Yes	
	I	Were analytical duplicates analyzed at the appropriate frequency?	Yes	
	I	Were RPDs or relative standard deviations within the laboratory QC limits?	Yes	
R9	O, I	**Method quantitation limits (MQLs):**		
	I	Are the MQLs for each method analyte included in the laboratory data package?	Yes	
	I	Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	Yes	
	I	Are unadjusted MQLs included in the laboratory data package?	Yes	
R10	O, I	**Other problems/anomalies**		
	I	Are all known problems/anomalies/special conditions noted in this LRC and ER?	Yes	
	I	Were all necessary corrective actions performed for the reported data?	Yes	
	I	Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	Yes	

Table 2. Supporting Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey PP Semi-Annual

Reviewer Name: Michael Ohlinger

LRC Date: 8/1/2023

Laboratory Job Number: 231960

Prep Batch Number(s): QC2306244

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S1	O, I	**Initial calibration (ICAL)**		
	I	Were response factors and/or relative response factors for each analyte within QC limits?	NA	
	I	Were percent RSDs or correlation coefficient criteria met?	NA	
	I	Was the number of standards recommended in the method used for all analytes?	NA	
	I	Were all points generated between the lowest and highest standard used to calculate the curve?	NA	
	I	Are ICAL data available for all instruments used?	NA	
	I	Has the initial calibration curve been verified using an appropriate second source standard?	NA	
S2	O, I	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB):**		
	I	Was the CCV analyzed at the method-required frequency?	NA	
	I	Were percent differences for each analyte within the method-required QC limits?	NA	
	I	Was the ICAL curve verified for each analyte?	NA	
	I	Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	NA	
S3	O	**Mass spectral tuning:**		
	I	Was the appropriate compound for the method used for tuning?	NA	
	I	Were ion abundance data within the method-required QC limits?	NA	
S4	O	**Internal standards (IS):**		
	I	Were IS area counts and retention times within the method-required QC limits?	NA	
S5	O, I	**Raw data (NELAC section 1 appendix A glossary, and section 5.)**		
	I	Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	Yes	
	I	Were data associated with manual integrations flagged on the raw data?	NA	

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S6	O	**Dual column confirmation**		
	I	Did dual column confirmation results meet the method-required QC?	NA	
S7	O	**Tentatively identified compounds (TICs):**		
	I	If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?	NA	
S8	I	**Interference Check Sample (ICS) results:**		
	I	Were percent recoveries within method QC limits?	NA	
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**		
	I	Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	NA	
S10	O, I	**Method detection limit (MDL) studies**		
	I	Was a MDL study performed for each reported analyte?	Yes	
	I	Is the MDL either adjusted or supported by the analysis of DCSs?	Yes	
S11	O, I	**Proficiency test reports:**		
	I	Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	Yes	
S12	O, I	**Standards documentation**		
	I	Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	Yes	
S13	O, I	**Compound/analyte identification procedures**		
	I	Are the procedures for compound/analyte identification documented?	Yes	
S14	O, I	**Demonstration of analyst competency (DOC)**		
	I	Was DOC conducted consistent with NELAC Chapter 5C?	Yes	
	I	Is documentation of the analyst's competency up-to-date and on file?	Yes	
S15	O, I	**Verification/validation documentation for methods (NELAC Chap 5n 5)**		
	I	Are all the methods used to generate the data documented, verified, and validated, where applicable?	Yes	
S16	O, I	**Laboratory standard operating procedures (SOPs):**		
	I	Are laboratory SOPs current and on file for each method performed?	Yes	

Table 3. Exception Reports.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey PP Semi-Annual

Reviewer Name: Michael Ohlinger

LRC Date: 8/1/2023

Laboratory Job Number: 231960

Prep Batch Number(s): QC2306244

Exception Report No.	Description

[1] Items identified by the letter "R" must be available as a hard copy or as a .pdf file. Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.

[2] O - organic analyses; I - inorganic analyses (including general chemistry constituents, when applicable).

[3] NA - Not applicable; NR - Not reviewed.

[4] Exception Report identification number; an Exception Report should be completed for an item if the result is "No" or "NR."

Water Analysis Report

Reissued

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-2
Customer Description: TG-32
Lab Number: 231985-001
Preparation:
Date Collected: 06/26/2023 11:42 EDT
Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.009	µg/L	1	0.100	0.008	J1	GES	07/11/2023 23:33	EPA 200.8-1994, Rev. 5.4
Arsenic	1.14	µg/L	1	0.10	0.03		GES	07/11/2023 23:33	EPA 200.8-1994, Rev. 5.4
Barium	13.5	µg/L	1	0.20	0.05		GES	07/11/2023 23:33	EPA 200.8-1994, Rev. 5.4
Beryllium	0.744	µg/L	1	0.050	0.007		GES	07/11/2023 23:33	EPA 200.8-1994, Rev. 5.4
Boron	3.06	mg/L	1	0.050	0.007		GES	07/11/2023 23:33	EPA 200.8-1994, Rev. 5.4
Cadmium	0.119	µg/L	1	0.020	0.004		GES	07/11/2023 23:33	EPA 200.8-1994, Rev. 5.4
Calcium	3.53	mg/L	1	0.05	0.01		GES	07/11/2023 23:33	EPA 200.8-1994, Rev. 5.4
Chromium	0.49	µg/L	1	0.30	0.07		GES	07/11/2023 23:33	EPA 200.8-1994, Rev. 5.4
Cobalt	27.3	µg/L	1	0.020	0.005		GES	07/11/2023 23:33	EPA 200.8-1994, Rev. 5.4
Lead	0.60	µg/L	1	0.20	0.05		GES	07/11/2023 23:33	EPA 200.8-1994, Rev. 5.4
Lithium	0.0595	mg/L	1	0.00030	0.00007		GES	07/11/2023 23:33	EPA 200.8-1994, Rev. 5.4
Magnesium	7.46	mg/L	1	0.100	0.006		GES	07/11/2023 23:33	EPA 200.8-1994, Rev. 5.4
Mercury	157	ng/L	2	10	4		RLP	07/06/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/11/2023 23:33	EPA 200.8-1994, Rev. 5.4
Potassium	1.38	mg/L	1	0.100	0.008		GES	07/11/2023 23:33	EPA 200.8-1994, Rev. 5.4
Selenium	4.32	µg/L	1	0.50	0.04		GES	07/11/2023 23:33	EPA 200.8-1994, Rev. 5.4
Sodium	108	mg/L	1	0.20	0.01		GES	07/11/2023 23:33	EPA 200.8-1994, Rev. 5.4
Strontium	0.0540	mg/L	1	0.00200	0.00005		GES	07/11/2023 23:33	EPA 200.8-1994, Rev. 5.4
Thallium	0.11	µg/L	1	0.20	0.02	J1	GES	07/11/2023 23:33	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	0.49	pCi/L	0.11	0.14		TTP	07/11/2023 11:33	SW-846 9315-1986, Rev. 0
Carrier Recovery	89.5	%						
Radium-228	0.87	pCi/L	0.16	0.50		ST	07/10/2023 16:11	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	80.6	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-2
Customer Description: TG-32
Lab Number: 231985-001-01
Preparation: Dissolved
Date Collected: 06/26/2023 11:42 EDT
Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.008	µg/L	1	0.100	0.008	J1	GES	07/11/2023 23:38	EPA 200.8-1994, Rev. 5.4
Arsenic	1.10	µg/L	1	0.10	0.03		GES	07/11/2023 23:38	EPA 200.8-1994, Rev. 5.4
Barium	13.3	µg/L	1	0.20	0.05		GES	07/11/2023 23:38	EPA 200.8-1994, Rev. 5.4
Beryllium	0.746	µg/L	1	0.050	0.007		GES	07/11/2023 23:38	EPA 200.8-1994, Rev. 5.4
Cadmium	0.110	µg/L	1	0.020	0.004		GES	07/11/2023 23:38	EPA 200.8-1994, Rev. 5.4
Chromium	0.59	µg/L	1	0.30	0.07		GES	07/11/2023 23:38	EPA 200.8-1994, Rev. 5.4
Cobalt	27.4	µg/L	1	0.020	0.005		GES	07/11/2023 23:38	EPA 200.8-1994, Rev. 5.4
Iron	0.229	mg/L	1	0.020	0.003		GES	07/11/2023 23:38	EPA 200.8-1994, Rev. 5.4
Lead	0.61	µg/L	1	0.20	0.05		GES	07/11/2023 23:38	EPA 200.8-1994, Rev. 5.4
Lithium	0.0599	mg/L	1	0.00030	0.00007		GES	07/11/2023 23:38	EPA 200.8-1994, Rev. 5.4
Manganese	0.102	mg/L	1	0.00100	0.00008		GES	07/11/2023 23:38	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	07/06/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/11/2023 23:38	EPA 200.8-1994, Rev. 5.4
Selenium	4.14	µg/L	1	0.50	0.04		GES	07/11/2023 23:38	EPA 200.8-1994, Rev. 5.4
Thallium	0.11	µg/L	1	0.20	0.02	J1	GES	07/11/2023 23:38	EPA 200.8-1994, Rev. 5.4

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
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Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-3
Customer Description: TG-32
Lab Number: 231985-002
Preparation:
Date Collected: 06/27/2023 12:01 EDT
Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.011	µg/L	1	0.100	0.008	J1	GES	07/11/2023 23:43	EPA 200.8-1994, Rev. 5.4
Arsenic	0.80	µg/L	1	0.10	0.03		GES	07/11/2023 23:43	EPA 200.8-1994, Rev. 5.4
Barium	52.2	µg/L	1	0.20	0.05		GES	07/11/2023 23:43	EPA 200.8-1994, Rev. 5.4
Beryllium	0.200	µg/L	1	0.050	0.007		GES	07/11/2023 23:43	EPA 200.8-1994, Rev. 5.4
Boron	0.037	mg/L	1	0.050	0.007	J1	GES	07/11/2023 23:43	EPA 200.8-1994, Rev. 5.4
Cadmium	0.020	µg/L	1	0.020	0.004		GES	07/11/2023 23:43	EPA 200.8-1994, Rev. 5.4
Calcium	2.95	mg/L	1	0.05	0.01		GES	07/11/2023 23:43	EPA 200.8-1994, Rev. 5.4
Chromium	0.31	µg/L	1	0.30	0.07		GES	07/11/2023 23:43	EPA 200.8-1994, Rev. 5.4
Cobalt	2.79	µg/L	1	0.020	0.005		GES	07/11/2023 23:43	EPA 200.8-1994, Rev. 5.4
Lead	0.25	µg/L	1	0.20	0.05		GES	07/11/2023 23:43	EPA 200.8-1994, Rev. 5.4
Lithium	0.0414	mg/L	1	0.00030	0.00007		GES	07/11/2023 23:43	EPA 200.8-1994, Rev. 5.4
Magnesium	1.42	mg/L	1	0.100	0.006		GES	07/11/2023 23:43	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	07/06/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/11/2023 23:43	EPA 200.8-1994, Rev. 5.4
Potassium	2.06	mg/L	1	0.100	0.008		GES	07/11/2023 23:43	EPA 200.8-1994, Rev. 5.4
Selenium	0.04	µg/L	1	0.50	0.04	J1	GES	07/11/2023 23:43	EPA 200.8-1994, Rev. 5.4
Sodium	8.14	mg/L	1	0.20	0.01		GES	07/11/2023 23:43	EPA 200.8-1994, Rev. 5.4
Strontium	0.0213	mg/L	1	0.00200	0.00005		GES	07/11/2023 23:43	EPA 200.8-1994, Rev. 5.4
Thallium	0.05	µg/L	1	0.20	0.02	J1	GES	07/11/2023 23:43	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	0.54	pCi/L	0.12	0.18		TTP	07/11/2023 11:33	SW-846 9315-1986, Rev. 0
Carrier Recovery	86.5	%						
Radium-228	0.37	pCi/L	0.12	0.38		ST	07/10/2023 16:11	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	89.9	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

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Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-3
Customer Description: TG-32
Lab Number: 231985-002-01
Preparation: Dissolved
Date Collected: 06/27/2023 12:01 EDT
Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.018	µg/L	1	0.100	0.008	J1	GES	07/11/2023 23:49	EPA 200.8-1994, Rev. 5.4
Arsenic	0.06	µg/L	1	0.10	0.03	J1	GES	07/11/2023 23:49	EPA 200.8-1994, Rev. 5.4
Barium	52.1	µg/L	1	0.20	0.05		GES	07/11/2023 23:49	EPA 200.8-1994, Rev. 5.4
Beryllium	0.180	µg/L	1	0.050	0.007		GES	07/11/2023 23:49	EPA 200.8-1994, Rev. 5.4
Cadmium	0.016	µg/L	1	0.020	0.004	J1	GES	07/11/2023 23:49	EPA 200.8-1994, Rev. 5.4
Chromium	0.34	µg/L	1	0.30	0.07		GES	07/11/2023 23:49	EPA 200.8-1994, Rev. 5.4
Cobalt	2.78	µg/L	1	0.020	0.005		GES	07/11/2023 23:49	EPA 200.8-1994, Rev. 5.4
Iron	0.074	mg/L	1	0.020	0.003		GES	07/11/2023 23:49	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	GES	07/11/2023 23:49	EPA 200.8-1994, Rev. 5.4
Lithium	0.0424	mg/L	1	0.00030	0.00007		GES	07/11/2023 23:49	EPA 200.8-1994, Rev. 5.4
Manganese	0.0315	mg/L	1	0.00100	0.00008		GES	07/11/2023 23:49	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	07/06/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/11/2023 23:49	EPA 200.8-1994, Rev. 5.4
Selenium	0.05	µg/L	1	0.50	0.04	J1	GES	07/11/2023 23:49	EPA 200.8-1994, Rev. 5.4
Thallium	0.04	µg/L	1	0.20	0.02	J1	GES	07/11/2023 23:49	EPA 200.8-1994, Rev. 5.4

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-4 Customer Description: TG-32

Lab Number: 231985-003 Preparation:

Date Collected: 06/27/2023 12:10 EDT Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.018	µg/L	1	0.100	0.008	J1	GES	07/11/2023 23:54	EPA 200.8-1994, Rev. 5.4
Arsenic	1.23	µg/L	1	0.10	0.03		GES	07/11/2023 23:54	EPA 200.8-1994, Rev. 5.4
Barium	132	µg/L	1	0.20	0.05		GES	07/11/2023 23:54	EPA 200.8-1994, Rev. 5.4
Beryllium	0.376	µg/L	1	0.050	0.007		GES	07/11/2023 23:54	EPA 200.8-1994, Rev. 5.4
Boron	0.018	mg/L	1	0.050	0.007	J1	GES	07/11/2023 23:54	EPA 200.8-1994, Rev. 5.4
Cadmium	0.021	µg/L	1	0.020	0.004		GES	07/11/2023 23:54	EPA 200.8-1994, Rev. 5.4
Calcium	2.90	mg/L	1	0.05	0.01		GES	07/11/2023 23:54	EPA 200.8-1994, Rev. 5.4
Chromium	0.56	µg/L	1	0.30	0.07		GES	07/11/2023 23:54	EPA 200.8-1994, Rev. 5.4
Cobalt	3.89	µg/L	1	0.020	0.005		GES	07/11/2023 23:54	EPA 200.8-1994, Rev. 5.4
Lead	0.15	µg/L	1	0.20	0.05	J1	GES	07/11/2023 23:54	EPA 200.8-1994, Rev. 5.4
Lithium	0.0240	mg/L	1	0.00030	0.00007		GES	07/11/2023 23:54	EPA 200.8-1994, Rev. 5.4
Magnesium	0.737	mg/L	1	0.100	0.006		GES	07/11/2023 23:54	EPA 200.8-1994, Rev. 5.4
Mercury	3	ng/L	1	5	2	J1	RLP	07/06/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/11/2023 23:54	EPA 200.8-1994, Rev. 5.4
Potassium	2.32	mg/L	1	0.100	0.008		GES	07/11/2023 23:54	EPA 200.8-1994, Rev. 5.4
Selenium	0.14	µg/L	1	0.50	0.04	J1	GES	07/11/2023 23:54	EPA 200.8-1994, Rev. 5.4
Sodium	6.68	mg/L	1	0.20	0.01		GES	07/11/2023 23:54	EPA 200.8-1994, Rev. 5.4
Strontium	0.0248	mg/L	1	0.00200	0.00005		GES	07/11/2023 23:54	EPA 200.8-1994, Rev. 5.4
Thallium	0.09	µg/L	1	0.20	0.02	J1	GES	07/11/2023 23:54	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	1.38	pCi/L	0.22	0.20		TTP	07/07/2023 13:34	SW-846 9315-1986, Rev. 0
Carrier Recovery	97.0	%						
Radium-228	0.34	pCi/L	0.15	0.50		ST	07/10/2023 16:11	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	74.0	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

Dolan Chemical Laboratory
4001 Bixby Road
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Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-4
Customer Description: TG-32
Lab Number: 231985-003-01
Preparation: Dissolved
Date Collected: 06/27/2023 12:10 EDT
Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.008	µg/L	1	0.100	0.008	U1	GES	07/11/2023 23:59	EPA 200.8-1994, Rev. 5.4
Arsenic	0.03	µg/L	1	0.10	0.03	J1	GES	07/11/2023 23:59	EPA 200.8-1994, Rev. 5.4
Barium	122	µg/L	1	0.20	0.05		GES	07/11/2023 23:59	EPA 200.8-1994, Rev. 5.4
Beryllium	0.361	µg/L	1	0.050	0.007		GES	07/11/2023 23:59	EPA 200.8-1994, Rev. 5.4
Cadmium	0.019	µg/L	1	0.020	0.004	J1	GES	07/11/2023 23:59	EPA 200.8-1994, Rev. 5.4
Chromium	0.28	µg/L	1	0.30	0.07	J1	GES	07/11/2023 23:59	EPA 200.8-1994, Rev. 5.4
Cobalt	3.82	µg/L	1	0.020	0.005		GES	07/11/2023 23:59	EPA 200.8-1994, Rev. 5.4
Iron	0.142	mg/L	1	0.020	0.003		GES	07/11/2023 23:59	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	GES	07/11/2023 23:59	EPA 200.8-1994, Rev. 5.4
Lithium	0.0245	mg/L	1	0.00030	0.00007		GES	07/11/2023 23:59	EPA 200.8-1994, Rev. 5.4
Manganese	0.0358	mg/L	1	0.00100	0.00008		GES	07/11/2023 23:59	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	07/06/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/11/2023 23:59	EPA 200.8-1994, Rev. 5.4
Selenium	<0.04	µg/L	1	0.50	0.04	U1	GES	07/11/2023 23:59	EPA 200.8-1994, Rev. 5.4
Thallium	0.09	µg/L	1	0.20	0.02	J1	GES	07/11/2023 23:59	EPA 200.8-1994, Rev. 5.4

AMERICAN ELECTRIC POWER

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Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-7 | Customer Description: TG-32
Lab Number: 231985-004 | Preparation:
Date Collected: 06/27/2023 10:51 EDT | Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.008	µg/L	1	0.100	0.008	U1	GES	07/12/2023 00:04	EPA 200.8-1994, Rev. 5.4
Arsenic	1.14	µg/L	1	0.10	0.03		GES	07/12/2023 00:04	EPA 200.8-1994, Rev. 5.4
Barium	40.3	µg/L	1	0.20	0.05		GES	07/12/2023 00:04	EPA 200.8-1994, Rev. 5.4
Beryllium	5.11	µg/L	1	0.050	0.007		GES	07/12/2023 00:04	EPA 200.8-1994, Rev. 5.4
Boron	2.02	mg/L	1	0.050	0.007		GES	07/12/2023 00:04	EPA 200.8-1994, Rev. 5.4
Cadmium	0.691	µg/L	1	0.020	0.004		GES	07/12/2023 00:04	EPA 200.8-1994, Rev. 5.4
Calcium	5.73	mg/L	1	0.05	0.01		GES	07/12/2023 00:04	EPA 200.8-1994, Rev. 5.4
Chromium	0.47	µg/L	1	0.30	0.07		GES	07/12/2023 00:04	EPA 200.8-1994, Rev. 5.4
Cobalt	39.3	µg/L	1	0.020	0.005		GES	07/12/2023 00:04	EPA 200.8-1994, Rev. 5.4
Lead	0.88	µg/L	1	0.20	0.05		GES	07/12/2023 00:04	EPA 200.8-1994, Rev. 5.4
Lithium	0.0780	mg/L	1	0.00030	0.00007		GES	07/12/2023 00:04	EPA 200.8-1994, Rev. 5.4
Magnesium	9.21	mg/L	1	0.100	0.006		GES	07/12/2023 00:04	EPA 200.8-1994, Rev. 5.4
Mercury	1220	ng/L	48	240	90		RLP	07/06/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/12/2023 00:04	EPA 200.8-1994, Rev. 5.4
Potassium	2.05	mg/L	1	0.100	0.008		GES	07/12/2023 00:04	EPA 200.8-1994, Rev. 5.4
Selenium	4.53	µg/L	1	0.50	0.04		GES	07/12/2023 00:04	EPA 200.8-1994, Rev. 5.4
Sodium	17.1	mg/L	1	0.20	0.01		GES	07/12/2023 00:04	EPA 200.8-1994, Rev. 5.4
Strontium	0.0776	mg/L	1	0.00200	0.00005		GES	07/12/2023 00:04	EPA 200.8-1994, Rev. 5.4
Thallium	0.20	µg/L	1	0.20	0.02		GES	07/12/2023 00:04	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	1.29	pCi/L	0.24	0.31		TTP	07/07/2023 13:34	SW-846 9315-1986, Rev. 0
Carrier Recovery	88.5	%						
Radium-228	3.40	pCi/L	0.19	0.50		ST	07/10/2023 16:11	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	80.7	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

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Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-7
Customer Description: TG-32
Lab Number: 231985-004-01
Preparation: Dissolved
Date Collected: 06/27/2023 10:51 EDT
Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.008	µg/L	1	0.100	0.008	U1	GES	07/12/2023 00:09	EPA 200.8-1994, Rev. 5.4
Arsenic	1.14	µg/L	1	0.10	0.03		GES	07/12/2023 00:09	EPA 200.8-1994, Rev. 5.4
Barium	40.4	µg/L	1	0.20	0.05		GES	07/12/2023 00:09	EPA 200.8-1994, Rev. 5.4
Beryllium	5.13	µg/L	1	0.050	0.007		GES	07/12/2023 00:09	EPA 200.8-1994, Rev. 5.4
Cadmium	0.692	µg/L	1	0.020	0.004		GES	07/12/2023 00:09	EPA 200.8-1994, Rev. 5.4
Chromium	0.55	µg/L	1	0.30	0.07		GES	07/12/2023 00:09	EPA 200.8-1994, Rev. 5.4
Cobalt	39.9	µg/L	1	0.020	0.005		GES	07/12/2023 00:09	EPA 200.8-1994, Rev. 5.4
Iron	0.049	mg/L	1	0.020	0.003		GES	07/12/2023 00:09	EPA 200.8-1994, Rev. 5.4
Lead	0.87	µg/L	1	0.20	0.05		GES	07/12/2023 00:09	EPA 200.8-1994, Rev. 5.4
Lithium	0.0785	mg/L	1	0.00030	0.00007		GES	07/12/2023 00:09	EPA 200.8-1994, Rev. 5.4
Manganese	0.0812	mg/L	1	0.00100	0.00008		GES	07/12/2023 00:09	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	07/10/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/12/2023 00:09	EPA 200.8-1994, Rev. 5.4
Selenium	4.57	µg/L	1	0.50	0.04		GES	07/12/2023 00:09	EPA 200.8-1994, Rev. 5.4
Thallium	0.18	µg/L	1	0.20	0.02	J1	GES	07/12/2023 00:09	EPA 200.8-1994, Rev. 5.4

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Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-12 Customer Description: TG-32
Lab Number: 231985-005 Preparation:
Date Collected: 06/26/2023 08:55 EDT Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.015	µg/L	1	0.100	0.008	J1	GES	07/12/2023 00:14	EPA 200.8-1994, Rev. 5.4
Arsenic	0.11	µg/L	1	0.10	0.03		GES	07/12/2023 00:14	EPA 200.8-1994, Rev. 5.4
Barium	16.3	µg/L	1	0.20	0.05		GES	07/12/2023 00:14	EPA 200.8-1994, Rev. 5.4
Beryllium	0.110	µg/L	1	0.050	0.007		GES	07/12/2023 00:14	EPA 200.8-1994, Rev. 5.4
Boron	0.019	mg/L	1	0.050	0.007	J1	GES	07/12/2023 00:14	EPA 200.8-1994, Rev. 5.4
Cadmium	0.007	µg/L	1	0.020	0.004	J1	GES	07/12/2023 00:14	EPA 200.8-1994, Rev. 5.4
Calcium	0.21	mg/L	1	0.05	0.01		GES	07/12/2023 00:14	EPA 200.8-1994, Rev. 5.4
Chromium	0.45	µg/L	1	0.30	0.07		GES	07/12/2023 00:14	EPA 200.8-1994, Rev. 5.4
Cobalt	0.932	µg/L	1	0.020	0.005		GES	07/12/2023 00:14	EPA 200.8-1994, Rev. 5.4
Lead	0.11	µg/L	1	0.20	0.05	J1	GES	07/12/2023 00:14	EPA 200.8-1994, Rev. 5.4
Lithium	0.00487	mg/L	1	0.00030	0.00007		GES	07/12/2023 00:14	EPA 200.8-1994, Rev. 5.4
Magnesium	0.291	mg/L	1	0.100	0.006		GES	07/12/2023 00:14	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	07/06/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	0.7	µg/L	1	0.5	0.1		GES	07/12/2023 00:14	EPA 200.8-1994, Rev. 5.4
Potassium	0.175	mg/L	1	0.100	0.008		GES	07/12/2023 00:14	EPA 200.8-1994, Rev. 5.4
Selenium	0.23	µg/L	1	0.50	0.04	J1	GES	07/12/2023 00:14	EPA 200.8-1994, Rev. 5.4
Sodium	3.34	mg/L	1	0.20	0.01		GES	07/12/2023 00:14	EPA 200.8-1994, Rev. 5.4
Strontium	0.00203	mg/L	1	0.00200	0.00005		GES	07/12/2023 00:14	EPA 200.8-1994, Rev. 5.4
Thallium	<0.02	µg/L	1	0.20	0.02	U1	GES	07/12/2023 00:14	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	0.45	pCi/L	0.13	0.21		TTP	07/07/2023 13:34	SW-846 9315-1986, Rev. 0
Carrier Recovery	106	%						
Radium-228	-0.11	pCi/L	0.14	0.50		ST	07/10/2023 16:11	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	79.1	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

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Groveport, OH 43125
Phone: 614-836-4221
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Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-12
Customer Description: TG-32
Lab Number: 231985-005-01
Preparation: Dissolved
Date Collected: 06/26/2023 08:55 EDT
Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.014	µg/L	1	0.100	0.008	J1	GES	07/12/2023 00:19	EPA 200.8-1994, Rev. 5.4
Arsenic	0.1	µg/L	1	0.10	0.03		GES	07/12/2023 00:19	EPA 200.8-1994, Rev. 5.4
Barium	16.5	µg/L	1	0.20	0.05		GES	07/12/2023 00:19	EPA 200.8-1994, Rev. 5.4
Beryllium	0.112	µg/L	1	0.050	0.007		GES	07/12/2023 00:19	EPA 200.8-1994, Rev. 5.4
Cadmium	0.006	µg/L	1	0.020	0.004	J1	GES	07/12/2023 00:19	EPA 200.8-1994, Rev. 5.4
Chromium	0.51	µg/L	1	0.30	0.07		GES	07/12/2023 00:19	EPA 200.8-1994, Rev. 5.4
Cobalt	0.926	µg/L	1	0.020	0.005		GES	07/12/2023 00:19	EPA 200.8-1994, Rev. 5.4
Iron	0.113	mg/L	1	0.020	0.003		GES	07/12/2023 00:19	EPA 200.8-1994, Rev. 5.4
Lead	0.11	µg/L	1	0.20	0.05	J1	GES	07/12/2023 00:19	EPA 200.8-1994, Rev. 5.4
Lithium	0.00485	mg/L	1	0.00030	0.00007		GES	07/12/2023 00:19	EPA 200.8-1994, Rev. 5.4
Manganese	0.00340	mg/L	1	0.00100	0.00008		GES	07/12/2023 00:19	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	07/06/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	0.5	µg/L	1	0.5	0.1		GES	07/12/2023 00:19	EPA 200.8-1994, Rev. 5.4
Selenium	0.25	µg/L	1	0.50	0.04	J1	GES	07/12/2023 00:19	EPA 200.8-1994, Rev. 5.4
Thallium	<0.02	µg/L	1	0.20	0.02	U1	GES	07/12/2023 00:19	EPA 200.8-1994, Rev. 5.4

