2020 Annual Groundwater Monitoring and Corrective Action Report

JH Campbell Power Plant
Dry Ash Landfill

West Olive, Michigan

January 2021

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Executive Summary

On behalf of Consumers Energy, TRC has prepared this report for the JH Campbell (JHC) Dry Ash Landfill to cover the period of January 1, 2020 to December 31, 2020 and document the status of groundwater monitoring and corrective action for 2020 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* (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.

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 six semiannual statistical evaluations performed to date, included those in the 2020 reporting period, have showed that no Appendix IV constituents were 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 2021.

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 (JHC 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 2020 activities at the Dry Ash Landfill. Assessment monitoring is ongoing at the Dry Ash Landfill as specified in §257.95. Data that have been collected and evaluated in 2020 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), Consumers Energy initiated an Assessment Monitoring Program for the Dry Ash Landfill pursuant to §257.95 of the CCR Rule that included sampling and analyzing groundwater within the groundwater monitoring system for all constituents listed in Appendix III and Appendix IV. On April 25, 2018, Consumers Energy entered assessment monitoring upon determining that an Alternate Source Demonstration for the Appendix III constituents was not successful.

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 five subsequent assessment monitoring evaluations, including those in the 2020 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. Assessment monitoring data that has been collected and evaluated in 2020 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.

Currently, there are no remaining active CCR surface impoundments at the JHC solid waste disposal facility. The CCR disposal area had contained two primary components: a system of wet ash ponds and a dry ash disposal facility (i.e., the JHC Dry Ash Landfill). The CCR surface impoundments located within the former wet ash pond area are Pond 1-2 Bottom Ash Ponds (Ponds 1-2), Pond 3 North and Pond 3 South Bottom Ash Pond (collectively Pond 3), and Pond A. All of these impoundments have been deactivated and decommissioned. 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 continues to be managed in the licensed Dry Ash Landfill which is regulated under Part 115 of the Natural Resources and Environmental Protection Act (NREPA), PA 451 of 1994, as amended, and monitored in adherence to the facility's Michigan Department of Environment, Great Lakes, and Energy (EGLE)[1]-approved *Hydrogeological Monitoring Plan (HMP) for JH Campbell Ash Storage Facility, Consumers Power Company, Solid Waste Disposal Area, Coal Ash, Type III* (September 1996).

The surface impoundments in the wet ash pond areas (Pond 3 and Ponds 1-2) were decommissioned throughout 2017 and 2018 and replaced with concrete bottom ash treatment tanks, which became operational in July 2018. In addition, Pond A has been decommissioned with final cover placed in summer 2019. Groundwater monitoring is being conducted at Pond A

[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.

during the post-closure period under the Pond A Hydrogeological Monitoring Plan, JH Campbell Power Plant, West Olive, Michigan (March 2019; Revised July 2019) (approved by the EGLE August 13, 2019), as well as in accordance with the RCRA CCR Rule.

Bottom ash is currently sluiced to the concrete tanks where it is dewatered. The settled and dewatered bottom ash is beneficially reused or managed at the Dry Ash Landfill. Sluice water decanted from the tanks flows through a permitted ditching system to the recirculation pond. Water in the recirculation pond is then discharged through a National Pollutant Discharge Elimination System (NPDES) permitted outfall and into Pigeon River.

The purpose of the dry ash disposal facility is to contain dry bottom and fly ash produced as a result of burning coal for power production. The facility consists of the existing CCR landfill Cells 1 through 5. The state permit also identifies Cells 6 through 9 for future construction and operation. 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 eastern face of Cell 2 have been closed along with Cell 3. Cell 4 is currently being filled with ash and partial cover has been constructed. Cell 5 was constructed in 2018 and put into service in 2019. Cells 6 through 9 have not yet been constructed.

This report focuses on the JHC Dry Ash Landfill, which includes Cell 5.

1.3 Geology/Hydrogeology

The upgradient/background wells are located to the north-northwest of the JHC Dry Ash Landfill. Groundwater is typically encountered around 30 to 35 feet below ground surface (ft bgs), except in the recently excavated areas of Bottom Ash Ponds 1-2 and Bottom Ash Pond 3 South where groundwater is now within 5 to 10 ft bgs due to grade changes, and generally flows to the south-southeast across the Dry Ash Landfill 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, Consumers Energy established a groundwater monitoring system for the JHC Dry Ash Landfill, which currently consists of 17 monitoring wells (6 background monitoring wells and 11 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 and JHC-MW-15030 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. No changes to the Dry Ash Landfill monitoring well network were made in 2020.

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 *JH Campbell Monitoring Program Sample Analysis Plan* (SAP) (ARCADIS, 2016).

2.2.1 Data Summary

The first semiannual groundwater assessment monitoring event for 2020 was performed on April 13 through 16, 2020 and the second semiannual groundwater assessment monitoring event for 2020 was performed on October 19 through 23, 2020. Both events were performed by Consumers Energy, and samples were analyzed by Consumers Energy Laboratory Services in Jackson, Michigan in accordance with the SAP. Static water elevation data were collected at all monitoring well locations. Groundwater samples were collected from the 6 background monitoring wells and 11 downgradient monitoring wells for the Appendix III and Appendix IV constituents and field parameters. A summary of the groundwater data collected during the April and October 2020 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, with the exception of TDS during the October 2020 event. TDS data for the October 2020 event contained errors introduced from inaccurate pre-determined bag weights provided by the lab materials manufacturer and have been considered unusable 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 elevations measured across the Site during the April and October 2020 events are provided on Table 1. April 2020 and October 2020 groundwater elevations were used to construct the groundwater contour maps provided on Figure 3 and Figure 4, respectively. The average hydraulic gradient was calculated using the following well pairs: JHC-MW-15029/JHC-MW-15030, JHC-MW-15029/JHC-MW-15005, JHC-MW-15019/JHC-MW-15035 and JHC-MW-15023/JHC-MW-15037 (Figure 2). 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 0.68 ft/day or 250 ft/year for the April 2020 event, and approximately 0.63 ft/day or 230 ft/year for the October 2020 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 2020 groundwater data in accordance with the assessment monitoring program. The statistical evaluation details are provided in Appendix B (*April 2020 Assessment Monitoring Data Summary and Statistical Evaluation*) and Appendix C (*October 2020 Assessment Monitoring Data Summary and Statistical Evaluation*).

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 (TRC, January 2019).

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 *2019 Annual Groundwater Monitoring Report, Consumers Energy, JH Campbell Site, Dry Ash Landfill CCR Unit* (2019 Annual Report) (TRC, January 2020), the statistical data comparison for the 2018 and 2019 semiannual assessment monitoring events indicated that no Appendix IV constituents were present at statistically significant levels exceeding the GWPSs. Therefore, assessment monitoring continued in 2020.

The statistical data comparison for the April 2020 (Appendix B) and October 2020 (Appendix C) semiannual assessment monitoring events continue to indicate that no Appendix IV constituents were present at statistically significant levels exceeding the GWPSs.

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 2021 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 2020. 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, as of the writing of this report, 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 2021 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 2021.

6.0 References

ARCADIS. May 13, 2016. Summary of Monitoring Well Design, Installation, and Development – Existing CCR Landfill (Cells 1, 2, 3 and 4). JH Campbell Electric Generation Facility – West Olive, Michigan. Prepared for Consumers Energy Company.

ARCADIS. May 18, 2016. Electric Generation Facilities RCRA CCR Detection Monitoring Program. JH Campbell Monitoring Program Sample and Analysis Plan, West Olive, Michigan. Prepared for Consumers Energy Company.

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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 2020
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 13, 2020		October 19, 2020	
							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	15.00	604.98	17.70	602.28
JHC-MW-15024	613.79	616.62	Sand	606.8	to	596.8	9.92	606.70	12.49	604.13
JHC-MW-15025	614.14	617.17	Sand	607.1	to	597.1	8.93	608.24	11.40	605.77
JHC-MW-15026	615.09	618.04	Sand	607.1	to	597.1	10.61	607.43	12.90	605.14
JHC-MW-15027	614.77	617.30	Sand	604.8	to	594.8	10.87	606.43	13.13	604.17
JHC-MW-15028	611.02	613.80	Sand	603.0	to	593.0	11.51	602.29	12.75	601.05
JHC-MW-15029	608.08	610.95	Sand	600.1	to	590.1	9.60	601.35	10.57	600.38
JHC-MW-15030	604.05	607.17	Sand	600.1	to	590.1	8.22	598.95	9.17	598.00
Pond 1N, 1S, 2N, 2S										
JHC-MW-15001	607.02	609.53	Sand	603.5	to	598.5	11.41	598.12	11.78	597.75
JHC-MW-15002	618.18	621.27	Sand	590.2	to	580.2	23.88	597.39	24.61	596.66
JHC-MW-15003	623.16	627.20	Sand	595.2	to	585.2	32.35	594.85	32.94	594.26
JHC-MW-15005	606.22	609.99	Sand	579.2	to	569.2	18.01	591.98	18.27	591.72
JHC-MW-18004	602.92	605.72	Sand	596.9	to	586.9	11.33	594.39	12.17	593.55
JHC-MW-18005	600.30	603.16	Sand	595.3	to	585.3	10.18	592.98	10.69	592.47
Pond 3N, 3S										
JHC-MW-15013	632.40	635.25	Sand	604.4	to	594.4	34.28	600.97	34.98	600.27
JHC-MW-15015	632.46	635.20	Sand	604.5	to	594.5	33.44	601.76	34.13	601.07
JHC-MW-15016	631.81	632.52	Sand	603.8	to	593.8	30.70	601.82	31.46	601.06
JHC-MW-18001	609.09	611.98	Sand	603.1	to	593.1	11.04	600.94	11.71	600.27
JHC-MW-18002	605.53	608.93	Sand	602.0	to	592.0	8.37	600.56	8.88	600.05
JHC-MW-18003	605.36	608.78	Sand	601.9	to	591.9	8.30	600.48	8.86	599.92
Landfill										
JHC-MW-15017	613.69	616.61	Sand	603.7	to	593.7	13.05	603.56	14.54	602.07
JHC-MW-15018	614.26	617.02	Sand	604.3	to	594.3	13.80	603.22	15.23	601.79
JHC-MW-15019	609.81	612.86	Sand	603.8	to	593.8	10.22	602.64	11.66	601.20
JHC-MW-15022	620.92	623.79	Sand	597.9	to	587.9	27.28	596.51	28.78	595.01
JHC-MW-15031	632.94	635.87	Sand	599.9	to	589.9	41.84	594.03	42.82	593.05
JHC-MW-15032	611.32	614.29	Sand	598.3	to	588.3	15.31	598.98	17.15	597.14
JHC-MW-15033	618.08	620.99	Sand	602.1	to	592.1	19.89	601.10	22.07	598.92
JHC-MW-15034	612.90	615.97	Sand	601.9	to	591.9	13.55	602.42	15.90	600.07
JHC-MW-15035	632.53	634.28	Sand	599.5	to	589.5	39.11	595.17	40.09	594.19
JHC-MW-15036	617.94	618.34	Sand	597.9	to	587.9	25.43	592.91	26.41	591.93
JHC-MW-15037	614.28	616.06	Sand	591.3	to	586.3	23.97	592.09	24.95	591.11
Pond A										
JHC-MW-15006	624.74	627.58	Sand	599.7	to	589.7	33.65	593.93	34.98	592.60
JHC-MW-15007	624.82	627.70	Sand	602.8	to	592.8	33.95	593.75	Dry	
JHC-MW-15008	632.43	635.30	Sand	604.4	to	594.4	Decommissioned		Decommissioned	
JHC-MW-15008R[(1)]	632.32	634.67	Sand	597.3	to	587.3	41.46	593.21	42.98	591.69
JHC-MW-15009	632.33	635.32	Sand	602.3	to	592.3	41.77	593.55	Dry	
JHC-MW-15010	632.55	635.57	Sand	602.6	to	592.6	41.28	594.29	42.38	593.19
JHC-MW-15011	627.71	630.83	Sand	600.7	to	590.7	37.83	593.00	38.71	592.12
Downgradient Wells										
MW-13	593.40	595.37	Clayey Silt	587.9	to	585.4	9.59	585.78	Dry	
MW-14S	587.36	590.98	Sand	582.9	to	577.9	8.38	582.60	9.02	581.96
PZ-23S	602.84	604.97	Sand	591.8	to	586.8	14.81	590.16	15.34	589.63
PZ-24S	586.56	590.15	Sand	584.6	to	579.6	7.94	582.21	7.53	582.62
PZ-40S	589.51	593.25	Sand	585.5	to	575.5	9.86	583.39	10.91	582.34
TW-19-04A	608.15	611.44	Sand	591.2	to	586.2	20.85	590.59	22.15	589.29
TW-19-05	603.44	606.36	Sand	592.8	to	587.8	14.37	591.99	16.14	590.22
TW-19-06A	599.61	602.54	Sand	592.3	to	587.3	11.81	590.73	13.44	589.10

Notes:
Survey conducted by Nederveld, November 2015, October 2018, December 2018, and August 2019.
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.
--: Not measured
(1): JHC-MW-15008R installed in June 2019.

Table 2
Summary of Field Parameters: April & October 2020
JH Campbell Dry Ash Landfill - West Olive - 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	4/16/2020	0.81	208.9	5.4	84	8.2	0.0
	10/20/2020	0.62	225.8	5.5	74	12.1	9.4
JHC-MW-15024	4/16/2020	0.87	203.3	6.5	321	7.5	0.0
	10/20/2020	0.28	116.1	6.9	308	11.9	9.1
JHC-MW-15025	4/16/2020	4.19	193.8	6.2	215	7.2	0.0
	10/20/2020	1.42	136.7	6.6	262	12.0	9.2
JHC-MW-15026	4/16/2020	2.86	189.4	6.4	185	8.1	0.0
	10/20/2020	3.77	138.1	6.4	127	11.5	8.6
JHC-MW-15027	4/16/2020	4.13	147.2	5.6	59	7.7	2.8
	10/20/2020	1.87	94.3	6.0	81	11.0	5.7
JHC-MW-15028	4/16/2020	7.13	186.4	6.0	82	8.8	0.0
	10/20/2020	4.92	101.4	7.3	82	12.5	7.6

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

Table 2
Summary of Field Parameters: April & October 2020
JH Campbell Dry Ash Landfill - West Olive - 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)
Landfill							
JHC-MW-15017	4/14/2020	1.98	181.5	5.6	495	7.9	0.0
	10/21/2020	1.10	192.7	5.9	480	13.0	8.6
JHC-MW-15018	4/14/2020	2.73	168.6	6.2	450	8.6	0.0
	10/21/2020	1.29	188.8	6.0	555	12.9	8.4
JHC-MW-15019	4/14/2020	4.60	180.0	5.9	356	8.0	0.0
	10/21/2020	2.04	199.4	5.9	722	13.4	7.1
JHC-MW-15022	4/14/2020	5.33	177.6	6.8	636	7.8	0.0
	10/21/2020	3.45	158.7	7.0	451	11.3	8.9
JHC-MW-15031	4/14/2020	0.68	96.5	6.7	417	12.8	0.2
	10/21/2020	3.00	127.1	6.4	485	14.0	9.6
JHC-MW-15032	4/14/2020	1.97	171.2	6.1	77	7.9	0.0
	10/21/2020	1.12	215.0	5.8	69	11.9	9.4
JHC-MW-15033	4/14/2020	3.24	166.7	6.6	95	8.7	0.0
	10/21/2020	1.78	184.8	6.4	116	11.6	8.0
JHC-MW-15034	4/14/2020	5.49	191.3	5.4	60	6.9	0.0
	10/21/2020	3.58	197.6	5.8	72	12.4	6.5
JHC-MW-15035	4/14/2020	0.58	-11.0	7.2	492	14.4	3.2
	10/22/2020	0.54	-4.1	7.2	483	15.1	6.1
JHC-MW-15036	4/14/2020	2.29	168.2	7.3	353	9.8	2.1
	10/22/2020	0.66	105.8	7.3	429	12.1	7.4
JHC-MW-15037	4/14/2020	3.89	170.4	7.1	621	8.6	0.0
	10/22/2020	3.19	160.5	7.0	649	10.5	7.6

