



# 2021 Annual Groundwater Monitoring and Corrective Action Report

**JH Campbell Power Plant  
Dry Ash Landfill**

**West Olive, Michigan**

January 2022

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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, 2021 to December 31, 2021 and document the status of groundwater monitoring and corrective action for 2021 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 eight semiannual statistical evaluations performed to date, included those in the 2021 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 2022.

## 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 2021 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 2021 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 seven subsequent assessment monitoring evaluations, including those in the 2021 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 2021 are presented in this report.

## 1.2 Site Overview

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

The existing Dry Ash Landfill is a double-composite geomembrane lined landfill which is licensed and permitted for CCR disposal and includes two double-lined leachate and contact water retention ponds. Site features are shown on Figure 2.

Dry, moisture-conditioned CCR from the three coal fired electric generating units is managed in the licensed Dry Ash Landfill which is regulated under Part 115 of the 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)<sup>1</sup>-approved *Hydrogeological Monitoring Plan (HMP) for JH Campbell Ash Storage Facility, Consumers Power Company, Solid Waste Disposal Area, Coal Ash, Type III* (September 1996).

Bottom ash is currently sluiced to concrete tanks where it is dewatered. The settled and dewatered bottom ash is beneficially reused or managed at the Dry Ash Landfill. The facility consists of the existing CCR landfill Cells 1 through 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 majority of the eastern half of Cell 2 have been closed along with Cell 3. Partial cover has been constructed over Cell 4. Cell 5 was constructed in 2018 and put into service in 2019. Cell 6 is under construction. The construction permit inclusive of Cells 6-9 was

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

approved by the EGLE on November 30, 2021.

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

## 2.0 Groundwater Monitoring

### 2.1 Monitoring Well Network

In accordance with 40 CFR 257.91, Consumers Energy established a groundwater monitoring system for the JHC Dry Ash Landfill, which currently consists of 16 monitoring wells (6 background monitoring wells and 10 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. Changes to the Dry Ash Landfill monitoring well network include the decommissioning of monitoring well JHC-MW-15019. Monitoring well JHC-MW-15019 was decommissioned on May 25, 2021 to accommodate Cell 6 construction. The monitoring well decommissioning log is presented in Appendix A.

### 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 2021 was performed on April 12 through 14, 2021 and the second semiannual groundwater assessment monitoring event for 2021 was performed on October 19 through 22, 2021. Both events were performed by Consumers Energy, and samples were analyzed by Consumers Energy Laboratory Services in Jackson, Michigan, with radium samples analyzed by TestAmerica Laboratories in St Louis, Missouri in accordance with the SAP. As mentioned above, monitoring well JHC-MW-15019 was decommissioned on May 25, 2021 to accommodate Cell 6 construction; therefore, a water level and sample was not collected in the second semiannual 2021 monitoring event. Static water elevation data were collected at all other monitoring well locations. Groundwater samples were collected from the 6 background monitoring wells during both events and 11 downgradient monitoring wells for the Appendix III and Appendix IV constituents and field parameters during the first semiannual event and 10 downgradient monitoring wells during the second semiannual event.

A summary of the groundwater data collected during the April and October 2021 events are provided on Table 1 (static groundwater elevation data), Table 2 (field data), Table 3 (background analytical results), and Table 4 (Dry Ash Landfill analytical results).

### **2.2.2 Data Quality Review**

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

### **2.2.3 Groundwater Flow Rate and Direction**

Groundwater elevations measured across the Site during the April and October 2021 events are provided on Table 1. April 2021 and October 2021 groundwater elevations were used to construct the groundwater contour maps provided on Figure 3 and Figure 4, respectively. The average hydraulic gradient of 0.0038 ft/ft in April 2021 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). The average hydraulic gradient of 0.0036 ft/ft in October 2021 was calculated using the following well pairs: JHC-MW-15026/PZ-23S, MW-15017/PZ-24S, and JHC-MW-15024/JHC-MW-15031 (Figure 2). 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 0.59 ft/day or 215 ft/year for the April 2021 event, and approximately 0.56 ft/day or 200 ft/year for the October 2021 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 2021 groundwater data in accordance with the assessment monitoring program. The statistical evaluation details are provided in Appendix C (*April 2021 Assessment Monitoring Data Summary and Statistical Evaluation*) and Appendix D (*October 2021 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 *2020 Annual Groundwater Monitoring Report, Consumers Energy, JH Campbell Site, Dry Ash Landfill CCR Unit (2020 Annual Report)* (TRC, January 2021), the statistical data comparison for the 2020 semiannual assessment monitoring events indicated that no Appendix IV constituents were present at statistically significant levels exceeding the GWPSs. Therefore, assessment monitoring continued in 2021.

The statistical data comparison for the April 2021 (Appendix C) and October 2021 (Appendix D) 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 2022 per §257.95(d).

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#### 4.0 Corrective Action

There were no corrective actions needed or performed for the Dry Ash Landfill within the calendar year 2021. 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.

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## 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 2022 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 2022.

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## 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.
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- 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 2021  
 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 12, 2021		October 19, 2021		
					Depth to Water (ft BTOC)	Groundwater Elevation (ft)	Depth to Water (ft BTOC)	Groundwater Elevation (ft)	
<b>Background</b>									
JHC-MW-15023	617.01	619.98	Sand	603.0 to 593.0	17.63	602.35	19.00	600.98	
JHC-MW-15024	613.79	616.62	Sand	606.8 to 596.8	12.92	603.70	14.15	602.47	
JHC-MW-15025	614.14	617.17	Sand	607.1 to 597.1	12.12	605.05	13.36	603.81	
JHC-MW-15026	615.09	618.04	Sand	607.1 to 597.1	13.85	604.19	15.11	602.93	
JHC-MW-15027	614.77	617.30	Sand	604.8 to 594.8	14.22	603.08	15.47	601.83	
JHC-MW-15028	611.02	613.80	Sand	603.0 to 593.0	14.03	599.77	15.06	598.74	
JHC-MW-15029	608.08	610.95	Sand	600.1 to 590.1	11.55	599.40	12.11	598.84	
JHC-MW-15030	604.05	607.17	Sand	600.1 to 590.1	9.58	597.59	10.32	596.85	
<b>Pond 1N, 1S, 2N, 2S</b>									
JHC-MW-15001	607.02	609.53	Sand	603.5 to 598.5	11.49	598.04	Dry		
JHC-MW-15002	618.18	621.27	Sand	590.2 to 580.2	25.16	596.11	25.35	595.92	
JHC-MW-15003	623.16	627.20	Sand	595.2 to 585.2	33.31	593.89	33.47	593.73	
JHC-MW-15005	606.22	609.99	Sand	579.2 to 569.2	18.50	591.49	18.50	591.49	
JHC-MW-18004	602.92	605.72	Sand	596.9 to 586.9	12.37	593.35	12.69	593.03	
JHC-MW-18005	600.30	603.16	Sand	595.3 to 585.3	10.50	592.66	11.90	591.26	
<b>Pond 3N, 3S</b>									
JHC-MW-15013	632.40	635.25	Sand	604.4 to 594.4	35.75	599.50	35.91	599.34	
JHC-MW-15015	632.46	635.20	Sand	604.5 to 594.5	35.07	600.13	35.30	599.90	
JHC-MW-15016	631.81	632.52	Sand	603.8 to 593.8	32.44	600.08	33.71	598.81 <sup>(5)</sup>	
JHC-MW-18001	609.09	611.98	Sand	603.1 to 593.1	12.52	599.46	12.85	599.13	
JHC-MW-18002	605.53	608.93	Sand	602.0 to 592.0	9.48	599.45	9.67	599.26	
JHC-MW-18003	605.36	608.78	Sand	601.9 to 591.9	9.38	599.40	9.61	599.17	
<b>Landfill</b>									
JHC-MW-15017	613.69	616.61	Sand	603.7 to 593.7	15.57	601.04 <sup>(3)</sup>	16.40	600.21	
JHC-MW-15018	614.26	617.02	Sand	604.3 to 594.3	16.30	600.72 <sup>(3)</sup>	17.05	599.97	
JHC-MW-15019	609.81	612.86	Sand	603.8 to 593.8	12.64	600.22 <sup>(3)</sup>	Decommissioned		
JHC-MW-15022	620.92	623.79	Sand	597.9 to 587.9	28.76	595.03 <sup>(4)</sup>	29.53	594.26	
JHC-MW-15031	632.94	635.87	Sand	599.9 to 589.9	43.31	592.56 <sup>(4)</sup>	43.65	592.22	
JHC-MW-15032	611.32	614.29	Sand	598.3 to 588.3	16.98	597.31 <sup>(3)</sup>	17.99	596.30	
JHC-MW-15033	618.08	620.99	Sand	602.1 to 592.1	21.82	599.17 <sup>(3)</sup>	23.03	597.96	
JHC-MW-15034	612.90	615.97	Sand	601.9 to 591.9	15.71	600.26 <sup>(3)</sup>	16.97	599.00	
JHC-MW-15035	632.53	634.28	Sand	599.5 to 589.5	40.75	593.53	41.11	593.17	
JHC-MW-15036	617.94	618.34	Sand	597.9 to 587.9	26.70	591.64	27.13	591.21	
JHC-MW-15037	614.28	616.06	Sand	591.3 to 586.3	25.05	591.01	25.55	590.51	
<b>Pond A</b>									
JHC-MW-15006	624.74	627.58	Sand	599.7 to 589.7	35.22	592.36	35.91	591.67	
JHC-MW-15007	624.82	627.70	Sand	602.8 to 592.8	Dry		Decommissioned		
JHC-MW-15007R <sup>(2)</sup>	625.73	628.26	Sand	595.7 to 585.7	Not Installed		37.00	591.26	
JHC-MW-15008R <sup>(1)</sup>	632.32	634.67	Sand	597.3 to 587.3	43.24	591.43	44.04	590.63	
JHC-MW-15009	632.33	635.32	Sand	602.3 to 592.3	Dry		Decommissioned		
JHC-MW-15009R <sup>(2)</sup>	632.15	635.05	Sand	595.2 to 585.2	Not Installed		43.87	591.18	
JHC-MW-15010	632.55	635.57	Sand	602.6 to 592.6	Dry		Decommissioned		
JHC-MW-15011	627.71	630.83	Sand	600.7 to 590.7	38.87	591.96	Decommissioned		
JHC-MW-15011R <sup>(2)</sup>	627.73	629.79	Sand	594.7 to 584.7	Not Installed		38.29	591.50	
<b>Downgradient Wells</b>									
MW-13	593.40	595.37	Clayey Silt	587.9 to 585.4	Dry		Dry		
MW-14S	587.36	590.98	Sand	582.9 to 577.9	9.60	581.38	10.02	580.96	
PZ-23S	602.84	604.97	Sand	591.8 to 586.8	15.96	589.01	15.61	589.36	
PZ-24S	586.56	590.15	Sand	584.6 to 579.6	7.23	582.92	8.59	581.56	
PZ-40S	589.51	593.25	Sand	585.5 to 575.5	10.83	582.42	11.99	581.26	
TW-19-04A	608.15	611.44	Sand	591.2 to 586.2	22.34	589.10	23.00	588.44	
TW-19-05	603.44	606.36	Sand	592.8 to 587.8	16.03	590.33	17.09	589.27	
TW-19-06A	599.61	602.54	Sand	592.3 to 587.3	13.18	589.36	14.13	588.41	

