2023 Annual Groundwater Monitoring and Corrective Action Report

JH Campbell Power Plant
Dry Ash Landfill

West Olive, Michigan

January 2024

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Executive Summary

On behalf of Consumers Energy, TRC has prepared this report for the JH Campbell Dry Ash Landfill to cover the period of January 1, 2023 to December 31, 2023 and document the status of groundwater monitoring and corrective action for 2023 in accordance with §257.90(e).

Consumers Energy first reported the potential for statistically significant increases (SSIs) for Appendix III constituents in the *Annual Groundwater Monitoring Report, JH Campbell Power Plant, Dry Ash Landfill*. The statistical evaluation of the Appendix III indicator parameters confirming SSIs over background were as follows:

- Boron at JHC-MW-15017, JHC-MW-15018, JHC-MW-15019, JHC-MW-15020, JHC-MW-15021, JHC-MW-15022, JHC-MW-15031, JHC-MW-15032, JHC-MW-15035, and JHC-MW-15037;
- Calcium at JHC-MW-15018, JHC-MW-15019, JHC-MW-15020, JHC-MW-15022, JHC-MW-15031, JHC-MW-15035, and JHC-MW-15037;
- Chloride at JHC-MW-15017, JHC-MW-15020, JHC-MW-15031;
- Sulfate at JHC-MW-15017, JHC-MW-15018, JHC-MW-15019, JHC-MW-15020, JHC-MW-15021, JHC-MW-15022, JHC-MW-15031, JHC-MW-15035, JHC-MW-15036, and JHC-MW-15037; and
- Total dissolved solids (TDS) at JHC-MW-15017, JHC-MW-15018, JHC-MW-15019, JHC-MW-15020, JHC-MW-15021, JHC-MW-15022, JHC-MW-15031, JHC-MW-15035, JHC-MW-15036, and JHC-MW-15037.

On April 25, 2018, Consumers Energy entered assessment monitoring upon determining that an Alternate Source Demonstration for the Appendix III constituents was not successful. After subsequent sampling for Appendix IV constituents, Consumers Energy compared the assessment monitoring data to the groundwater protection standards (GWPSs) to determine whether or not Appendix IV constituents are detected at statistically significant levels above the GWPSs in accordance with §257.95.

The subsequent semiannual statistical evaluations performed to-date, including those in the 2023 reporting period, have shown that no Appendix IV constituents are present at statistically significant levels above the GWPSs. Therefore, Consumers Energy remains in assessment monitoring and will not seek to initiate an assessment of corrective measures pursuant to §257.95(g)(3).

Consumers Energy will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98. The next semiannual assessment monitoring events are tentatively scheduled for the second and fourth calendar quarter of 2024.

1.0 Introduction

On April 17, 2015, the United States Environmental Protection Agency (USEPA) published the final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA) (the CCR Rule) (USEPA, April 2015 as amended). Standards for groundwater monitoring and corrective action codified in the CCR Rule (40 CFR 257.90 – 257.98) apply to the Consumers Energy Company (Consumers Energy) Dry Ash Landfill at the JH Campbell Power Plant Site (Dry Ash Landfill). Pursuant to the CCR Rule, no later than January 31, 2018, and annually thereafter, the owner or operator of a CCR unit must prepare an annual groundwater monitoring and corrective action report for the CCR unit documenting the status of groundwater monitoring and corrective action for the preceding year in accordance with §257.90(e).

On behalf of Consumers Energy, TRC has prepared this Annual Groundwater Monitoring Report for calendar year 2023 activities at the Dry Ash Landfill from January 1, 2023 to December 31, 2023. The Dry Ash Landfill was in assessment monitoring at the beginning and at the end of the period covered by this report. Data that have been collected and evaluated in 2023 under §257.90 - §257.98 are presented in this report.

1.1 Program Summary

Consumers Energy first reported the potential for statistically significant increases (SSIs) for Appendix III constituents in the *Annual Groundwater Monitoring Report, JH Campbell Power Plant, Dry Ash Landfill CCR Unit* (TRC, January 2018). The statistical evaluation of the Appendix III indicator parameters confirming SSIs over background were as follows:

- Boron at JHC-MW-15017, JHC-MW-15018, JHC-MW-15019, JHC-MW-15020, JHC-MW-15021, JHC-MW-15022, JHC-MW-15031, JHC-MW-15032, JHC-MW-15035, and JHC-MW-15037;
- Calcium at JHC-MW-15018, JHC-MW-15019, JHC-MW-15020, JHC-MW-15022, JHC-MW-15031, JHC-MW-15035, and JHC-MW-15037;
- Chloride at JHC-MW-15017, JHC-MW-15020, JHC-MW-15031;
- Sulfate at JHC-MW-15017, JHC-MW-15018, JHC-MW-15019, JHC-MW-15020, JHC-MW-15021, JHC-MW-15022, JHC-MW-15031, JHC-MW-15035, JHC-MW-15036, and JHC-MW-15037; and
- Total dissolved solids (TDS) at JHC-MW-15017, JHC-MW-15018, JHC-MW-15019, JHC-MW-15020, JHC-MW-15021, JHC-MW-15022, JHC-MW-15031, JHC-MW-15035, JHC-MW-15036, and JHC-MW-15037.

As discussed in the *2018 Annual Groundwater Monitoring Report for the JH Campbell Power Plant Dry Ash Landfill CCR Unit* (2018 Annual Report) (TRC, January 2019), upon determining that an Alternate Source Demonstration for the Appendix III constituents was not successful, Consumers Energy initiated an Assessment Monitoring Program for the Dry Ash Landfill on April 25, 2018 pursuant to §257.95 of the CCR Rule. The assessment monitoring program includes sampling and analyzing groundwater within the groundwater monitoring system for all constituents listed in Appendix III and Appendix IV. In accordance with §257.93(h)(2) and within

the compliance schedule clarified by the USEPA in April 2018, the first round of semiannual assessment monitoring data was statistically evaluated against the Groundwater Protection Standards (GWPSs) as reported on January 14, 2019 and placed in the operating record in accordance with §257.105(h)(8). This comparison showed that no Appendix IV constituents were present at statistically significant levels above the GWPSs. Therefore, Consumers Energy remained in assessment monitoring. The subsequent assessment monitoring evaluations, including those in the 2023 reporting period, have also indicated that no Appendix IV constituents have been present in downgradient monitoring wells at statistically significant levels exceeding the GWPSs. Therefore, the Dry Ash Landfill monitoring system remained in assessment monitoring and has continued to be sampled for the Appendix III and Appendix IV constituents and statistically evaluated on a semiannual basis in accordance with §257.95.

In addition to the semiannual assessment monitoring performed in accordance with §257.95, Consumers Energy is also conducting quarterly monitoring in accordance with the Michigan Department of Environment, Great Lakes, and Energy (EGLE)[1]-approved *Dry Ash Landfill Hydrogeological Monitoring Plan* (HMP) (TRC, October 2020, Revised November 2021). Quarterly monitoring results are reported under a separate cover in accordance with the requirements of the Michigan Natural Resources and Environmental Protection Act (NREPA), also known as Part 115 of PA 451 of 1994, as amended (a.k.a., Michigan Part 115 Solid Waste Management) and the HMP. Assessment monitoring data that has been collected and evaluated in 2023 in accordance with the CCR Rule are presented in this report.

1.2 Site Overview

The JH Campbell Plant is a coal fired power generation facility located in West Olive, Michigan, on the eastern shore of Lake Michigan. It is bordered by the Pigeon River on the south, 156th Avenue on the east, and Croswell Street to the north with Lakeshore Drive bisecting the site from north to south. The power generating plant consists of three coal fired electric generating units located on the western side of the site and the CCR disposal area is on the east side of the site, east of Lakeshore Drive. Figure 1 is a site location map showing the facility and the surrounding area.

The existing Dry Ash Landfill is a double-composite geomembrane lined landfill which is licensed and permitted for CCR disposal and includes two double-lined leachate and contact water retention ponds. Site features are shown on Figure 2. Dry, moisture-conditioned CCR from the three coal fired electric generating units is managed in the licensed Dry Ash Landfill which is regulated under Part 115 of the NREPA, PA 451 of 1994, as amended, and monitored in adherence to the facility's HMP.

Bottom ash is currently sluiced to concrete tanks where it is dewatered. The settled and dewatered bottom ash is beneficially reused or managed at the Dry Ash Landfill. The facility consists of the existing CCR landfill Cells 1 through 6. Dry ash from all generating units is stored in silos until it is placed into the facility or is sold and shipped off site. At this time, the north faces of Cells 1 and 2 and the majority of the eastern half of Cell 2 have been closed

[1] Effective Monday, April 22, 2019, the Michigan Department of Environmental Quality (MDEQ) became known as the Michigan Department of Environment, Great Lakes, and Energy.

along with Cell 3. Partial cover has been constructed over Cell 4. Cell 5 was constructed in 2018 and put into service in 2019. Cell 6 was constructed in 2021 and put into service in 2022.

This report focuses on the Dry Ash Landfill.

1.3 Geology/Hydrogeology

Groundwater is typically encountered at elevations ranging from 604 feet near the background wells (located to the north-northwest of the Dry Ash Landfill) to 590 feet along the southeast corner of the Dry Ash Landfill and south of the former Ponds 1-2 and Pond A CCR surface impoundments and generally flows to the south-southeast toward the Pigeon River. The subsurface materials encountered at the JH Campbell site generally consist of approximately 40 to 60 feet of poorly graded, fine-grained lacustrine sand. A laterally extensive clay-rich till is generally encountered within approximately 40 to 60 ft bgs across the site that according to deep drilling logs conducted at the JH Campbell Power Plant (just west of the CCR units) is on the order of 80 feet thick and extends to the top of shale bedrock approximately 140 ft bgs.

2.0 Groundwater Monitoring

2.1 Monitoring Well Network

In accordance with 40 CFR 257.91 and as documented in the *2022 Annual Groundwater Monitoring and Corrective Action Report, Consumers Energy, JH Campbell Power Plant, Dry Ash Landfill* (2022 Annual Report) (TRC, January 2023), Consumers Energy established a groundwater monitoring system for the JHC Dry Ash Landfill, which currently consists of 14 monitoring wells (6 background monitoring wells and 8 downgradient monitoring wells) that are screened in the uppermost aquifer. The monitoring well locations are shown on Figure 2. Six monitoring wells located north-northwest of the Dry Ash Landfill provide data on background groundwater quality that has not been affected by CCR management at the site (JHC-MW-15023 through JHC-MW-15028). Background groundwater quality data from these six background wells are additionally used for the CCR groundwater monitoring program at three other JH Campbell CCR units.

As shown on Figure 2, monitoring wells JHC-MW-15029, JHC-MW-15030, JHC-MW-15032, and JHC-MW-5034 are used for water level measurements only. Static water level data are collected at additional wells throughout the JH Campbell CCR units and used to construct a site-wide groundwater contour map.

2.2 Semiannual Groundwater Monitoring

Per §257.95, all wells in the CCR unit monitoring program must be sampled at least semiannually. One semiannual event must include analysis for all constituents from Appendix III and Appendix IV constituents and one semiannual event may include analysis for those constituents in Appendix IV of the CCR Rule that were detected during prior sampling. In addition to the Appendix III and IV constituents, field parameters including dissolved oxygen, oxidation reduction potential, specific conductivity, temperature, and turbidity were collected at each well. Samples were collected and analyzed in accordance with the HMP which also includes an updated sampling and analysis plan (SAP) used for the semiannual assessment monitoring program in accordance with §257.95 of the CCR Rule.

2.2.1 Data Summary

The first semiannual groundwater assessment monitoring event for 2023 was performed on April 10 through 13, 2023 and the second semiannual groundwater assessment monitoring event was performed on October 16 through 18, 2023. Both events were performed by Consumers Energy, and samples were analyzed by Consumers Energy Laboratory Services in Jackson, Michigan, with radium samples analyzed by Eurofins Environmental Testing in St Louis, Missouri in accordance with the SAP. Static water elevation data were collected at all monitoring well locations. Groundwater samples were collected from the background monitoring wells and the Dry Ash Landfill monitoring wells during both events for the Appendix III and Appendix IV constituents and field parameters.

A summary of the groundwater data collected during the April and October 2023 events are provided on Table 1 (static groundwater elevation data), Table 2 (field data), Table 3

(background analytical results), and Table 4 (Dry Ash Landfill analytical results).

2.2.2 Data Quality Review

Data from each round were evaluated for completeness, overall quality and usability, method-specified sample holding times, precision and accuracy, and potential sample contamination. The data were found to be complete and usable for the purposes of the CCR monitoring program. The data quality reviews are summarized in Appendix A.

2.2.3 Groundwater Flow Rate and Direction

Groundwater elevation data collected during the semiannual assessment monitoring events were generally similar to data collected previously in the background, detection monitoring events, and previous assessment monitoring events. The data showed that groundwater within the uppermost aquifer generally flows to the south-southeast across the site, with a southwesterly groundwater flow component on the western edge of the site.

Groundwater elevations measured across the site during the April and October 2023 events are provided on Table 1. April 2023 and October 2023 groundwater elevations were used to construct the groundwater contour maps provided on Figure 3 and Figure 4, respectively. The average hydraulic gradient for each sampling event was calculated using the following well pairs: JHC-MW-15026/PZ-23S, MW-15017/PZ-24S, and JHC-MW-15024/JHC-MW-15031 (Figure 2). The average hydraulic gradient was 0.0037 ft/ft in April 2023 and 0.0035 ft/ft in October 2023. Using the mean hydraulic conductivity of 62 ft/day (ARCADIS, 2016) and an assumed effective porosity of 0.4, the estimated average seepage velocity is approximately 0.58 ft/day or 210 ft/year for the April 2023 event, and approximately 0.54 ft/day or 200 ft/year for the October 2023 event.

The general groundwater flow direction is similar to that identified in previous monitoring rounds and continues to demonstrate that the downgradient wells are appropriately positioned to detect the presence of Appendix IV constituents that could potentially migrate from the Dry Ash Landfill.

3.0 Statistical Evaluation

Assessment monitoring is continuing at the Dry Ash Landfill in accordance with §257.95. The following section summarizes the statistical approach applied to assess the 2023 groundwater data in accordance with the assessment monitoring program. The statistical evaluation details are provided in Appendix C (*Statistical Evaluation of April 2023 Assessment Monitoring Sampling Event*) and Appendix D (*Statistical Evaluation of October 2023 Assessment Monitoring Sampling Event)*.

3.1 Establishing Groundwater Protection Standards

The Groundwater Protection Standards (GWPSs) are used to assess whether Appendix IV constituent concentrations are present in groundwater at unacceptable levels as a result of CCR Unit operations by statistically comparing concentrations in the downgradient wells to the GWPSs for each Appendix IV constituent. The calculation of the GWPSs is documented in the Groundwater Protection Standards technical memorandum included in Appendix C of the 2018 Annual Report.

3.2 Data Comparison to Groundwater Protection Standards

Consistent with the *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (Unified Guidance) (USEPA, 2009), the preferred method for comparisons to a fixed standard are confidence limits. An exceedance of the standard occurs when the 99 percent lower confidence level of the downgradient data exceeds the GWPS. As presented in the 2018 through 2022 Annual Reports, the statistical data comparison through the 2022 semiannual assessment monitoring events indicated that no Appendix IV constituents were present at statistically significant levels exceeding the GWPSs. Therefore, assessment monitoring continued in 2023.

There are no parameter-well combinations that included a direct exceedance of the GWPS over the past eight semiannual assessment monitoring events conducted through October 2023, with the exception of antimony. Therefore, confidence limits were not calculated for any Appendix IV constituent besides antimony. During the October 2022 sampling event, antimony was detected above the GWPS in one downgradient well in an otherwise non-detect dataset. Since the initial detection of antimony occurred, the lower confidence level for antimony has remained below the GWPS. A summary of the confidence intervals for April and October 2023 are provided in Tables 5 and 6.

Per §257.95(e), Consumers Energy can return to detection monitoring at the Dry Ash Landfill if the concentrations of all of the Appendix III and IV constituents are at or below background values for two consecutive events, using the statistical procedures included in §257.93(g). As shown on Table 4, several Appendix III and Appendix IV constituents are above the background upper tolerance limits (UTLs). Therefore, Consumers Energy will continue semiannual assessment monitoring in 2024 per §257.95(d).

4.0 Corrective Action

There were no corrective actions needed or performed for the Dry Ash Landfill within the calendar year 2023. The semiannual assessment monitoring analysis completed to-date indicate that no Appendix IV constituents are present at statistically significant levels exceeding the GWPSs. Therefore, Consumers Energy has continued semiannual assessment monitoring at the Dry Ash Landfill per §257.95(d) and will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

5.0 Conclusions and Recommendations

Assessment monitoring groundwater samples are collected semiannually from the groundwater monitoring system wells and analyzed for Appendix III and Appendix IV constituents pursuant to §257.95(d). The semiannual assessment monitoring analysis completed to-date indicate that no Appendix IV constituents are present at statistically significant levels exceeding the GWPSs. Therefore, Consumers Energy has continued semiannual assessment monitoring at the Dry Ash Landfill.

Per §257.95(e), Consumers Energy can return to detection monitoring at the Dry Ash Landfill if the concentrations of all of the Appendix III and IV constituents are at or below background values for two consecutive events, using the statistical procedures included in §257.93(g). Several Appendix III and Appendix IV constituents remain above the background levels. Therefore, Consumers Energy will continue semiannual assessment monitoring in 2024 per §257.95(d) and will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

The next semiannual monitoring events are tentatively scheduled for the second and fourth calendar quarter of 2024.

6.0 References

TRC. January 2018. Annual Groundwater Monitoring Report, Consumers Energy, JH Campbell Site, Dry Ash Landfill CCR Unit, West Olive, Michigan. Prepared for Consumers Energy Company.

TRC. January 2019. 2018 Annual Groundwater Monitoring Report, Consumers Energy, JH Campbell Site, Dry Ash Landfill CCR Unit, West Olive, Michigan. Prepared for Consumers Energy Company.

TRC. January 2020. 2019 Annual Groundwater Monitoring Report, Consumers Energy, JH Campbell Site, Dry Ash Landfill CCR Unit, West Olive, Michigan. Prepared for Consumers Energy Company.

TRC. October 2020, Revised November 2021. Dry Ash Landfill Hydrogeological Monitoring Plan, JH Campbell Power Plant, West Olive, Michigan. Prepared for Consumers Energy.

TRC. January 2021. 2020 Annual Groundwater Monitoring Report, Consumers Energy, JH Campbell Site, Dry Ash Landfill CCR Unit, West Olive, Michigan. Prepared for Consumers Energy Company.

TRC. January 2022. 2021 Annual Groundwater Monitoring Report, Consumers Energy, JH Campbell Site, Dry Ash Landfill CCR Unit, West Olive, Michigan. Prepared for Consumers Energy Company.

TRC. January 2023. 2022 Annual Groundwater and Corrective Action Monitoring Report, Consumers Energy, JH Campbell Power Plant, Dry Ash Landfill, West Olive, Michigan. Prepared for Consumers Energy Company.

USEPA. 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance. Office of Conservation and Recovery. EPA 530/R-09-007.

USEPA. April 2015. 40 CFR Parts 257 and 261. Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule. 80 Federal Register 74 (April 17, 2015), pp. 21301-21501 (80 FR 21301).