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

Table 3
Summary of Groundwater Sampling Results (Analytical): April & October 2020
JH Campbell Background – RCRA CCR Monitoring Program
West Olive, Michigan

					Sample Location:	JHC-MW-15023		JHC-MW-15024		JHC-MW-15025	
					Sample Date:	4/16/2020	10/20/2020	4/16/2020	10/20/2020	4/16/2020	10/20/2020
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^						
Appendix III											
Boron	ug/L	NC	500	500	7,200	45	71	22	35	26	33
Calcium	mg/L	NC	NC	NC	500(2)	9.59	11.1	32.8	39.0	16.1	23.2
Chloride	mg/L	250**	250(1)	250(1)	500(2)	1.84	1.60	20.1	17.1	15.8	22.6
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250**	250(1)	250(1)	500(2)	9.75	10.1	6.26	8.93	8.63	9.82
Total Dissolved Solids	mg/L	500**	500(1)	500(1)	500	56	57	158	181	98	142
pH, Field	SU	**6.5 - 8.5****	**6.5 - 8.5(1)**	**6.5 - 8.5(1)**	**6.5 - 9.0**	**5.4**	**5.5**	6.5	6.9	**6.2**	6.6
Appendix IV											
Antimony	ug/L	6	6.0	6.0	130	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	10	10	10	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	2,000	2,000	820	20	21	18	20	20	11
Beryllium	ug/L	4	4.0	4.0	18	< 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
Chromium	ug/L	100	100	100	11	< 1	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	NC	40	100	100	< 15	< 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
Lead	ug/L	NC	4.0	4.0	39	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	170	350	440	< 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
Molybdenum	ug/L	NC	73	210	3,200	< 5	< 5	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NC	NC	NC	NC	< 0.165	< 0.262	< 0.222	< 0.294	< 0.280	< 0.269
Radium-228	pCi/L	NC	NC	NC	NC	< 0.634	< 0.182	< 0.717	< 0.582	< 1.90	< 0.209
Radium-226/228	pCi/L	5	NC	NC	NC	< 0.634	< 0.262	< 0.717	< 0.582	< 1.90	< 0.269
Selenium	ug/L	50	50	50	5.0	< 1	< 1	< 1	1	< 1	1
Thallium	ug/L	2	2.0	2.0	3.7	< 2	< 2	< 2	< 2	< 2	< 2

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
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 30, 2013.
** - 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 EGLE policy and procedure 09-014 dated June 20, 2012.
(1) - Criterion is the aesthetic drinking water value per footnote {E}.
(2) - Criterion is based on the total dissolved solids GSI value per footnote {EE}.
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 3
Summary of Groundwater Sampling Results (Analytical): April & October 2020
JH Campbell Background – RCRA CCR Monitoring Program
West Olive, Michigan

					Sample Location:	JHC-MW-15026		JHC-MW-15027		JHC-MW-15028	
					Sample Date:	4/16/2020	10/20/2020	4/16/2020	10/20/2020	4/16/2020	10/20/2020
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^						
Appendix III											
Boron	ug/L	NC	500	500	7,200	< 20	25	< 20	< 20	< 20	< 20
Calcium	mg/L	NC	NC	NC	500(2)	16.6	17.1	7.78	12.9	11.1	17.4
Chloride	mg/L	250**	250(1)	250(1)	500(2)	7.21	5.33	< 1.00	< 1.00	< 1.00	< 1.00
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250**	250(1)	250(1)	500(2)	6.94	7.87	7.86	6.54	5.22	6.15
Total Dissolved Solids	mg/L	500**	500(1)	500(1)	500	76	75	37	49	42	68
pH, Field	SU	**6.5 - 8.5****	**6.5 - 8.5(1)**	**6.5 - 8.5(1)**	**6.5 - 9.0**	**6.4**	**6.4**	**5.6**	**6.0**	**6.0**	7.3
Appendix IV											
Antimony	ug/L	6	6.0	6.0	130	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	10	10	10	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	2,000	2,000	820	15	14	25	14	14	7
Beryllium	ug/L	4	4.0	4.0	18	< 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
Chromium	ug/L	100	100	100	11	< 1	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	NC	40	100	100	< 15	< 6	< 6	< 6	< 15	< 6
Fluoride	ug/L	4,000	NC	NC	NC	< 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
Lithium	ug/L	NC	170	350	440	< 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
Molybdenum	ug/L	NC	73	210	3,200	< 5	< 5	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NC	NC	NC	NC	< 0.139	< 0.264	< 0.184	< 0.368	< 0.262	< 0.258
Radium-228	pCi/L	NC	NC	NC	NC	< 0.676	< 0.364	< 1.37	< 0.411	< 0.651	0.346
Radium-226/228	pCi/L	5	NC	NC	NC	< 0.676	< 0.364	< 1.37	< 0.411	< 0.651	0.403
Selenium	ug/L	50	50	50	5.0	< 1	< 1	< 1	< 1	< 1	< 1
Thallium	ug/L	2	2.0	2.0	3.7	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
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 30, 2013.
** - 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 EGLE policy and procedure 09-014 dated June 20, 2012.
(1) - Criterion is the aesthetic drinking water value per footnote {E}.
(2) - Criterion is based on the total dissolved solids GSI value per footnote {EE}.
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 Groundwater Sampling Results (Analytical): April & October 2020
JH Campbell Dry Ash Landfill – RCRA CCR Monitoring Program
West Olive, Michigan

							JHC-MW-15017		JHC-MW-15018		JHC-MW-15019		JHC-MW-15022		JHC-MW-15031	
						Sample Location:										
						Sample Date:	4/14/2020	10/21/2020	4/14/2020	10/21/2020	4/14/2020	10/21/2020	4/14/2020	10/21/2020	4/14/2020	10/21/2020
Constituent	Unit	UTL	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^										
Appendix III																
Boron	ug/L	51	NC	**500**	**500**	7,200	243	210	142	167	204	**509**	311	146	75	114
Calcium	mg/L	46	NC	NC	NC	500(2)	64.4	54.9	50.6	65.0	43.2	81.6	119	66.9	49.8	56.1
Chloride	mg/L	43	250**	250(1)	250(1)	500(2)	36.0	37.4	28.5	35.9	16.6	57.3	< 1.00	5.39	20.1	25.0
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	< 1,000	< 1,000
Sulfate	mg/L	14	250**	250(1)	250(1)	500(2)	69.0	62.9	52.8	59.0	45.7	91.0	14.2	33.3	23.5	35.1
Total Dissolved Solids	mg/L	258	**500****	**500(1)**	**500(1)**	**500**	339	NA(3)	405	NA(3)	359	NA(3)	405	NA(3)	266	NA(3)
pH, Field	SU	4.8 - 9.2	**6.5 - 8.5****	**6.5 - 8.5(1)**	**6.5 - 8.5(1)**	**6.5 - 9.0**	**5.6**	**5.9**	**6.2**	**6.0**	**5.9**	**5.9**	6.8	7.0	6.7	**6.4**
Appendix IV																
Antimony	ug/L	2	6	6.0	6.0	130	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	1	10	10	10	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	35	2,000	2,000	2,000	820	34	22	96	77	97	144	23	14	17	20
Beryllium	ug/L	1	4	4.0	4.0	18	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	0.2	5	5.0	5.0	3.5	0.4	< 0.2	0.2	< 0.2	< 0.2	0.3	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	2	100	100	100	11	< 1	1	< 1	< 1	< 1	1	< 1	1	< 1	3
Cobalt	ug/L	15	NC	40	100	100	< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15
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	< 1,000	< 1,000
Lead	ug/L	1	NC	4.0	4.0	39	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	10	NC	170	350	440	< 10	< 10	< 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	< 0.2	< 0.2
Molybdenum	ug/L	5	NC	73	210	3,200	16	21	< 5	< 5	7	< 5	< 5	18	< 5	< 5
Radium-226	pCi/L	NA	NC	NC	NC	NC	< 0.209	0.335	< 0.209	< 0.367	0.210	< 0.329	< 0.281	< 0.386	< 0.210	< 0.358
Radium-228	pCi/L	NA	NC	NC	NC	NC	0.566	< 0.414	< 0.575	< 0.632	0.571	< 0.412	< 0.443	< 0.304	< 0.412	< 0.412
Radium-226/228	pCi/L	1.93	5	NC	NC	NC	0.618	0.574	< 0.575	0.747	0.781	0.632	< 0.443	< 0.386	< 0.412	< 0.412
Selenium	ug/L	5	50	50	50	**5.0**	**16**	**15**	**12**	**14**	**22**	**6**	3	**7**	2	3
Thallium	ug/L	2	2	2.0	2.0	3.7	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2

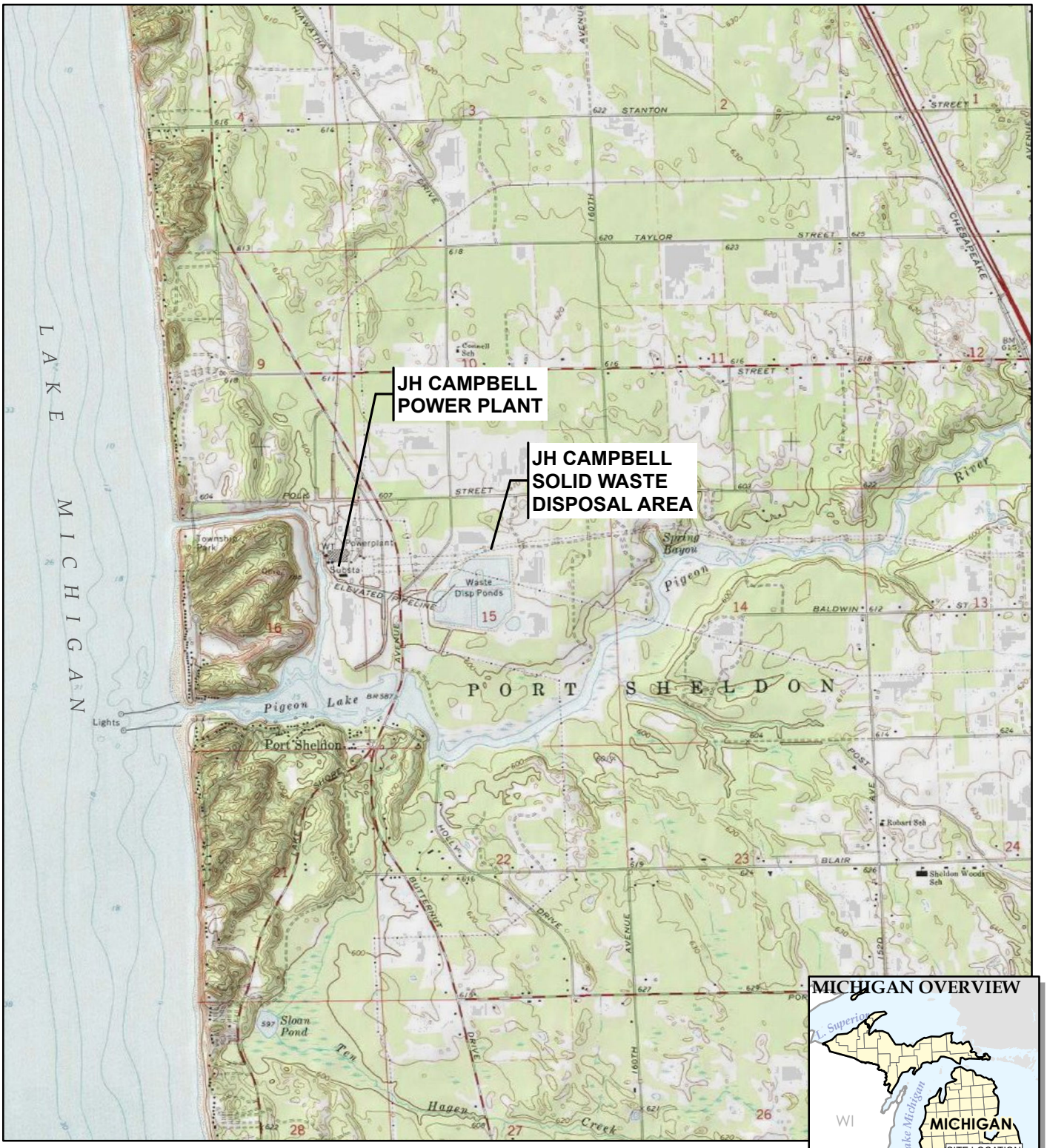
Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
UTL - Upper Tolerance Limit of the background data set. Appendix III UTLs established in TRC's technical memorandum dated January 15, 2018. Appendix IV UTLs established in TRC's technical memorandum dated October 15, 2018.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
NA - not applicable.
NC - no criteria.
* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.
** - 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 EGLE policy and procedure 09-014 dated June 20, 2012.
(1) - Criterion is the aesthetic drinking water value per footnote {E}.
(2) - Criterion is based on the total dissolved solids GSI value per footnote {EE}.
(3) - Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.
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 Groundwater Sampling Results (Analytical): April & October 2020
JH Campbell Dry Ash Landfill – RCRA CCR Monitoring Program
West Olive, Michigan

						Sample Location:	JHC-MW-15032		JHC-MW-15033		JHC-MW-15034		JHC-MW-15035		JHC-MW-15036		JHC-MW-15037	
						Sample Date:	4/14/2020	10/21/2020	4/14/2020	10/21/2020	4/14/2020	10/21/2020	4/14/2020	10/22/2020	4/14/2020	10/22/2020	4/14/2020	10/22/2020
Constituent	Unit	UTL	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^												
Appendix III																		
Boron	ug/L	51	NC	**500**	**500**	7,200	45	45	51	54	59	57	64	60	77	81	266	185
Calcium	mg/L	46	NC	NC	NC	500(2)	8.76	10.8	12.0	14.2	5.10	8.99	70.4	65.7	51.1	59.3	100	93.4
Chloride	mg/L	43	250**	250(1)	250(1)	500(2)	1.76	1.66	1.41	2.65	1.53	1.82	15.0	10.9	8.51	10.4	2.65	7.52
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	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	14	250**	250(1)	250(1)	500(2)	9.60	11.3	10.8	11.0	11.5	15.7	21.1	19.6	17.4	21.9	25.9	53.5
Total Dissolved Solids	mg/L	258	**500****	**500(1)**	**500(1)**	**500**	101	NA(3)	59	NA(3)	52	NA(3)	300	NA(3)	221	NA(3)	385	NA(3)
pH, Field	SU	4.8 - 9.2	**6.5 - 8.5****	**6.5 - 8.5(1)**	**6.5 - 8.5(1)**	**6.5 - 9.0**	**6.1**	**5.8**	6.6	**6.4**	**5.4**	**5.8**	7.2	7.2	7.3	7.3	7.1	7.0
Appendix IV																		
Antimony	ug/L	2	6	6.0	6.0	130	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	1	10	10	10	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	35	2,000	2,000	2,000	820	8	8	6	6	13	6	17	13	9	9	15	14
Beryllium	ug/L	1	4	4.0	4.0	18	< 1	< 1	< 1	< 1	< 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	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	2	100	100	100	11	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	15	NC	40	100	100	< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15
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	< 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	< 1	< 1	< 1	< 1
Lithium	ug/L	10	NC	170	350	440	< 10	< 10	< 10	< 10	< 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	< 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	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NA	NC	NC	NC	NC	< 0.228	< 0.407	< 0.294	< 0.346	< 0.208	< 0.295	< 0.217	< 0.647	< 0.198	< 0.554	< 0.177	< 0.535
Radium-228	pCi/L	NA	NC	NC	NC	NC	< 0.473	< 0.422	0.498	< 0.397	< 0.436	< 0.386	0.560	< 0.440	0.581	< 0.367	< 0.449	< 0.400
Radium-226/228	pCi/L	1.93	5	NC	NC	NC	< 0.473	< 0.422	< 0.487	< 0.397	< 0.436	< 0.386	0.687	< 0.647	0.659	< 0.554	< 0.449	< 0.535
Selenium	ug/L	5	50	50	50	**5.0**	< 1	< 1	< 1	< 1	< 1	< 1	1	2	< 1	< 1	**10**	**12**
Thallium	ug/L	2	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.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
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.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
NA - not applicable.
NC - no criteria.
* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.
** - 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 EGLE policy and procedure 09-014 dated June 20, 2012.
(1) - Criterion is the aesthetic drinking water value per footnote {E}.
(2) - Criterion is based on the total dissolved solids GSI value per footnote {EE}.
(3) - Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unu
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.

