

Annual Groundwater Monitoring Report

Kentucky Power Company

Mitchell Plant

Landfill

Moundsville, WV

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An **AEP** Company

BOUNDLESS ENERGYSM

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I. Overview

This *Annual Groundwater Monitoring Report* (Report) has been prepared to report the status of activities for the preceding year for the landfill at Kentucky Power Company's, a wholly owned subsidiary of American Electric Power Company (AEP), Mitchell Power Plant. The USEPA's CCR rules require that the Annual Groundwater Monitoring Report be posted to the operating record for the preceding year no later than January 31st.

In general, the following activities were completed in 2022:

- The unit was in detection monitoring at the beginning and end of 2022;
- Groundwater samples were collected on May 12, 2022 and on October 5, 2022, and analyzed for Appendix III constituents, as specified in 40 CFR 257.94 and AEP's *Groundwater Sampling and Analysis Plan (2016)*;
- Groundwater monitoring data underwent various validation tests, including tests for completeness, valid values, transcription errors, and consistent units;
- Appendix III constituents were compared to prediction limits (intervals for pH) established from background data established previously. Statistical comparisons to background were made for samples collected on October 20, 2021 and May 12, 2022;
- The statistical evaluation of the October 20, 2021 sampling, completed on February 14, 2022, concluded that there were no statistically significant increases (SSIs) over background of any Appendix III constituents. The statistical evaluation of the May 12, 2022 sampling and August 31, 2022 resampling concluded that there was a potential SSI at one well (chloride at monitoring well MW-1102F);
- Because potential SSIs over background of Appendix III constituents were detected at Mitchell Plant's landfill during the May 12, 2021 initial sampling, the corresponding October 12, 2021 resampling, and statistical analysis completed on December 14, 2021, an ASD study was conducted resulting in a March 11, 2022 ASD report. Because a potential SSI over background of an Appendix III constituent was detected at Mitchell Plant's landfill during the May 12, 2022 initial sampling, the corresponding August 31, 2022 resampling, and statistical analysis completed on December 5, 2022, an ASD study will be completed in 2023;
- Statistical analysis of the groundwater samples collected and analyzed for all Appendix III constituents during the sampling event on October 5, 2022 will be completed in 2023.

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 one or more SSIs over background levels (Attached as Appendix 2, where applicable);
- A discussion of whether any alternate source demonstrations were performed, and the conclusions (Attached as Appendix 3, where applicable);
- A summary of any transition between monitoring programs, for example the date and circumstances for transitioning from detection monitoring to assessment monitoring (Notices attached as Appendix 4, where applicable);
- Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a statement regarding the rationale for the installation/decommission (Attached as Appendix 5, where applicable); and
- Other information required to be included in the annual report such as an alternate monitoring frequency, or assessment of corrective measures, if applicable.

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

A figure that depicts the PE-certified groundwater monitoring network, the monitoring well locations, and their corresponding identification is provided in Appendix 1.

III. Monitoring Wells Installed or Decommissioned

There were no monitoring wells installed or decommissioned in 2022. The network design, as summarized in the *Groundwater Monitoring Network Design Report* (2016) and as posted at the CCR web site for Mitchell Plant, did not change. That 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

In response to initially significant increases in concentrations of chloride, fluoride, and total dissolved solids detected in groundwater samples at monitoring well MW-1102F and pH at MW-1502R during the May 12, 2021 sampling event, resamples for these constituents were collected

at the well on October 12, 2021. In response to an initially significant increase in the concentration of chloride detected in the groundwater sample at monitoring well MW-1102F during the May 12, 2022 sampling event, a resample for this constituent was collected at the well on August 31, 2022. Appendix 1 contains tables showing the groundwater quality data collected during the establishment of background quality and detection monitoring. Static water elevation data from each monitoring event also are shown in Appendix 1, along with the groundwater velocities, groundwater flow direction, and potentiometric maps developed after each sampling event.

V. Groundwater Quality Data Statistical Analysis

The statistical evaluation of the October 20, 2021 sampling, completed on February 14, 2022, concluded that there were no SSIs over background of any Appendix III constituents. Statistical analysis of the detection monitoring samples collected on May 12, 2022 was completed on December 5, 2022. The evaluation concluded that an SSI of chloride over background was detected at MW-1102F. Memoranda with the results of the statistical evaluations are provided in Appendix 2.

As required by 40 CFR 257.94, groundwater samples were collected and analyzed for all Appendix III constituents during a second semiannual sampling event on October 5, 2022. A statistical evaluation of these results will be completed in 2023.

VI. Alternative Source Demonstrations

Because potential SSIs over background were detected during the May 12, 2021 sampling event and the resample collected on October 12, 2021, an alternative source demonstration (ASD) study was conducted resulting in an March 11, 2022 ASD report. The report concluded that the SSIs were not due to a release from the Mitchell Landfill, but were instead attributed to natural variation in groundwater quality. The report is provided in Appendix 3. An ASD study is being conducted in response to potential SSIs detected over background during the May 12, 2022 sampling event. This study will be completed in 2023.

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

No transition between monitoring requirements occurred in 2022; the CCR unit was in detection monitoring at the beginning and at the end of the year. A statement to this effect is provided in Appendix 4. The sampling frequency of twice per year will be maintained for the Appendix III constituents (boron, calcium, chloride, fluoride, pH, sulfate and total dissolved solids).

Regarding defining an alternate monitoring frequency, the groundwater velocity and monitoring well production is high enough at this facility that no modification of the semiannual detection monitoring schedule is necessary.

VIII. Other Information Required

The Mitchell landfill has remained in its current status of detection monitoring. All required information has been included in this annual groundwater monitoring report.

IX. Description of Any Problems Encountered in 2022 and Actions Taken

No significant problems were encountered. Through the use of low-flow purging and sampling methodology, samples representative of uppermost aquifer groundwater were obtained and the schedule was met to support this annual groundwater report preparation. There were, however, dry wells encountered during sampling, but this did not affect the statistical evaluation or monitoring network at the landfill. The minimum requirement of one upgradient and three downgradient wells was still met.

X. A Projection of Key Activities for the Upcoming Year

Key activities for 2023 include the following:

- Detection monitoring on a semiannual schedule;
- Statistical evaluation of the detection monitoring results to determine any SSIs (or decreases with respect to pH);
- Responding to any new data received in light of CCR rule requirements;
- Preparation of the next annual groundwater report.

APPENDIX 1 - Groundwater Data Tables and Figures

Tables follow showing the groundwater monitoring data collected, the rate of groundwater flow each time groundwater was sampled, the number of samples collected per monitoring well, dates that the samples were collected, and whether each sample was collected as part of a detection monitoring or an assessment monitoring program. Figures follow showing the PE-certified groundwater monitoring network with the corresponding well identifications along with static water elevation data and groundwater flow directions each time groundwater was sampled in the form of annotated satellite images.

**Table 1 - Groundwater Data Summary: MW-1101F
Mitchell - LF
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
6/15/2016	Background	0.042	88.3	3.87	0.22	7.4	64.3	395
8/3/2016	Background	0.380	91.0	3.30	0.21	7.4	62.1	425
9/28/2016	Background	0.054	88.6	3.73	0.26	8.7	58.1	466

Notes:

mg/L: milligrams per liter

SU: standard unit

<: 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.

- -: Not analyzed

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.

Table 1 - Groundwater Data Summary: MW-1101F

Mitchell - LF

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	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L
6/15/2016	Background	0.21	1.64	159	0.023	0.08	0.6	0.294	0.304	0.22	0.525	0.012	< 0.002 U1	3.87	0.2	0.02 J1
8/3/2016	Background	0.14	1.46	155	0.033	0.08	0.6	0.244	1.494	0.21	0.673	0.017	< 0.002 U1	4.04	0.2	< 0.01 U1
9/28/2016	Background	0.18	1.79	142	0.029	0.12	0.8	0.231	1.561	0.26	0.511	0.016	< 0.002 U1	3.39	0.3	0.02 J1

Notes:

µg/L: micrograms per liter

mg/L: milligrams per liter

pCi/L: picocuries per liter

<: 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.

- -: Not analyzed

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.

**Table 1 - Groundwater Data Summary: MW-1101R
Mitchell - LF
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
6/15/2016	Background	0.287	6.91	8.41	1.20	8.2	76.4	741
8/3/2016	Background	0.518	5.00	10.3	1.56	8.4	76.4	750
9/28/2016	Background	0.382	6.12	13.3	1.83	8.5	43.5	43
11/16/2016	Background	1.80	19.4	15.2	2.29	8.6	32.2	801
2/14/2017	Background	0.501	2.23	15.4	2.40	8.6	32.0	806
4/12/2017	Background	0.360	4.02	14.4	2.17	8.7	39.2	798
5/24/2017	Background	0.380	1.91	15.1	2.41	8.7	28.6	793
7/25/2017	Background	0.415	1.76	15.8	2.61	8.7	28.7	788
10/11/2017	Detection	0.394	1.87	16.9	2.59	8.7	29.1	784
1/11/2018	Detection	--	1.75	--	--	7.9	28.8	--
4/10/2018	Detection	0.344	1.75	16.5	2.62	8.5	29.0	790
8/29/2018	Detection	0.371	2.42	16.3	2.45	9.0	29.7	783
5/1/2019	Detection	0.376	1.90	16.9	2.62	10.5	28.7	809
6/12/2019	Detection	0.371	2.03	16.2	2.38	8.8	27.4	822
10/23/2019	Detection	0.389	1.81	17.2	2.70	8.7	28.4	820
5/6/2020	Detection	0.364	2.17	15.1	2.46	8.2	23.9	828
10/21/2020	Detection	0.409	2.42	16.6	2.57	9.1	28.5	845
5/12/2021	Detection	0.349	2.46	16.8	2.47	8.3	27.5	856
10/20/2021	Detection	0.359	2.6	16.9	2.60	8.6	24.6	850
5/12/2022	Detection	0.373	2.52	17.5	2.67	9.0	29.1	840
10/5/2022	Detection	0.394	2.79	18.3	2.81	8.3	29.3	840

Notes:

mg/L: milligrams per liter

SU: standard unit

<: 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.

--: Not analyzed

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.

Table 1 - Groundwater Data Summary: MW-1101R

Mitchell - LF

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	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L
6/15/2016	Background	0.82	8.11	185	0.031	0.03	1.1	0.650	0.493	1.20	1.22	0.002	0.003 J1	31.8	0.5	0.05 J1
8/3/2016	Background	1.10	10.8	149	0.023	0.03	1.0	0.363	0.4776	1.56	0.674	0.012	< 0.002 U1	32.9	0.5	0.02 J1
9/28/2016	Background	0.92	11.1	149	0.01 J1	0.02	0.7	0.301	0.565	1.83	0.550	0.009	< 0.002 U1	26.2	0.5	0.01 J1
11/16/2016	Background	0.67	14.2	125	0.01 J1	0.02 J1	0.595	0.143	1.808	2.29	0.292	0.026	< 0.002 U1	20.6	0.4	< 0.01 U1
2/14/2017	Background	0.69	15.3	102	0.01 J1	0.02 J1	0.512	0.160	1.661	2.40	0.327	0.012	< 0.002 U1	34.0	0.4	0.02 J1
4/12/2017	Background	0.84	12.4	117	0.02 J1	0.02 J1	0.824	0.333	0.19	2.17	0.634	0.010	0.002 J1	16.7	0.5	< 0.01 U1
5/24/2017	Background	0.66	15.7	102	0.01 J1	0.01 J1	0.526	0.299	0.759	2.41	0.298	< 0.0002 U1	< 0.002 U1	14.8	0.3	< 0.01 U1
7/25/2017	Background	0.62	14.5	91.3	0.01 J1	0.01 J1	0.377	0.126	0.977	2.61	0.235	0.009	< 0.002 U1	18.3	0.3	0.02 J1

Notes:

µg/L: micrograms per liter

mg/L: milligrams per liter

pCi/L: picocuries per liter

<: 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.

- -: Not analyzed

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.