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Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-13
Customer Description: TG-32
Lab Number: 231985-006
Preparation:
Date Collected: 06/26/2023 08:28 EDT
Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.008	µg/L	1	0.100	0.008	U1	GES	07/12/2023 01:26	EPA 200.8-1994, Rev. 5.4
Arsenic	1.56	µg/L	1	0.10	0.03		GES	07/12/2023 01:26	EPA 200.8-1994, Rev. 5.4
Barium	39.8	µg/L	1	0.20	0.05		GES	07/12/2023 01:26	EPA 200.8-1994, Rev. 5.4
Beryllium	0.234	µg/L	1	0.050	0.007		GES	07/12/2023 01:26	EPA 200.8-1994, Rev. 5.4
Boron	0.067	mg/L	1	0.050	0.007		GES	07/12/2023 01:26	EPA 200.8-1994, Rev. 5.4
Cadmium	<0.004	µg/L	1	0.020	0.004	U1	GES	07/12/2023 01:26	EPA 200.8-1994, Rev. 5.4
Calcium	10.6	mg/L	1	0.05	0.01		GES	07/12/2023 01:26	EPA 200.8-1994, Rev. 5.4
Chromium	0.31	µg/L	1	0.30	0.07		GES	07/12/2023 01:26	EPA 200.8-1994, Rev. 5.4
Cobalt	51.5	µg/L	1	0.020	0.005		GES	07/12/2023 01:26	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	GES	07/12/2023 01:26	EPA 200.8-1994, Rev. 5.4
Lithium	0.142	mg/L	1	0.00030	0.00007		GES	07/12/2023 01:26	EPA 200.8-1994, Rev. 5.4
Magnesium	14.5	mg/L	1	0.100	0.006		GES	07/12/2023 01:26	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	07/10/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/12/2023 01:26	EPA 200.8-1994, Rev. 5.4
Potassium	4.98	mg/L	1	0.100	0.008		GES	07/12/2023 01:26	EPA 200.8-1994, Rev. 5.4
Selenium	<0.04	µg/L	1	0.50	0.04	U1	GES	07/12/2023 01:26	EPA 200.8-1994, Rev. 5.4
Sodium	20.9	mg/L	1	0.20	0.01		GES	07/12/2023 01:26	EPA 200.8-1994, Rev. 5.4
Strontium	0.0706	mg/L	1	0.00200	0.00005		GES	07/12/2023 01:26	EPA 200.8-1994, Rev. 5.4
Thallium	0.03	µg/L	1	0.20	0.02	J1	GES	07/12/2023 01:26	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	0.68	pCi/L	0.17	0.24		TTP	07/07/2023 13:34	SW-846 9315-1986, Rev. 0
Carrier Recovery	88.5	%						
Radium-228	0.93	pCi/L	0.14	0.45		ST	07/10/2023 16:11	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	87.0	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

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Groveport, OH 43125
Phone: 614-836-4221
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Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-13
Customer Description: TG-32
Lab Number: 231985-006-01
Preparation: Dissolved
Date Collected: 06/26/2023 08:28 EDT
Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.008	µg/L	1	0.100	0.008	U1	GES	07/12/2023 01:31	EPA 200.8-1994, Rev. 5.4
Arsenic	1.18	µg/L	1	0.10	0.03		GES	07/12/2023 01:31	EPA 200.8-1994, Rev. 5.4
Barium	39.9	µg/L	1	0.20	0.05		GES	07/12/2023 01:31	EPA 200.8-1994, Rev. 5.4
Beryllium	0.193	µg/L	1	0.050	0.007		GES	07/12/2023 01:31	EPA 200.8-1994, Rev. 5.4
Cadmium	<0.004	µg/L	1	0.020	0.004	U1	GES	07/12/2023 01:31	EPA 200.8-1994, Rev. 5.4
Chromium	0.26	µg/L	1	0.30	0.07	J1	GES	07/12/2023 01:31	EPA 200.8-1994, Rev. 5.4
Cobalt	52.0	µg/L	1	0.020	0.005		GES	07/12/2023 01:31	EPA 200.8-1994, Rev. 5.4
Iron	45.0	mg/L	5	0.10	0.02		GES	07/12/2023 11:16	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	GES	07/12/2023 01:31	EPA 200.8-1994, Rev. 5.4
Lithium	0.142	mg/L	1	0.00030	0.00007		GES	07/12/2023 01:31	EPA 200.8-1994, Rev. 5.4
Manganese	0.520	mg/L	1	0.00100	0.00008		GES	07/12/2023 01:31	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	07/06/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/12/2023 01:31	EPA 200.8-1994, Rev. 5.4
Selenium	<0.04	µg/L	1	0.50	0.04	U1	GES	07/12/2023 01:31	EPA 200.8-1994, Rev. 5.4
Thallium	0.03	µg/L	1	0.20	0.02	J1	GES	07/12/2023 01:31	EPA 200.8-1994, Rev. 5.4

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Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-17
Customer Description: TG-32
Lab Number: 231985-007
Preparation:
Date Collected: 06/26/2023 12:47 EDT
Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.008	µg/L	1	0.100	0.008	J1	GES	07/12/2023 01:36	EPA 200.8-1994, Rev. 5.4
Arsenic	0.16	µg/L	1	0.10	0.03		GES	07/12/2023 01:36	EPA 200.8-1994, Rev. 5.4
Barium	112	µg/L	1	0.20	0.05		GES	07/12/2023 01:36	EPA 200.8-1994, Rev. 5.4
Beryllium	0.354	µg/L	1	0.050	0.007		GES	07/12/2023 01:36	EPA 200.8-1994, Rev. 5.4
Boron	0.032	mg/L	1	0.050	0.007	J1	GES	07/12/2023 01:36	EPA 200.8-1994, Rev. 5.4
Cadmium	0.022	µg/L	1	0.020	0.004		GES	07/12/2023 01:36	EPA 200.8-1994, Rev. 5.4
Calcium	0.23	mg/L	1	0.05	0.01		GES	07/12/2023 01:36	EPA 200.8-1994, Rev. 5.4
Chromium	0.49	µg/L	1	0.30	0.07		GES	07/12/2023 01:36	EPA 200.8-1994, Rev. 5.4
Cobalt	5.15	µg/L	1	0.020	0.005		GES	07/12/2023 01:36	EPA 200.8-1994, Rev. 5.4
Lead	0.13	µg/L	1	0.20	0.05	J1	GES	07/12/2023 01:36	EPA 200.8-1994, Rev. 5.4
Lithium	0.0106	mg/L	1	0.00030	0.00007		GES	07/12/2023 01:36	EPA 200.8-1994, Rev. 5.4
Magnesium	1.60	mg/L	1	0.100	0.006		GES	07/12/2023 01:36	EPA 200.8-1994, Rev. 5.4
Mercury	297	ng/L	4	20	7		RLP	07/10/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/12/2023 01:36	EPA 200.8-1994, Rev. 5.4
Potassium	0.384	mg/L	1	0.100	0.008		GES	07/12/2023 01:36	EPA 200.8-1994, Rev. 5.4
Selenium	0.17	µg/L	1	0.50	0.04	J1	GES	07/12/2023 01:36	EPA 200.8-1994, Rev. 5.4
Sodium	5.80	mg/L	1	0.20	0.01		GES	07/12/2023 01:36	EPA 200.8-1994, Rev. 5.4
Strontium	0.00855	mg/L	1	0.00200	0.00005		GES	07/12/2023 01:36	EPA 200.8-1994, Rev. 5.4
Thallium	<0.02	µg/L	1	0.20	0.02	U1	GES	07/12/2023 01:36	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	2.10	pCi/L	0.27	0.24		TTP	07/07/2023 13:34	SW-846 9315-1986, Rev. 0
Carrier Recovery	105	%						
Radium-228	0.80	pCi/L	0.16	0.52		ST	07/10/2023 16:11	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	80.2	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

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Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-17
Customer Description: TG-32
Lab Number: 231985-007-01
Preparation: Dissolved
Date Collected: 06/26/2023 12:47 EDT
Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.009	µg/L	1	0.100	0.008	J1	GES	07/12/2023 01:42	EPA 200.8-1994, Rev. 5.4
Arsenic	0.08	µg/L	1	0.10	0.03	J1	GES	07/12/2023 01:42	EPA 200.8-1994, Rev. 5.4
Barium	121	µg/L	1	0.20	0.05		GES	07/12/2023 01:42	EPA 200.8-1994, Rev. 5.4
Beryllium	0.369	µg/L	1	0.050	0.007		GES	07/12/2023 01:42	EPA 200.8-1994, Rev. 5.4
Cadmium	0.023	µg/L	1	0.020	0.004		GES	07/12/2023 01:42	EPA 200.8-1994, Rev. 5.4
Chromium	0.37	µg/L	1	0.30	0.07		GES	07/12/2023 01:42	EPA 200.8-1994, Rev. 5.4
Cobalt	5.50	µg/L	1	0.020	0.005		GES	07/12/2023 01:42	EPA 200.8-1994, Rev. 5.4
Iron	0.006	mg/L	1	0.020	0.003	J1	GES	07/12/2023 01:42	EPA 200.8-1994, Rev. 5.4
Lead	0.12	µg/L	1	0.20	0.05	J1	GES	07/12/2023 01:42	EPA 200.8-1994, Rev. 5.4
Lithium	0.0111	mg/L	1	0.00030	0.00007		GES	07/12/2023 01:42	EPA 200.8-1994, Rev. 5.4
Manganese	0.00528	mg/L	1	0.00100	0.00008		GES	07/12/2023 01:42	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	07/10/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/12/2023 01:42	EPA 200.8-1994, Rev. 5.4
Selenium	0.16	µg/L	1	0.50	0.04	J1	GES	07/12/2023 01:42	EPA 200.8-1994, Rev. 5.4
Thallium	<0.02	µg/L	1	0.20	0.02	U1	GES	07/12/2023 01:42	EPA 200.8-1994, Rev. 5.4

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
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Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-18
Customer Description: TG-32
Lab Number: 231985-008
Preparation:
Date Collected: 06/27/2023 08:42 EDT
Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.009	µg/L	1	0.100	0.008	J1	GES	07/12/2023 01:47	EPA 200.8-1994, Rev. 5.4
Arsenic	0.55	µg/L	1	0.10	0.03		GES	07/12/2023 01:47	EPA 200.8-1994, Rev. 5.4
Barium	89.0	µg/L	1	0.20	0.05		GES	07/12/2023 01:47	EPA 200.8-1994, Rev. 5.4
Beryllium	0.132	µg/L	1	0.050	0.007		GES	07/12/2023 01:47	EPA 200.8-1994, Rev. 5.4
Boron	0.009	mg/L	1	0.050	0.007	J1	GES	07/12/2023 01:47	EPA 200.8-1994, Rev. 5.4
Cadmium	0.013	µg/L	1	0.020	0.004	J1	GES	07/12/2023 01:47	EPA 200.8-1994, Rev. 5.4
Calcium	0.23	mg/L	1	0.05	0.01		GES	07/12/2023 01:47	EPA 200.8-1994, Rev. 5.4
Chromium	0.57	µg/L	1	0.30	0.07		GES	07/12/2023 01:47	EPA 200.8-1994, Rev. 5.4
Cobalt	0.933	µg/L	1	0.020	0.005		GES	07/12/2023 01:47	EPA 200.8-1994, Rev. 5.4
Lead	0.13	µg/L	1	0.20	0.05	J1	GES	07/12/2023 01:47	EPA 200.8-1994, Rev. 5.4
Lithium	0.0138	mg/L	1	0.00030	0.00007		GES	07/12/2023 01:47	EPA 200.8-1994, Rev. 5.4
Magnesium	0.325	mg/L	1	0.100	0.006		GES	07/12/2023 01:47	EPA 200.8-1994, Rev. 5.4
Mercury	10	ng/L	1	5	2		RLP	07/06/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/12/2023 01:47	EPA 200.8-1994, Rev. 5.4
Potassium	0.776	mg/L	1	0.100	0.008		GES	07/12/2023 01:47	EPA 200.8-1994, Rev. 5.4
Selenium	0.15	µg/L	1	0.50	0.04	J1	GES	07/12/2023 01:47	EPA 200.8-1994, Rev. 5.4
Sodium	5.51	mg/L	1	0.20	0.01		GES	07/12/2023 01:47	EPA 200.8-1994, Rev. 5.4
Strontium	0.00483	mg/L	1	0.00200	0.00005		GES	07/12/2023 01:47	EPA 200.8-1994, Rev. 5.4
Thallium	0.04	µg/L	1	0.20	0.02	J1	GES	07/12/2023 01:47	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	0.57	pCi/L	0.14	0.20		TTP	07/07/2023 13:34	SW-846 9315-1986, Rev. 0
Carrier Recovery	102	%						
Radium-228	1.96	pCi/L	0.28	0.89		ST	07/10/2023 16:11	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	69.4	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-18
Customer Description: TG-32
Lab Number: 231985-008-01
Preparation: Dissolved
Date Collected: 06/27/2023 08:42 EDT
Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.009	µg/L	1	0.100	0.008	J1	GES	07/12/2023 01:52	EPA 200.8-1994, Rev. 5.4
Arsenic	0.05	µg/L	1	0.10	0.03	J1	GES	07/12/2023 01:52	EPA 200.8-1994, Rev. 5.4
Barium	91.9	µg/L	1	0.20	0.05		GES	07/12/2023 01:52	EPA 200.8-1994, Rev. 5.4
Beryllium	0.150	µg/L	1	0.050	0.007		GES	07/12/2023 01:52	EPA 200.8-1994, Rev. 5.4
Cadmium	0.014	µg/L	1	0.020	0.004	J1	GES	07/12/2023 01:52	EPA 200.8-1994, Rev. 5.4
Chromium	0.24	µg/L	1	0.30	0.07	J1	GES	07/12/2023 01:52	EPA 200.8-1994, Rev. 5.4
Cobalt	0.966	µg/L	1	0.020	0.005		GES	07/12/2023 01:52	EPA 200.8-1994, Rev. 5.4
Iron	0.022	mg/L	1	0.020	0.003		GES	07/12/2023 01:52	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	GES	07/12/2023 01:52	EPA 200.8-1994, Rev. 5.4
Lithium	0.0149	mg/L	1	0.00030	0.00007		GES	07/12/2023 01:52	EPA 200.8-1994, Rev. 5.4
Manganese	0.00426	mg/L	1	0.00100	0.00008		GES	07/12/2023 01:52	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	07/06/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/12/2023 01:52	EPA 200.8-1994, Rev. 5.4
Selenium	0.07	µg/L	1	0.50	0.04	J1	GES	07/12/2023 01:52	EPA 200.8-1994, Rev. 5.4
Thallium	0.03	µg/L	1	0.20	0.02	J1	GES	07/12/2023 01:52	EPA 200.8-1994, Rev. 5.4

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Groveport, OH 43125
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Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-22 | Customer Description: TG-32
Lab Number: 231985-009 | Preparation:
Date Collected: 06/26/2023 09:43 EDT | Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.04	µg/L	5	0.50	0.04	U1	GES	07/12/2023 11:21	EPA 200.8-1994, Rev. 5.4
Arsenic	3.4	µg/L	5	0.5	0.2		GES	07/12/2023 11:21	EPA 200.8-1994, Rev. 5.4
Barium	13.5	µg/L	5	1.0	0.3		GES	07/12/2023 11:21	EPA 200.8-1994, Rev. 5.4
Beryllium	7.71	µg/L	5	0.25	0.04		GES	07/12/2023 11:21	EPA 200.8-1994, Rev. 5.4
Boron	0.06	mg/L	5	0.25	0.04	J1	GES	07/12/2023 11:21	EPA 200.8-1994, Rev. 5.4
Cadmium	1.09	µg/L	5	0.10	0.02		GES	07/12/2023 11:21	EPA 200.8-1994, Rev. 5.4
Calcium	15.5	mg/L	5	0.25	0.05		GES	07/12/2023 11:21	EPA 200.8-1994, Rev. 5.4
Chromium	0.7	µg/L	5	1.5	0.4	J1	GES	07/12/2023 11:21	EPA 200.8-1994, Rev. 5.4
Cobalt	109	µg/L	5	0.10	0.03		GES	07/12/2023 11:21	EPA 200.8-1994, Rev. 5.4
Lead	<0.3	µg/L	5	1.0	0.3	U1	GES	07/12/2023 11:21	EPA 200.8-1994, Rev. 5.4
Lithium	0.236	mg/L	5	0.0015	0.0004		GES	07/12/2023 11:21	EPA 200.8-1994, Rev. 5.4
Magnesium	21.4	mg/L	5	0.50	0.03		GES	07/12/2023 11:21	EPA 200.8-1994, Rev. 5.4
Mercury	29	ng/L	1	5	2		RLP	07/10/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.5	µg/L	5	2.5	0.5	U1	GES	07/12/2023 11:21	EPA 200.8-1994, Rev. 5.4
Potassium	4.55	mg/L	5	0.50	0.04		GES	07/12/2023 11:21	EPA 200.8-1994, Rev. 5.4
Selenium	7.0	µg/L	5	2.5	0.2		GES	07/12/2023 11:21	EPA 200.8-1994, Rev. 5.4
Sodium	90.8	mg/L	5	1.00	0.05		GES	07/12/2023 11:21	EPA 200.8-1994, Rev. 5.4
Strontium	0.121	mg/L	5	0.0100	0.0003		GES	07/12/2023 11:21	EPA 200.8-1994, Rev. 5.4
Thallium	0.2	µg/L	5	1.0	0.1	J1	GES	07/12/2023 11:21	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	1.51	pCi/L	0.27	0.28		TTP	07/07/2023 13:34	SW-846 9315-1986, Rev. 0
Carrier Recovery	68.9	%						
Radium-228	2.26	pCi/L	0.17	0.48		ST	07/10/2023 16:11	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	80.6	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

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Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-22
Customer Description: TG-32
Lab Number: 231985-009-01
Preparation: Dissolved
Date Collected: 06/26/2023 09:43 EDT
Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.008	µg/L	1	0.100	0.008	U1	GES	07/12/2023 02:02	EPA 200.8-1994, Rev. 5.4
Arsenic	3.44	µg/L	1	0.10	0.03		GES	07/12/2023 02:02	EPA 200.8-1994, Rev. 5.4
Barium	11.6	µg/L	1	0.20	0.05		GES	07/12/2023 02:02	EPA 200.8-1994, Rev. 5.4
Beryllium	5.90	µg/L	1	0.050	0.007		GES	07/12/2023 02:02	EPA 200.8-1994, Rev. 5.4
Cadmium	1.09	µg/L	1	0.020	0.004		GES	07/12/2023 02:02	EPA 200.8-1994, Rev. 5.4
Chromium	0.41	µg/L	1	0.30	0.07		GES	07/12/2023 02:02	EPA 200.8-1994, Rev. 5.4
Cobalt	112	µg/L	1	0.020	0.005		GES	07/12/2023 02:02	EPA 200.8-1994, Rev. 5.4
Iron	37.4	mg/L	5	0.10	0.02		GES	07/12/2023 11:26	EPA 200.8-1994, Rev. 5.4
Lead	0.15	µg/L	1	0.20	0.05	J1	GES	07/12/2023 02:02	EPA 200.8-1994, Rev. 5.4
Lithium	0.188	mg/L	1	0.00030	0.00007		GES	07/12/2023 02:02	EPA 200.8-1994, Rev. 5.4
Manganese	0.453	mg/L	1	0.00100	0.00008		GES	07/12/2023 02:02	EPA 200.8-1994, Rev. 5.4
Mercury	3	ng/L	1	5	2	J1	RLP	07/06/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/12/2023 02:02	EPA 200.8-1994, Rev. 5.4
Selenium	8.05	µg/L	1	0.50	0.04		GES	07/12/2023 02:02	EPA 200.8-1994, Rev. 5.4
Thallium	0.20	µg/L	1	0.20	0.02		GES	07/12/2023 02:02	EPA 200.8-1994, Rev. 5.4

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Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-28 | Customer Description: TG-32
Lab Number: 231985-010 | Preparation:
Date Collected: 06/26/2023 12:26 EDT | Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.015	µg/L	1	0.100	0.008	J1	GES	07/12/2023 02:07	EPA 200.8-1994, Rev. 5.4
Arsenic	0.22	µg/L	1	0.10	0.03		GES	07/12/2023 02:07	EPA 200.8-1994, Rev. 5.4
Barium	119	µg/L	1	0.20	0.05		GES	07/12/2023 02:07	EPA 200.8-1994, Rev. 5.4
Beryllium	0.562	µg/L	1	0.050	0.007		GES	07/12/2023 02:07	EPA 200.8-1994, Rev. 5.4
Boron	0.299	mg/L	1	0.050	0.007		GES	07/12/2023 02:07	EPA 200.8-1994, Rev. 5.4
Cadmium	0.054	µg/L	1	0.020	0.004		GES	07/12/2023 02:07	EPA 200.8-1994, Rev. 5.4
Calcium	1.48	mg/L	1	0.05	0.01		GES	07/12/2023 02:07	EPA 200.8-1994, Rev. 5.4
Chromium	0.47	µg/L	1	0.30	0.07		GES	07/12/2023 02:07	EPA 200.8-1994, Rev. 5.4
Cobalt	13.1	µg/L	1	0.020	0.005		GES	07/12/2023 02:07	EPA 200.8-1994, Rev. 5.4
Lead	0.11	µg/L	1	0.20	0.05	J1	GES	07/12/2023 02:07	EPA 200.8-1994, Rev. 5.4
Lithium	0.0235	mg/L	1	0.00030	0.00007		GES	07/12/2023 02:07	EPA 200.8-1994, Rev. 5.4
Magnesium	2.89	mg/L	1	0.100	0.006		GES	07/12/2023 02:07	EPA 200.8-1994, Rev. 5.4
Mercury	13	ng/L	1	5	2		RLP	07/06/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/12/2023 02:07	EPA 200.8-1994, Rev. 5.4
Potassium	0.764	mg/L	1	0.100	0.008		GES	07/12/2023 02:07	EPA 200.8-1994, Rev. 5.4
Selenium	0.21	µg/L	1	0.50	0.04	J1	GES	07/12/2023 02:07	EPA 200.8-1994, Rev. 5.4
Sodium	5.82	mg/L	1	0.20	0.01		GES	07/12/2023 02:07	EPA 200.8-1994, Rev. 5.4
Strontium	0.0204	mg/L	1	0.00200	0.00005		GES	07/12/2023 02:07	EPA 200.8-1994, Rev. 5.4
Thallium	0.03	µg/L	1	0.20	0.02	J1	GES	07/12/2023 02:07	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	2.64	pCi/L	0.31	0.19		TTP	07/07/2023 13:34	SW-846 9315-1986, Rev. 0
Carrier Recovery	90.8	%						
Radium-228	1.36	pCi/L	0.16	0.47		ST	07/12/2023 14:00	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	88.9	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-28
Customer Description: TG-32
Lab Number: 231985-010-01
Preparation: Dissolved
Date Collected: 06/26/2023 12:26 EDT
Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.008	µg/L	1	0.100	0.008	U1	GES	07/12/2023 02:12	EPA 200.8-1994, Rev. 5.4
Arsenic	0.07	µg/L	1	0.10	0.03	J1	GES	07/12/2023 02:12	EPA 200.8-1994, Rev. 5.4
Barium	117	µg/L	1	0.20	0.05		GES	07/12/2023 02:12	EPA 200.8-1994, Rev. 5.4
Beryllium	0.495	µg/L	1	0.050	0.007		GES	07/12/2023 02:12	EPA 200.8-1994, Rev. 5.4
Cadmium	0.044	µg/L	1	0.020	0.004		GES	07/12/2023 02:12	EPA 200.8-1994, Rev. 5.4
Chromium	0.36	µg/L	1	0.30	0.07		GES	07/12/2023 02:12	EPA 200.8-1994, Rev. 5.4
Cobalt	12.2	µg/L	1	0.020	0.005		GES	07/12/2023 02:12	EPA 200.8-1994, Rev. 5.4
Iron	0.010	mg/L	1	0.020	0.003	J1	GES	07/12/2023 02:12	EPA 200.8-1994, Rev. 5.4
Lead	0.08	µg/L	1	0.20	0.05	J1	GES	07/12/2023 02:12	EPA 200.8-1994, Rev. 5.4
Lithium	0.0232	mg/L	1	0.00030	0.00007		GES	07/12/2023 02:12	EPA 200.8-1994, Rev. 5.4
Manganese	0.0496	mg/L	1	0.00100	0.00008		GES	07/12/2023 02:12	EPA 200.8-1994, Rev. 5.4
Mercury	2	ng/L	1	5	2	J1	RLP	07/06/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/12/2023 02:12	EPA 200.8-1994, Rev. 5.4
Selenium	0.21	µg/L	1	0.50	0.04	J1	GES	07/12/2023 02:12	EPA 200.8-1994, Rev. 5.4
Thallium	0.02	µg/L	1	0.20	0.02	J1	GES	07/12/2023 02:12	EPA 200.8-1994, Rev. 5.4

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Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-30
Customer Description: TG-32
Lab Number: 231985-011
Preparation:
Date Collected: 06/26/2023 12:03 EDT
Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.010	µg/L	1	0.100	0.008	J1	GES	07/25/2023 20:36	EPA 200.8-1994, Rev. 5.4
Arsenic	0.21	µg/L	1	0.10	0.03		GES	07/25/2023 20:36	EPA 200.8-1994, Rev. 5.4
Barium	76.7	µg/L	1	0.20	0.05		GES	07/25/2023 20:36	EPA 200.8-1994, Rev. 5.4
Beryllium	0.086	µg/L	1	0.050	0.007		GES	07/25/2023 20:36	EPA 200.8-1994, Rev. 5.4
Boron	1.80	mg/L	1	0.050	0.007		GES	07/25/2023 20:36	EPA 200.8-1994, Rev. 5.4
Cadmium	0.008	µg/L	1	0.020	0.004	J1	GES	07/25/2023 20:36	EPA 200.8-1994, Rev. 5.4
Calcium	0.54	mg/L	1	0.05	0.01		GES	07/25/2023 20:36	EPA 200.8-1994, Rev. 5.4
Chromium	0.57	µg/L	1	0.30	0.07		GES	07/25/2023 20:36	EPA 200.8-1994, Rev. 5.4
Cobalt	3.81	µg/L	1	0.020	0.005		GES	07/25/2023 20:36	EPA 200.8-1994, Rev. 5.4
Lead	0.08	µg/L	1	0.20	0.05	J1	GES	07/25/2023 20:36	EPA 200.8-1994, Rev. 5.4
Lithium	0.00896	mg/L	1	0.00030	0.00007		GES	07/25/2023 20:36	EPA 200.8-1994, Rev. 5.4
Magnesium	1.92	mg/L	1	0.100	0.006		GES	07/25/2023 20:36	EPA 200.8-1994, Rev. 5.4
Mercury	130	ng/L	2	10	4		RLP	07/06/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/25/2023 20:36	EPA 200.8-1994, Rev. 5.4
Potassium	0.754	mg/L	1	0.100	0.008		GES	07/25/2023 20:36	EPA 200.8-1994, Rev. 5.4
Selenium	0.45	µg/L	1	0.50	0.04	J1	GES	07/25/2023 20:36	EPA 200.8-1994, Rev. 5.4
Sodium	71.8	mg/L	1	0.20	0.01		GES	07/25/2023 20:36	EPA 200.8-1994, Rev. 5.4
Strontium	0.00865	mg/L	1	0.00200	0.00005		GES	07/25/2023 20:36	EPA 200.8-1994, Rev. 5.4
Thallium	0.04	µg/L	1	0.20	0.02	J1	GES	07/25/2023 20:36	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	1.12	pCi/L	0.21	0.22		TTP	07/07/2023 13:34	SW-846 9315-1986, Rev. 0
Carrier Recovery	90.2	%						
Radium-228	0.56	pCi/L	0.15	0.48		ST	07/12/2023 14:00	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	85.8	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
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Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-30
Customer Description: TG-32
Lab Number: 231985-011-01
Preparation: Dissolved
Date Collected: 06/26/2023 12:03 EDT
Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.008	µg/L	1	0.100	0.008	J1	GES	07/25/2023 20:41	EPA 200.8-1994, Rev. 5.4
Arsenic	0.15	µg/L	1	0.10	0.03		GES	07/25/2023 20:41	EPA 200.8-1994, Rev. 5.4
Barium	61.6	µg/L	1	0.20	0.05		GES	07/25/2023 20:41	EPA 200.8-1994, Rev. 5.4
Beryllium	0.103	µg/L	1	0.050	0.007		GES	07/25/2023 20:41	EPA 200.8-1994, Rev. 5.4
Cadmium	0.009	µg/L	1	0.020	0.004	J1	GES	07/25/2023 20:41	EPA 200.8-1994, Rev. 5.4
Chromium	0.30	µg/L	1	0.30	0.07		GES	07/25/2023 20:41	EPA 200.8-1994, Rev. 5.4
Cobalt	3.83	µg/L	1	0.020	0.005		GES	07/25/2023 20:41	EPA 200.8-1994, Rev. 5.4
Iron	0.024	mg/L	1	0.020	0.003		GES	07/25/2023 20:41	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	GES	07/25/2023 20:41	EPA 200.8-1994, Rev. 5.4
Lithium	0.00897	mg/L	1	0.00030	0.00007		GES	07/25/2023 20:41	EPA 200.8-1994, Rev. 5.4
Manganese	0.0143	mg/L	1	0.00100	0.00008		GES	07/25/2023 20:41	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	07/10/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/25/2023 20:41	EPA 200.8-1994, Rev. 5.4
Selenium	0.35	µg/L	1	0.50	0.04	J1	GES	07/25/2023 20:41	EPA 200.8-1994, Rev. 5.4
Thallium	0.03	µg/L	1	0.20	0.02	J1	GES	07/25/2023 20:41	EPA 200.8-1994, Rev. 5.4