USEPA. July 2018. 40 CFR Part 257. Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals from Electric Utilities; Amendments to the National Minimum Criteria (Phase One, Part One); Final Rule. 83 Federal Register 146 (July 30, 2018), pp. 36435-36456 (83 FR 36435).

USEPA. April 2018. Barnes Johnson (Office of Resource Conservation and Recovery) to James Roewer (c/o Edison Electric Institute) and Douglas Green, Margaret Fawal (Venable LLP). Re: Coal Combustion Residuals Rule Groundwater Monitoring Requirements. April 30, 2018. United States Environmental Protection Agency, Washington, D.C. 20460. Office of Solid Waste and Emergency Response, now the Office of Land and Emergency Management.

Tables

Table 1

Summary of Groundwater Elevation Data - April - October 2023
JH Campbell – RCRA CCR Monitoring Program
West Olive, Michigan

Well Location	Ground Surface Elevation (ft)	TOC Elevation (ft)	Geologic Unit of Screen Interval	Screen Interval Elevation (ft)			April 10, 2023		October 16, 2023	
							Depth to Water (ft BTOC)	Groundwater Elevation (ft)	Depth to Water (ft BTOC)	Groundwater Elevation (ft)
Background										
JHC-MW-15023	617.01	619.98	Sand	603.0	to	593.0	16.57	603.41	19.34	600.64
JHC-MW-15024	613.79	616.62	Sand	606.8	to	596.8	12.41	604.21	14.64	601.98
JHC-MW-15025	614.14	617.17	Sand	607.1	to	597.1	11.87	605.30	13.95	603.22
JHC-MW-15026	615.09	618.04	Sand	607.1	to	597.1	14.02	604.02	15.73	602.31
JHC-MW-15027	614.77	617.30	Sand	604.8	to	594.8	14.63	602.67	16.26	601.04
JHC-MW-15028	611.02	613.80	Sand	603.0	to	593.0	14.33	599.47	15.92	597.88
JHC-MW-15029	608.08	610.95	Sand	600.1	to	590.1	11.54	599.41	12.97	597.98
JHC-MW-15030	604.05	607.17	Sand	600.1	to	590.1	9.15	598.02	10.69	596.48
Pond 1N, 1S, 2N, 2S										
JHC-MW-15001	607.02	609.53	Sand	603.5	to	598.5	NM		NM	
JHC-MW-15002	618.18	621.27	Sand	590.2	to	580.2	24.50	596.77	NM	
JHC-MW-15003	623.16	627.20	Sand	595.2	to	585.2	32.69	594.51	NM	
JHC-MW-15005	606.22	609.99	Sand	579.2	to	569.2	18.13	591.86	NM	
JHC-MW-18004	602.92	605.72	Sand	596.9	to	586.9	11.37	594.35	NM	
JHC-MW-18005	600.30	603.16	Sand	595.3	to	585.3	10.30	592.86	NM	
JHC-MW-22001	601.52	604.28	Sand	596.5	to	586.5	10.68	593.60	NM	
Pond 3N, 3S										
JHC-MW-15013	632.40	635.25	Sand	604.4	to	594.4	35.39	599.89	NM	
JHC-MW-15015	632.46	635.20	Sand	604.5	to	594.5	34.96	600.24	NM	
JHC-MW-15016	631.81	632.52	Sand	603.8	to	593.8	32.42	600.10	NM	
JHC-MW-18001	609.09	611.98	Sand	603.1	to	593.1	12.26	599.72	NM	
JHC-MW-18002	605.53	608.93	Sand	602.0	to	592.0	9.09	599.84	NM	
JHC-MW-18003	605.36	608.78	Sand	601.9	to	591.9	9.00	599.78	NM	
Landfill										
JHC-MW-15017	613.69	616.61	Sand	603.7	to	593.7	15.90	600.71	17.14	599.47
JHC-MW-15018	614.26	617.02	Sand	604.3	to	594.3	16.67	600.35	17.74	599.28
JHC-MW-15022	620.92	623.79	Sand	597.9	to	587.9	NM		NM	
JHC-MW-15031	632.94	635.87	Sand	599.9	to	589.9	43.20	592.67	43.94	591.93
JHC-MW-15032	611.32	614.29	Sand	598.3	to	588.3	16.02	598.27	18.17	596.12
JHC-MW-15033	618.08	620.99	Sand	602.1	to	592.1	NM		NM	
JHC-MW-15034	612.90	615.97	Sand	601.9	to	591.9	14.59	601.38	17.26	598.71
JHC-MW-15035	632.53	634.28	Sand	599.5	to	589.5	40.84	593.44	41.46	592.82
JHC-MW-15036	617.94	618.34	Sand	597.9	to	587.9	26.49	591.85	27.34	591.00
JHC-MW-15037	614.28	616.06	Sand	591.3	to	586.3	24.68	591.38	25.73	590.33
MW-B3	630.51	634.17	Sand	598.5	to	593.5	38.53	595.64	38.97	595.20
MW-B4	633.80	635.67	Sand	593.8	to	588.8	41.28	594.39	41.80	593.87
Pond A										
JHC-MW-15006	624.74	627.58	Sand	599.7	to	589.7	34.39	593.19	36.04	591.54
JHC-MW-15007R[(2)]	625.73	628.26	Sand	595.7	to	585.7	35.33	592.93	37.08	591.18
JHC-MW-15008R[(1)]	632.32	634.67	Sand	597.3	to	587.3	42.25	592.42	44.06	590.61
JHC-MW-15009R[(2)]	632.15	635.05	Sand	595.2	to	585.2	42.55	592.5	44.00	591.05
JHC-MW-15011R[(2)]	627.73	629.79	Sand	594.7	to	584.7	36.94	592.85	38.21	591.58
Downgradient Wells										
MW-13	593.40	595.37	Clayey Silt	587.9	to	585.4	Dry		Dry	
MW-14S	587.36	590.98	Sand	582.9	to	577.9	10.74	580.24	10.92	580.06
PZ-23S	602.84	604.97	Sand	591.8	to	586.8	14.72	590.25	15.49	589.48
PZ-24S	586.56	590.15	Sand	584.6	to	579.6	7.33	582.82	8.98	581.17
PZ-40S	589.51	593.25	Sand	585.5	to	575.5	10.16	583.09	12.55	580.70
TW-19-05	603.44	606.36	Sand	592.8	to	587.8	14.86	591.50	17.20	589.16
TW-19-06A	599.61	602.54	Sand	592.3	to	587.3	11.91	590.63	14.20	588.34

Notes:

Survey conducted by Nederveld, November 2015, October 2018, December 2018, August 2019, and July 2021.

Elevation in feet relative to North American Vertical Datum 1988 (NAVD 88).

TOC: Top of well casing.

ft BTOC: Feet below top of well casing.

NM: Not measured

(1) JHC-MW-15008R installed in June 2019.

(2) JHC-MW-15007R, JHC-MW-15009R, and JHC-MW-15011R installed in July 2021.

Table 2
Summary of Field Parameters
JH Campbell Dry Ash Landfill - RCRA CCR Monitoring Program
West Olive, Michigan

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (SU)	Specific Conductivity (umhos/cm)	Temperature (°C)	Turbidity (NTU)
Background							
JHC-MW-15023	4/13/2023	4.42	245.3	5.3	111	12.8	4.1
	10/16/2023	2.17	268.6	6.0	104	11.6	4.5
JHC-MW-15024	4/13/2023	2.73	163.3	7.6	349	11.6	3.8
	10/16/2023	0.56	178.8	7.4	369	11.6	1.9
JHC-MW-15025	4/12/2023	6.16	129.1	7.6	239	10.8	5.5
	10/16/2023	1.25	176.3	7.9	409	11.8	2.1
JHC-MW-15026	4/13/2023	7.73	234.8	5.8	32	11.2	4.3
	10/16/2023	5.29	318.8	5.9	40	12.6	2.9
JHC-MW-15027	4/13/2023	8.75	227.4	6.2	129	10.5	4.9
	10/16/2023	5.97	167.1	6.4	133	12.9	2.8
JHC-MW-15028	4/12/2023	6.81	134.3	8.1	129	10.7	6.4
	10/16/2023	6.57	134.5	8.3	142	13.0	0.2
Dry Ash Landfill							
JHC-MW-15017	4/12/2023	4.15	153.5	6.6	488	14.7	1.8
	10/17/2023	0.92	216.6	6.9	448	12.3	2.2
JHC-MW-15018	4/11/2023	3.28	189.5	6.2	333	11.6	3.4
	10/17/2023	0.80	227.9	6.5	303	13.1	1.4
JHC-MW-15031	4/12/2023	1.66	78.6	7.1	335	14.1	1.1
	10/17/2023	1.13	210.3	7.2	420	13.1	1.0
JHC-MW-15035	4/12/2023	0.88	67.5	7.0	558	15.5	1.4
	10/17/2023	0.90	194.0	7.0	699	14.6	3.3
JHC-MW-15036	4/10/2023	2.96	125.9	7.4	369	12.0	3.6
	10/17/2023	0.90	193.8	7.7	298	12.2	2.7
JHC-MW-15037	4/11/2023	3.37	129.2	7.1	459	11.4	2.3
	10/17/2023	5.04	259.2	7.2	526	11.3	2.2
MW-B3	4/12/2023	1.81	134.1	6.0	491	13.0	1.4
	10/17/2023	1.11	212.4	6.0	454	13.0	1.1
MW-B4	4/12/2023	0.64	54.1	6.9	566	15.0	3.1
	10/17/2023	0.43	165.1	7.1	441	14.8	1.9

Notes:
mg/L - Milligrams per Liter.
mV - Millivolts.
SU - Standard Units.
umhos/cm - Micromhos per centimeter.
°C - Degrees Celsius.
NTU - Nephelometric Turbidity Unit

Table 3
Summary of Background Groundwater Sampling Results (Analytical)
JH Campbell Background – RCRA CCR Monitoring Program
West Olive, Michigan

					Sample Location:	JHC-MW-15023		JHC-MW-15024		JHC-MW-15025		JHC-MW-15026		JHC-MW-15027		JHC-MW-15028	
					Sample Date:	4/13/2023	10/16/2023	4/13/2023	10/16/2023	4/12/2023	10/16/2023	4/13/2023	10/16/2023	4/13/2023	10/16/2023	4/12/2023	10/16/2023
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	background											
Appendix III[(1)]																	
Boron	ug/L	NC	500	500	7,200	29	35	< 20	23	< 20	22	< 20	< 20	< 20	25	< 20	< 20
Calcium	mg/L	NC	NC	NC	500[EE]	12.7	11.4	33.1	37.2	20.4	35.5	2.98	3.85	15.3	17.0	16.3	18.9
Chloride	mg/L	250**	250[E]	250[E]	500[EE]	3.81	5.35	24.1	33.7	17.1	37.2	1.27	2.08	< 1.00	1.44	< 1.00	< 1.00
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250**	250[E]	250[E]	500[EE]	14.4	12.7	9.14	9.81	6.29	10.6	5.78	6.06	4.71	7.59	5.15	5.45
Total Dissolved Solids	mg/L	500**	500[E]	500[E]	500	97	88	176	214	114	226	50	40	81	96	60	85
pH, Field	SU	**6.5 - 8.5****	**6.5 - 8.5[E]**	**6.5 - 8.5[E]**	**6.5 - 9.0**	**5.3**	**6.0**	7.6	7.4	7.6	7.9	**5.8**	**5.9**	**6.2**	**6.4**	8.1	8.3
Appendix IV[(1)]																	
Antimony	ug/L	6	6.0	6.0	130	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	10	10	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	2,000	2,000	820	59	25	18	20	6	10	7	8	37	20	7	6
Beryllium	ug/L	4	4.0	4.0	18	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	5.0	5.0	3.5	0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	100	100	11	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	NC	40	100	100	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	4.0	4.0	39	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	170	350	440	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	2.0	2.0	0.20[#]	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	73	210	3,200	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NC	NC	NC	NC	0.182	< 0.106	< 0.148	< 0.117	< 0.199	< 0.104	< 0.312	0.157	< 0.152	< 0.0896	< 0.165	< 0.115
Radium-228	pCi/L	NC	NC	NC	NC	< 0.556	< 0.644	< 0.478	< 0.746	< 0.577	1.03	< 1.10	< 0.545	< 0.519	0.683	< 0.605	0.934
Radium-226/228	pCi/L	5	NC	NC	NC	< 0.556	< 0.644	< 0.478	< 0.746	< 0.577	1.07	< 1.10	0.638	< 0.519	0.765	< 0.605	0.949
Selenium	ug/L	50	50	50	5.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Thallium	ug/L	2	2.0	2.0	3.7	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:
ug/L - micrograms per liter; mg/L - milligrams per liter.
pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April, 2012.
NC - no criteria.
* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 21, 2020, updated October 12, 2023.
** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using site-specific hardness of 180 mg CaCO3/L as measured at surface water sample SW-01 collected on April 9, 2018 from the Pigeon River. Chromium GSI criterion based on hexavalent chromium per footnote {H}.
# - If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.
[E] - Criterion is the aesthetic drinking water value per footnote {E}.
[EE] - Criterion is based on the total dissolved solids GSI value per footnote {EE}.
(1) 40 CFR Part 257 Appendix III Detection Monitoring Constituents and Appendix IV Assessment Monitoring Constituents.
BOLD value indicates an exceedance of one or more of the listed criteria.
RED value indicates an exceedance of the MCL.
All metals were analyzed as total unless otherwise specified.

Table 4
Summary of Dry Ash Landfill Groundwater Sampling Results (Analytical)
JH Campbell Dry Ash Landfill – RCRA CCR Monitoring Program
West Olive, Michigan

							Sample Location:	JHC-MW-15017		JHC-MW-15018		JHC-MW-15031		JHC-MW-15035	
							Sample Date:	4/12/2023	10/17/2023	4/11/2023	10/17/2023	4/12/2023	10/17/2023	4/12/2023	10/17/2023
Constituent	Unit	UTL	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^									
Appendix III[(1)]															
Boron	ug/L	51	NC	500	500	7,200		179	108	153	122	50	64	67	95
Calcium	mg/L	46	NC	NC	NC	500[EE]		60.5	53.0	40.6	30.2	52.9	56.4	94.5	97.5
Chloride	mg/L	43	250**	250[E]	250[E]	500[EE]		16.4	19.2	14.9	13.3	2.82	3.19	9.27	12.5
Fluoride	ug/L	1,000	4,000	NC	NC	NC		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	14	250**	250[E]	250[E]	500[EE]		48.0	38.3	33.4	22.1	21.3	18.5	31.0	41.5
Total Dissolved Solids	mg/L	258	500**	500[E]	500[E]	500		287	293	194	192	205	255	355	422
pH, Field	SU	4.8 - 9.2	**6.5 - 8.5****	**6.5 - 8.5[E]**	**6.5 - 8.5[E]**	**6.5 - 9.0**		6.6	6.9	**6.2**	6.5	7.1	7.2	7.0	7.0
Appendix IV[(1)]															
Antimony	ug/L	2	6	6.0	6.0	130		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	1	10	10	10	10		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	35	2,000	2,000	2,000	820		38	21	49	15	13	15	19	22
Beryllium	ug/L	1	4	4.0	4.0	18		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	0.2	5	5.0	5.0	3.5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	2	100	100	100	11		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	15	NC	40	100	100		< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	1,000	4,000	NC	NC	NC		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	1	NC	4.0	4.0	39		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	10	NC	170	350	440		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	0.2	2	2.0	2.0	0.20[#]		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	5	NC	73	210	3,200		25	< 5	< 5	< 5	< 5	< 5	32	< 5
Radium-226	pCi/L	NA	NC	NC	NC	NC		< 0.200	< 0.0896	< 0.227	< 0.118	< 0.172	< 0.104	< 0.185	< 0.122
Radium-228	pCi/L	NA	NC	NC	NC	NC		< 0.533	< 0.531	< 0.607	0.577	< 0.496	< 0.678	< 0.539	< 0.592
Radium-226/228	pCi/L	1.93	5	NC	NC	NC		< 0.533	< 0.531	< 0.607	0.623	0.498	< 0.678	< 0.539	< 0.592
Selenium	ug/L	5	50	50	50	**5.0**		**21**	**13**	**14**	5	3	3	1	< 1
Thallium	ug/L	2	2	2.0	2.0	3.7		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:
ug/L - micrograms per liter; mg/L - milligrams per liter.
pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April, 2012.
UTL - Upper Tolerance Limit of the background data set. Appendix III UTLs established in TRC's technical memorandum dated January 15, 2018. Appendix IV UTLs established in TRC's technical memorandum dated October 15, 2018.
NC - no criteria.
* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 21, 2020, updated October 12, 2023.
** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using site-specific hardness of 180 mg CaCO3/L as measured at surface water sample SW-01 collected on April 9, 2018 from the Pigeon River. Chromium GSI criterion based on hexavalent chromium per footnote {H}.
# - If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.
E - Criterion is the aesthetic drinking water value per footnote {E}.
EE - Criterion is based on the total dissolved solids GSI value per footnote {EE}.
(1) 40 CFR Part 257 Appendix III Detection Monitoring Constituents and Appendix IV Assessment Monitoring Constituents.
Indicates that the concentration in one or more wells exceeds the background level. If concentrations of all Appendix III and Appendix IV constituents are below the background level for two consecutive events, the unit may return to detection monitoring.
BOLD value indicates an exceedance of one or more of the listed criteria.
RED value indicates an exceedance of the MCL.
All metals were analyzed as total unless otherwise specified.