Figures



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

N

1 " = 3,000 '
1:36,000

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FEET

TRC
1540 Eisenhower Place
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www.trccompanies.com
TRC - GIS

PROJECT:

CONSUMERS ENERGY COMPANY
JH CAMPBELL POWER PLANT
WEST OLIVE, MICHIGAN

TITLE:

SITE LOCATION MAP

DRAWN BY:	S. MAJOR
CHECKED BY:	B. YELEN
APPROVED BY:	S. HOLMSTROM
DATE:	JANUARY 2021
PROJ. NO.:	367390
FILE:	367390-001-007.mxd

FIGURE 1

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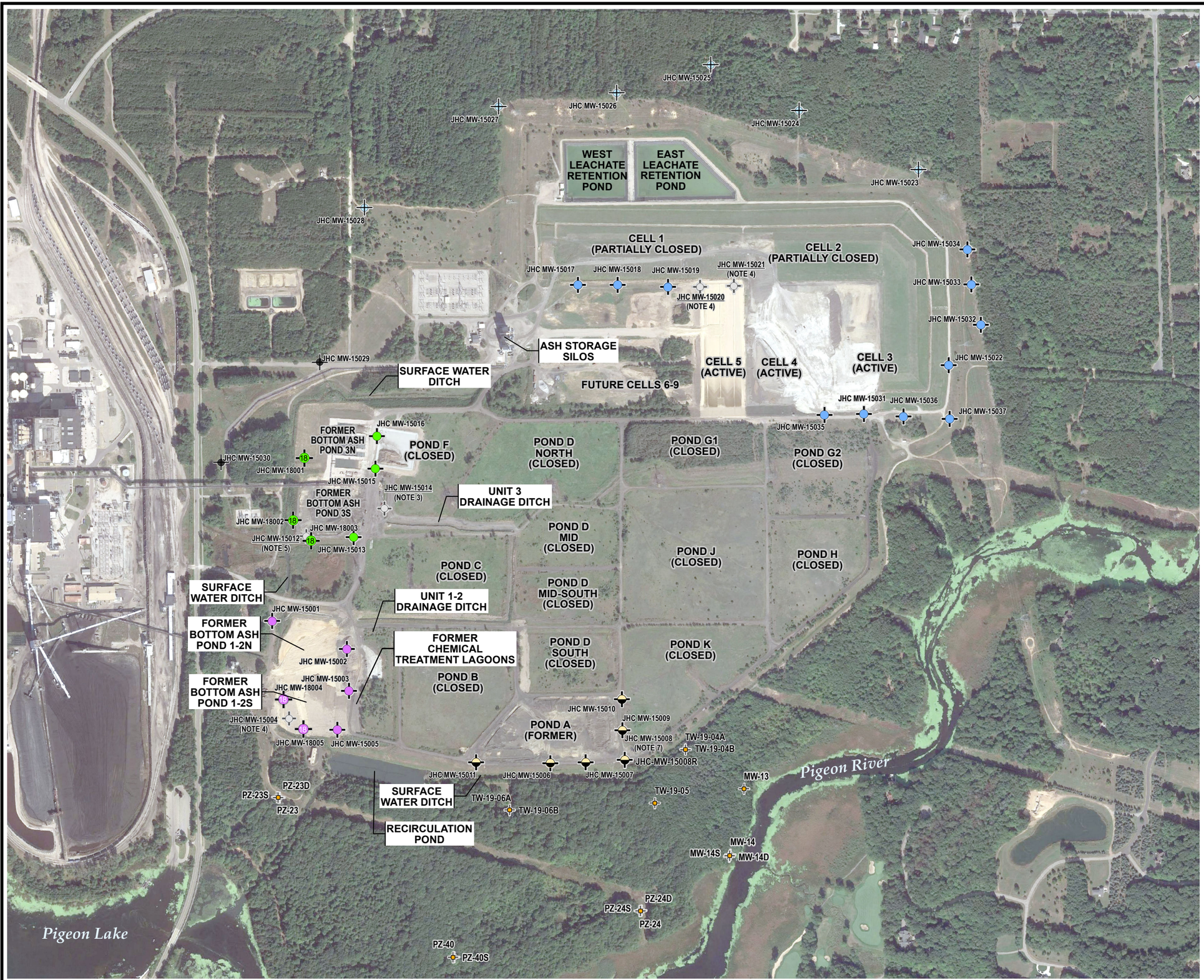

LEGEND

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

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
2. WELL LOCATIONS BASED ON SURVEY DATA THROUGH 12/07/2018.
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.

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0 700 1,400 Feet

1 " = 700 '

1:8,400

PROJECT:

CONSUMERS ENERGY COMPANY
JH CAMPBELL POWER PLANT
WEST OLIVE, MICHIGAN

TITLE:

SITE PLAN WITH CCR MONITORING WELL LOCATIONS

DRAWN BY:	S. MAJOR	PROJ NO.:	367390.0000.0000
CHECKED BY:	B. YELEN		
APPROVED BY:	S. HOLMSTROM		**FIGURE 2**
DATE:	JANUARY 2021		

TRC
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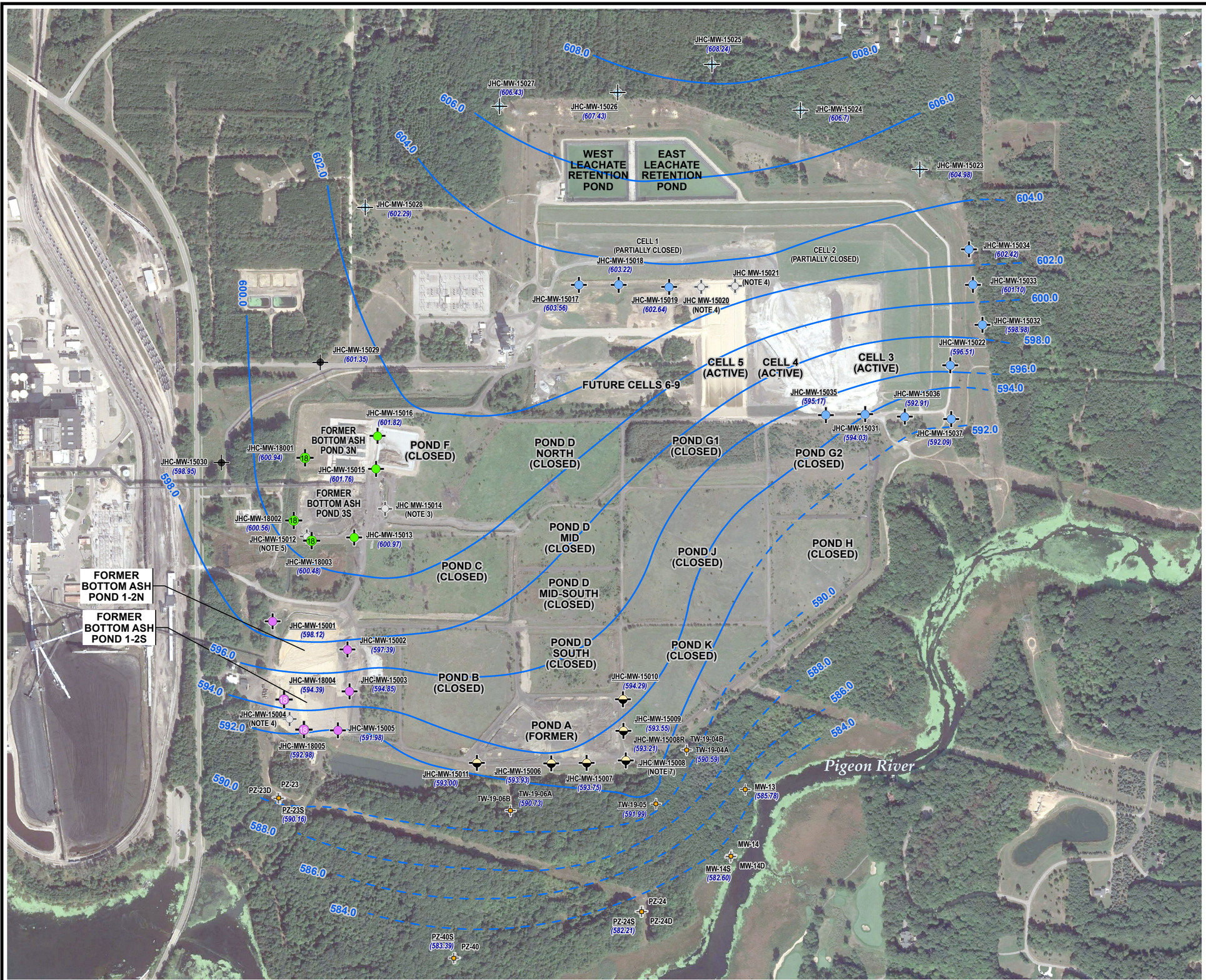
FILE NO.: 367390-001-002.mxd

Plot Date: 1/28/2021, 09:49:40 AM by SMAJOR -- LAYOUT: ANSI B (11"x17")
Path: S:\1-PROJECTS\Consumers_Energy_Company\Michigan\CCR_GW\2017_2697\367390-001_Map Rotation: 0
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)

TRC - GIS



LEGEND

- BACKGROUND MONITORING WELL
- BOTTOM ASH POND 1/2 N/S MONITORING WELL
- BOTTOM ASH POND 3 N/S MONITORING WELL
- DOWNGRADIENT LANDFILL MONITORING WELL
- DOWNGRADIENT POND A MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- DECOMMISSIONED MONITORING WELL
- NEW DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL (2018)
- NEW DOWNGRADIENT BOTTOM ASH POND 3 N/S MONITORING WELL (2018)
- NATURE AND EXTENT WELL
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- (600.97) GROUNDWATER ELEVATION (FEET) SHALLOW WELLS
- (NM) NOT MEASURED

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
2. WELL LOCATIONS BASED ON SURVEY DATA THROUGH 12/07/2018.
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.

N

0 700 1,400 Feet

1 " = 700 '

1:8,400

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

TITLE:
GROUNDWATER CONTOUR MAP APRIL 2020

DRAWN BY:	S. MAJOR	PROJ NO.:	367390.0000
CHECKED BY:	K. LOWERY		
APPROVED BY:	S. HOLMSTROM		
DATE:	JANUARY 2021		

FIGURE 3

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FILE NO.: 367390-001-003.mxd

Plot Date: 1/28/2021, 09:58:14 AM by SMAJOR -- LAYOUT: ANSI B (11"x17")
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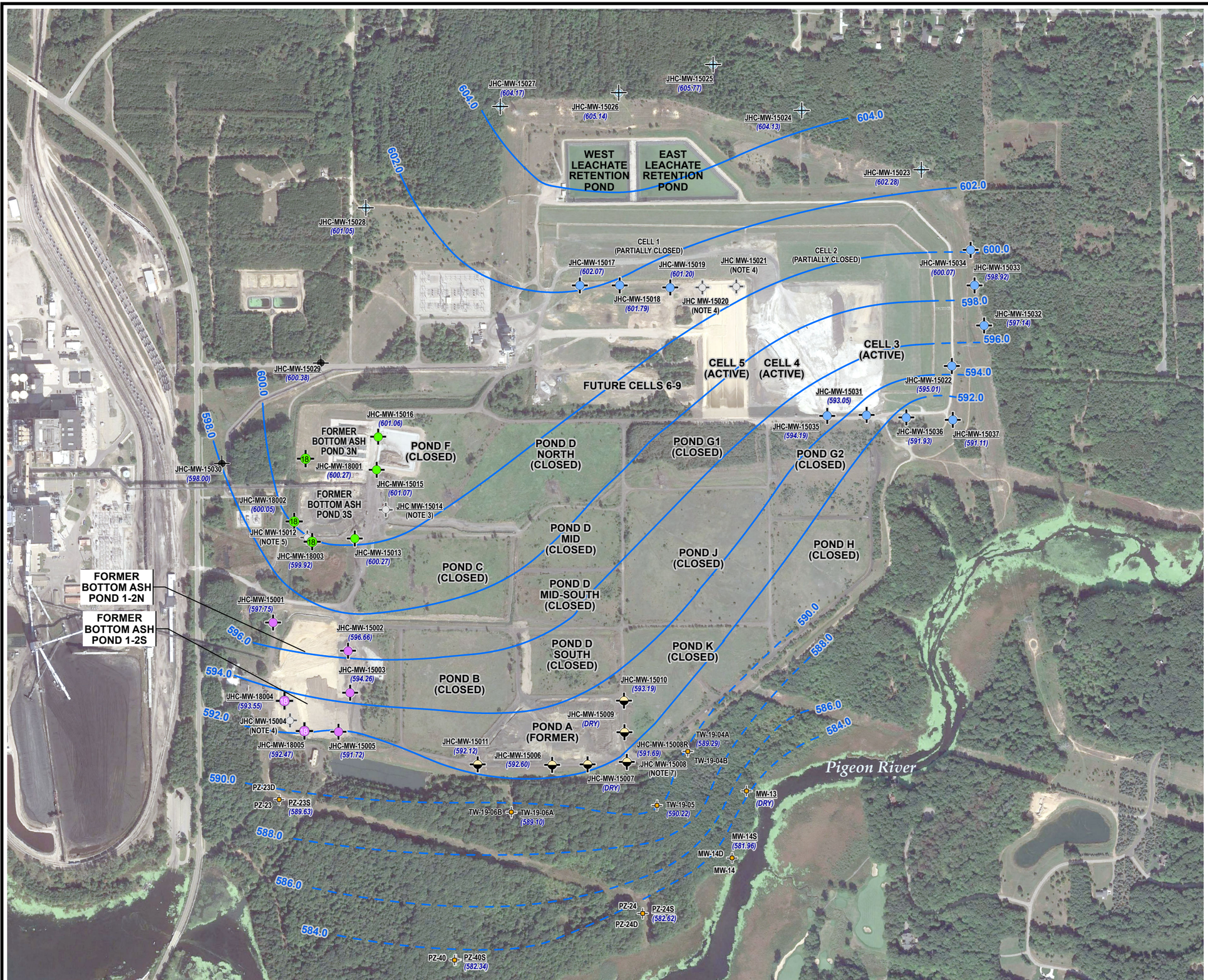
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

TRC - GIS



LEGEND

- BACKGROUND MONITORING WELL
- BOTTOM ASH POND 1/2 N/S MONITORING WELL
- BOTTOM ASH POND 3 N/S MONITORING WELL
- DOWNGRADIENT LANDFILL MONITORING WELL
- DOWNGRADIENT POND A MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- DECOMMISSIONED MONITORING WELL
- NEW DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL (2018)
- NEW DOWNGRADIENT BOTTOM ASH POND 3 N/S MONITORING WELL (2018)
- NATURE AND EXTENT WELL
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- (600.97) GROUNDWATER ELEVATION (FEET) SHALLOW WELLS
- (NM) NOT MEASURED

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
2. WELL LOCATIONS BASED ON SURVEY DATA THROUGH 12/07/2018.
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. STATIC WATER ELEVATIONS IN NORTH AMERICAN VERTICAL DATUM 1988, NAVD 88.

N

0 700 1,400 Feet

1 " = 700 '

1:8,400

PROJECT:

CONSUMERS ENERGY COMPANY
JH CAMPBELL POWER PLANT
WEST OLIVE, MICHIGAN

TITLE:

GROUNDWATER CONTOUR MAP OCTOBER 2020

DRAWN BY:	S. MAJOR	PROJ NO.:	367390.0000
CHECKED BY:	B. YELEN		
APPROVED BY:	S. HOLMSTROM		**FIGURE 4**
DATE:	JANUARY 2021		

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FILE NO.: 367390-001-006.mxd

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Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

TRC - GIS

Appendix A
Data Quality Review

Laboratory Data Quality Review
Groundwater Monitoring Event April 2020
CEC JH Campbell Background Wells

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the April 2020 sampling event. Samples were analyzed for metals, anions, and total dissolved solids (TDS) by CE Laboratory Services in Jackson, Missouri. The laboratory analytical results were reported in laboratory project number 20-0395.