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Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-31
Customer Description: TG-32
Lab Number: 231985-012
Preparation:
Date Collected: 06/26/2023 11:01 EDT
Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.009	µg/L	1	0.100	0.008	J1	GES	07/25/2023 20:46	EPA 200.8-1994, Rev. 5.4
Arsenic	0.36	µg/L	1	0.10	0.03		GES	07/25/2023 20:46	EPA 200.8-1994, Rev. 5.4
Barium	32.9	µg/L	1	0.20	0.05		GES	07/25/2023 20:46	EPA 200.8-1994, Rev. 5.4
Beryllium	1.08	µg/L	5	0.25	0.04		GES	07/26/2023 11:44	EPA 200.8-1994, Rev. 5.4
Boron	0.025	mg/L	1	0.050	0.007	J1	GES	07/25/2023 20:46	EPA 200.8-1994, Rev. 5.4
Cadmium	0.064	µg/L	1	0.020	0.004		GES	07/25/2023 20:46	EPA 200.8-1994, Rev. 5.4
Calcium	2.69	mg/L	1	0.05	0.01		GES	07/25/2023 20:46	EPA 200.8-1994, Rev. 5.4
Chromium	0.63	µg/L	1	0.30	0.07		GES	07/25/2023 20:46	EPA 200.8-1994, Rev. 5.4
Cobalt	10.1	µg/L	1	0.020	0.005		GES	07/25/2023 20:46	EPA 200.8-1994, Rev. 5.4
Lead	0.33	µg/L	1	0.20	0.05		GES	07/25/2023 20:46	EPA 200.8-1994, Rev. 5.4
Lithium	0.0889	mg/L	5	0.0015	0.0004		GES	07/26/2023 11:44	EPA 200.8-1994, Rev. 5.4
Magnesium	3.92	mg/L	1	0.100	0.006		GES	07/25/2023 20:46	EPA 200.8-1994, Rev. 5.4
Mercury	77	ng/L	1	5	2		RLP	07/06/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/25/2023 20:46	EPA 200.8-1994, Rev. 5.4
Potassium	1.55	mg/L	1	0.100	0.008		GES	07/25/2023 20:46	EPA 200.8-1994, Rev. 5.4
Selenium	0.78	µg/L	1	0.50	0.04		GES	07/25/2023 20:46	EPA 200.8-1994, Rev. 5.4
Sodium	31.1	mg/L	1	0.20	0.01		GES	07/25/2023 20:46	EPA 200.8-1994, Rev. 5.4
Strontium	0.0389	mg/L	1	0.00200	0.00005		GES	07/25/2023 20:46	EPA 200.8-1994, Rev. 5.4
Thallium	0.09	µg/L	1	0.20	0.02	J1	GES	07/25/2023 20:46	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	2.21	pCi/L	0.29	0.26		TTP	07/07/2023 13:34	SW-846 9315-1986, Rev. 0
Carrier Recovery	90.9	%						
Radium-228	2.08	pCi/L	0.16	0.44		ST	07/12/2023 14:00	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	82.6	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

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Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-31
Customer Description: TG-32
Lab Number: 231985-012-01
Preparation: Dissolved
Date Collected: 06/26/2023 11:01 EDT
Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.009	µg/L	1	0.100	0.008	J1	GES	07/25/2023 20:51	EPA 200.8-1994, Rev. 5.4
Arsenic	0.26	µg/L	1	0.10	0.03		GES	07/25/2023 20:51	EPA 200.8-1994, Rev. 5.4
Barium	31.1	µg/L	1	0.20	0.05		GES	07/25/2023 20:51	EPA 200.8-1994, Rev. 5.4
Beryllium	1.06	µg/L	5	0.25	0.04		GES	07/26/2023 11:49	EPA 200.8-1994, Rev. 5.4
Cadmium	0.065	µg/L	1	0.020	0.004		GES	07/25/2023 20:51	EPA 200.8-1994, Rev. 5.4
Chromium	0.34	µg/L	1	0.30	0.07		GES	07/25/2023 20:51	EPA 200.8-1994, Rev. 5.4
Cobalt	9.88	µg/L	1	0.020	0.005		GES	07/25/2023 20:51	EPA 200.8-1994, Rev. 5.4
Iron	0.109	mg/L	1	0.020	0.003		GES	07/25/2023 20:51	EPA 200.8-1994, Rev. 5.4
Lead	0.28	µg/L	1	0.20	0.05		GES	07/25/2023 20:51	EPA 200.8-1994, Rev. 5.4
Lithium	0.0871	mg/L	5	0.0015	0.0004		GES	07/26/2023 11:49	EPA 200.8-1994, Rev. 5.4
Manganese	0.0257	mg/L	1	0.00100	0.00008		GES	07/25/2023 20:51	EPA 200.8-1994, Rev. 5.4
Mercury	7	ng/L	1	5	2		RLP	07/06/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/25/2023 20:51	EPA 200.8-1994, Rev. 5.4
Selenium	0.80	µg/L	1	0.50	0.04		GES	07/25/2023 20:51	EPA 200.8-1994, Rev. 5.4
Thallium	0.08	µg/L	1	0.20	0.02	J1	GES	07/25/2023 20:51	EPA 200.8-1994, Rev. 5.4

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Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-32
Customer Description: TG-32
Lab Number: 231985-013
Preparation:
Date Collected: 06/26/2023 09:30 EDT
Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.012	µg/L	1	0.100	0.008	J1	GES	07/25/2023 20:56	EPA 200.8-1994, Rev. 5.4
Arsenic	1.53	µg/L	1	0.10	0.03		GES	07/25/2023 20:56	EPA 200.8-1994, Rev. 5.4
Barium	23.4	µg/L	1	0.20	0.05		GES	07/25/2023 20:56	EPA 200.8-1994, Rev. 5.4
Beryllium	0.905	µg/L	1	0.050	0.007		GES	07/25/2023 20:56	EPA 200.8-1994, Rev. 5.4
Boron	0.595	mg/L	1	0.050	0.007		GES	07/25/2023 20:56	EPA 200.8-1994, Rev. 5.4
Cadmium	0.042	µg/L	1	0.020	0.004		GES	07/25/2023 20:56	EPA 200.8-1994, Rev. 5.4
Calcium	5.26	mg/L	1	0.05	0.01		GES	07/25/2023 20:56	EPA 200.8-1994, Rev. 5.4
Chromium	0.61	µg/L	1	0.30	0.07		GES	07/25/2023 20:56	EPA 200.8-1994, Rev. 5.4
Cobalt	15.9	µg/L	1	0.020	0.005		GES	07/25/2023 20:56	EPA 200.8-1994, Rev. 5.4
Lead	0.17	µg/L	1	0.20	0.05	J1	GES	07/25/2023 20:56	EPA 200.8-1994, Rev. 5.4
Lithium	0.0500	mg/L	1	0.00030	0.00007		GES	07/25/2023 20:56	EPA 200.8-1994, Rev. 5.4
Magnesium	5.74	mg/L	1	0.100	0.006		GES	07/25/2023 20:56	EPA 200.8-1994, Rev. 5.4
Mercury	760	ng/L	10	50	20		RLP	07/10/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/25/2023 20:56	EPA 200.8-1994, Rev. 5.4
Potassium	2.57	mg/L	1	0.100	0.008		GES	07/25/2023 20:56	EPA 200.8-1994, Rev. 5.4
Selenium	1.59	µg/L	1	0.50	0.04		GES	07/25/2023 20:56	EPA 200.8-1994, Rev. 5.4
Sodium	27.0	mg/L	1	0.20	0.01		GES	07/25/2023 20:56	EPA 200.8-1994, Rev. 5.4
Strontium	0.0736	mg/L	1	0.00200	0.00005		GES	07/25/2023 20:56	EPA 200.8-1994, Rev. 5.4
Thallium	0.11	µg/L	1	0.20	0.02	J1	GES	07/25/2023 20:56	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	1.41	pCi/L	0.20	0.17		TTP	07/11/2023 12:45	SW-846 9315-1986, Rev. 0
Carrier Recovery	87.4	%						
Radium-228	2.52	pCi/L	0.17	0.46		ST	07/12/2023 14:00	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	85.3	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

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Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-32
Customer Description: TG-32
Lab Number: 231985-013-01
Preparation: Dissolved
Date Collected: 06/26/2023 09:30 EDT
Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.009	µg/L	1	0.100	0.008	J1	GES	07/25/2023 21:01	EPA 200.8-1994, Rev. 5.4
Arsenic	1.29	µg/L	1	0.10	0.03		GES	07/25/2023 21:01	EPA 200.8-1994, Rev. 5.4
Barium	23.4	µg/L	1	0.20	0.05		GES	07/25/2023 21:01	EPA 200.8-1994, Rev. 5.4
Beryllium	1.08	µg/L	1	0.050	0.007		GES	07/25/2023 21:01	EPA 200.8-1994, Rev. 5.4
Cadmium	0.064	µg/L	1	0.020	0.004		GES	07/25/2023 21:01	EPA 200.8-1994, Rev. 5.4
Chromium	0.38	µg/L	1	0.30	0.07		GES	07/25/2023 21:01	EPA 200.8-1994, Rev. 5.4
Cobalt	17.1	µg/L	1	0.020	0.005		GES	07/25/2023 21:01	EPA 200.8-1994, Rev. 5.4
Iron	10.7	mg/L	1	0.020	0.003		GES	07/25/2023 21:01	EPA 200.8-1994, Rev. 5.4
Lead	0.11	µg/L	1	0.20	0.05	J1	GES	07/25/2023 21:01	EPA 200.8-1994, Rev. 5.4
Lithium	0.0527	mg/L	1	0.00030	0.00007		GES	07/25/2023 21:01	EPA 200.8-1994, Rev. 5.4
Manganese	0.0782	mg/L	1	0.00100	0.00008		GES	07/25/2023 21:01	EPA 200.8-1994, Rev. 5.4
Mercury	27	ng/L	1	5	2		RLP	07/10/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/25/2023 21:01	EPA 200.8-1994, Rev. 5.4
Selenium	1.74	µg/L	1	0.50	0.04		GES	07/25/2023 21:01	EPA 200.8-1994, Rev. 5.4
Thallium	0.10	µg/L	1	0.20	0.02	J1	GES	07/25/2023 21:01	EPA 200.8-1994, Rev. 5.4

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Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-33
Customer Description: TG-32
Lab Number: 231985-014
Preparation:
Date Collected: 06/26/2023 10:34 EDT
Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.021	µg/L	1	0.100	0.008	J1	GES	07/25/2023 21:07	EPA 200.8-1994, Rev. 5.4
Arsenic	1.08	µg/L	1	0.10	0.03		GES	07/25/2023 21:07	EPA 200.8-1994, Rev. 5.4
Barium	41.4	µg/L	1	0.20	0.05		GES	07/25/2023 21:07	EPA 200.8-1994, Rev. 5.4
Beryllium	1.48	µg/L	5	0.25	0.04		GES	07/26/2023 11:54	EPA 200.8-1994, Rev. 5.4
Boron	0.114	mg/L	1	0.050	0.007		GES	07/25/2023 21:07	EPA 200.8-1994, Rev. 5.4
Cadmium	0.056	µg/L	1	0.020	0.004		GES	07/25/2023 21:07	EPA 200.8-1994, Rev. 5.4
Calcium	1.73	mg/L	1	0.05	0.01		GES	07/25/2023 21:07	EPA 200.8-1994, Rev. 5.4
Chromium	0.39	µg/L	1	0.30	0.07		GES	07/25/2023 21:07	EPA 200.8-1994, Rev. 5.4
Cobalt	10.7	µg/L	1	0.020	0.005		GES	07/25/2023 21:07	EPA 200.8-1994, Rev. 5.4
Lead	0.48	µg/L	1	0.20	0.05		GES	07/25/2023 21:07	EPA 200.8-1994, Rev. 5.4
Lithium	0.0246	mg/L	5	0.0015	0.0004		GES	07/26/2023 11:54	EPA 200.8-1994, Rev. 5.4
Magnesium	4.05	mg/L	1	0.100	0.006		GES	07/25/2023 21:07	EPA 200.8-1994, Rev. 5.4
Mercury	5610	ng/L	100	500	200		RLP	07/10/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/25/2023 21:07	EPA 200.8-1994, Rev. 5.4
Potassium	0.271	mg/L	1	0.100	0.008		GES	07/25/2023 21:07	EPA 200.8-1994, Rev. 5.4
Selenium	4.21	µg/L	1	0.50	0.04		GES	07/25/2023 21:07	EPA 200.8-1994, Rev. 5.4
Sodium	16.8	mg/L	1	0.20	0.01		GES	07/25/2023 21:07	EPA 200.8-1994, Rev. 5.4
Strontium	0.0303	mg/L	1	0.00200	0.00005		GES	07/25/2023 21:07	EPA 200.8-1994, Rev. 5.4
Thallium	0.03	µg/L	1	0.20	0.02	J1	GES	07/25/2023 21:07	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	0.78	pCi/L	0.17	0.24		TTP	07/11/2023 12:45	SW-846 9315-1986, Rev. 0
Carrier Recovery	86.1	%						
Radium-228	1.18	pCi/L	0.16	0.48		ST	07/12/2023 14:00	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	87.7	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: AD-33
Customer Description: TG-32
Lab Number: 231985-014-01
Preparation: Dissolved
Date Collected: 06/26/2023 10:34 EDT
Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.008	µg/L	1	0.100	0.008	J1	GES	07/25/2023 21:12	EPA 200.8-1994, Rev. 5.4
Arsenic	1.07	µg/L	1	0.10	0.03		GES	07/25/2023 21:12	EPA 200.8-1994, Rev. 5.4
Barium	40.5	µg/L	1	0.20	0.05		GES	07/25/2023 21:12	EPA 200.8-1994, Rev. 5.4
Beryllium	1.17	µg/L	1	0.050	0.007		GES	07/25/2023 21:12	EPA 200.8-1994, Rev. 5.4
Cadmium	0.053	µg/L	1	0.020	0.004		GES	07/25/2023 21:12	EPA 200.8-1994, Rev. 5.4
Chromium	0.29	µg/L	1	0.30	0.07	J1	GES	07/25/2023 21:12	EPA 200.8-1994, Rev. 5.4
Cobalt	10.4	µg/L	1	0.020	0.005		GES	07/25/2023 21:12	EPA 200.8-1994, Rev. 5.4
Iron	0.014	mg/L	1	0.020	0.003	J1	GES	07/25/2023 21:12	EPA 200.8-1994, Rev. 5.4
Lead	0.26	µg/L	1	0.20	0.05		GES	07/25/2023 21:12	EPA 200.8-1994, Rev. 5.4
Lithium	0.0202	mg/L	1	0.00030	0.00007		GES	07/25/2023 21:12	EPA 200.8-1994, Rev. 5.4
Manganese	0.00629	mg/L	1	0.00100	0.00008		GES	07/25/2023 21:12	EPA 200.8-1994, Rev. 5.4
Mercury	670	ng/L	10	50	20		RLP	07/10/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/25/2023 21:12	EPA 200.8-1994, Rev. 5.4
Selenium	4.09	µg/L	1	0.50	0.04		GES	07/25/2023 21:12	EPA 200.8-1994, Rev. 5.4
Thallium	0.03	µg/L	1	0.20	0.02	J1	GES	07/25/2023 21:12	EPA 200.8-1994, Rev. 5.4

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: Duplicate - 1
Customer Description: TG-32
Lab Number: 231985-015
Preparation:
Date Collected: 06/26/2023 13:00 EDT
Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.008	µg/L	1	0.100	0.008	U1	GES	07/25/2023 21:17	EPA 200.8-1994, Rev. 5.4
Arsenic	1.55	µg/L	1	0.10	0.03		GES	07/25/2023 21:17	EPA 200.8-1994, Rev. 5.4
Barium	39.1	µg/L	1	0.20	0.05		GES	07/25/2023 21:17	EPA 200.8-1994, Rev. 5.4
Beryllium	0.223	µg/L	1	0.050	0.007		GES	07/25/2023 21:17	EPA 200.8-1994, Rev. 5.4
Boron	0.069	mg/L	1	0.050	0.007		GES	07/25/2023 21:17	EPA 200.8-1994, Rev. 5.4
Cadmium	<0.004	µg/L	1	0.020	0.004	U1	GES	07/25/2023 21:17	EPA 200.8-1994, Rev. 5.4
Calcium	10.5	mg/L	1	0.05	0.01		GES	07/25/2023 21:17	EPA 200.8-1994, Rev. 5.4
Chromium	0.29	µg/L	1	0.30	0.07	J1	GES	07/25/2023 21:17	EPA 200.8-1994, Rev. 5.4
Cobalt	53.7	µg/L	1	0.020	0.005		GES	07/25/2023 21:17	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	GES	07/25/2023 21:17	EPA 200.8-1994, Rev. 5.4
Lithium	0.141	mg/L	1	0.00030	0.00007		GES	07/25/2023 21:17	EPA 200.8-1994, Rev. 5.4
Magnesium	14.9	mg/L	1	0.100	0.006		GES	07/25/2023 21:17	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	07/06/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/25/2023 21:17	EPA 200.8-1994, Rev. 5.4
Potassium	4.98	mg/L	1	0.100	0.008		GES	07/25/2023 21:17	EPA 200.8-1994, Rev. 5.4
Selenium	<0.04	µg/L	1	0.50	0.04	U1	GES	07/25/2023 21:17	EPA 200.8-1994, Rev. 5.4
Sodium	21.3	mg/L	1	0.20	0.01		GES	07/25/2023 21:17	EPA 200.8-1994, Rev. 5.4
Strontium	0.0691	mg/L	1	0.00200	0.00005		GES	07/25/2023 21:17	EPA 200.8-1994, Rev. 5.4
Thallium	0.03	µg/L	1	0.20	0.02	J1	GES	07/25/2023 21:17	EPA 200.8-1994, Rev. 5.4

Dolan Chemical Laboratory
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Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: Duplicate - 1
Customer Description: TG-32
Lab Number: 231985-015-01
Preparation: Dissolved
Date Collected: 06/26/2023 13:00 EDT
Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.008	µg/L	1	0.100	0.008	U1	GES	07/25/2023 21:22	EPA 200.8-1994, Rev. 5.4
Arsenic	1.17	µg/L	1	0.10	0.03		GES	07/25/2023 21:22	EPA 200.8-1994, Rev. 5.4
Barium	39.6	µg/L	1	0.20	0.05		GES	07/25/2023 21:22	EPA 200.8-1994, Rev. 5.4
Beryllium	0.210	µg/L	1	0.050	0.007		GES	07/25/2023 21:22	EPA 200.8-1994, Rev. 5.4
Cadmium	<0.004	µg/L	1	0.020	0.004	U1	GES	07/25/2023 21:22	EPA 200.8-1994, Rev. 5.4
Chromium	0.28	µg/L	1	0.30	0.07	J1	GES	07/25/2023 21:22	EPA 200.8-1994, Rev. 5.4
Cobalt	53.1	µg/L	1	0.020	0.005		GES	07/25/2023 21:22	EPA 200.8-1994, Rev. 5.4
Iron	43.0	mg/L	5	0.10	0.02		GES	07/26/2023 12:04	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	GES	07/25/2023 21:22	EPA 200.8-1994, Rev. 5.4
Lithium	0.141	mg/L	1	0.00030	0.00007		GES	07/25/2023 21:22	EPA 200.8-1994, Rev. 5.4
Manganese	0.520	mg/L	1	0.00100	0.00008		GES	07/25/2023 21:22	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	07/06/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/25/2023 21:22	EPA 200.8-1994, Rev. 5.4
Selenium	<0.04	µg/L	1	0.50	0.04	U1	GES	07/25/2023 21:22	EPA 200.8-1994, Rev. 5.4
Thallium	0.02	µg/L	1	0.20	0.02	J1	GES	07/25/2023 21:22	EPA 200.8-1994, Rev. 5.4

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: Equipment Blank
Customer Description: TG-32
Lab Number: 231985-016
Preparation:
Date Collected: 06/26/2023 09:40 EDT
Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.008	µg/L	1	0.100	0.008	U1	GES	07/25/2023 21:27	EPA 200.8-1994, Rev. 5.4
Arsenic	<0.03	µg/L	1	0.10	0.03	U1	GES	07/25/2023 21:27	EPA 200.8-1994, Rev. 5.4
Barium	<0.05	µg/L	1	0.20	0.05	U1	GES	07/25/2023 21:27	EPA 200.8-1994, Rev. 5.4
Beryllium	0.027	µg/L	1	0.050	0.007	J1	GES	07/25/2023 21:27	EPA 200.8-1994, Rev. 5.4
Boron	<0.007	mg/L	1	0.050	0.007	U1	GES	07/25/2023 21:27	EPA 200.8-1994, Rev. 5.4
Cadmium	<0.004	µg/L	1	0.020	0.004	U1	GES	07/25/2023 21:27	EPA 200.8-1994, Rev. 5.4
Calcium	<0.01	mg/L	1	0.05	0.01	U1	GES	07/25/2023 21:27	EPA 200.8-1994, Rev. 5.4
Chromium	0.32	µg/L	1	0.30	0.07		GES	07/25/2023 21:27	EPA 200.8-1994, Rev. 5.4
Cobalt	0.037	µg/L	1	0.020	0.005		GES	07/25/2023 21:27	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	GES	07/25/2023 21:27	EPA 200.8-1994, Rev. 5.4
Lithium	<0.00007	mg/L	1	0.00030	0.00007	U1	GES	07/25/2023 21:27	EPA 200.8-1994, Rev. 5.4
Magnesium	<0.006	mg/L	1	0.100	0.006	U1	GES	07/25/2023 21:27	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	07/10/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/25/2023 21:27	EPA 200.8-1994, Rev. 5.4
Potassium	<0.008	mg/L	1	0.100	0.008	U1	GES	07/25/2023 21:27	EPA 200.8-1994, Rev. 5.4
Selenium	<0.04	µg/L	1	0.50	0.04	U1	GES	07/25/2023 21:27	EPA 200.8-1994, Rev. 5.4
Sodium	<0.01	mg/L	1	0.20	0.01	U1	GES	07/25/2023 21:27	EPA 200.8-1994, Rev. 5.4
Strontium	<0.00005	mg/L	1	0.00200	0.00005	U1	GES	07/25/2023 21:27	EPA 200.8-1994, Rev. 5.4
Thallium	<0.02	µg/L	1	0.20	0.02	U1	GES	07/25/2023 21:27	EPA 200.8-1994, Rev. 5.4

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Customer Sample ID: Field Blank
Customer Description: TG-32
Lab Number: 231985-017
Preparation:
Date Collected: 06/26/2023 12:25 EDT
Date Received: 06/30/2023 11:30 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.008	µg/L	1	0.100	0.008	U1	GES	07/25/2023 21:32	EPA 200.8-1994, Rev. 5.4
Arsenic	<0.03	µg/L	1	0.10	0.03	U1	GES	07/25/2023 21:32	EPA 200.8-1994, Rev. 5.4
Barium	<0.05	µg/L	1	0.20	0.05	U1	GES	07/25/2023 21:32	EPA 200.8-1994, Rev. 5.4
Beryllium	0.015	µg/L	1	0.050	0.007	J1	GES	07/25/2023 21:32	EPA 200.8-1994, Rev. 5.4
Boron	<0.007	mg/L	1	0.050	0.007	U1	GES	07/25/2023 21:32	EPA 200.8-1994, Rev. 5.4
Cadmium	<0.004	µg/L	1	0.020	0.004	U1	GES	07/25/2023 21:32	EPA 200.8-1994, Rev. 5.4
Calcium	<0.01	mg/L	1	0.05	0.01	U1	GES	07/25/2023 21:32	EPA 200.8-1994, Rev. 5.4
Chromium	0.53	µg/L	1	0.30	0.07		GES	07/25/2023 21:32	EPA 200.8-1994, Rev. 5.4
Cobalt	0.036	µg/L	1	0.020	0.005		GES	07/25/2023 21:32	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	GES	07/25/2023 21:32	EPA 200.8-1994, Rev. 5.4
Lithium	<0.00007	mg/L	1	0.00030	0.00007	U1	GES	07/25/2023 21:32	EPA 200.8-1994, Rev. 5.4
Magnesium	<0.006	mg/L	1	0.100	0.006	U1	GES	07/25/2023 21:32	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	07/10/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	07/25/2023 21:32	EPA 200.8-1994, Rev. 5.4
Potassium	<0.008	mg/L	1	0.100	0.008	U1	GES	07/25/2023 21:32	EPA 200.8-1994, Rev. 5.4
Selenium	<0.04	µg/L	1	0.50	0.04	U1	GES	07/25/2023 21:32	EPA 200.8-1994, Rev. 5.4
Sodium	<0.01	mg/L	1	0.20	0.01	U1	GES	07/25/2023 21:32	EPA 200.8-1994, Rev. 5.4
Strontium	<0.00005	mg/L	1	0.00200	0.00005	U1	GES	07/25/2023 21:32	EPA 200.8-1994, Rev. 5.4
Thallium	<0.02	µg/L	1	0.20	0.02	U1	GES	07/25/2023 21:32	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	0.20	pCi/L	0.08	0.19		TTP	07/11/2023 12:45	SW-846 9315-1986, Rev. 0
Carrier Recovery	87.8	%						
Radium-228	-0.02	pCi/L	0.13	0.46		ST	07/12/2023 14:00	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	89.6	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

231985
Job Comments:

Report originally issued 8/4/23. Report reissued 10/29/23 to correct rounding errors on report and EDD.

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

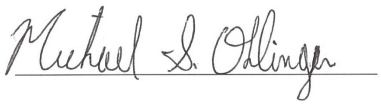
Water Analysis Report

Reissued

Job ID: 231985 **Customer: Pirkey Power Station** **Date Reported: 10/29/2023**

Report Verification

This report and the above data have been confirmed by the following analyst.



Michael Ohlinger, Chemist
Email: msohlinger@aep.com
Phone: 614-836-4184
Audinet: 8-210-4184

Data Qualifer Legend

J1 - Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
U1 - Not detected at or above method detection limit (MDL).

Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

Dolan Chemical Laboratory (DCL)
4001 Bixby Road
Groveport, Ohio 43125
Contacts: Michael Ohlinger (614-836-4184)
Dave Conover (614-836-4219)

Project Name: Pirkey PP CCR
Contact Name: Leslie Fuerschbach
Contact Phone: 318-673-2744
Sampler(s): Matt Hamilton Kenny McDonald

Analysis Turnaround Time (in Calendar Days)
(•) Routine (28 days for Monitoring Wells)

Site Contact: | Date:

For Lab Use Only:
COC/Order #: 231985

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	250 mL bottle, pH<2, HNO_3 — Sb, As, B, Ba, Be, Ca, Cd, Cr, Co, K, Li, Mg, Mo, Na, Pb, Se, Sr, Tl	Field-filter 250 mL bottle, then pH<2, HNO_3 — Dissolved Sb, As, Ba, Be, Cd, Cr, Co, Fe, Li, Mn, Mo, Pb, Se, Tl	Three (six every 10th*) 1 L bottles, pH<2, HNO3 — Ra-226, Ra-228	250 mL Glass bottle, HCL**, pH<2 — Mercury	250 mL Glass bottle, HCL**, pH<2 — Dissolved Mercury			Sample Specific Notes:
AD-2	6/26/2023	1042	G	GW	7		X	X	X	X	X			
AD-3	6/27/2023	1101	G	GW	7		X	X	X	X	X			
AD-4	6/27/2023	1110	G	GW	7		X	X	X	X	X			
AD-7	6/27/2023	951	G	GW	7		X	X	X	X	X			
AD-12	6/26/2023	755	G	GW	7		X	X	X	X	X			
AD-13	6/26/2023	728	G	GW	10		X	X	X	X	X			
AD-17	6/26/2023	1147	G	GW	7		X	X	X	X	X			
AD-18	6/27/2023	742	G	GW	7		X	X	X	X	X			
AD-22	6/26/2023	843	G	GW	7		X	X	X	X	X			
AD-28	6/26/2023	1126	G	GW	7		X	X	X	X	X			
AD-30	6/26/2023	1103	G	GW	7		X	X	X	X	X			
AD-31	6/26/2023	1001	G	GW	7		X	X	X	X	X			
Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____; F= filter in field							**4**	**F4**	**4**	**2**	**F2**			

** Six 1L Bottles must be collected for Radium for every 10th sample.*

Special Instructions/QC Requirements & Comments:

TG-32 needed

Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
[signature]	Eng	6-28-23 1600		
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: Michael Ohlinger	Date/Time: 6/30/23 11:30Am

Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

Dolan Chemical Laboratory (DCL)
4001 Bixby Road
Groveport, Ohio 43125
Contacts: Michael Ohlinger (614-836-4184)
Dave Conover (614-836-4219)

Project Name: Pirkey PP CCR
Contact Name: Leslie Fuerschbach
Contact Phone: 318-673-2744
Sampler(s): Matt Hamilton Kenny McDonald

Analysis Turnaround Time (in Calendar Days)
◉ Routine (28 days for Monitoring Wells)

Site Contact:

Date:

For Lab Use Only:
COC/Order #:

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	250 mL bottle, pH<2, HNO_3 Sb, As, B, Ba, Be, Ca Cd, Cr, Co, K, Li, Mg, Mo, Na, Pb, Se, Sr, Tl	Field-filter 250 mL bottle, then pH<2, HNO_3 Dissolved Sb, As, Ba, Be, Cd, Cr, Co, Fe, Li, Mn, Mo, Pb, Se, Tl	Three (six every 10th*) 1 L bottles, pH<2, HNO3 Ra-226, Ra-228	250 mL Glass bottle, HCL**, pH<2 Mercury	250 mL Glass bottle, HCL**, pH<2 Dissolved Mercury			Sample Specific Notes:
AD-32	6/26/2023	830	G	GW	7		X	X	X	X	X			
AD-33	6/23/2023	934	G	GW	7		X	X	X	X	X			
Duplicate - 1	6/26/2023	1200	G	GW	4		X	X		X	X			
Equipment Blank	6/26/2023	840	G	GW	2		X			X				
Field Blank	6/26/2023	1125	G	GW	5		X		X	X				
Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____; F= filter in field							4	F4	4	2	F2			

* *Six 1L Bottles must be collected for Radium for every 10th sample.*

Special Instructions/QC Requirements & Comments:

TG-32 needed

Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
[signature]	Eqk	6-26-23 16:00		
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Date/Time:
			Michael Ohlinger	6/30/23 11:30 AM

AEP WATER & WASTE SAMPLE RECEIPT FORM

Package Type	Delivery Type
(Cooler) Box Bag Envelope	PONY UPS (FedEX) USPS
	Other _____

Plant/Customer Pickry **Number of Plastic Containers:** 81

Opened By WCG / MGK 6/20/23 **Number of Glass Containers:** 32

Date/Time 6/20/23 11:30 AM **Number of Mercury Containers:** -

Were all temperatures within 0-6°C? Y / N or (N/A) **Initial:** _____ on ice / (no ice)

(IR Gun Ser# 2213689000, *Expir.* 03/24/2024) - If No, specify each deviation: _____

Was container in good condition? (Y) / N Comments _____

Was Chain of Custody received? (Y) / N Comments _____

Requested turnaround: Routine If **RUSH**, who was notified? _____

pH (15 min)	Cr^{+6} (pres) (24 hr)	NO_2 or NO_3 (48 hr)	*ortho*-PO_4 (48 hr)	Hg-diss (pres) (48 hr)

Was COC filled out properly? (Y) / N Comments _____

Were samples labeled properly? (Y) / N Comments _____

Were correct containers used? (Y) / N Comments _____

Was pH checked & Color Coding done? (Y) / N or N/A **Initial & Date:** MGK WCG 6/20/23

pH paper (circle one): MQuant,PN1.09535.0001,LOT#_____ [OR] Lab Rat,PN4801,LOT# X000RWDG21 Exp 11/15/2024

- Was Add'l Preservative needed? Y / (N) If Yes: By whom & when: _____ (See Prep Book)

Is sample filtration requested? Y / (N) Comments _____ (See Prep Book)

Was the customer contacted? If Yes: Person Contacted: _____

Lab ID# 231985 Initial & Date & Time : _____

Comments: _____

Logged by MSO _____

_____

Reviewed by WCG _____

_____

REMINDER: Document the pertinent sample integrity information and deviations in sample receipt (as noted above) in the "Notes" field in the LIMS to be included on the report to the customer.