**Notes:**

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

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

TOC: Top of well casing.

ft BTOC: Feet below top of well casing.

--: Not measured

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

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

(3) Static water level data collected on April 13, 2021.

(4) Static water level data collected on April 14, 2021.

(5) Static water level data collected on October 20, 2021.

**Table 2**  
 Summary of Field Parameter Results – April & October 2021  
 JH Campbell Dry Ash Landfill – RCRA CCR Monitoring Program  
 West Olive, Michigan

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (SU)	Specific Conductivity (umhos/cm)	Temperature (°C)	Turbidity (NTU)
<b>Background</b>							
JHC-MW-15023	4/12/2021	0.71	242.9	5.3	108	10.8	3.40
	10/20/2021	0.93	208.3	5.8	91	13.8	2.08
JHC-MW-15024	4/13/2021	0.43	171.4	6.8	322	9.3	3.40
	10/20/2021	0.79	124.8	7.0	422	12.4	4.50
JHC-MW-15025	4/13/2021	1.53	209.8	6.7	254	7.5	2.50
	10/19/2021	0.74	144.5	7.8	340	13.1	4.53
JHC-MW-15026	4/13/2021	3.12	224.3	5.6	84	8.5	5.00
	10/19/2021	0.50	181.6	5.7	45	14.5	2.33
JHC-MW-15027	4/13/2021	1.75	130.7	5.7	76	7.9	5.70
	10/19/2021	0.63	69.4	5.9	107	16.0	8.34
JHC-MW-15028	4/12/2021	5.16	166.8	7.6	114	9.2	5.30
	10/19/2021	2.32	52.6	8.3	159	14.8	4.91
<b>Landfill</b>							
JHC-MW-15017	4/13/2021	1.16	141.0	6.1	516	10.4	2.20
	10/21/2021	0.84	144.1	6.49	515	12.9	3.18
JHC-MW-15018	4/13/2021	0.96	182.6	5.9	653	10.7	2.60
	10/21/2021	1.30	155.0	6.03	525	12.9	6.20
JHC-MW-15019 <sup>(1)</sup>	4/13/2021	1.81	184.4	6.1	705	10.1	3.60
JHC-MW-15022	4/14/2021	6.59	252.8	6.4	647	9.0	3.40
	10/21/2021	4.64	111.7	6.94	588	11.5	2.30
JHC-MW-15031	4/13/2021	0.62	-23.8	7.1	425	13.9	2.00
	10/22/2021	0.92	92.5	7.34	431	13.5	0.01
JHC-MW-15032	4/13/2021	1.55	214.4	5.6	69	9.1	6.00
	10/21/2021	3.37	240.7	5.47	98	13.8	2.77
JHC-MW-15033	4/13/2021	3.07	200.0	6.2	97	10.0	8.50
	10/21/2021	3.03	205.4	6.32	93	12.6	2.72
JHC-MW-15034	4/13/2021	4.23	262.1	5.2	68	8.8	7.90
	10/21/2021	3.00	230.3	5.48	65	13.9	1.90
JHC-MW-15035	4/14/2021	0.26	-51.9	7.3	423	15.4	2.20
	10/22/2021	0.42	98.6	7.16	612	14.6	0.0
JHC-MW-15036	4/14/2021	1.25	135.4	7.1	413	11.1	3.50
	10/22/2021	0.77	17.8	7.64	330	12.7	2.29
JHC-MW-15037	4/14/2021	2.45	191.9	6.7	491	10.0	4.40
	10/22/2021	1.21	24.4	7.16	437	12.0	3.36

**Notes:**

mg/L - Milligrams per Liter.

mV - Millivolts.

SU - Standard Units.

umhos/cm - Micromhos per centimeter.

°C - Degrees Celsius.

NTU - Nephelometric Turbidity Unit.

(1) Monitoring well JHC-MW-15019 was decommissioned on May 25, 2021 to accommodate Cell 6 construction.

**Table 3**  
 Summary of Background Groundwater Sampling Results (Analytical) – April & October 2021  
 JH Campbell Background – RCRA CCR Monitoring Program  
 West Olive, Michigan

Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI <sup>^</sup>	Background															
						JHC-MW-15023		JHC-MW-15024		JHC-MW-15025		JHC-MW-15026		JHC-MW-15027		JHC-MW-15028					
Sample Location:						4/12/2021		10/20/2021		4/13/2021		10/19/2021		4/13/2021		10/19/2021		4/12/2021		10/19/2021	
Sample Date:						4/12/2021		10/20/2021		4/13/2021		10/19/2021		4/13/2021		10/19/2021		4/12/2021		10/19/2021	
<b>Appendix III<sup>(1)</sup></b>																					
Boron	ug/L	NC	500	500	7,200	50	41	21	< 20	20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	
Calcium	mg/L	NC	NC	NC	500 <sup>EE</sup>	11.1	10.7	36.8	40.2	19.8	24.2	9.23	4.01	10.9	13.4	14.0	20.0				
Chloride	mg/L	250 <sup>**</sup>	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	2.64	3.60	21.5	47.1	19.5	23.3	4.05	1.09	< 1.00	< 1.00	< 1.00	< 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	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	
Sulfate	mg/L	250 <sup>**</sup>	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	12.2	11.8	8.14	7.53	9.02	8.98	6.88	5.81	7.09	7.89	5.99	5.90				
Total Dissolved Solids	mg/L	500 <sup>**</sup>	500 <sup>E</sup>	500 <sup>E</sup>	500	66	77	175	242	135	259	51	34	56	71	65	203				
pH, Field	SU	<b>6.5 - 8.5<sup>**</sup></b>	<b>6.5 - 8.5<sup>E</sup></b>	<b>6.5 - 8.5<sup>E</sup></b>	<b>6.5 - 9.0</b>	<b>5.3</b>	<b>5.8</b>	6.8	7.0	6.7	7.8	<b>5.6</b>	<b>5.7</b>	<b>5.7</b>	<b>5.9</b>	7.6	8.3				
<b>Appendix IV<sup>(1)</sup></b>																					
Antimony	ug/L	6	6.0	6.0	130	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	
Arsenic	ug/L	10	10	10	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	
Barium	ug/L	2,000	2,000	2,000	820	17	21	17	25	6	6	10	8	8	15	5	8				
Beryllium	ug/L	4	4.0	4.0	18	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	
Cadmium	ug/L	5	5.0	5.0	3.5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	
Chromium	ug/L	100	100	100	11	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	
Cobalt	ug/L	NC	40	100	100	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	
Lead	ug/L	NC	4.0	4.0	39	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	
Lithium	ug/L	NC	170	350	440	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	
Mercury	ug/L	2	2.0	2.0	0.20 <sup>#</sup>	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	
Molybdenum	ug/L	NC	73	210	3,200	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	
Radium-226	pCi/L	NC	NC	NC	NC	< 0.120	< 0.148	< 0.146	< 0.144	< 0.115	< 0.155	< 0.125	< 0.154	< 0.129	< 0.131	< 0.115	< 0.127				
Radium-228	pCi/L	NC	NC	NC	NC	0.478	< 0.407	< 0.472	< 0.349	< 0.414	< 0.434	< 0.434	0.449	< 0.434	< 0.380	< 0.435	< 0.393				
Radium-226/228	pCi/L	5	NC	NC	NC	0.501	< 0.407	< 0.472	0.364	< 0.414	< 0.434	0.449	0.573	< 0.434	< 0.380	< 0.435	< 0.393				
Selenium	ug/L	50	50	50	5.0	< 1	< 1	< 1	2	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	
Thallium	ug/L	2	2.0	2.0	3.7	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	