During the April 2020 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 6020, SW-846 7470A

Note that results for an extended list of metals (magnesium, potassium, and sodium), ammonia, nitrate, nitrite, alkalinity, and sulfide were provided for samples JHC-MW-15024, JHC-MW-15025, and JHC-MW-15027 as supplemental monitoring in laboratory project number 20-0395 but were not evaluated or included in this review. Further, the evaluation of radium results for samples collected during the April 2020 sampling event will be included in a supplemental review once results are available.

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, 2017). 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 equipment blanks and field blanks. Field and equipment blanks are used to assess potential contamination arising from field procedures;

- 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 laboratory control samples were not provided for review by the laboratory. 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.

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 iron, copper, nickel, silver, vanadium, and zinc 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

- Preparation dates were not provided by the laboratory. Since the analyses were performed within the preparation holding times, where applicable, there is no impact on data usability due to this issue.
- The cooler temperatures were between 6.1 and 8.2 degrees Celsius and the laboratory noted that samples were not received on ice. Samples were not received by the laboratory on the same day as collection. Therefore, results for TDS and anions in all samples collected during this sampling event should be considered estimated and may be biased low as summarized in the attached table. However, results for TDS and anions are consistent with historical results. Therefore, data usability is not affected.
- 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 JHC-MW-15025 for mercury, 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-03/JHC-MW-15023. All criteria were met.
- It is unknown if laboratory duplicate analyses were performed on a sample from this data set since the QC reported by the laboratory was incomplete.
- Undiluted laboratory RLs were at the project-specified RLs in the monitoring plan with the following exceptions/notes:
  - RLs for total boron (20 µg/L), chloride (1,000 µg/L), and TDS (10,000 µg/L) were lower than the monitoring plan RLs (50 µg/L, 2,000 µg/L, and 50,000 µg/L, respectively). Boron in JHC-MW-15023, JHC-MW-15024, JHC-MW-15025, and DUP-03, TDS in JHC-MW-15027, JHC-MW-15028, and DUP-03, and chloride in JHC-MW-15023 were affected by the lower RL since boron, chloride, and/or TDS were detected in these samples above the laboratory's RL and below the monitoring plan RL. RLs are consistent with the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Op Memo WMRPD-115-14; therefore, data usability is not affected.
  - The RL for total barium (5 µg/L) in all samples was higher than the monitoring plan RL (1 µg/L). However, barium was detected in all samples except for the blanks (EB-03 and FB-03). The RL is consistent with the EGLE Op Memo; therefore, data usability is not affected.
  - The nondetect RL for total cobalt (15 µg/L) in all samples was higher than the monitoring plan RL (6 µg/L) and does not meet project needs.
  - The laboratory indicated in the case narrative that due to matrix interference/possible carry over effects, the RL for silver was increased to 0.3 µg/L for sample JHC-MW-15024; this RL does not meet the project-specified RL of 0.2 µg/L.

Attachment A

Summary of Data Non-Conformances for Landfill Groundwater Analytical Data
JH Campbell Background Wells – RCRA CCR Monitoring Program
West Olive, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
JHC-MW-15023	4/16/2020	TDS, Chloride, Fluoride, Sulfate	Samples not received on ice with elevated cooler temperature; sample results should be considered estimated and may be biased low. However, results were consistent with historical results; therefore, data usability is not affected.
JHC-MW-15024	4/16/2020		
JHC-MW-15025	4/16/2020		
JHC-MW-15026	4/16/2020		
JHC-MW-15027	4/16/2020		
JHC-MW-15028	4/16/2020		
EB-03	4/16/2020		
FB-03	4/16/2020		
DUP-03	4/16/2020		

Laboratory Data Quality Review
Groundwater Monitoring Event April 2020 – Radium
Consumers Energy JH Campbell Background Wells

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the April 2020 sampling event. Samples were analyzed for radium; radium analyses were subcontracted to Eurofins TA in St. Louis, Missouri (Eurofins TA – St. Louis). The laboratory analytical results were reported in laboratory project number 160-37918-1.

During the April 2020 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 (Radium-226, Radium-228, Combined Radium)	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, where applicable. 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;

- Percent recoveries for carriers. Carriers are used to assess the chemical yield for the preparation and/or instrument efficiency;
- 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 Appendix 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

- A method blank was analyzed with each analytical batch. Target analytes were not detected in the method blank samples.
- One equipment blank (EB-03) and one field blank (FB-03) were collected. Target analytes were not detected.
- The LCS and LCSD recoveries and relative percent differences (RPDs) were within QC limits with the following exceptions.
    - The recovery for radium-228 (24%) in the LCSD and the replicate error ratio (RER) in the LCS/LCSD analyses (3.46) performed with preparation batch 471099 were outside of the acceptance limits (75-125% and 1, respectively). The laboratory indicated that there was insufficient sample volume for re-preparation. There is no adverse impact on the data usability due to these issues since the recovery for radium-228 was acceptable in the LCS.
- MS and MSD analyses were not performed.
- The field duplicate pair samples were DUP-03/JHC-MW-15023; all criteria were met.
- Laboratory duplicate analyses were not performed.
- Carrier recoveries were within 40-110% with the following exceptions.
    - The barium carrier recoveries in the radium-228 analyses of samples JHC-MW-15025 (25.8%) and sample JHC-MW-15027 (34.7%) were below the acceptance criteria (40-110%). The laboratory indicated that there was physical evidence of matrix interference present during sample preparation; there was insufficient sample volume for re-

preparation. Therefore, the nondetect results for radium-228 in these samples should be considered estimated and biased low, as summarized in the attached table. However, the nondetect results were within or above the range of historical results. Therefore, data usability is not affected.

- Samples did not undergo a 21-day wait period prior to radium-226 analysis; however, combined radium results were < 5 pCi/L so there is no impact on data usability.
- The minimum detectable concentrations (MDCs) for radium-228 in samples JHC-MW-15025 (1.90 pCi/L) and sample JHC-MW-15027 (1.37 pCi/L) were above the project-specified limit of 1.00 pCi/L likely due to matrix interference; however, combined radium results were < 5 pCi/L so there is no adverse impact on data usability.

Attachment A
Summary of Data Non-Conformances
JH Campbell Background – RCRA CCR Monitoring Program
West Olive, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
JHC-MW-15025	4/16/2020	Radium 228	Low barium carrier recovery. Potential low bias exists for these nondetect results. However, results are within or above the range of historical results; therefore, data usability is not affected.
JHC-MW-15027	4/16/2020		

Laboratory Data Quality Review
Groundwater Monitoring Event April 2020
Consumers Energy JH Campbell Landfill

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the April 2020 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 project number 20-0383.

During the April 2020 sampling event, a groundwater sample was collected from each of the following wells:

- JHC-MW-15017
- JHC-MW-15018
- JHC-MW-15019
- JHC-MW-15022
- JHC-MW-15031
- JHC-MW-15032
- JHC-MW-15033
- JHC-MW-15034
- 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 6020, SW-846 7470A

Note that the evaluation of radium results for samples collected during the April 2020 sampling event will be included in a supplemental review once results are available.

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, 2017). The following items were included in the evaluation of the data:

- Sample receipt;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;
- Data for equipment blanks and field blanks. Field and equipment blanks are used to assess potential contamination arising from field procedures;

- 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 laboratory control samples were not provided for review. 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 all parameters included in this review.

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.

- Appendix III and Appendix 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

- Preparation dates were not provided by CE Laboratory Services. Since the analyses were performed within the preparation holding times, where applicable, there is no impact on data usability due to this issue.
- One equipment blank (EB-01) and one field blank (FB-01) were collected. Target analytes were not detected.
- MS and MSD analyses were performed on sample JHC-MW-15031 for mercury, 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-15018. The RPD for TDS (34%) and the absolute difference for chromium were above the acceptance limits. Therefore, the positive and nondetect results for TDS and chromium in all samples collected during this

sampling event should be considered estimated as summarized in the attached table. However, TDS and anion results are within the range of historical results. Therefore, data usability is not affected.

- It is unknown if laboratory duplicate analyses were performed on a sample from this data set since the QC reported by the laboratory was incomplete.
- The nondetect RL for TDS (10 mg/L) in samples EB-01 and FB-01 is higher than the sampling and analysis plan RL of 1 mg/L. The RL is consistent with the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Op Memo WMRPD-115-14; therefore, data usability is not affected.

Attachment A

Summary of Data Non-Conformances

JH Campbell Landfill – RCRA CCR Monitoring Program

West Olive, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
JHC-MW-15017	4/14/2020	TDS, Chromium	Field duplicate variability; positive and nondetect results should be considered estimated. However, results are within the range of historical results; therefore, data usability is not affected.
JHC-MW-15018	4/14/2020		
JHC-MW-15019	4/14/2020		
JHC-MW-15022	4/14/2020		
JHC-MW-15031	4/14/2020		
JHC-MW-15032	4/14/2020		
JHC-MW-15033	4/14/2020		
JHC-MW-15034	4/14/2020		
JHC-MW-15035	4/14/2020		
JHC-MW-15036	4/14/2020		
JHC-MW-15037	4/14/2020		

Laboratory Data Quality Review
Groundwater Monitoring Event April 2020 – Radium
Consumers Energy JH Campbell Landfill

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the April 2020 sampling event. Samples were analyzed for radium; radium analyses were subcontracted to Eurofins TA in St. Louis, Missouri (Eurofins TA – St. Louis). The laboratory analytical results were reported in laboratory project number 160-37919-1.

During the April 2020 sampling event, a groundwater sample was collected from each of the following wells:

- JHC-MW-15017
- JHC-MW-15018
- JHC-MW-15019
- JHC-MW-15022
- JHC-MW-15031
- JHC-MW-15032
- JHC-MW-15033
- JHC-MW-15034
- JHC-MW-15035
- JHC-MW-15036
- JHC-MW-15037

Each sample was analyzed for the following constituents:

Analyte Group	Method
Radium (Radium-226, Radium-228, Combined Radium)	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). The LCSs 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;
- Percent recoveries for carriers. Carriers are used to assess the chemical yield for the preparation and/or instrument efficiency;
- 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 Appendix 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

- A method blank was analyzed with each analytical batch. Target analytes were not detected in the method blank samples.
- One equipment blank (EB-01) and one field blank (FB-01) were collected. Target analytes were not detected.
- The LCS recoveries for all analytes were within QC limits.
- MS and MSD analyses were not performed on a sample from this data set.
- The field duplicate pair samples were DUP-01/JHC-MW-15018. Target analytes included in this review were not detected in either sample.
- Laboratory duplicate analyses were not performed on a sample from this data set.
- Carrier recoveries were within 40-110%.
- Samples did not undergo a 21-day wait period prior to radium-226 analysis; however, combined radium results were < 5 pCi/L so there is no impact on data usability.

Laboratory Data Quality Review
Groundwater Monitoring Event October 2020
CEC JH Campbell Background Wells

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the October 2020 sampling event. Samples were analyzed for total metals, anions, and total dissolved solids (TDS) by CE Laboratory Services in Jackson, Michigan. The radium analyses were subcontracted to Eurofins-TestAmerica in St. Louis, Missouri (Eurofins TA – St. Louis). The laboratory analytical results were reported in laboratory sample delivery groups 20-1192 and 160-40223-1.

During the October 2020 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
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 USEPA National Functional Guidelines for Inorganic Superfund Methods Data Review (USEPA, 2017) and 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.

It should be noted that results for method blanks and laboratory control samples were not provided for review by the laboratory. 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.

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 iron, copper, nickel, silver, vanadium, and zinc 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

- A method blank was analyzed with each analytical batch for radium. Radium 228 was detected in MB 160-490784/23-A at 0.5069 +/- 0.266 pCi/L. There was no impact on data usability since radium 228 was not detected in the associated samples.
- One equipment blank (EB-01) and one field blank (FB-01) were collected. Target analytes were not detected in these blank samples.
- An LCS and LCSD were analyzed with each analytical batch for radium; the following issues were noted.

- Radium 226 recovered above the acceptance limits (75-125%) in LCS 160-490013/1-A (132%). No data are affected as no associated samples had positive detections for radium 226.
- Radium 228 recovered above the acceptance limits (75-125%) in LCSD 160-490784/1-A (132%). Further, the replicate error ratio was above the acceptance limit (1.0) for LCS 160-490784/1-A and LCSD 160-490784/2-A (1.02) for radium 228. No data are affected as no associated samples had positive detections for radium 228.

- MS and MSD analyses were performed on sample JHC-MW-15025 for mercury, 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-15028. All criteria were met.
- The barium carrier in samples JHC-MW-15023 (146%), JHC-MW-15025 (182%), JHC-MW-15026 (154%), and JHC-MW-15028 (140%) recovered above the acceptance limits (40-110%) for the radium 226 and 228 analyses. The carrier results were truncated by the laboratory to 100% to minimize potential high bias. The positive and nondetect results of radium 226 and 228 for these samples are potentially uncertain as summarized in the attached table, Attachment A.
- The barium carrier in sample JHC-MW-15024 (124%) recovered above the acceptance limits (40-110%) for the radium 226 analysis. The carrier result was truncated by the laboratory to 100% to minimize potential high bias. The nondetect result for radium 226 in this sample is uncertain as summarized in the attached table, Attachment A.
- CE Laboratory identified that the pre-determined weights of the bags used in the TDS analyses were inaccurate and this issue could not be resolved to determine the potential bias on the individual sample results. Therefore, the positive and nondetect results for TDS in all samples are potentially uncertain as summarized in the attached table, Attachment A. However, the results do not vary significantly from historical data for each monitoring well, therefore, the TDS data are considered usable for purposes of this monitoring program.

Attachment A

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

Samples	Collection Date	Analyte	Non-Conformance/Issue
JHC-MW-15023	10/20/2020	TDS	Pre-weighed sample bag weights were potentially inaccurate. Indicates uncertainty in results.
JHC-MW-15024	10/20/2020		
JHC-MW-15025	10/20/2020		
JHC-MW-15026	10/20/2020		
JHC-MW-15027	10/20/2020		
JHC-MW-15028	10/20/2020		
DUP-01	10/20/2020		
FB-01	10/20/2020		
EB-01	10/20/2020		
JHC-MW-15024	10/20/2020	Radium 226	Barium carrier recovery above acceptance criteria (40-110%); carrier results truncated by laboratory to 100%. Indicates potential uncertainty in results.
JHC-MW-15023	10/20/2020	Radium 226, Radium 228	Barium carrier recovery above acceptance criteria (40-110%); carrier results truncated by laboratory to 100%. Indicates potential uncertainty in results.
JHC-MW-15025	10/20/2020		
JHC-MW-15026	10/20/2020		
JHC-MW-15028	10/20/2020		

Laboratory Data Quality Review
Groundwater Monitoring Event October 2020
Consumers Energy JH Campbell Landfill

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the October 2020 sampling event. Samples were analyzed for total metals, anions, and total dissolved solids by CE Laboratory Services in Jackson, Michigan. The radium analyses were subcontracted to Eurofins-TestAmerica in St. Louis, Missouri (Eurofins TA – St. Louis). The laboratory analytical results were reported in laboratory sample delivery groups 20-1196R and 160-40226-1.

During the October 2020 sampling event, a groundwater sample was collected from each of the following wells:

- JHC-MW-15017
- JHC-MW-15018
- JHC-MW-15019
- JHC-MW-15022
- JHC-MW-15031
- JHC-MW-15032
- JHC-MW-15033
- JHC-MW-15034
- 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/SW-846 7470A
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 USEPA National Functional Guidelines for Inorganic Superfund Methods Data Review (USEPA, 2017) and 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.

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 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, with the exception TDS data that varies significantly from historical data. A summary of the data quality review, including non-conformances and issues identified in this evaluation are noted below.

- Appendix III and Appendix 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

- A method blank was analyzed with each analytical batch for radium. Radium-228 was detected in MB 160-490784/23-A at 0.5069 +/- 0.266 pCi/L. No data were affected as radium-228 was not detected in the associated samples.