Municipal Solid Waste Laboratory Review Checklist

This data package consists of:

- [x] This signature page, and the laboratory review checklist consisting of Table 1, Reportable Data (which includes the reportable data identified on this page), Table 2, Supporting Data, and Table 3, Exception Reports.
- [x] R1 Field chain-of-custody documentation
- [x] R2 Sample identification cross-reference
- [x] R3 Test reports (analytical data sheets) for each environmental sample that includes:
  - (a) Items specified in NELAC Chapter 5 for reporting results, e.g., Section 5.5.10 in 2003 NELAC Standard
  - (b) Dilution factors
  - (c) Preparation methods
  - (d) Cleanup methods
  - (e) If required for the project, tentatively identified compounds (TICs)
- [NA] R4 Surrogate recovery data including:
  - (a) Calculated recovery (%R)
  - (b) The laboratory's surrogate QC limits
- [x] R5 Test reports/summary forms for blank samples
- [x] R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  - (a) LCS spiking amounts
  - (b) Calculated %R for each analyte
  - (c) The laboratory's LCS QC limits
- [x] R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  - (a) Samples associated with the MS/MSD clearly identified
  - (b) MS/MSD spiking amounts
  - (c) Concentration of each MS/MSD analyte measured in the parent and spiked samples
  - (d) Calculated %Rs and relative percent differences (RPDs)
  - (e) The laboratory's MS/MSD QC limits
- [x] R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  - (a) The amount of analyte measured in the duplicate
  - (b) The calculated RPD
  - (c) The laboratory's QC limits for analytical duplicates
- [x] R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix
- [x] R10 Other problems or anomalies
- [x] The Exception Report for every item for which the result is "No" or "NR" (Not Reviewed)

Release Statement: I am responsible for the release of this laboratory data package. This data package as been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Check, if applicable: (●) This laboratory is an in-house laboratory controlled by the person responding to rule. The official signing the cover page of the rule-required report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Tamisha Palmer	Tamisha T. Palmer	Chemical Laboratory Technician, Prin	07/11/2023
Name (printed)	Signature	Official Title	Date

Radium Laboratory Review Checklist

Table 1. Reportable Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey Power

Reviewer Name: Tamisha Palmer

LRC Date: 07/011/2023

Laboratory Job Number: 231985

Prep Batch Number(s): PB23070304

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
R1	O, I	**Chain-of-custody (COC)**		
	I	Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	Yes	
	I	Were all departures from standard conditions described in an exception report?	Yes	
R2	O, I	**Sample and quality control (QC) identification**		
	I	Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	Yes	
	I	Are all laboratory ID numbers cross-referenced to the corresponding QC data?	Yes	
R3	O, I	**Test reports**		
	I	Were all samples prepared and analyzed within holding times?	Yes	
	I	Other than those results < MQL, were all other raw values bracketed by calibration standards?	NA	
	I	Were calculations checked by a peer or supervisor?	Yes	
	I	Were all analyte identifications checked by a peer or supervisor?	Yes	
	I	Were sample quantitation limits reported for all analytes not detected?	Yes	
	I	Were all results for soil and sediment samples reported on a dry weight basis?	NA	
	I	Was % moisture (or solids) reported for all soil and sediment samples?	NA	
	I	If required for the project, TICs reported?	NA	
R4	O	**Surrogate recovery data**		
	I	Were surrogates added prior to extraction?	NA	
	I	Were surrogate percent recoveries in all samples within the laboratory QC limits?	NA	
R5	O, I	**Test reports/summary forms for blank samples**		
	I	Were appropriate type(s) of blanks analyzed?	Yes	
	I	Were blanks analyzed at the appropriate frequency?	Yes	

Radium Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
	I	Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	Yes	
	I	Were blank concentrations < MQL?	Yes	
R6	O, I	**Laboratory control samples (LCS):**		
	I	Were all COCs included in the LCS?	Yes	
	I	Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	Yes	
	I	Were LCSs analyzed at the required frequency?	Yes	
	I	Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	Yes	
	I	Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	Yes	
	I	Was the LCSD RPD within QC limits?	Yes	
R7	O, I	**Matrix spike (MS) and matrix spike duplicate (MSD) data**		
	I	Were the project/method specified analytes included in the MS and MSD?	Yes	
	I	Were MS/MSD analyzed at the appropriate frequency?	Yes	
	I	Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	Yes	
	I	Were MS/MSD RPDs within laboratory QC limits?	No	ER1
R8	O, I	**Analytical duplicate data**		
	I	Were appropriate analytical duplicates analyzed for each matrix?	NA	
	I	Were analytical duplicates analyzed at the appropriate frequency?	NA	
	I	Were RPDs or relative standard deviations within the laboratory QC limits?	NA	
R9	O, I	**Method quantitation limits (MQLs):**		
	I	Are the MQLs for each method analyte included in the laboratory data package?	Yes	
	I	Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	Yes	
	I	Are unadjusted MQLs included in the laboratory data package?	Yes	
R10	O, I	**Other problems/anomalies**		
	I	Are all known problems/anomalies/special conditions noted in this LRC and ER?	Yes	
	I	Were all necessary corrective actions performed for the reported data?	Yes	
	I	Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	Yes	

Radium Laboratory Review Checklist

Table 2. Supporting Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey Power

Reviewer Name: Tamisha Palmer

LRC Date: 07/011/2023

Laboratory Job Number: 231985

Prep Batch Number(s): PB23070304

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S1	O, I	**Initial calibration (ICAL)**		
	I	Were response factors and/or relative response factors for each analyte within QC limits?	NA	
	I	Were percent RSDs or correlation coefficient criteria met?	Yes	
	I	Was the number of standards recommended in the method used for all analytes?	Yes	
	I	Were all points generated between the lowest and highest standard used to calculate the curve?	NA	
	I	Are ICAL data available for all instruments used?	Yes	
	I	Has the initial calibration curve been verified using an appropriate second source standard?	Yes	
S2	O, I	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB):**		
	I	Was the CCV analyzed at the method-required frequency?	NA	
	I	Were percent differences for each analyte within the method-required QC limits?	NA	
	I	Was the ICAL curve verified for each analyte?	NA	
	I	Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	NA	
S3	O	**Mass spectral tuning:**		
	I	Was the appropriate compound for the method used for tuning?	NA	
	I	Were ion abundance data within the method-required QC limits?	NA	
S4	O	**Internal standards (IS):**		
	I	Were IS area counts and retention times within the method-required QC limits?	NA	
S5	O, I	**Raw data (NELAC section 1 appendix A glossary, and section 5.)**		
	I	Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	Yes	
	I	Were data associated with manual integrations flagged on the raw data?	NA	

Radium Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S6	O	**Dual column confirmation**		
	I	Did dual column confirmation results meet the method-required QC?	NA	
S7	O	**Tentatively identified compounds (TICs):**		
	I	If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?	NA	
S8	I	**Interference Check Sample (ICS) results:**		
	I	Were percent recoveries within method QC limits?	NA	
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**		
	I	Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	NA	
S10	O, I	**Method detection limit (MDL) studies**		
	I	Was a MDL study performed for each reported analyte?	Yes	
	I	Is the MDL either adjusted or supported by the analysis of DCSs?	Yes	
S11	O, I	**Proficiency test reports:**		
	I	Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	Yes	
S12	O, I	**Standards documentation**		
	I	Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	Yes	
S13	O, I	**Compound/analyte identification procedures**		
	I	Are the procedures for compound/analyte identification documented?	Yes	
S14	O, I	**Demonstration of analyst competency (DOC)**		
	I	Was DOC conducted consistent with NELAC Chapter 5C?	Yes	
	I	Is documentation of the analyst's competency up-to-date and on file?	Yes	
S15	O, I	**Verification/validation documentation for methods (NELAC Chap 5n 5)**		
	I	Are all the methods used to generate the data documented, verified, and validated, where applicable?	Yes	
S16	O, I	**Laboratory standard operating procedures (SOPs):**		
	I	Are laboratory SOPs current and on file for each method performed?	Yes	

Radium Laboratory Review Checklist

Table 3. Exception Reports.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey Power

Reviewer Name: Tamisha Palmer

LRC Date: 07/011/2023

Laboratory Job Number: 231985

Prep Batch Number(s): PB23070304

Exception Report No.	Description
ER1	The precision between the MS and MSD was not within 25%

[1] Items identified by the letter "R" must be available as a hard copy or as a .pdf file. Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.

[2] O - organic analyses; I - inorganic analyses (including general chemistry constituents, when applicable).

[3] NA - Not applicable; NR - Not reviewed.

[4] Exception Report identification number; an Exception Report should be completed for an item if the result is "No" or "NR."

Municipal Solid Waste Laboratory Review Checklist

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- [x] R2 Sample identification cross-reference
- [x] R3 Test reports (analytical data sheets) for each environmental sample that includes:
  - (a) Items specified in NELAC Chapter 5 for reporting results, e.g., Section 5.5.10 in 2003 NELAC Standard
  - (b) Dilution factors
  - (c) Preparation methods
  - (d) Cleanup methods
  - (e) If required for the project, tentatively identified compounds (TICs)
- [NA] R4 Surrogate recovery data including:
  - (a) Calculated recovery (%R)
  - (b) The laboratory's surrogate QC limits
- [x] R5 Test reports/summary forms for blank samples
- [x] R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  - (a) LCS spiking amounts
  - (b) Calculated %R for each analyte
  - (c) The laboratory's LCS QC limits
- [x] R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  - (a) Samples associated with the MS/MSD clearly identified
  - (b) MS/MSD spiking amounts
  - (c) Concentration of each MS/MSD analyte measured in the parent and spiked samples
  - (d) Calculated %Rs and relative percent differences (RPDs)
  - (e) The laboratory's MS/MSD QC limits
- [x] R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  - (a) The amount of analyte measured in the duplicate
  - (b) The calculated RPD
  - (c) The laboratory's QC limits for analytical duplicates
- [x] R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix
- [x] R10 Other problems or anomalies
- [x] The Exception Report for every item for which the result is "No" or "NR" (Not Reviewed)

Release Statement: I am responsible for the release of this laboratory data package. This data package as been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Check, if applicable: (●) This laboratory is an in-house laboratory controlled by the person responding to rule. The official signing the cover page of the rule-required report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Tamisha Palmer	Tamisha T. Palmer	Chemical Technician Prin	07/13/2023
Name (printed)	Signature	Official Title	Date

Radium Laboratory Review Checklist

Table 1. Reportable Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey Power

Reviewer Name: Tamisha Palmer

LRC Date: 07/13/2023

Laboratory Job Number: 231985, 231991

Prep Batch Number(s): PB23070606

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
R1	O, I	**Chain-of-custody (COC)**		
	I	Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	Yes	
	I	Were all departures from standard conditions described in an exception report?	Yes	
R2	O, I	**Sample and quality control (QC) identification**		
	I	Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	Yes	
	I	Are all laboratory ID numbers cross-referenced to the corresponding QC data?	Yes	
R3	O, I	**Test reports**		
	I	Were all samples prepared and analyzed within holding times?	Yes	
	I	Other than those results < MQL, were all other raw values bracketed by calibration standards?	NA	
	I	Were calculations checked by a peer or supervisor?	Yes	
	I	Were all analyte identifications checked by a peer or supervisor?	Yes	
	I	Were sample quantitation limits reported for all analytes not detected?	Yes	
	I	Were all results for soil and sediment samples reported on a dry weight basis?	NA	
	I	Was % moisture (or solids) reported for all soil and sediment samples?	NA	
	I	If required for the project, TICs reported?	NA	
R4	O	**Surrogate recovery data**		
	I	Were surrogates added prior to extraction?	NA	
	I	Were surrogate percent recoveries in all samples within the laboratory QC limits?	NA	
R5	O, I	**Test reports/summary forms for blank samples**		
	I	Were appropriate type(s) of blanks analyzed?	Yes	
	I	Were blanks analyzed at the appropriate frequency?	Yes	

Radium Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
	I	Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	Yes	
	I	Were blank concentrations < MQL?	Yes	
R6	O, I	**Laboratory control samples (LCS):**		
	I	Were all COCs included in the LCS?	Yes	
	I	Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	Yes	
	I	Were LCSs analyzed at the required frequency?	Yes	
	I	Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	Yes	
	I	Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	Yes	
	I	Was the LCSD RPD within QC limits?	Yes	
R7	O, I	**Matrix spike (MS) and matrix spike duplicate (MSD) data**		
	I	Were the project/method specified analytes included in the MS and MSD?	Yes	
	I	Were MS/MSD analyzed at the appropriate frequency?	Yes	
	I	Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	Yes	
	I	Were MS/MSD RPDs within laboratory QC limits?	Yes	
R8	O, I	**Analytical duplicate data**		
	I	Were appropriate analytical duplicates analyzed for each matrix?	NA	
	I	Were analytical duplicates analyzed at the appropriate frequency?	NA	
	I	Were RPDs or relative standard deviations within the laboratory QC limits?	NA	
R9	O, I	**Method quantitation limits (MQLs):**		
	I	Are the MQLs for each method analyte included in the laboratory data package?	Yes	
	I	Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	Yes	
	I	Are unadjusted MQLs included in the laboratory data package?	Yes	
R10	O, I	**Other problems/anomalies**		
	I	Are all known problems/anomalies/special conditions noted in this LRC and ER?	Yes	
	I	Were all necessary corrective actions performed for the reported data?	Yes	
	I	Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	Yes	

Table 2. Supporting Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey Power

Reviewer Name: Tamisha Palmer

LRC Date: 07/13/2023

Laboratory Job Number: 231985, 231991

Prep Batch Number(s): PB23070606

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S1	O, I	**Initial calibration (ICAL)**		
	I	Were response factors and/or relative response factors for each analyte within QC limits?	NA	
	I	Were percent RSDs or correlation coefficient criteria met?	Yes	
	I	Was the number of standards recommended in the method used for all analytes?	Yes	
	I	Were all points generated between the lowest and highest standard used to calculate the curve?	NA	
	I	Are ICAL data available for all instruments used?	Yes	
	I	Has the initial calibration curve been verified using an appropriate second source standard?	Yes	
S2	O, I	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB):**		
	I	Was the CCV analyzed at the method-required frequency?	NA	
	I	Were percent differences for each analyte within the method-required QC limits?	NA	
	I	Was the ICAL curve verified for each analyte?	NA	
	I	Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	NA	
S3	O	**Mass spectral tuning:**		
	I	Was the appropriate compound for the method used for tuning?	NA	
	I	Were ion abundance data within the method-required QC limits?	NA	
S4	O	**Internal standards (IS):**		
	I	Were IS area counts and retention times within the method-required QC limits?	NA	
S5	O, I	**Raw data (NELAC section 1 appendix A glossary, and section 5.)**		
	I	Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	Yes	
	I	Were data associated with manual integrations flagged on the raw data?	NA	

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S6	O	**Dual column confirmation**		
	I	Did dual column confirmation results meet the method-required QC?	NA	
S7	O	**Tentatively identified compounds (TICs):**		
	I	If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?	NA	
S8	I	**Interference Check Sample (ICS) results:**		
	I	Were percent recoveries within method QC limits?	NA	
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**		
	I	Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	NA	
S10	O, I	**Method detection limit (MDL) studies**		
	I	Was a MDL study performed for each reported analyte?	Yes	
	I	Is the MDL either adjusted or supported by the analysis of DCSs?	Yes	
S11	O, I	**Proficiency test reports:**		
	I	Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	Yes	
S12	O, I	**Standards documentation**		
	I	Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	Yes	
S13	O, I	**Compound/analyte identification procedures**		
	I	Are the procedures for compound/analyte identification documented?	Yes	
S14	O, I	**Demonstration of analyst competency (DOC)**		
	I	Was DOC conducted consistent with NELAC Chapter 5C?	Yes	
	I	Is documentation of the analyst's competency up-to-date and on file?	Yes	
S15	O, I	**Verification/validation documentation for methods (NELAC Chap 5n 5)**		
	I	Are all the methods used to generate the data documented, verified, and validated, where applicable?	Yes	
S16	O, I	**Laboratory standard operating procedures (SOPs):**		
	I	Are laboratory SOPs current and on file for each method performed?	Yes	

Table 3. Exception Reports.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey Power

Reviewer Name: Tamisha Palmer

LRC Date: 07/13/2023

Laboratory Job Number: 231985, 231991

Prep Batch Number(s): PB23070606

Exception Report No.	Description

[1] Items identified by the letter "R" must be available as a hard copy or as a .pdf file. Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.

[2] O - organic analyses; I - inorganic analyses (including general chemistry constituents, when applicable).

[3] NA - Not applicable; NR - Not reviewed.

[4] Exception Report identification number; an Exception Report should be completed for an item if the result is "No" or "NR."

Municipal Solid Waste Laboratory Review Checklist

This data package consists of:

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  - (b) Dilution factors
  - (c) Preparation methods
  - (d) Cleanup methods
  - (e) If required for the project, tentatively identified compounds (TICs)
- [NA] R4 Surrogate recovery data including:
  - (a) Calculated recovery (%R)
  - (b) The laboratory's surrogate QC limits
- [x] R5 Test reports/summary forms for blank samples
- [x] R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  - (a) LCS spiking amounts
  - (b) Calculated %R for each analyte
  - (c) The laboratory's LCS QC limits
- [x] R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  - (a) Samples associated with the MS/MSD clearly identified
  - (b) MS/MSD spiking amounts
  - (c) Concentration of each MS/MSD analyte measured in the parent and spiked samples
  - (d) Calculated %Rs and relative percent differences (RPDs)
  - (e) The laboratory's MS/MSD QC limits
- [x] R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  - (a) The amount of analyte measured in the duplicate
  - (b) The calculated RPD
  - (c) The laboratory's QC limits for analytical duplicates
- [x] R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix
- [x] R10 Other problems or anomalies
- [x] The Exception Report for every item for which the result is "No" or "NR" (Not Reviewed)

Release Statement: I am responsible for the release of this laboratory data package. This data package as been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Check, if applicable: [•] This laboratory is an in-house laboratory controlled by the person responding to rule. The official signing the cover page of the rule-required report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Jonathan Barnhill		Lab Supervisor	08/03/2023
Name (printed)	Signature	Official Title	Date

ICP-MS Laboratory Review Checklist

Table 1. Reportable Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey CCR

Reviewer Name: Jonathan Barnhill

LRC Date: 08/03/2023

Laboratory Job Number: 231985

Prep Batch Number(s): PB23070502 PB23070503 QC2307072 QC2307106 QC2307184 QC2307222

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
R1	O, I	**Chain-of-custody (COC)**		
	I	Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	Yes	
	I	Were all departures from standard conditions described in an exception report?	Yes	
R2	O, I	**Sample and quality control (QC) identification**		
	I	Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	Yes	
	I	Are all laboratory ID numbers cross-referenced to the corresponding QC data?	Yes	
R3	O, I	**Test reports**		
	I	Were all samples prepared and analyzed within holding times?	YES	
	I	Other than those results < MQL, were all other raw values bracketed by calibration standards?	No	ER1
	I	Were calculations checked by a peer or supervisor?	Yes	
	I	Were all analyte identifications checked by a peer or supervisor?	Yes	
	I	Were sample quantitation limits reported for all analytes not detected?	Yes	
	I	Were all results for soil and sediment samples reported on a dry weight basis?	NA	
	I	Was % moisture (or solids) reported for all soil and sediment samples?	NA	
	I	If required for the project, TICs reported?	NA	
R4	O	**Surrogate recovery data**		
	I	Were surrogates added prior to extraction?	NA	
	I	Were surrogate percent recoveries in all samples within the laboratory QC limits?	NA	
R5	O, I	**Test reports/summary forms for blank samples**		
	I	Were appropriate type(s) of blanks analyzed?	Yes	
	I	Were blanks analyzed at the appropriate frequency?	Yes	

ICP-MS Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
	I	Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	Yes	
	I	Were blank concentrations < MQL?	Yes	
R6	O, I	**Laboratory control samples (LCS):**		
	I	Were all COCs included in the LCS?	Yes	
	I	Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	Yes	
	I	Were LCSs analyzed at the required frequency?	Yes	
	I	Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	Yes	
	I	Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	Yes	
	I	Was the LCSD RPD within QC limits?	Yes	
R7	O, I	**Matrix spike (MS) and matrix spike duplicate (MSD) data**		
	I	Were the project/method specified analytes included in the MS and MSD?	Yes	
	I	Were MS/MSD analyzed at the appropriate frequency?	Yes	
	I	Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	YES	
	I	Were MS/MSD RPDs within laboratory QC limits?	YES	
R8	O, I	**Analytical duplicate data**		
	I	Were appropriate analytical duplicates analyzed for each matrix?	Yes	
	I	Were analytical duplicates analyzed at the appropriate frequency?	Yes	
	I	Were RPDs or relative standard deviations within the laboratory QC limits?	Yes	
R9	O, I	**Method quantitation limits (MQLs):**		
	I	Are the MQLs for each method analyte included in the laboratory data package?	Yes	
	I	Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	Yes	
	I	Are unadjusted MQLs included in the laboratory data package?	Yes	
R10	O, I	**Other problems/anomalies**		
	I	Are all known problems/anomalies/special conditions noted in this LRC and ER?	Yes	
	I	Were all necessary corrective actions performed for the reported data?	Yes	
	I	Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	Yes	

ICP-MS Laboratory Review Checklist

Table 2. Supporting Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey CCR

Reviewer Name: Jonathan Barnhill

LRC Date: 08/03/2023

Laboratory Job Number: 231985

Prep Batch Number(s): PB23070502 PB23070503 QC2307072 QC2307106 QC2307184 QC2307222

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S1	O, I	**Initial calibration (ICAL)**		
	I	Were response factors and/or relative response factors for each analyte within QC limits?	NA	
	I	Were percent RSDs or correlation coefficient criteria met?	Yes	
	I	Was the number of standards recommended in the method used for all analytes?	Yes	
	I	Were all points generated between the lowest and highest standard used to calculate the curve?	Yes	
	I	Are ICAL data available for all instruments used?	Yes	
	I	Has the initial calibration curve been verified using an appropriate second source standard?	Yes	
S2	O, I	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB):**		
	I	Was the CCV analyzed at the method-required frequency?	Yes	
	I	Were percent differences for each analyte within the method-required QC limits?	Yes	
	I	Was the ICAL curve verified for each analyte?	Yes	
	I	Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	No	ER2
S3	O	**Mass spectral tuning:**		
	I	Was the appropriate compound for the method used for tuning?	Yes	
	I	Were ion abundance data within the method-required QC limits?	Yes	
S4	O	**Internal standards (IS):**		
	I	Were IS area counts and retention times within the method-required QC limits?	Yes	
S5	O, I	**Raw data (NELAC section 1 appendix A glossary, and section 5.)**		
	I	Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	Yes	
	I	Were data associated with manual integrations flagged on the raw data?	NA	

ICP-MS Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S6	O	**Dual column confirmation**		
	I	Did dual column confirmation results meet the method-required QC?	NA	
S7	O	**Tentatively identified compounds (TICs):**		
	I	If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?	NA	
S8	I	**Interference Check Sample (ICS) results:**		
	I	Were percent recoveries within method QC limits?	NA	
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**		
	I	Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	NA	
S10	O, I	**Method detection limit (MDL) studies**		
	I	Was a MDL study performed for each reported analyte?	Yes	
	I	Is the MDL either adjusted or supported by the analysis of DCSs?	Yes	
S11	O, I	**Proficiency test reports:**		
	I	Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	Yes	
S12	O, I	**Standards documentation**		
	I	Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	Yes	
S13	O, I	**Compound/analyte identification procedures**		
	I	Are the procedures for compound/analyte identification documented?	Yes	
S14	O, I	**Demonstration of analyst competency (DOC)**		
	I	Was DOC conducted consistent with NELAC Chapter 5C?	Yes	
	I	Is documentation of the analyst's competency up-to-date and on file?	Yes	
S15	O, I	**Verification/validation documentation for methods (NELAC Chap 5n 5)**		
	I	Are all the methods used to generate the data documented, verified, and validated, where applicable?	Yes	
S16	O, I	**Laboratory standard operating procedures (SOPs):**		
	I	Are laboratory SOPs current and on file for each method performed?	Yes	

Table 3. Exception Reports.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey CCR

Reviewer Name: Jonathan Barnhill

LRC Date: 08/03/2023

Laboratory Job Number: 231985

Prep Batch Number(s): PB23070502 PB23070503 QC2307072 QC2307106 QC2307184 QC2307222

Exception Report No.	Description
ER1	Linear Dynamic Range (LDR) study used to determine upper limit of analyte calibration.
ER2	CCB acceptance criteria is CCB<2.2*MDL.

[1] Items identified by the letter "R" must be available as a hard copy or as a .pdf file. Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.

[2] O - organic analyses; I - inorganic analyses (including general chemistry constituents, when applicable).

[3] NA - Not applicable; NR - Not reviewed.

[4] Exception Report identification number; an Exception Report should be completed for an item if the result is "No" or "NR."