Table 1 - Groundwater Data Summary: MW-1102F

**Mitchell - LF
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
6/15/2016	Background	0.109	4.34	12.4	0.56	8.0	37.2	523
8/3/2016	Background	0.280	5.48	11.9	0.58	8.2	35.9	535
10/3/2016	Background	0.160	5.45	11.8	0.60	8.1	29.5	519
11/15/2016	Background	0.117	4.87	11.7	0.56	8.1	27.4	551
2/14/2017	Background	0.109	5.04	11.3	0.53	8.2	29.9	521
4/12/2017	Background	0.109	4.67	11.3	0.53	8.3	30.6	530
5/24/2017	Background	0.118	5.31	13.7	0.56	8.3	31.8	521
7/26/2017	Background	0.202	5.41	11.4	0.57	8.3	31.5	519
10/10/2017	Detection	0.278	4.79	12.4	0.57	8.4	32.3	526
1/11/2018	Detection	--	4.47	--	--	7.9	32.1	--
4/10/2018	Detection	0.109	4.40	13.4	0.63	8.2	33.2	539
8/28/2018	Detection	0.247	4.48	14.1	0.64	8.6	33.8	549
5/1/2019	Detection	0.126	4.69	15.2	0.66	9.5	37.6	577
6/12/2019	Detection	0.110	4.36	14.9	0.74	8.2	38.0	574
10/23/2019	Detection	0.114	4.46	16.3	0.68	8.3	38.8	564
1/31/2020	Detection	--	--	16.3	--	8.2	--	--
5/6/2020	Detection	0.129	4.33	16.0	0.69	8.8	33.8	574
7/15/2020	Detection	--	--	16.0	--	8.4	--	--
10/21/2020	Detection	0.147	3.81	17.3	0.76	9.0	39.2	580
3/17/2021	Detection	0.113	4.10	18.2	0.84	9.6	38.8	585
5/12/2021	Detection	0.114	4.08	18.2	0.79	8.9	38.4	584
10/12/2021	Detection	--	--	18.3	0.79	8.3	--	610
10/20/2021	Detection	0.121	4.3	18.5	0.82	8.3	35.9	590
5/12/2022	Detection	0.126	4.37	20.0	0.85	8.8	40.8	600
8/31/2022	Detection	--	--	19.9	--	8.2	--	--
10/5/2022	Detection	0.124	4.34	21.5	0.86	7.9	41.3	590

Notes:

mg/L: milligrams per liter

SU: standard unit

<: 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.

--: Not analyzed

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.

Table 1 - Groundwater Data Summary: MW-1102F

Mitchell - LF

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	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L
6/15/2016	Background	0.71	9.37	214	< 0.005 U1	0.04	0.4	0.096	0.352	0.56	0.335	0.003	< 0.002 U1	28.1	0.3	< 0.01 U1
8/3/2016	Background	0.69	8.16	212	< 0.005 U1	0.02 J1	0.4	0.090	0.881	0.58	0.183	0.006	< 0.002 U1	25.8	0.3	0.01 J1
10/3/2016	Background	0.64	8.45	194	0.005 J1	0.01 J1	0.5	0.286	0.972	0.60	0.298	0.002	< 0.002 U1	23.9	0.3	< 0.01 U1
11/15/2016	Background	0.63	8.49	212	0.005 J1	0.008 J1	0.435	0.074	1.859	0.56	0.141	0.003	< 0.002 U1	22.9	0.3	< 0.01 U1
2/14/2017	Background	0.62	8.66	197	0.006 J1	0.006 J1	0.411	0.049	1.015	0.53	0.131	0.004	< 0.002 U1	21.4	0.3	0.02 J1
4/12/2017	Background	0.56	7.68	191	0.005 J1	0.01 J1	0.399	0.079	0.1825	0.53	0.135	0.005	< 0.002 U1	19.3	0.3	0.01 J1
5/24/2017	Background	0.60	8.76	229	0.01 J1	0.02	0.807	0.203	0.3252	0.56	0.335	< 0.0002 U1	< 0.002 U1	20.0	0.4	0.01 J1
7/26/2017	Background	0.54	7.58	205	< 0.004 U1	0.01 J1	0.323	0.072	0.942	0.57	0.121	0.007	< 0.002 U1	34.7	0.3	0.03 J1

Notes:

µg/L: micrograms per liter

mg/L: milligrams per liter

pCi/L: picocuries per liter

<: 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.

- -: Not analyzed

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.

**Table 1 - Groundwater Data Summary: MW-1102R
Mitchell - LF
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
6/15/2016	Background	0.339	3.49	219	2.97	8.2	47.8	1,470
8/3/2016	Background	0.467	4.05	217	2.98	8.3	44.9	1,450
10/3/2016	Background	0.332	5.33	213	2.96	8.3	35.1	1,530

Notes:

mg/L: milligrams per liter

SU: standard unit

<: 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.

- -: Not analyzed

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.

Table 1 - Groundwater Data Summary: MW-1102R

Mitchell - LF

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	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L
6/15/2016	Background	2.01	2.64	292	0.02 J1	0.35	0.5	0.799	0.710	2.97	0.558	0.015	< 0.002 U1	68.7	0.9	0.01 J1
8/3/2016	Background	1.71	3.57	356	0.128	0.14	3.0	1.75	1.217	2.98	2.82	0.021	0.007 J1	66.0	1.2	0.03 J1
10/3/2016	Background	1.73	3.37	441	0.307	0.17	3.9	3.01	2.828	2.96	7.24	0.028	0.007	51.4	1.9	0.03 J1

Notes:

µg/L: micrograms per liter

mg/L: milligrams per liter

pCi/L: picocuries per liter

<: 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.

--: Not analyzed

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.

**Table 1 - Groundwater Data Summary: MW-1103F
Mitchell - LF
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
6/15/2016	Background	0.355	3.01	243	3.11	8.3	0.5	1,390
8/2/2016	Background	0.402	2.99	247	3.20	8.3	0.3	1,420
10/3/2016	Background	0.321	3.12	242	3.34	8.4	< 0.04 U1	1,380
11/16/2016	Background	0.323	2.97	240	2.96	8.4	0.2	1,370
2/15/2017	Background	0.303	2.82	240	3.07	8.5	0.2	1,400
4/11/2017	Background	0.304	2.57	234	3.05	8.6	0.4	1,400
5/23/2017	Background	0.346	2.88	237	3.23	8.5	0.4	1,370
7/26/2017	Background	0.343	2.76	240	3.24	8.5	0.3	1,370
10/11/2017	Detection	0.328	3.09	247	3.17	8.6	0.5	1,390
4/11/2018	Detection	0.286	2.58	239	3.16	8.3	0.5	1,390
8/29/2018	Detection	0.332	2.76	244	3.03	8.6	0.4	1,380
5/2/2019	Detection	0.342	2.95	245	3.13	9.1	0.8	1,360
6/12/2019	Detection	0.329	2.96	233	3.55	8.3	0.9	1,410
10/23/2019	Detection	0.336	3.44	242	3.25	8.5	0.8	1,440
5/6/2020	Detection	0.358	3.48	235	2.96	8.9	0.8	1,420
10/21/2020	Detection	0.332	3.05	237	3.07	8.8	0.8	1,440
5/12/2021	Detection	0.294	3.50	247	2.96	9.1	1.2	1,440
10/20/2021	Detection	0.299	3.3	241	3.08	8.5	0.77	1,450
5/12/2022	Detection	0.333	4.04	244	3.07	8.7	1.5	1,430
10/5/2022	Detection	0.335	4.12	290	3.21	8.1	1.0	1,590

Notes:

mg/L: milligrams per liter

SU: standard unit

<: 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.

--: Not analyzed

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.

Table 1 - Groundwater Data Summary: MW-1103F

Mitchell - LF

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	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L
6/15/2016	Background	0.16	8.03	639	0.029	0.02	1.0	0.351	1.100	3.11	0.674	0.012	< 0.002 U1	10.1	0.2	0.01 J1
8/2/2016	Background	0.14	7.01	704	0.026	0.01 J1	0.9	0.299	0.899	3.20	0.479	0.016	< 0.002 U1	2.61	0.2	< 0.01 U1
10/3/2016	Background	0.04 J1	5.80	558	0.01 J1	0.03	0.4	0.180	1.026	3.34	0.313	0.016	< 0.004 U1	2.66	0.1 J1	0.01 J1
11/16/2016	Background	0.10	7.71	723	0.01 J1	0.009 J1	0.471	0.159	1.570	2.96	0.218	0.015	< 0.002 U1	2.57	0.1	< 0.01 U1
2/15/2017	Background	0.03 J1	7.67	631	0.009 J1	0.008 J1	0.336	0.147	1.416	3.07	0.213	0.016	< 0.002 U1	2.81	0.09 J1	0.03 J1
4/11/2017	Background	0.07	8.46	618	0.006 J1	0.006 J1	0.262	0.102	2.183	3.05	0.088	0.015	< 0.002 U1	3.19	0.1	< 0.01 U1
5/23/2017	Background	0.03 J1	7.85	688	0.006 J1	0.007 J1	0.260	0.149	1.214	3.23	0.194	0.006	< 0.002 U1	2.80	0.06 J1	< 0.01 U1
7/26/2017	Background	0.02 J1	6.81	562	< 0.004 U1	0.007 J1	0.112	0.136	1.798	3.24	0.103	0.015	< 0.002 U1	5.46	0.07 J1	0.02 J1

Notes:

µg/L: micrograms per liter

mg/L: milligrams per liter

pCi/L: picocuries per liter

<: 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.

--: Not analyzed

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.

**Table 1 - Groundwater Data Summary: MW-1104R
Mitchell - LF
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
6/21/2016	Background	0.431	39.4	485	1.18	7.9	162	2,390

Notes:

mg/L: milligrams per liter

SU: standard unit

<: 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.

--: Not analyzed

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.

Table 1 - Groundwater Data Summary: MW-1104R

Mitchell - LF

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	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L
6/21/2016	Background	0.66	4.35	182	0.570	0.18	3.4	4.36	0.153	1.18	9.41	0.014	< 0.09 U1	42.3	2.3	0.133

Notes:

µg/L: micrograms per liter

mg/L: milligrams per liter

pCi/L: picocuries per liter

<: 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.

- -: Not analyzed

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.

Table 1 - Groundwater Data Summary: MW-1502R

**Mitchell - LF
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
6/20/2016	Background	0.268	71.5	33.4	0.18	7.3	155	474
8/9/2016	Background	0.160	95.4	34.0	0.17	7.3	187	547
9/27/2016	Background	0.376	103	39.7	0.1 J1	7.4	183	560
11/9/2016	Background	0.214	87.3	25.4	0.1 J1	7.4	186	551
2/15/2017	Background	0.069	90.0	167	0.16	7.5	90.1	564
4/12/2017	Background	0.075	72.2	79.5	0.16	7.6	102	507
5/23/2017	Background	0.100	73.9	52.4	0.17	7.6	118	466
7/25/2017	Background	0.158	61.7	18.8	0.20	7.3	88.6	358
10/11/2017	Detection	0.132	91.0	24.5	0.1 J1	7.3	159	535
1/11/2018	Detection	--	240	--	--	7.0	149	--
4/10/2018	Detection	0.051	78.3	196	0.19	7.4	87.6	616
8/29/2018	Detection	0.150	95.7	99.3	0.17	7.7	167	650
5/2/2019	Detection	0.1 J1	93.6	245	0.17	8.5	105	702
6/12/2019	Detection	0.127	80.7	155	0.23	7.3	114	661
10/23/2019	Detection	0.194	104	102	0.18	7.2	252	758
1/31/2020	Detection	--	--	--	--	7.4	120	474
5/6/2020	Detection	0.081	64.8	74.6	0.18	7.8	93.0	471
9/1/2020	Detection	--	--	--	--	7.2	--	--
10/21/2020	Detection	0.267	92.5	56.6	0.18	7.7	249	679
3/17/2021	Detection	0.083	94.9	274	0.24	7.9	117	759
5/12/2021	Detection	0.121	73.0	113	0.24	8.3	118	540
10/12/2021	Detection	--	--	--	--	7.4	--	--
10/20/2021	Detection	0.194	91.0	91.8	0.21	7.5	176	650
5/12/2022	Detection	0.084	84.0 M1	102	0.21	8.3	105	520
10/5/2022	Detection	0.135	89.5 M1, P3	69.4	0.21	6.9	131	540

Notes:

mg/L: milligrams per liter

SU: standard unit

<: 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.