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

**Table 4**  
 Summary of Groundwater Sampling Results (Analytical) – April & October 2021  
 JH Campbell Dry Ash Landfill – RCRA CCR Monitoring Program  
 West Olive, Michigan

		Sample Location:					JHC-MW-15017		JHC-MW-15018		JHC-MW-15019 <sup>(2)</sup>	JHC-MW-15022		JHC-MW-15031		JHC-MW-15032	
		Sample Date:					4/13/2021	10/21/2021	4/13/2021	10/21/2021	4/13/2021	4/14/2021	10/21/2021	4/13/2021	10/22/2021	4/13/2021	10/21/2021
Constituent	Unit	UTL	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI <sup>^</sup>	downgradient										
<b>Appendix III<sup>(1)</sup></b>																	
Boron	ug/L	51	NC	500	500	7,200	148	167	258	327	318	250	197	51	64	40	75
Calcium	mg/L	46	NC	NC	NC	500 <sup>EE</sup>	61.1	58.5	85.2	62.7	86.1	87.7	85.3	49.7	54.2	7.70	9.99
Chloride	mg/L	43	250**	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	31.0	29.9	34.2	25.9	37.0	1.28	1.46	9.49	7.56	1.12	1.66
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
Sulfate	mg/L	14	250**	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	43.6	46.4	56.7	73.2	48.0	25.8	32.8	27.7	21.3	10.8	13.9
Total Dissolved Solids	mg/L	258	500**	500 <sup>E</sup>	500 <sup>E</sup>	500	296	292	375	329	405	371	361	180	< 10	43	62
pH, Field	SU	4.8 - 9.2	<b>6.5 - 8.5**</b>	<b>6.5 - 8.5<sup>E</sup></b>	<b>6.5 - 8.5<sup>E</sup></b>	<b>6.5 - 9.0</b>	<b>6.1</b>	<b>6.5</b>	<b>5.9</b>	<b>6.0</b>	<b>6.1</b>	<b>6.4</b>	6.9	7.1	7.3	<b>5.6</b>	<b>5.5</b>
<b>Appendix IV<sup>(1)</sup></b>																	
Antimony	ug/L	2	6	6.0	6.0	130	< 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
Barium	ug/L	35	2,000	2,000	2,000	820	25	28	57	61	57	21	21	15	15	8	13
Beryllium	ug/L	1	4	4.0	4.0	18	< 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	0.3	< 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
Cobalt	ug/L	15	NC	40	100	100	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	1,000	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 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
Lithium	ug/L	10	NC	170	350	440	< 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
Molybdenum	ug/L	5	NC	73	210	3,200	5	< 5	< 5	< 5	< 5	< 5	9	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NA	NC	NC	NC	NC	< 0.0986	< 0.170	0.115	0.227	< 0.133	< 0.121	< 0.182	< 0.146	< 0.184	< 0.129	< 0.216
Radium-228	pCi/L	NA	NC	NC	NC	NC	< 0.354	0.584	< 0.439	< 0.401	< 0.415	< 0.432	< 0.417	< 0.502	< 0.435	< 0.573	< 0.320
Radium-226/228	pCi/L	1.93	5	NC	NC	NC	< 0.354	0.660	< 0.439	0.616	< 0.415	< 0.432	< 0.417	< 0.502	< 0.435	< 0.573	< 0.320
Selenium	ug/L	5	50	50	50	<b>5.0</b>	<b>14</b>	<b>20</b>	<b>21</b>	<b>20</b>	<b>16</b>	<b>8</b>	<b>10</b>	3	3	< 1	< 1
Thallium	ug/L	2	2	2.0	2.0	3.7	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2

**Notes:**

ug/L - micrograms per liter; mg/L - milligrams per liter.  
 pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.  
 MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April, 2012.  
 UTL - Upper Tolerance Limit of the background data set. Appendix III UTLs established in TRC's technical memorandum dated January 15, 2018. Appendix IV UTLs established in TRC's technical memorandum dated October 15, 2018.  
 NC - no criteria.  
 \* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 21, 2020.  
 \*\* - 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 CaCO<sub>3</sub>/L as measured at surface water sample SW-01 collected on April 9, 2018 from the Pigeon River. Chromium GSI criterion based on hexavalent chromium per footnote (H).  
 # - If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.  
 E - Criterion is the aesthetic drinking water value per footnote (E).  
 EE - Criterion is based on the total dissolved solids GSI value per footnote (EE).  
 (1) 40 CFR Part 257 Appendix III Detection Monitoring Constituents and Appendix IV Assessment Monitoring Constituents.  
 (2) Monitoring well JHC-MW-15019 was decommissioned on May 25, 2021 to accommodate Cell 6 construction.  
 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 2021  
 JH Campbell Dry Ash Landfill – RCRA CCR Monitoring Program  
 West Olive, Michigan

							Sample Location:		JHC-MW-15033		JHC-MW-15034		JHC-MW-15035		JHC-MW-15036		JHC-MW-15037	
							Sample Date:		4/13/2021	10/21/2021	4/13/2021	10/21/2021	4/14/2021	10/22/2021	4/14/2021	10/22/2021	4/14/2021	10/22/2021
Constituent	Unit	UTL	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	downgradient											
<b>Appendix III<sup>(1)</sup></b>																		
Boron	ug/L	51	NC	500	500	7,200	46	43	50	46	52	73	80	76	112	118		
Calcium	mg/L	46	NC	NC	NC	500 <sup>EE</sup>	11.2	9.81	6.13	4.91	56.8	82.0	52.1	39.5	59.0	61.7		
Chloride	mg/L	43	250 <sup>**</sup>	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	1.61	< 1.00	2.80	2.06	9.07	14.0	9.50	5.71	21.3	7.05		
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	1,490		
Sulfate	mg/L	14	250 <sup>**</sup>	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	10.0	7.38	11.8	12.1	17.5	26.2	21.0	14.5	17.2	17.7		
Total Dissolved Solids	mg/L	258	500 <sup>**</sup>	500 <sup>E</sup>	500 <sup>E</sup>	500	50	58	248	< 10	240	365	229	169	254	249		
pH, Field	SU	4.8 - 9.2	<b>6.5 - 8.5<sup>**</sup></b>	<b>6.5 - 8.5<sup>E</sup></b>	<b>6.5 - 8.5<sup>E</sup></b>	<b>6.5 - 9.0</b>	<b>6.2</b>	<b>6.3</b>	<b>5.2</b>	<b>5.5</b>	7.3	7.2	7.1	7.6	6.7	7.2		
<b>Appendix IV<sup>(1)</sup></b>																		
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	< 5	< 5	6	6	12	19	8	7	10	11		
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	< 0.2	< 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		
Cobalt	ug/L	15	NC	40	100	100	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6		
Fluoride	ug/L	1,000	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,490		
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	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5		
Radium-226	pCi/L	NA	NC	NC	NC	NC	< 0.128	< 0.174	< 0.138	< 0.183	< 0.125	0.353	< 0.138	< 0.209	< 0.117	< 0.235		
Radium-228	pCi/L	NA	NC	NC	NC	NC	< 0.397	0.845	< 0.393	< 0.390	< 0.425	0.375	< 0.486	0.387	< 0.465	< 0.397		
Radium-226/228	pCi/L	1.93	5	NC	NC	NC	< 0.397	0.939	< 0.393	< 0.390	< 0.425	0.728	< 0.486	< 0.386	< 0.465	< 0.397		
Selenium	ug/L	5	50	50	50	5.0	< 1	< 1	< 1	< 1	2	2	< 1	1	4	5		
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.