Municipal Solid Waste Laboratory Review Checklist

This data package consists of:

- [x] This signature page, and the laboratory review checklist consisting of Table 1, Reportable Data (which includes the reportable data identified on this page), Table 2, Supporting Data, and Table 3, Exception Reports.
- [x] R1 Field chain-of-custody documentation
- [x] R2 Sample identification cross-reference
- [x] R3 Test reports (analytical data sheets) for each environmental sample that includes:
  - (a) Items specified in NELAC Chapter 5 for reporting results, e.g., Section 5.5.10 in 2003 NELAC Standard
  - (b) Dilution factors
  - (c) Preparation methods
  - (d) Cleanup methods
  - (e) If required for the project, tentatively identified compounds (TICs)
- [NA] R4 Surrogate recovery data including:
  - (a) Calculated recovery (%R)
  - (b) The laboratory's surrogate QC limits
- [x] R5 Test reports/summary forms for blank samples
- [x] R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  - (a) LCS spiking amounts
  - (b) Calculated %R for each analyte
  - (c) The laboratory's LCS QC limits
- [x] R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  - (a) Samples associated with the MS/MSD clearly identified
  - (b) MS/MSD spiking amounts
  - (c) Concentration of each MS/MSD analyte measured in the parent and spiked samples
  - (d) Calculated %Rs and relative percent differences (RPDs)
  - (e) The laboratory's MS/MSD QC limits
- [x] R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  - (a) The amount of analyte measured in the duplicate
  - (b) The calculated RPD
  - (c) The laboratory's QC limits for analytical duplicates
- [x] R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix
- [x] R10 Other problems or anomalies
- [x] The Exception Report for every item for which the result is "No" or "NR" (Not Reviewed)

Release Statement: I am responsible for the release of this laboratory data package. This data package as been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Check, if applicable: [•] This laboratory is an in-house laboratory controlled by the person responding to rule. The official signing the cover page of the rule-required report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Sunita Timsina	Timsina	Chemist Associate	07/12/2023
Name (printed)	Signature	Official Title	Date

Radium Laboratory Review Checklist

Table 1. Reportable Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey Power Station

Reviewer Name: Sunita Timsina

LRC Date: 07/12/2023

Laboratory Job Number: 231985

Prep Batch Number(s): PB23070305, PB23070306, PB23070605

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
R1	O, I	**Chain-of-custody (COC)**		
	I	Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	Yes	
	I	Were all departures from standard conditions described in an exception report?	Yes	
R2	O, I	**Sample and quality control (QC) identification**		
	I	Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	Yes	
	I	Are all laboratory ID numbers cross-referenced to the corresponding QC data?	Yes	
R3	O, I	**Test reports**		
	I	Were all samples prepared and analyzed within holding times?	Yes	
	I	Other than those results < MQL, were all other raw values bracketed by calibration standards?	NA	
	I	Were calculations checked by a peer or supervisor?	Yes	
	I	Were all analyte identifications checked by a peer or supervisor?	Yes	
	I	Were sample quantitation limits reported for all analytes not detected?	Yes	
	I	Were all results for soil and sediment samples reported on a dry weight basis?	NA	
	I	Was % moisture (or solids) reported for all soil and sediment samples?	NA	
	I	If required for the project, TICs reported?	NA	
R4	O	**Surrogate recovery data**		
	I	Were surrogates added prior to extraction?	NA	
	I	Were surrogate percent recoveries in all samples within the laboratory QC limits?	NA	
R5	O, I	**Test reports/summary forms for blank samples**		
	I	Were appropriate type(s) of blanks analyzed?	Yes	
	I	Were blanks analyzed at the appropriate frequency?	Yes	

Radium Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
	I	Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	Yes	
	I	Were blank concentrations < MQL?	Yes	
R6	O, I	**Laboratory control samples (LCS):**		
	I	Were all COCs included in the LCS?	Yes	
	I	Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	Yes	
	I	Were LCSs analyzed at the required frequency?	Yes	
	I	Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	Yes	
	I	Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	Yes	
	I	Was the LCSD RPD within QC limits?	Yes	
R7	O, I	**Matrix spike (MS) and matrix spike duplicate (MSD) data**		
	I	Were the project/method specified analytes included in the MS and MSD?	Yes	
	I	Were MS/MSD analyzed at the appropriate frequency?	Yes	
	I	Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	NA	
	I	Were MS/MSD RPDs within laboratory QC limits?	NA	
R8	O, I	**Analytical duplicate data**		
	I	Were appropriate analytical duplicates analyzed for each matrix?	Yes	
	I	Were analytical duplicates analyzed at the appropriate frequency?	Yes	
	I	Were RPDs or relative standard deviations within the laboratory QC limits?	No	ER1
R9	O, I	**Method quantitation limits (MQLs):**		
	I	Are the MQLs for each method analyte included in the laboratory data package?	Yes	
	I	Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	Yes	
	I	Are unadjusted MQLs included in the laboratory data package?	Yes	
R10	O, I	**Other problems/anomalies**		
	I	Are all known problems/anomalies/special conditions noted in this LRC and ER?	Yes	
	I	Were all necessary corrective actions performed for the reported data?	Yes	
	I	Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	Yes	

Radium Laboratory Review Checklist

Table 2. Supporting Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey Power Station

Reviewer Name: Sunita Timsina

LRC Date: 07/12/2023

Laboratory Job Number: 231985

Prep Batch Number(s): PB23070305, PB23070306, PB23070605

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S1	O, I	**Initial calibration (ICAL)**		
	I	Were response factors and/or relative response factors for each analyte within QC limits?	NA	
	I	Were percent RSDs or correlation coefficient criteria met?	Yes	
	I	Was the number of standards recommended in the method used for all analytes?	Yes	
	I	Were all points generated between the lowest and highest standard used to calculate the curve?	NA	
	I	Are ICAL data available for all instruments used?	Yes	
	I	Has the initial calibration curve been verified using an appropriate second source standard?	Yes	
S2	O, I	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB):**		
	I	Was the CCV analyzed at the method-required frequency?	NA	
	I	Were percent differences for each analyte within the method-required QC limits?	NA	
	I	Was the ICAL curve verified for each analyte?	NA	
	I	Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	NA	
S3	O	**Mass spectral tuning:**		
	I	Was the appropriate compound for the method used for tuning?	NA	
	I	Were ion abundance data within the method-required QC limits?	NA	
S4	O	**Internal standards (IS):**		
	I	Were IS area counts and retention times within the method-required QC limits?	NA	
S5	O, I	**Raw data (NELAC section 1 appendix A glossary, and section 5.)**		
	I	Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	Yes	
	I	Were data associated with manual integrations flagged on the raw data?	NA	

Radium Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S6	O	**Dual column confirmation**		
	I	Did dual column confirmation results meet the method-required QC?	NA	
S7	O	**Tentatively identified compounds (TICs):**		
	I	If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?	NA	
S8	I	**Interference Check Sample (ICS) results:**		
	I	Were percent recoveries within method QC limits?	NA	
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**		
	I	Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	NA	
S10	O, I	**Method detection limit (MDL) studies**		
	I	Was a MDL study performed for each reported analyte?	Yes	
	I	Is the MDL either adjusted or supported by the analysis of DCSs?	Yes	
S11	O, I	**Proficiency test reports:**		
	I	Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	Yes	
S12	O, I	**Standards documentation**		
	I	Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	Yes	
S13	O, I	**Compound/analyte identification procedures**		
	I	Are the procedures for compound/analyte identification documented?	Yes	
S14	O, I	**Demonstration of analyst competency (DOC)**		
	I	Was DOC conducted consistent with NELAC Chapter 5C?	Yes	
	I	Is documentation of the analyst's competency up-to-date and on file?	Yes	
S15	O, I	**Verification/validation documentation for methods (NELAC Chap 5n 5)**		
	I	Are all the methods used to generate the data documented, verified, and validated, where applicable?	Yes	
S16	O, I	**Laboratory standard operating procedures (SOPs):**		
	I	Are laboratory SOPs current and on file for each method performed?	Yes	

Table 3. Exception Reports.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey Power Station

Reviewer Name: Sunita Timsina

LRC Date: 07/12/2023

Laboratory Job Number: 231985

Prep Batch Number(s): PB23070305, PB23070306, PB23070605

Exception Report No.	Description
ER1	PB23070605, RPD between a sample and duplicate sample was above acceptance limit.

[1] Items identified by the letter "R" must be available as a hard copy or as a .pdf file. Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
[2] O - organic analyses; I - inorganic analyses (including general chemistry constituents, when applicable).
[3] NA - Not applicable; NR - Not reviewed.
[4] Exception Report identification number; an Exception Report should be completed for an item if the result is "No" or "NR."

Table 1. Reportable Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey

Reviewer Name: Susann Sulzmann

LRC Date: 07-18-2023

Laboratory Job Number: 231985

Prep Batch Number(s): PB23070601, PB23070602, PB23070701, PB23070702

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
R1	O, I	**Chain-of-custody (COC)**		
	I	Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	Yes	
	I	Were all departures from standard conditions described in an exception report?	Yes	
R2	O, I	**Sample and quality control (QC) identification**		
	I	Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	Yes	
	I	Are all laboratory ID numbers cross-referenced to the corresponding QC data?	Yes	
R3	O, I	**Test reports**		
	I	Were all samples prepared and analyzed within holding times?	yes	
	I	Other than those results < MQL, were all other raw values bracketed by calibration standards?	yes	
	I	Were calculations checked by a peer or supervisor?	Yes	
	I	Were all analyte identifications checked by a peer or supervisor?	Yes	
	I	Were sample quantitation limits reported for all analytes not detected?	Yes	
	I	Were all results for soil and sediment samples reported on a dry weight basis?	NA	
	I	Was % moisture (or solids) reported for all soil and sediment samples?	NA	
	I	If required for the project, TICs reported?	NA	
R4	O	**Surrogate recovery data**		
	I	Were surrogates added prior to extraction?	NA	
	I	Were surrogate percent recoveries in all samples within the laboratory QC limits?	NA	
R5	O, I	**Test reports/summary forms for blank samples**		
	I	Were appropriate type(s) of blanks analyzed?	Yes	
	I	Were blanks analyzed at the appropriate frequency?	Yes	

Mercury Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
	I	Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	Yes	
	I	Were blank concentrations < MQL?	yes	
R6	O, I	**Laboratory control samples (LCS):**		
	I	Were all COCs included in the LCS?	Yes	
	I	Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	Yes	
	I	Were LCSs analyzed at the required frequency?	Yes	
	I	Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?		
	I	Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	Yes	
	I	Was the LCSD RPD within QC limits?	yes	
R7	O, I	**Matrix spike (MS) and matrix spike duplicate (MSD) data**		
	I	Were the project/method specified analytes included in the MS and MSD?	Yes	
	I	Were MS/MSD analyzed at the appropriate frequency?	Yes	
	I	Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	yes	
	I	Were MS/MSD RPDs within laboratory QC limits?	yes	
R8	O, I	**Analytical duplicate data**		
	I	Were appropriate analytical duplicates analyzed for each matrix?	Yes	
	I	Were analytical duplicates analyzed at the appropriate frequency?	Yes	
	I	Were RPDs or relative standard deviations within the laboratory QC limits?	yes	
R9	O, I	**Method quantitation limits (MQLs):**		
	I	Are the MQLs for each method analyte included in the laboratory data package?	Yes	
	I	Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	Yes	
	I	Are unadjusted MQLs included in the laboratory data package?	Yes	
R10	O, I	**Other problems/anomalies**		
	I	Are all known problems/anomalies/special conditions noted in this LRC and ER?	Yes	
	I	Were all necessary corrective actions performed for the reported data?	Yes	
	I	Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	Yes	

Table 2. Supporting Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey

Reviewer Name: Susann Sulzmann

LRC Date: 07-18-2023

Laboratory Job Number: 231985

Prep Batch Number(s): PB23070601, PB23070602, PB23070701, PB23070702

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S1	O, I	**Initial calibration (ICAL)**		
	I	Were response factors and/or relative response factors for each analyte within QC limits?	NA	
	I	Were percent RSDs or correlation coefficient criteria met?	Yes	
	I	Was the number of standards recommended in the method used for all analytes?	Yes	
	I	Were all points generated between the lowest and highest standard used to calculate the curve?	yes	
	I	Are ICAL data available for all instruments used?	Yes	
	I	Has the initial calibration curve been verified using an appropriate second source standard?	Yes	
S2	O, I	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB):**		
	I	Was the CCV analyzed at the method-required frequency?	Yes	
	I	Were percent differences for each analyte within the method-required QC limits?	Yes	
	I	Was the ICAL curve verified for each analyte?	Yes	
	I	Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	No	ER1
S3	O	**Mass spectral tuning:**		
	I	Was the appropriate compound for the method used for tuning?	NA	
	I	Were ion abundance data within the method-required QC limits?	NA	
S4	O	**Internal standards (IS):**		
	I	Were IS area counts and retention times within the method-required QC limits?	NA	
S5	O, I	**Raw data (NELAC section 1 appendix A glossary, and section 5.)**		
	I	Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	Yes	
	I	Were data associated with manual integrations flagged on the raw data?	NA	

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S6	O	**Dual column confirmation**		
	I	Did dual column confirmation results meet the method-required QC?	NA	
S7	O	**Tentatively identified compounds (TICs):**		
	I	If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?	NA	
S8	I	**Interference Check Sample (ICS) results:**		
	I	Were percent recoveries within method QC limits?	NA	
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**		
	I	Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	NA	
S10	O, I	**Method detection limit (MDL) studies**		
	I	Was a MDL study performed for each reported analyte?	Yes	
	I	Is the MDL either adjusted or supported by the analysis of DCSs?	Yes	
S11	O, I	**Proficiency test reports:**		
	I	Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	Yes	
S12	O, I	**Standards documentation**		
	I	Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	Yes	
S13	O, I	**Compound/analyte identification procedures**		
	I	Are the procedures for compound/analyte identification documented?	Yes	
S14	O, I	**Demonstration of analyst competency (DOC)**		
	I	Was DOC conducted consistent with NELAC Chapter 5C?	Yes	
	I	Is documentation of the analyst's competency up-to-date and on file?	Yes	
S15	O, I	**Verification/validation documentation for methods (NELAC Chap 5n 5)**		
	I	Are all the methods used to generate the data documented, verified, and validated, where applicable?	Yes	
S16	O, I	**Laboratory standard operating procedures (SOPs):**		
	I	Are laboratory SOPs current and on file for each method performed?	Yes	

Table 3. Exception Reports.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey

Reviewer Name: Susann Sulzmann

LRC Date: 07-18-2023

Laboratory Job Number: 231985

Prep Batch Number(s): PB23070601, PB23070602, PB23070701, PB23070702

Exception Report No.	Description
ER1	CCB acceptance criteria is CCB<MQL.

[1] Items identified by the letter "R" must be available as a hard copy or as a .pdf file. Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
[2] O - organic analyses; I - inorganic analyses (including general chemistry constituents, when applicable).
[3] NA - Not applicable; NR - Not reviewed.
[4] Exception Report identification number; an Exception Report should be completed for an item if the result is "No" or "NR."

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 232660 **Customer: Pirkey Power Station** **Date Reported: 09/18/2023**

Customer Sample ID: AD-2
Customer Description: TG-32
Lab Number: 232660-001
Preparation:
Date Collected: 08/23/2023 11:03 EDT
Date Received: 08/25/2023 11:55 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.37	mg/L	2	0.10	0.02		CRJ	08/29/2023 14:22	EPA 300.1 -1997, Rev. 1.0
Chloride	30.9	mg/L	2	0.04	0.01		CRJ	08/29/2023 14:22	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.20	mg/L	2	0.06	0.02		CRJ	08/29/2023 14:22	EPA 300.1 -1997, Rev. 1.0
Sulfate	271	mg/L	10	3.0	0.6		CRJ	08/29/2023 13:49	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	08/28/2023 10:20	SM 2320B-2011
TDS, Filterable Residue	490	mg/L	1	50	20		ELT	08/28/2023 09:19	SM 2540C-2015

Customer Sample ID: AD-4
Customer Description: TG-32
Lab Number: 232660-002
Preparation:
Date Collected: 08/23/2023 08:28 EDT
Date Received: 08/25/2023 11:55 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.20	mg/L	2	0.10	0.02		CRJ	08/29/2023 16:34	EPA 300.1 -1997, Rev. 1.0
Chloride	3.88	mg/L	2	0.04	0.01		CRJ	08/29/2023 16:34	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.04	mg/L	2	0.06	0.02	J1	CRJ	08/29/2023 16:34	EPA 300.1 -1997, Rev. 1.0
Sulfate	18.5	mg/L	2	0.6	0.1		CRJ	08/29/2023 16:34	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	08/28/2023 10:20	SM 2320B-2011
TDS, Filterable Residue	130	mg/L	1	50	20		ELT	08/28/2023 09:26	SM 2540C-2015

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Job ID: 232660 **Customer: Pirkey Power Station** **Date Reported: 09/18/2023**

Customer Sample ID: AD-12
Customer Description: TG-32
Lab Number: 232660-003
Preparation:
Date Collected: 08/23/2023 09:46 EDT
Date Received: 08/25/2023 11:55 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.11	mg/L	2	0.10	0.02		CRJ	08/29/2023 15:28	EPA 300.1 -1997, Rev. 1.0
Chloride	4.74	mg/L	2	0.04	0.01		CRJ	08/29/2023 15:28	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.07	mg/L	2	0.06	0.02		CRJ	08/29/2023 15:28	EPA 300.1 -1997, Rev. 1.0
Sulfate	3.5	mg/L	2	0.6	0.1		CRJ	08/29/2023 15:28	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	08/28/2023 10:20	SM 2320B-2011
TDS, Filterable Residue	75	mg/L	1	50	20		ELT	08/28/2023 09:26	SM 2540C-2015

Customer Sample ID: AD-18
Customer Description: TG-32
Lab Number: 232660-004
Preparation:
Date Collected: 08/23/2023 10:50 EDT
Date Received: 08/25/2023 11:55 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.11	mg/L	2	0.10	0.02		CRJ	08/29/2023 16:01	EPA 300.1 -1997, Rev. 1.0
Chloride	5.02	mg/L	2	0.04	0.01		CRJ	08/29/2023 16:01	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.02	mg/L	2	0.06	0.02	J1	CRJ	08/29/2023 16:01	EPA 300.1 -1997, Rev. 1.0
Sulfate	6.9	mg/L	2	0.6	0.1		CRJ	08/29/2023 16:01	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	08/28/2023 10:20	SM 2320B-2011
TDS, Filterable Residue	88	mg/L	1	50	20		ELT	08/28/2023 09:35	SM 2540C-2015

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 232660 **Customer: Pirkey Power Station** **Date Reported: 09/18/2023**

Customer Sample ID: AD-31
Customer Description: TG-32
Lab Number: 232660-005
Preparation:
Date Collected: 08/23/2023 10:23 EDT
Date Received: 08/25/2023 11:55 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.27	mg/L	2	0.10	0.02		CRJ	08/29/2023 19:19	EPA 300.1 -1997, Rev. 1.0
Chloride	21.9	mg/L	2	0.04	0.01		CRJ	08/29/2023 19:19	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.1	mg/L	2	0.06	0.02		CRJ	08/29/2023 19:19	EPA 300.1 -1997, Rev. 1.0
Sulfate	69.4	mg/L	2	0.6	0.1		CRJ	08/29/2023 19:19	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	08/28/2023 10:20	SM 2320B-2011
TDS, Filterable Residue	240	mg/L	1	50	20		ELT	08/28/2023 09:35	SM 2540C-2015

Customer Sample ID: AD-32
Customer Description: TG-32
Lab Number: 232660-006
Preparation:
Date Collected: 08/23/2023 10:21 EDT
Date Received: 08/25/2023 11:55 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Bromide	0.75	mg/L	2	0.10	0.02		CRJ	08/29/2023 18:13	EPA 300.1 -1997, Rev. 1.0
Chloride	12.7	mg/L	2	0.04	0.01		CRJ	08/29/2023 18:13	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.07	mg/L	2	0.06	0.02		CRJ	08/29/2023 18:13	EPA 300.1 -1997, Rev. 1.0
Sulfate	73.0	mg/L	2	0.6	0.1		CRJ	08/29/2023 18:13	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	<5	mg/L	1	20	5	U1	MGK	08/28/2023 10:20	SM 2320B-2011
TDS, Filterable Residue	190	mg/L	1	50	20		ELT	08/28/2023 09:41	SM 2540C-2015

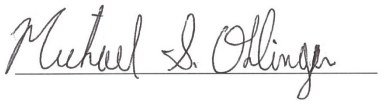
Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 232660 **Customer: Pirkey Power Station** **Date Reported: 09/18/2023**

Report Verification

This report and the above data have been confirmed by the following analyst.



Michael Ohlinger, Chemist
Email: msohlinger@aep.com
Phone: 614-836-4184
Audinet: 8-210-4184

Data Qualifer Legend

U1 - Not detected at or above method detection limit (MDL).

J1 - Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.

Chain of Custody Record

232660

Program: Coal Combustion Residuals (CCR)

Dolan Chemical Laboratory (DCL)
4001 Bixby Road
Groveport, Ohio 43125
Contacts: Michael Ohlinger (614-836-4184)
Dave Conover (614-836-4219)

Project Name: Pirkey PP EBAP
Contact Name: Leslie Fuerschbach
Contact Phone: 318-673-2744
Sampler(s): Kenny McDonald Brad Bates

Analysis Turnaround Time (In Calendar Days)
◉ Routine (28 days for Monitoring Wells)

Site Contact:

Date:

For Lab Use Only:
COC/Order #:

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	Mercury (250 mL bottle, pH<2, HNO3)	Dissolved Mercury (Field-filter 250 mL bottle, then pH<2, HNO3)	F, Cl, SO4, Br, TDS, Alkalinity (1 L bottle, Cool, 0-6C)	Ra-226, Ra-228 (Three (six every 10th*) 1 L bottles, pH<2, HNO3)				Sample Specific Notes
AD-2	8/23/2023	1003	G	GW	1				X					
AD-4	8/23/2023	728	G	GW	1				X					
AD-12	8/23/2023	846	G	GW	1				X					
AD-18	8/23/2023	950	G	GW	1				X					
AD-31	8/23/2023	923	G	GW	1				X					
AD-32	8/23/2023	921	G	GW	1				X					
Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____; F= filter in field							4	F4	1	4				

* *Six 1L Bottles must be collected for Radium for every 10th sample.*

Special Instructions/QC Requirements & Comments:

TG-32 needed

Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
[signature]	EAGLE	08/24/23 1400		
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: [signature]	Date/Time: 08/25/23 11:55 AM

WATER & WASTE SAMPLE RECEIPT FORM

Package Type: (Cooler) Box Bag Envelope

Delivery Type: PONY (UPS) FedEX USPS Other _____

Plant/Customer Pirkey PP

Number of Plastic Containers: 6

Opened By Misgina

Number of Glass Containers: _____

Date/Time 08/25/23 11:55 Am

Number of Mercury Containers: _____

Were all temperatures within 0-6°C? (Y) / N or N/A Initial: mbc (on ice) / no ice

(IR Gun Ser# 2213689000, Expir. 03/24/2024) - If No, specify each deviation: _____

Was container in good condition? (Y) / N Comments _____

Was Chain of Custody received? (Y) / N Comments _____

Requested turnaround: 21 days If **RUSH**, who was notified? _____

pH (15 min)	Cr^{+6} (pres) (24 hr)	NO_2 or NO_3 (48 hr)	*ortho*-PO_4 (48 hr)	Hg-diss (pres) (48 hr)

Was COC filled out properly? (Y) / N Comments _____

Were samples labeled properly? (Y) / N Comments _____

Were correct containers used? (Y) / N Comments _____

Was pH checked & Color Coding done? Y / (N) or N/A **Initial & Date**: mbc 08/25/23

pH paper (circle one) MQuant,PN1.09535.0001,LOT#_____ [OR] Lab Rat,PN4801,LOT# X000RWBG21 Exp 11/15/2024

- Was Add'l Preservative needed? Y / (N) If Yes: By whom & when: _____ (See Prep Book)

s sample filtration requested? Y / (N) Comments _____ (See Prep Book)

Was the customer contacted? If Yes: Person Contacted: _____

Lab ID# 232660 Initial & Date & Time _____

Comments: _____

Logged by mbc

Reviewed by WCG

REMINDER: Document the pertinent sample integrity information and deviations in sample receipt as noted above) in the "Notes" field in the LIMS to be included on the report to the customer.

Municipal Solid Waste Laboratory Review Checklist

This data package consists of:

- [x] This signature page, and the laboratory review checklist consisting of Table 1, Reportable Data (which includes the reportable data identified on this page), Table 2, Supporting Data, and Table 3, Exception Reports.
- [x] R1 Field chain-of-custody documentation
- [x] R2 Sample identification cross-reference
- [x] R3 Test reports (analytical data sheets) for each environmental sample that includes:
  - (a) Items specified in NELAC Chapter 5 for reporting results, e.g., Section 5.5.10 in 2003 NELAC Standard
  - (b) Dilution factors
  - (c) Preparation methods
  - (d) Cleanup methods
  - (e) If required for the project, tentatively identified compounds (TICs)
- [NA] R4 Surrogate recovery data including:
  - (a) Calculated recovery (%R)
  - (b) The laboratory's surrogate QC limits
- [x] R5 Test reports/summary forms for blank samples
- [x] R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  - (a) LCS spiking amounts
  - (b) Calculated %R for each analyte
  - (c) The laboratory's LCS QC limits
- [x] R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  - (a) Samples associated with the MS/MSD clearly identified
  - (b) MS/MSD spiking amounts
  - (c) Concentration of each MS/MSD analyte measured in the parent and spiked samples
  - (d) Calculated %Rs and relative percent differences (RPDs)
  - (e) The laboratory's MS/MSD QC limits
- [x] R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  - (a) The amount of analyte measured in the duplicate
  - (b) The calculated RPD
  - (c) The laboratory's QC limits for analytical duplicates
- [x] R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix
- [x] R10 Other problems or anomalies
- [x] The Exception Report for every item for which the result is "No" or "NR" (Not Reviewed)

Release Statement: I am responsible for the release of this laboratory data package. This data package as been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Check, if applicable: (●) This laboratory is an in-house laboratory controlled by the person responding to rule. The official signing the cover page of the rule-required report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Michael Ohlinger	Michael Ohlinger	Chemist	9/14/2023
Name (printed)	Signature	Official Title	Date

Alkalinity Laboratory Review Checklist

Table 1. Reportable Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey

Reviewer Name: Michael Ohlinger

LRC Date: 9/14/2023

Laboratory Job Number: 232660

Prep Batch Number(s): QC2308225

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
R1	O, I	**Chain-of-custody (COC)**		
	I	Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	Yes	
	I	Were all departures from standard conditions described in an exception report?	Yes	
R2	O, I	**Sample and quality control (QC) identification**		
	I	Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	Yes	
	I	Are all laboratory ID numbers cross-referenced to the corresponding QC data?	Yes	
R3	O, I	**Test reports**		
	I	Were all samples prepared and analyzed within holding times?	Yes	
	I	Other than those results < MQL, were all other raw values bracketed by calibration standards?	NA	
	I	Were calculations checked by a peer or supervisor?	Yes	
	I	Were all analyte identifications checked by a peer or supervisor?	Yes	
	I	Were sample quantitation limits reported for all analytes not detected?	Yes	
	I	Were all results for soil and sediment samples reported on a dry weight basis?	NA	
	I	Was % moisture (or solids) reported for all soil and sediment samples?	NA	
	I	If required for the project, TICs reported?	NA	
R4	O	**Surrogate recovery data**		
	I	Were surrogates added prior to extraction?	NA	
	I	Were surrogate percent recoveries in all samples within the laboratory QC limits?	NA	
R5	O, I	**Test reports/summary forms for blank samples**		
	I	Were appropriate type(s) of blanks analyzed?	Yes	
	I	Were blanks analyzed at the appropriate frequency?	Yes	

Alkalinity Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
	I	Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	Yes	
	I	Were blank concentrations < MQL?	Yes	
R6	O, I	**Laboratory control samples (LCS):**		
	I	Were all COCs included in the LCS?	Yes	
	I	Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	Yes	
	I	Were LCSs analyzed at the required frequency?	Yes	
	I	Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	Yes	
	I	Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	Yes	
	I	Was the LCSD RPD within QC limits?	Yes	
R7	O, I	**Matrix spike (MS) and matrix spike duplicate (MSD) data**		
	I	Were the project/method specified analytes included in the MS and MSD?	NA	
	I	Were MS/MSD analyzed at the appropriate frequency?	NA	
	I	Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	NA	
	I	Were MS/MSD RPDs within laboratory QC limits?	NA	
R8	O, I	**Analytical duplicate data**		
	I	Were appropriate analytical duplicates analyzed for each matrix?	Yes	
	I	Were analytical duplicates analyzed at the appropriate frequency?	Yes	
	I	Were RPDs or relative standard deviations within the laboratory QC limits?	Yes	
R9	O, I	**Method quantitation limits (MQLs):**		
	I	Are the MQLs for each method analyte included in the laboratory data package?	Yes	
	I	Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	Yes	
	I	Are unadjusted MQLs included in the laboratory data package?	Yes	
R10	O, I	**Other problems/anomalies**		
	I	Are all known problems/anomalies/special conditions noted in this LRC and ER?	Yes	
	I	Were all necessary corrective actions performed for the reported data?	Yes	
	I	Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	Yes	

Alkalinity Laboratory Review Checklist

Table 2. Supporting Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey

Reviewer Name: Michael Ohlinger

LRC Date: 9/14/2023

Laboratory Job Number: 232660

Prep Batch Number(s): QC2308225

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S1	O, I	**Initial calibration (ICAL)**		
	I	Were response factors and/or relative response factors for each analyte within QC limits?	NA	
	I	Were percent RSDs or correlation coefficient criteria met?	NA	
	I	Was the number of standards recommended in the method used for all analytes?	NA	
	I	Were all points generated between the lowest and highest standard used to calculate the curve?	Yes	
	I	Are ICAL data available for all instruments used?	NA	
	I	Has the initial calibration curve been verified using an appropriate second source standard?	NA	
S2	O, I	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB):**		
	I	Was the CCV analyzed at the method-required frequency?	Yes	
	I	Were percent differences for each analyte within the method-required QC limits?	Yes	
	I	Was the ICAL curve verified for each analyte?	Yes	
	I	Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	No	ER1
S3	O	**Mass spectral tuning:**		
	I	Was the appropriate compound for the method used for tuning?	NA	
	I	Were ion abundance data within the method-required QC limits?	NA	
S4	O	**Internal standards (IS):**		
	I	Were IS area counts and retention times within the method-required QC limits?	NA	
S5	O, I	**Raw data (NELAC section 1 appendix A glossary, and section 5.)**		
	I	Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	Yes	
	I	Were data associated with manual integrations flagged on the raw data?	NA	

Alkalinity Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S6	O	**Dual column confirmation**		
	I	Did dual column confirmation results meet the method-required QC?	NA	
S7	O	**Tentatively identified compounds (TICs):**		
	I	If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?	NA	
S8	I	**Interference Check Sample (ICS) results:**		
	I	Were percent recoveries within method QC limits?	NA	
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**		
	I	Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	NA	
S10	O, I	**Method detection limit (MDL) studies**		
	I	Was a MDL study performed for each reported analyte?	Yes	
	I	Is the MDL either adjusted or supported by the analysis of DCSs?	Yes	
S11	O, I	**Proficiency test reports:**		
	I	Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	Yes	
S12	O, I	**Standards documentation**		
	I	Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	Yes	
S13	O, I	**Compound/analyte identification procedures**		
	I	Are the procedures for compound/analyte identification documented?	Yes	
S14	O, I	**Demonstration of analyst competency (DOC)**		
	I	Was DOC conducted consistent with NELAC Chapter 5C?	Yes	
	I	Is documentation of the analyst's competency up-to-date and on file?	Yes	
S15	O, I	**Verification/validation documentation for methods (NELAC Chap 5n 5)**		
	I	Are all the methods used to generate the data documented, verified, and validated, where applicable?	Yes	
S16	O, I	**Laboratory standard operating procedures (SOPs):**		
	I	Are laboratory SOPs current and on file for each method performed?	Yes	

Alkalinity Laboratory Review Checklist

Table 3. Exception Reports.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey

Reviewer Name: Michael Ohlinger

LRC Date: 9/14/2023

Laboratory Job Number: 232660

Prep Batch Number(s): QC2308225

Exception Report No.	Description
ER1	CCB acceptance criteria is CCB<0.5*MQL.