Table 4
Summary of Dry Ash Landfill Groundwater Sampling Results (Analytical)
JH Campbell Dry Ash Landfill – RCRA CCR Monitoring Program
West Olive, Michigan

							JHC-MW-15036		JHC-MW-15037		MW-B3		MW-B4	
						Sample Location:								
						Sample Date:	4/10/2023	10/17/2023	4/11/2023	10/16/2023	4/12/2023	10/17/2023	4/12/2023	10/17/2023
Constituent	Unit	UTL	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^								
Appendix III[(1)]														
Boron	ug/L	51	NC	500	500	7,200	93	68	107	133	93	129	279	230
Calcium	mg/L	46	NC	NC	NC	500[EE]	52.1	35.9	67.8	78	76.8	53.7	88.7	57
Chloride	mg/L	43	250**	250[E]	250[E]	500[EE]	4.01	4.73	1.36	< 1.00	16.5	20.7	20.2	12.2
Fluoride	ug/L	1,000	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	14	250**	250[E]	250[E]	500[EE]	18.3	18.7	24.4	37.2	71.9	62.3	24.1	18.4
Total Dissolved Solids	mg/L	258	500**	500[E]	500[E]	500	207	182	264	336	330	316	353	274
pH, Field	SU	4.8 - 9.2	**6.5 - 8.5****	**6.5 - 8.5[E]**	**6.5 - 8.5[E]**	**6.5 - 9.0**	7.4	7.7	7.1	7.2	**6.0**	**6.0**	6.9	7.1
Appendix IV[(1)]														
Antimony	ug/L	2	6	6.0	6.0	130	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	1	10	10	10	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	35	2,000	2,000	2,000	820	8	6	13	13	80	60	44	28
Beryllium	ug/L	1	4	4.0	4.0	18	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	0.2	5	5.0	5.0	3.5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	2	100	100	100	11	< 1	< 1	1	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	15	NC	40	100	100	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	1,000	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	1	NC	4.0	4.0	39	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	10	NC	170	350	440	< 10	< 10	< 10	< 10	16	17	< 10	< 10
Mercury	ug/L	0.2	2	2.0	2.0	0.20[#]	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	5	NC	73	210	3,200	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NA	NC	NC	NC	NC	< 0.186	< 0.110	< 0.178	< 0.118	< 0.190	0.111	0.243	< 0.123
Radium-228	pCi/L	NA	NC	NC	NC	NC	< 0.505	< 0.497	< 0.533	< 0.669	< 0.473	< 0.596	< 0.702	< 0.654
Radium-226/228	pCi/L	1.93	5	NC	NC	NC	< 0.505	< 0.497	< 0.533	< 0.669	< 0.473	< 0.596	0.738	< 0.654
Selenium	ug/L	5	50	50	50	**5.0**	< 1	< 1	**6**	**8**	**8**	4	3	3
Thallium	ug/L	2	2	2.0	2.0	3.7	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:
ug/L - micrograms per liter; mg/L - milligrams per liter.
pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April, 2012.
UTL - Upper Tolerance Limit of the background data set. Appendix III UTLs established in TRC's technical memorandum dated January 15, 2018. Appendix IV UTLs established in TRC's technical memorandum dated October 15, 2018.
NC - no criteria.
* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 21, 2020, updated October 12, 2023.
** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using site-specific hardness of 180 mg CaCO3/L as measured at surface water sample SW-01 collected on April 9, 2018 from the Pigeon River. Chromium GSI criterion based on hexavalent chromium per footnote {H}.
# - If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.
[E] - Criterion is the aesthetic drinking water value per footnote {E}.
[EE] - Criterion is based on the total dissolved solids GSI value per footnote {EE}.
(1) 40 CFR Part 257 Appendix III Detection Monitoring Constituents and Appendix IV Assessment Monitoring Constituents.
Indicates that the concentration in one or more wells exceeds the background level. If concentrations of all Appendix III and Appendix IV constituents are below the background level for two consecutive events, the unit may return to detection monitoring.
BOLD value indicates an exceedance of one or more of the listed criteria.
RED value indicates an exceedance of the MCL.
All metals were analyzed as total unless otherwise specified.

Table 5

Summary of Groundwater Protection Standard Exceedances – April 2023

JH Campbell Dry Ash Landfill - RCRA CCR Monitoring Program

West Olive, Michigan

Constituent	Units	GWPS	JHC-MW-15035	
			LCL	UCL
Antimony	ug/L	6	1.0	7.0

Notes:

ug/L - micrograms per Liter.

GWPS - Groundwater Protection Standard as established in TRC's Technical Memorandum dated October 15, 2018.

UCL - Upper Confidence Limit (α = 0.01) of the downgradient data set.

LCL - Lower Confidence Limit (α = 0.01) of the downgradient data set.

Indicates a statistically significant exceedance of the GWPS. An exceedance occurs when the LCL is greater than the GWPS.

Table 6

Summary of Groundwater Protection Standard Exceedances – October 2023

JH Campbell Dry Ash Landfill - RCRA CCR Monitoring Program

West Olive, Michigan

Constituent	Units	GWPS	JHC-MW-15035	
			LCL	UCL
Antimony	ug/L	6	1.0	7.0

Notes:

ug/L - micrograms per Liter.

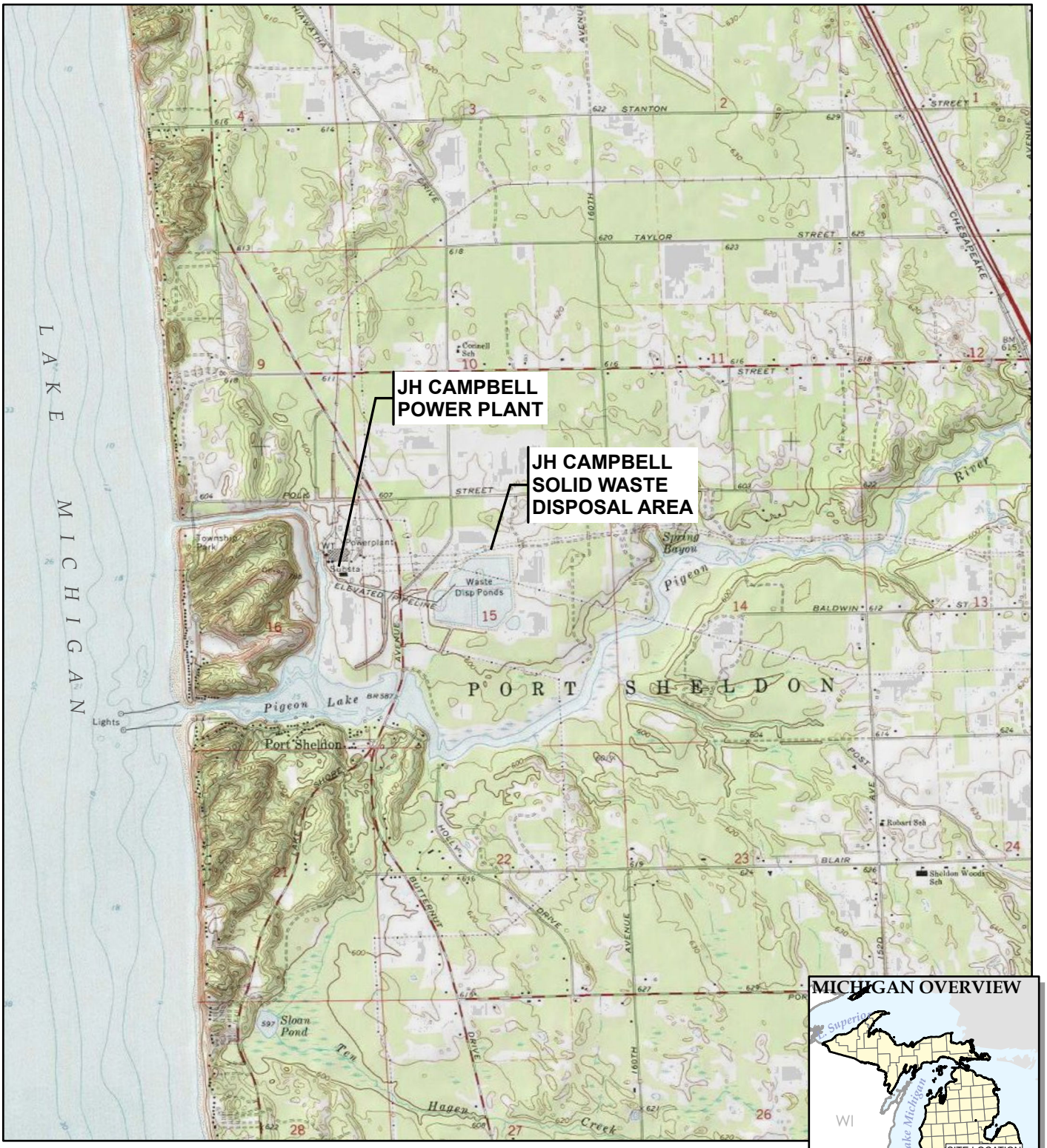
GWPS - Groundwater Protection Standard as established in TRC's Technical Memorandum dated October 15, 2018.

UCL - Upper Confidence Limit (α = 0.01) of the downgradient data set.

LCL - Lower Confidence Limit (α = 0.01) of the downgradient data set.

Indicates a statistically significant exceedance of the GWPS. An exceedance occurs when the LCL is greater than the GWPS.

Figures



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

N

1:36,000
1:36,000

0 3,000 6,000 FEET

TRC

999 Fourier Drive
Suite 101
Madison, WI 53717
Phone: 608.826.3663

TRC - GIS

PROJECT:

CONSUMERS ENERGY COMPANY
JH CAMPBELL POWER PLANT
WEST OLIVE, MICHIGAN

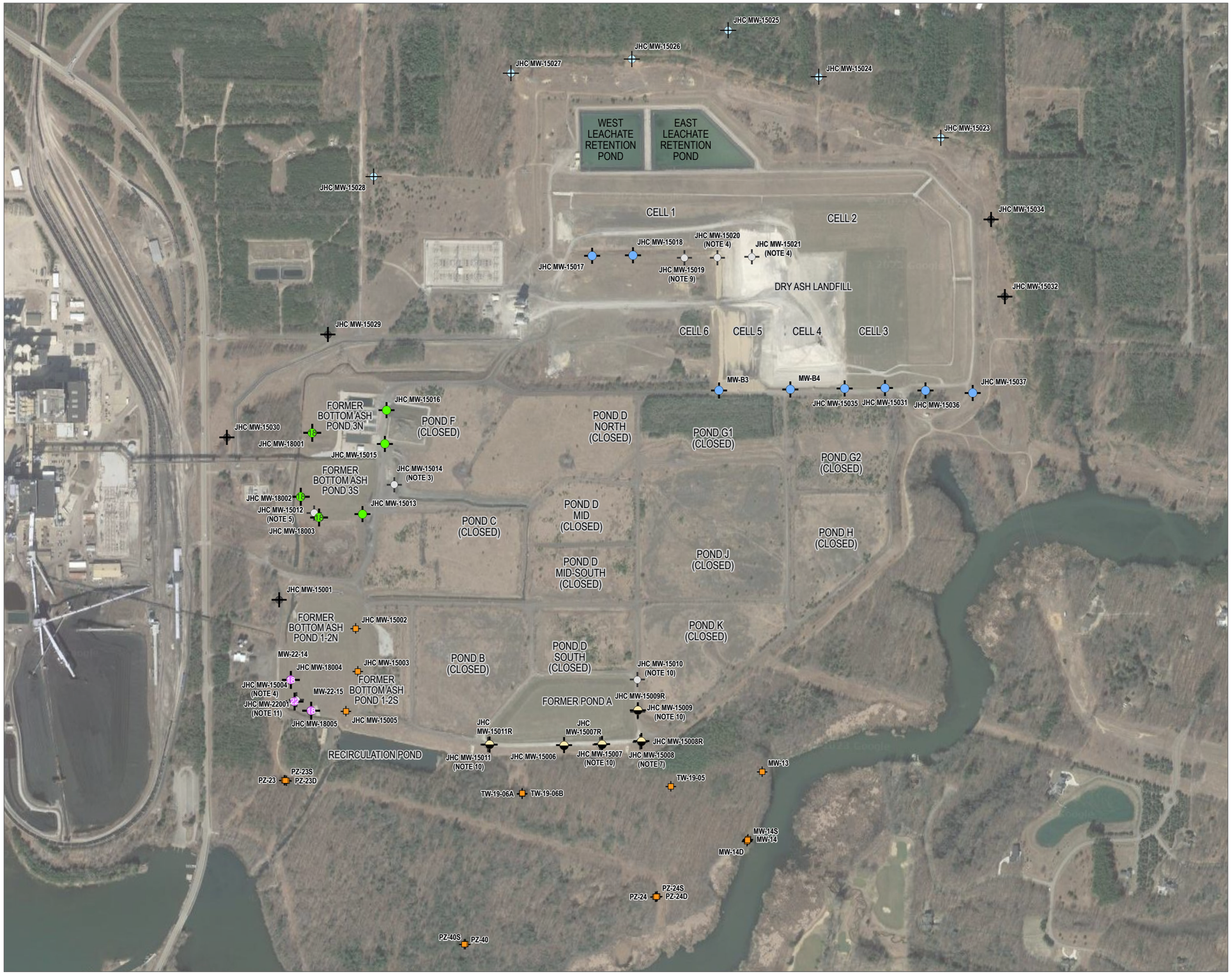
TITLE:

SITE LOCATION MAP

DRAWN BY:	A. FOJTIK
CHECKED BY:	H. SCHNAIDT
APPROVED BY:	S. HOLMSTROM
DATE:	JANUARY 2024
PROJ. NO.:	514398.0000
FILE:	T:\1-PROJECTS\Consumers_Energy\464090_JHC\2-APRX\464090_JHC.aprx

FIGURE 1

-- Saved By: AFOJTIK on 12/13/2023, 12:18:40 PM



LEGEND

- BACKGROUND MONITORING WELL
- DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL
- DOWNGRADIENT BOTTOM ASH POND 3 N/S MONITORING WELL
- DOWNGRADIENT LANDFILL MONITORING WELL
- DOWNGRADIENT POND A MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- DECOMMISSIONED
- DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL (2018)
- DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL (2022)
- DOWNGRADIENT BOTTOM ASH POND 3 N/S MONITORING WELL (2018)
- NATURE AND EXTENT/DOWNGRADIENT MONITORING WELLS

NOTES:

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2021.
2. WELL LOCATIONS BASED ON SURVEY DATA THROUGH JUNE 15, 2022.
3. MONITORING WELL DECOMMISSIONED NOVEMBER 13, 2017.
4. MONITORING WELL DECOMMISSIONED JUNE 14, 2018.
5. MONITORING WELL DECOMMISSIONED OCTOBER 10, 2018.
6. JHC-MW-1800X MONITORING WELLS INSTALLED IN DECEMBER 2018.
7. MONITORING WELL DECOMMISSIONED JUNE 24 , 2019.
8. JHC-MW-15008R AND TW-19-XX MONITORING WELLS INSTALLED IN JUNE 2019.
9. MONITORING WELLS DECOMMISSIONED MAY 25, 2021.
10. MONITORING WELLS DECOMMISSIONED AND REPLACED JULY 20-22, 2021.
11. JHC-MW-22001 MONITORING WELL INSTALLED MAY 12, 2022.

N

1:8,400
1" = 700'

0 500 1,000 FEET

PROJECT:	CONSUMERS ENERGY COMPANY JH CAMPBELL POWER PLANT WEST OLIVE, MICHIGAN
TITLE:	SITE PLAN WITH CCR MONITORING WELL LOCATIONS
DRAWN BY: A. FOJTIK	PROJ. NO.: 514398.0000
CHECKED BY: H. SCHNAIDT	FIGURE 2
APPROVED BY: S. HOLMSTROM	
DATE: JANUARY 2024	

TRC
999 FOURIER DRIVE
SUITE 101
MADISON, WI 53717
PHONE: 608.826.3663

FILE: 464090_JHC.aprx

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl; Map Rotation: 0
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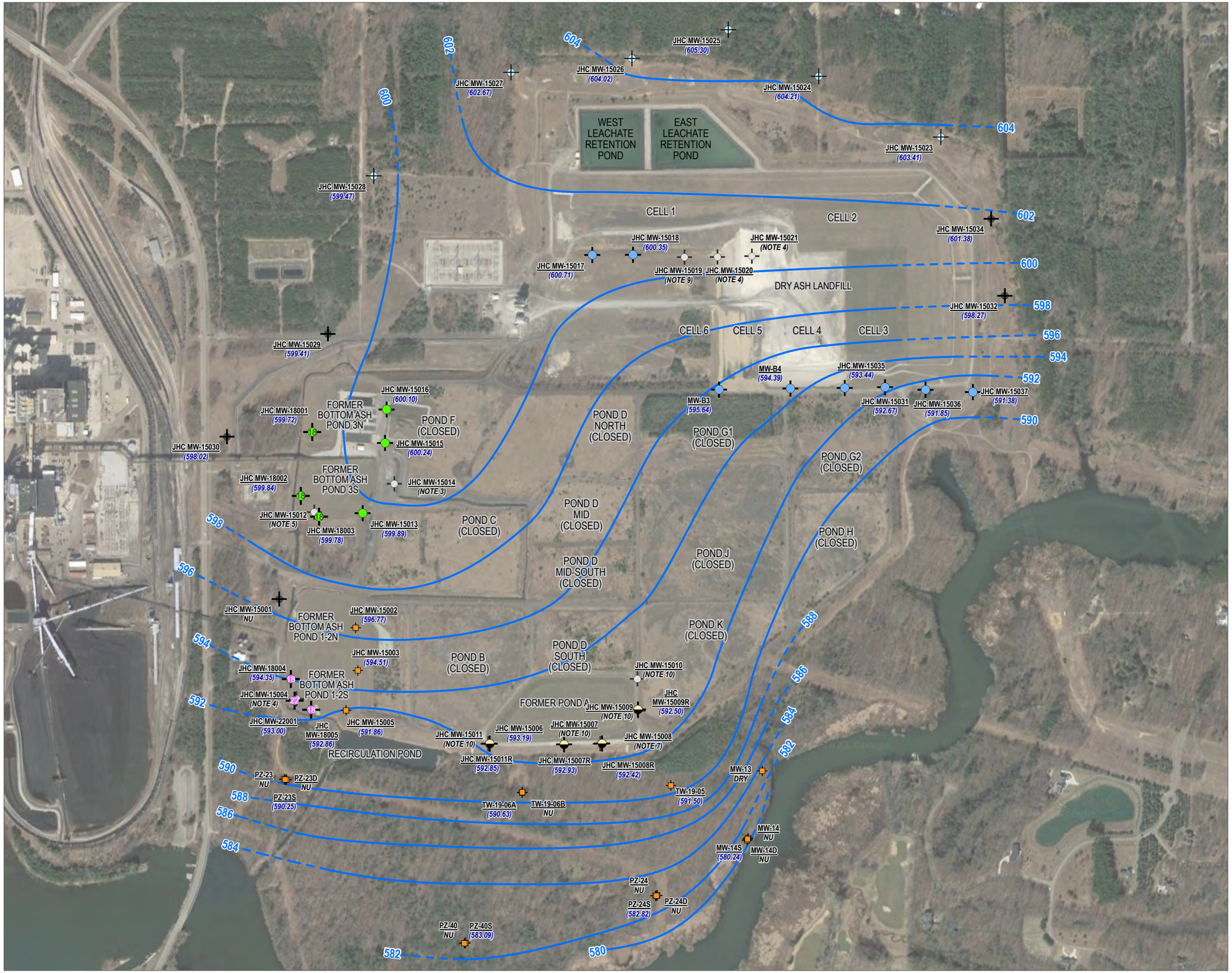

LEGEND

- BACKGROUND MONITORING WELL
- DOWNGRADIENT BOTTOM ASH POND 3 N/S MONITORING WELL
- DOWNGRADIENT LANDFILL MONITORING WELL
- DOWNGRADIENT POND A MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- DECOMMISSIONED
- DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL (2018)
- DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL (2022)
- DOWNGRADIENT BOTTOM ASH POND 3 N/S MONITORING WELL (2018)
- NATURE AND EXTENT/DOWNGRADIENT MONITORING WELLS
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- *NU* NOT USED/NOT APPLICABLE

NOTES:

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2021.
2. WELL LOCATIONS BASED ON SURVEY DATA THROUGH JUNE 15, 2022.
3. MONITORING WELL DECOMMISSIONED NOVEMBER 13, 2017.
4. MONITORING WELL DECOMMISSIONED JUNE 14, 2018.
5. MONITORING WELL DECOMMISSIONED OCTOBER 10, 2018.
6. JHC-MW-1800X MONITORING WELLS INSTALLED IN DECEMBER 2018.
7. MONITORING WELL DECOMMISSIONED JUNE 24 , 2019.
8. JHC-MW-15008R AND TW-19-XX MONITORING WELLS INSTALLED IN JUNE 2019.
9. MONITORING WELLS DECOMMISSIONED MAY 25, 2021.
10. MONITORING WELLS DECOMMISSIONED AND REPLACED JULY 20-22, 2021.
11. JHC-MW-22001 MONITORING WELL INSTALLED MAY 12, 2022.
12. STATIC WATER ELEVATIONS IN NORTH AMERICAN VERTICAL DATUM 1988, NAVD 88.