- One equipment blank (EB-05) and one field blank (FB-05) were collected. Target analytes were not detected in these blanks.
- An LCS and LCSD were analyzed with each analytical batch for radium; the following issues were noted.
  - Radium 226 recovered above the acceptance limits (75-125%) in LCS 160-490769/1-A (136%) and LCSD 160-490769/2-A (126%). No data are affected as no associated samples had positive detections for radium 226.
  - Radium 228 recovered above the acceptance limits (75-125%) in LCSD 160-490772/2-A (132%) and LCS 160-490784/1-A (132%). No data are affected as no associated samples had positive detections for radium 228.
  - The replicate error ratio was above the acceptance limit (1.0) for LCS 160-490772/1-A and LCSD 160-490772/2-A (1.03), and LCS 160-490784/1-A and LCSD 160-490784/2-A (1.02) for radium 228. No data are affected as no associated samples had positive detections for radium 228.
- MS and MSD analyses were not performed on a sample from this data set.
- The field duplicate pair samples were DUP-05/JHC-MW-15018. The relative percent difference (RPD) for all analytes were within criteria with the exception of TDS. The RPD for TDS (46.6%) exceeded the acceptance limit. Potential uncertainty exists for positive results for TDS in all groundwater samples in this data set as noted in the attached table, Attachment A.
- Carrier recoveries, where applicable, were within 40-110%.
- CE Laboratory identified that the pre-determined weights of the bags used in the TDS analyses were inaccurate and this issue could not be resolved to determine the potential bias on the individual sample results. Therefore, the positive and nondetect results for TDS in all samples are potentially uncertain as summarized in the attached table, Attachment A. All TDS data varies significantly from historical data for each respective monitoring well. Due to the identified issue with the bag weights and the inconsistencies with historical data, all TDS data should be considered unusable for the purposes of this monitoring program.

Attachment A

Summary of Data Non-Conformances

JH Campbell Landfill – RCRA CCR Monitoring Program

West Olive, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
JHC-MW-15017	10/21/2020	TDS	Pre-weighed sample bag weights were potentially inaccurate. Indicates uncertainty in results.
JHC-MW-15018	10/21/2020		
JHC-MW-15019	10/21/2020		
JHC-MW-15022	10/21/2020		
JHC-MW-15031	10/21/2020		
JHC-MW-15032	10/21/2020		
JHC-MW-15033	10/21/2020		
JHC-MW-15034	10/21/2020		
JHC-MW-15035	10/22/2020		
JHC-MW-15036	10/22/2020		
JHC-MW-15037	10/22/2020		
DUP-05	10/21/2020		
FB-05	10/22/2020		
EB-05	10/22/2020		
JHC-MW-15017	10/21/2020	TDS	Field duplicate RPD exceeds acceptance criteria (<30%); indicates potential uncertainty in TDS results.
JHC-MW-15018	10/21/2020		
JHC-MW-15019	10/21/2020		
JHC-MW-15022	10/21/2020		
JHC-MW-15031	10/21/2020		
JHC-MW-15032	10/21/2020		
JHC-MW-15033	10/21/2020		
JHC-MW-15034	10/21/2020		
JHC-MW-15035	10/22/2020		
JHC-MW-15036	10/22/2020		
JHC-MW-15037	10/22/2020		
DUP-05	10/21/2020		

Appendix B
April 2020 Assessment Monitoring Statistical Evaluation

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Technical Memorandum

Date:	July 31, 2020
To:	Bethany Swanberg, Consumers Energy
From:	Sarah Holmstrom, TRC Kristin Lowery, TRC
Project No.:	367390.0000.0000 Phase 1 Task 4
Subject:	Statistical Evaluation of April 2020 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, 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 (JHC) Dry Ash Landfill. The first semiannual assessment monitoring event for 2020 was conducted on April 13 through 16, 2020. 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 2020 data indicates no constituents are present at statistically significant levels that exceed the GWPSs at the Dry Ash Landfill monitoring wells. 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 execute the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

Assessment Monitoring Statistical Evaluation

The compliance well network at the JHC Dry Ash Landfill CCR Unit consists of eleven monitoring wells (JHC-MW-15017 through JHC-MW-15019, JHC-MW-15022, and JHC-MW-15031 through JHC-MW-15037) located on the south and east perimeters of the landfill Cells 1 through 4.

[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.

Following the first semiannual assessment monitoring sampling event, compliance well data for the JHC 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 Appendix IV constituent, the concentrations from each well were first compared directly to the GWPS, as shown on Table A1. No parameter-well combinations included a direct exceedance of the GWPS within the past 8 events (June 2017 through April 2020) for data that met project data quality objectives[3]. Therefore, no confidence limits were calculated for the Dry Ash Landfill.

The direct comparison of the Appendix IV constituents shows no potential GWPS exceedances. These results are consistent with the results of the initial assessment monitoring data statistical evaluation and Consumers Energy will continue to initiate an assessment of corrective measures per §257.95(g). Consumers Energy will continue executing the self-implementing groundwater

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

[3] Anomalously high chromium results were reported for JHC-MW-15022 and JHC-MW-15035 in April 2019. Reanalysis was conducted with similar results, but the relative percent difference (RPD) was above the acceptance criteria. The two wells were resampled in in June 2019 with results consistent with earlier sampling events. The June 2019 chromium concentrations are used for statistical analysis in lieu of the April 2019 results.

compliance schedule in conformance with §257.90 - §257.98.

Attachments

Table B1 Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation

Table

Table B1
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:	6/22/2017	8/16/2017	9/27/2017	4/26/2018	6/20/2018	11/13/2018	4/23/2019	10/8/2019	4/14/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS										
Appendix III															
Boron	ug/L	NC	NA	51	NA		407	347	405	--	245	274	340	350	243
Calcium	mg/L	NC	NA	46	NA		56.0	56.3	44.8	--	44.0	60.9	81	77	64.4
Chloride	mg/L	250*	NA	43	NA		70.8	112	119	--	97.0	170	120	60	36.0
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	14	NA		70.3	84.2	101	--	60.6	72.0	100	92	69
Total Dissolved Solids	mg/L	500*	NA	258	NA		366	476	490	--	348	474	520	280	339
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		6.1	6.1	5.2	6.0(1)	6.0	6.1	6.1	6.3	5.6
Appendix IV															
Antimony	ug/L	6	NA	2	6		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Barium	ug/L	2,000	NA	35	2,000		76.4	103	--	79.7	80.0	85.5	70	47	34
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Cadmium	ug/L	5	NA	0.2	5		0.22	0.42	--	0.47	0.54	0.60	0.57	0.24	0.4
Chromium	ug/L	100	NA	2	100		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	12	< 1.0	< 1
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 15
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	1	15		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Lithium	ug/L	NC	40	10	40		< 10	< 10	--	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2
Molybdenum	ug/L	NC	100	5	100		< 5.0	10.6	--	8.3	6.2	28.5	11	10	16
Radium-226	pCi/L	NC	NA	NA	NA		< 0.388	< 0.917	--	1.17	< 0.785	< 1.05	0.176	0.259	< 0.209
Radium-228	pCi/L	NC	NA	NA	NA		1.27	1.51	--	0.773	2.74	< 0.910	0.827	0.384	0.566
Radium-226/228	pCi/L	5	NA	1.93	5		1.64	2.30	--	1.94	3.02	< 1.96	1.00	0.643	0.618
Selenium	ug/L	50	NA	5	50		23.5	27.4	--	18.2	18.5	18.8	16	14	16
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional Screening Level from 83 FR 36435.
UTL - Upper Tolerance Limit (95%) of the background data set.
GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
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 CCR rules.
All metals were analyzed as total unless otherwise specified.
(1) pH value potentially biased high due to groundwater quality meter malfunction.
(2) April 2019 result not used for assessment monitoring.
(3) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.

Table B1
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:	6/22/2017	6/22/2017	8/16/2017	8/16/2017	9/27/2017	9/27/2017	4/26/2018	6/20/2018	11/13/2018	4/23/2019	10/8/2019	4/14/2020	4/14/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS			Field Dup		Field Dup		Field Dup							Field Dup
Appendix III																			
Boron	ug/L	NC	NA	51	NA		159	165	133	139	127	130	--	117	115	130	170	142	148
Calcium	mg/L	NC	NA	46	NA		74.5	73.6	62.7	61.0	55.3	57.0	--	44.8	37.6	58	48	50.6	50.7
Chloride	mg/L	250*	NA	43	NA		43.8	44.4	43.7	43.6	41.5	41.6	--	31.9	33.2	43	44	28.5	28.3
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 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*	NA	14	NA		79.8	78.9	88.4	86.2	80.8	81.1	--	62.3	51.1	61	84	52.8	52.9
Total Dissolved Solids	mg/L	500*	NA	258	NA		336	458	390	350	310	468	--	194	276	320	370	405	287
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		6.4	--	6.3	--	6.3	--	6.2(1)	6.1	6.3	6.4	6.0	6.2	--
Appendix IV																			
Antimony	ug/L	6	NA	2	6		< 1.0	< 1.0	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	< 1.0	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000		69.1	65.1	89.7	97.5	--	--	89.0	76.5	79.6	80	130	96	95
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20	0.29	0.2	0.2
Chromium	ug/L	100	NA	2	100		< 1.0	< 1.0	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	3
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	< 15.0	< 15.0	--	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 15	< 15
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 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	15	1	15		< 1.0	< 1.0	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Lithium	ug/L	NC	40	10	40		< 10	< 10	< 10	< 10	--	--	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100		< 5.0	< 5.0	6.8	6.8	--	--	17.2	19.7	6.7	< 5.0	< 5.0	< 5	< 5
Radium-226	pCi/L	NC	NA	NA	NA		0.420	0.596	0.667	1.15	--	--	< 0.656	< 0.692	< 0.760	0.217	0.348	< 0.209	< 0.220
Radium-228	pCi/L	NC	NA	NA	NA		< 0.556	< 0.623	1.24	0.935	--	--	< 0.572	< 1.14	< 0.918	< 0.476	0.390	< 0.575	< 0.561
Radium-226/228	pCi/L	5	NA	1.93	5		0.910	1.15	1.91	2.09	--	--	< 1.23	< 1.83	< 1.68	< 0.476	0.739	< 0.575	< 0.561
Selenium	ug/L	50	NA	5	50		15.6	15.7	13.9	13.9	--	--	12.7	9.9	8.2	12	15	12	13
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	< 2.0	< 2.0	--	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2

Notes:

ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional Screening Level from 83 FR 36435.
UTL - Upper Tolerance Limit (95%) of the background data set.
GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
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 CCR rules.
All metals were analyzed as total unless otherwise specified.
(1) pH value potentially biased high due to groundwater quality meter malfunction.
(2) April 2019 result not used for assessment monitoring.
(3) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.

Table B1
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-15019							
						Sample Date:	6/22/2017	8/16/2017	9/27/2017	4/26/2018	6/20/2018	11/14/2018	4/23/2019	10/8/2019	4/14/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS										
Appendix III															
Boron	ug/L	NC	NA	51	NA		166	180	191	--	195	159	150	150	204
Calcium	mg/L	NC	NA	46	NA		85.9	53.1	58.3	--	64.1	30.4	45	34	43.2
Chloride	mg/L	250*	NA	43	NA		48.6	27.0	36.7	--	26.2	7.4	14	6.0	16.6
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	14	NA		53.8	42.6	48.8	--	40.8	19.8	25	23	45.7
Total Dissolved Solids	mg/L	500*	NA	258	NA		378	268	306	--	286	250	200	280	359
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		6.8	6.4	6.4	6.7(1)	6.6	6.0	6.5	6.4	5.9
Appendix IV															
Antimony	ug/L	6	NA	2	6		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Barium	ug/L	2,000	NA	35	2,000		41.1	40.0	--	63.6	44.6	53.5	46	58	97
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2
Chromium	ug/L	100	NA	2	100		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 15
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	1	15		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Lithium	ug/L	NC	40	10	40		< 10	< 10	--	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2
Molybdenum	ug/L	NC	100	5	100		7.0	< 5.0	--	11.2	7.7	10.4	12	16	7
Radium-226	pCi/L	NC	NA	NA	NA		< 0.601	< 0.856	--	0.402	< 0.717	< 0.838	0.124	0.187	0.210
Radium-228	pCi/L	NC	NA	NA	NA		0.685	0.947	--	< 0.638	< 0.951	< 0.801	< 0.465	< 0.295	0.571
Radium-226/228	pCi/L	5	NA	1.93	5		< 1.12	< 1.75	--	0.911	< 1.67	< 1.64	< 0.465	0.327	0.781
Selenium	ug/L	50	NA	5	50		18.0	15.8	--	22.2	18.4	24.8	11	11	22
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2

Notes:

ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional Screening Level from 83 FR 36435.
UTL - Upper Tolerance Limit (95%) of the background data set.
GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
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 CCR rules.
All metals were analyzed as total unless otherwise specified.
(1) pH value potentially biased high due to groundwater quality meter malfunction.
(2) April 2019 result not used for assessment monitoring.
(3) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.

Table B1
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-15022										
						Sample Date:	6/22/2017	8/15/2017	9/27/2017	4/27/2018	6/20/2018	11/14/2018	11/14/2018	4/24/2019	4/24/2019	6/21/2019	10/9/2019	4/14/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS								Field Dup		Field Dup			
Appendix III																		
Boron	ug/L	NC	NA	51	NA		397	376	340	--	315	376	374	360	360	--	330	311
Calcium	mg/L	NC	NA	46	NA		101	122	103	--	109	109	106	110	110	--	130	119
Chloride	mg/L	250*	NA	43	NA		1.1	1.6	2.4	--	3.5	3.7	3.8	2.7	2.7	--	< 2.0	< 1
Fluoride	ug/L	4,000	NA	1,000	NA		< 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*	NA	14	NA		19.2	35.0	43.7	--	26.0	40.6	40.7	37	37	--	37	14.2
Total Dissolved Solids	mg/L	500*	NA	258	NA		502	466	406	--	414	358	400	410	400	--	540	405
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		7.0	7.0	7.0	7.6(1)	6.9	7.0	--	7.0	--	7.1	7.0	6.8
Appendix IV																		
Antimony	ug/L	6	NA	2	6		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1.0	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1.0	< 1
Barium	ug/L	2,000	NA	35	2,000		22.6	26.8	--	20.3	21.2	21.3	22.6	23	22	--	26	23
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1.0	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--	< 0.20	< 0.2
Chromium	ug/L	100	NA	2	100		< 1.0	< 1.0	--	1.3	< 1.0	1.7	1.5	82 (2)(3)	63 (3)	2.2 (3)	5.9	< 1
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 6.0	--	< 6.0	< 15
Fluoride	ug/L	4,000	NA	1,000	4,000		< 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	15	1	15		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1.0	< 1
Lithium	ug/L	NC	40	10	40		< 10	< 10	--	< 10	< 10	< 10	< 10	< 10	< 10	--	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--	< 0.20	< 0.2
Molybdenum	ug/L	NC	100	5	100		< 5.0	5.3	--	5.2	< 5.0	6.5	6.0	7.2	6.4	--	5.2	< 5
Radium-226	pCi/L	NC	NA	NA	NA		< 0.426	< 0.861	--	< 0.431	< 0.673	< 0.692	<0.924	< 0.0968	< 0.0955	--	0.190	< 0.281
Radium-228	pCi/L	NC	NA	NA	NA		< 0.511	< 1.03	--	< 0.583	< 0.697	0.999	< 0.849	< 0.505	< 0.470	--	< 0.480	< 0.443
Radium-226/228	pCi/L	5	NA	1.93	5		< 0.937	< 1.89	--	< 1.01	< 1.37	< 1.35	< 1.77	< 0.505	< 0.470	--	< 0.480	< 0.443
Selenium	ug/L	50	NA	5	50		1.3	4.1	--	4.1	2.8	5.6	5.2	7.2	7.4	--	6.4	3
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	--	< 2.0	< 2

Notes:

ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional Screening Level from 83 FR 36435.
UTL - Upper Tolerance Limit (95%) of the background data set.
GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
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 CCR rules.
All metals were analyzed as total unless otherwise specified.
(1) pH value potentially biased high due to groundwater quality meter malfunction.
(2) April 2019 result not used for assessment monitoring.
(3) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.