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

MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April, 2012.

UTL - Upper Tolerance Limit of the background data set. Appendix III UTLs established in TRC's technical memorandum dated

January 15, 2018. Appendix IV UTLs established in TRC's technical memorandum dated October 15, 2018.

NC - no criteria.

\* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 21, 2020.

\*\* - 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 CaCO<sub>3</sub>/L as measured at surface water sample SW-01 collected on April 9, 2018 from the Pigeon River. Chromium GSI criterion based on hexavalent chromium per footnote {H}.

# - If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.

E - Criterion is the aesthetic drinking water value per footnote {E}.

EE - Criterion is based on the total dissolved solids GSI value per footnote {EE}.

(1) 40 CFR Part 257 Appendix III Detection Monitoring Constituents and Appendix IV Assessment Monitoring Constituents.

(2) Monitoring well JHC-MW-15019 was decommissioned on May 25, 2021 to accommodate Cell 6 construction.

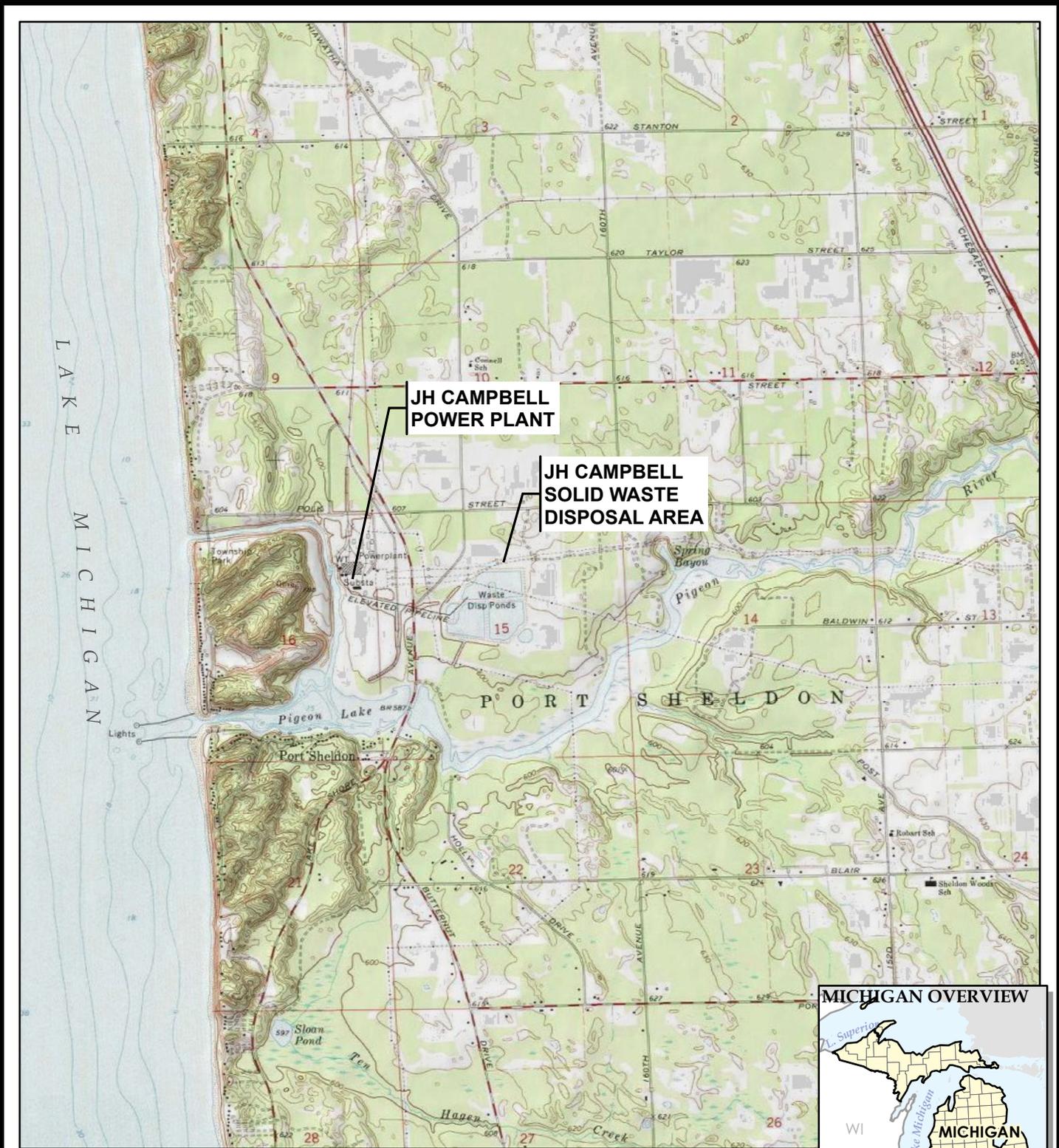
Indicates that the concentration in one or more wells exceeds the background level. If concentrations of all Appendix III and Appendix IV constituents are below the background level for two consecutive events, the unit may return to detection monitoring.

**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.



1540 Eisenhower Place  
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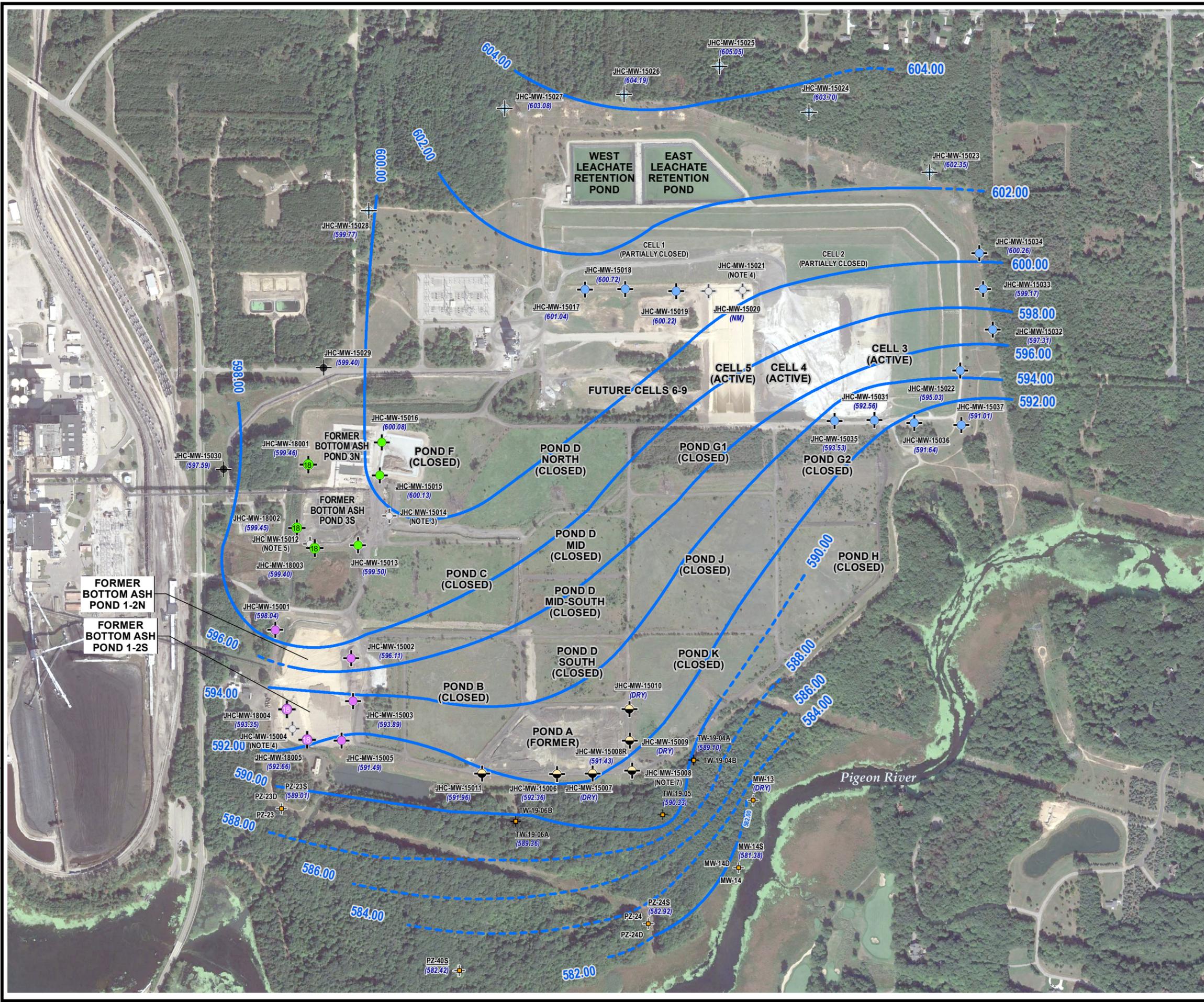
PROJECT: **CONSUMERS ENERGY COMPANY  
JH CAMPBELL POWER PLANT  
WEST OLIVE, MICHIGAN**