--: Not analyzed

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.

M1: The associated matrix spike (MS) or matrix spike duplicate (MSD) recovery was outside acceptance limits.

P1: The precision between duplicate results was above acceptance limits.

Table 1 - Groundwater Data Summary: MW-1502R

Mitchell - LF

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	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L
6/20/2016	Background	0.22	0.28	30.6	< 0.005 U1	0.005 J1	0.3	0.082	0.143	0.18	0.064	0.002	< 0.09 U1	3.48	8.2	0.01 J1
8/9/2016	Background	0.20	0.26	34.1	< 0.005 U1	0.006 J1	0.3	0.068	1.029	0.17	0.089	0.010	< 0.002 U1	8.71	7.4	< 0.01 U1
9/27/2016	Background	0.16	0.27	38.2	< 0.005 U1	0.004 J1	0.4	0.076	0.429	0.1 J1	0.064	0.012	< 0.002 U1	8.40	8.8	< 0.01 U1
11/9/2016	Background	0.20	0.84	44.2	0.062	0.009 J1	1.44	0.507	2.497	0.1 J1	0.764	0.006	< 0.002 U1	3.19	5.3	0.03 J1
2/15/2017	Background	0.13	0.24	27.7	0.006 J1	< 0.004 U1	1.90	0.069	2.61	0.16	0.061	0.009	< 0.002 U1	1.84	4.3	0.03 J1
4/12/2017	Background	0.13	0.69	29.2	0.053	0.008 J1	1.20	0.426	0.613	0.16	0.630	0.015	0.002 J1	1.91	4.8	0.02 J1
5/23/2017	Background	0.15	0.53	32.2	0.033	< 0.005 U1	0.918	0.238	0.647	0.17	0.364	0.002	< 0.002 U1	2.46	4.7	0.01 J1
7/25/2017	Background	0.21	0.30	19.0	0.008 J1	< 0.005 U1	0.196	0.082	0.6323	0.20	0.088	0.009	< 0.002 U1	2.47	3.2	0.03 J1

Notes:

µg/L: micrograms per liter

mg/L: milligrams per liter

pCi/L: picocuries per liter

<: 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.

--: Not analyzed

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.

**Table 1: Residence Time Calculation Summary
Mitchell Landfill**

CCR Management Unit	Monitoring Well Pair	Well Diameter (inches)	2022-05		2022-10	
			Vertical Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Vertical Groundwater Velocity (ft/year)	Groundwater Residence Time (days)
Landfill	MW1101F/R ^[1]	2.0	2.8	22	2.9	21
	MW1102F/R ^[1]	2.0	0.6	97	0.6	109
	MW1103F/R ^[2]	2.0	1.7	36	1.7	36
	MW1104F/R ^[2]	2.0	1.0	64	0.9	65
	MW1501F/R ^[3]	4.0	2.4	52	2.4	51
	MW1502R ^[3]	4.0	NC	NC	NC	NC
	MW1503F/R ^[3]	4.0	1.3	92	1.3	93

Notes:

[1] - Sidegradient Well

[2] - Background Well

[3] - Downgradient Well

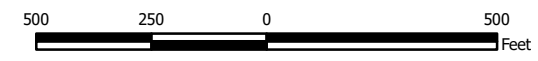
NC - No calculation can be generated



- Legend**
- ◆ Compliance Sampling Location
 - ◆ Upgradient Sampling Location
 - CCR Landfill (Approximate Limits of Waste)

Notes

- Monitoring well coordinates provided by AEP.
- Site features based on information available in the Groundwater Monitoring Network Evaluation (CEC, 2016) provided by AEP.

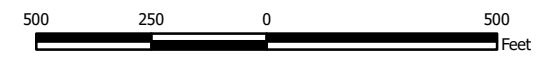


Site Layout	
Landfill - Fish Creek Aquifer	
Mitchell Power Generation Plant Marshall County, West Virginia	
Geosyntec consultants	
Columbus, Ohio	2018/01/26
Figure 1a	



Legend
 ◆ Compliance Sampling Location
 ◆ Upgradient Sampling Location
 [Dashed Line] CCR Landfill (Approximate Limits of Waste)

Notes
 - Monitoring well coordinates provided by AEP.
 - Site features based on information available in the Groundwater Monitoring Network Evaluation (CEC, 2016) provided by AEP.

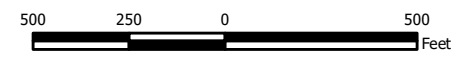


Site Layout Landfill - Rush Run Aquifer Mitchell Power Generation Plant Marshall County, West Virginia		Figure 1b
Columbus, Ohio	2018/01/26	



- Legend**
- ◆ Groundwater Monitoring Well
 - Groundwater Elevation Contour
 - - - Groundwater Elevation Contour (Inferred)
 - ➔ Groundwater Flow Direction

- Notes**
- Monitoring well coordinates and water level data (collected on May 10, 2022) provided by AEP.
 - Site features based on information available in the Groundwater Monitoring Network Evaluation (CEC, 2016) provided by AEP.
 - Groundwater elevation units are feet above mean sea level (NAVD 88).



**Potentiometric Surface Map - Fish Creek
May 2022**

Mitchell Power Generation Plant
Marshall County, West Virginia

Geosyntec
consultants

Columbus, Ohio

2022/11/22

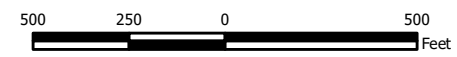
Figure
2



- Legend**
- ◆ Groundwater Monitoring Well
 - Groundwater Elevation Contour
 - - - Groundwater Elevation Contour (Inferred)
 - ➔ Groundwater Flow Direction

Notes

- Monitoring well coordinates and water level data (collected on May 10, 2022) provided by AEP.
- Site features based on information available in the Groundwater Monitoring Network Evaluation (CEC, 2016) provided by AEP.
- Groundwater elevation units are feet above mean sea level (NAVD 88).



**Potentiometric Surface Map - Rush Run
May 2022**

Mitchell Power Generation Plant
Marshall County, West Virginia

Geosyntec
consultants

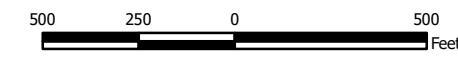
Columbus, Ohio 2022/11/22

Figure
3



- Legend**
- ⊕ Groundwater Monitoring Well
 - Groundwater Elevation Contour
 - - - Groundwater Elevation Contour (Inferred)
 - ➔ Groundwater Flow Direction

- Notes**
- Monitoring well coordinates and water level data (collected on October 5, 2022) provided by AEP.
 - Site features based on information available in the Groundwater Monitoring Network Evaluation (CEC, 2016) provided by AEP.
 - Groundwater elevation units are feet above mean sea level (NAVD 88).



**Potentiometric Surface Map - Fish Creek
October 2022**

Mitchell Power Generation Plant
Marshall County, West Virginia

Geosyntec
consultants

Columbus, Ohio

2023/01/23

Figure
4

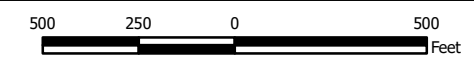


Legend

- ◆ Groundwater Monitoring Well
- Groundwater Elevation Contour
- - - Groundwater Elevation Contour (Inferred)
- ➔ Groundwater Flow Direction

Notes

- Monitoring well coordinates and water level data (collected on October 5, 2022) provided by AEP.
- Site features based on information available in the Groundwater Monitoring Network Evaluation (CEC, 2016) provided by AEP.
- Groundwater elevation units are feet above mean sea level (NAVD 88).



**Potentiometric Surface Map - Rush Run
October 2022**

Mitchell Power Generation Plant
Marshall County, West Virginia

Geosyntec
consultants

Figure
5

Columbus, Ohio 2023/01/09

APPENDIX 2 - Statistical Analyses

The February 2022 and December 2022 statistical memoranda summarizing previous detection monitoring sampling events follow.

Memorandum

Date: February 14, 2022

To: David Miller (AEP)

Copies to: Bill Smith (AEP)

From: Allison Kreinberg (Geosyntec)

Subject: Evaluation of Detection Monitoring Data at Mitchell Plant's Landfill (LF)

In accordance with the United States Environmental Protection Agency's (USEPA's) regulations regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (40 CFR 257 Subpart D, "CCR rule"), the second semi-annual detection monitoring event of 2021 at the Mitchell Landfill (LF), an existing CCR unit at the Mitchell Power Plant located in Moundsville, West Virginia was completed on October 20, 2021.

Background values for the LF were originally calculated in January 2018. After a minimum of four detection monitoring events, the results of those events were compared to the existing background and the dataset was updated as appropriate. Revised upper prediction limits (UPLs) were calculated for each Appendix III parameter to represent background values. Lower prediction limits (LPLs) were also calculated for pH. Details on the calculation of the most recent revision to the background values are described in Geosyntec's *Statistical Analysis Summary* report, dated January 17, 2022.

To achieve an acceptably high statistical power while maintaining a site-wide false-positive rate (SWFPR) of 10% per year or less, prediction limits were calculated based on a one-of-two retesting procedure. With this procedure, a statistically significant increase (SSI) is only concluded if both samples in a series of two exceeds the UPL (or are below the LPL for pH). In practice, if the initial result did not exceed the UPL, a second sample was not collected or analyzed.

Detection monitoring results and the relevant background values are compared in Table 1. No SSIs were observed at the Mitchell LF CCR unit, and as a result the Mitchell LF will remain in detection monitoring.

Evaluation of Detection Monitoring Data – Mitchell LF
February 14, 2022
Page 2

The statistical analysis was conducted within 90 days of completion of sampling and analysis in accordance with 40 CFR 257.93(h)(2). A certification of these statistics by a qualified professional engineer is provided in Attachment A.

**Table 1 - Detection Monitoring Data Comparison
Mitchell - Landfill**

Analyte	Unit	Description	MW-1101R	MW-1102F	MW-1502R
			10/20/2021	10/20/2021	10/20/2021
Boron	mg/L	Intrawell Background Value (UPL)	0.498	0.280	0.267
		Analytical Result	0.359	0.121	0.194
Calcium	mg/L	Intrawell Background Value (UPL)	2.61	5.60	110
		Analytical Result	2.6	4.3	91.0
Chloride	mg/L	Intrawell Background Value (UPL)	18.1	19.6	250
		Analytical Result	16.9	18.5	91.8
Fluoride	mg/L	Intrawell Background Value (UPL)	3.09	0.875	0.254
		Analytical Result	2.60	0.82	0.21
pH	SU	Intrawell Background Value (UPL)	9.1	9.6	8.5
		Intrawell Background Value (LPL)	7.9	7.6	7.2
		Analytical Result	8.6	8.3	7.5
Sulfate	mg/L	Intrawell Background Value (UPL)	37.8	44.6	236
		Analytical Result	24.6	35.9	176
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	930	614	778
		Analytical Result	850	590	650

Notes:

UPL: Upper prediction limit

LPL: Lower prediction limit

Bold values exceed the background value.

Background values are shaded gray.