Table B1
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:	6/22/2017	6/22/2017	8/16/2017	8/16/2017	9/27/2017	9/27/2017	4/27/2018	6/20/2018	11/14/2018	4/24/2019	10/9/2019	4/14/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS			Field Dup		Field Dup		Field Dup						
Appendix III																		
Boron	ug/L	NC	NA	51	NA		96.5	98.9	97.0	< 100	95.6	99.5	--	108	104	79	85	75
Calcium	mg/L	NC	NA	46	NA		63.9	66.8	62.5	67.5	68.5	67.2	--	66.9	63.3	59	57	49.8
Chloride	mg/L	250*	NA	43	NA		41.7	41.7	48.1	48.5	47.5	47.1	--	38.9	33.4	24	28	20.1
Fluoride	ug/L	4,000	NA	1,000	NA		< 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*	NA	14	NA		35.2	35.1	40.9	41.2	38.9	38.7	--	40.0	34.7	25	26	23.5
Total Dissolved Solids	mg/L	500*	NA	258	NA		348	412	454	454	386	452	--	352	268	280	220	266
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		6.9	--	6.8	--	6.8	--	7.6(1)	6.8	6.7	6.9	6.9	6.7
Appendix IV																		
Antimony	ug/L	6	NA	2	6		< 1.0	< 1.0	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	< 1.0	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Barium	ug/L	2,000	NA	35	2,000		16.6	17.0	19.2	18.9	--	--	15.4	18.9	21.4	14	17	17
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2
Chromium	ug/L	100	NA	2	100		12.3	8.2	1.7	1.1	--	--	< 1.0	< 1.0	24.6	5.4	1.9	< 1
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	< 15.0	< 15.0	--	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 15
Fluoride	ug/L	4,000	NA	1,000	4,000		< 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	15	1	15		< 1.0	< 1.0	< 1.0	< 1.0	--	--	< 1.0	< 1.0	1.3	< 1.0	< 1.0	< 1
Lithium	ug/L	NC	40	10	40		< 10	< 10	< 10	< 10	--	--	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2
Molybdenum	ug/L	NC	100	5	100		< 5.0	< 5.0	< 5.0	< 5.0	--	--	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5
Radium-226	pCi/L	NC	NA	NA	NA		< 1.03	0.393	< 0.423	0.675	--	--	< 0.479	< 0.638	0.849	0.102	0.199	< 0.210
Radium-228	pCi/L	NC	NA	NA	NA		< 0.636	< 0.662	< 1.05	< 0.894	--	--	< 0.708	< 1.02	< 0.773	< 0.427	0.600	< 0.412
Radium-226/228	pCi/L	5	NA	1.93	5		< 1.67	0.835	< 1.47	1.33	--	--	< 1.19	< 1.66	< 1.50	0.466	0.798	< 0.412
Selenium	ug/L	50	NA	5	50		1.3	1.3	< 1.0	1.9	--	--	4.0	3.0	2.4	< 1.0	< 1.0	2
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	< 2.0	< 2.0	--	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional Screening Level from 83 FR 36435.
UTL - Upper Tolerance Limit (95%) of the background data set.
GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
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 CCR rules.
All metals were analyzed as total unless otherwise specified.
(1) pH value potentially biased high due to groundwater quality meter malfunction.
(2) April 2019 result not used for assessment monitoring.
(3) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.

Table B1
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-15032								
						Sample Date:	6/23/2017	8/15/2017	9/26/2017	4/26/2018	6/19/2018	6/19/2018	11/14/2018	4/24/2019	10/8/2019	4/14/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS							Field Dup				
Appendix III																
Boron	ug/L	NC	NA	51	NA		56.4	62.4	57.8	--	45.7	44.6	49.4	< 50	58	45
Calcium	mg/L	NC	NA	46	NA		7.2	7.0	6.8	--	8.8	8.4	8.1	9.4	7.9	8.76
Chloride	mg/L	250*	NA	43	NA		2.7	3.0	3.2	--	3.4	3.4	4.2	2.6	2.3	1.76
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	14	NA		13.9	16.3	< 2.0	--	11.8	11.6	11.9	11	12	9.60
Total Dissolved Solids	mg/L	500*	NA	258	NA		54	< 50.0	84	--	64	< 50.0	< 50.0	53	68	101
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		6.0	6.1	6.0	5.9(1)	6.3	--	6.2	6.3	6.3	6.1
Appendix IV																
Antimony	ug/L	6	NA	2	6		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Barium	ug/L	2,000	NA	35	2,000		7.3	9.1	--	7.8	8.8	8.7	7.7	8.3	7.9	8
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2
Chromium	ug/L	100	NA	2	100		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	--	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 15
Fluoride	ug/L	4,000	NA	1,000	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	NC	15	1	15		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Lithium	ug/L	NC	40	10	40		< 10	< 10	--	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2
Molybdenum	ug/L	NC	100	5	100		< 5.0	< 5.0	--	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5
Radium-226	pCi/L	NC	NA	NA	NA		< 0.457	< 0.973	--	< 0.514	< 0.464	< 0.722	< 0.748	< 0.118	0.157	< 0.228
Radium-228	pCi/L	NC	NA	NA	NA		< 0.893	< 0.923	--	< 0.784	< 0.721	< 1.17	< 0.812	< 0.395	< 0.347	< 0.473
Radium-226/228	pCi/L	5	NA	1.93	5		< 1.35	< 1.90	--	< 1.30	< 1.19	< 1.89	< 1.56	< 0.395	0.427	< 0.473
Selenium	ug/L	50	NA	5	50		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2

Notes:

ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional Screening Level from 83 FR 36435.
UTL - Upper Tolerance Limit (95%) of the background data set.
GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
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 CCR rules.
All metals were analyzed as total unless otherwise specified.
(1) pH value potentially biased high due to groundwater quality meter malfunction.
(2) April 2019 result not used for assessment monitoring.
(3) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.

Table B1
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-15033								
						Sample Date:	6/23/2017	8/15/2017	9/26/2017	4/26/2018	4/26/2018	6/19/2018	11/14/2018	4/24/2019	10/8/2019	4/14/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS						Field Dup					
Appendix III																
Boron	ug/L	NC	NA	51	NA		33.0	30.8	34.1	--	--	33.0	41.8	< 50	51	51
Calcium	mg/L	NC	NA	46	NA		12.6	9.6	10.1	--	--	9.0	10.0	10	11	12.0
Chloride	mg/L	250*	NA	43	NA		1.7	1.1	1.4	--	--	3.4	3.2	< 2.0	2.6	1.41
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	14	NA		9.0	9.7	< 2.0	--	--	8.1	9.2	9.5	12	10.8
Total Dissolved Solids	mg/L	500*	NA	258	NA		124	126	< 50.0	--	--	68	< 50.0	58	71	59
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		6.8	6.8	6.7	6.8(1)	--	6.7	6.7	6.7	6.9	6.6
Appendix IV																
Antimony	ug/L	6	NA	2	6		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Barium	ug/L	2,000	NA	35	2,000		5.2	4.6	--	4.8	4.3	5.2	6.1	< 5.0	5.4	6
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2
Chromium	ug/L	100	NA	2	100		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	--	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 15
Fluoride	ug/L	4,000	NA	1,000	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	NC	15	1	15		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Lithium	ug/L	NC	40	10	40		< 10	< 10	--	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2
Molybdenum	ug/L	NC	100	5	100		< 5.0	< 5.0	--	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5
Radium-226	pCi/L	NC	NA	NA	NA		0.521	< 0.617	--	< 0.460	< 0.151	< 0.570	< 0.766	< 0.0696	0.167	< 0.294
Radium-228	pCi/L	NC	NA	NA	NA		< 0.824	< 1.05	--	< 0.732	< 0.792	< 0.845	< 0.729	< 0.306	< 0.333	0.498
Radium-226/228	pCi/L	5	NA	1.93	5		< 1.30	< 1.67	--	< 1.19	< 0.943	< 1.42	< 1.50	< 0.306	< 0.333	< 0.487
Selenium	ug/L	50	NA	5	50		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2

Notes:

ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional Screening Level from 83 FR 36435.
UTL - Upper Tolerance Limit (95%) of the background data set.
GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
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 CCR rules.
All metals were analyzed as total unless otherwise specified.
(1) pH value potentially biased high due to groundwater quality meter malfunction.
(2) April 2019 result not used for assessment monitoring.
(3) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.

Table B1
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-15034								
						Sample Date:	6/23/2017	8/15/2017	9/26/2017	4/25/2018	6/19/2018	11/14/2018	4/24/2019	10/8/2019	10/8/2019	4/14/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS										Field Dup	
Appendix III																
Boron	ug/L	NC	NA	51	NA		68.1	62.1	51.4	--	62.6	62.5	51	68	65	59
Calcium	mg/L	NC	NA	46	NA		5.5	5.9	6.0	--	5.8	6.0	5.4	5.4	5.1	5.10
Chloride	mg/L	250*	NA	43	NA		1.5	2.0	2.2	--	3.1	3.5	2.1	< 2.0	< 2.0	1.53
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	14	NA		12.6	16.5	< 2.0	--	12.5	14.4	12	15	15	11.5
Total Dissolved Solids	mg/L	500*	NA	258	NA		104	60	< 50.0	--	50	< 50.0	< 50	54	56	52
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		6.1	6.1	6.0	6.0(1)	6.0	5.9	5.9	6.1	--	5.4
Appendix IV																
Antimony	ug/L	6	NA	2	6		< 1.0	< 1.0	--	1.7	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Barium	ug/L	2,000	NA	35	2,000		5.4	5.5	--	5.3	5.5	6.0	5.5	6.5	6.6	13
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2
Chromium	ug/L	100	NA	2	100		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	1.2	< 1.0	< 1.0	< 1
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 6.0	< 15
Fluoride	ug/L	4,000	NA	1,000	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	NC	15	1	15		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Lithium	ug/L	NC	40	10	40		< 10	< 10	--	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2
Molybdenum	ug/L	NC	100	5	100		< 5.0	< 5.0	--	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5
Radium-226	pCi/L	NC	NA	NA	NA		< 0.607	< 0.763	--	< 0.775	< 0.514	< 0.688	< 0.0948	0.133	< 0.134	< 0.208
Radium-228	pCi/L	NC	NA	NA	NA		0.905	< 0.760	--	< 0.804	< 1.04	< 0.786	< 0.381	< 0.384	< 0.308	< 0.436
Radium-226/228	pCi/L	5	NA	1.93	5		1.49	< 1.52	--	< 1.58	< 1.55	< 1.47	< 0.381	< 0.384	< 0.308	< 0.436
Selenium	ug/L	50	NA	5	50		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional Screening Level from 83 FR 36435.
UTL - Upper Tolerance Limit (95%) of the background data set.
GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
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 CCR rules.
All metals were analyzed as total unless otherwise specified.
(1) pH value potentially biased high due to groundwater quality meter malfunction.
(2) April 2019 result not used for assessment monitoring.
(3) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.

Table B1
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:	6/23/2017	8/16/2017	9/26/2017	4/27/2018	6/20/2018	11/14/2018	4/24/2019	6/21/2019	6/21/2019	10/9/2019	4/14/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS										Field Dup		
Appendix III																	
Boron	ug/L	NC	NA	51	NA		121	116	126	--	111	78.2	91	--	--	78	64
Calcium	mg/L	NC	NA	46	NA		82.1	91.3	107	--	90.5	66.6	98	--	--	84	70.4
Chloride	mg/L	250*	NA	43	NA		28.3	33.9	35.9	--	27.1	20.00	23.00	--	--	24	15.0
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	--	--	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	14	NA		28.2	35.4	35.6	--	26.7	18.8	24	--	--	25	21.1
Total Dissolved Solids	mg/L	500*	NA	258	NA		314	578	512	--	342	274	360	--	--	370	300
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		7.2	7.0	7.0	8.0 (1)	7.0	7.3	7.2	7.1	--	7.2	7.2
Appendix IV																	
Antimony	ug/L	6	NA	2	6		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--	--	< 1.0	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--	--	< 1.0	< 1
Barium	ug/L	2,000	NA	35	2,000		15.8	19.4	--	17.4	18.1	12.3	17	--	--	16	17
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--	--	< 1.0	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	--	--	< 0.20	< 0.2
Chromium	ug/L	100	NA	2	100		1.1	< 1.0	--	4.8	< 1.0	< 1.0	290 (2)(3)	1.8 (3)	2.5 (3)	4.4	< 1
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	--	--	< 6.0	< 15
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	--	--	< 1,000	< 1,000
Lead	ug/L	NC	15	1	15		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--	--	< 1.0	< 1
Lithium	ug/L	NC	40	10	40		< 10	< 10	--	< 10	< 10	< 10	< 10	--	--	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	--	--	< 0.20	< 0.2
Molybdenum	ug/L	NC	100	5	100		< 5.0	< 5.0	--	< 5.0	< 5.0	< 5.0	11	--	--	< 5.0	< 5
Radium-226	pCi/L	NC	NA	NA	NA		< 0.452	< 1.08	--	< 0.733	< 0.548	< 0.850	< 0.101	--	--	0.203	< 0.217
Radium-228	pCi/L	NC	NA	NA	NA		0.899	0.952	--	0.937	1.27	< 0.914	< 0.357	--	--	< 0.567	0.560
Radium-226/228	pCi/L	5	NA	1.93	5		< 1.35	< 1.98	--	< 1.41	1.63	< 1.76	< 0.357	--	--	< 0.567	0.687
Selenium	ug/L	50	NA	5	50		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--	--	< 1.0	1
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	--	--	< 2.0	< 2

Notes:

ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional Screening Level from 83 FR 36435.
UTL - Upper Tolerance Limit (95%) of the background data set.
GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
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 CCR rules.
All metals were analyzed as total unless otherwise specified.
(1) pH value potentially biased high due to groundwater quality meter malfunction.
(2) April 2019 result not used for assessment monitoring.
(3) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.

Table B1
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:	6/23/2017	8/15/2017	9/26/2017	4/27/2018	6/20/2018	11/14/2018	4/24/2019	10/8/2019	4/14/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS										
Appendix III															
Boron	ug/L	NC	NA	51	NA		87.3	51.7	41.3	--	88.3	79.2	80	71	77
Calcium	mg/L	NC	NA	46	NA		69.4	39.6	34.5	--	64.8	51.6	50	55	51.1
Chloride	mg/L	250*	NA	43	NA		27.2	23.4	13.5	--	24.3	14.7	14	13	8.51
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	14	NA		29.4	20.3	14.9	--	26.1	20.0	19	24	17.4
Total Dissolved Solids	mg/L	500*	NA	258	NA		404	246	300	--	278	216	220	320	221
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		7.3	7.5	7.5	8.1(1)	7.1	7.4	7.4	7.5	7.3
Appendix IV															
Antimony	ug/L	6	NA	2	6		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Barium	ug/L	2,000	NA	35	2,000		10.9	7.2	--	8.9	11.5	8.2	8.4	9.4	9
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2
Chromium	ug/L	100	NA	2	100		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 15
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	1	15		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Lithium	ug/L	NC	40	10	40		< 10	< 10	--	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2
Molybdenum	ug/L	NC	100	5	100		< 5.0	< 5.0	--	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5
Radium-226	pCi/L	NC	NA	NA	NA		< 0.692	< 0.671	--	< 0.618	< 0.555	0.812	< 0.0882	0.160	< 0.198
Radium-228	pCi/L	NC	NA	NA	NA		< 0.783	< 1.21	--	< 0.626	< 0.743	< 0.670	< 0.384	< 0.441	0.581
Radium-226/228	pCi/L	5	NA	1.93	5		< 1.48	< 1.88	--	< 1.24	< 1.30	0.874	< 0.384	0.442	0.659
Selenium	ug/L	50	NA	5	50		< 1.0	< 1.0	--	1.6	< 1.0	< 1.0	< 1.0	1.9	< 1
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2

Notes:

ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional Screening Level from 83 FR 36435.
UTL - Upper Tolerance Limit (95%) of the background data set.
GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
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 CCR rules.
All metals were analyzed as total unless otherwise specified.
(1) pH value potentially biased high due to groundwater quality meter malfunction.
(2) April 2019 result not used for assessment monitoring.
(3) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.