TITLE: **SITE LOCATION MAP**

DRAWN BY:	S. MAJOR
CHECKED BY:	B. YELEN
APPROVED BY:	S. HOLMSTROM
DATE:	JANUARY 2022
PROJ. NO.:	418422
FILE:	418422-001-007.mxd

**FIGURE 1**





**LEGEND**

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

(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

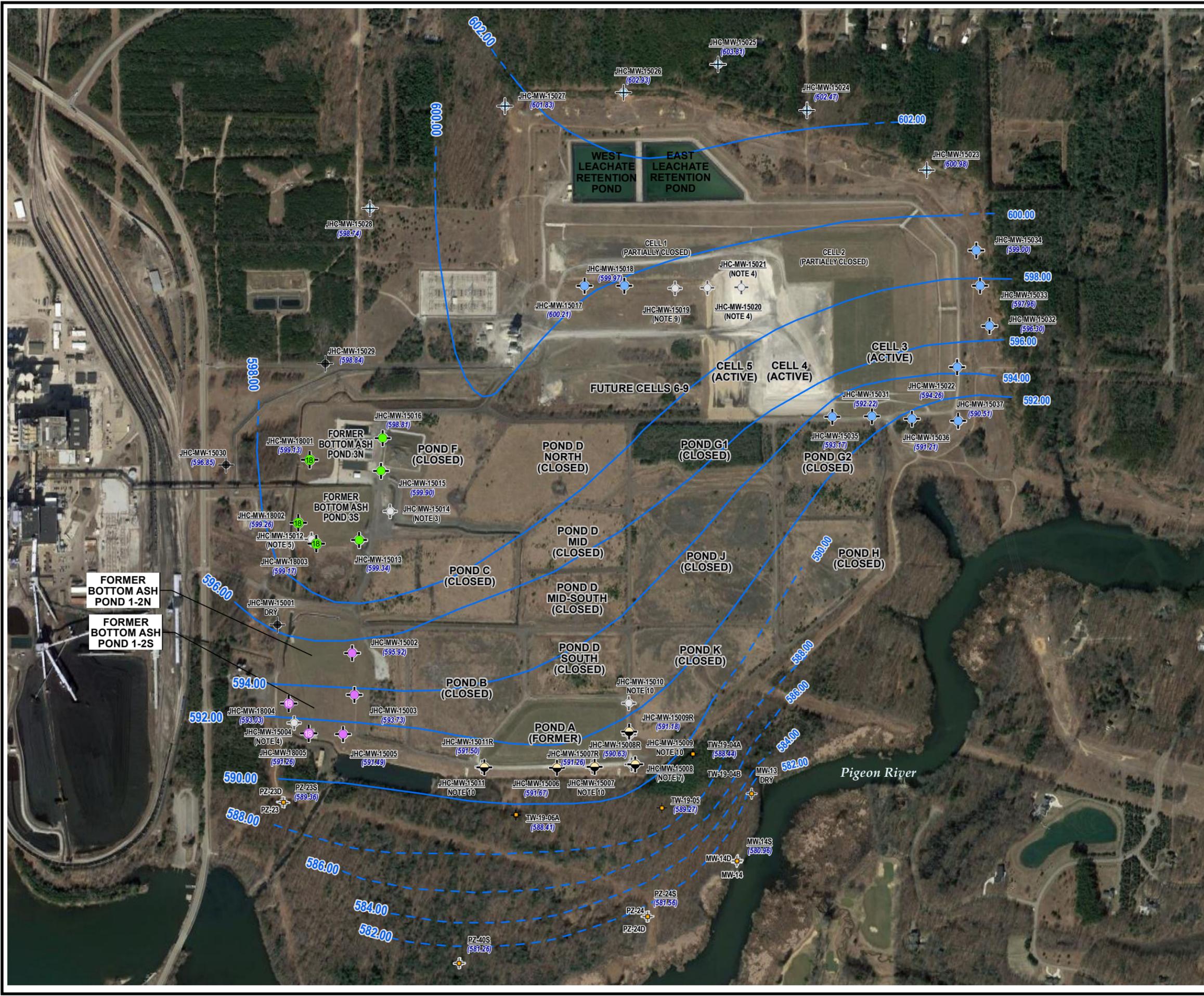
1" = 700'  
1:8,400

PROJECT:		<b>CONSUMERS ENERGY COMPANY JH CAMPBELL POWER PLANT WEST OLIVE, MICHIGAN</b>	
TITLE:		<b>GROUNDWATER CONTOUR MAP APRIL 2021</b>	
DRAWN BY:	A. ADAIR	PROJ NO.:	418422.0000
CHECKED BY:	K. LOWERY	<b>FIGURE 3</b>	
APPROVED BY:	K. LOWERY		
DATE:	JULY 2021		

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Phone: 734.971.7080  
www.trccompanies.com

FILE NO.: 418422\_200\_003.mxd

Plot Date: 1/21/2022 13:16:33 PM by: AFOJTIK - LAYOUT: ANSI B(11"x17")  
 Path: S:\1-PROJECTS\Consumers\_Energy\_Company\Michigan\CCR\_GW\2017\_2697672\_JHC\2\Map\Report\418422-003-002\_af.mxd  
 Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)  
 TRC - GIS



- ### LEGEND
- BACKGROUND MONITORING WELL
  - DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL
  - DOWNGRADIENT BOTTOM ASH POND 3 N/S MONITORING WELL
  - DOWNGRADIENT LANDFILL MONITORING WELL
  - PIEZOMETER 2021
  - 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)
  - DOWNGRADIENT MONITORING WELLS
  - STAFF GAUGE
  - TEMPORARY WELL
  - HMP WELL
- (591.25) GROUNDWATER ELEVATION (FEET ABOVE MSL)

- ### NOTES
1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2021.
  2. WELL LOCATIONS BASED ON SURVEY DATA THROUGH 8/14/2019.
  3. MONITORING WELL DECOMMISSIONED NOVEMBER 13, 2017.
  4. MONITORING WELL DECOMMISSIONED JUNE 14, 2018.
  5. MONITORING WELL DECOMMISSIONED OCTOBER 10, 2018.
  6. JHC-MW-1800X MONITORING WELLS INSTALLED IN DECEMBER 2018.
  7. MONITORING WELL DECOMMISSIONED JUNE 24, 2019.
  8. JHC-MW-15008R AND TW-19-XX MONITORING WELLS INSTALLED IN JUNE 2019.
  9. MONITORING WELLS DECOMMISSIONED MAY 25, 2021.
  10. MONITORING WELLS DECOMMISSIONED JULY 20-21, 2021.
  11. STATIC WATER ELEVATIONS IN NORTH AMERICAN VERTICAL DATUM 1988, NAVD 88.



<b>PROJECT:</b>	
<b>CONSUMERS ENERGY COMPANY JH CAMPBELL POWER PLANT WEST OLIVE, MICHIGAN</b>	
<b>TITLE:</b>	
<b>GROUNDWATER CONTOUR MAP OCTOBER 2021</b>	
DRAWN BY: A. FOJTIK	PROJ NO.: 418422-0000
CHECKED BY: B. YELEN	<b>FIGURE 4</b>
APPROVED BY: S. HOLMSTROM	
DATE: JANUARY 2022	
1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trccompanies.com	
FILE NO.: 418422-003-002_af.mxd	

# Appendix A

## Monitoring Well Decommissioning Log

**STEARNS DRILLING COMPANY**

6974 Hammond SE  
 Dutton, Michigan 49316-9116  
 616/698-7770  
 FAX 616/698-9886

Job No. 21-15997-5

**ABANDONMENT OF WELL# JHC MW-15019**

Sheet: 1 of 1

Project: Consumers JH Campbell

Location: West Olive, MI

Date Completed: 5/25/21

Crew Chief: D Cooper

Drill Rig:

Boring Method:

Hole Plugged With: Holeplug

**GROUNDWATER:**

Encountered @ 9.40 ft.  
 After completion ft.  
 After hrs. ft.  
 Seepage: ft.  
 Boring Caved at: ft.