ATTACHMENT A

Certification by a Qualified Professional Engineer

CERTIFICATION BY QUALIFIED PROFESSIONAL ENGINEER

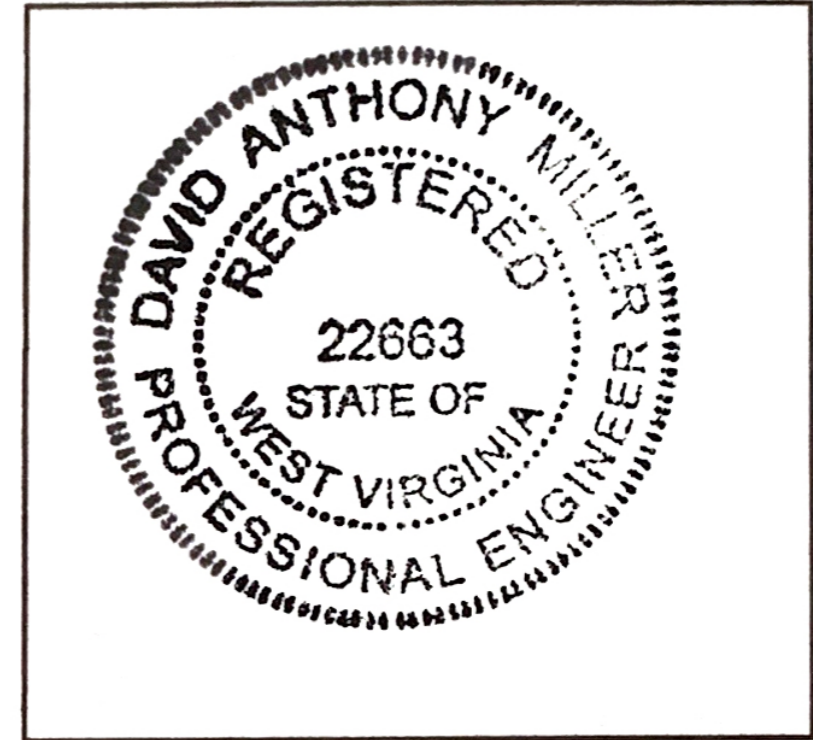
I certify that the selected statistical method, described above and in the January 17, 2022 *Statistical Analysis Summary* report, is appropriate for evaluating the groundwater monitoring data for the Mitchell LF CCR management area and that the requirements of 40 CFR 257.93(f) have been met.

DAVID ANTHONY MILLER

Printed Name of Licensed Professional Engineer

David Anthony Miller

Signature



22663

License Number

WEST VIRGINIA

Licensing State

02.14.22

Date

Memorandum

Date: November 28, 2022

To: David Miller (AEP)

Copies to: Bill Smith (AEP)

From: Allison Kreinberg (Geosyntec)

Subject: Evaluation of Detection Monitoring Data at Mitchell Plant's Landfill (LF)

In accordance with the United States Environmental Protection Agency's (USEPA's) regulations regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (40 CFR 257 Subpart D, "CCR rule"), the first semi-annual detection monitoring event of 2022 at the Mitchell Landfill (LF), an existing CCR unit at the Mitchell Power Plant located in Moundsville, West Virginia was completed on May 12, 2022. Based on the results, a resample was collected on August 31, 2022.

Background values for the LF were originally calculated in January 2018 and were revised in February 2020. After a minimum of four detection monitoring events, the results of those events were compared to the existing background and the dataset was updated as appropriate. Revised upper prediction limits (UPLs) were calculated for each Appendix III parameter to represent background values. Lower prediction limits (LPLs) were also calculated for pH. Details on the calculation of these revised background values are described in Geosyntec's *Statistical Analysis Summary* report, dated January 17, 2022.

To achieve an acceptably high statistical power while maintaining a site-wide false-positive rate (SWFPR) of 10% per year or less, prediction limits were calculated based on a one-of-two retesting procedure. With this procedure, a statistically significant increase (SSI) is concluded only if both samples in a series of two exceed the UPL (or are below the LPL for pH). In practice, if the initial result did not exceed the UPL, a second sample was not collected or analyzed.

Detection monitoring results and the relevant background values are compared in Table 1 and noted exceedances are described in the list below.

- Chloride concentrations exceeded the intrawell UPL of 19.6 mg/L in both the initial (20.0 mg/L) and second (19.9 mg/L) samples collected at MW-1102F. Therefore, an SSI over background is concluded for chloride at MW-1102F.

In response to the exceedances noted above, the Mitchell LF CCR unit will either transition to assessment monitoring or an alternative source demonstration (ASD) for chloride at MW-1102F will be conducted in accordance with 40 CFR 257.94(e)(2). If the ASD is successful, the Mitchell LF will remain in detection monitoring.

The statistical analysis was conducted within 90 days of completion of sampling and analysis in accordance with 40 CFR 257.93(h)(2). A certification of these statistics by a qualified professional engineer is provided in Attachment A.

**Table 1 - Detection Monitoring Data Comparison
Mitchell - Landfill**

Analyte	Unit	Description	MW-1101R	MW-1102F		MW-1502R
			5/12/2022	5/12/2022	8/31/2022	5/12/2022
Boron	mg/L	Intrawell Background Value (UPL)	0.498	0.280		0.267
		Analytical Result	0.373	0.126	--	0.084
Calcium	mg/L	Intrawell Background Value (UPL)	2.61	5.60		110
		Analytical Result	2.52	4.37	--	84.0
Chloride	mg/L	Intrawell Background Value (UPL)	18.1	19.6		250
		Analytical Result	17.5	20.0	19.9	102
Fluoride	mg/L	Intrawell Background Value (UPL)	3.09	0.875		0.254
		Analytical Result	2.67	0.85	--	0.21
pH	SU	Intrawell Background Value (UPL)	9.1	9.6		8.5
		Intrawell Background Value (LPL)	7.9	7.6		7.2
		Analytical Result	9.0	8.8	--	8.3
Sulfate	mg/L	Intrawell Background Value (UPL)	37.8	44.6		236
		Analytical Result	29.1	40.8	--	105
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	930	614		778
		Analytical Result	840	600	--	520

Notes:

UPL: Upper prediction limit

LPL: Lower prediction limit

Background values are shaded gray.

Bold values exceed the background value.

--: Not measured

ATTACHMENT A

Certification by a Qualified Professional Engineer

CERTIFICATION BY QUALIFIED PROFESSIONAL ENGINEER

I certify that the selected statistical method, described above and in the January 17, 2022 *Statistical Analysis Summary* report, is appropriate for evaluating the groundwater monitoring data for the Mitchell LF CCR management area and that the requirements of 40 CFR 257.93(f) have been met.

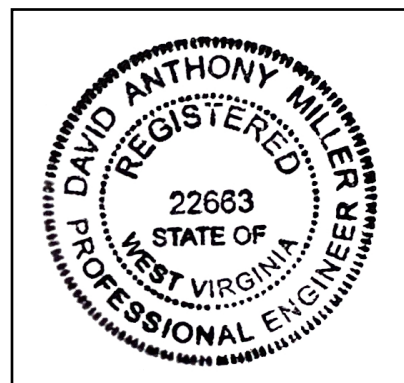
David Anthony Miller
Printed Name of Licensed Professional Engineer

David Anthony Miller
Signature

22663
License Number

West Virginia
Licensing State

12.05.2022
Date



APPENDIX 3 – Alternative Source Demonstrations

The March 2022 ASD report follows.

**ALTERNATIVE SOURCE
DEMONSTRATION REPORT
FEDERAL CCR RULE**

**Mitchell Plant Landfill
Marshall County, West Virginia**

Submitted to



1 Riverside Plaza
Columbus, Ohio 43215-2372

Submitted by



engineers | scientists | innovators

941 Chatham Lane, Suite 103
Columbus, Ohio 43221

March 11, 2022

CHA8495

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Attachment B	Potentiometric Maps
Attachment C	Certification by a Qualified Professional Engineer

LIST OF ACRONYMS AND ABBREVIATIONS

AEP	American Electric Power
ASD	Alternative Source Demonstration
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
EPA	Environmental Protection Agency
LF	Landfill
LPL	Lower Prediction Limit
QC	Quality Control
SSI	Statistically Significant Increase
TDS	Total Dissolved Solids
UPL	Upper Prediction Limit
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey

SECTION 1

INTRODUCTION AND SUMMARY

1.1 Introduction

This Alternative Source Demonstration (ASD) report has been prepared to address statistically significant increases (SSIs) for chloride, fluoride, and total dissolved solids (TDS) at the Mitchell Plant Landfill (LF) following the first semiannual detection monitoring event of 2021.

Following completion of four detection monitoring events, the previously calculated upper prediction limits (UPLs) for the Landfill were recalculated for each Appendix III parameter to represent background values (Geosyntec, 2020a). A lower prediction limit (LPL) was also recalculated for pH. The revised prediction limits were calculated based on a one-of-two retesting procedure in accordance with the Unified Guidance (USEPA, 2009) and the statistical analysis plan developed for the site (AEP, 2017). With this procedure, an SSI is concluded only if both samples in a series of two (the initial sample and the resample) exceed the UPL, or in the case of pH are both below the LPL or above the UPL.

The first semiannual detection monitoring event of 2021 was performed in May 2021 (initial sampling event) and October 2021 (verification sampling event) and the results were compared to the recalculated prediction limits. During this detection monitoring event, SSIs were identified for chloride, fluoride, and TDS at monitoring well MW-1102F. A summary of the detection monitoring analytical results for all constituents listed in 40 CFR Part 257 Appendix III and the calculated prediction limits for comparison is provided in **Table 1**.

1.2 CCR Rule Requirements

In accordance with the United States Environmental Protection Agency (USEPA) regulations regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments, Rule 40 CFR 257.94(e)(2) states the following:

*The owner or operator may demonstrate that a source other than the CCR unit caused the statistically significant increase over background levels for a constituent or that **the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality**. The owner or operator must complete the written demonstration within 90 days of detecting a statistically significant increase over background levels to include obtaining a certification from a qualified professional engineer verifying the accuracy of the information in the report.*

The first semiannual detection monitoring event for 2021 was completed in May and a resampling event was completed in October 2021 to identify SSIs over background limits. Pursuant to 40 CFR 257.94(e)(2), Geosyntec Consultants, Inc. (Geosyntec) has prepared this ASD report to identify

whether the SSIs identified for chloride, fluoride, and TDS at MW-1102F are from a source other than the LF.

1.3 Demonstration of Alternative Sources

An evaluation was completed to assess possible alternative sources to which identified SSIs could be attributed. Alternative sources were identified amongst five types:

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

A demonstration was conducted to assess whether the increases in chloride, fluoride, and TDS at MW-1102F were based on a Type IV cause (Natural Variation) and not by a release from the LF.

SECTION 2

ALTERNATIVE SOURCE DEMONSTRATION

A brief description of the site geology, ASD evaluation methodology, and the proposed alternative source are described below.

2.1 Site Geology Summary

The LF was designed and constructed in accordance with West Virginia Department of Environmental Protection Class F Industrial Landfill requirements. The LF design includes several engineering controls, including a composite liner, groundwater interceptor drainage system, and a leachate collection system (CEC, 2016).

The local geology consists of sandstone units separated by sharp contacts with shale or coal seams (CEC, 2016). From top to bottom, the named sandstone units underlying the LF include: the Burton Sandstone, the Fish Creek Sandstone, the Rush Run Sandstone, the Jollytown Sandstone, and the Hundred Sandstone. A cross-section of the geology underlying the LF which was included in the groundwater monitoring network report (CEC, 2016) is provided as **Attachment A**. The Burton Sandstone was identified as a hydrostratigraphic unit that did not require monitoring because the unit is not water-bearing upgradient of the Landfill and is absent downgradient of the Landfill due to natural incision.

2.2 Groundwater Monitoring History and Flow Characteristics

The LF monitoring well network was installed, and groundwater has been monitored under the West Virginia Solid Waste Management Rule (33CSR1) since 2012, which is prior to construction of the LF in 2013 and the initial waste placement in 2014 (CEC, 2016). Background monitoring under the Federal CCR Rule began in 2016. Wells set within either the Fish Creek Sandstone or Rush Run Sandstone are both included in the monitoring network for the Federal program (CEC, 2016). The well of concern (MW-1102F) is set within the Fish Creek Sandstone.

The cross-section of the geology shown in **Attachment A** indicates the presence of the Fish Creek Sandstone spanning the entire length of the cross-section as a continuous layer. Boring logs indicate that this unit is a clastic aquifer consisting of siltstone and sandstone, with the sandstone described as “micaceous, very fine to medium grained sand” (CEC, 2016). The cross-section transect fully encompasses the LF; therefore, it is reasonable to assume that the Fish Creek Sandstone constitutes an uninterrupted groundwater flow pathway permitting hydraulic connectivity between (at a minimum) upgradient well MW-1103F to downgradient well MW-1503F. The continuous nature of the Fish Creek Sandstone within the cross-section suggests that the unit extends in a similar fashion outside of the identified transect where incision has not occurred.