1:8,400
1" = 700'
0 500 1,000 FEET

PROJECT: CONSUMERS ENERGY COMPANY
JH CAMPBELL POWER PLANT
WEST OLIVE, MICHIGAN

TITLE: GROUNDWATER CONTOUR MAP
APRIL 2023

DRAWN BY:	A. FOJTIK	PROJ. NO.:	514398.0000
CHECKED BY:	H. SCHNAIDT		FIGURE 3
APPROVED BY:	S. HOLMSTROM		
DATE:	JANUARY 2023		

TRC
999 FOURIER DRIVE
SUITE 101
MADISON, WI 53717
PHONE: 608.826.3663

FILE: 464090_JHC.aprx

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl; Map Rotation: 0
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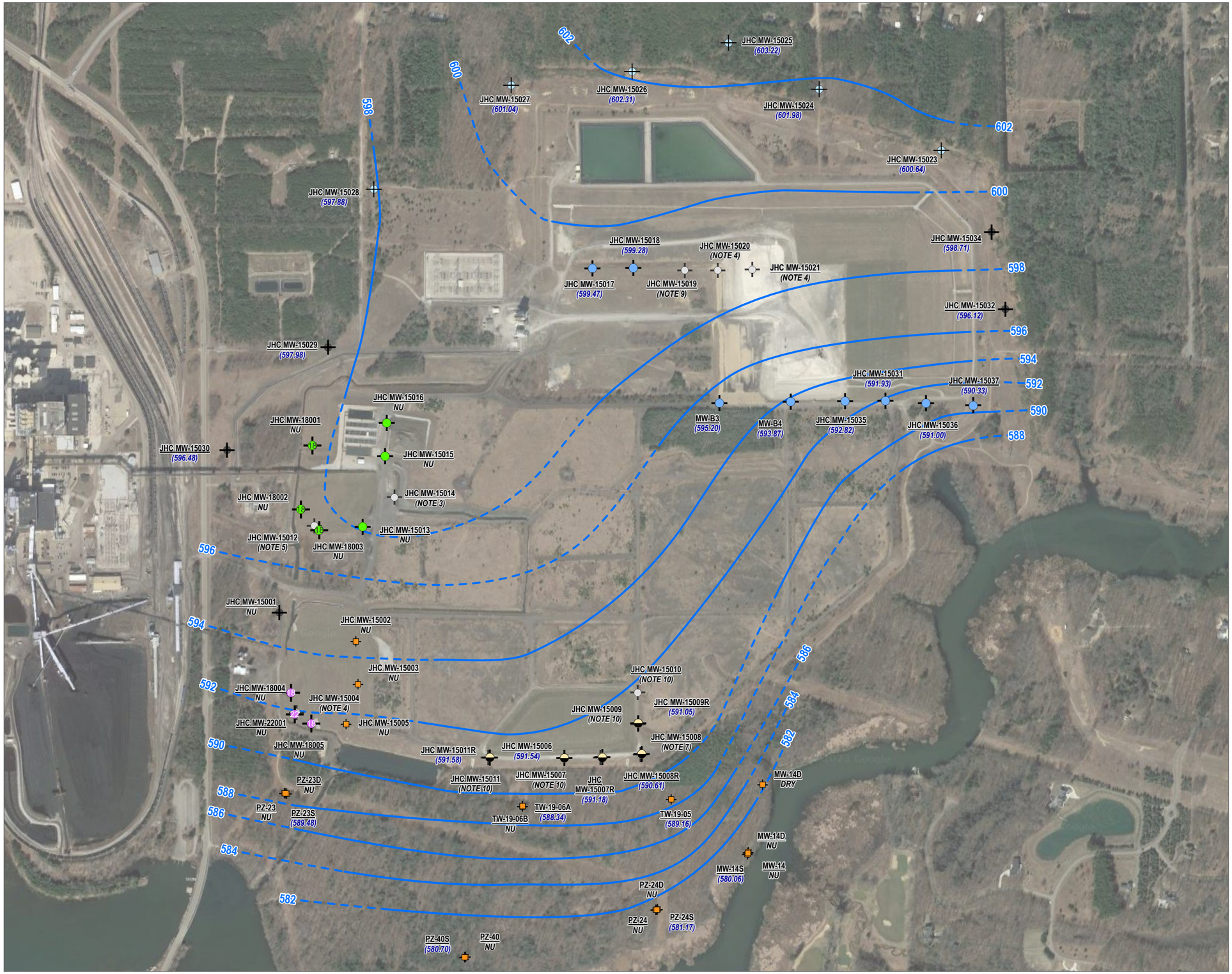

LEGEND

- BACKGROUND MONITORING WELL
- DOWNGRADIENT BOTTOM ASH POND 3 N/S MONITORING WELL
- DOWNGRADIENT LANDFILL MONITORING WELL
- DOWNGRADIENT POND A MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- DECOMMISSIONED
- DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL (2018)
- DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL (2022)
- DOWNGRADIENT BOTTOM ASH POND 3 N/S MONITORING WELL (2018)
- NATURE AND EXTENT/DOWNGRADIENT MONITORING WELLS
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- *NU* NOT USED/NOT APPLICABLE

NOTES:

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2021.
2. WELL LOCATIONS BASED ON SURVEY DATA THROUGH JUNE 15, 2022.
3. MONITORING WELL DECOMMISSIONED NOVEMBER 13, 2017.
4. MONITORING WELL DECOMMISSIONED JUNE 14, 2018.
5. MONITORING WELL DECOMMISSIONED OCTOBER 10, 2018.
6. JHC-MW-1800X MONITORING WELLS INSTALLED IN DECEMBER 2018.
7. MONITORING WELL DECOMMISSIONED JUNE 24 , 2019.
8. JHC-MW-15008R AND TW-19-XX MONITORING WELLS INSTALLED IN JUNE 2019.
9. MONITORING WELLS DECOMMISSIONED MAY 25, 2021.
10. MONITORING WELLS DECOMMISSIONED AND REPLACED JULY 20-22, 2021.
11. JHC-MW-22001 MONITORING WELL INSTALLED MAY 12, 2022.
12. STATIC WATER ELEVATIONS IN NORTH AMERICAN VERTICAL DATUM 1988, NAVD 88.

1:8,400
1" = 700'
0 500 1,000 FEET

PROJECT: CONSUMERS ENERGY COMPANY
JH CAMPBELL POWER PLANT
WEST OLIVE, MICHIGAN

TITLE: GROUNDWATER CONTOUR MAP
OCTOBER 2023

DRAWN BY:	A. FOJTIK	PROJ. NO.:	514398.0000
CHECKED BY:	H. SCHNAIDT		
APPROVED BY:	S. HOLMSTROM		FIGURE 4
DATE:	JANUARY 2024		

TRC
999 FOURIER DRIVE
SUITE 101
MADISON, WI 53717
PHONE: 608.826.3663

FILE: 464090_JHC.aprx

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl; Map Rotation: 0
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Appendix A
Data Quality Review

Laboratory Data Quality Review
Groundwater Monitoring Event April 2023
CEC JH Campbell Background Wells

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the April 2023 sampling event. Samples were analyzed for total metals, anions, alkalinity, and total dissolved solids (TDS) by CE Laboratory Services in Jackson, Michigan. The laboratory analytical results were reported in laboratory sample delivery group (SDG) 23-0320.

During the April 2023 sampling event, a groundwater sample was collected from each of the following wells:

- JHC-MW-15023
- JHC-MW-15024
- JHC-MW-15025
- JHC-MW-15026
- JHC-MW-15027
- JHC-MW-15028

Each sample was analyzed for the following constituents:

Analyte Group	Method
Anions (Fluoride, Chloride, Sulfate)	EPA 300.0
Total Dissolved Solids (TDS)	SM 2540C
Total Metals	SW-846 6020B/7470A
Alkalinity	SM 2320B

TRC reviewed the laboratory data to assess data usability. The following sections summarize the data review procedure and the results of the review.

Data Usability Review Procedure

The analytical data were reviewed using the USEPA National Functional Guidelines for Inorganic Superfund Methods Data Review (USEPA, 2020). The following items were included in the evaluation of the data:

- Sample receipt, as noted in the cover page or case narrative;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;
- Data for method blanks, equipment blanks, and field blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Field and equipment blanks are used to assess potential contamination arising from field procedures;
- Data for laboratory control samples (LCSs) and laboratory control sample duplicates (LCSDs), when performed. The LCSs and/or LCSDs are used to assess the accuracy of the analytical method using a clean matrix;

- Percent recoveries for matrix spike (MS) and matrix spike duplicates (MSD), when performed on project samples. Percent recoveries are calculated for each analyte spiked and used to assess bias due to sample matrix effects;
- Data for laboratory duplicates, when performed on project samples. The laboratory duplicates are replicate analyses of one sample and are used to assess the precision of the analytical method;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

It should be noted that results for method blanks and LCSs were not provided for review by CE Laboratory Services. Therefore, potential contamination arising from laboratory sample preparation and/or analytical procedures and the accuracy of the analytical method using a clean matrix could not be evaluated for the total metals, anions, alkalinity, and TDS analyses.

This data usability report addresses the following items:

- Usability of the data if quality control (QC) results suggest potential problems with all or some of the data;
- Actions regarding specific QC criteria exceedances.

Review Summary

The data quality objectives and laboratory completeness goals for the project were met, and the data are usable for their intended purpose. A summary of the data quality review, including non-conformances and issues identified in this evaluation are noted below.

- The reviewed Appendix III and IV constituents as well as alkalinity will be utilized for the purposes of an assessment monitoring program.
- Data are usable for the purposes of the assessment monitoring program.
- When the data are evaluated through an assessment monitoring statistical program, findings below may be used to support the removal of outliers.

QA/QC Sample Summary

- One equipment blank (EB-01) and one field blank (FB-01) were collected. Target analytes were not detected in these blank samples.
- MS and MSD analyses were performed on sample JHC-MW-15025 for total metals and anions. The recoveries were within the acceptance limits. Relative percent differences (RPDs) were not provided by the laboratory and therefore were not evaluated; further, MS/MSD concentrations were not provided by the laboratory. However, since all recoveries were within the acceptance limits, there is no impact on data usability due to this issue.
- The field duplicate pair samples were DUP-01/JHC-MW-15027 for total metals, anions, alkalinity, and TDS. All criteria were met.

Laboratory Data Quality Review
Groundwater Monitoring Event April 2023
CEC JH Campbell Background Wells

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the April 2023 sampling event. Samples were analyzed for radium by Eurofins in St. Louis, Missouri (Eurofins - St. Louis). The laboratory analytical results were reported in laboratory sample delivery group (SDG) 160-49762-1.

During the April 2023 sampling event, a groundwater sample was collected from each of the following wells:

- JHC-MW-15023
- JHC-MW-15024
- JHC-MW-15025
- JHC-MW-15026
- JHC-MW-15027
- JHC-MW-15028

Each sample was analyzed for the following constituents:

Analyte Group	Method
Radium (Ra-226, Ra-228, Combined Ra-226 & Ra-228)	EPA 903.0, EPA 904.0

TRC reviewed the laboratory data to assess data usability. The following sections summarize the data review procedure and the results of the review.

Data Usability Review Procedure

The analytical data were reviewed using the Department of Energy Evaluation of Radiochemical Data Usability (USDOE, 1997). The following items were included in the evaluation of the data:

- Sample receipt, as noted in the cover page or case narrative;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;
- Data for method blanks, equipment blanks, and field blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Field and equipment blanks are used to assess potential contamination arising from field procedures;
- Data for laboratory control samples (LCSs) and laboratory control sample duplicates (LCSDs), when performed. The LCSs and/or LCSDs are used to assess the accuracy of the analytical method using a clean matrix;
- Percent recoveries for matrix spike (MS) and matrix spike duplicates (MSD), when performed on project samples. Percent recoveries are calculated for each analyte spiked and used to assess bias due to sample matrix effects;
- Percent recoveries for carriers, where applicable, for radiochemistry only. Carriers are used to assess the chemical yield for the preparation and/or instrument efficiency;

- Data for laboratory duplicates, when performed on project samples. The laboratory duplicates are replicate analyses of one sample and are used to assess the precision of the analytical method;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

This data usability report addresses the following items:

- Usability of the data if quality control (QC) results suggest potential problems with all or some of the data;
- Actions regarding specific QC criteria exceedances.

Review Summary

The data quality objectives and laboratory completeness goals for the project were met, and the data are usable for their intended purpose. A summary of the data quality review, including non-conformances and issues identified in this evaluation are noted below.

- The reviewed constituents will be utilized for the purposes of an assessment monitoring program.
- Data are usable for the purposes of the assessment monitoring program.
- When the data are evaluated through an assessment monitoring statistical program, findings below may be used to support the removal of outliers.

QA/QC Sample Summary

- Target analytes were not detected in the method blanks (MBs) with the following exception.
  - Radium-228 was detected in MB 160-610088/1-A at 0.5308 +/- 0.333 pCi/L; however, radium-228 was not detected in the associated samples, thus no data are affected.
- One equipment blank (EB-01) and one field blank (FB-01) were collected. Target analytes were not detected in these blank samples.
- LCS/LCSD recoveries and relative percent differences for all target analytes were within laboratory control limits.
- MS/MSD and laboratory duplicate analyses were not performed on a sample from this SDG.
- The field duplicate pair samples were DUP-01/JHC-MW-15027. All criteria were met.
- Carrier recoveries were within 40-110%.

Laboratory Data Quality Review
Groundwater Monitoring Event April 2023
Consumers Energy JH Campbell Landfill Wells

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the April 2023 sampling event. Samples were analyzed for total metals, anions, alkalinity, and total dissolved solids by CE Laboratory Services in Jackson, Michigan. The laboratory analytical results were reported in laboratory sample delivery groups (SDGs) 23-0324.

During the April 2023 sampling event, a groundwater sample was collected from each of the following wells:

Landfill Wells:

- JHC-MW-15017
- JHC-MW-15018
- JHC-MW-15031
- MW-B3
- MW-B4
- JHC-MW-15035
- JHC-MW-15036
- JHC-MW-15037

Each sample was analyzed for the following constituents:

Analyte Group	Method
Anions (Fluoride, Chloride, Sulfate)	EPA 300.0
Total Dissolved Solids (TDS)	SM 2540C
Total Metals	SW-846 6020B/7470A
Alkalinity	SM 2320B

TRC reviewed the laboratory data to assess data usability. The following sections summarize the data review procedure and the results of the review.

Data Usability Review Procedure

The analytical data were reviewed using the USEPA National Functional Guidelines for Inorganic Superfund Methods Data Review (USEPA, 2020). The following items were included in the evaluation of the data:

- Sample receipt; as noted in the cover page or case narrative;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;
- Data for method blanks, equipment blanks, and field blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Field and equipment blanks are used to assess potential contamination arising from field procedures;

- Data for laboratory control samples (LCSs) and laboratory control sample duplicates (LCSDs), when performed. The LCSs and/or LCSDs are used to assess the accuracy of the analytical method using a clean matrix;
- Percent recoveries for matrix spike (MS) and matrix spike duplicates (MSD), when performed on project samples. Percent recoveries are calculated for each analyte spiked and used to assess bias due to sample matrix effects;
- Data for laboratory duplicates, when performed on project samples. The laboratory duplicates are replicate analyses of one sample and are used to assess the precision of the analytical method;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

It should be noted that results for method blanks and LCS were not provided for review by CE Laboratory Services. Therefore, potential contamination arising from laboratory sample preparation and/or analytical procedures and the accuracy of the analytical method using a clean matrix could not be evaluated for the total metals, anions, alkalinity, and TDS analyses.

This data usability report addresses the following items:

- Usability of the data if quality control (QC) results suggest potential problems with all or some of the data;
- Actions regarding specific QC criteria exceedances.

Review Summary

The data quality objectives and laboratory completeness goals for the project were met, and the data are usable for their intended purpose. A summary of the data quality review, including non-conformances and issues identified in this evaluation are noted below.

- The reviewed Appendix III and IV constituents as well as alkalinity will be utilized for the purposes of an assessment monitoring program.
- Data are usable for the purposes of the assessment monitoring program.
- When the data are evaluated through an assessment monitoring statistical program, findings below may be used to support the removal of outliers.

QA/QC Sample Summary

- One equipment blank (EB-05) and one field blank (FB-05) were collected. Target analytes were not detected in these blank samples.
- MS and MSD analyses were performed on sample MW-B4 for total metals and anions. The recoveries were within the acceptance limits. Relative percent differences (RPDs) were not provided by the laboratory and therefore were not evaluated; further, MS/MSD concentrations were not provided by the laboratory. However, since all recoveries were within the acceptance limits, there is no impact on data usability due to this issue.
- The field duplicate pair samples were DUP-05 and JHC-MW-15031 for total metals, anions, alkalinity, and TDS. All criteria were met.

- The RL for cadmium was above the requested RL (0.2 mg/L) in sample CS2 (0.6 mg/L) due to matrix interference.

Laboratory Data Quality Review
Groundwater Monitoring Event April 2023
Consumers Energy JH Campbell Landfill Wells

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the April 2023 sampling event. Samples were analyzed for radium by Eurofins in St. Louis, Missouri (Eurofins - St. Louis). The laboratory analytical results were reported in laboratory sample delivery group (SDG) 160-49754-1.

During the April 2023 sampling event, a groundwater sample was collected from each of the following wells:

- JHC-MW-15017
- JHC-MW-15018
- JHC-MW-15031
- MW-B3
- MW-B4
- JHC-MW-15035
- JHC-MW-15036
- JHC-MW-15037

Each sample was analyzed for the following constituents:

Analyte Group	Method
Radium (Ra-226, Ra-228, Combined Ra-226 & Ra-228)	EPA 903.0, EPA 904.0

TRC reviewed the laboratory data to assess data usability. The following sections summarize the data review procedure and the results of the review.

Data Usability Review Procedure

The analytical data were reviewed using the Department of Energy Evaluation of Radiochemical Data Usability (USDOE, 1997). The following items were included in the evaluation of the data:

- Sample receipt; as noted in the cover page or case narrative;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;
- Data for method blanks, equipment blanks, and field blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Field and equipment blanks are used to assess potential contamination arising from field procedures;
- Data for laboratory control samples (LCSs) and laboratory control sample duplicates (LCSDs), when performed. The LCSs and/or LCSDs are used to assess the accuracy of the analytical method using a clean matrix;
- Percent recoveries for matrix spike (MS) and matrix spike duplicates (MSD), when performed on project samples. Percent recoveries are calculated for each analyte spiked and used to assess bias due to sample matrix effects;
- Percent recoveries for carriers, where applicable, for radiochemistry only. Carriers are used to assess the chemical yield for the preparation and/or instrument efficiency;

- Data for laboratory duplicates, when performed on project samples. The laboratory duplicates are replicate analyses of one sample and are used to assess the precision of the analytical method;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

This data usability report addresses the following items:

- Usability of the data if quality control (QC) results suggest potential problems with all or some of the data;
- Actions regarding specific QC criteria exceedances.

Review Summary

The data quality objectives and laboratory completeness goals for the project were met, and the data are usable for their intended purpose. A summary of the data quality review, including non-conformances and issues identified in this evaluation are noted below.