[1] Items identified by the letter "R" must be available as a hard copy or as a .pdf file. Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.

[2] O - organic analyses; I - inorganic analyses (including general chemistry constituents, when applicable).

[3] NA - Not applicable; NR - Not reviewed.

[4] Exception Report identification number; an Exception Report should be completed for an item if the result is "No" or "NR."

Municipal Solid Waste Laboratory Review Checklist

This data package consists of:

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- [x] R2 Sample identification cross-reference
- [x] R3 Test reports (analytical data sheets) for each environmental sample that includes:
  - (a) Items specified in NELAC Chapter 5 for reporting results, e.g., Section 5.5.10 in 2003 NELAC Standard
  - (b) Dilution factors
  - (c) Preparation methods
  - (d) Cleanup methods
  - (e) If required for the project, tentatively identified compounds (TICs)
- [x] R4 Surrogate recovery data including:
  - (a) Calculated recovery (%R)
  - (b) The laboratory's surrogate QC limits
- [x] R5 Test reports/summary forms for blank samples
- [x] R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  - (a) LCS spiking amounts
  - (b) Calculated %R for each analyte
  - (c) The laboratory's LCS QC limits
- [x] R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  - (a) Samples associated with the MS/MSD clearly identified
  - (b) MS/MSD spiking amounts
  - (c) Concentration of each MS/MSD analyte measured in the parent and spiked samples
  - (d) Calculated %Rs and relative percent differences (RPDs)
  - (e) The laboratory's MS/MSD QC limits
- [x] R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  - (a) The amount of analyte measured in the duplicate
  - (b) The calculated RPD
  - (c) The laboratory's QC limits for analytical duplicates
- [x] R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix
- [x] R10 Other problems or anomalies
- [x] The Exception Report for every item for which the result is "No" or "NR" (Not Reviewed)

Release Statement: I am responsible for the release of this laboratory data package. This data package as been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Check, if applicable: (●) This laboratory is an in-house laboratory controlled by the person responding to rule. The official signing the cover page of the rule-required report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Tim Arnold		Chemist Principal	9/7/2023
Name (printed)	Signature	Official Title	Date

Ion Chromatography Laboratory Review Checklist

Table 1. Reportable Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey PP EBAP

Reviewer Name: Tim Arnold

LRC Date: 9/7/2023

Laboratory Job Number: 232660

Prep Batch Number(s): QC2308242

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
R1	O, I	**Chain-of-custody (COC)**		
	I	Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	Yes	
	I	Were all departures from standard conditions described in an exception report?	Yes	
R2	O, I	**Sample and quality control (QC) identification**		
	I	Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	Yes	
	I	Are all laboratory ID numbers cross-referenced to the corresponding QC data?	Yes	
R3	O, I	**Test reports**		
	I	Were all samples prepared and analyzed within holding times?	Yes	
	I	Other than those results < MQL, were all other raw values bracketed by calibration standards?	Yes	
	I	Were calculations checked by a peer or supervisor?	Yes	
	I	Were all analyte identifications checked by a peer or supervisor?	Yes	
	I	Were sample quantitation limits reported for all analytes not detected?	Yes	
	I	Were all results for soil and sediment samples reported on a dry weight basis?	NA	
	I	Was % moisture (or solids) reported for all soil and sediment samples?	NA	
	I	If required for the project, TICs reported?	NA	
R4	O	**Surrogate recovery data**		
	I	Were surrogates added prior to extraction?	Yes	
	I	Were surrogate percent recoveries in all samples within the laboratory QC limits?	Yes	
R5	O, I	**Test reports/summary forms for blank samples**		
	I	Were appropriate type(s) of blanks analyzed?	Yes	
	I	Were blanks analyzed at the appropriate frequency?	Yes	

Ion Chromatography Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
	I	Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	Yes	
	I	Were blank concentrations < MQL?	Yes	
R6	O, I	**Laboratory control samples (LCS):**		
	I	Were all COCs included in the LCS?	Yes	
	I	Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	Yes	
	I	Were LCSs analyzed at the required frequency?	Yes	
	I	Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	Yes	
	I	Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	Yes	
	I	Was the LCSD RPD within QC limits?	Yes	
R7	O, I	**Matrix spike (MS) and matrix spike duplicate (MSD) data**		
	I	Were the project/method specified analytes included in the MS and MSD?	Yes	
	I	Were MS/MSD analyzed at the appropriate frequency?	Yes	
	I	Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	Yes	
	I	Were MS/MSD RPDs within laboratory QC limits?	Yes	
R8	O, I	**Analytical duplicate data**		
	I	Were appropriate analytical duplicates analyzed for each matrix?	Yes	
	I	Were analytical duplicates analyzed at the appropriate frequency?	Yes	
	I	Were RPDs or relative standard deviations within the laboratory QC limits?	Yes	
R9	O, I	**Method quantitation limits (MQLs):**		
	I	Are the MQLs for each method analyte included in the laboratory data package?	Yes	
	I	Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	Yes	
	I	Are unadjusted MQLs included in the laboratory data package?	Yes	
R10	O, I	**Other problems/anomalies**		
	I	Are all known problems/anomalies/special conditions noted in this LRC and ER?	Yes	
	I	Were all necessary corrective actions performed for the reported data?	Yes	
	I	Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	Yes	

Ion Chromatography Laboratory Review Checklist

Table 2. Supporting Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey PP EBAP

Reviewer Name: Tim Arnold

LRC Date: 9/7/2023

Laboratory Job Number: 232660

Prep Batch Number(s): QC2308242

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S1	O, I	**Initial calibration (ICAL)**		
	I	Were response factors and/or relative response factors for each analyte within QC limits?	NA	
	I	Were percent RSDs or correlation coefficient criteria met?	Yes	
	I	Was the number of standards recommended in the method used for all analytes?	Yes	
	I	Were all points generated between the lowest and highest standard used to calculate the curve?	Yes	
	I	Are ICAL data available for all instruments used?	Yes	
	I	Has the initial calibration curve been verified using an appropriate second source standard?	Yes	
S2	O, I	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB):**		
	I	Was the CCV analyzed at the method-required frequency?	Yes	
	I	Were percent differences for each analyte within the method-required QC limits?	Yes	
	I	Was the ICAL curve verified for each analyte?	Yes	
	I	Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	No	ER1
S3	O	**Mass spectral tuning:**		
	I	Was the appropriate compound for the method used for tuning?	NA	
	I	Were ion abundance data within the method-required QC limits?	NA	
S4	O	**Internal standards (IS):**		
	I	Were IS area counts and retention times within the method-required QC limits?	NA	
S5	O, I	**Raw data (NELAC section 1 appendix A glossary, and section 5.)**		
	I	Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	Yes	
	I	Were data associated with manual integrations flagged on the raw data?	NA	

Ion Chromatography Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S6	O	**Dual column confirmation**		
	I	Did dual column confirmation results meet the method-required QC?	NA	
S7	O	**Tentatively identified compounds (TICs):**		
	I	If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?	NA	
S8	I	**Interference Check Sample (ICS) results:**		
	I	Were percent recoveries within method QC limits?	NA	
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**		
	I	Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	NA	
S10	O, I	**Method detection limit (MDL) studies**		
	I	Was a MDL study performed for each reported analyte?	Yes	
	I	Is the MDL either adjusted or supported by the analysis of DCSs?	Yes	
S11	O, I	**Proficiency test reports:**		
	I	Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	Yes	
S12	O, I	**Standards documentation**		
	I	Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	Yes	
S13	O, I	**Compound/analyte identification procedures**		
	I	Are the procedures for compound/analyte identification documented?	Yes	
S14	O, I	**Demonstration of analyst competency (DOC)**		
	I	Was DOC conducted consistent with NELAC Chapter 5C?	Yes	
	I	Is documentation of the analyst's competency up-to-date and on file?	Yes	
S15	O, I	**Verification/validation documentation for methods (NELAC Chap 5n 5)**		
	I	Are all the methods used to generate the data documented, verified, and validated, where applicable?	Yes	
S16	O, I	**Laboratory standard operating procedures (SOPs):**		
	I	Are laboratory SOPs current and on file for each method performed?	Yes	

Table 3. Exception Reports.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey PP EBAP

Reviewer Name: Tim Arnold

LRC Date: 9/7/2023

Laboratory Job Number: 232660

Prep Batch Number(s): QC2308242

Exception Report No.	Description
ER1	CCB acceptance criteria is CCB<MQL.

[1] Items identified by the letter "R" must be available as a hard copy or as a .pdf file. Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
[2] O - organic analyses; I - inorganic analyses (including general chemistry constituents, when applicable).
[3] NA - Not applicable; NR - Not reviewed.
[4] Exception Report identification number; an Exception Report should be completed for an item if the result is "No" or "NR."

Municipal Solid Waste Laboratory Review Checklist

This data package consists of:

- [x] This signature page, and the laboratory review checklist consisting of Table 1, Reportable Data (which includes the reportable data identified on this page), Table 2, Supporting Data, and Table 3, Exception Reports.
- [x] R1 Field chain-of-custody documentation
- [x] R2 Sample identification cross-reference
- [x] R3 Test reports (analytical data sheets) for each environmental sample that includes:
  - (a) Items specified in NELAC Chapter 5 for reporting results, e.g., Section 5.5.10 in 2003 NELAC Standard
  - (b) Dilution factors
  - (c) Preparation methods
  - (d) Cleanup methods
  - (e) If required for the project, tentatively identified compounds (TICs)
- [NA] R4 Surrogate recovery data including:
  - (a) Calculated recovery (%R)
  - (b) The laboratory's surrogate QC limits
- [x] R5 Test reports/summary forms for blank samples
- [x] R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  - (a) LCS spiking amounts
  - (b) Calculated %R for each analyte
  - (c) The laboratory's LCS QC limits
- [x] R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  - (a) Samples associated with the MS/MSD clearly identified
  - (b) MS/MSD spiking amounts
  - (c) Concentration of each MS/MSD analyte measured in the parent and spiked samples
  - (d) Calculated %Rs and relative percent differences (RPDs)
  - (e) The laboratory's MS/MSD QC limits
- [x] R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  - (a) The amount of analyte measured in the duplicate
  - (b) The calculated RPD
  - (c) The laboratory's QC limits for analytical duplicates
- [x] R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix
- [x] R10 Other problems or anomalies
- [x] The Exception Report for every item for which the result is "No" or "NR" (Not Reviewed)

Release Statement: I am responsible for the release of this laboratory data package. This data package as been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Check, if applicable: (●) This laboratory is an in-house laboratory controlled by the person responding to rule. The official signing the cover page of the rule-required report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Sandra Williams	Sandra D. Williams	Chemist	9-14-2023
Name (printed)	Signature	Official Title	Date

TDS Laboratory Review Checklist

Table 1. Reportable Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey

Reviewer Name: Sandra Williams

LRC Date: 9-14-2023

Laboratory Job Number: 232660

Prep Batch Number(s): QC2308258

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
R1	O, I	**Chain-of-custody (COC)**		
	I	Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	Yes	
	I	Were all departures from standard conditions described in an exception report?	NA	
R2	O, I	**Sample and quality control (QC) identification**		
	I	Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	Yes	
	I	Are all laboratory ID numbers cross-referenced to the corresponding QC data?	Yes	
R3	O, I	**Test reports**		
	I	Were all samples prepared and analyzed within holding times?	Yes	
	I	Other than those results < MQL, were all other raw values bracketed by calibration standards?	NA	
	I	Were calculations checked by a peer or supervisor?	Yes	
	I	Were all analyte identifications checked by a peer or supervisor?	Yes	
	I	Were sample quantitation limits reported for all analytes not detected?	Yes	
	I	Were all results for soil and sediment samples reported on a dry weight basis?	NA	
	I	Was % moisture (or solids) reported for all soil and sediment samples?	NA	
	I	If required for the project, TICs reported?	NA	
R4	O	**Surrogate recovery data**		
	I	Were surrogates added prior to extraction?	NA	
	I	Were surrogate percent recoveries in all samples within the laboratory QC limits?	NA	
R5	O, I	**Test reports/summary forms for blank samples**		
	I	Were appropriate type(s) of blanks analyzed?	Yes	
	I	Were blanks analyzed at the appropriate frequency?	Yes	

TDS Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
	I	Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	Yes	
	I	Were blank concentrations < MQL?	Yes	
R6	O, I	**Laboratory control samples (LCS):**		
	I	Were all COCs included in the LCS?	Yes	
	I	Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	Yes	
	I	Were LCSs analyzed at the required frequency?	Yes	
	I	Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	Yes	
	I	Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	Yes	
	I	Was the LCSD RPD within QC limits?	Yes	
R7	O, I	**Matrix spike (MS) and matrix spike duplicate (MSD) data**		
	I	Were the project/method specified analytes included in the MS and MSD?	NA	
	I	Were MS/MSD analyzed at the appropriate frequency?	NA	
	I	Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	NA	
	I	Were MS/MSD RPDs within laboratory QC limits?	NA	
R8	O, I	**Analytical duplicate data**		
	I	Were appropriate analytical duplicates analyzed for each matrix?	Yes	
	I	Were analytical duplicates analyzed at the appropriate frequency?	Yes	
	I	Were RPDs or relative standard deviations within the laboratory QC limits?	Yes	
R9	O, I	**Method quantitation limits (MQLs):**		
	I	Are the MQLs for each method analyte included in the laboratory data package?	Yes	
	I	Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	Yes	
	I	Are unadjusted MQLs included in the laboratory data package?	Yes	
R10	O, I	**Other problems/anomalies**		
	I	Are all known problems/anomalies/special conditions noted in this LRC and ER?	Yes	
	I	Were all necessary corrective actions performed for the reported data?	Yes	
	I	Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	Yes	

Table 2. Supporting Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey

Reviewer Name: Sandra Williams

LRC Date: 9-14-2023

Laboratory Job Number: 232660

Prep Batch Number(s): QC2308258

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S1	O, I	**Initial calibration (ICAL)**		
	I	Were response factors and/or relative response factors for each analyte within QC limits?	NA	
	I	Were percent RSDs or correlation coefficient criteria met?	NA	
	I	Was the number of standards recommended in the method used for all analytes?	NA	
	I	Were all points generated between the lowest and highest standard used to calculate the curve?	NA	
	I	Are ICAL data available for all instruments used?	NA	
	I	Has the initial calibration curve been verified using an appropriate second source standard?	NA	
S2	O, I	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB):**		
	I	Was the CCV analyzed at the method-required frequency?	NA	
	I	Were percent differences for each analyte within the method-required QC limits?	NA	
	I	Was the ICAL curve verified for each analyte?	NA	
	I	Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	NA	
S3	O	**Mass spectral tuning:**		
	I	Was the appropriate compound for the method used for tuning?	NA	
	I	Were ion abundance data within the method-required QC limits?	NA	
S4	O	**Internal standards (IS):**		
	I	Were IS area counts and retention times within the method-required QC limits?	NA	
S5	O, I	**Raw data (NELAC section 1 appendix A glossary, and section 5.)**		
	I	Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	Yes	
	I	Were data associated with manual integrations flagged on the raw data?	NA	

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S6	O	**Dual column confirmation**		
	I	Did dual column confirmation results meet the method-required QC?	NA	
S7	O	**Tentatively identified compounds (TICs):**		
	I	If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?	NA	
S8	I	**Interference Check Sample (ICS) results:**		
	I	Were percent recoveries within method QC limits?	NA	
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**		
	I	Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	NA	
S10	O, I	**Method detection limit (MDL) studies**		
	I	Was a MDL study performed for each reported analyte?	Yes	
	I	Is the MDL either adjusted or supported by the analysis of DCSs?	Yes	
S11	O, I	**Proficiency test reports:**		
	I	Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	Yes	
S12	O, I	**Standards documentation**		
	I	Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	Yes	
S13	O, I	**Compound/analyte identification procedures**		
	I	Are the procedures for compound/analyte identification documented?	Yes	
S14	O, I	**Demonstration of analyst competency (DOC)**		
	I	Was DOC conducted consistent with NELAC Chapter 5C?	Yes	
	I	Is documentation of the analyst's competency up-to-date and on file?	Yes	
S15	O, I	**Verification/validation documentation for methods (NELAC Chap 5n 5)**		
	I	Are all the methods used to generate the data documented, verified, and validated, where applicable?	Yes	
S16	O, I	**Laboratory standard operating procedures (SOPs):**		
	I	Are laboratory SOPs current and on file for each method performed?	Yes	

Table 3. Exception Reports.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey

Reviewer Name: Sandra Williams

LRC Date: 9-14-2023

Laboratory Job Number: 232660

Prep Batch Number(s): QC2308258

Exception Report No.	Description

[1] Items identified by the letter "R" must be available as a hard copy or as a .pdf file. Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.

[2] O - organic analyses; I - inorganic analyses (including general chemistry constituents, when applicable).

[3] NA - Not applicable; NR - Not reviewed.

[4] Exception Report identification number; an Exception Report should be completed for an item if the result is "No" or "NR."

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 232672 **Customer: Pirkey Power Station** **Date Reported: 09/22/2023**

Customer Sample ID: AD-2
Lab Number: 232672-001
Date Collected: 08/23/2023 11:03 EDT

Customer Description:
Preparation:
Date Received: 08/28/2023 13:17 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.008	µg/L	1	0.100	0.008	J1	GES	09/05/2023 14:43	EPA 200.8-1994, Rev. 5.4
Arsenic	0.78	µg/L	1	0.10	0.03		GES	09/05/2023 14:43	EPA 200.8-1994, Rev. 5.4
Barium	13.8	µg/L	1	0.20	0.05		GES	09/05/2023 14:43	EPA 200.8-1994, Rev. 5.4
Beryllium	0.715	µg/L	1	0.050	0.007		GES	09/05/2023 14:43	EPA 200.8-1994, Rev. 5.4
Boron	3.05	mg/L	1	0.050	0.007		GES	09/05/2023 14:43	EPA 200.8-1994, Rev. 5.4
Cadmium	0.116	µg/L	1	0.020	0.004		GES	09/05/2023 14:43	EPA 200.8-1994, Rev. 5.4
Calcium	3.37	mg/L	1	0.05	0.01		GES	09/05/2023 14:43	EPA 200.8-1994, Rev. 5.4
Chromium	0.48	µg/L	1	0.30	0.07		GES	09/05/2023 14:43	EPA 200.8-1994, Rev. 5.4
Cobalt	25.8	µg/L	1	0.020	0.005		GES	09/05/2023 14:43	EPA 200.8-1994, Rev. 5.4
Lead	0.64	µg/L	1	0.20	0.05		GES	09/05/2023 14:43	EPA 200.8-1994, Rev. 5.4
Lithium	0.0601	mg/L	1	0.00030	0.00007		GES	09/05/2023 14:43	EPA 200.8-1994, Rev. 5.4
Magnesium	7.02	mg/L	1	0.100	0.006		GES	09/05/2023 14:43	EPA 200.8-1994, Rev. 5.4
Mercury	270	ng/L	10	50	20		RLP	09/01/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	09/05/2023 14:43	EPA 200.8-1994, Rev. 5.4
Potassium	1.41	mg/L	1	0.100	0.008		GES	09/05/2023 14:43	EPA 200.8-1994, Rev. 5.4
Selenium	2.72	µg/L	1	0.50	0.04		GES	09/05/2023 14:43	EPA 200.8-1994, Rev. 5.4
Sodium	105	mg/L	1	0.20	0.01		GES	09/05/2023 14:43	EPA 200.8-1994, Rev. 5.4
Strontium	0.0504	mg/L	1	0.00200	0.00005		GES	09/05/2023 14:43	EPA 200.8-1994, Rev. 5.4
Thallium	0.11	µg/L	1	0.20	0.02	J1	GES	09/05/2023 14:43	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	1.49	pCi/L	0.34	0.56		ST	09/05/2023 15:40	SW-846 9315-1986, Rev. 0
Carrier Recovery	93.5	%						
Radium-228	1	pCi/L	0.21	0.66	B1	ST	09/11/2023 13:28	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	64.8	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 232672 **Customer: Pirkey Power Station** **Date Reported: 09/22/2023**

Customer Sample ID: AD-2
Customer Description:
Lab Number: 232672-001-01
Preparation: Dissolved
Date Collected: 08/23/2023 11:03 EDT
Date Received: 08/28/2023 13:17 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.009	µg/L	1	0.100	0.008	J1	GES	09/05/2023 14:48	EPA 200.8-1994, Rev. 5.4
Arsenic	0.84	µg/L	1	0.10	0.03		GES	09/05/2023 14:48	EPA 200.8-1994, Rev. 5.4
Barium	13.6	µg/L	1	0.20	0.05		GES	09/05/2023 14:48	EPA 200.8-1994, Rev. 5.4
Beryllium	0.802	µg/L	1	0.050	0.007		GES	09/05/2023 14:48	EPA 200.8-1994, Rev. 5.4
Cadmium	0.104	µg/L	1	0.020	0.004		GES	09/05/2023 14:48	EPA 200.8-1994, Rev. 5.4
Chromium	0.41	µg/L	1	0.30	0.07		GES	09/05/2023 14:48	EPA 200.8-1994, Rev. 5.4
Cobalt	25.4	µg/L	1	0.020	0.005		GES	09/05/2023 14:48	EPA 200.8-1994, Rev. 5.4
Iron	0.524	mg/L	1	0.020	0.003		GES	09/05/2023 14:48	EPA 200.8-1994, Rev. 5.4
Lead	0.63	µg/L	1	0.20	0.05		GES	09/05/2023 14:48	EPA 200.8-1994, Rev. 5.4
Lithium	0.0628	mg/L	1	0.00030	0.00007		GES	09/05/2023 14:48	EPA 200.8-1994, Rev. 5.4
Manganese	0.0983	mg/L	1	0.00100	0.00008		GES	09/05/2023 14:48	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	08/30/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	09/05/2023 14:48	EPA 200.8-1994, Rev. 5.4
Selenium	2.83	µg/L	1	0.50	0.04		GES	09/05/2023 14:48	EPA 200.8-1994, Rev. 5.4
Thallium	0.11	µg/L	1	0.20	0.02	J1	GES	09/05/2023 14:48	EPA 200.8-1994, Rev. 5.4

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 232672 **Customer: Pirkey Power Station** **Date Reported: 09/22/2023**

Customer Sample ID: AD-4
Lab Number: 232672-002
Date Collected: 08/23/2023 08:28 EDT

Customer Description:
Preparation:
Date Received: 08/28/2023 13:17 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.011	µg/L	1	0.100	0.008	J1	GES	09/05/2023 14:53	EPA 200.8-1994, Rev. 5.4
Arsenic	0.36	µg/L	1	0.10	0.03		GES	09/05/2023 14:53	EPA 200.8-1994, Rev. 5.4
Barium	117	µg/L	1	0.20	0.05		GES	09/05/2023 14:53	EPA 200.8-1994, Rev. 5.4
Beryllium	0.246	µg/L	1	0.050	0.007		GES	09/05/2023 14:53	EPA 200.8-1994, Rev. 5.4
Boron	0.027	mg/L	1	0.050	0.007	J1	GES	09/05/2023 14:53	EPA 200.8-1994, Rev. 5.4
Cadmium	0.021	µg/L	1	0.020	0.004		GES	09/05/2023 14:53	EPA 200.8-1994, Rev. 5.4
Calcium	2.18	mg/L	1	0.05	0.01		GES	09/05/2023 14:53	EPA 200.8-1994, Rev. 5.4
Chromium	0.40	µg/L	1	0.30	0.07		GES	09/05/2023 14:53	EPA 200.8-1994, Rev. 5.4
Cobalt	3.63	µg/L	1	0.020	0.005		GES	09/05/2023 14:53	EPA 200.8-1994, Rev. 5.4
Lead	0.07	µg/L	1	0.20	0.05	J1	GES	09/05/2023 14:53	EPA 200.8-1994, Rev. 5.4
Lithium	0.0243	mg/L	1	0.00030	0.00007		GES	09/05/2023 14:53	EPA 200.8-1994, Rev. 5.4
Magnesium	0.687	mg/L	1	0.100	0.006		GES	09/05/2023 14:53	EPA 200.8-1994, Rev. 5.4
Mercury	3	ng/L	1	5	2	J1	RLP	08/30/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	09/05/2023 14:53	EPA 200.8-1994, Rev. 5.4
Potassium	2.19	mg/L	1	0.100	0.008		GES	09/05/2023 14:53	EPA 200.8-1994, Rev. 5.4
Selenium	0.04	µg/L	1	0.50	0.04	J1	GES	09/05/2023 14:53	EPA 200.8-1994, Rev. 5.4
Sodium	6.41	mg/L	1	0.20	0.01		GES	09/05/2023 14:53	EPA 200.8-1994, Rev. 5.4
Strontium	0.0183	mg/L	1	0.00200	0.00005		GES	09/05/2023 14:53	EPA 200.8-1994, Rev. 5.4
Thallium	0.08	µg/L	1	0.20	0.02	J1	GES	09/05/2023 14:53	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	1.34	pCi/L	0.31	0.48		ST	09/05/2023 15:40	SW-846 9315-1986, Rev. 0
Carrier Recovery	95.1	%						
Radium-228	0.90	pCi/L	0.24	0.76	B1	ST	09/11/2023 13:28	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	61.5	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Job ID: 232672 **Customer: Pirkey Power Station** **Date Reported: 09/22/2023**

Customer Sample ID: AD-4
Customer Description:
Lab Number: 232672-002-01
Preparation: Dissolved
Date Collected: 08/23/2023 08:28 EDT
Date Received: 08/28/2023 13:17 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.008	µg/L	1	0.100	0.008	U1	GES	09/05/2023 14:59	EPA 200.8-1994, Rev. 5.4
Arsenic	0.24	µg/L	1	0.10	0.03		GES	09/05/2023 14:59	EPA 200.8-1994, Rev. 5.4
Barium	115	µg/L	1	0.20	0.05		GES	09/05/2023 14:59	EPA 200.8-1994, Rev. 5.4
Beryllium	0.263	µg/L	1	0.050	0.007		GES	09/05/2023 14:59	EPA 200.8-1994, Rev. 5.4
Cadmium	0.020	µg/L	1	0.020	0.004		GES	09/05/2023 14:59	EPA 200.8-1994, Rev. 5.4
Chromium	0.33	µg/L	1	0.30	0.07		GES	09/05/2023 14:59	EPA 200.8-1994, Rev. 5.4
Cobalt	3.70	µg/L	1	0.020	0.005		GES	09/05/2023 14:59	EPA 200.8-1994, Rev. 5.4
Iron	3.45	mg/L	1	0.020	0.003		GES	09/05/2023 14:59	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	GES	09/05/2023 14:59	EPA 200.8-1994, Rev. 5.4
Lithium	0.0249	mg/L	1	0.00030	0.00007		GES	09/05/2023 14:59	EPA 200.8-1994, Rev. 5.4
Manganese	0.0344	mg/L	1	0.00100	0.00008		GES	09/05/2023 14:59	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	08/30/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	09/05/2023 14:59	EPA 200.8-1994, Rev. 5.4
Selenium	<0.04	µg/L	1	0.50	0.04	U1	GES	09/05/2023 14:59	EPA 200.8-1994, Rev. 5.4
Thallium	0.09	µg/L	1	0.20	0.02	J1	GES	09/05/2023 14:59	EPA 200.8-1994, Rev. 5.4

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 232672 **Customer: Pirkey Power Station** **Date Reported: 09/22/2023**

Customer Sample ID: AD-12
Lab Number: 232672-003
Date Collected: 08/23/2023 09:46 EDT