A potentiometric site map showing the location of Fish Creek Sandstone monitoring wells and groundwater flow directions during October 2021 is provided in **Figure 1**. Groundwater flow at and around the Landfill does not display noticeable seasonal variation. Potentiometric maps generated for the Fish Creek monitoring well network using groundwater elevations collected during October 2020, March 2021, May 2021, and October 2021 field events are provided as **Attachment B**.

2.3 Proposed Alternative Source

Initial review of site geochemistry, site historical data, and laboratory QA/QC did not identify alternative sources of chloride, fluoride, and TDS due to Type I (sampling) or Type II (laboratory) causes. A review of the statistical methods used did not identify any Type III (statistical) causes. A preliminary review did not identify any Type V (anthropogenic) causes. As described below, the SSIs have been attributed to natural variation associated with the underlying geology, which is a Type IV (natural variation) cause.

2.3.1 Comparison to Background Concentrations

Chloride, fluoride, and TDS in groundwater at the LF are monitored using intrawell prediction limits. A comparison of the reported concentrations for chloride, fluoride, and TDS between MW-1102F and nearest upgradient background well MW-1103F shows that concentrations of these parameters at the background location have consistently been more than an order of magnitude greater, including before waste was placed in the unit in 2014 (**Figure 2, Figure 3, and Figure 4**, respectively). While chloride concentrations are consistently around 250 mg/L at background well MW-1103F, concentrations at downgradient well MW-1102F have not exceeded 20 mg/L (**Figure 2**). Likewise, fluoride concentrations are consistently around 3.0 mg/L at background well MW-1103F, whereas concentrations at downgradient well MW-1102F have not exceeded 1.0 mg/L (**Figure 3**). TDS concentrations are consistently around 1400 mg/L at background well MW-1103F, whereas concentrations at downgradient well MW-1102F are consistently around 600 mg/L (**Figure 4**). Since TDS is a measurement of the dissolved ion concentrations in groundwater, the differences in major ion concentrations such as chloride result in corresponding variability in TDS concentrations.

Background wells set within the Fish Creek formation were installed prior to the construction of the LF at upgradient locations in a groundwater flow system containing little seasonal variation. These wells provide data points characterizing groundwater chemistry at locations which are not susceptible to LF impacts. The range of chemical concentrations observed between wells which are upgradient and downgradient of the LF establishes that significant natural variation exists within the aquifer unit. Fluctuations of chemical concentrations within this range may result from advective flow through the aquifer.

Therefore, the changes in chloride, fluoride, and TDS concentrations at MW-1102F could represent natural variation in the dilution of higher chloride, fluoride, and TDS concentration groundwater from within the Fish Creek Sandstone as it migrates through the aquifer. This

conclusion was also noted in previous ASDs completed for chloride at MW-1102F (Geosyntec, 2019; Geosyntec, 2020b; Geosyntec, 2020c; Geosyntec, 2021).

2.3.2 Comparison of Groundwater Boron Concentrations to Landfill Leachate

Boron is a geochemically conservative parameter which is not significantly attenuated during advective flow. Concentrations of boron in groundwater are unlikely to be modified as a result of geochemical processes common in clastic aquifers such as mineral precipitation/dissolution, ion exchange, or oxygenation-reduction (redox) variations. Because of this, changes in boron concentrations can be interpreted as results of physical mixing processes alone.

Figure 5 displays boron concentrations at MW-1102F, upgradient well MW-1103F, and within the LF leachate over time, including reported concentrations in groundwater prior to waste placement in 2014. The LF leachate samples presented in **Figure 5** are representative of composite leachate generated in the leachate collection system. Boron concentrations in LF leachate are approximately two orders of magnitude greater than those reported at either monitoring well. Should a release from the LF occur, the effect of physical mixing would be observed in downgradient groundwater boron concentrations due to the multiple orders of magnitude difference in concentrations between the leachate and the groundwater.

Figure 5 indicates that boron concentrations in groundwater at upgradient and downgradient monitoring locations are stable since monitoring began in 2012. This stability in boron concentrations at MW-1102F provides additional support that the SSIs observed at this well are not attributable to LF leachate.

2.4 Sampling Requirements

The conclusions of this ASD support the determination that the identified SSIs are from natural variation and not due to a release from the LF. Therefore, the unit will remain in the detection monitoring program. Groundwater at the unit will be sampled for Appendix III parameters on a semiannual basis.

SECTION 3

CONCLUSIONS

The preceding information serves as the ASD prepared in accordance with 40 CFR 257.94(e)(2) and supports the conclusion that the SSIs for chloride, fluoride, and TDS observed during the first semiannual sampling event of 2021 are not due to a release from the LF. The observed chloride, fluoride, and TDS SSIs are instead attributed to natural variation.

The alternative source of chloride, fluoride, and TDS at MW-1102F is the natural chemical concentration variation of the native water of the Fish Creek Sandstone, which has been shown to contain a range of concentrations for chloride, fluoride, and TDS. The Fish Creek Sandstone is documented in **Attachment A** to be a continuous unit of porous sandstone/siltstone spanning from upgradient of the LF to downgradient of the LF without interruption. Boring logs and cross-sections included with the Groundwater Monitoring System Demonstration (CEC, 2016) suggest that the Fish Creek Sandstone is hydrologically continuous and comprised of very fine to medium grained sandstone.

Given the hydrogeology of the unit and geochemistry at upgradient and downgradient monitoring points relative to the LF leachate, the concentrations of chloride, fluoride, and TDS at MW-1102F are attributed to the alternative natural source rather than a release from the LF.

This demonstration meets the requirements in both 40 C.F.R. § 257.95(3)(ii) and the Technical Manual for the Municipal Solid Waste Landfill regulatory program at 40 C.F.R. § 258.54(c)(iii) that a statistically significant increase may result from natural variation in the groundwater quality. Therefore, no further action is warranted, and the Mitchell Landfill will remain in the detection monitoring program. Certification of this ASD by a qualified professional engineer is provided in **Attachment C**.

SECTION 4

REFERENCES

- American Electric Power (AEP). 2017. Statistical Analysis Plan – Mitchell Plant. January 2017.
- Civil & Environmental Consultants, Inc. (CEC). 2016. CCR Groundwater Monitoring System Demonstration. Mitchell Landfill – Mitchell Power Generation Plant. March.
- Geosyntec Consultants, 2019. Alternative Source Demonstration – Federal CCR Rule. Mitchell Plant Landfill. Marshall County, West Virginia. November.
- Geosyntec Consultants, 2020a. Statistical Analysis Summary – Background Update Calculations. Mitchell Plant Landfill. Marshall County, West Virginia. February.
- Geosyntec Consultants, 2020b. Alternative Source Demonstration – Federal CCR Rule. Mitchell Plant Landfill. Marshall County, West Virginia. May.
- Geosyntec Consultants, 2020c. Alternative Source Demonstration – Federal CCR Rule. Mitchell Plant Landfill. Marshall County, West Virginia. November.
- Geosyntec Consultants, 2021. Alternative Source Demonstration – Federal CCR Rule. Mitchell Plant Landfill. Marshall County, West Virginia. August.
- U.S. EPA, 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance. EPA 530/R-09-007. March 2009.
- U.S. EPA, 2015. Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities (Final Rule). Fed. Reg. 80 FR 21301, pp. 21301-21501, 40 CFR Parts 257 and 261, April.

TABLES

**Table 1: Detection Monitoring Data Evaluation
Mitchell - Landfill**

Analyte	Unit	Description	MW-1101R	MW-1102F		MW-1502R	
			5/12/2021	5/12/2021	10/12/2021	5/12/2021	10/12/2021
Boron	mg/L	Intrawell Background Value (UPL)	0.525	0.280		0.265	
		Analytical Result	0.349	0.114	--	0.121	--
Calcium	mg/L	Intrawell Background Value (UPL)	6.91	5.71		109	
		Analytical Result	2.46	4.08	--	73.0	--
Chloride	mg/L	Intrawell Background Value (UPL)	18.1	15.4		191	
		Analytical Result	16.8	18.2	18.3	113	--
Fluoride	mg/L	Intrawell Background Value (UPL)	3.14	0.781		0.244	
		Analytical Result	2.47	0.79	0.79	0.24	--
pH	SU	Intrawell Background Value (UPL)	9.1	9.5		7.7	
		Intrawell Background Value (LPL)	7.9	7.6		7.1	
		Analytical Result	8.3	8.9	--	8.3	7.4
Sulfate	mg/L	Intrawell Background Value (UPL)	38.4	45.0		213	
		Analytical Result	27.5	38.4	--	118	--
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	1,600	577		744	
		Analytical Result	856	584	610	540	--

Notes:

UPL: Upper prediction limit

LPL: Lower prediction limit

Bold values exceed the background value.

Background values are shaded gray.

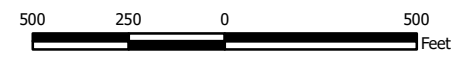
FIGURES



- Legend**
- ◆ Groundwater Monitoring Well
 - Groundwater Flow Direction
 - Groundwater Elevation Contour
 - - - Groundwater Elevation Contour (Inferred)

Notes

- Monitoring well coordinates and water level data (collected on October 19, 2021) provided by AEP.
- Site features based on information available in the Groundwater Monitoring Network Evaluation (CEC, 2016) provided by AEP.
- Groundwater elevation units are feet above mean sea level (NAVD 88).



**Potentiometric Surface Map - Fish Creek
October 2021**

Mitchell Power Generation Plant
Marshall County, West Virginia

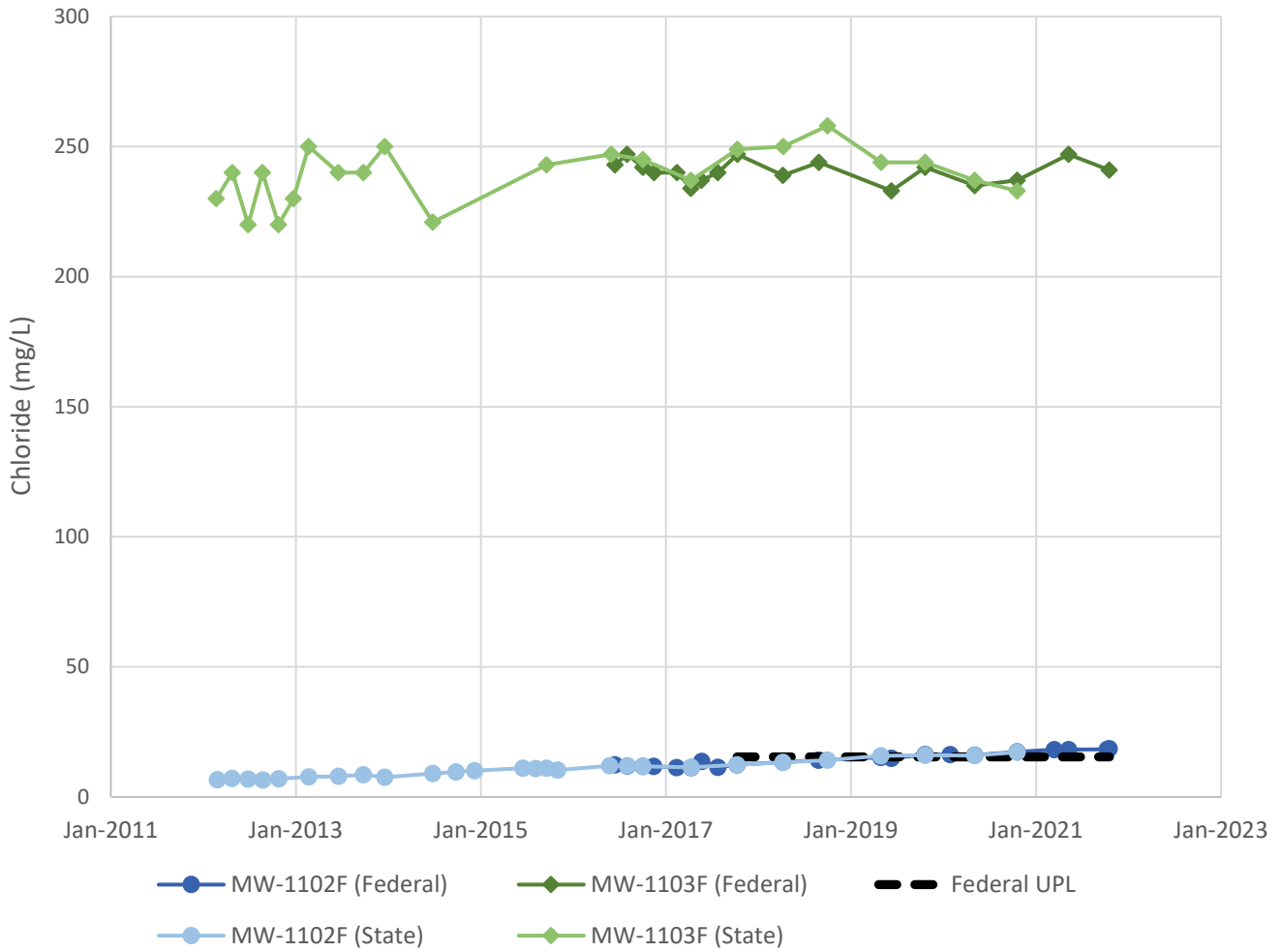
Geosyntec
consultants

Columbus, Ohio

2022/01/11

Figure

1



Notes: Data are shown for both the federal and state monitoring programs. MW-1103F is a background monitoring location for the Fish Creek Formation. Downgradient location MW-1102F is also screened in the Fish Creek Formation. Samples for chloride analysis were not filtered for the federal or state programs.