- The reviewed constituents will be utilized for the purposes of an assessment monitoring program.
- Data are usable for the purposes of the assessment monitoring program.
- When the data are evaluated through an assessment monitoring statistical program, findings below may be used to support the removal of outliers.

QA/QC Sample Summary

- Target analytes were not detected in the method blanks.
- One equipment blank (EB-05) and one field blank (FB-05) were collected. Target analytes were not detected in these blank samples with the following exception.
  - Combined radium-226/228 was detected in EB-05 at 0.584 +/- 0.372 pCi/L. Potential false positive exists for combined radium-226/228 results with normalized absolute differences (NADs) <1.96, as summarized in Attachment A.
- LCS/LCSD recoveries and relative percent differences (RPDs) for all target analytes were within laboratory control limits.
- MS/MSD and laboratory duplicate analyses were not performed on a sample from this SDG.
- The field duplicate pair samples were DUP-05/JHC-MW-15031. All criteria were met.
- Carrier recoveries were within 40-110%.

Attachment A

Summary of Data Non-Conformances for Landfill Groundwater Analytical Data
JH Campbell Landfill and Leachate Wells – Hydrogeological Monitoring Program
West Olive, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
JHC-MW-15031	4/12/2023	Combined Radium 226/228	Detected result is potentially a false positive due to equipment blank contamination (normalized absolute difference <1.96).
MW-B4	4/12/2023		

Laboratory Data Quality Review
Groundwater Monitoring Event October 2023
Consumers Energy JH Campbell Background Wells

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the October 2023 sampling event. Samples were analyzed for total metals, anions, and total dissolved solids (TDS) by CE Laboratory Services in Jackson, Michigan. The laboratory analytical results were reported in laboratory sample delivery group (SDG) 23-1002.

During the October 2023 sampling event, a groundwater sample was collected from each of the following wells:

- JHC-MW-15023
- JHC-MW-15024
- JHC-MW-15025
- JHC-MW-15026
- JHC-MW-15027
- JHC-MW-15028

Each sample was analyzed for the following constituents:

Analyte Group	Method
Anions (Fluoride, Chloride, Sulfate)	EPA 300.0
Total Dissolved Solids (TDS)	SM 2540C
Total Metals	SW-846 6020B/7470A

TRC reviewed the laboratory data to assess data usability. The following sections summarize the data review procedure and the results of the review.

Data Usability Review Procedure

The analytical data were reviewed using the USEPA National Functional Guidelines for Inorganic Superfund Methods Data Review (USEPA, 2020). The following items were included in the evaluation of the data:

- Sample receipt, as noted in the cover page or case narrative;
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- Reporting limits (RLs) compared to project-required RLs;
- Data for method blanks, equipment blanks, and field blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Field and equipment blanks are used to assess potential contamination arising from field procedures;
- Data for laboratory control samples (LCSs) and laboratory control sample duplicates (LCSDs), when performed. The LCSs and/or LCSDs are used to assess the accuracy of the analytical method using a clean matrix;
- Percent recoveries for matrix spikes (MS) and matrix spike duplicates (MSD), when performed on project samples. Percent recoveries are calculated for each analyte spiked and used to assess bias due to sample matrix effects;

- Data for laboratory duplicates, when performed on project samples. The laboratory duplicates are replicate analyses of one sample and are used to assess the precision of the analytical method;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

It should be noted that results for method blanks and LCSs were not provided for review by CE Laboratory Services. Therefore, potential contamination arising from laboratory sample preparation and/or analytical procedures and the accuracy of the analytical method using a clean matrix could not be evaluated for the total metals, anions, and TDS analyses.

This data usability report addresses the following items:

- Usability of the data if quality control (QC) results suggest potential problems with all or some of the data;
- Actions regarding specific QC criteria exceedances.

Review Summary

The data quality objectives and laboratory completeness goals for the project were met, and the data are usable for their intended purpose. A summary of the data quality review, including non-conformances and issues identified in this evaluation are noted below.

- The reviewed Appendix III and IV constituents will be utilized for the purposes of an assessment monitoring program.
- Data are usable for the purposes of the assessment monitoring program.
- When the data are evaluated through an assessment monitoring statistical program, findings below may be used to support the removal of outliers.

QA/QC Sample Summary

- One equipment blank (EB-01) and one field blank (FB-01) were collected. Target analytes were not detected in these blank samples.
- MS and MSD analyses were performed on sample JHC-MW-15025 for total metals and anions. The recoveries were within the acceptance limits. Relative percent differences were not provided by the laboratory and therefore were not evaluated; further, MS/MSD concentrations were not provided by the laboratory. However, since all recoveries were within the acceptance limits, there is no impact on data usability due to this issue.
- Samples DUP-01/JHC-MW-15023 were submitted as the field duplicate pair with this data set; all criteria were met.

Laboratory Data Quality Review
Groundwater Monitoring Event October 2023
Consumers Energy JH Campbell Background Wells

Groundwater samples were collected by Consumers Energy (CE) Laboratory Samples and were analyzed for radium by Eurofins Environment Testing in Earth City, Missouri. The laboratory analytical results were reported in laboratory sample delivery group (SDG) 160-52007-1.

During the October 2023 sampling event, a groundwater sample was collected from each of the following wells:

- JHC-MW-15023
- JHC-MW-15024
- JHC-MW-15025
- JHC-MW-15026
- JHC-MW-15027
- JHC-MW-15028

Each sample was analyzed for the following constituents:

Analyte Group	Method
Radium (Ra-226, Ra-228, Combined Ra-226 & Ra-228)	EPA 903.0, EPA 904.0

TRC reviewed the laboratory data to assess data usability. The following sections summarize the data review procedure and the results of the review.

Data Usability Review Procedure

The analytical data were reviewed using the Department of Energy Evaluation of Radiochemical Data Usability (USDOE, 1997). The following items were included in the evaluation of the data:

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- Data for laboratory control samples (LCSs) and laboratory control sample duplicates (LCSDs), when performed. The LCSs and/or LCSDs are used to assess the accuracy of the analytical method using a clean matrix;
- Percent recoveries for matrix spike (MS) and matrix spike duplicates (MSD), when performed on project samples. Percent recoveries are calculated for each analyte spiked and used to assess bias due to sample matrix effects;
- Percent recoveries for carriers, where applicable, for radiochemistry only. Carriers are used to assess the chemical yield for the preparation and/or instrument efficiency;

- Data for laboratory duplicates, when performed on project samples. The laboratory duplicates are replicate analyses of one sample and are used to assess the precision of the analytical method;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

This data usability report addresses the following items:

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- Actions regarding specific QC criteria exceedances.

Review Summary

The data quality objectives and laboratory completeness goals for the project were met, and the data are usable for their intended purpose. A summary of the data quality review, including non-conformances and issues identified in this evaluation are noted below.

- The reviewed constituents will be utilized for the purposes of an assessment monitoring program.
- Data are usable for the purposes of the assessment monitoring program.
- When the data are evaluated through an assessment monitoring statistical program, findings below may be used to support the removal of outliers.

QA/QC Sample Summary

- Target analytes were not detected in the method blanks.
- One equipment blank (EB-01) and one field blank (FB-01) were collected. Target analytes were not detected in the blank samples with the following exceptions:
  - Radium-228 (0.743 +/- 0.366 pCi/L) and radium-226/228 (0.705 +/- 0.369 pCi/L) were detected in sample EB-01 at the listed concentrations. Potential false positive exists for positive radium-228 and/or radium-226/228 results with normalized absolute differences <1.96, as summarized in attachment A.
- LCS recoveries for all target analytes were within laboratory control limits.
- MS/MSD and laboratory duplicate analyses were not performed on a sample from this data set.
- Samples DUP-01/JHC-MW-15023 were submitted as the field duplicate pair with this data set; all criteria were met.
- Carrier recoveries were within 40-110%.

Attachment A

Summary of Data Non-Conformances for Groundwater Analytical Data

JH Campbell Background– CCR Monitoring Program

West Olive, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
JHC-MW-15025	10/16/2023	Radium-228 and Radium-226/288	Equipment blank contamination; potential false positive.
JHC-MW-15027	10/16/2023		
JHC-MW-15028	10/16/2023		
JHC-MW-15026	10/16/2023	Radium-226/228	

Laboratory Data Quality Review
Groundwater Monitoring Event October 2023
Consumers Energy JH Campbell Landfill Wells

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the October 2023 sampling event. Samples were analyzed for total metals, anions, and total dissolved solids by CE Laboratory Services in Jackson, Michigan. The laboratory analytical results were reported in laboratory sample delivery group (SDG) 23-1004.

During the October 2023 sampling event, a groundwater sample was collected from each of the following wells:

Landfill Wells:

- JHC-MW-15017
- JHC-MW-15018
- JHC-MW-15031
- MW-B3
- MW-B4
- JHC-MW-15035
- JHC-MW-15036
- JHC-MW-15037

Each sample was analyzed for one or more of the following constituents:

Analyte Group	Method
Anions (Fluoride, Chloride, Sulfate)	EPA 300.0
Total Dissolved Solids (TDS)	SM 2540C
Total Metals	SW-846 6020B/7470A

TRC reviewed the laboratory data to assess data usability. The following sections summarize the data review procedure and the results of the review.

Data Usability Review Procedure

The analytical data were reviewed using the USEPA National Functional Guidelines for Inorganic Superfund Methods Data Review (USEPA, 2020). The following items were included in the evaluation of the data:

- Sample receipt; as noted in the cover page or case narrative;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;
- Data for method blanks, equipment blanks, and field blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Field and equipment blanks are used to assess potential contamination arising from field procedures;
- Data for laboratory control samples (LCSs) and laboratory control sample duplicates (LCSDs), when performed. The LCSs and/or LCSDs are used to assess the accuracy of the analytical method using a clean matrix;

- Percent recoveries for matrix spikes (MS) and matrix spike duplicates (MSD), when performed on project samples. Percent recoveries are calculated for each analyte spiked and used to assess bias due to sample matrix effects;
- Data for laboratory duplicates, when performed on project samples. The laboratory duplicates are replicate analyses of one sample and are used to assess the precision of the analytical method;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

It should be noted that results for method blanks and LCSs were not provided for review by CE Laboratory Services. Therefore, potential contamination arising from laboratory sample preparation and/or analytical procedures and the accuracy of the analytical method using a clean matrix could not be evaluated for the total metals, anions, and TDS analyses.

This data usability report addresses the following items:

- Usability of the data if quality control (QC) results suggest potential problems with all or some of the data;
- Actions regarding specific QC criteria exceedances.

Review Summary

The data quality objectives and laboratory completeness goals for the project were met, and the data are usable for their intended purpose. A summary of the data quality review, including non-conformances and issues identified in this evaluation are noted below.

- The reviewed Appendix III and IV constituents will be utilized for the purposes of an assessment monitoring program.
- Data are usable for the purposes of the assessment monitoring program.
- When the data are evaluated through an assessment monitoring statistical program, findings below may be used to support the removal of outliers.

QA/QC Sample Summary

- One equipment blank (EB-03) and one field blank (FB-03) were collected. Target analytes were not detected in these blank samples.
- MS and MSD analyses were performed on sample MW-B4 for total metals and anions. The recoveries were within the acceptance limits. Relative percent differences were not provided by the laboratory and therefore were not evaluated; further, MS/MSD concentrations were not provided by the laboratory. However, since all recoveries were within the acceptance limits, there is no impact on data usability due to this issue.
- Samples DUP-03/JHC-MW-15037 were submitted as the field duplicate pair with this data set; all criteria were met.

Laboratory Data Quality Review
Groundwater Monitoring Event October 2023
Consumers Energy JH Campbell Landfill Wells

Groundwater samples were collected by Consumers Energy (CE) Laboratory Samples and were analyzed for radium by Eurofins Environment Testing in Earth City, Missouri. The laboratory analytical results were reported in laboratory sample delivery group (SDG) 160-52009-1.

During the October 2023 sampling event, a groundwater sample was collected from each of the following wells:

Landfill Wells:

- JHC-MW-15017
- JHC-MW-15018
- JHC-MW-15031
- MW-B3
- MW-B4
- JHC-MW-15035
- JHC-MW-15036
- JHC-MW-15037

Each sample was analyzed for the following constituents:

Analyte Group	Method
Radium (Ra-226, Ra-228, Combined Ra-226 & Ra-228)	EPA 903.0, EPA 904.0

TRC reviewed the laboratory data to assess data usability. The following sections summarize the data review procedure and the results of the review.

Data Usability Review Procedure

The analytical data were reviewed using the Department of Energy Evaluation of Radiochemical Data Usability (USDOE, 1997). The following items were included in the evaluation of the data:

- Sample receipt; as noted in the cover page or case narrative;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;
- Data for method blanks, equipment blanks, and field blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Field and equipment blanks are used to assess potential contamination arising from field procedures;
- Data for laboratory control samples (LCSs) and laboratory control sample duplicates (LCSDs), when performed. The LCSs and/or LCSDs are used to assess the accuracy of the analytical method using a clean matrix;
- Percent recoveries for matrix spike (MS) and matrix spike duplicates (MSD), when performed on project samples. Percent recoveries are calculated for each analyte spiked and used to assess bias due to sample matrix effects;

- Percent recoveries for carriers, where applicable, for radiochemistry only. Carriers are used to assess the chemical yield for the preparation and/or instrument efficiency;
- Data for laboratory duplicates, when performed on project samples. The laboratory duplicates are replicate analyses of one sample and are used to assess the precision of the analytical method;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

This data usability report addresses the following items:

- Usability of the data if quality control (QC) results suggest potential problems with all or some of the data;
- Actions regarding specific QC criteria exceedances.

Review Summary

The data quality objectives and laboratory completeness goals for the project were met, and the data are usable for their intended purpose. A summary of the data quality review, including non-conformances and issues identified in this evaluation are noted below.

- The reviewed constituents will be utilized for the purposes of an assessment monitoring program.
- Data are usable for the purposes of the assessment monitoring program.
- When the data are evaluated through an assessment monitoring statistical program, findings below may be used to support the removal of outliers.

QA/QC Sample Summary

- Target analytes were not detected in the method blanks.
- One equipment blank (EB-03) and one field blank (FB-03) were collected. Target analytes were not detected in these blank samples.
- LCS recoveries for all target analytes were within laboratory control limits.
- MS/MSD and laboratory duplicate analyses were not performed on a sample from this data set.
- Samples DUP-03/JHC-MW-15037 were submitted as the field duplicate pair with this data set; all criteria were met.
- Carrier recoveries were within 40-110%.

Appendix B
April 2023 Assessment Monitoring Statistical Evaluation

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Technical Memorandum

Date:	July 20, 2023
To:	Bethany Swanberg, Consumers Energy
From:	Sarah Holmstrom, TRC Kristin Lowery, TRC Henry Schnaidt, TRC
Project No.:	514398.0001.0000 Phase 1 Task 2
Subject:	Statistical Evaluation of April 2023 Assessment Monitoring Sampling Event JH Campbell Dry Ash Landfill, Consumers Energy Company, West Olive, Michigan

During the statistical evaluation of the initial assessment monitoring event (June 2018), no Appendix IV constituents were present at statistically significant levels exceeding the Groundwater Protection Standards (GWPSs). Therefore, Consumers Energy Company (Consumers Energy) is continuing semiannual assessment monitoring in accordance with §257.95 of the CCR Rule[1] at the JH Campbell Power Plant Dry Ash Landfill. The first semiannual assessment monitoring event for 2023 was conducted on April 10 through April 13, 2023. In accordance with §257.95, the assessment monitoring data must be compared to GWPSs to determine whether or not Appendix IV constituents are detected at statistically significant levels above the GWPSs. GWPSs were established in accordance with §257.95(h), as described in the October 15, 2018 Groundwater Protection Standards technical memorandum, which was also included in the 2018 Annual Groundwater Monitoring Report (TRC, January 2019). The following narrative describes the methods employed and the results obtained.

The statistical evaluation of the first semiannual assessment monitoring event of 2023 data indicates no constituents are present at statistically significant levels that exceed the GWPSs at the Dry Ash Landfill monitoring wells.

Constituent	GWPS	# Downgradient Wells Observed

No constituents are present at statistically significant levels above the GWPSs.

These results are consistent with the results of the previous assessment monitoring data statistical evaluations and concentrations remain above background levels. Consumers Energy will continue semiannual assessment monitoring per §257.95 and continue to execute the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

[1] USEPA final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA) published April 17, 2015, as amended.

Assessment Monitoring Statistical Evaluation

The compliance well network at the JHC Dry Ash Landfill CCR Unit currently consists of eight monitoring wells (JHC-MW-15017, JHC-MW-15018, JHC-MW-15031, JHC-MW-15035 through JHC-MW-15037, MW-B3, and MW-B4) located on the south perimeter of the landfill Cells 1 through 6.

Following the semiannual assessment monitoring sampling event, compliance well data for the Dry Ash Landfill were evaluated in accordance with the Groundwater Statistical Evaluation Plan (Stats Plan) (TRC, October 2017). An assessment monitoring program was developed to evaluate concentrations of CCR constituents present in the uppermost aquifer relative to acceptable levels (i.e., GWPSs). To evaluate whether or not a GWPS exceedance is statistically significant, the difference in concentration observed at the downgradient wells during a given assessment monitoring event compared to the GWPS must be large enough, after accounting for variability in the sample data, that the result is unlikely to have occurred merely by chance. Consistent with the Unified Guidance[2], the preferred method for comparisons to a fixed standard are confidence limits. An exceedance of the standard occurs when the 99 percent lower confidence level of the downgradient data exceeds the GWPS. Based on the number of historical observations in the representative sample population, the population mean, the population standard deviation, and a selected confidence level (i.e., 99 percent), an upper and lower confidence limit is calculated. The actual mean concentration of the population, with 99 percent confidence, will fall between the lower and upper confidence limits.

The concentrations observed in the downgradient wells are deemed to be a statistically significant exceedance when the 99 percent lower confidence limit of the downgradient data exceeds the GWPS. If the confidence interval straddles the GWPS (i.e. the lower confidence level is below the GWPS but the upper confidence level is above), the statistical test result indicates that there is insufficient confidence that the measured concentrations are different from the GWPS and thus there is no compelling evidence that the measured concentration is a result of a release from the CCR unit versus the inherent variability of the sample data. This statistical approach is consistent with the statistical methods for assessment monitoring presented in §257.93(f) and (g). Statistical evaluation methodologies built into the CCR Rule, and numerous other federal rules, are key in determining whether or not individually measured data points represent a concentration increase over the baseline or a fixed standard (such as a GWPS in an assessment monitoring program).

For each detected constituent, the concentrations from each well were first compared directly to the GWPS, as shown on Table 1. Monitoring wells MW-B3 and MW-B4 were not part of the CCR monitoring program prior to 2022; they were previously monitored under the old HMP which deviates from the sampling and analysis procedures included in the November 2021 sample and analysis plan (SAP) that is used for the semiannual assessment monitoring program. Constituent-well combinations that included a direct exceedance of the GWPS within the past eight monitoring events (October 2019 through April 2023) were retained for further analysis (Attachment 1). Direct comparison GWPS exceedances include the following constituent well combinations:

- Antimony in JHC-MW-15035.

[2] USEPA. 2009. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance*. Office of Conservation and Recovery. EPA 530/R-09-007.