**MONITOR WELL DATA:**

Pipe/Type:  
 Length:  
 Above Ground:  
 Cap:

Screen/Type:  
 Size:  
 Slot:  
 Set @  
 Backfilled:

Bentonite Seal:  
 Grout/Type:  
 Depth:  
 Protective Casing:  
 Materials Cleaned:  
 Development:

**REMARKS:**

**LEGEND:**

BlowCount/Blows per 6"  
 w/140# hammer x 30" drop  
 SS-2" Split Spoon Sampler  
 LS-Brass Liner Sample  
 ST-Shelby Tube Sample  
 SNR-Sample not recovered  
 LB-Large Bore

Sample Type	REC	Blow Count	Depth Feet	ABANDONMENT DESCRIPTION	T	W
			5	Water level 12.55' from top of casing Total depth 19.13' from top of casing Top of casing 3.15' above grade 2" sch. 40 PVC well Pull 4" protective cover Cut 2" well off 2' below grade Fill 2" well with Bentonite Holeplug - 3/8" Pull 6" bumper posts Restore surface with Native soils		
			10	GPS - 42.915342, -86.184929		
			15			
			20	Total well depth of 15.98' from ground surface		
			25			
			30			

# Appendix B

## Data Quality Review

## Laboratory Data Quality Review Groundwater Monitoring Event April 2021 CEC JH Campbell Background Wells

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the April 2021 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 (SDGs) 21-0446R and 160-41801-1 Revision 1.

During the April 2021 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/ 7470A
Alkalinity	SM 2320B
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, 2020) 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 for the total metals, anions, alkalinity, and TDS analyses.

This data usability report addresses the following items:

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

## **Review Summary**

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

- The reviewed Appendix III and IV constituents 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 was not detected in the method blanks.
- One equipment blank (EB-02) and one field blank (FB-02) were collected. Target analytes were not detected in these blank samples.
- All samples were analyzed 12 or 13 days past holding time for alkalinity. Positive results for alkalinity in the samples are potentially biased low, as shown in the attached table, Attachment A.

- The LCS and LCSD recoveries and relative percent differences (RPDs) for radium were within QC limits.
- MS and MSD analyses were performed on sample JHC-MW-15025 for mercury, total metals, and anions. The recoveries were within the acceptance limits. 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-02/JHC-MW-15028. All criteria were met.
- Carrier recoveries, where applicable, were within 40-110%.

**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-15023	4/12/2021	Alkalinity	Analysis run outside of holding time; results are potentially biased low
JHC-MW-15024	4/13/2021		
JHC-MW-15025	4/13/2021		
JHC-MW-15026	4/13/2021		
JHC-MW-15027	4/13/2021		
JHC-MW-15028	4/12/2021		
DUP-02	4/12/2021		

## Laboratory Data Quality Review Groundwater Monitoring Event April 2021 Consumers Energy JH Campbell Landfill

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the April 2021 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 (SDGs) 21-0444R and 160-41802-1 Revision 1.

During the April 2021 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
Alkalinity	SM 2320B
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, 2020) 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, alkalinity, and TDS analyses.

This data usability report addresses the following items:

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

## **Review Summary**

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

- 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 was not detected in the method blanks.
- One equipment blank (EB-04) and one field blank (FB-04) were collected. Target analytes were not detected in these blanks.

- All samples were analyzed eight or nine days past holding time for alkalinity. Positive results for alkalinity in the samples are potentially biased low, as shown in the attached table, Attachment A.
- The LCS and LCSD recoveries and relative percent differences (RPDs) for radium 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-05/JHC-MW-15017. The RPDs for all analytes were within criteria.
- Carrier recoveries, where applicable, were within 40-110%.

**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	4/13/2021	Alkalinity	Analysis run outside of holding time; results are potentially biased low
JHC-MW-15018	4/13/2021		
JHC-MW-15019	4/13/2021		
JHC-MW-15022	4/14/2021		
JHC-MW-15031	4/14/2021		
JHC-MW-15032	4/13/2021		
JHC-MW-15033	4/13/2021		
JHC-MW-15034	4/13/2021		
JHC-MW-15035	4/14/2021		
JHC-MW-15036	4/14/2021		
JHC-MW-15037	4/14/2021		
DUP-05	4/13/2021		

## Laboratory Data Quality Review Groundwater Monitoring Event October 2021 CEC JH Campbell Background Wells

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the October 2021 sampling event. Samples were analyzed for total metals, anions, total dissolved solids (TDS), and alkalinity by CE Laboratory Services in Jackson, Michigan. The laboratory analytical results were reported in laboratory sample delivery group (SDG) 21-1276.

During the October 2021 sampling event, a groundwater sample was collected from each of the following wells:

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

Each sample was analyzed for the following constituents:

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

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

### Data Usability Review Procedure

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

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

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

It should be noted that results for method blanks and 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 for the total metals, anions, alkalinity, and TDS analyses.

This data usability report addresses the following items:

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

## **Review Summary**

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

- The reviewed Appendix III and IV constituents as well as 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**

- One equipment blank (EB-01) and one field blank (FB-01) were collected. Target analytes were not detected in these blank samples.
- MS and MSD analyses were performed on sample JHC-MW-15025 for 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 with the following exception.

- The RPD for TDS (61%) was above the acceptance criteria. Therefore, potential uncertainty exists for the positive results for TDS in all groundwater samples, as summarized in the attached table, Attachment A.

**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-15023	10/20/2021		
JHC-MW-15024	10/20/2021		
JHC-MW-15025	10/19/2021		
JHC-MW-15026	10/19/2021	Total Dissolved Solids	Field duplicate variability; potential uncertainty exists.
JHC-MW-15027	10/19/2021		
JHC-MW-15028	10/19/2021		
DUP-01	10/19/2021		

# Laboratory Data Quality Review Groundwater Monitoring Event October 2021 CEC JH Campbell Background Wells

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the October 2021 sampling event. Samples were analyzed for radium by Eurofins-TestAmerica laboratory in St. Louis, Missouri. The laboratory analytical results were reported in laboratory sample delivery group (SDG) 160-43807-1.

During the October 2021 sampling event, a groundwater sample was collected from each of the following wells:

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

Each sample was analyzed for the following constituents:

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

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

## Data Usability Review Procedure

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

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

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

This data usability report addresses the following items:

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

## **Review Summary**

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

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

## **QA/QC Sample Summary**

- Target analytes were not detected in the method blanks.
- One equipment blank (EB-01) and one field blank (FB-01) were collected. Target analytes were not detected in the equipment and field blanks.
- LCS/LCSD recoveries and relative percent differences were within laboratory control limits.
- MS/MSD and laboratory duplicate analyses were not performed on a sample from this SDG.
- The field duplicate pair samples were DUP-01/JHC-MW-15028. All criteria were met.
- Carrier recoveries were within 40-110%.

## Laboratory Data Quality Review Groundwater Monitoring Event October 2021 Consumers Energy JH Campbell Landfill

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the October 2021 sampling event. Samples were analyzed for total metals, anions, total dissolved solids, and alkalinity by CE Laboratory Services in Jackson, Michigan. The laboratory analytical results were reported in laboratory sample delivery group (SDG) 21-1279.

During the October 2021 sampling event, a groundwater sample was collected from each of the following wells:

- JHC-MW-15017                      ■ JHC-MW-15018                      ■ JHC-MW-15022
- JHC-MW-15031                      ■ JHC-MW-15032                      ■ JHC-MW-15033
- JHC-MW-15034                      ■ JHC-MW-15035                      ■ JHC-MW-15036
- 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
Alkalinity	SM 2320B

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

### Data Usability Review Procedure

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

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

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

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

This data usability report addresses the following items:

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

## **Review Summary**

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

- 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**

- One equipment blank (EB-04) and one field blank (FB-04) were collected. Target analytes were not detected in the field blank. Selenium was detected in the equipment blank, EB-04, at 1.0 ug/L. Potential false positive results exist for selenium in select groundwater samples as summarized in the attached table, Attachment A.
- MS and MSD analyses were not performed on a sample from this data set.
- The field duplicate pair samples were DUP-04 and JHC-MW-15034; the relative percent differences (RPDs) between the parent and duplicate sample were within the QC limits.
- The laboratory RL for cobalt (15 ug/L) was above the requested RL of 6 ug/L. All groundwater samples were non-detect for cobalt at the elevated RL.