Chloride Time Series Graph

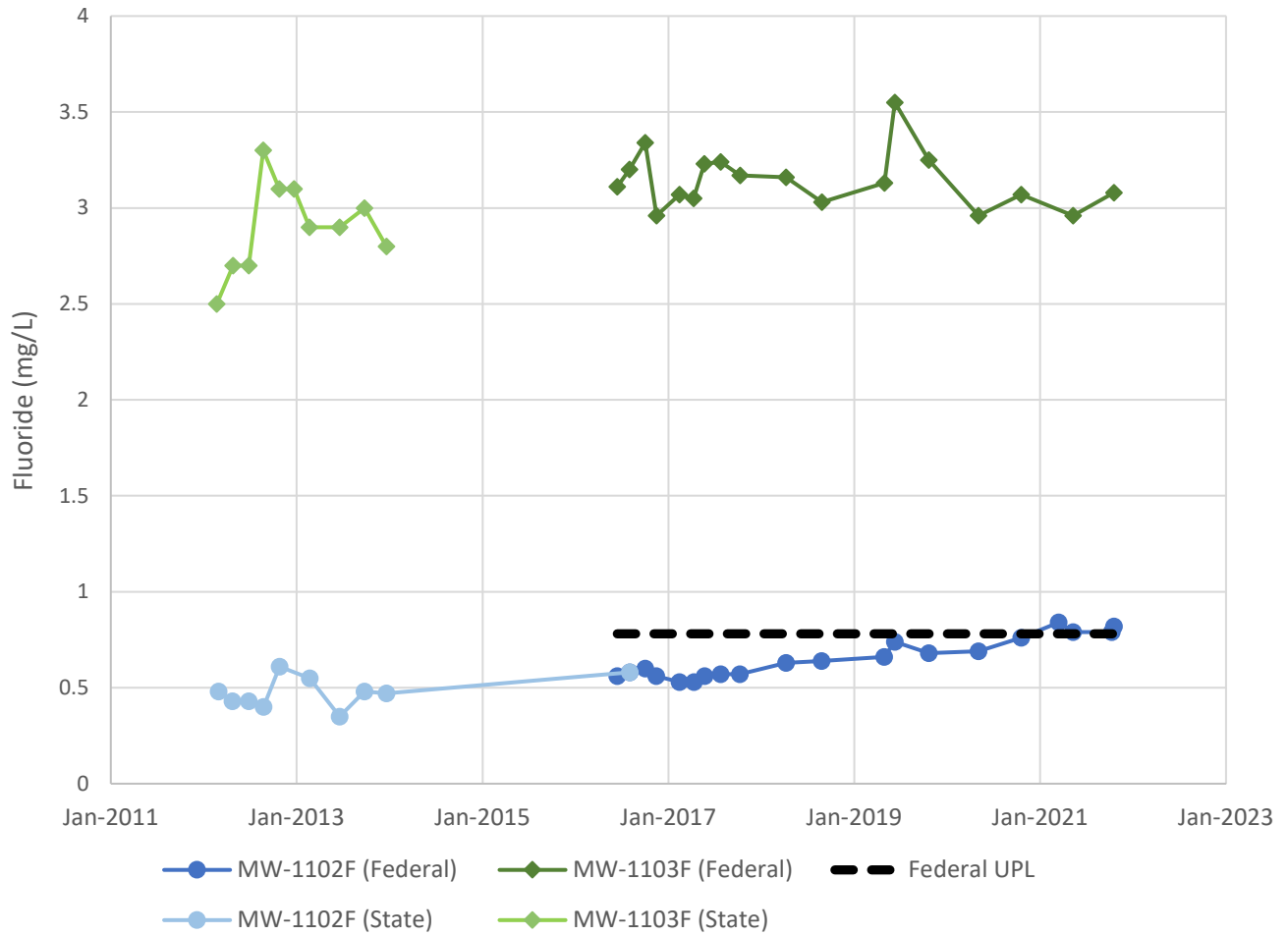
Mitchell Landfill



Figure
2

Columbus, Ohio

February-2022



Notes: Data are shown for both the federal and state monitoring programs. MW-1103F is a background monitoring location for the Fish Creek Formation. Downgradient location MW-1102F is also screened in the Fish Creek Formation. Samples for fluoride analysis were not filtered for the federal or state programs.

Fluoride Time Series Graph

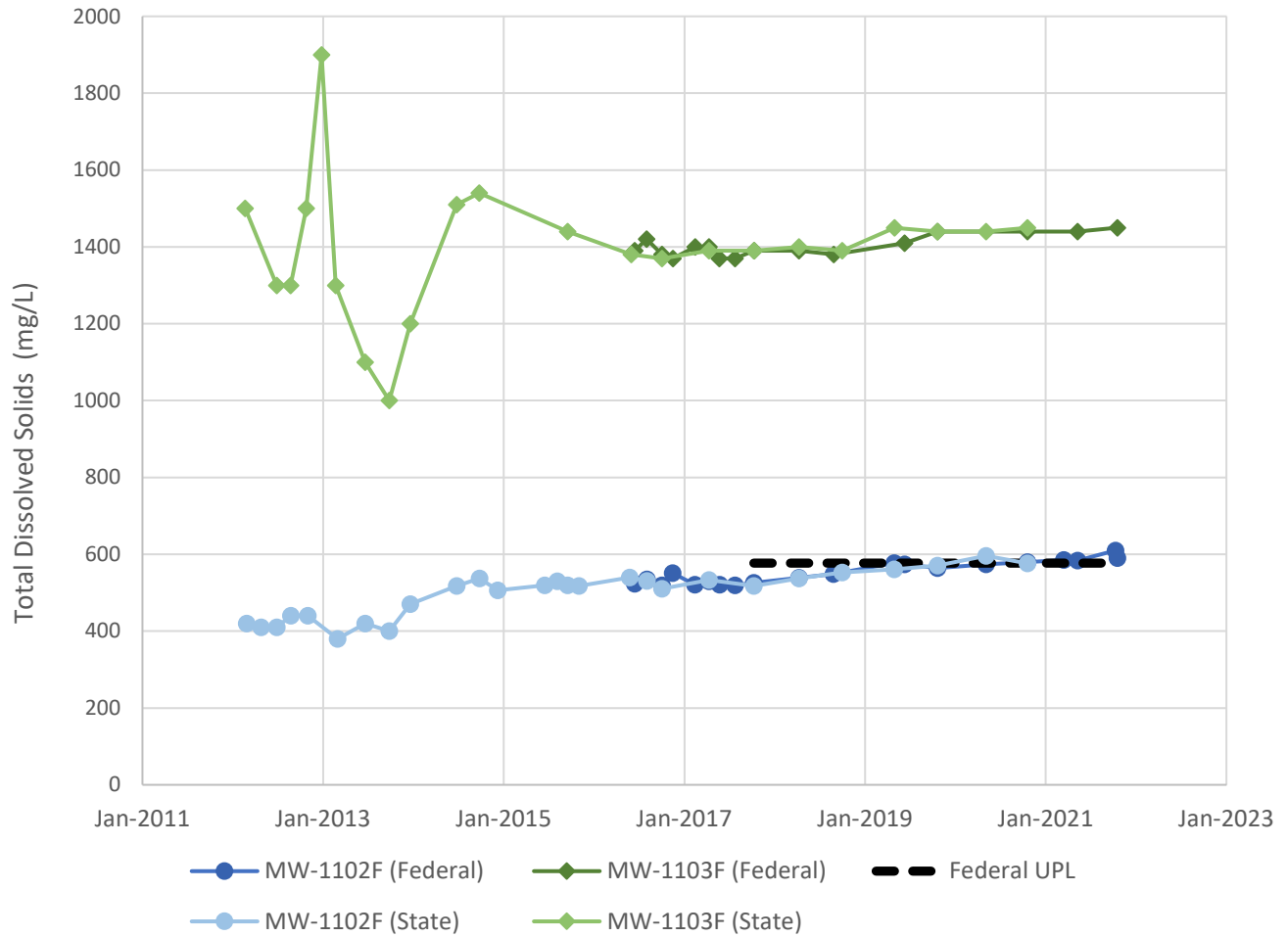
Mitchell Landfill



Figure
3

Columbus, Ohio

February-2022



Notes: Data are shown for both the federal and state monitoring programs. MW-1103F is a background monitoring location for the Fish Creek Formation. Downgradient location MW-1102F is also screened in the Fish Creek Formation. Samples for total dissolved solids analysis were not filtered for the federal or state programs.