Groundwater data were then evaluated utilizing Sanitas™ statistical software. Sanitas™ is a software tool that is commercially available for performing statistical evaluations consistent with procedures outlined in the Unified Guidance. Within the Sanitas™ statistical program, confidence limits were selected to perform the statistical comparison of compliance data to a fixed standard. Parametric or non-parametric confidence intervals were calculated, as appropriate, for each of the constituents using a 99 percent confidence level for each individual statistical test, i.e., a significance level (α) of 0.01. The following narrative describes the methods employed, the results obtained and the Sanitas™ output files are included as an attachment.

The statistical data evaluation included the following steps:

- Review of data quality checklists for the data sets;
- Graphical representation of the monitoring data as time versus concentration by well-constituent pair;
- Outlier testing of individual data points that appear from the graphical representations as potential outliers;
- Evaluation of visual trends apparent in the graphical representations for statistical significance;
- Evaluation of percentage of non-detects for each well-constituent pair;
- Distribution of the data; and
- Calculation of the confidence intervals for each cumulative dataset.

The results of these evaluations are presented and discussed below.

Initially, results for the past eight events were observed visually for potential trends and outliers (time-series plots in Attachment 1). No outliers or significant trends were noted.

Data from each round were evaluated for completeness, overall quality, and usability and were deemed appropriate for the purposes of the groundwater monitoring program, except as noted in Table 1. The Sanitas™ software was then used to test compliance at the downgradient monitoring wells using the confidence interval method for the most recent eight sampling events. Eight independent sampling events provide an appropriate density of data as recommended per the Unified Guidance yet are collected recently enough to provide an indication of current conditions. The tests were run with a per-well significance of α = 0.01. The software outputs are included in Attachment 1 along with data reports showing the values used for the evaluation. The percentage of non-detect observations are also included in Attachment 1. Non-detect data were handled in accordance with the HMP for the purposes of calculating the confidence intervals.

The Sanitas™ software generates an output that includes graphs of the parametric or non-parametric confidence intervals for each well along with notes on data transformations, as appropriate. The data distributions are as follows:

Distribution	Constituent-Well Combinations
Non-Parametric (non-detects)	Antimony at JHC-MW-15035

The confidence interval test compares the lower confidence limit to the GWPS. The results of the assessment monitoring statistical evaluation for the downgradient wells indicate that no constituents are present at statistically significant concentrations above the GWPS. Consumers Energy will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

Attachments

Table 1 Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation

Attachment 1 Sanitas™ Output

Table 1

Table 1

Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation

JH Campbell Landfill – RCRA CCR Monitoring Program

West Olive, Michigan

	Sample Location:		JHC-MW-15017								
		Sample Date:	10/8/2019	4/14/2020	10/21/2020	4/13/2021	4/13/2021	10/21/2021	4/12/2022	10/20/2022	4/12/2023
Constituent	Unit	GWPS					Field Dup				
Appendix III											
Boron	ug/L	NA	350	243	210	148	151	167	161	163	179
Calcium	mg/L	NA	77	64.4	54.9	61.1	60.4	58.5	60.6	61.6	60.5
Chloride	mg/L	NA	60	36.0	37.4	31.0	30.8	29.9	25.4	24.1	16.4
Fluoride	ug/L	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	NA	92	69.0	62.9	43.6	43.4	46.4	39.2	43.2	48.0
Total Dissolved Solids	mg/L	NA	280	339	NU(2)	296	303	292	276	313	287
pH, Field	SU	NA	6.3	5.6	5.9	6.1	--	6.5	6.8	6.4	6.6
Appendix IV											
Antimony	ug/L	**6**	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	47	34	22	25	25	28	24	28	38
Beryllium	ug/L	4	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	0.24	0.4	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	< 1.0	< 1	1	< 1	< 1	< 1	2	< 1	< 1
Cobalt	ug/L	15	< 6.0	< 15	< 15	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	15	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	40	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	100	10	16	21	5	5	< 5	< 5	< 5	25
Radium-226/228	pCi/L	5	0.643	0.618	0.574	< 0.354	< 0.497	0.660	< 0.376	< 0.627	< 0.533
Selenium	ug/L	50	14	16	15	14	13	20	18	19	21
Thallium	ug/L	2	< 2.0	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

ug/L - micrograms per liter; mg/L - milligrams per liter.

pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.

NA - not applicable.

NU - sample results are unusable.

-- - not analyzed.

GWPS - Groundwater Protection Standard. GWPS is the higher of the Maximum Contaminant Level/Regional Screening Level and Upper Tolerance Limit as established in TRC's Technical Memorandum dated October 15, 2018.

Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the HMP.

All metals were analyzed as total unless otherwise specified.

(1) April 2019 result not used for assessment monitoring.

(2) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table 1

Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation

JH Campbell Landfill – RCRA CCR Monitoring Program

West Olive, Michigan

	Sample Location:		JHC-MW-15018									
	Sample Date:		10/8/2019	4/14/2020	4/14/2020	10/21/2020	10/21/2020	4/13/2021	10/21/2021	4/13/2022	10/20/2022	4/11/2023
Constituent	Unit	GWPS										
Appendix III					Field Dup		Field Dup					
Boron	ug/L	NA	170	142	148	167	165	258	327	287	269	153
Calcium	mg/L	NA	48	50.6	50.7	65.0	68.1	85.2	62.7	65.9	59.6	40.6
Chloride	mg/L	NA	44	28.5	28.3	35.9	34.5	34.2	25.9	28.8	25.5	14.9
Fluoride	ug/L	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	NA	84	52.8	52.9	59.0	55.7	56.7	73.2	58.7	53.6	33.4
Total Dissolved Solids	mg/L	NA	370	405	287	NU(2)	NU(2)	375	329	300	316	194
pH, Field	SU	NA	6.0	6.2	--	6.0	--	5.9	6.0	5.9	5.9	6.2
Appendix IV												
Antimony	ug/L	**6**	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	130	96	95	77	78	57	61	45	31	49
Beryllium	ug/L	4	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	0.29	0.2	0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	< 1.0	< 1	3	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	15	< 6.0	< 15	< 15	< 15	< 15	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	15	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	40	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	100	< 5.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	6	< 5
Radium-226/228	pCi/L	5	0.739	< 0.575	< 0.561	0.747	0.926	< 0.439	0.616	0.343	0.682	< 0.607
Selenium	ug/L	50	15	12	13	14	13	21	20	18	19	14
Thallium	ug/L	2	< 2.0	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

ug/L - micrograms per liter; mg/L - milligrams per liter.

pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.

NA - not applicable.

NU - sample results are unusable.

-- - not analyzed.

GWPS - Groundwater Protection Standard. GWPS is the higher of the Maximum Contaminant Level/Regional Screening Level and Upper Tolerance Limit as established in TRC's Technical Memorandum dated October 15, 2018.

Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the HMP.

All metals were analyzed as total unless otherwise specified.

(1) April 2019 result not used for assessment monitoring.

(2) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table 1

Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation

JH Campbell Landfill – RCRA CCR Monitoring Program

West Olive, Michigan

		Sample Location:	JHC-MW-15031								
		Sample Date:	10/9/2019	4/14/2020	10/21/2020	4/13/2021	10/22/2021	4/12/2022	10/20/2022	4/12/2023	4/12/2023
Constituent	Unit	GWPS									Field Dup
Appendix III											
Boron	ug/L	NA	85	75	114	51	64	58	56	50	56
Calcium	mg/L	NA	57	49.8	56.1	49.7	54.2	59.8	49.6	52.9	54.0
Chloride	mg/L	NA	28	20.1	25.0	9.49	7.56	10.4	3.28	2.82	2.74
Fluoride	ug/L	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	NA	26	23.5	35.1	27.7	21.3	27.5	16	21.3	21.3
Total Dissolved Solids	mg/L	NA	220	266	NU(2)	180	< 10	220	215	205	205
pH, Field	SU	NA	6.9	6.7	6.4	7.1	7.3	7.1	7.5	7.1	--
Appendix IV											
Antimony	ug/L	**6**	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	17	17	20	15	15	14	12	13	13
Beryllium	ug/L	4	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	1.9	< 1	3	< 1	< 1	1	< 1	< 1	< 1
Cobalt	ug/L	15	< 6.0	< 15	< 15	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	15	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	40	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	100	< 5.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Radium-226/228	pCi/L	5	0.798	< 0.412	< 0.412	< 0.502	< 0.435	< 0.456	< 0.576	0.498	< 0.618
Selenium	ug/L	50	< 1.0	2	3	3	3	3	2	3	3
Thallium	ug/L	2	< 2.0	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

ug/L - micrograms per liter; mg/L - milligrams per liter.

pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.

NA - not applicable.

NU - sample results are unusable.

-- - not analyzed.

GWPS - Groundwater Protection Standard. GWPS is the higher of the Maximum Contaminant Level/Regional Screening Level and Upper Tolerance Limit as established in TRC's Technical Memorandum dated October 15, 2018.

Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the HMP.

All metals were analyzed as total unless otherwise specified.

(1) April 2019 result not used for assessment monitoring.

(2) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
JH Campbell Landfill – RCRA CCR Monitoring Program
West Olive, Michigan

		Sample Location:	JHC-MW-15035							
		Sample Date:	10/9/2019	4/14/2020	10/22/2020	4/14/2021	10/22/2021	4/12/2022	10/20/2022	4/12/2023
Constituent	Unit	GWPS								
Appendix III										
Boron	ug/L	NA	78	64	60	52	73	81	59	67
Calcium	mg/L	NA	84	70.4	65.7	56.8	82.0	79.2	64.2	94.5
Chloride	mg/L	NA	24	15.0	10.9	9.07	14.0	9.35	7.98	9.27
Fluoride	ug/L	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	NA	25	21.1	19.6	17.5	26.2	25.7	29.4	31.0
Total Dissolved Solids	mg/L	NA	370	300	NU(2)	240	365	320	272	355
pH, Field	SU	NA	7.2	7.2	7.2	7.3	7.2	7.2	7.4	7.0
Appendix IV										
Antimony	ug/L	**6**	< 1.0	< 1	< 1	< 1	< 1	< 1	**7**	< 1
Arsenic	ug/L	10	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	16	17	13	12	19	17	14	19
Beryllium	ug/L	4	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	4.4	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	15	< 6.0	< 15	< 15	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	15	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	40	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	100	< 5.0	< 5	< 5	< 5	< 5	< 5	< 5	32
Radium-226/228	pCi/L	5	< 0.567	0.687	< 0.647	< 0.425	0.728	< 0.378	< 0.450	< 0.539
Selenium	ug/L	50	< 1.0	1	2	2	2	3	3	1
Thallium	ug/L	2	< 2.0	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

ug/L - micrograms per liter; mg/L - milligrams per liter.

pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.

NA - not applicable.

NU - sample results are unusable.

-- - not analyzed.

GWPS - Groundwater Protection Standard. GWPS is the higher of the Maximum Contaminant Level/Regional Screening Level and Upper Tolerance Limit as established in TRC's Technical Memorandum dated October 15, 2018.

Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the HMP.

All metals were analyzed as total unless otherwise specified.

(1) April 2019 result not used for assessment monitoring.

(2) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table 1

Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation

JH Campbell Landfill – RCRA CCR Monitoring Program

West Olive, Michigan

		Sample Location:	JHC-MW-15036									
		Sample Date:	10/8/2019	4/14/2020	10/22/2020	4/14/2021	10/22/2021	4/12/2022	4/12/2022	10/20/2022	10/20/2022	4/10/2023
Constituent	Unit	GWPS										
Appendix III									Field Dup		Field Dup	
Boron	ug/L	NA	71	77	81	80	76	94	94	48	48	93
Calcium	mg/L	NA	55	51.1	59.3	52.1	39.5	57.6	57.0	32.8	33.8	52.1
Chloride	mg/L	NA	13	8.51	10.4	9.50	5.71	9.20	9.13	9.60	9.66	4.01
Fluoride	ug/L	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	NA	24	17.4	21.9	21.0	14.5	19.2	19.1	15.3	14.7	18.3
Total Dissolved Solids	mg/L	NA	320	221	NU(2)	229	169	238	246	163	164	207
pH, Field	SU	NA	7.5	7.3	7.3	7.1	7.6	7.4	--	7.3	--	7.4
Appendix IV												
Antimony	ug/L	**6**	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	9.4	9	9	8	7	9	10	6	6	8
Beryllium	ug/L	4	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	15	< 6.0	< 15	< 15	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	15	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	40	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	100	< 5.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Radium-226/228	pCi/L	5	0.442	0.659	< 0.554	< 0.486	< 0.386	< 0.395	< 0.398	< 0.616	0.591	< 0.505
Selenium	ug/L	50	1.9	< 1	< 1	< 1	1	2	2	< 1	< 1	< 1
Thallium	ug/L	2	< 2.0	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

ug/L - micrograms per liter; mg/L - milligrams per liter.

pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.

NA - not applicable.

NU - sample results are unusable.

-- - not analyzed.

GWPS - Groundwater Protection Standard. GWPS is the higher of the Maximum Contaminant Level/Regional Screening Level and Upper Tolerance Limit as established in TRC's Technical Memorandum dated October 15, 2018.

Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the HMP.

All metals were analyzed as total unless otherwise specified.

(1) April 2019 result not used for assessment monitoring.

(2) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table 1

Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation

JH Campbell Landfill – RCRA CCR Monitoring Program

West Olive, Michigan

		Sample Location:	JHC-MW-15037							
		Sample Date:	10/8/2019	4/14/2020	10/22/2020	4/14/2021	10/22/2021	4/12/2022	10/20/2022	4/11/2023
Constituent	Unit	GWPS								
Appendix III										
Boron	ug/L	NA	280	266	185	112	118	170	118	107
Calcium	mg/L	NA	110	100	93.4	59.0	61.7	85.1	52.3	67.8
Chloride	mg/L	NA	4.4	2.65	7.52	21.3	7.05	6.92	1.78	1.36
Fluoride	ug/L	NA	< 1,000	< 1,000	< 1,000	< 1,000	1,490	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	NA	46	25.9	53.5	17.2	17.7	42.8	24.1	24.4
Total Dissolved Solids	mg/L	NA	400	385	NU(2)	254	249	359	270	264
pH, Field	SU	NA	7.3	7.1	7.0	6.7	7.2	7.2	6.7	7.1
Appendix IV										
Antimony	ug/L	**6**	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	14	15	14	10	11	18	12	13
Beryllium	ug/L	4	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	1.2	< 1	< 1	< 1	< 1	1	< 1	1
Cobalt	ug/L	15	< 6.0	< 15	< 15	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	< 1,000	< 1,000	< 1,000	< 1,000	1,490	< 1,000	< 1,000	< 1,000
Lead	ug/L	15	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	40	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	100	< 5.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Radium-226/228	pCi/L	5	< 0.518	< 0.449	< 0.535	< 0.465	< 0.397	< 0.312	0.671	< 0.533
Selenium	ug/L	50	16	10	12	4	5	19	4	6
Thallium	ug/L	2	< 2.0	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

ug/L - micrograms per liter; mg/L - milligrams per liter.

pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.

NA - not applicable.

NU - sample results are unusable.

-- - not analyzed.

GWPS - Groundwater Protection Standard. GWPS is the higher of the Maximum Contaminant Level/Regional Screening Level and Upper Tolerance Limit as established in TRC's Technical Memorandum dated October 15, 2018.

Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the HMP.

All metals were analyzed as total unless otherwise specified.

(1) April 2019 result not used for assessment monitoring.

(2) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table 1

Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation

JH Campbell Landfill – RCRA CCR Monitoring Program

West Olive, Michigan

	Sample Location:		MW-B3			MW-B4		
	Sample Date:		4/12/2022	10/20/2022	4/12/2023	4/12/2022	10/20/2022	4/12/2023
Constituent	Unit	GWPS						
Appendix III								
Boron	ug/L	NA	92	74	93	178	274	279
Calcium	mg/L	NA	95.8	70.1	76.8	52.5	83.5	88.7
Chloride	mg/L	NA	6.65	24.2	16.5	19.6	34.5	20.2
Fluoride	ug/L	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	NA	24.1	73.8	71.9	18.5	28.9	24.1
Total Dissolved Solids	mg/L	NA	348	383	330	245	410	353
pH, Field	SU	NA	6.5	6.1	6.0	7.2	6.9	6.9
Appendix IV								
Antimony	ug/L	**6**	1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	70	69	80	29	54	44
Beryllium	ug/L	4	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	1	< 1	< 1	2	< 1	< 1
Cobalt	ug/L	15	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	15	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	40	12	12	16	< 10	< 10	< 10
Mercury	ug/L	2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	100	< 5	< 5	< 5	< 5	< 5	< 5
Radium-226/228	pCi/L	5	0.558	< 0.571	< 0.473	< 0.410	< 0.486	0.738
Selenium	ug/L	50	29	7	8	4	2	3
Thallium	ug/L	2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

ug/L - micrograms per liter; mg/L - milligrams per liter.

pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.

NA - not applicable.

NU - sample results are unusable.

-- - not analyzed.

GWPS - Groundwater Protection Standard. GWPS is the higher of the Maximum Contaminant Level/Regional Screening Level and Upper Tolerance Limit as established in TRC's Technical Memorandum dated October 15, 2018.

Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the HMP.

All metals were analyzed as total unless otherwise specified.

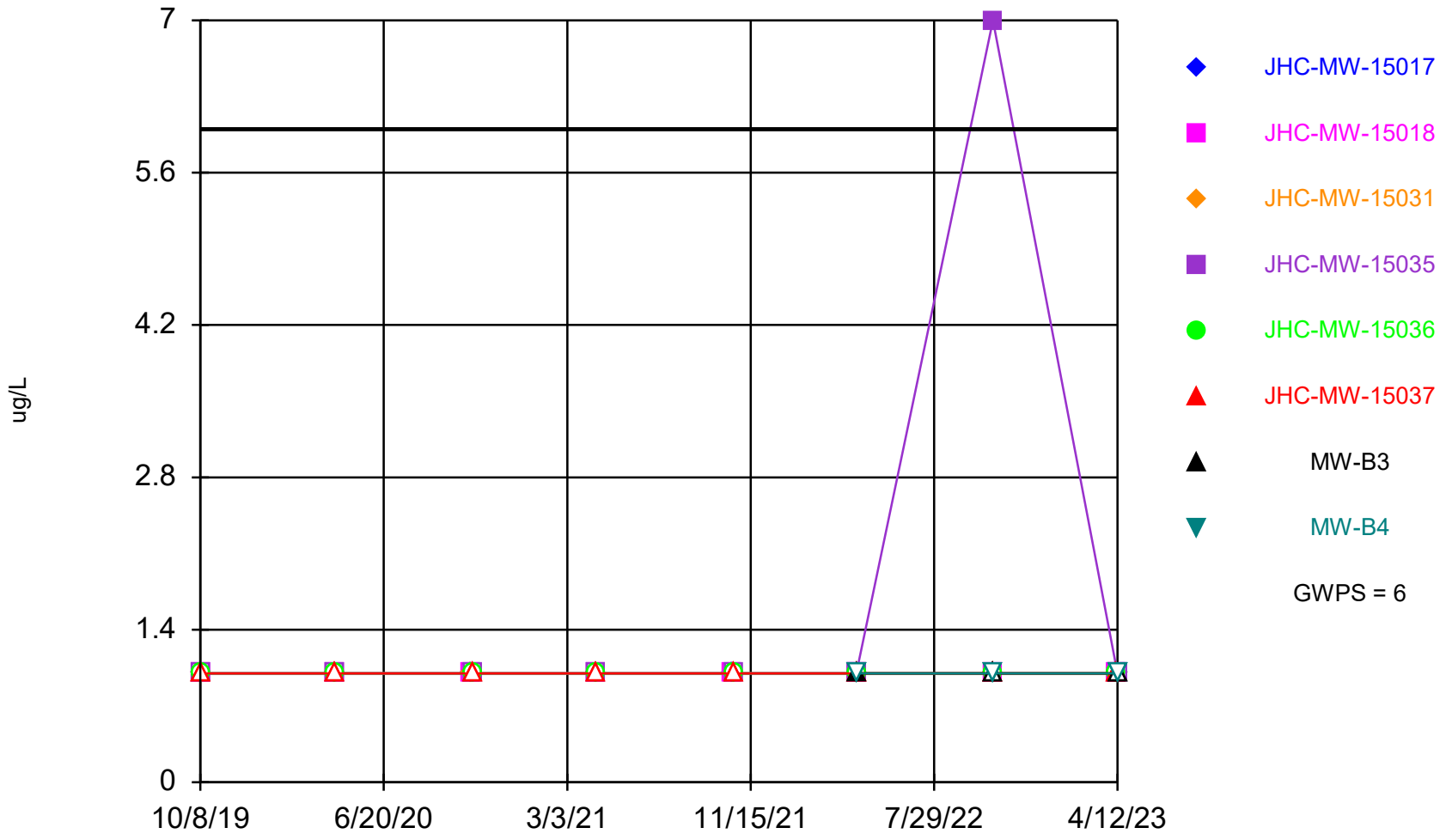
(1) April 2019 result not used for assessment monitoring.