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

<b>Samples</b>	<b>Collection Date</b>	<b>Analyte</b>	<b>Non-Conformance/Issue</b>
JHC-MW-15031	10/22/2021	Selenium	Detection in equipment blank; potential false positive result
JHC-MW-15035	10/22/2021		
JHC-MW-15036	10/22/2021		
JHC-MW-15037	10/22/2021		

**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	10/21/2021	Radium 228, Combined Radium	Potential false positive results due to field and equipment blank contamination.
JHC-MW-15033	10/21/2021		
JHC-MW-15035	10/22/2021	Radium 228	
JHC-MW-15036	10/22/2021	Combined Radium	
JHC-MW-15018	10/21/2021		

# **Appendix C**

## **April 2021 Assessment Monitoring Statistical Evaluation**

## Technical Memorandum

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**Date:** July 30, 2021

**To:** Bethany Swanberg, Consumers Energy

**From:** Sarah Holmstrom, TRC  
Kristin Lowery, TRC

**Project No.:** 418422.0001.0000 Phase 1 Task 3

**Subject:** Statistical Evaluation of April 2021 Assessment Monitoring Sampling Event  
JH Campbell Dry Ash Landfill, Consumers Energy Company, West Olive, Michigan

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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<sup>1</sup> at the JH Campbell Power Plant (JHC) Dry Ash Landfill. The first semiannual assessment monitoring event for 2021 was conducted on April 12 through 14, 2021. 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 2021 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.

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<sup>1</sup> 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).

## Technical Memorandum

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<sup>2</sup>, 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 B1. No parameter-well combinations included a direct exceedance of the GWPS within the past 8 events (April 2018 through April 2021) for data that met project data quality objectives<sup>3</sup>. 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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<sup>2</sup> USEPA. 2009. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance*. Office of Conservation and Recovery. EPA 530/R-09-007.

<sup>3</sup> 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 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