Total Dissolved Solids Time Series Graph

Mitchell Landfill

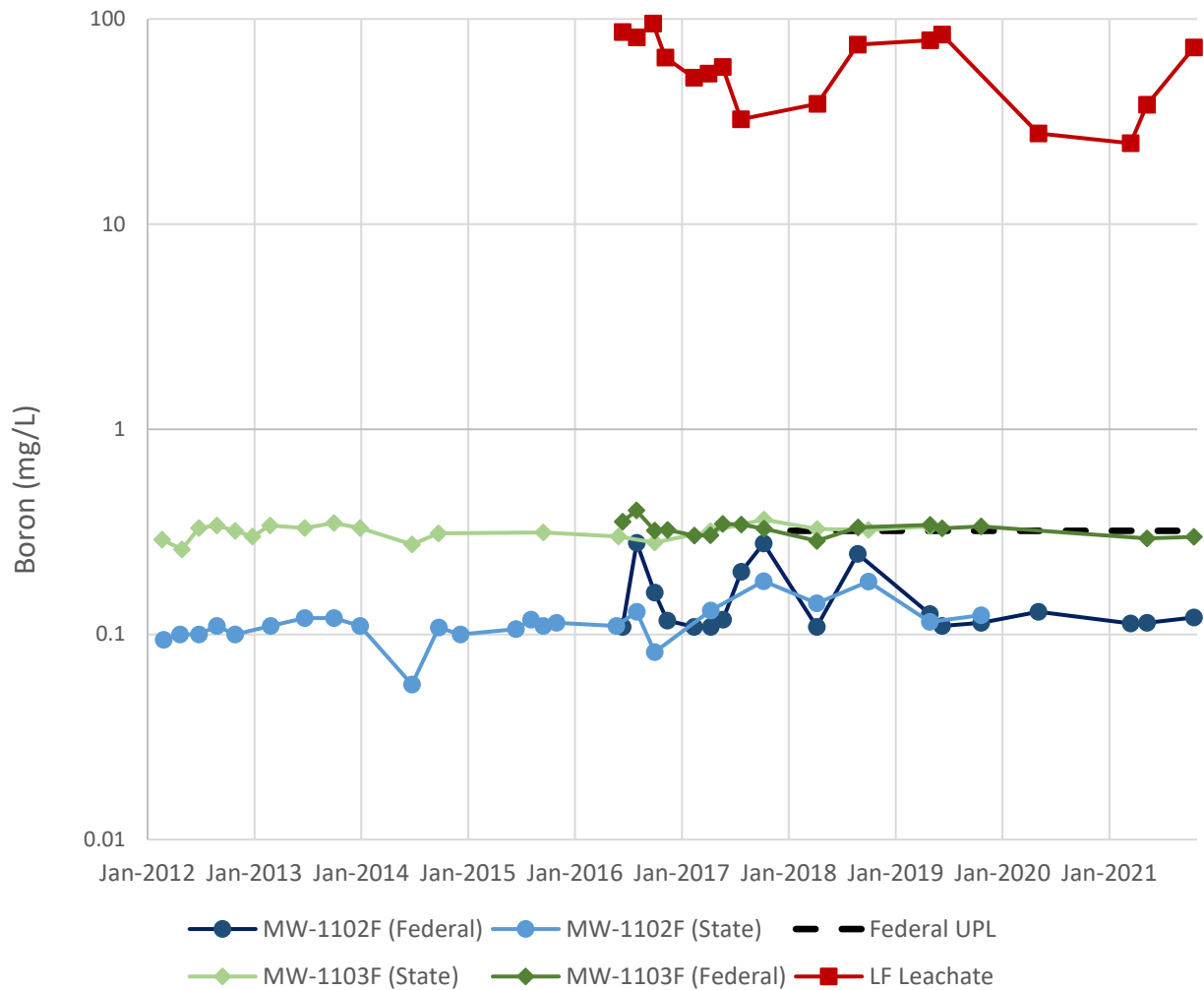


Figure

4

Columbus, Ohio

February-2022



Notes: Data are shown for both the federal and state monitoring programs. MW-1103F is a background monitoring location for the Fish Creek Formation. Downgradient location MW-1102F is also screened in the Fish Creek Formation. Samples for analysis of boron concentrations were not filtered for the federal program and were filtered for the state program.