(2) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Attachment 1
Sanitas™ Output

Hollow symbols indicate censored values.

Antimony Comparison to GWPS



Time Series Analysis Run 5/19/2023 2:19 PM

Client: Consumers Energy Data: 2Q23_JHC_Sanitas

Summary Report

Constituent: Antimony, Total Analysis Run 5/19/2023 2:20 PM
Client: Consumers Energy Data: 2Q23_JHC_Sanitas

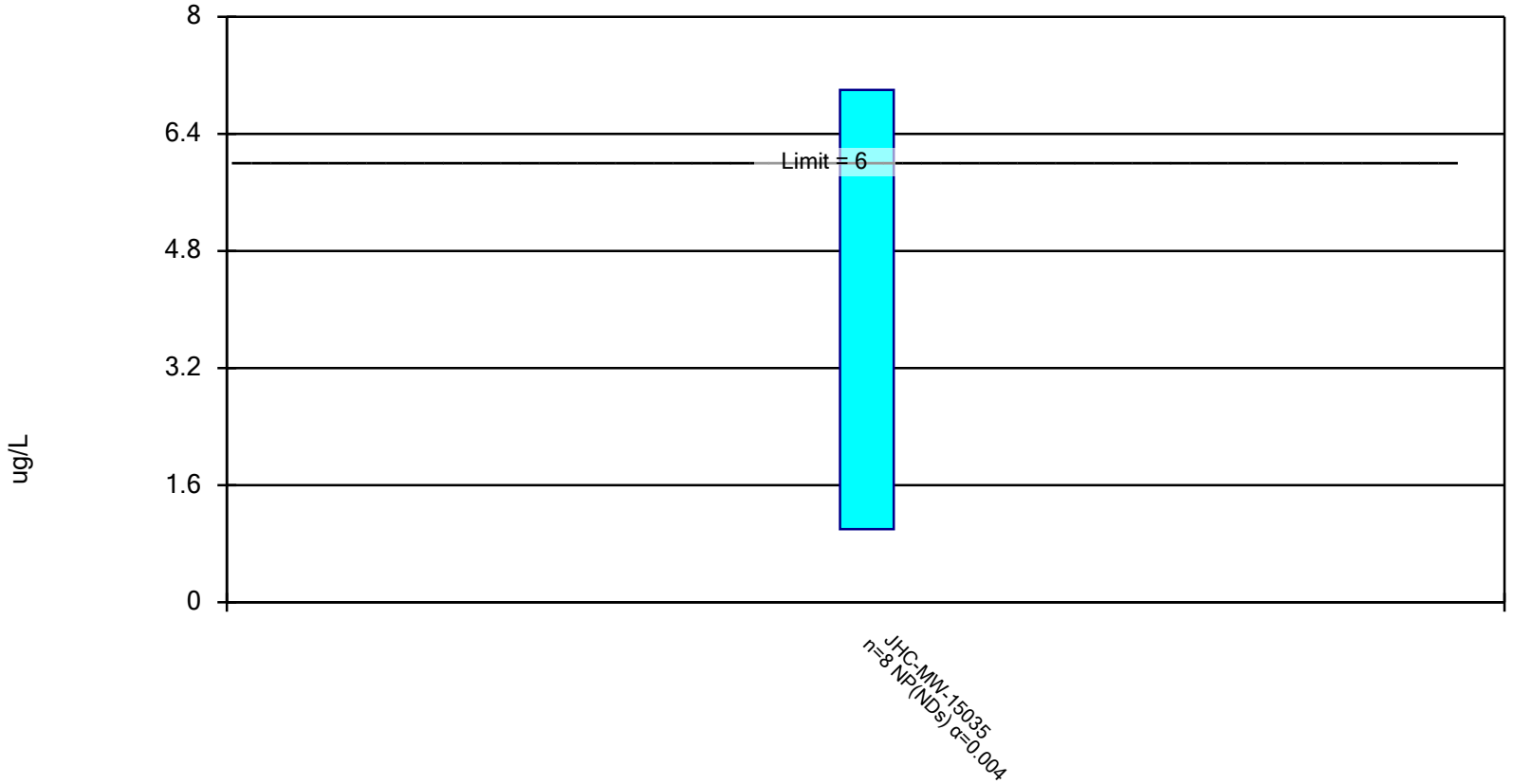
For observations made between 10/8/2019 and 4/12/2023, a summary of the selected data set:

Observations = 54
NDs = 96%
Wells = 8
Minimum Value = 1
Maximum Value = 7
Mean Value = 1.111
Median Value = 1
Standard Deviation = 0.8165
Coefficient of Variation = 0.7348
Skewness = 7.143

Well	#Obs.	NDs	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
JHC-MW-15017	8	100%	1	1	1	1	0	0	NaN
JHC-MW-15018	8	100%	1	1	1	1	0	0	NaN
JHC-MW-15031	8	100%	1	1	1	1	0	0	NaN
JHC-MW-15035	8	87%	1	7	1.75	1	2.121	1.212	2.268
JHC-MW-15036	8	100%	1	1	1	1	0	0	NaN
JHC-MW-15037	8	100%	1	1	1	1	0	0	NaN
MW-B3	3	66%	1	1	1	1	0	0	NaN
MW-B4	3	100%	1	1	1	1	0	0	NaN

Non-Parametric Confidence Interval

Compliance Limit is not exceeded.



Constituent: Antimony, Total Analysis Run 5/19/2023 2:21 PM

Client: Consumers Energy Data: 2Q23_JHC_Sanitas

Confidence Interval

Constituent: Antimony, Total (ug/L) Analysis Run 5/19/2023 2:22 PM

Client: Consumers Energy Data: 2Q23_JHC_Sanitas

	JHC-MW-15035
10/9/2019	<1
4/14/2020	<1
10/22/2020	<1
4/14/2021	<1
10/22/2021	<1
4/12/2022	<1
10/20/2022	7
4/12/2023	<1
Mean	1.75
Std. Dev.	2.121
Upper Lim.	7
Lower Lim.	1

ND substitution: RL or RL/2 if <15% NDs.

Appendix C
October 2023 Assessment Monitoring Statistical Evaluation

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Technical Memorandum

Date:	January 16, 2024
To:	Harold D. Register, Jr., Consumers Energy
From:	Sarah Holmstrom, TRC Kristin Lowery, TRC Henry Schnaidt, TRC
Project No.:	514398.0001.0000 Phase 1 Task 2
Subject:	Statistical Evaluation of October 2023 Assessment Monitoring Sampling Event JH Campbell Dry Ash Landfill, Consumers Energy Company, West Olive, Michigan

During the statistical evaluation of the initial assessment monitoring event (June 2018), no Appendix IV constituents were present at statistically significant levels exceeding the Groundwater Protection Standards (GWPSs). Therefore, Consumers Energy Company (Consumers Energy) is continuing semiannual assessment monitoring in accordance with §257.95 of the CCR Rule[1] at the JH Campbell Power Plant Dry Ash Landfill. The second semiannual assessment monitoring event for 2023 was conducted on October 16 through October 18, 2023. In accordance with §257.95, the assessment monitoring data must be compared to GWPSs to determine whether or not Appendix IV constituents are detected at statistically significant levels above the GWPSs. GWPSs were established in accordance with §257.95(h), as described in the October 15, 2018 Groundwater Protection Standards technical memorandum, which was also included in the 2018 Annual Groundwater Monitoring Report (TRC, January 2019). The following narrative describes the methods employed and the results obtained.

The statistical evaluation of the second semiannual assessment monitoring event of 2023 data indicates no constituents are present at statistically significant levels that exceed the GWPSs at the Dry Ash Landfill monitoring wells.

Constituent	GWPS	# Downgradient Wells Observed

No constituents are present at statistically significant levels above the GWPSs.

These results are consistent with the results of the previous assessment monitoring data statistical evaluations and concentrations remain above background levels. Consumers Energy will continue semiannual assessment monitoring per §257.95 and continue to execute the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

[1] USEPA final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA) published April 17, 2015, as amended.

Assessment Monitoring Statistical Evaluation

The compliance well network at the JHC Dry Ash Landfill CCR Unit currently consists of eight monitoring wells (JHC-MW-15017, JHC-MW-15018, JHC-MW-15031, JHC-MW-15035 through JHC-MW-15037, MW-B3, and MW-B4) located on the south perimeter of the landfill Cells 1 through 6.

Following the semiannual assessment monitoring sampling event, compliance well data for the Dry Ash Landfill were evaluated in accordance with the Groundwater Statistical Evaluation Plan (Stats Plan) (TRC, October 2017). An assessment monitoring program was developed to evaluate concentrations of CCR constituents present in the uppermost aquifer relative to acceptable levels (i.e., GWPSs). To evaluate whether or not a GWPS exceedance is statistically significant, the difference in concentration observed at the downgradient wells during a given assessment monitoring event compared to the GWPS must be large enough, after accounting for variability in the sample data, that the result is unlikely to have occurred merely by chance. Consistent with the Unified Guidance[2], the preferred method for comparisons to a fixed standard are confidence limits. An exceedance of the standard occurs when the 99 percent lower confidence level of the downgradient data exceeds the GWPS. Based on the number of historical observations in the representative sample population, the population mean, the population standard deviation, and a selected confidence level (i.e., 99 percent), an upper and lower confidence limit is calculated. The actual mean concentration of the population, with 99 percent confidence, will fall between the lower and upper confidence limits.

The concentrations observed in the downgradient wells are deemed to be a statistically significant exceedance when the 99 percent lower confidence limit of the downgradient data exceeds the GWPS. If the confidence interval straddles the GWPS (i.e. the lower confidence level is below the GWPS but the upper confidence level is above), the statistical test result indicates that there is insufficient confidence that the measured concentrations are different from the GWPS and thus there is no compelling evidence that the measured concentration is a result of a release from the CCR unit versus the inherent variability of the sample data. This statistical approach is consistent with the statistical methods for assessment monitoring presented in §257.93(f) and (g). Statistical evaluation methodologies built into the CCR Rule, and numerous other federal rules, are key in determining whether or not individually measured data points represent a concentration increase over the baseline or a fixed standard (such as a GWPS in an assessment monitoring program).

For each detected constituent, the concentrations from each well were first compared directly to the GWPS, as shown on Table 1. Monitoring wells MW-B3 and MW-B4 were not part of the CCR monitoring program prior to 2022; they were previously monitored under the old HMP which deviates from the sampling and analysis procedures included in the November 2021 sample and analysis plan (SAP) that is used for the semiannual assessment monitoring program. Constituent-well combinations that included a direct exceedance of the GWPS within the past eight monitoring events (April 2020 through October 2023) were retained for further analysis (Attachment 1). Direct comparison GWPS exceedances include the following constituent well combinations:

- Antimony in JHC-MW-15035.

[2] USEPA. 2009. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance*. Office of Conservation and Recovery. EPA 530/R-09-007.

Groundwater data were then evaluated utilizing Sanitas™ statistical software. Sanitas™ is a software tool that is commercially available for performing statistical evaluations consistent with procedures outlined in the Unified Guidance. Within the Sanitas™ statistical program, confidence limits were selected to perform the statistical comparison of compliance data to a fixed standard. Parametric or non-parametric confidence intervals were calculated, as appropriate, for each of the constituents using a 99 percent confidence level for each individual statistical test, i.e., a significance level (α) of 0.01. The following narrative describes the methods employed, the results obtained and the Sanitas™ output files are included as an attachment.

The statistical data evaluation included the following steps:

- Review of data quality checklists for the data sets;
- Graphical representation of the monitoring data as time versus concentration by well-constituent pair;
- Outlier testing of individual data points that appear from the graphical representations as potential outliers;
- Evaluation of visual trends apparent in the graphical representations for statistical significance;
- Evaluation of percentage of non-detects for each well-constituent pair;
- Distribution of the data; and
- Calculation of the confidence intervals for each cumulative dataset.

The results of these evaluations are presented and discussed below.

Initially, results for the past eight events were observed visually for potential trends and outliers (time-series plots in Attachment 1). No significant trends were noted. The single detection for antimony has not been confirmed by consecutive detections and is considered an outlier; however, the detection has conservatively been maintained in the analysis and will eventually roll out of the window of the eight most recent data points.

Data from each round were evaluated for completeness, overall quality, and usability and were deemed appropriate for the purposes of the groundwater monitoring program, except as noted in Table 1. The Sanitas™ software was then used to test compliance at the downgradient monitoring wells using the confidence interval method for the most recent eight sampling events. Eight independent sampling events provide an appropriate density of data as recommended per the Unified Guidance yet are collected recently enough to provide an indication of current conditions. The tests were run with a per-well significance of $\alpha = 0.01$. The software outputs are included in Attachment 1 along with data reports showing the values used for the evaluation. The percentage of non-detect observations are also included in Attachment 1. Non-detect data were handled in accordance with the HMP for the purposes of calculating the confidence intervals.

The Sanitas™ software generates an output that includes graphs of the parametric or non-parametric confidence intervals for each well along with notes on data transformations, as appropriate. The data distributions are as follows:

Distribution	Constituent-Well Combinations
Non-Parametric (non-detects)	Antimony at JHC-MW-15035

The confidence interval test compares the lower confidence limit to the GWPS. The results of the assessment monitoring statistical evaluation for the downgradient wells indicate that no constituents are present at statistically significant concentrations above the GWPS. Consumers Energy will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

Attachments

Table 1 Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation

Attachment 1 Sanitas™ Output

Table 1

Table 1

Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation

JH Campbell Landfill – RCRA CCR Monitoring Program

West Olive, Michigan

	Sample Location:		JHC-MW-15017									
		Sample Date:	4/14/2020	10/21/2020	4/13/2021	4/13/2021	10/21/2021	4/12/2022	10/20/2022	4/12/2023	10/17/2023
Constituent	Unit	GWPS									
Appendix III						Field Dup					
Boron	ug/L	NA	243	210	148	151	167	161	163	179	108
Calcium	mg/L	NA	64.4	54.9	61.1	60.4	58.5	60.6	61.6	60.5	53
Chloride	mg/L	NA	36.0	37.4	31.0	30.8	29.9	25.4	24.1	16.4	19.2
Fluoride	ug/L	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	NA	69.0	62.9	43.6	43.4	46.4	39.2	43.2	48	38.3
Total Dissolved Solids	mg/L	NA	339	NU(2)	296	303	292	276	313	287	293
pH, Field	SU	NA	5.6	5.9	6.1	--	6.5	6.8	6.4	6.6	6.9
Appendix IV											
Antimony	ug/L	**6**	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	34	22	25	25	28	24	28	38	21
Beryllium	ug/L	4	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	0.4	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	< 1	1	< 1	< 1	< 1	2	< 1	< 1	< 1
Cobalt	ug/L	15	< 15	< 15	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	15	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	40	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	100	16	21	5	5	< 5	< 5	< 5	25	< 5
Radium-226/228	pCi/L	5	0.618	0.574	< 0.354	< 0.497	0.660	< 0.376	< 0.627	< 0.533	< 0.531
Selenium	ug/L	50	16	15	14	13	20	18	19	21	13
Thallium	ug/L	2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

ug/L - micrograms per liter; mg/L - milligrams per liter.

pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.

NA - not applicable.

NU - sample results are unusable.

-- - not analyzed.

GWPS - Groundwater Protection Standard. GWPS is the higher of the Maximum Contaminant Level/Regional Screening Level and Upper Tolerance Limit as established in TRC's Technical Memorandum dated October 15, 2018.

Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the HMP.

All metals were analyzed as total unless otherwise specified.

(1) April 2019 result not used for assessment monitoring.

(2) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table 1

Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation

JH Campbell Landfill – RCRA CCR Monitoring Program

West Olive, Michigan

	Sample Location:		JHC-MW-15018									
	Sample Date:		4/14/2020	4/14/2020	10/21/2020	10/21/2020	4/13/2021	10/21/2021	4/13/2022	10/20/2022	4/11/2023	10/17/2023
Constituent	Unit	GWPS										
Appendix III				Field Dup		Field Dup						
Boron	ug/L	NA	142	148	167	165	258	327	287	269	153	122
Calcium	mg/L	NA	50.6	50.7	65.0	68.1	85.2	62.7	65.9	59.6	40.6	30.2
Chloride	mg/L	NA	28.5	28.3	35.9	34.5	34.2	25.9	28.8	25.5	14.9	13.3
Fluoride	ug/L	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	NA	52.8	52.9	59.0	55.7	56.7	73.2	58.7	53.6	33.4	22.1
Total Dissolved Solids	mg/L	NA	405	287	NU(2)	NU(2)	375	329	300	316	194	192
pH, Field	SU	NA	6.2	--	6.0	--	5.9	6.0	5.9	5.9	6.2	6.5
Appendix IV												
Antimony	ug/L	**6**	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	96	95	77	78	57	61	45	31	49	15
Beryllium	ug/L	4	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	0.2	0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	< 1	3	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	15	< 15	< 15	< 15	< 15	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	15	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	40	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	100	< 5	< 5	< 5	< 5	< 5	< 5	< 5	6	< 5	< 5
Radium-226/228	pCi/L	5	< 0.575	< 0.561	0.747	0.926	< 0.439	0.616	0.343	0.682	< 0.607	0.623
Selenium	ug/L	50	12	13	14	13	21	20	18	19	14	5
Thallium	ug/L	2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

ug/L - micrograms per liter; mg/L - milligrams per liter.

pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.

NA - not applicable.

NU - sample results are unusable.

-- - not analyzed.

GWPS - Groundwater Protection Standard. GWPS is the higher of the Maximum Contaminant Level/Regional Screening Level and Upper Tolerance Limit as established in TRC's Technical Memorandum dated October 15, 2018.

Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the HMP.

All metals were analyzed as total unless otherwise specified.

(1) April 2019 result not used for assessment monitoring.