Table B1
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:	6/23/2017	8/15/2017	9/26/2017	4/27/2018	6/20/2018	11/14/2018	4/24/2019	10/8/2019	4/14/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS										
Appendix III															
Boron	ug/L	NC	NA	51	NA		263	171	114	--	153	221	150	280	266
Calcium	mg/L	NC	NA	46	NA		94.6	83.8	76.0	--	72.6	103	73	110	100
Chloride	mg/L	250*	NA	43	NA		14.7	25.0	30.3	--	7.9	8.2	6.3	4.4	2.65
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	14	NA		41.3	52.3	45.3	--	36.3	50.1	22	46	25.9
Total Dissolved Solids	mg/L	500*	NA	258	NA		404	408	376	--	360	406	270	400	385
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		7.2	7.2	7.3	7.9(1)	7.1	7.3	7.3	7.3	7.1
Appendix IV															
Antimony	ug/L	6	NA	2	6		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Barium	ug/L	2,000	NA	35	2,000		15.1	13.4	--	11.5	11.7	14.3	9.7	14	15
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2
Chromium	ug/L	100	NA	2	100		< 1.0	< 1.0	--	< 1.0	< 1.0	1.6	1.7	1.2	< 1
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 15
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	1	15		< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Lithium	ug/L	NC	40	10	40		< 10	< 10	--	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2
Molybdenum	ug/L	NC	100	5	100		< 5.0	< 5.0	--	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5
Radium-226	pCi/L	NC	NA	NA	NA		< 0.733	< 0.685	--	< 0.549	< 0.648	< 0.578	< 0.0813	0.232	< 0.177
Radium-228	pCi/L	NC	NA	NA	NA		0.941	< 1.22	--	< 0.699	< 0.804	< 0.729	< 0.342	< 0.518	< 0.449
Radium-226/228	pCi/L	5	NA	1.93	5		< 1.40	< 1.91	--	< 1.25	< 1.45	< 1.31	0.403	< 0.518	< 0.449
Selenium	ug/L	50	NA	5	50		11.9	14.1	--	1.1	9.9	21.1	3.8	16	10
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2

Notes:

ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional Screening Level from 83 FR 36435.
UTL - Upper Tolerance Limit (95%) of the background data set.
GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
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 CCR rules.
All metals were analyzed as total unless otherwise specified.
(1) pH value potentially biased high due to groundwater quality meter malfunction.
(2) April 2019 result not used for assessment monitoring.
(3) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.

Appendix C
October 2020 Assessment Monitoring Statistical Evaluation

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Technical Memorandum

Date:	January 22, 2021
To:	Bethany Swanberg, Consumers Energy
From:	Sarah Holmstrom, TRC Kristin Lowery, TRC
Project No.:	367390.0000.0000 Phase 1 Task 4
Subject:	Statistical Evaluation of October 2020 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, 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 (JHC) Dry Ash Landfill. The second semiannual assessment monitoring event for 2020 was conducted on October 19 through 23, 2020. 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 2020 data indicates no constituents are present at statistically significant levels that exceed the GWPSs at the Dry Ash Landfill monitoring wells. 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 execute the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

Assessment Monitoring Statistical Evaluation

The compliance well network at the JHC Dry Ash Landfill CCR Unit consists of eleven monitoring wells (JHC-MW-15017 through JHC-MW-15019, JHC-MW-15022, and JHC-MW-15031 through

[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 per Phase One, Part One of the CCR Rule (83 FR 36435).

JHC-MW-15037) located on the south and east perimeters of the landfill Cells 1 through 4.

Following the semiannual assessment monitoring sampling event, compliance well data for the JHC 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 Appendix IV constituent, the concentrations from each well were first compared directly to the GWPS, as shown on Table C1. No parameter-well combinations included a direct exceedance of the GWPS within the past 8 events (August 2017 through October 2020) for data that met project data quality objectives[3]. Therefore, no confidence limits were calculated for the Dry Ash Landfill.

The direct comparison of the Appendix IV constituents shows no potential GWPS exceedances. These results are consistent with the results of the initial assessment monitoring data statistical

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

[3] Anomalously high chromium results were reported for JHC-MW-15022 and JHC-MW-15035 in April 2019. Reanalysis was conducted with similar results, but the relative percent difference (RPD) was above the acceptance criteria. The two wells were resampled in in June 2019 with results consistent with earlier sampling events. The June 2019 chromium concentrations are used for statistical analysis in lieu of the April 2019 results

evaluation and Consumers Energy will continue to initiate an assessment of corrective measures per §257.95(g). Consumers Energy will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

Attachments

Table C1 Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation

Table

Table C1
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:	8/16/2017	9/27/2017	4/26/2018	6/20/2018	11/13/2018	4/23/2019	10/8/2019	4/14/2020	10/21/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS										
Appendix III															
Boron	ug/L	NC	NA	51	NA		347	405	--	245	274	340	350	243	210
Calcium	mg/L	NC	NA	46	NA		56.3	44.8	--	44	60.9	81	77	64.4	54.9
Chloride	mg/L	250*	NA	43	NA		112	119	--	97	170	120	60	36.0	37.4
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	14	NA		84.2	101	--	60.6	72.0	100	92	69	62.9
Total Dissolved Solids	mg/L	500*	NA	258	NA		476	490	--	348	474	520	280	339	NA(4)
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		6.1	5.2	6.0(1)	6.0	6.1	6.1	6.3	5.6	5.9
Appendix IV															
Antimony	ug/L	6	NA	2	6		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000		103	--	79.7	80.0	85.5	70	47	34	22
Beryllium	ug/L	4	NA	1	4		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5		0.42	--	0.47	0.54	0.60	0.57	0.24	0.4	< 0.2
Chromium	ug/L	100	NA	2	100		< 1.0	--	< 1.0	< 1.0	< 1.0	12	< 1.0	< 1	1
Cobalt	ug/L	NC	6	15	15		< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 15	< 15
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	1	15		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Lithium	ug/L	NC	40	10	40		< 10	--	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100		10.6	--	8.3	6.2	28.5	11	10	16	21
Radium-226	pCi/L	NC	NA	NA	NA		< 0.917	--	1.17	< 0.785	< 1.05	0.176	0.259	< 0.209	0.335
Radium-228	pCi/L	NC	NA	NA	NA		1.51	--	0.773	2.74	< 0.910	0.827	0.384	0.566	< 0.414
Radium-226/228	pCi/L	5	NA	1.93	5		2.30	--	1.94	3.02	< 1.96	1.00	0.643	0.618	0.574
Selenium	ug/L	50	NA	5	50		27.4	--	18.2	18.5	18.8	16	14	16	15
Thallium	ug/L	2	NA	2	2		< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2

Notes:

ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional Screening Level from 83 FR 36435.
UTL - Upper Tolerance Limit (95%) of the background data set.
GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
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 CCR rules.
All metals were analyzed as total unless otherwise specified.
(1) pH value potentially biased high due to groundwater quality meter malfunction.
(2) April 2019 result not used for assessment monitoring.
(3) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.
(4) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table C1
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:	8/16/2017	8/16/2017	9/27/2017	9/27/2017	4/26/2018	6/20/2018	11/13/2018	4/23/2019	10/8/2019	4/14/2020	4/14/2020	10/21/2020	10/21/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS			Field Dup		Field Dup							Field Dup		Field Dup
Appendix III																			
Boron	ug/L	NC	NA	51	NA		133	139	127	130	--	117	115	130	170	142	148	167	165
Calcium	mg/L	NC	NA	46	NA		62.7	61	55.3	57	--	44.8	37.6	58	48	50.6	50.7	65.0	68.1
Chloride	mg/L	250*	NA	43	NA		43.7	43.6	41.5	41.6	--	31.9	33.2	43	44	28.5	28.3	35.9	34.5
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 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*	NA	14	NA		88.4	86.2	80.8	81.1	--	62.3	51.1	61	84	52.8	52.9	59.0	55.7
Total Dissolved Solids	mg/L	500*	NA	258	NA		390	350	310	468	--	194	276	320	370	405	287	441	NA(4)
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		6.3	--	6.3	--	6.2(1)	6.1	6.3	6.4	6.0	6.2	--	6.0	--
Appendix IV																			
Antimony	ug/L	6	NA	2	6		< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000		89.7	97.5	--	--	89.0	76.5	79.6	80	130	96	95	77	78
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20	0.29	0.2	0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100		< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	3	< 1	< 1
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	--	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 15	< 15	< 15	< 15
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 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	15	1	15		< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	40	10	40		< 10	< 10	--	--	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100		6.8	6.8	--	--	17.2	19.7	6.7	< 5.0	< 5.0	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NC	NA	NA	NA		0.667	1.15	--	--	< 0.656	< 0.692	< 0.760	0.217	0.348	< 0.209	< 0.220	< 0.367	< 0.684
Radium-228	pCi/L	NC	NA	NA	NA		1.24	0.935	--	--	< 0.572	< 1.14	< 0.918	< 0.476	0.390	< 0.575	< 0.561	< 0.632	< 0.427
Radium-226/228	pCi/L	5	NA	1.93	5		1.91	2.09	--	--	< 1.23	< 1.83	< 1.68	< 0.476	0.739	< 0.575	< 0.561	0.747	0.926
Selenium	ug/L	50	NA	5	50		13.9	13.9	--	--	12.7	9.9	8.2	12	15	12	13	14	13
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	--	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2	< 2	< 2

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional Screening Level from 83 FR 36435.
UTL - Upper Tolerance Limit (95%) of the background data set.
GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
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 CCR rules.
All metals were analyzed as total unless otherwise specified.
(1) pH value potentially biased high due to groundwater quality meter malfunction.
(2) April 2019 result not used for assessment monitoring.
(3) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.
(4) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table C1
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-15019							
						Sample Date:	8/16/2017	9/27/2017	4/26/2018	6/20/2018	11/14/2018	4/23/2019	10/8/2019	4/14/2020	10/21/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS										
Appendix III															
Boron	ug/L	NC	NA	51	NA		180	191	--	195	159	150	150	204	509
Calcium	mg/L	NC	NA	46	NA		53.1	58.3	--	64.1	30.4	45	34	43.2	81.6
Chloride	mg/L	250*	NA	43	NA		27	36.7	--	26.2	7.4	14	6.0	16.6	57.3
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	14	NA		42.6	48.8	--	40.8	19.8	25	23	45.7	91.0
Total Dissolved Solids	mg/L	500*	NA	258	NA		268	306	--	286	250	200	280	359	NA(4)
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		6.4	6.4	6.7(1)	6.6	6.0	6.5	6.4	5.9	5.9
Appendix IV															
Antimony	ug/L	6	NA	2	6		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000		40.0	--	63.6	44.6	53.5	46	58	97	144
Beryllium	ug/L	4	NA	1	4		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	0.3
Chromium	ug/L	100	NA	2	100		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	1
Cobalt	ug/L	NC	6	15	15		< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 15	< 15
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	1	15		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Lithium	ug/L	NC	40	10	40		< 10	--	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100		< 5.0	--	11.2	7.7	10.4	12	16	7	< 5
Radium-226	pCi/L	NC	NA	NA	NA		< 0.856	--	0.402	< 0.717	< 0.838	0.124	0.187	0.210	< 0.329
Radium-228	pCi/L	NC	NA	NA	NA		0.947	--	< 0.638	< 0.951	< 0.801	< 0.465	< 0.295	0.571	< 0.412
Radium-226/228	pCi/L	5	NA	1.93	5		< 1.75	--	0.911	< 1.67	< 1.64	< 0.465	0.327	0.781	0.632
Selenium	ug/L	50	NA	5	50		15.8	--	22.2	18.4	24.8	11	11	22	6
Thallium	ug/L	2	NA	2	2		< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2

Notes:

ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional Screening Level from 83 FR 36435.
UTL - Upper Tolerance Limit (95%) of the background data set.
GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
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 CCR rules.
All metals were analyzed as total unless otherwise specified.
(1) pH value potentially biased high due to groundwater quality meter malfunction.
(2) April 2019 result not used for assessment monitoring.
(3) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.
(4) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table C1
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-15022										
						Sample Date:	8/15/2017	9/27/2017	4/27/2018	6/20/2018	11/14/2018	11/14/2018	4/24/2019	4/24/2019	6/21/2019	10/9/2019	4/14/2020	10/21/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS							Field Dup		Field Dup				
Appendix III																		
Boron	ug/L	NC	NA	51	NA		376	340	--	315	376	374	360	360	--	330	311	146
Calcium	mg/L	NC	NA	46	NA		122	103	--	109	109	106	110	110	--	130	119	66.9
Chloride	mg/L	250*	NA	43	NA		1.6	2.4	--	3.5	3.7	3.8	2.7	2.7	--	< 2.0	< 1.00	5.39
Fluoride	ug/L	4,000	NA	1,000	NA		< 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*	NA	14	NA		35	43.7	--	26	40.6	40.7	37	37	--	37	14.2	33.3
Total Dissolved Solids	mg/L	500*	NA	258	NA		466	406	--	414	358	400	410	400	--	540	405	NA[(4)]
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		7.0	7.0	7.6[(1)]	6.9	7.0	--	7.0	--	7.1	7.0	6.8	7.0
Appendix IV																		
Antimony	ug/L	6	NA	2	6		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1.0	< 1	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1.0	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000		26.8	--	20.3	21.2	21.3	22.6	23	22	--	26	23	14
Beryllium	ug/L	4	NA	1	4		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1.0	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--	< 0.20	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100		< 1.0	--	1.3	< 1.0	1.7	1.5	82 [(2)(3)]	63 [(3)]	2.2 [(3)]	5.9	< 1	1
Cobalt	ug/L	NC	6	15	15		< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 6.0	--	< 6.0	< 15	< 15
Fluoride	ug/L	4,000	NA	1,000	4,000		< 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	15	1	15		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1.0	< 1	< 1
Lithium	ug/L	NC	40	10	40		< 10	--	< 10	< 10	< 10	< 10	< 10	< 10	--	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--	< 0.20	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100		5.3	--	5.2	< 5.0	6.5	6.0	7.2	6.4	--	5.2	< 5	18
Radium-226	pCi/L	NC	NA	NA	NA		< 0.861	--	< 0.431	< 0.673	< 0.692	<0.924	< 0.0968	< 0.0955	--	0.190	< 0.281	< 0.386
Radium-228	pCi/L	NC	NA	NA	NA		< 1.03	--	< 0.583	< 0.697	0.999	< 0.849	< 0.505	< 0.470	--	< 0.480	< 0.443	< 0.304
Radium-226/228	pCi/L	5	NA	1.93	5		< 1.89	--	< 1.01	< 1.37	< 1.35	< 1.77	< 0.505	< 0.470	--	< 0.480	< 0.443	< 0.386
Selenium	ug/L	50	NA	5	50		4.1	--	4.1	2.8	5.6	5.2	7.2	7.4	--	6.4	3	7
Thallium	ug/L	2	NA	2	2		< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	--	< 2.0	< 2	< 2

Notes:

ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional Screening Level from 83 FR 36435.
UTL - Upper Tolerance Limit (95%) of the background data set.
GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
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 CCR rules.
All metals were analyzed as total unless otherwise specified.
(1) pH value potentially biased high due to groundwater quality meter malfunction.
(2) April 2019 result not used for assessment monitoring.
(3) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.
(4) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table C1
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:	8/16/2017	8/16/2017	9/27/2017	9/27/2017	4/27/2018	6/20/2018	11/14/2018	4/24/2019	10/9/2019	4/14/2020	10/21/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS			Field Dup		Field Dup							
Appendix III																	
Boron	ug/L	NC	NA	51	NA		97	< 100	95.6	99.5	--	108	104	79	85	75	114
Calcium	mg/L	NC	NA	46	NA		62.5	67.5	68.5	67.2	--	66.9	63.3	59	57	49.8	56.1
Chloride	mg/L	250*	NA	43	NA		48.1	48.5	47.5	47.1	--	38.9	33.4	24	28	20.1	25.0
Fluoride	ug/L	4,000	NA	1,000	NA		< 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*	NA	14	NA		40.9	41.2	38.9	38.7	--	40	34.7	25	26	23.5	35.1
Total Dissolved Solids	mg/L	500*	NA	258	NA		454	454	386	452	--	352	268	280	220	266	NA(4)
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		6.8	--	6.8	--	7.6(1)	6.8	6.7	6.9	6.9	6.7	6.4
Appendix IV																	
Antimony	ug/L	6	NA	2	6		< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000		19.2	18.9	--	--	15.4	18.9	21.4	14	17	17	20
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100		1.7	1.1	--	--	< 1.0	< 1.0	24.6	5.4	1.9	< 1	3
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	--	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 15	< 15
Fluoride	ug/L	4,000	NA	1,000	4,000		< 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	15	1	15		< 1.0	< 1.0	--	--	< 1.0	< 1.0	1.3	< 1.0	< 1.0	< 1	< 1
Lithium	ug/L	NC	40	10	40		< 10	< 10	--	--	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100		< 5.0	< 5.0	--	--	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5	< 5
Radium-226	pCi/L	NC	NA	NA	NA		< 0.423	0.675	--	--	< 0.479	< 0.638	0.849	0.102	0.199	< 0.210	< 0.358
Radium-228	pCi/L	NC	NA	NA	NA		< 1.05	< 0.894	--	--	< 0.708	< 1.02	< 0.773	< 0.427	0.600	< 0.412	< 0.412
Radium-226/228	pCi/L	5	NA	1.93	5		< 1.47	1.33	--	--	< 1.19	< 1.66	< 1.50	0.466	0.798	< 0.412	< 0.412
Selenium	ug/L	50	NA	5	50		< 1.0	1.9	--	--	4.0	3.0	2.4	< 1.0	< 1.0	2	3
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	--	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2