Customer Description:
Preparation:
Date Received: 08/28/2023 13:17 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.013	µg/L	1	0.100	0.008	J1	GES	09/05/2023 15:04	EPA 200.8-1994, Rev. 5.4
Arsenic	0.1	µg/L	1	0.10	0.03		GES	09/05/2023 15:04	EPA 200.8-1994, Rev. 5.4
Barium	15.6	µg/L	1	0.20	0.05		GES	09/05/2023 15:04	EPA 200.8-1994, Rev. 5.4
Beryllium	0.129	µg/L	1	0.050	0.007		GES	09/05/2023 15:04	EPA 200.8-1994, Rev. 5.4
Boron	0.017	mg/L	1	0.050	0.007	J1	GES	09/05/2023 15:04	EPA 200.8-1994, Rev. 5.4
Cadmium	0.007	µg/L	1	0.020	0.004	J1	GES	09/05/2023 15:04	EPA 200.8-1994, Rev. 5.4
Calcium	0.22	mg/L	1	0.05	0.01		GES	09/05/2023 15:04	EPA 200.8-1994, Rev. 5.4
Chromium	0.45	µg/L	1	0.30	0.07		GES	09/05/2023 15:04	EPA 200.8-1994, Rev. 5.4
Cobalt	0.855	µg/L	1	0.020	0.005		GES	09/05/2023 15:04	EPA 200.8-1994, Rev. 5.4
Lead	0.11	µg/L	1	0.20	0.05	J1	GES	09/05/2023 15:04	EPA 200.8-1994, Rev. 5.4
Lithium	0.00494	mg/L	1	0.00030	0.00007		GES	09/05/2023 15:04	EPA 200.8-1994, Rev. 5.4
Magnesium	0.286	mg/L	1	0.100	0.006		GES	09/05/2023 15:04	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	08/30/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	0.5	µg/L	1	0.5	0.1		GES	09/05/2023 15:04	EPA 200.8-1994, Rev. 5.4
Potassium	0.184	mg/L	1	0.100	0.008		GES	09/05/2023 15:04	EPA 200.8-1994, Rev. 5.4
Selenium	0.23	µg/L	1	0.50	0.04	J1	GES	09/05/2023 15:04	EPA 200.8-1994, Rev. 5.4
Sodium	3.23	mg/L	1	0.20	0.01		GES	09/05/2023 15:04	EPA 200.8-1994, Rev. 5.4
Strontium	0.00223	mg/L	1	0.00200	0.00005		GES	09/05/2023 15:04	EPA 200.8-1994, Rev. 5.4
Thallium	<0.02	µg/L	1	0.20	0.02	U1	GES	09/05/2023 15:04	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	0.42	pCi/L	0.17	0.40		ST	09/05/2023 15:40	SW-846 9315-1986, Rev. 0
Carrier Recovery	103	%						
Radium-228	0.92	pCi/L	0.17	0.54	B1	ST	09/11/2023 13:28	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	69.5	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Job ID: 232672 **Customer: Pirkey Power Station** **Date Reported: 09/22/2023**

Customer Sample ID: AD-12
Customer Description:
Lab Number: 232672-003-01
Preparation: Dissolved
Date Collected: 08/23/2023 09:46 EDT
Date Received: 08/28/2023 13:17 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.013	µg/L	1	0.100	0.008	J1	GES	09/05/2023 15:09	EPA 200.8-1994, Rev. 5.4
Arsenic	0.06	µg/L	1	0.10	0.03	J1	GES	09/05/2023 15:09	EPA 200.8-1994, Rev. 5.4
Barium	15.6	µg/L	1	0.20	0.05		GES	09/05/2023 15:09	EPA 200.8-1994, Rev. 5.4
Beryllium	0.116	µg/L	1	0.050	0.007		GES	09/05/2023 15:09	EPA 200.8-1994, Rev. 5.4
Cadmium	0.009	µg/L	1	0.020	0.004	J1	GES	09/05/2023 15:09	EPA 200.8-1994, Rev. 5.4
Chromium	0.27	µg/L	1	0.30	0.07	J1	GES	09/05/2023 15:09	EPA 200.8-1994, Rev. 5.4
Cobalt	0.890	µg/L	1	0.020	0.005		GES	09/05/2023 15:09	EPA 200.8-1994, Rev. 5.4
Iron	0.007	mg/L	1	0.020	0.003	J1	GES	09/05/2023 15:09	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	GES	09/05/2023 15:09	EPA 200.8-1994, Rev. 5.4
Lithium	0.00497	mg/L	1	0.00030	0.00007		GES	09/05/2023 15:09	EPA 200.8-1994, Rev. 5.4
Manganese	0.00518	mg/L	1	0.00100	0.00008		GES	09/05/2023 15:09	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	08/30/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	0.3	µg/L	1	0.5	0.1	J1	GES	09/05/2023 15:09	EPA 200.8-1994, Rev. 5.4
Selenium	0.24	µg/L	1	0.50	0.04	J1	GES	09/05/2023 15:09	EPA 200.8-1994, Rev. 5.4
Thallium	<0.02	µg/L	1	0.20	0.02	U1	GES	09/05/2023 15:09	EPA 200.8-1994, Rev. 5.4

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 232672 **Customer: Pirkey Power Station** **Date Reported: 09/22/2023**

Customer Sample ID: AD-18
Lab Number: 232672-004
Date Collected: 08/23/2023 10:50 EDT

Customer Description:
Preparation:
Date Received: 08/28/2023 13:17 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.056	µg/L	1	0.100	0.008	J1	GES	09/05/2023 15:14	EPA 200.8-1994, Rev. 5.4
Arsenic	0.54	µg/L	1	0.10	0.03		GES	09/05/2023 15:14	EPA 200.8-1994, Rev. 5.4
Barium	70.6	µg/L	1	0.20	0.05		GES	09/05/2023 15:14	EPA 200.8-1994, Rev. 5.4
Beryllium	0.115	µg/L	1	0.050	0.007		GES	09/05/2023 15:14	EPA 200.8-1994, Rev. 5.4
Boron	0.012	mg/L	1	0.050	0.007	J1	GES	09/05/2023 15:14	EPA 200.8-1994, Rev. 5.4
Cadmium	0.015	µg/L	1	0.020	0.004	J1	GES	09/05/2023 15:14	EPA 200.8-1994, Rev. 5.4
Calcium	3.17	mg/L	1	0.05	0.01		GES	09/05/2023 15:14	EPA 200.8-1994, Rev. 5.4
Chromium	1.15	µg/L	1	0.30	0.07		GES	09/05/2023 15:14	EPA 200.8-1994, Rev. 5.4
Cobalt	0.731	µg/L	1	0.020	0.005		GES	09/05/2023 15:14	EPA 200.8-1994, Rev. 5.4
Lead	0.43	µg/L	1	0.20	0.05		GES	09/05/2023 15:14	EPA 200.8-1994, Rev. 5.4
Lithium	0.0119	mg/L	1	0.00030	0.00007		GES	09/05/2023 15:14	EPA 200.8-1994, Rev. 5.4
Magnesium	0.321	mg/L	1	0.100	0.006		GES	09/05/2023 15:14	EPA 200.8-1994, Rev. 5.4
Mercury	5	ng/L	1	5	2		RLP	08/30/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	0.1	µg/L	1	0.5	0.1	J1	GES	09/05/2023 15:14	EPA 200.8-1994, Rev. 5.4
Potassium	1.03	mg/L	1	0.100	0.008		GES	09/05/2023 15:14	EPA 200.8-1994, Rev. 5.4
Selenium	0.18	µg/L	1	0.50	0.04	J1	GES	09/05/2023 15:14	EPA 200.8-1994, Rev. 5.4
Sodium	4.90	mg/L	1	0.20	0.01		GES	09/05/2023 15:14	EPA 200.8-1994, Rev. 5.4
Strontium	0.0159	mg/L	1	0.00200	0.00005		GES	09/05/2023 15:14	EPA 200.8-1994, Rev. 5.4
Thallium	0.03	µg/L	1	0.20	0.02	J1	GES	09/05/2023 15:14	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	0.78	pCi/L	0.22	0.35		ST	09/05/2023 15:40	SW-846 9315-1986, Rev. 0
Carrier Recovery	110	%						
Radium-228	0.49	pCi/L	0.21	0.70	B1	ST	09/11/2023 13:28	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	59.9	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Job ID: 232672 **Customer: Pirkey Power Station** **Date Reported: 09/22/2023**

Customer Sample ID: AD-18
Customer Description:
Lab Number: 232672-004-01
Preparation: Dissolved
Date Collected: 08/23/2023 10:50 EDT
Date Received: 08/28/2023 13:17 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.008	µg/L	1	0.100	0.008	U1	GES	09/05/2023 15:19	EPA 200.8-1994, Rev. 5.4
Arsenic	0.05	µg/L	1	0.10	0.03	J1	GES	09/05/2023 15:19	EPA 200.8-1994, Rev. 5.4
Barium	66.2	µg/L	1	0.20	0.05		GES	09/05/2023 15:19	EPA 200.8-1994, Rev. 5.4
Beryllium	0.075	µg/L	1	0.050	0.007		GES	09/05/2023 15:19	EPA 200.8-1994, Rev. 5.4
Cadmium	0.011	µg/L	1	0.020	0.004	J1	GES	09/05/2023 15:19	EPA 200.8-1994, Rev. 5.4
Chromium	0.24	µg/L	1	0.30	0.07	J1	GES	09/05/2023 15:19	EPA 200.8-1994, Rev. 5.4
Cobalt	0.670	µg/L	1	0.020	0.005		GES	09/05/2023 15:19	EPA 200.8-1994, Rev. 5.4
Iron	0.013	mg/L	1	0.020	0.003	J1	GES	09/05/2023 15:19	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	GES	09/05/2023 15:19	EPA 200.8-1994, Rev. 5.4
Lithium	0.0118	mg/L	1	0.00030	0.00007		GES	09/05/2023 15:19	EPA 200.8-1994, Rev. 5.4
Manganese	0.00251	mg/L	1	0.00100	0.00008		GES	09/05/2023 15:19	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	08/30/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	09/05/2023 15:19	EPA 200.8-1994, Rev. 5.4
Selenium	0.06	µg/L	1	0.50	0.04	J1	GES	09/05/2023 15:19	EPA 200.8-1994, Rev. 5.4
Thallium	0.03	µg/L	1	0.20	0.02	J1	GES	09/05/2023 15:19	EPA 200.8-1994, Rev. 5.4

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Job ID: 232672 **Customer: Pirkey Power Station** **Date Reported: 09/22/2023**

Customer Sample ID: AD-31
Lab Number: 232672-005
Date Collected: 08/23/2023 10:23 EDT

Customer Description:
Preparation:
Date Received: 08/28/2023 13:17 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.008	µg/L	1	0.100	0.008	U1	GES	09/05/2023 15:24	EPA 200.8-1994, Rev. 5.4
Arsenic	0.32	µg/L	1	0.10	0.03		GES	09/05/2023 15:24	EPA 200.8-1994, Rev. 5.4
Barium	31.7	µg/L	1	0.20	0.05		GES	09/05/2023 15:24	EPA 200.8-1994, Rev. 5.4
Beryllium	0.818	µg/L	1	0.050	0.007		GES	09/05/2023 15:24	EPA 200.8-1994, Rev. 5.4
Boron	0.021	mg/L	1	0.050	0.007	J1	GES	09/05/2023 15:24	EPA 200.8-1994, Rev. 5.4
Cadmium	0.052	µg/L	1	0.020	0.004		GES	09/05/2023 15:24	EPA 200.8-1994, Rev. 5.4
Calcium	2.10	mg/L	1	0.05	0.01		GES	09/05/2023 15:24	EPA 200.8-1994, Rev. 5.4
Chromium	0.56	µg/L	1	0.30	0.07		GES	09/05/2023 15:24	EPA 200.8-1994, Rev. 5.4
Cobalt	8.14	µg/L	1	0.020	0.005		GES	09/05/2023 15:24	EPA 200.8-1994, Rev. 5.4
Lead	0.32	µg/L	1	0.20	0.05		GES	09/05/2023 15:24	EPA 200.8-1994, Rev. 5.4
Lithium	0.0644	mg/L	1	0.00030	0.00007		GES	09/05/2023 15:24	EPA 200.8-1994, Rev. 5.4
Magnesium	3.10	mg/L	1	0.100	0.006		GES	09/05/2023 15:24	EPA 200.8-1994, Rev. 5.4
Mercury	890	ng/L	10	50	20		RLP	08/30/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	09/05/2023 15:24	EPA 200.8-1994, Rev. 5.4
Potassium	1.51	mg/L	1	0.100	0.008		GES	09/05/2023 15:24	EPA 200.8-1994, Rev. 5.4
Selenium	0.33	µg/L	1	0.50	0.04	J1	GES	09/05/2023 15:24	EPA 200.8-1994, Rev. 5.4
Sodium	26.0	mg/L	1	0.20	0.01		GES	09/05/2023 15:24	EPA 200.8-1994, Rev. 5.4
Strontium	0.0315	mg/L	1	0.00200	0.00005		GES	09/05/2023 15:24	EPA 200.8-1994, Rev. 5.4
Thallium	0.08	µg/L	1	0.20	0.02	J1	GES	09/05/2023 15:24	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	3.35	pCi/L	0.48	0.46		ST	09/05/2023 15:40	SW-846 9315-1986, Rev. 0
Carrier Recovery	94.0	%						
Radium-228	2.15	pCi/L	0.23	0.68	B1	ST	09/11/2023 13:28	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	64.7	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 232672 **Customer: Pirkey Power Station** **Date Reported: 09/22/2023**

Customer Sample ID: AD-31
Customer Description:
Lab Number: 232672-005-01
Preparation: Dissolved
Date Collected: 08/23/2023 10:23 EDT
Date Received: 08/28/2023 13:17 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.008	µg/L	1	0.100	0.008	U1	GES	09/05/2023 15:29	EPA 200.8-1994, Rev. 5.4
Arsenic	0.16	µg/L	1	0.10	0.03		GES	09/05/2023 15:29	EPA 200.8-1994, Rev. 5.4
Barium	31.9	µg/L	1	0.20	0.05		GES	09/05/2023 15:29	EPA 200.8-1994, Rev. 5.4
Beryllium	0.802	µg/L	1	0.050	0.007		GES	09/05/2023 15:29	EPA 200.8-1994, Rev. 5.4
Cadmium	0.061	µg/L	1	0.020	0.004		GES	09/05/2023 15:29	EPA 200.8-1994, Rev. 5.4
Chromium	0.23	µg/L	1	0.30	0.07	J1	GES	09/05/2023 15:29	EPA 200.8-1994, Rev. 5.4
Cobalt	8.49	µg/L	1	0.020	0.005		GES	09/05/2023 15:29	EPA 200.8-1994, Rev. 5.4
Iron	0.117	mg/L	1	0.020	0.003		GES	09/05/2023 15:29	EPA 200.8-1994, Rev. 5.4
Lead	0.23	µg/L	1	0.20	0.05		GES	09/05/2023 15:29	EPA 200.8-1994, Rev. 5.4
Lithium	0.0636	mg/L	1	0.00030	0.00007		GES	09/05/2023 15:29	EPA 200.8-1994, Rev. 5.4
Manganese	0.0238	mg/L	1	0.00100	0.00008		GES	09/05/2023 15:29	EPA 200.8-1994, Rev. 5.4
Mercury	18	ng/L	1	5	2		RLP	08/30/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	09/05/2023 15:29	EPA 200.8-1994, Rev. 5.4
Selenium	0.27	µg/L	1	0.50	0.04	J1	GES	09/05/2023 15:29	EPA 200.8-1994, Rev. 5.4
Thallium	0.09	µg/L	1	0.20	0.02	J1	GES	09/05/2023 15:29	EPA 200.8-1994, Rev. 5.4

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 232672 **Customer: Pirkey Power Station** **Date Reported: 09/22/2023**

Customer Sample ID: AD-32
Lab Number: 232672-006
Date Collected: 08/23/2023 10:21 EDT

Customer Description:
Preparation:
Date Received: 08/28/2023 13:17 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.013	µg/L	1	0.100	0.008	J1	GES	09/05/2023 15:34	EPA 200.8-1994, Rev. 5.4
Arsenic	2.19	µg/L	1	0.10	0.03		GES	09/05/2023 15:34	EPA 200.8-1994, Rev. 5.4
Barium	22.7	µg/L	1	0.20	0.05		GES	09/05/2023 15:34	EPA 200.8-1994, Rev. 5.4
Beryllium	0.921	µg/L	1	0.050	0.007		GES	09/05/2023 15:34	EPA 200.8-1994, Rev. 5.4
Boron	0.418	mg/L	1	0.050	0.007		GES	09/05/2023 15:34	EPA 200.8-1994, Rev. 5.4
Cadmium	0.071	µg/L	1	0.020	0.004		GES	09/05/2023 15:34	EPA 200.8-1994, Rev. 5.4
Calcium	3.71	mg/L	1	0.05	0.01		GES	09/05/2023 15:34	EPA 200.8-1994, Rev. 5.4
Chromium	0.83	µg/L	1	0.30	0.07		GES	09/05/2023 15:34	EPA 200.8-1994, Rev. 5.4
Cobalt	11.3	µg/L	1	0.020	0.005		GES	09/05/2023 15:34	EPA 200.8-1994, Rev. 5.4
Lead	0.26	µg/L	1	0.20	0.05		GES	09/05/2023 15:34	EPA 200.8-1994, Rev. 5.4
Lithium	0.0482	mg/L	1	0.00030	0.00007		GES	09/05/2023 15:34	EPA 200.8-1994, Rev. 5.4
Magnesium	4.11	mg/L	1	0.100	0.006		GES	09/05/2023 15:34	EPA 200.8-1994, Rev. 5.4
Mercury	950	ng/L	50	250	90		RLP	08/30/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	09/05/2023 15:34	EPA 200.8-1994, Rev. 5.4
Potassium	2.30	mg/L	1	0.100	0.008		GES	09/05/2023 15:34	EPA 200.8-1994, Rev. 5.4
Selenium	1.04	µg/L	1	0.50	0.04		GES	09/05/2023 15:34	EPA 200.8-1994, Rev. 5.4
Sodium	24.4	mg/L	1	0.20	0.01		GES	09/05/2023 15:34	EPA 200.8-1994, Rev. 5.4
Strontium	0.0595	mg/L	1	0.00200	0.00005		GES	09/05/2023 15:34	EPA 200.8-1994, Rev. 5.4
Thallium	0.10	µg/L	1	0.20	0.02	J1	GES	09/05/2023 15:34	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	2.86	pCi/L	0.42	0.35		ST	09/05/2023 15:40	SW-846 9315-1986, Rev. 0
Carrier Recovery	98.9	%						
Radium-228	2.30	pCi/L	0.29	0.85	B1	ST	09/11/2023 13:28	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	51.5	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 232672 **Customer: Pirkey Power Station** **Date Reported: 09/22/2023**

Customer Sample ID: AD-32
Lab Number: 232672-006-01
Date Collected: 08/23/2023 10:21 EDT

Customer Description:
Preparation: Dissolved
Date Received: 08/28/2023 13:17 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.008	µg/L	1	0.100	0.008	U1	GES	09/05/2023 15:40	EPA 200.8-1994, Rev. 5.4
Arsenic	1.56	µg/L	1	0.10	0.03		GES	09/05/2023 15:40	EPA 200.8-1994, Rev. 5.4
Barium	20.2	µg/L	1	0.20	0.05		GES	09/05/2023 15:40	EPA 200.8-1994, Rev. 5.4
Beryllium	0.995	µg/L	1	0.050	0.007		GES	09/05/2023 15:40	EPA 200.8-1994, Rev. 5.4
Cadmium	0.080	µg/L	1	0.020	0.004		GES	09/05/2023 15:40	EPA 200.8-1994, Rev. 5.4
Chromium	0.24	µg/L	1	0.30	0.07	J1	GES	09/05/2023 15:40	EPA 200.8-1994, Rev. 5.4
Cobalt	11.2	µg/L	1	0.020	0.005		GES	09/05/2023 15:40	EPA 200.8-1994, Rev. 5.4
Iron	5.08	mg/L	1	0.020	0.003		GES	09/05/2023 15:40	EPA 200.8-1994, Rev. 5.4
Lead	0.1	µg/L	1	0.20	0.05	J1	GES	09/05/2023 15:40	EPA 200.8-1994, Rev. 5.4
Lithium	0.0468	mg/L	1	0.00030	0.00007		GES	09/05/2023 15:40	EPA 200.8-1994, Rev. 5.4
Manganese	0.0475	mg/L	1	0.00100	0.00008		GES	09/05/2023 15:40	EPA 200.8-1994, Rev. 5.4
Mercury	13	ng/L	1	5	2		RLP	08/30/2023 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	09/05/2023 15:40	EPA 200.8-1994, Rev. 5.4
Selenium	0.91	µg/L	1	0.50	0.04		GES	09/05/2023 15:40	EPA 200.8-1994, Rev. 5.4
Thallium	0.1	µg/L	1	0.20	0.02	J1	GES	09/05/2023 15:40	EPA 200.8-1994, Rev. 5.4

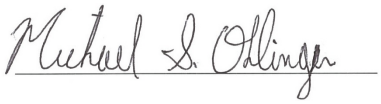
Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 232672 **Customer: Pirkey Power Station** **Date Reported: 09/22/2023**

Report Verification

This report and the above data have been confirmed by the following analyst.



Michael Ohlinger, Chemist
Email: msohlinger@aep.com
Phone: 614-836-4184
Audinet: 8-210-4184

Data Qualifer Legend

J1 - Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.

U1 - Not detected at or above method detection limit (MDL).

B1 - Analyte detected in method blank (MB) at or above the method criteria.

Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

Dolan Chemical Laboratory (DCL)
4001 Bixby Road
Groveport, Ohio 43125
Contacts: Michael Ohlinger (614-836-4184)
Dave Conover (614-836-4219)

Project Name: Pirkey PP EBAP
Contact Name: Leslie Fuerschbach
Contact Phone: 318-673-2744
Sampler(s): Kenny McDonald Brad Bates

Analysis Turnaround Time (in Calendar Days)
◉ Routine (28 days for Monitoring Wells)

Site Contact:

Date:

For Lab Use Only:
COC/Order #: 232672

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	250 mL bottle, pH<2, HNO_3 — Sb, As, B, Ba, Be, Ca, Cd, Cr, Co, K, Li, Mg, Mo, Na, Pb, Se, Sr, Tl	Field-filter 250 mL bottle, then pH<2, HNO_3 — Dissolved Sb, As, Ba, Be, Cd, Cr, Co, Fe, Li, Mn, Mo, Pb, Se, Tl	Three (six every 10th*) 1 L bottles, pH<2, HNO3 — Ra-226, Ra-228	250 mL Glass bottle, HCL**, pH<2 — Mercury	Field-filter 250 mL Glass bottle, HCL**, pH<2 — Dissolved Mercury			Sample Specific Notes:
AD-2	8/23/2023	1003	G	GW	7		X	X	X	X	X			
AD-4	8/23/2023	728	G	GW	7		X	X	X	X	X			
AD-12	8/23/2023	846	G	GW	7		X	X	X	X	X			
AD-18	8/23/2023	950	G	GW	7		X	X	X	X	X			
AD-31	8/23/2023	923	G	GW	7		X	X	X	X	X			
AD-32	8/23/2023	921	G	GW	7		X	X	X	X	X			
Preservation Used: 1= Ice, 2= HCl; 3= H_2SO_4; 4=HNO_3; 5=NaOH; 6= Other _____; F= filter in field							4	F4	4	2	F2			

* *Six 1L Bottles must be collected for Radium for every 10th sample.*

Special Instructions/QC Requirements & Comments:

TG-32 needed

Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
[signature]	EAGLE	08/24/23 1400		
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: [signature]	Date/Time: 08/28/23 1:10 Pm

Form COC-04, AEP Chain of Custody (COC) Record for Coal Combustion Residual (CCR) Sampling - Shreveport, Rev. 1, 1/10/17

WATER & WASTE SAMPLE RECEIPT FORM

Package Type	Delivery Type
(Cooler) Box Bag Envelope	PONY UPS (FedEX) USPS
	Other _____

Plant/Customer Pilgrim PP. **Number of Plastic Containers:** 30

Opened By Krisgma **Number of Glass Containers:** _____

Date/Time 08/28/23 1:10Pm **Number of Mercury Containers:** 12

Were all temperatures within 0-6°C? Y / N or (N/A) **Initial** mGlc on ice / (no ice)

(IR Gun Ser# 2213689000, *Expir.* 03/24/2024) - If No, specify each deviation: _____

Was container in good condition? (Y) / N Comments _____

Was Chain of Custody received? (Y) / N Comments _____

Requested turnaround: _____ If **RUSH**, who was notified? _____

pH (15 min)	Cr^{+6} (pres) (24 hr)	NO_2 or NO_3 (48 hr)	*ortho*-PO_4 (48 hr)	Hg-diss (pres) (48 hr)

Was COC filled out properly? (Y) / N Comments _____

Were samples labeled properly? (Y) / N Comments _____

Were correct containers used? (Y) / N Comments _____

Was pH checked & Color Coding done? (Y) / N or N/A **Initial & Date:** mGlc 08/28/23

pH paper (circle one): MQuant,PN1.09535.0001,LOT#_____ [OR] Lab Rat,PN4801,LOT# X000RWDG21 Exp 11/15/2024

- Was Add'l Preservative needed? Y / (N) If Yes: By whom & when: _____ (See Prep Book)

Is sample filtration requested? Y / (N) Comments _____ (See Prep Book)

Was the customer contacted? If Yes: Person Contacted: _____

Lab ID# 232672 Initial & Date & Time : _____

Logged by mGlc Comments: _____

Reviewed by WCG _____

_____

_____

REMINDER: Document the pertinent sample integrity information and deviations in sample receipt (as noted above) in the "Notes" field in the LIMS to be included on the report to the customer.

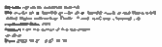
Municipal Solid Waste Laboratory Review Checklist

This data package consists of:

- [x] This signature page, and the laboratory review checklist consisting of Table 1, Reportable Data (which includes the reportable data identified on this page), Table 2, Supporting Data, and Table 3, Exception Reports.
- [x] R1 Field chain-of-custody documentation
- [x] R2 Sample identification cross-reference
- [x] R3 Test reports (analytical data sheets) for each environmental sample that includes:
  - (a) Items specified in NELAC Chapter 5 for reporting results, e.g., Section 5.5.10 in 2003 NELAC Standard
  - (b) Dilution factors
  - (c) Preparation methods
  - (d) Cleanup methods
  - (e) If required for the project, tentatively identified compounds (TICs)
- [NA] R4 Surrogate recovery data including:
  - (a) Calculated recovery (%R)
  - (b) The laboratory's surrogate QC limits
- [x] R5 Test reports/summary forms for blank samples
- [x] R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  - (a) LCS spiking amounts
  - (b) Calculated %R for each analyte
  - (c) The laboratory's LCS QC limits
- [x] R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  - (a) Samples associated with the MS/MSD clearly identified
  - (b) MS/MSD spiking amounts
  - (c) Concentration of each MS/MSD analyte measured in the parent and spiked samples
  - (d) Calculated %Rs and relative percent differences (RPDs)
  - (e) The laboratory's MS/MSD QC limits
- [x] R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  - (a) The amount of analyte measured in the duplicate
  - (b) The calculated RPD
  - (c) The laboratory's QC limits for analytical duplicates
- [x] R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix
- [x] R10 Other problems or anomalies
- [x] The Exception Report for every item for which the result is "No" or "NR" (Not Reviewed)

Release Statement: I am responsible for the release of this laboratory data package. This data package as been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Check, if applicable: [•] This laboratory is an in-house laboratory controlled by the person responding to rule. The official signing the cover page of the rule-required report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Jonathan Barnhill		Lab Supervisor	9-21-2023
Name (printed)	Signature	Official Title	Date

ICP-MS Laboratory Review Checklist

Table 1. Reportable Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey PP EBAP

Reviewer Name: Jonathan Barnhill

LRC Date: 9-21-2023

Laboratory Job Number: 232672

Prep Batch Number(s): PB23083103 QC2309030

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
R1	O, I	**Chain-of-custody (COC)**		
	I	Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	Yes	
	I	Were all departures from standard conditions described in an exception report?	Yes	
R2	O, I	**Sample and quality control (QC) identification**		
	I	Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	Yes	
	I	Are all laboratory ID numbers cross-referenced to the corresponding QC data?	Yes	
R3	O, I	**Test reports**		
	I	Were all samples prepared and analyzed within holding times?	Yes	
	I	Other than those results < MQL, were all other raw values bracketed by calibration standards?	No	ER1
	I	Were calculations checked by a peer or supervisor?	Yes	
	I	Were all analyte identifications checked by a peer or supervisor?	Yes	
	I	Were sample quantitation limits reported for all analytes not detected?	Yes	
	I	Were all results for soil and sediment samples reported on a dry weight basis?	NA	
	I	Was % moisture (or solids) reported for all soil and sediment samples?	NA	
	I	If required for the project, TICs reported?	NA	
R4	O	**Surrogate recovery data**		
	I	Were surrogates added prior to extraction?	NA	
	I	Were surrogate percent recoveries in all samples within the laboratory QC limits?	NA	
R5	O, I	**Test reports/summary forms for blank samples**		
	I	Were appropriate type(s) of blanks analyzed?	Yes	
	I	Were blanks analyzed at the appropriate frequency?	Yes	

ICP-MS Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
	I	Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	Yes	
	I	Were blank concentrations < MQL?	Yes	
R6	O, I	**Laboratory control samples (LCS):**		
	I	Were all COCs included in the LCS?	Yes	
	I	Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	Yes	
	I	Were LCSs analyzed at the required frequency?	Yes	
	I	Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	Yes	
	I	Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	Yes	
	I	Was the LCSD RPD within QC limits?	Yes	
R7	O, I	**Matrix spike (MS) and matrix spike duplicate (MSD) data**		
	I	Were the project/method specified analytes included in the MS and MSD?	Yes	
	I	Were MS/MSD analyzed at the appropriate frequency?	Yes	
	I	Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	Yes	
	I	Were MS/MSD RPDs within laboratory QC limits?	Yes	
R8	O, I	**Analytical duplicate data**		
	I	Were appropriate analytical duplicates analyzed for each matrix?	Yes	
	I	Were analytical duplicates analyzed at the appropriate frequency?	Yes	
	I	Were RPDs or relative standard deviations within the laboratory QC limits?	Yes	
R9	O, I	**Method quantitation limits (MQLs):**		
	I	Are the MQLs for each method analyte included in the laboratory data package?	Yes	
	I	Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	Yes	
	I	Are unadjusted MQLs included in the laboratory data package?	Yes	
R10	O, I	**Other problems/anomalies**		
	I	Are all known problems/anomalies/special conditions noted in this LRC and ER?	Yes	
	I	Were all necessary corrective actions performed for the reported data?	Yes	
	I	Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	Yes	

ICP-MS Laboratory Review Checklist

Table 2. Supporting Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey PP EBAP

Reviewer Name: Jonathan Barnhill

LRC Date: 9-21-2023

Laboratory Job Number: 232672

Prep Batch Number(s): PB23083103 QC2309030

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S1	O, I	**Initial calibration (ICAL)**		
	I	Were response factors and/or relative response factors for each analyte within QC limits?	NA	
	I	Were percent RSDs or correlation coefficient criteria met?	Yes	
	I	Was the number of standards recommended in the method used for all analytes?	Yes	
	I	Were all points generated between the lowest and highest standard used to calculate the curve?	Yes	
	I	Are ICAL data available for all instruments used?	Yes	
	I	Has the initial calibration curve been verified using an appropriate second source standard?	Yes	
S2	O, I	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB):**		
	I	Was the CCV analyzed at the method-required frequency?	Yes	
	I	Were percent differences for each analyte within the method-required QC limits?	Yes	
	I	Was the ICAL curve verified for each analyte?	Yes	
	I	Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	No	ER2
S3	O	**Mass spectral tuning:**		
	I	Was the appropriate compound for the method used for tuning?	Yes	
	I	Were ion abundance data within the method-required QC limits?	Yes	
S4	O	**Internal standards (IS):**		
	I	Were IS area counts and retention times within the method-required QC limits?	Yes	
S5	O, I	**Raw data (NELAC section 1 appendix A glossary, and section 5.)**		
	I	Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	Yes	
	I	Were data associated with manual integrations flagged on the raw data?	NA	

ICP-MS Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S6	O	**Dual column confirmation**		
	I	Did dual column confirmation results meet the method-required QC?	NA	
S7	O	**Tentatively identified compounds (TICs):**		
	I	If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?	NA	
S8	I	**Interference Check Sample (ICS) results:**		
	I	Were percent recoveries within method QC limits?	NA	
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**		
	I	Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	NA	
S10	O, I	**Method detection limit (MDL) studies**		
	I	Was a MDL study performed for each reported analyte?	Yes	
	I	Is the MDL either adjusted or supported by the analysis of DCSs?	Yes	
S11	O, I	**Proficiency test reports:**		
	I	Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	Yes	
S12	O, I	**Standards documentation**		
	I	Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	Yes	
S13	O, I	**Compound/analyte identification procedures**		
	I	Are the procedures for compound/analyte identification documented?	Yes	
S14	O, I	**Demonstration of analyst competency (DOC)**		
	I	Was DOC conducted consistent with NELAC Chapter 5C?	Yes	
	I	Is documentation of the analyst's competency up-to-date and on file?	Yes	
S15	O, I	**Verification/validation documentation for methods (NELAC Chap 5n 5)**		
	I	Are all the methods used to generate the data documented, verified, and validated, where applicable?	Yes	
S16	O, I	**Laboratory standard operating procedures (SOPs):**		
	I	Are laboratory SOPs current and on file for each method performed?	Yes	

Table 3. Exception Reports.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey PP EBAP

Reviewer Name: Jonathan Barnhill

LRC Date: 9-21-2023

Laboratory Job Number: 232672

Prep Batch Number(s): PB23083103 QC2309030

Exception Report No.	Description
ER1	Linear Dynamic Range (LDR) study used to determine upper limit of analyte calibration.
ER2	CCB acceptance criteria is CCB<2.2*MDL.