(2) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table 1

Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation

JH Campbell Landfill – RCRA CCR Monitoring Program

West Olive, Michigan

	Sample Location:		JHC-MW-15031								
		Sample Date:	4/14/2020	10/21/2020	4/13/2021	10/22/2021	4/12/2022	10/20/2022	4/12/2023	4/12/2023	10/17/2023
Constituent	Unit	GWPS								Field Dup	
Appendix III											
Boron	ug/L	NA	75	114	51	64	58	56	50	56	64
Calcium	mg/L	NA	49.8	56.1	49.7	54.2	59.8	49.6	52.9	54	56.4
Chloride	mg/L	NA	20.1	25.0	9.49	7.56	10.4	3.28	2.82	2.74	3.19
Fluoride	ug/L	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	NA	23.5	35.1	27.7	21.3	27.5	16	21.3	21.3	18.5
Total Dissolved Solids	mg/L	NA	266	NU(2)	180	< 10	220	215	205	205	255
pH, Field	SU	NA	6.7	6.4	7.1	7.3	7.1	7.5	7.1	--	7.2
Appendix IV											
Antimony	ug/L	**6**	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	17	20	15	15	14	12	13	13	15
Beryllium	ug/L	4	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	< 1	3	< 1	< 1	1	< 1	< 1	< 1	< 1
Cobalt	ug/L	15	< 15	< 15	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	15	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	40	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	100	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Radium-226/228	pCi/L	5	< 0.412	< 0.412	< 0.502	< 0.435	< 0.456	< 0.576	0.498	< 0.618	< 0.678
Selenium	ug/L	50	2	3	3	3	3	2	3	3	3
Thallium	ug/L	2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

ug/L - micrograms per liter; mg/L - milligrams per liter.

pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.

NA - not applicable.

NU - sample results are unusable.

-- - not analyzed.

GWPS - Groundwater Protection Standard. GWPS is the higher of the Maximum Contaminant Level/Regional Screening Level and Upper Tolerance Limit as established in TRC's Technical Memorandum dated October 15, 2018.

Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the HMP.

All metals were analyzed as total unless otherwise specified.

(1) April 2019 result not used for assessment monitoring.

(2) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table 1

Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation

JH Campbell Landfill – RCRA CCR Monitoring Program

West Olive, Michigan

		Sample Location:	JHC-MW-15035							
		Sample Date:	4/14/2020	10/22/2020	4/14/2021	10/22/2021	4/12/2022	10/20/2022	4/12/2023	10/17/2023
Constituent	Unit	GWPS								
Appendix III										
Boron	ug/L	NA	64	60	52	73	81	59	67	95
Calcium	mg/L	NA	70.4	65.7	56.8	82.0	79.2	64.2	94.5	97.5
Chloride	mg/L	NA	15.0	10.9	9.07	14.0	9.35	7.98	9.27	12.5
Fluoride	ug/L	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	NA	21.1	19.6	17.5	26.2	25.7	29.4	31	41.5
Total Dissolved Solids	mg/L	NA	300	NU(2)	240	365	320	272	355	422
pH, Field	SU	NA	7.2	7.2	7.3	7.2	7.2	7.4	7.0	7.0
Appendix IV										
Antimony	ug/L	**6**	< 1	< 1	< 1	< 1	< 1	**7**	< 1	< 1
Arsenic	ug/L	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	17	13	12	19	17	14	19	22
Beryllium	ug/L	4	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	15	< 15	< 15	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	15	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	40	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	100	< 5	< 5	< 5	< 5	< 5	< 5	32	< 5
Radium-226/228	pCi/L	5	0.687	< 0.647	< 0.425	0.728	< 0.378	< 0.450	< 0.539	< 0.592
Selenium	ug/L	50	1	2	2	2	3	3	1	< 1
Thallium	ug/L	2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

ug/L - micrograms per liter; mg/L - milligrams per liter.

pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.

NA - not applicable.

NU - sample results are unusable.

-- - not analyzed.

GWPS - Groundwater Protection Standard. GWPS is the higher of the Maximum Contaminant Level/Regional Screening Level and Upper Tolerance Limit as established in TRC's Technical Memorandum dated October 15, 2018.

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(2) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table 1

Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation

JH Campbell Landfill – RCRA CCR Monitoring Program

West Olive, Michigan

	Sample Location:		JHC-MW-15036									
	Sample Date:		4/14/2020	10/22/2020	4/14/2021	10/22/2021	4/12/2022	4/12/2022	10/20/2022	10/20/2022	4/10/2023	10/17/2023
Constituent	Unit	GWPS						Field Dup		Field Dup		
Appendix III												
Boron	ug/L	NA	77	81	80	76	94	94	48	48	93	68
Calcium	mg/L	NA	51.1	59.3	52.1	39.5	57.6	57.0	32.8	33.8	52.1	35.9
Chloride	mg/L	NA	8.51	10.4	9.50	5.71	9.20	9.13	9.60	9.66	4.01	4.73
Fluoride	ug/L	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	NA	17.4	21.9	21.0	14.5	19.2	19.1	15.3	14.7	18.3	18.7
Total Dissolved Solids	mg/L	NA	221	NU(2)	229	169	238	246	163	164	207	182
pH, Field	SU	NA	7.3	7.3	7.1	7.6	7.4	--	7.3	--	7.4	7.7
Appendix IV												
Antimony	ug/L	**6**	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	9	9	8	7	9	10	6	6	8	6
Beryllium	ug/L	4	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	15	< 15	< 15	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	15	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	40	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	100	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Radium-226/228	pCi/L	5	0.659	< 0.554	< 0.486	< 0.386	< 0.395	< 0.398	< 0.616	0.591	< 0.505	< 0.497
Selenium	ug/L	50	< 1	< 1	< 1	1	2	2	< 1	< 1	< 1	< 1
Thallium	ug/L	2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

ug/L - micrograms per liter; mg/L - milligrams per liter.

pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.

NA - not applicable.

NU - sample results are unusable.

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(2) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table 1

Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation

JH Campbell Landfill – RCRA CCR Monitoring Program

West Olive, Michigan

		Sample Location:	JHC-MW-15037								
		Sample Date:	4/14/2020	10/22/2020	4/14/2021	10/22/2021	4/12/2022	10/20/2022	4/11/2023	10/16/2023	10/16/2023
Constituent	Unit	GWPS								Field Dup	
Appendix III											
Boron	ug/L	NA	266	185	112	118	170	118	107	139	133
Calcium	mg/L	NA	100	93.4	59.0	61.7	85.1	52.3	67.8	78.8	78
Chloride	mg/L	NA	2.65	7.52	21.3	7.05	6.92	1.78	1.36	1.09	< 1
Fluoride	ug/L	NA	< 1,000	< 1,000	< 1,000	1,490	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	NA	25.9	53.5	17.2	17.7	42.8	24.1	24.4	37.4	37.2
Total Dissolved Solids	mg/L	NA	385	NU(2)	254	249	359	270	264	337	336
pH, Field	SU	NA	7.1	7.0	6.7	7.2	7.2	6.7	7.1	--	7.2
Appendix IV											
Antimony	ug/L	**6**	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	15	14	10	11	18	12	13	13	13
Beryllium	ug/L	4	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	< 1	< 1	< 1	< 1	1	< 1	1	< 1	< 1
Cobalt	ug/L	15	< 15	< 15	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	< 1,000	< 1,000	< 1,000	1,490	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	15	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	40	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	100	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Radium-226/228	pCi/L	5	< 0.449	< 0.535	< 0.465	< 0.397	< 0.312	0.671	< 0.533	< 0.533	< 0.669
Selenium	ug/L	50	10	12	4	5	19	4	6	8	8
Thallium	ug/L	2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

ug/L - micrograms per liter; mg/L - milligrams per liter.

pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.

NA - not applicable.

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-- - not analyzed.

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(2) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table 1

Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation

JH Campbell Landfill – RCRA CCR Monitoring Program

West Olive, Michigan

		Sample Location:	MW-B3				MW-B4			
		Sample Date:	4/12/2022	10/20/2022	4/12/2023	10/17/2023	4/12/2022	10/20/2022	4/12/2023	10/17/2023
Constituent	Unit	GWPS								
Appendix III										
Boron	ug/L	NA	92	74	93	129	178	274	279	230
Calcium	mg/L	NA	95.8	70.1	76.8	53.7	52.5	83.5	88.7	57
Chloride	mg/L	NA	6.65	24.2	16.5	20.7	19.6	34.5	20.2	12.2
Fluoride	ug/L	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	NA	24.1	73.8	71.9	62.3	18.5	28.9	24.1	18.4
Total Dissolved Solids	mg/L	NA	348	383	330	316	245	410	353	274
pH, Field	SU	NA	6.5	6.1	6.0	6.0	7.2	6.9	6.9	7.1
Appendix IV										
Antimony	ug/L	**6**	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	70	69	80	60	29	54	44	28
Beryllium	ug/L	4	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	1	< 1	< 1	< 1	2	< 1	< 1	< 1
Cobalt	ug/L	15	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	15	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	40	12	12	16	17	< 10	< 10	< 10	< 10
Mercury	ug/L	2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	100	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Radium-226/228	pCi/L	5	0.558	< 0.571	< 0.473	< 0.596	< 0.410	< 0.486	0.738	< 0.654
Selenium	ug/L	50	29	7	8	4	4	2	3	3
Thallium	ug/L	2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

ug/L - micrograms per liter; mg/L - milligrams per liter.

pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.

NA - not applicable.

NU - sample results are unusable.

-- - not analyzed.

GWPS - Groundwater Protection Standard. GWPS is the higher of the Maximum Contaminant Level/Regional Screening Level and Upper Tolerance Limit as established in TRC's Technical Memorandum dated October 15, 2018.

Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the HMP.

All metals were analyzed as total unless otherwise specified.

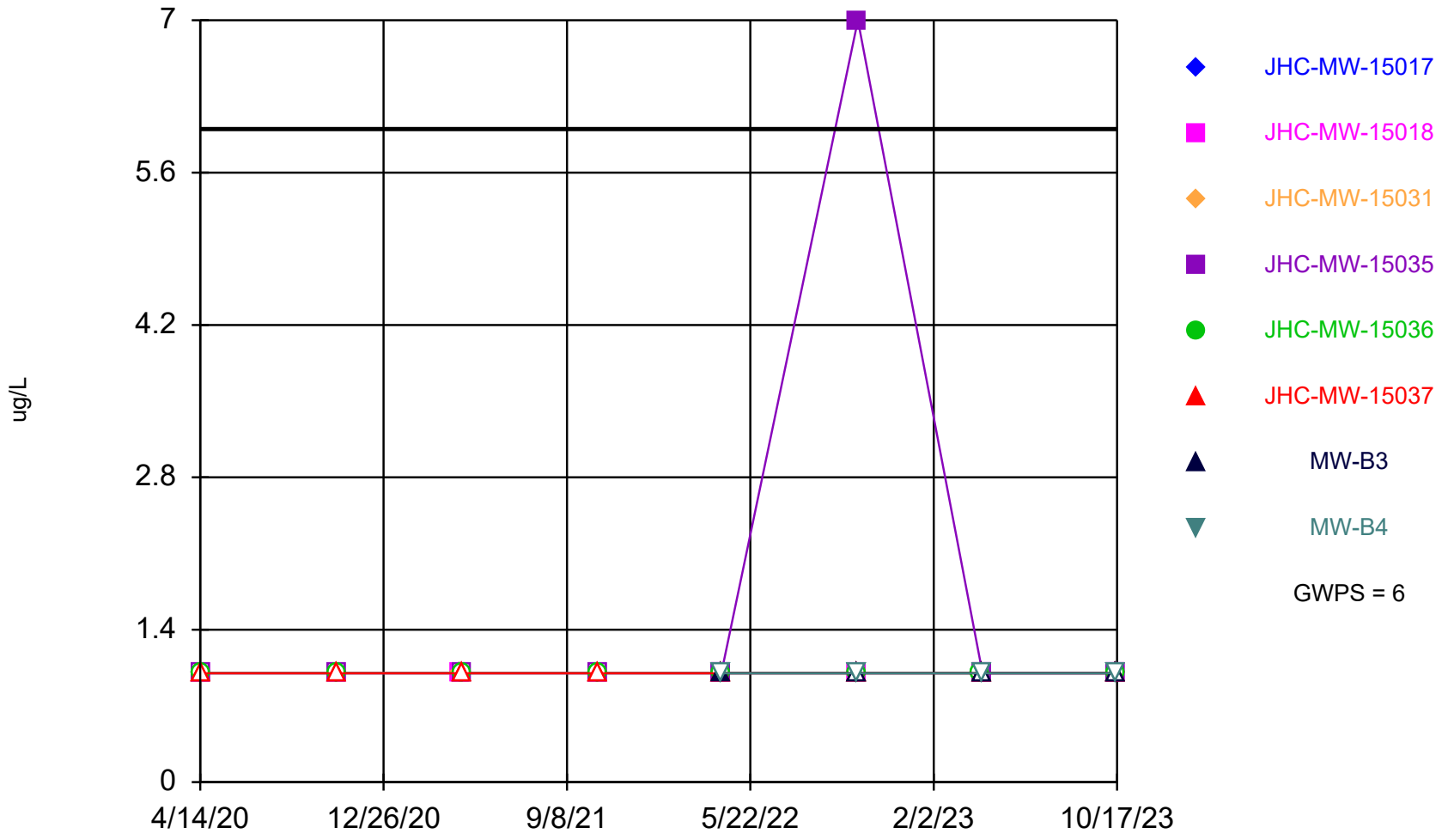
(1) April 2019 result not used for assessment monitoring.

(2) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Attachment 1
Sanitas™ Output

Hollow symbols indicate censored values.

Antimony Comparison to GWPS



Time Series Analysis Run 12/11/2023 11:47 AM

Data: 4Q23_JHC_Sanitas

Summary Report

Constituent: Antimony, Total Analysis Run 12/11/2023 11:50 AM
Data: 4Q23_JHC_Sanitas

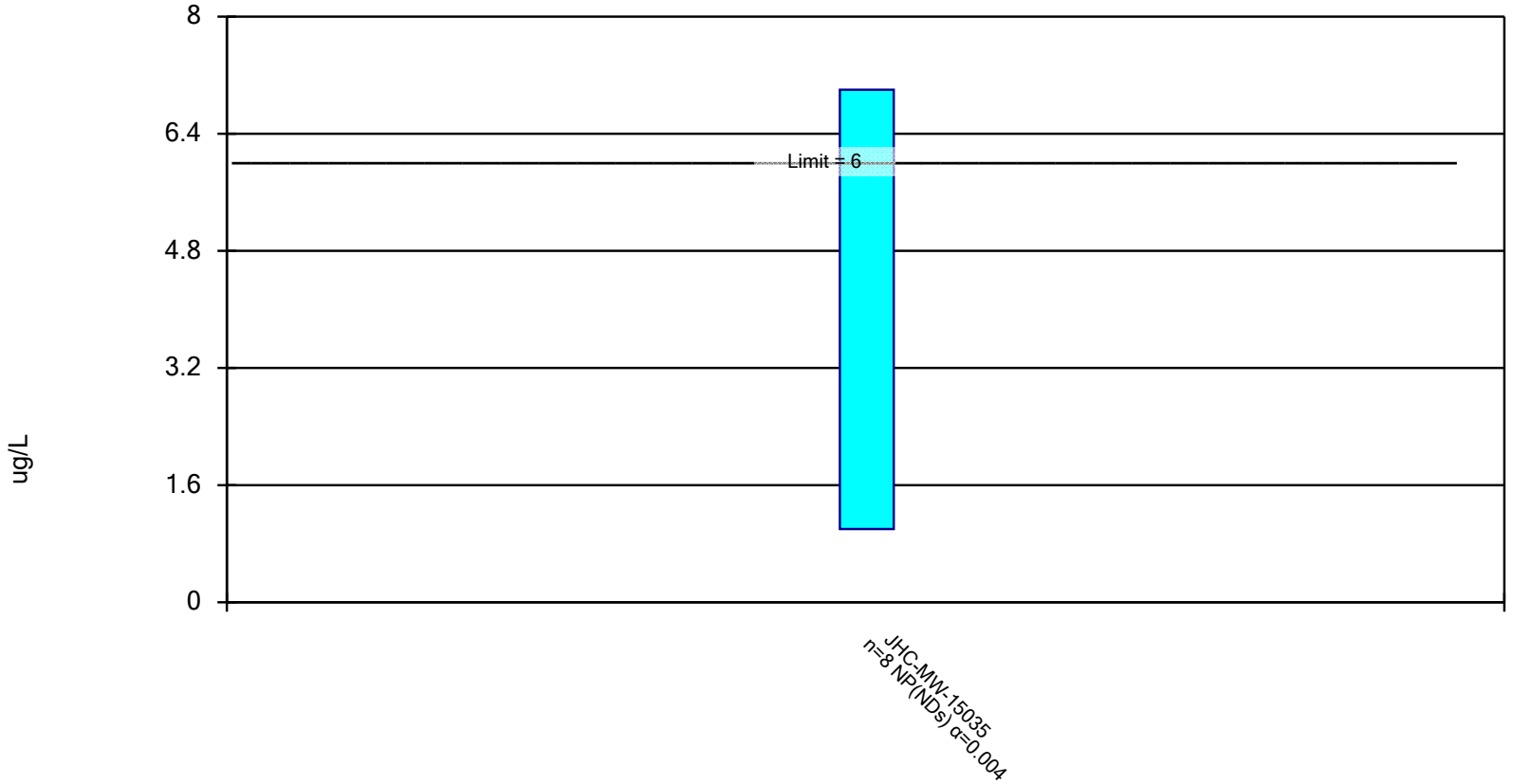
For observations made between 4/14/2020 and 10/17/2023, a summary of the selected data set:

Observations = 56
NDs = 96%
Wells = 8
Minimum Value = 1
Maximum Value = 7
Mean Value = 1.107
Median Value = 1
Standard Deviation = 0.8018
Coefficient of Variation = 0.7242
Skewness = 7.281

Well	#Obs.	NDs	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
JHC-MW-15017	8	100%	1	1	1	1	0	0	NaN
JHC-MW-15018	8	100%	1	1	1	1	0	0	NaN
JHC-MW-15031	8	100%	1	1	1	1	0	0	NaN
JHC-MW-15035	8	87%	1	7	1.75	1	2.121	1.212	2.268
JHC-MW-15036	8	100%	1	1	1	1	0	0	NaN
JHC-MW-15037	8	100%	1	1	1	1	0	0	NaN
MW-B3	4	75%	1	1	1	1	0	0	NaN
MW-B4	4	100%	1	1	1	1	0	0	NaN

Non-Parametric Confidence Interval

Compliance Limit is not exceeded.



Constituent: Antimony, Total Analysis Run 12/7/2023 4:16 PM

Client: Consumers Energy Data: 4Q23_JHC_Sanitas

Confidence Interval

Constituent: Antimony, Total (ug/L) Analysis Run 12/7/2023 4:17 PM

Client: Consumers Energy Data: 4Q23_JHC_Sanitas

	JHC-MW-15035
4/14/2020	<1
10/22/2020	<1
4/14/2021	<1
10/22/2021	<1
4/12/2022	<1
10/20/2022	7
4/12/2023	<1
10/17/2023	<1
Mean	1.75
Std. Dev.	2.121
Upper Lim.	7
Lower Lim.	1

ND substitution: RL or RL/2 if <15% NDs.