Boron Time Series Graph

Mitchell Landfill

Geosyntec
consultants



Figure

5

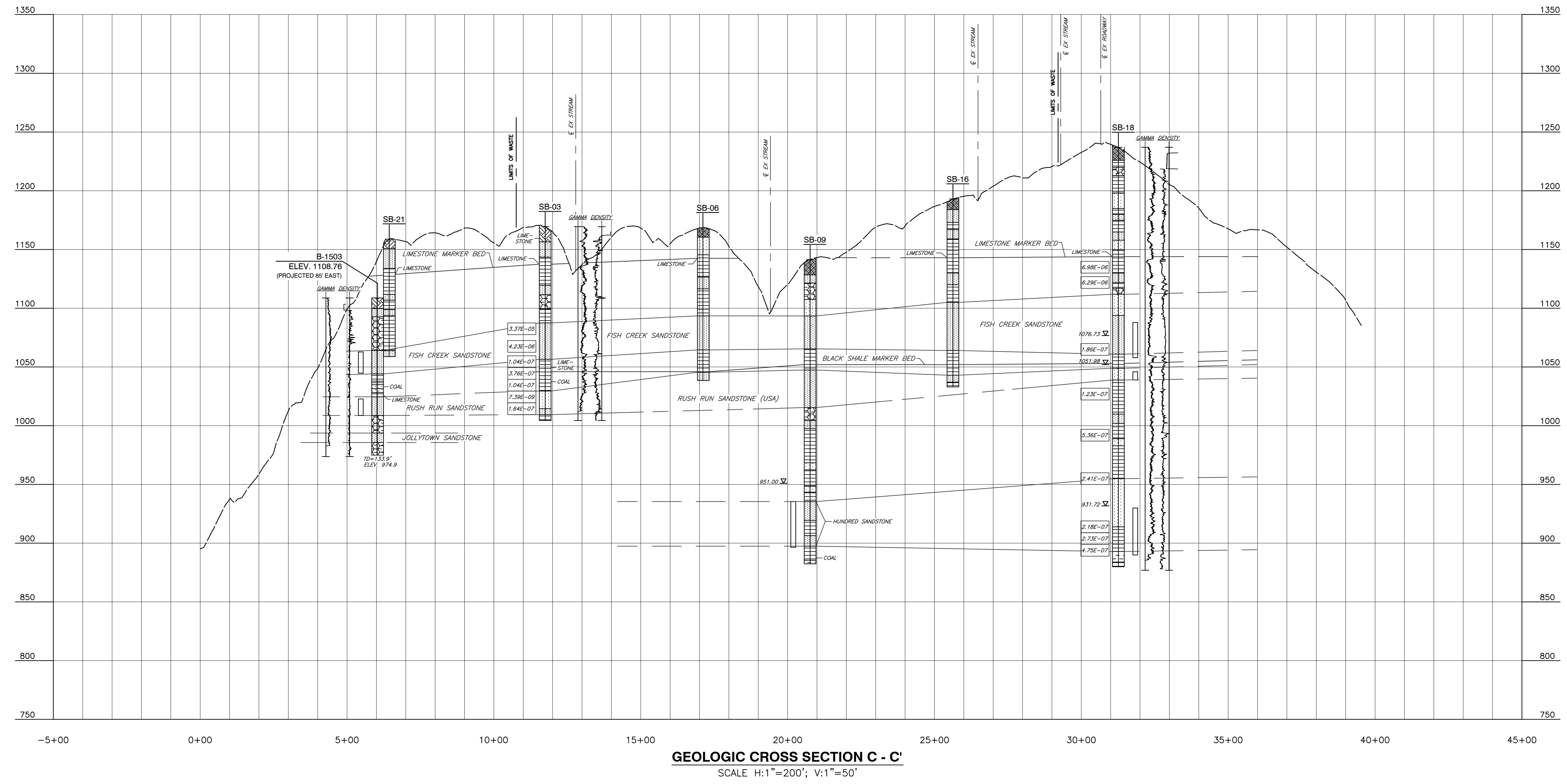
Columbus, Ohio

February-2022

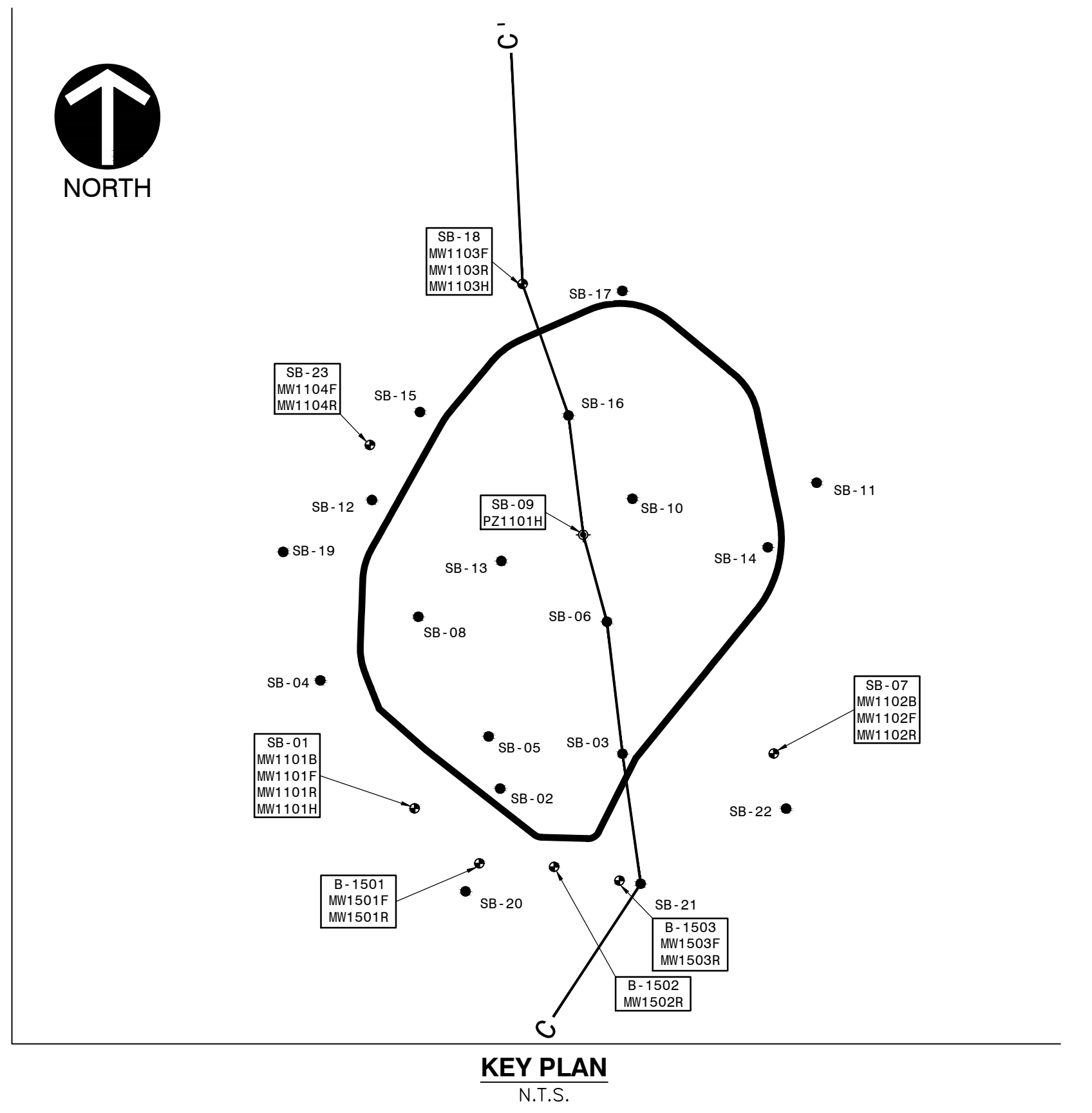
ATTACHMENT A

Geologic Cross-Section

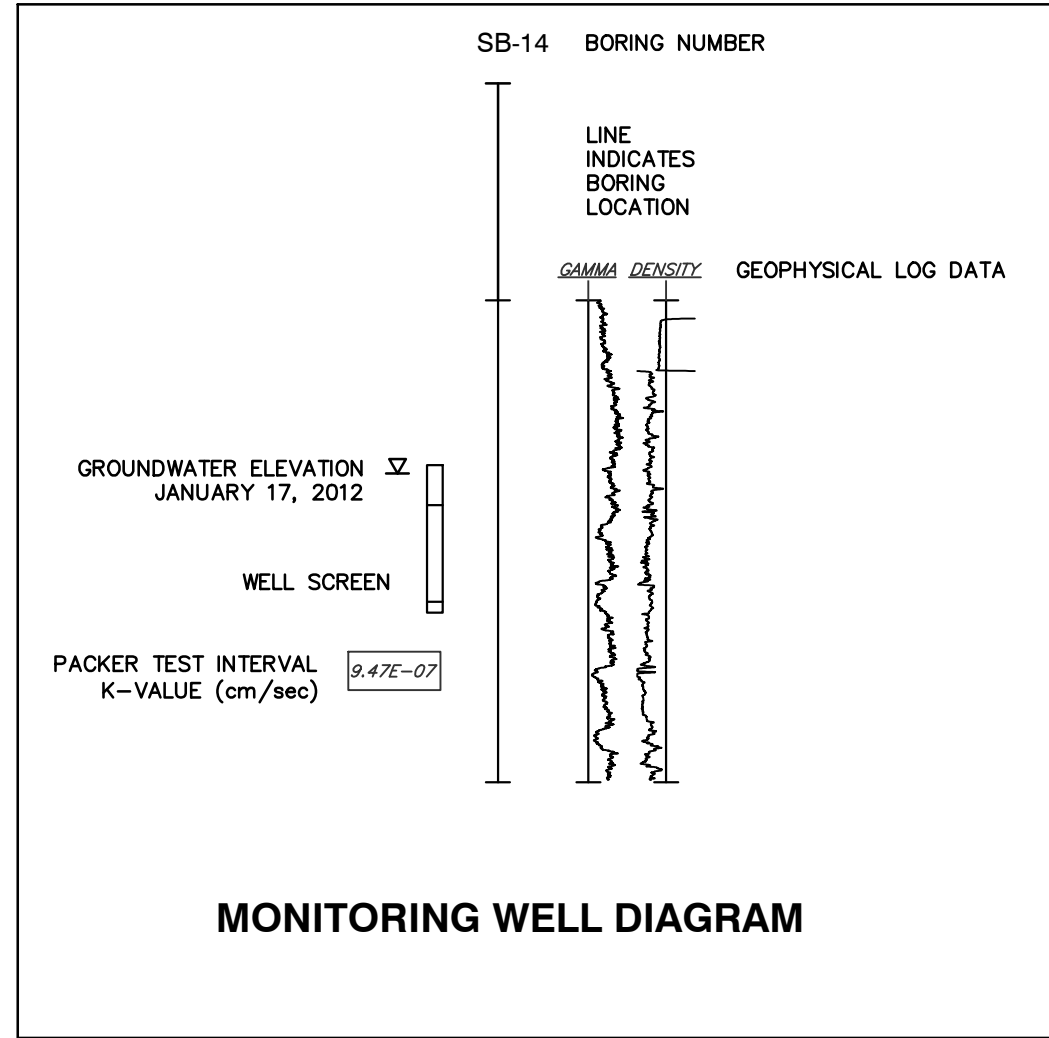
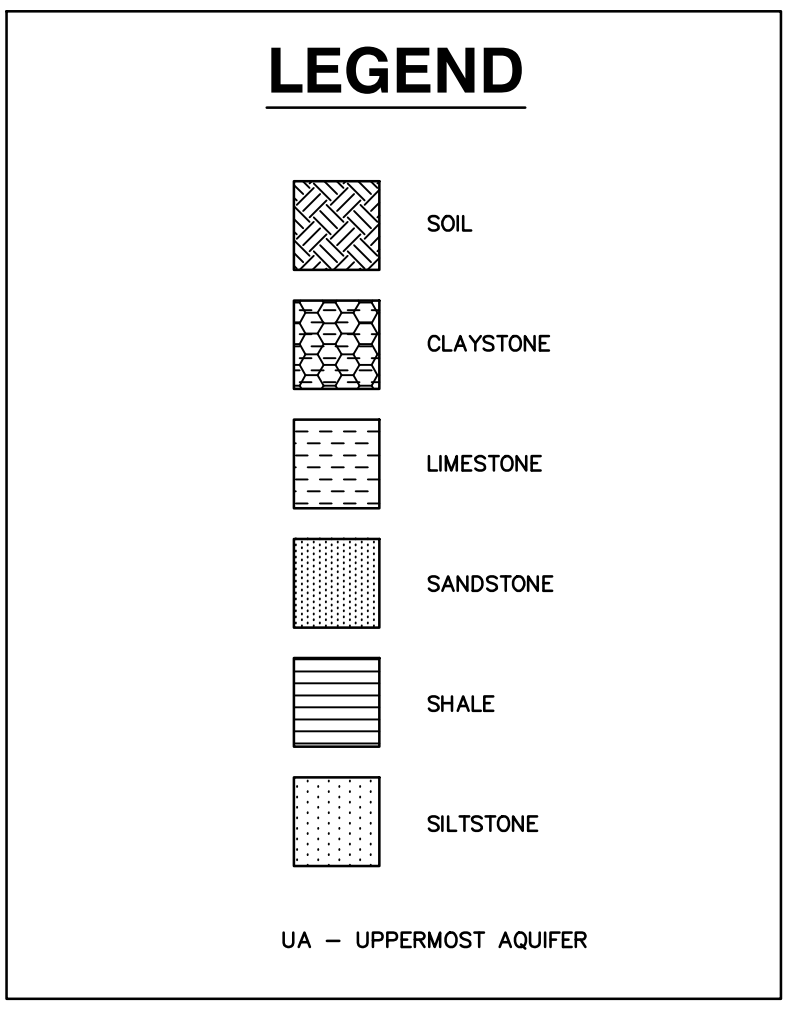
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GEOLOGIC CROSS SECTION C - C'
SCALE H:1"=200'; V:1"=50'



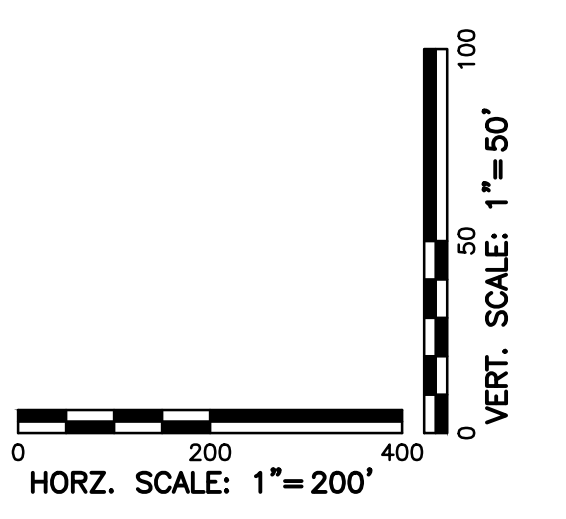
KEY PLAN
N.T.S.



MONITORING WELL DIAGRAM

NOTE:

1. THE BORING LOGS AND RELATED INFORMATION PRESENTED HEREIN DEPICT SUBSURFACE CONDITIONS AT THE TEST BORING LOCATIONS AND AT THE TIME OF DRILLING. SOIL CONDITIONS AT OTHER LOCATIONS MAY DIFFER.
2. GEOLOGIC CORRELATIONS SHOWN BETWEEN TEST BORINGS GENERALLY ARE BASED ON A STRAIGHT-LINE INTERPOLATION. ACTUAL CONDITIONS BETWEEN TEST BORINGS MAY DIFFER.



<p>REVISION RECORD</p> <table border="1"> <tr> <th>NO.</th> <th>DATE</th> <th>DESCRIPTION</th> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table>		NO.	DATE	DESCRIPTION			
NO.	DATE	DESCRIPTION					
<p>AMERICAN ELECTRIC POWER MITCHELL LANDFILL MITCHELL POWER GENERATION PLANT MARSHALL COUNTY, WEST VIRGINIA</p>							
<p>Civil & Environmental Consultants, Inc. 5899 Montclair Blvd. - Cincinnati, OH 45210 513-985-0226 - 800-759-5614 www.cercinc.com</p>							
<p>GROUNDWATER MONITORING SYSTEM DEMONSTRATION</p>							
<p>GEOLOGIC CROSS SECTION C-C'</p>							
<p>DATE: DECEMBER 2015</p>	<p>DRAWN BY: RAS</p>						
<p>DWG SCALE: AS NOTED</p>	<p>CHECKED BY: RAS</p>						
<p>PROJECT NO: 110-416-7601</p>	<p>APPROVED BY: APA</p>						
<p>FIGURE NO.: 6</p>							

ATTACHMENT B

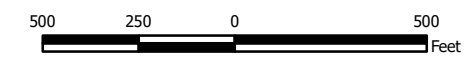
Potentiometric Maps



- Legend**
- ⊕ Groundwater Monitoring Well
 - Groundwater Flow Direction
 - Groundwater Elevation Contour
 - - - Groundwater Elevation Contour (Inferred)

Notes

- Monitoring well coordinates and water level data (collected on October 20, 2020) provided by AEP.
- Site features based on information available in the Groundwater Monitoring Network Evaluation (CEC, 2016) provided by AEP.
- Groundwater elevation units are feet above mean sea level (NAVD 88).



**Potentiometric Surface Map - Fish Creek
October 2020**

Mitchell Power Generation Plant
Marshall County, West Virginia

Geosyntec
consultants

Columbus, Ohio

2020/12/29

Figure
1

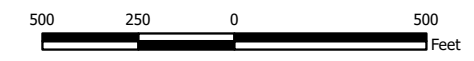


Legend

- ◆ Groundwater Monitoring Well
- Groundwater Flow Direction
- Groundwater Elevation Contour
- - - Groundwater Elevation Contour (Inferred)

Notes

- Monitoring well coordinates and water level data (collected on March 16, 2021) provided by AEP.
- Site features based on information available in the Groundwater Monitoring Network Evaluation (CEC, 2016) provided by AEP.
- Groundwater elevation units are feet above mean sea level (NAVD 88).



**Potentiometric Surface Map - Fish Creek
March 2021**

Mitchell Power Generation Plant
Marshall County, West Virginia

Geosyntec
consultants

Columbus, Ohio

2021/06/11

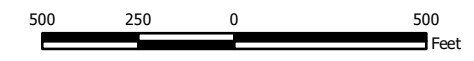
Figure
1



- Legend**
- ⊕ Groundwater Monitoring Well
 - Groundwater Flow Direction
 - Groundwater Elevation Contour
 - - - Groundwater Elevation Contour (Inferred)

Notes

- Monitoring well coordinates and water level data (collected on May 11, 2021) provided by AEP.
- Site features based on information available in the Groundwater Monitoring Network Evaluation (CEC, 2016) provided by AEP.
- Groundwater elevation units are feet above mean sea level (NAVD 88).



**Potentiometric Surface Map - Fish Creek
May 2021**

Mitchell Power Generation Plant
Marshall County, West Virginia

Geosyntec
consultants

Columbus, Ohio

2021/09/07

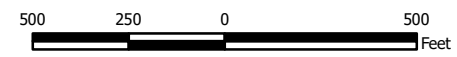
Figure
1



- Legend**
- Groundwater Monitoring Well
 - Groundwater Flow Direction
 - Groundwater Elevation Contour
 - Groundwater Elevation Contour (Inferred)

Notes

- Monitoring well coordinates and water level data (collected on October 19, 2021) provided by AEP.
- Site features based on information available in the Groundwater Monitoring Network Evaluation (CEC, 2016) provided by AEP.
- Groundwater elevation units are feet above mean sea level (NAVD 88).



**Potentiometric Surface Map - Fish Creek
October 2021**

Mitchell Power Generation Plant
Marshall County, West Virginia

Geosyntec
consultants

Columbus, Ohio

2022/01/11

Figure

1

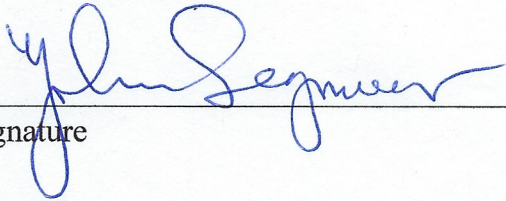
ATTACHMENT C

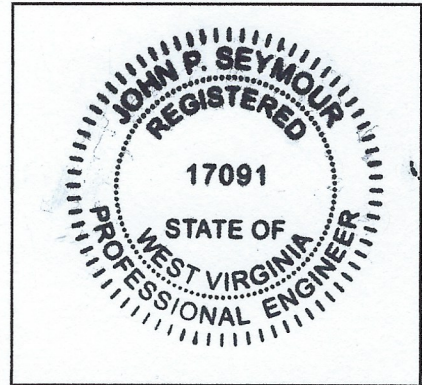
**Certification by a Qualified Professional
Engineer**

CERTIFICATION BY A QUALIFIED PROFESSIONAL ENGINEER

I certify that the selected and above described alternative source demonstration is appropriate for evaluating the groundwater monitoring data for the Mitchell Landfill CCR management area and that the requirements of 40 CFR 257.94(e)(2) have been met.

John Seymour
Printed Name of Licensed Professional Engineer


Signature



017091
License Number

West Virginia
Licensing State

3/11/2022
Date

APPENDIX 4 - Notices for Monitoring Program Transitions

No transition between monitoring requirements occurred in 2022; the CCR unit was in detection monitoring at the beginning and at the end of the year. Notices for monitoring program transitions are not applicable at this time.

APPENDIX 5 - Well Installation/Decommissioning Logs

No monitoring wells installed or decommissioned in 2022. Well installation/decommissioning logs are not applicable at this time.