[1] Items identified by the letter "R" must be available as a hard copy or as a .pdf file. Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.

[2] O - organic analyses; I - inorganic analyses (including general chemistry constituents, when applicable).

[3] NA - Not applicable; NR - Not reviewed.

[4] Exception Report identification number; an Exception Report should be completed for an item if the result is "No" or "NR."

Municipal Solid Waste Laboratory Review Checklist

This data package consists of:

- [x] This signature page, and the laboratory review checklist consisting of Table 1, Reportable Data (which includes the reportable data identified on this page), Table 2, Supporting Data, and Table 3, Exception Reports.
- [x] R1 Field chain-of-custody documentation
- [x] R2 Sample identification cross-reference
- [x] R3 Test reports (analytical data sheets) for each environmental sample that includes:
  - (a) Items specified in NELAC Chapter 5 for reporting results, e.g., Section 5.5.10 in 2003 NELAC Standard
  - (b) Dilution factors
  - (c) Preparation methods
  - (d) Cleanup methods
  - (e) If required for the project, tentatively identified compounds (TICs)
- [NA] R4 Surrogate recovery data including:
  - (a) Calculated recovery (%R)
  - (b) The laboratory's surrogate QC limits
- [x] R5 Test reports/summary forms for blank samples
- [x] R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  - (a) LCS spiking amounts
  - (b) Calculated %R for each analyte
  - (c) The laboratory's LCS QC limits
- [x] R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  - (a) Samples associated with the MS/MSD clearly identified
  - (b) MS/MSD spiking amounts
  - (c) Concentration of each MS/MSD analyte measured in the parent and spiked samples
  - (d) Calculated %Rs and relative percent differences (RPDs)
  - (e) The laboratory's MS/MSD QC limits
- [x] R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  - (a) The amount of analyte measured in the duplicate
  - (b) The calculated RPD
  - (c) The laboratory's QC limits for analytical duplicates
- [x] R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix
- [x] R10 Other problems or anomalies
- [x] The Exception Report for every item for which the result is "No" or "NR" (Not Reviewed)

Release Statement: I am responsible for the release of this laboratory data package. This data package as been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Check, if applicable: [•] This laboratory is an in-house laboratory controlled by the person responding to rule. The official signing the cover page of the rule-required report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Susann Sulzmann	S. Sulzmann	Senior Chemist	09-08-2023
Name (printed)	Signature	Official Title	Date

Mercury Laboratory Review Checklist

Table 1. Reportable Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey

Reviewer Name: Susann Sulzmann

LRC Date: 08-31-2023, 09-01-2023

Laboratory Job Number: 232672

Prep Batch Number(s): 23083001, 23083003, 23090101

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
R1	O, I	**Chain-of-custody (COC)**		
	I	Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	Yes	
	I	Were all departures from standard conditions described in an exception report?	Yes	
R2	O, I	**Sample and quality control (QC) identification**		
	I	Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	Yes	
	I	Are all laboratory ID numbers cross-referenced to the corresponding QC data?	Yes	
R3	O, I	**Test reports**		
	I	Were all samples prepared and analyzed within holding times?	yes	
	I	Other than those results < MQL, were all other raw values bracketed by calibration standards?	yes	
	I	Were calculations checked by a peer or supervisor?	Yes	
	I	Were all analyte identifications checked by a peer or supervisor?	Yes	
	I	Were sample quantitation limits reported for all analytes not detected?	Yes	
	I	Were all results for soil and sediment samples reported on a dry weight basis?	NA	
	I	Was % moisture (or solids) reported for all soil and sediment samples?	NA	
	I	If required for the project, TICs reported?	NA	
R4	O	**Surrogate recovery data**		
	I	Were surrogates added prior to extraction?	NA	
	I	Were surrogate percent recoveries in all samples within the laboratory QC limits?	NA	
R5	O, I	**Test reports/summary forms for blank samples**		
	I	Were appropriate type(s) of blanks analyzed?	Yes	
	I	Were blanks analyzed at the appropriate frequency?	Yes	

Mercury Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
	I	Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	Yes	
	I	Were blank concentrations < MQL?	yes	
R6	O, I	**Laboratory control samples (LCS):**		
	I	Were all COCs included in the LCS?	Yes	
	I	Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	Yes	
	I	Were LCSs analyzed at the required frequency?	Yes	
	I	Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?		
	I	Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	Yes	
	I	Was the LCSD RPD within QC limits?	yes	
R7	O, I	**Matrix spike (MS) and matrix spike duplicate (MSD) data**		
	I	Were the project/method specified analytes included in the MS and MSD?	Yes	
	I	Were MS/MSD analyzed at the appropriate frequency?	Yes	
	I	Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	yes	
	I	Were MS/MSD RPDs within laboratory QC limits?	yes	
R8	O, I	**Analytical duplicate data**		
	I	Were appropriate analytical duplicates analyzed for each matrix?	Yes	
	I	Were analytical duplicates analyzed at the appropriate frequency?	Yes	
	I	Were RPDs or relative standard deviations within the laboratory QC limits?	yes	
R9	O, I	**Method quantitation limits (MQLs):**		
	I	Are the MQLs for each method analyte included in the laboratory data package?	Yes	
	I	Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	Yes	
	I	Are unadjusted MQLs included in the laboratory data package?	Yes	
R10	O, I	**Other problems/anomalies**		
	I	Are all known problems/anomalies/special conditions noted in this LRC and ER?	Yes	
	I	Were all necessary corrective actions performed for the reported data?	Yes	
	I	Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	Yes	

Mercury Laboratory Review Checklist

Table 2. Supporting Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey

Reviewer Name: Susann Sulzmann

LRC Date: 08-31-2023, 09-01-2023

Laboratory Job Number: 232672

Prep Batch Number(s): 23083001, 23083003, 23090101

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S1	O, I	**Initial calibration (ICAL)**		
	I	Were response factors and/or relative response factors for each analyte within QC limits?	NA	
	I	Were percent RSDs or correlation coefficient criteria met?	Yes	
	I	Was the number of standards recommended in the method used for all analytes?	Yes	
	I	Were all points generated between the lowest and highest standard used to calculate the curve?	yes	
	I	Are ICAL data available for all instruments used?	Yes	
	I	Has the initial calibration curve been verified using an appropriate second source standard?	Yes	
S2	O, I	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB):**		
	I	Was the CCV analyzed at the method-required frequency?	Yes	
	I	Were percent differences for each analyte within the method-required QC limits?	Yes	
	I	Was the ICAL curve verified for each analyte?	Yes	
	I	Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	No	ER1
S3	O	**Mass spectral tuning:**		
	I	Was the appropriate compound for the method used for tuning?	NA	
	I	Were ion abundance data within the method-required QC limits?	NA	
S4	O	**Internal standards (IS):**		
	I	Were IS area counts and retention times within the method-required QC limits?	NA	
S5	O, I	**Raw data (NELAC section 1 appendix A glossary, and section 5.)**		
	I	Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	Yes	
	I	Were data associated with manual integrations flagged on the raw data?	NA	

Mercury Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S6	O	**Dual column confirmation**		
	I	Did dual column confirmation results meet the method-required QC?	NA	
S7	O	**Tentatively identified compounds (TICs):**		
	I	If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?	NA	
S8	I	**Interference Check Sample (ICS) results:**		
	I	Were percent recoveries within method QC limits?	NA	
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**		
	I	Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	NA	
S10	O, I	**Method detection limit (MDL) studies**		
	I	Was a MDL study performed for each reported analyte?	Yes	
	I	Is the MDL either adjusted or supported by the analysis of DCSs?	Yes	
S11	O, I	**Proficiency test reports:**		
	I	Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	Yes	
S12	O, I	**Standards documentation**		
	I	Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	Yes	
S13	O, I	**Compound/analyte identification procedures**		
	I	Are the procedures for compound/analyte identification documented?	Yes	
S14	O, I	**Demonstration of analyst competency (DOC)**		
	I	Was DOC conducted consistent with NELAC Chapter 5C?	Yes	
	I	Is documentation of the analyst's competency up-to-date and on file?	Yes	
S15	O, I	**Verification/validation documentation for methods (NELAC Chap 5n 5)**		
	I	Are all the methods used to generate the data documented, verified, and validated, where applicable?	Yes	
S16	O, I	**Laboratory standard operating procedures (SOPs):**		
	I	Are laboratory SOPs current and on file for each method performed?	Yes	

Table 3. Exception Reports.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey

Reviewer Name: Susann Sulzmann

LRC Date: 08-31-2023, 09-01-2023

Laboratory Job Number: 232672

Prep Batch Number(s): 23083001, 23083003, 23090101

Exception Report No.	Description
ER1	CCB acceptance criteria is CCB<MQL.

[1] Items identified by the letter "R" must be available as a hard copy or as a .pdf file. Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.

[2] O - organic analyses; I - inorganic analyses (including general chemistry constituents, when applicable).

[3] NA - Not applicable; NR - Not reviewed.

[4] Exception Report identification number; an Exception Report should be completed for an item if the result is "No" or "NR."

Municipal Solid Waste Laboratory Review Checklist

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  - (a) Items specified in NELAC Chapter 5 for reporting results, e.g., Section 5.5.10 in 2003 NELAC Standard
  - (b) Dilution factors
  - (c) Preparation methods
  - (d) Cleanup methods
  - (e) If required for the project, tentatively identified compounds (TICs)
- [NA] R4 Surrogate recovery data including:
  - (a) Calculated recovery (%R)
  - (b) The laboratory's surrogate QC limits
- [x] R5 Test reports/summary forms for blank samples
- [x] R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  - (a) LCS spiking amounts
  - (b) Calculated %R for each analyte
  - (c) The laboratory's LCS QC limits
- [x] R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  - (a) Samples associated with the MS/MSD clearly identified
  - (b) MS/MSD spiking amounts
  - (c) Concentration of each MS/MSD analyte measured in the parent and spiked samples
  - (d) Calculated %Rs and relative percent differences (RPDs)
  - (e) The laboratory's MS/MSD QC limits
- [x] R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  - (a) The amount of analyte measured in the duplicate
  - (b) The calculated RPD
  - (c) The laboratory's QC limits for analytical duplicates
- [x] R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix
- [x] R10 Other problems or anomalies
- [x] The Exception Report for every item for which the result is "No" or "NR" (Not Reviewed)

Release Statement: I am responsible for the release of this laboratory data package. This data package as been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Check, if applicable: (●) This laboratory is an in-house laboratory controlled by the person responding to rule. The official signing the cover page of the rule-required report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Tamisha T. Palmer	Tamisha T. Palmer	Chemical Technician, Prin.	09/14/2023
Name (printed)	Signature	Official Title	Date

Radium Laboratory Review Checklist

Table 1. Reportable Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey Plant

Reviewer Name: Tamisha Palmer

LRC Date: 09/14/2023

Laboratory Job Number: 232672

Prep Batch Number(s): PB23090102

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
R1	O, I	**Chain-of-custody (COC)**		
	I	Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	Yes	
	I	Were all departures from standard conditions described in an exception report?	Yes	
R2	O, I	**Sample and quality control (QC) identification**		
	I	Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	Yes	
	I	Are all laboratory ID numbers cross-referenced to the corresponding QC data?	Yes	
R3	O, I	**Test reports**		
	I	Were all samples prepared and analyzed within holding times?	Yes	
	I	Other than those results < MQL, were all other raw values bracketed by calibration standards?	NA	
	I	Were calculations checked by a peer or supervisor?	Yes	
	I	Were all analyte identifications checked by a peer or supervisor?	Yes	
	I	Were sample quantitation limits reported for all analytes not detected?	Yes	
	I	Were all results for soil and sediment samples reported on a dry weight basis?	NA	
	I	Was % moisture (or solids) reported for all soil and sediment samples?	NA	
	I	If required for the project, TICs reported?	NA	
R4	O	**Surrogate recovery data**		
	I	Were surrogates added prior to extraction?	NA	
	I	Were surrogate percent recoveries in all samples within the laboratory QC limits?	NA	
R5	O, I	**Test reports/summary forms for blank samples**		
	I	Were appropriate type(s) of blanks analyzed?	Yes	
	I	Were blanks analyzed at the appropriate frequency?	Yes	

Radium Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
	I	Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	Yes	
	I	Were blank concentrations < MQL?	Yes	
R6	O, I	**Laboratory control samples (LCS):**		
	I	Were all COCs included in the LCS?	Yes	
	I	Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	Yes	
	I	Were LCSs analyzed at the required frequency?	Yes	
	I	Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?		
	I	Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	Yes	
	I	Was the LCSD RPD within QC limits?	Yes	
R7	O, I	**Matrix spike (MS) and matrix spike duplicate (MSD) data**		
	I	Were the project/method specified analytes included in the MS and MSD?	Yes	
	I	Were MS/MSD analyzed at the appropriate frequency?	Yes	
	I	Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	NA	
	I	Were MS/MSD RPDs within laboratory QC limits?	NA	
R8	O, I	**Analytical duplicate data**		
	I	Were appropriate analytical duplicates analyzed for each matrix?	Yes	
	I	Were analytical duplicates analyzed at the appropriate frequency?	Yes	
	I	Were RPDs or relative standard deviations within the laboratory QC limits?	NA	
R9	O, I	**Method quantitation limits (MQLs):**		
	I	Are the MQLs for each method analyte included in the laboratory data package?	Yes	
	I	Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	Yes	
	I	Are unadjusted MQLs included in the laboratory data package?	Yes	
R10	O, I	**Other problems/anomalies**		
	I	Are all known problems/anomalies/special conditions noted in this LRC and ER?	Yes	
	I	Were all necessary corrective actions performed for the reported data?	Yes	
	I	Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	Yes	

Radium Laboratory Review Checklist

Table 2. Supporting Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey Plant

Reviewer Name: Tamisha Palmer

LRC Date: 09/14/2023

Laboratory Job Number: 232672

Prep Batch Number(s): PB23090102

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S1	O, I	**Initial calibration (ICAL)**		
	I	Were response factors and/or relative response factors for each analyte within QC limits?	NA	
	I	Were percent RSDs or correlation coefficient criteria met?	Yes	
	I	Was the number of standards recommended in the method used for all analytes?	Yes	
	I	Were all points generated between the lowest and highest standard used to calculate the curve?	NA	
	I	Are ICAL data available for all instruments used?	Yes	
	I	Has the initial calibration curve been verified using an appropriate second source standard?	Yes	
S2	O, I	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB):**		
	I	Was the CCV analyzed at the method-required frequency?	NA	
	I	Were percent differences for each analyte within the method-required QC limits?	NA	
	I	Was the ICAL curve verified for each analyte?	NA	
	I	Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	NA	
S3	O	**Mass spectral tuning:**		
	I	Was the appropriate compound for the method used for tuning?	NA	
	I	Were ion abundance data within the method-required QC limits?	NA	
S4	O	**Internal standards (IS):**		
	I	Were IS area counts and retention times within the method-required QC limits?	NA	
S5	O, I	**Raw data (NELAC section 1 appendix A glossary, and section 5.)**		
	I	Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	Yes	
	I	Were data associated with manual integrations flagged on the raw data?	NA	

Radium Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S6	O	**Dual column confirmation**		
	I	Did dual column confirmation results meet the method-required QC?	NA	
S7	O	**Tentatively identified compounds (TICs):**		
	I	If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?	NA	
S8	I	**Interference Check Sample (ICS) results:**		
	I	Were percent recoveries within method QC limits?	NA	
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**		
	I	Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	NA	
S10	O, I	**Method detection limit (MDL) studies**		
	I	Was a MDL study performed for each reported analyte?	Yes	
	I	Is the MDL either adjusted or supported by the analysis of DCSs?	Yes	
S11	O, I	**Proficiency test reports:**		
	I	Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	Yes	
S12	O, I	**Standards documentation**		
	I	Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	Yes	
S13	O, I	**Compound/analyte identification procedures**		
	I	Are the procedures for compound/analyte identification documented?	Yes	
S14	O, I	**Demonstration of analyst competency (DOC)**		
	I	Was DOC conducted consistent with NELAC Chapter 5C?	Yes	
	I	Is documentation of the analyst's competency up-to-date and on file?	Yes	
S15	O, I	**Verification/validation documentation for methods (NELAC Chap 5n 5)**		
	I	Are all the methods used to generate the data documented, verified, and validated, where applicable?	Yes	
S16	O, I	**Laboratory standard operating procedures (SOPs):**		
	I	Are laboratory SOPs current and on file for each method performed?	Yes	

Table 3. Exception Reports.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey Plant

Reviewer Name: Tamisha Palmer

LRC Date: 09/14/2023

Laboratory Job Number: 232672

Prep Batch Number(s): PB23090102

Exception Report No.	Description

[1] Items identified by the letter "R" must be available as a hard copy or as a .pdf file. Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
[2] O - organic analyses; I - inorganic analyses (including general chemistry constituents, when applicable).
[3] NA - Not applicable; NR - Not reviewed.
[4] Exception Report identification number; an Exception Report should be completed for an item if the result is "No" or "NR."

Municipal Solid Waste Laboratory Review Checklist

This data package consists of:

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- [x] R2 Sample identification cross-reference
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  - (a) Items specified in NELAC Chapter 5 for reporting results, e.g., Section 5.5.10 in 2003 NELAC Standard
  - (b) Dilution factors
  - (c) Preparation methods
  - (d) Cleanup methods
  - (e) If required for the project, tentatively identified compounds (TICs)
- [NA] R4 Surrogate recovery data including:
  - (a) Calculated recovery (%R)
  - (b) The laboratory's surrogate QC limits
- [x] R5 Test reports/summary forms for blank samples
- [x] R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  - (a) LCS spiking amounts
  - (b) Calculated %R for each analyte
  - (c) The laboratory's LCS QC limits
- [x] R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  - (a) Samples associated with the MS/MSD clearly identified
  - (b) MS/MSD spiking amounts
  - (c) Concentration of each MS/MSD analyte measured in the parent and spiked samples
  - (d) Calculated %Rs and relative percent differences (RPDs)
  - (e) The laboratory's MS/MSD QC limits
- [x] R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  - (a) The amount of analyte measured in the duplicate
  - (b) The calculated RPD
  - (c) The laboratory's QC limits for analytical duplicates
- [x] R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix
- [x] R10 Other problems or anomalies
- [x] The Exception Report for every item for which the result is "No" or "NR" (Not Reviewed)

Release Statement: I am responsible for the release of this laboratory data package. This data package as been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Check, if applicable: (●) This laboratory is an in-house laboratory controlled by the person responding to rule. The official signing the cover page of the rule-required report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Tamisha T. Palmer	Tamisha T. Palmer	Chemical Technician Prin.	09/14/2023
Name (printed)	Signature	Official Title	Date

Radium Laboratory Review Checklist

Table 1. Reportable Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey Plant

Reviewer Name: Tamisha Palmer

LRC Date: 09/14/2023

Laboratory Job Number: 232672

Prep Batch Number(s): PB23090103

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
R1	O, I	**Chain-of-custody (COC)**		
	I	Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	Yes	
	I	Were all departures from standard conditions described in an exception report?	Yes	
R2	O, I	**Sample and quality control (QC) identification**		
	I	Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	Yes	
	I	Are all laboratory ID numbers cross-referenced to the corresponding QC data?	Yes	
R3	O, I	**Test reports**		
	I	Were all samples prepared and analyzed within holding times?	Yes	
	I	Other than those results < MQL, were all other raw values bracketed by calibration standards?	NA	
	I	Were calculations checked by a peer or supervisor?	Yes	
	I	Were all analyte identifications checked by a peer or supervisor?	Yes	
	I	Were sample quantitation limits reported for all analytes not detected?	Yes	
	I	Were all results for soil and sediment samples reported on a dry weight basis?	NA	
	I	Was % moisture (or solids) reported for all soil and sediment samples?	NA	
	I	If required for the project, TICs reported?	NA	
R4	O	**Surrogate recovery data**		
	I	Were surrogates added prior to extraction?	NA	
	I	Were surrogate percent recoveries in all samples within the laboratory QC limits?	NA	
R5	O, I	**Test reports/summary forms for blank samples**		
	I	Were appropriate type(s) of blanks analyzed?	Yes	
	I	Were blanks analyzed at the appropriate frequency?	Yes	

Radium Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
	I	Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	Yes	
	I	Were blank concentrations < MQL?	No	ER1
R6	O, I	**Laboratory control samples (LCS):**		
	I	Were all COCs included in the LCS?	Yes	
	I	Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	Yes	
	I	Were LCSs analyzed at the required frequency?	Yes	
	I	Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	Yes	
	I	Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	Yes	
	I	Was the LCSD RPD within QC limits?	Yes	
R7	O, I	**Matrix spike (MS) and matrix spike duplicate (MSD) data**		
	I	Were the project/method specified analytes included in the MS and MSD?	Yes	
	I	Were MS/MSD analyzed at the appropriate frequency?	Yes	
	I	Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	NA	
	I	Were MS/MSD RPDs within laboratory QC limits?	NA	
R8	O, I	**Analytical duplicate data**		
	I	Were appropriate analytical duplicates analyzed for each matrix?	NA	
	I	Were analytical duplicates analyzed at the appropriate frequency?	NA	
	I	Were RPDs or relative standard deviations within the laboratory QC limits?	NA	
R9	O, I	**Method quantitation limits (MQLs):**		
	I	Are the MQLs for each method analyte included in the laboratory data package?	Yes	
	I	Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	Yes	
	I	Are unadjusted MQLs included in the laboratory data package?	Yes	
R10	O, I	**Other problems/anomalies**		
	I	Are all known problems/anomalies/special conditions noted in this LRC and ER?	Yes	
	I	Were all necessary corrective actions performed for the reported data?	Yes	
	I	Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	Yes	

Radium Laboratory Review Checklist

Table 2. Supporting Data.

Laboratory Name: American Electric Power Dolan Chemical Laboratory

Project Name: Pirkey Plant

Reviewer Name: Tamisha Palmer

LRC Date: 09/14/2023

Laboratory Job Number: 232672

Prep Batch Number(s): PB23090103

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S1	O, I	**Initial calibration (ICAL)**		
	I	Were response factors and/or relative response factors for each analyte within QC limits?	NA	
	I	Were percent RSDs or correlation coefficient criteria met?	Yes	
	I	Was the number of standards recommended in the method used for all analytes?	Yes	
	I	Were all points generated between the lowest and highest standard used to calculate the curve?	NA	
	I	Are ICAL data available for all instruments used?	Yes	
	I	Has the initial calibration curve been verified using an appropriate second source standard?	Yes	
S2	O, I	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB):**		
	I	Was the CCV analyzed at the method-required frequency?	NA	
	I	Were percent differences for each analyte within the method-required QC limits?	NA	
	I	Was the ICAL curve verified for each analyte?	NA	
	I	Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	NA	
S3	O	**Mass spectral tuning:**		
	I	Was the appropriate compound for the method used for tuning?	NA	
	I	Were ion abundance data within the method-required QC limits?	NA	
S4	O	**Internal standards (IS):**		
	I	Were IS area counts and retention times within the method-required QC limits?	NA	
S5	O, I	**Raw data (NELAC section 1 appendix A glossary, and section 5.)**		
	I	Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	Yes	
	I	Were data associated with manual integrations flagged on the raw data?	NA	

Radium Laboratory Review Checklist

Item[1]	Analytes[2]	Description	Result (Yes, No, NA, NR)[3]	Exception Report No.[4]
S6	O	**Dual column confirmation**		
	I	Did dual column confirmation results meet the method-required QC?	NA	
S7	O	**Tentatively identified compounds (TICs):**		
	I	If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?	NA	
S8	I	**Interference Check Sample (ICS) results:**		
	I	Were percent recoveries within method QC limits?	NA	
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**		
	I	Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	NA	
S10	O, I	**Method detection limit (MDL) studies**		
	I	Was a MDL study performed for each reported analyte?	Yes	
	I	Is the MDL either adjusted or supported by the analysis of DCSs?	Yes	
S11	O, I	**Proficiency test reports:**		
	I	Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	Yes	
S12	O, I	**Standards documentation**		
	I	Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	Yes	
S13	O, I	**Compound/analyte identification procedures**		
	I	Are the procedures for compound/analyte identification documented?	Yes	
S14	O, I	**Demonstration of analyst competency (DOC)**		
	I	Was DOC conducted consistent with NELAC Chapter 5C?	Yes	
	I	Is documentation of the analyst's competency up-to-date and on file?	Yes	
S15	O, I	**Verification/validation documentation for methods (NELAC Chap 5n 5)**		
	I	Are all the methods used to generate the data documented, verified, and validated, where applicable?	Yes	
S16	O, I	**Laboratory standard operating procedures (SOPs):**		
	I	Are laboratory SOPs current and on file for each method performed?	Yes	

APPENDIX 6- Well Installation/Decommissioning Logs

Reports documenting monitoring well plugging and abandonment or well installation are included in the appendix.

STATE OF TEXAS PLUGGING REPORT for Tracking #232687

Owner:	**SWEPCO**	Owner Well #:	**MW-7 (AD-7)**
Address:	**2400 FM 3251 Hallsville, TX 75650**	Grid #:	**35-37-1**
Well Location:	**2400 FM 3251 Hallsville, TX 75650**	Latitude:	**32° 27' 40.81" N**
		Longitude:	**094° 29' 12.31" W**
Well County:	**Harrison**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company: **No Data** Date Drilled: **10/3/1983**

Driller: **No Data** License Number: **No Data**

	Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Borehole:	**10**	**0**	**40**

Plugging Information

Date Plugged: **9/12/2023** Plugger: **Rich Herman**

Plug Method: **Pour in 3/8 bentonite chips when standing water in well is less than 100 feet depth, cement top 2 feet**

Casing Left in Well:

Dia (in.)	*Top (ft.)*	*Bottom (ft.)*
4	**0**	**40**

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**40**	**Bentonite 9 Bags/Sacks**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **ETTL Engineers & Consultants, Inc.**

1717 East Erwin Street
Tyler, TX 75702

Driller Name: **Rich Herman** License Number: **59385**

Comments: **All casing and screen left in the hole. When attempting to pull, 3' of stickup was all that came out. No cement cap per client request due to grading that is currently going on**