Notes:

ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional Screening Level from 83 FR 36435.
UTL - Upper Tolerance Limit (95%) of the background data set.
GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
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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 CCR rules.
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(3) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.
(4) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table C1
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-15032									
					Sample Date:	8/15/2017	9/26/2017	4/26/2018	6/19/2018	6/19/2018	11/14/2018	4/24/2019	10/8/2019	4/14/2020	10/21/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS					Field Dup					
Appendix III															
Boron	ug/L	NC	NA	51	NA	62.4	57.8	--	45.7	44.6	49.4	< 50	58	45	45
Calcium	mg/L	NC	NA	46	NA	7	6.8	--	8.8	8.4	8.1	9.4	7.9	8.76	10.8
Chloride	mg/L	250*	NA	43	NA	3	3.2	--	3.4	3.4	4.2	2.6	2.3	1.76	1.66
Fluoride	ug/L	4,000	NA	1,000	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	14	NA	16.3	< 2.0	--	11.8	11.6	11.9	11	12	9.60	11.3
Total Dissolved Solids	mg/L	500*	NA	258	NA	< 50.0	84	--	64	< 50.0	< 50.0	53	68	101	NA(4)
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA	6.1	6.0	5.9(1)	6.3	--	6.2	6.3	6.3	6.1	5.8
Appendix IV															
Antimony	ug/L	6	NA	2	6	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Arsenic	ug/L	10	NA	1	10	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000	9.1	--	7.8	8.8	8.7	7.7	8.3	7.9	8	8
Beryllium	ug/L	4	NA	1	4	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Cobalt	ug/L	NC	6	15	15	< 15.0	--	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 15	< 15
Fluoride	ug/L	4,000	NA	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1000
Lead	ug/L	NC	15	1	15	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Lithium	ug/L	NC	40	10	40	< 10	--	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100	< 5.0	--	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5	< 5
Radium-226	pCi/L	NC	NA	NA	NA	< 0.973	--	< 0.514	< 0.464	< 0.722	< 0.748	< 0.118	0.157	< 0.228	< 0.407
Radium-228	pCi/L	NC	NA	NA	NA	< 0.923	--	< 0.784	< 0.721	< 1.17	< 0.812	< 0.395	< 0.347	< 0.473	< 0.422
Radium-226/228	pCi/L	5	NA	1.93	5	< 1.90	--	< 1.30	< 1.19	< 1.89	< 1.56	< 0.395	0.427	< 0.473	< 0.422
Selenium	ug/L	50	NA	5	50	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Thallium	ug/L	2	NA	2	2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional Screening Level from 83 FR 36435.
UTL - Upper Tolerance Limit (95%) of the background data set.
GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
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 CCR rules.
All metals were analyzed as total unless otherwise specified.
(1) pH value potentially biased high due to groundwater quality meter malfunction.
(2) April 2019 result not used for assessment monitoring.
(3) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.
(4) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table C1
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-15033									
					Sample Date:	8/15/2017	9/26/2017	4/26/2018	4/26/2018	6/19/2018	11/14/2018	4/24/2019	10/8/2019	4/14/2020	10/21/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS										
Appendix III									Field Dup						
Boron	ug/L	NC	NA	51	NA	30.8	34.1	--	--	33	41.8	< 50	51	51	54
Calcium	mg/L	NC	NA	46	NA	9.6	10.1	--	--	9	10.0	10	11	12.0	14.2
Chloride	mg/L	250*	NA	43	NA	1.1	1.4	--	--	3.4	3.2	< 2.0	2.6	1.41	2.65
Fluoride	ug/L	4,000	NA	1,000	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	14	NA	9.7	< 2.0	--	--	8.1	9.2	9.5	12	10.8	11.0
Total Dissolved Solids	mg/L	500*	NA	258	NA	126	< 50.0	--	--	68	< 50.0	58	71	59	NA(4)
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA	6.8	6.7	6.8(1)	--	6.7	6.7	6.7	6.9	6.6	6.4
Appendix IV															
Antimony	ug/L	6	NA	2	6	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Arsenic	ug/L	10	NA	1	10	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000	4.6	--	4.8	4.3	5.2	6.1	< 5.0	5.4	6	6
Beryllium	ug/L	4	NA	1	4	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Cobalt	ug/L	NC	6	15	15	< 15.0	--	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 15	< 15
Fluoride	ug/L	4,000	NA	1,000	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	NC	15	1	15	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Lithium	ug/L	NC	40	10	40	< 10	--	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100	< 5.0	--	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5	< 5
Radium-226	pCi/L	NC	NA	NA	NA	< 0.617	--	< 0.460	< 0.151	< 0.570	< 0.766	< 0.0696	0.167	< 0.294	< 0.346
Radium-228	pCi/L	NC	NA	NA	NA	< 1.05	--	< 0.732	< 0.792	< 0.845	< 0.729	< 0.306	< 0.333	0.498	< 0.397
Radium-226/228	pCi/L	5	NA	1.93	5	< 1.67	--	< 1.19	< 0.943	< 1.42	< 1.50	< 0.306	< 0.333	< 0.487	< 0.397
Selenium	ug/L	50	NA	5	50	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Thallium	ug/L	2	NA	2	2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2

Notes:

ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional Screening Level from 83 FR 36435.
UTL - Upper Tolerance Limit (95%) of the background data set.
GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
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 CCR rules.
All metals were analyzed as total unless otherwise specified.
(1) pH value potentially biased high due to groundwater quality meter malfunction.
(2) April 2019 result not used for assessment monitoring.
(3) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.
(4) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table C1
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-15034								
						Sample Date:	8/15/2017	9/26/2017	4/25/2018	6/19/2018	11/14/2018	4/24/2019	10/8/2019	10/8/2019	4/14/2020	10/21/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS									Field Dup		
Appendix III																
Boron	ug/L	NC	NA	51	NA		62.1	51.4	--	62.6	62.5	51	68	65	59	57
Calcium	mg/L	NC	NA	46	NA		5.9	6	--	5.8	6.0	5.4	5.4	5.1	5.10	8.99
Chloride	mg/L	250*	NA	43	NA		2	2.2	--	3.1	3.5	2.1	< 2.0	< 2.0	1.53	1.82
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	14	NA		16.5	< 2.0	--	12.5	14.4	12	15	15	11.5	15.7
Total Dissolved Solids	mg/L	500*	NA	258	NA		60	< 50.0	--	50	< 50.0	< 50	54	56	52	NA(4)
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		6.1	6.0	6.0(1)	6.0	5.9	5.9	6.1	--	5.4	5.8
Appendix IV																
Antimony	ug/L	6	NA	2	6		< 1.0	--	1.7	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000		5.5	--	5.3	5.5	6.0	5.5	6.5	6.6	13	6
Beryllium	ug/L	4	NA	1	4		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100		< 1.0	--	< 1.0	< 1.0	< 1.0	1.2	< 1.0	< 1.0	< 1	< 1
Cobalt	ug/L	NC	6	15	15		< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 6.0	< 15	< 15
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1000
Lead	ug/L	NC	15	1	15		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Lithium	ug/L	NC	40	10	40		< 10	--	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100		< 5.0	--	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5	< 5
Radium-226	pCi/L	NC	NA	NA	NA		< 0.763	--	< 0.775	< 0.514	< 0.688	< 0.0948	0.133	< 0.134	< 0.208	< 0.295
Radium-228	pCi/L	NC	NA	NA	NA		< 0.760	--	< 0.804	< 1.04	< 0.786	< 0.381	< 0.384	< 0.308	< 0.436	< 0.386
Radium-226/228	pCi/L	5	NA	1.93	5		< 1.52	--	< 1.58	< 1.55	< 1.47	< 0.381	< 0.384	< 0.308	< 0.436	< 0.386
Selenium	ug/L	50	NA	5	50		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Thallium	ug/L	2	NA	2	2		< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional Screening Level from 83 FR 36435.
UTL - Upper Tolerance Limit (95%) of the background data set.
GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
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 CCR rules.
All metals were analyzed as total unless otherwise specified.
(1) pH value potentially biased high due to groundwater quality meter malfunction.
(2) April 2019 result not used for assessment monitoring.
(3) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.
(4) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table C1
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:	8/16/2017	9/26/2017	4/27/2018	6/20/2018	11/14/2018	4/24/2019	6/21/2019	6/21/2019	10/9/2019	4/14/2020	10/22/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS									Field Dup			
Appendix III																	
Boron	ug/L	NC	NA	51	NA		116	126	--	111	78.2	91	--	--	78	64	60
Calcium	mg/L	NC	NA	46	NA		91.3	107	--	90.5	66.6	98	--	--	84	70.4	65.7
Chloride	mg/L	250*	NA	43	NA		33.9	35.9	--	27.1	20.00	23.00	--	--	24	15.0	10.9
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	--	--	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	14	NA		35.4	35.6	--	26.7	18.8	24	--	--	25	21.1	19.6
Total Dissolved Solids	mg/L	500*	NA	258	NA		578	512	--	342	274	360	--	--	370	300	NA(4)
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		7.0	7.0	8.0(1)	7.0	7.3	7.2	7.1	--	7.2	7.2	7.2
Appendix IV																	
Antimony	ug/L	6	NA	2	6		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--	--	< 1.0	< 1	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--	--	< 1.0	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000		19.4	--	17.4	18.1	12.3	17	--	--	16	17	13
Beryllium	ug/L	4	NA	1	4		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--	--	< 1.0	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	--	--	< 0.20	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100		< 1.0	--	4.8	< 1.0	< 1.0	290 (2)(3)	1.8 (3)	2.5 (3)	4.4	< 1	< 1
Cobalt	ug/L	NC	6	15	15		< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	--	--	< 6.0	< 15	< 15
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	--	--	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	1	15		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--	--	< 1.0	< 1	< 1
Lithium	ug/L	NC	40	10	40		< 10	--	< 10	< 10	< 10	< 10	--	--	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	--	--	< 0.20	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100		< 5.0	--	< 5.0	< 5.0	< 5.0	11	--	--	< 5.0	< 5	< 5
Radium-226	pCi/L	NC	NA	NA	NA		< 1.08	--	< 0.733	< 0.548	< 0.850	< 0.101	--	--	0.203	< 0.217	< 0.647
Radium-228	pCi/L	NC	NA	NA	NA		0.952	--	0.937	1.27	< 0.914	< 0.357	--	--	< 0.567	0.560	< 0.440
Radium-226/228	pCi/L	5	NA	1.93	5		< 1.98	--	< 1.41	1.63	< 1.76	< 0.357	--	--	< 0.567	0.687	< 0.647
Selenium	ug/L	50	NA	5	50		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--	--	< 1.0	1	2
Thallium	ug/L	2	NA	2	2		< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	--	--	< 2.0	< 2	< 2

Notes:

ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional Screening Level from 83 FR 36435.
UTL - Upper Tolerance Limit (95%) of the background data set.
GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
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 CCR rules.
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(4) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table C1
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:	8/15/2017	9/26/2017	4/27/2018	6/20/2018	11/14/2018	4/24/2019	10/8/2019	4/14/2020	10/22/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS										
Appendix III															
Boron	ug/L	NC	NA	51	NA		51.7	41.3	--	88.3	79.2	80	71	77	81
Calcium	mg/L	NC	NA	46	NA		39.6	34.5	--	64.8	51.6	50	55	51.1	59.3
Chloride	mg/L	250*	NA	43	NA		23.4	13.5	--	24.3	14.7	14	13	8.51	10.4
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	14	NA		20.3	14.9	--	26.1	20.0	19	24	17.4	21.9
Total Dissolved Solids	mg/L	500*	NA	258	NA		246	300	--	278	216	220	320	221	NA(4)
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		7.5	7.5	8.1(1)	7.1	7.4	7.4	7.5	7.3	7.3
Appendix IV															
Antimony	ug/L	6	NA	2	6		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000		7.2	--	8.9	11.5	8.2	8.4	9.4	9	9
Beryllium	ug/L	4	NA	1	4		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Cobalt	ug/L	NC	6	15	15		< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 15	< 15
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	1	15		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Lithium	ug/L	NC	40	10	40		< 10	--	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100		< 5.0	--	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5	< 5
Radium-226	pCi/L	NC	NA	NA	NA		< 0.671	--	< 0.618	< 0.555	0.812	< 0.0882	0.160	< 0.198	< 0.554
Radium-228	pCi/L	NC	NA	NA	NA		< 1.21	--	< 0.626	< 0.743	< 0.670	< 0.384	< 0.441	0.581	< 0.367
Radium-226/228	pCi/L	5	NA	1.93	5		< 1.88	--	< 1.24	< 1.30	0.874	< 0.384	0.442	0.659	< 0.554
Selenium	ug/L	50	NA	5	50		< 1.0	--	1.6	< 1.0	< 1.0	< 1.0	1.9	< 1	< 1
Thallium	ug/L	2	NA	2	2		< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional Screening Level from 83 FR 36435.
UTL - Upper Tolerance Limit (95%) of the background data set.
GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
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 CCR rules.
All metals were analyzed as total unless otherwise specified.
(1) pH value potentially biased high due to groundwater quality meter malfunction.
(2) April 2019 result not used for assessment monitoring.
(3) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.
(4) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table C1
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:	8/15/2017	9/26/2017	4/27/2018	6/20/2018	11/14/2018	4/24/2019	10/8/2019	4/14/2020	10/22/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS										
Appendix III															
Boron	ug/L	NC	NA	51	NA		171	114	--	153	221	150	280	266	185
Calcium	mg/L	NC	NA	46	NA		83.8	76	--	72.6	103	73	110	100	93.4
Chloride	mg/L	250*	NA	43	NA		25	30.3	--	7.9	8.2	6.3	4.4	2.65	7.52
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	14	NA		52.3	45.3	--	36.3	50.1	22	46	25.9	53.5
Total Dissolved Solids	mg/L	500*	NA	258	NA		408	376	--	360	406	270	400	385	NA(4)
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		7.2	7.3	7.9(1)	7.1	7.3	7.3	7.3	7.1	7.0
Appendix IV															
Antimony	ug/L	6	NA	2	6		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000		13.4	--	11.5	11.7	14.3	9.7	14	15	14
Beryllium	ug/L	4	NA	1	4		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100		< 1.0	--	< 1.0	< 1.0	1.6	1.7	1.2	< 1	< 1
Cobalt	ug/L	NC	6	15	15		< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 15	< 15
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	1	15		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Lithium	ug/L	NC	40	10	40		< 10	--	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100		< 5.0	--	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5	< 5
Radium-226	pCi/L	NC	NA	NA	NA		< 0.685	--	< 0.549	< 0.648	< 0.578	< 0.0813	0.232	< 0.177	< 0.535
Radium-228	pCi/L	NC	NA	NA	NA		< 1.22	--	< 0.699	< 0.804	< 0.729	< 0.342	< 0.518	< 0.449	< 0.400
Radium-226/228	pCi/L	5	NA	1.93	5		< 1.91	--	< 1.25	< 1.45	< 1.31	0.403	< 0.518	< 0.449	< 0.535
Selenium	ug/L	50	NA	5	50		14.1	--	1.1	9.9	21.1	3.8	16	10	12
Thallium	ug/L	2	NA	2	2		< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2

Notes:

ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
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