## Technical Memorandum

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:						4/26/2018	6/20/2018	11/13/2018	4/23/2019	10/8/2019	4/14/2020	10/21/2020	4/13/2021	4/13/2021	
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS										
<b>Appendix III</b>														Field Dup	
Boron	ug/L	NC	NA	51	NA	--	245	274	340	350	243	210	148	151	
Calcium	mg/L	NC	NA	46	NA	--	44	60.9	81	77	64.4	54.9	61.1	60.4	
Chloride	mg/L	250*	NA	43	NA	--	97	170	120	60	36.0	37.4	31.0	30.8	
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	--	60.6	72.0	100	92	69	63	43.6	43.4	
Total Dissolved Solids	mg/L	500*	NA	258	NA	--	348	474	520	280	339	NA <sup>(4)</sup>	296	303	
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA	6.0 <sup>(1)</sup>	6.0	6.1	6.1	6.3	5.6	5.9	6.1	--	
<b>Appendix IV</b>															
Antimony	ug/L	6	NA	2	6	< 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	< 1	< 1	< 1	
Barium	ug/L	2,000	NA	35	2,000	79.7	80.0	85.5	70	47	34	22	25	25	
Beryllium	ug/L	4	NA	1	4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	
Cadmium	ug/L	5	NA	0.2	5	0.47	0.54	0.60	0.57	0.24	0.4	< 0.2	< 0.2	< 0.2	
Chromium	ug/L	100	NA	2	100	< 1.0	< 1.0	< 1.0	12	< 1.0	< 1	1	< 1	< 1	
Cobalt	ug/L	NC	6	15	15	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 15	< 15	< 6	< 6	
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	< 1	< 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	< 0.2	< 0.2	< 0.2	< 0.2	
Molybdenum	ug/L	NC	100	5	100	8.3	6.2	28.5	11	10	16	21	5	5	
Radium-226	pCi/L	NC	NA	NA	NA	1.17	< 0.785	< 1.05	0.176	0.259	< 0.209	0.335	< 0.0986	< 0.106	
Radium-228	pCi/L	NC	NA	NA	NA	0.773	2.74	< 0.910	0.827	0.384	0.566	< 0.414	< 0.354	< 0.497	
Radium-226/228	pCi/L	5	NA	1.93	5	1.94	3.02	< 1.96	1.00	0.643	0.618	0.574	< 0.354	< 0.497	
Selenium	ug/L	50	NA	5	50	18.2	18.5	18.8	16	14	16	15	14	13	
Thallium	ug/L	2	NA	2	2	< 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 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:						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	4/13/2021
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS							Field Dup		Field Dup	
<b>Appendix III</b>															
Boron	ug/L	NC	NA	51	NA	--	117	115	130	170	142	148	167	165	258
Calcium	mg/L	NC	NA	46	NA	--	44.8	37.6	58	48	50.6	50.7	65.0	68.1	85.2
Chloride	mg/L	250*	NA	43	NA	--	31.9	33.2	43	44	28.5	28.3	35.9	34.5	34.2
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	--	62.3	51.1	61	84	52.8	52.9	59.0	55.7	56.7
Total Dissolved Solids	mg/L	500*	NA	258	NA	--	194	276	320	370	405	287	441	NA <sup>(4)</sup>	375
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA	6.2 <sup>(1)</sup>	6.1	6.3	6.4	6.0	6.2	--	6.0	--	5.9
<b>Appendix IV</b>															
Antimony	ug/L	6	NA	2	6	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	NA	1	10	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000	89.0	76.5	79.6	80	130	96	95	77	78	57
Beryllium	ug/L	4	NA	1	4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5	< 0.20	< 0.20	< 0.20	< 0.20	0.29	0.2	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	3	< 1	< 1	< 1
Cobalt	ug/L	NC	6	15	15	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 15	< 15	< 15	< 15	< 6
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	< 1	< 1	< 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	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100	17.2	19.7	6.7	< 5.0	< 5.0	< 5	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NC	NA	NA	NA	< 0.656	< 0.692	< 0.760	0.217	0.348	< 0.209	< 0.220	< 0.367	< 0.684	0.115
Radium-228	pCi/L	NC	NA	NA	NA	< 0.572	< 1.14	< 0.918	< 0.476	0.390	< 0.575	< 0.561	< 0.632	< 0.427	< 0.439
Radium-226/228	pCi/L	5	NA	1.93	5	< 1.23	< 1.83	< 1.68	< 0.476	0.739	< 0.575	< 0.561	0.747	0.926	< 0.439
Selenium	ug/L	50	NA	5	50	12.7	9.9	8.2	12	15	12	13	14	13	21
Thallium	ug/L	2	NA	2	2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 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.
- 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 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:						4/26/2018	6/20/2018	11/14/2018	4/23/2019	10/8/2019	4/14/2020	10/21/2020	4/13/2021
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS								
<b>Appendix III</b>													
Boron	ug/L	NC	NA	51	NA	--	195	159	150	150	204	509	318
Calcium	mg/L	NC	NA	46	NA	--	64.1	30.4	45	34	43.2	81.6	86.1
Chloride	mg/L	250*	NA	43	NA	--	26.2	7.4	14	6.0	16.6	57.3	37.0
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
Sulfate	mg/L	250*	NA	14	NA	--	40.8	19.8	25	23	45.7	91.0	48.0
Total Dissolved Solids	mg/L	500*	NA	258	NA	--	286	250	200	280	359	NA <sup>(4)</sup>	405
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA	6.7 <sup>(1)</sup>	6.6	6.0	6.5	6.4	5.9	5.9	6.1
<b>Appendix IV</b>													
Antimony	ug/L	6	NA	2	6	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Arsenic	ug/L	10	NA	1	10	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000	63.6	44.6	53.5	46	58	97	144	57
Beryllium	ug/L	4	NA	1	4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	0.3	0.3
Chromium	ug/L	100	NA	2	100	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	1	< 1
Cobalt	ug/L	NC	6	15	15	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 15	< 15	< 6
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
Lead	ug/L	NC	15	1	15	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 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	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100	11.2	7.7	10.4	12	16	7	< 5	< 5
Radium-226	pCi/L	NC	NA	NA	NA	0.402	< 0.717	< 0.838	0.124	0.187	0.210	< 0.329	< 0.133
Radium-228	pCi/L	NC	NA	NA	NA	< 0.638	< 0.951	< 0.801	< 0.465	< 0.295	0.571	< 0.412	< 0.415
Radium-226/228	pCi/L	5	NA	1.93	5	0.911	< 1.67	< 1.64	< 0.465	0.327	0.781	0.632	< 0.415
Selenium	ug/L	50	NA	5	50	22.2	18.4	24.8	11	11	22	6	16
Thallium	ug/L	2	NA	2	2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 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 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:						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	4/14/2021
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS				Field Dup		Field Dup					
<b>Appendix III</b>																
Boron	ug/L	NC	NA	51	NA	--	315	376	374	360	360	--	330	311	146	250
Calcium	mg/L	NC	NA	46	NA	--	109	109	106	110	110	--	130	119	66.9	87.7
Chloride	mg/L	250*	NA	43	NA	--	3.5	3.7	3.8	2.7	2.7	--	< 2.0	< 1.00	5.39	1.28
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	--	26	40.6	40.7	37	37	--	37	14.2	33.3	25.8
Total Dissolved Solids	mg/L	500*	NA	258	NA	--	414	358	400	410	400	--	540	405	NA <sup>(4)</sup>	371
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA	7.6 <sup>(1)</sup>	6.9	7.0	--	7.0	--	7.1	7.0	6.8	7.0	6.4
<b>Appendix IV</b>																
Antimony	ug/L	6	NA	2	6	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1.0	< 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
Barium	ug/L	2,000	NA	35	2,000	20.3	21.2	21.3	22.6	23	22	--	26	23	14	21
Beryllium	ug/L	4	NA	1	4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1.0	< 1	< 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	< 0.2
Chromium	ug/L	100	NA	2	100	1.3	< 1.0	1.7	1.5	<b>82<sup>(2)(3)</sup></b>	<b>63<sup>(3)</sup></b>	<b>2.2<sup>(3)</sup></b>	5.9	< 1	1	< 1
Cobalt	ug/L	NC	6	15	15	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 6.0	--	< 6.0	< 15	< 15	< 6
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	< 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	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100	5.2	< 5.0	6.5	6.0	7.2	6.4	--	5.2	< 5	18	< 5
Radium-226	pCi/L	NC	NA	NA	NA	< 0.431	< 0.673	< 0.692	< 0.924	< 0.0968	< 0.0955	--	0.190	< 0.281	< 0.386	< 0.121
Radium-228	pCi/L	NC	NA	NA	NA	< 0.583	< 0.697	0.999	< 0.849	< 0.505	< 0.470	--	< 0.480	< 0.443	< 0.304	< 0.432
Radium-226/228	pCi/L	5	NA	1.93	5	< 1.01	< 1.37	< 1.35	< 1.77	< 0.505	< 0.470	--	< 0.480	< 0.443	< 0.386	< 0.432
Selenium	ug/L	50	NA	5	50	4.1	2.8	5.6	5.2	7.2	7.4	--	6.4	3	7	8
Thallium	ug/L	2	NA	2	2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	--	< 2.0	< 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 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:						4/27/2018	6/20/2018	11/14/2018	4/24/2019	10/9/2019	4/14/2020	10/21/2020	4/13/2021
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS								
<b>Appendix III</b>													
Boron	ug/L	NC	NA	51	NA	--	108	104	79	85	75	114	51
Calcium	mg/L	NC	NA	46	NA	--	66.9	63.3	59	57	49.8	56.1	49.7
Chloride	mg/L	250*	NA	43	NA	--	38.9	33.4	24	28	20.1	25.0	9.49
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
Sulfate	mg/L	250*	NA	14	NA	--	40	34.7	25	26	23.5	35.1	27.7
Total Dissolved Solids	mg/L	500*	NA	258	NA	--	352	268	280	220	266	NA <sup>(4)</sup>	180
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA	7.6 <sup>(1)</sup>	6.8	6.7	6.9	6.9	6.7	6.4	7.1
<b>Appendix IV</b>													
Antimony	ug/L	6	NA	2	6	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Arsenic	ug/L	10	NA	1	10	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000	15.4	18.9	21.4	14	17	17	20	15
Beryllium	ug/L	4	NA	1	4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100	< 1.0	< 1.0	24.6	5.4	1.9	< 1	3	< 1
Cobalt	ug/L	NC	6	15	15	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 15	< 15	< 6
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
Lead	ug/L	NC	15	1	15	< 1.0	< 1.0	1.3	< 1.0	< 1.0	< 1	< 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	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5	< 5	< 5
Radium-226	pCi/L	NC	NA	NA	NA	< 0.479	< 0.638	0.849	0.102	0.199	< 0.210	< 0.358	< 0.146
Radium-228	pCi/L	NC	NA	NA	NA	< 0.708	< 1.02	< 0.773	< 0.427	0.600	< 0.412	< 0.412	< 0.502
Radium-226/228	pCi/L	5	NA	1.93	5	< 1.19	< 1.66	< 1.50	0.466	0.798	< 0.412	< 0.412	< 0.502
Selenium	ug/L	50	NA	5	50	4.0	3.0	2.4	< 1.0	< 1.0	2	3	3
Thallium	ug/L	2	NA	2	2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 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 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:						4/26/2018	6/19/2018	6/19/2018	11/14/2018	4/24/2019	10/8/2019	4/14/2020	10/21/2020	4/13/2021	
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS										
<b>Appendix III</b>									Field Dup						
Boron	ug/L	NC	NA	51	NA	--	45.7	44.6	49.4	< 50	58	45	45	40	
Calcium	mg/L	NC	NA	46	NA	--	8.8	8.4	8.1	9.4	7.9	8.76	10.8	7.70	
Chloride	mg/L	250*	NA	43	NA	--	3.4	3.4	4.2	2.6	2.3	1.76	1.66	1.12	
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	--	11.8	11.6	11.9	11	12	9.60	11.3	10.8	
Total Dissolved Solids	mg/L	500*	NA	258	NA	--	64	< 50.0	< 50.0	53	68	101	NA <sup>(4)</sup>	43	
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA	5.9 <sup>(1)</sup>	6.3	--	6.2	6.3	6.3	6.1	5.8	5.6	
<b>Appendix IV</b>															
Antimony	ug/L	6	NA	2	6	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	
Arsenic	ug/L	10	NA	1	10	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	
Barium	ug/L	2,000	NA	35	2,000	7.8	8.8	8.7	7.7	8.3	7.9	8	8	8	
Beryllium	ug/L	4	NA	1	4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 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	< 0.2	
Chromium	ug/L	100	NA	2	100	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	
Cobalt	ug/L	NC	6	15	15	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 15	< 15	< 6	
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	< 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	< 0.2	< 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	< 5	
Radium-226	pCi/L	NC	NA	NA	NA	< 0.514	< 0.464	< 0.722	< 0.748	< 0.118	0.157	< 0.228	< 0.407	< 0.129	
Radium-228	pCi/L	NC	NA	NA	NA	< 0.784	< 0.721	< 1.17	< 0.812	< 0.395	< 0.347	< 0.473	< 0.422	< 0.573	
Radium-226/228	pCi/L	5	NA	1.93	5	< 1.30	< 1.19	< 1.89	< 1.56	< 0.395	0.427	< 0.473	< 0.422	< 0.573	
Selenium	ug/L	50	NA	5	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	
Thallium	ug/L	2	NA	2	2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 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.
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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 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:						4/26/2018	4/26/2018	6/19/2018	11/14/2018	4/24/2019	10/8/2019	4/14/2020	10/21/2020	4/13/2021	
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		Field Dup								
<b>Appendix III</b>															
Boron	ug/L	NC	NA	51	NA	--	--	33	41.8	< 50	51	51	54	46	
Calcium	mg/L	NC	NA	46	NA	--	--	9	10.0	10	11	12.0	14.2	11.2	
Chloride	mg/L	250*	NA	43	NA	--	--	3.4	3.2	< 2.0	2.6	1.41	2.65	1.61	
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	--	--	8.1	9.2	9.5	12	10.8	11.0	10.0	
Total Dissolved Solids	mg/L	500*	NA	258	NA	--	--	68	< 50.0	58	71	59	NA <sup>(4)</sup>	50	
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA	6.8 <sup>(1)</sup>	--	6.7	6.7	6.7	6.9	6.6	6.4	6.2	
<b>Appendix IV</b>															
Antimony	ug/L	6	NA	2	6	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	
Arsenic	ug/L	10	NA	1	10	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	
Barium	ug/L	2,000	NA	35	2,000	4.8	4.3	5.2	6.1	< 5.0	5.4	6	6	< 5	
Beryllium	ug/L	4	NA	1	4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 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	< 0.2	
Chromium	ug/L	100	NA	2	100	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	
Cobalt	ug/L	NC	6	15	15	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 15	< 15	< 6	
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	< 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	< 0.2	< 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	< 5	
Radium-226	pCi/L	NC	NA	NA	NA	< 0.460	< 0.151	< 0.570	< 0.766	< 0.0696	0.167	< 0.294	< 0.346	< 0.128	
Radium-228	pCi/L	NC	NA	NA	NA	< 0.732	< 0.792	< 0.845	< 0.729	< 0.306	< 0.333	0.498	< 0.397	< 0.397	
Radium-226/228	pCi/L	5	NA	1.93	5	< 1.19	< 0.943	< 1.42	< 1.50	< 0.306	< 0.333	< 0.487	< 0.397	< 0.397	
Selenium	ug/L	50	NA	5	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	
Thallium	ug/L	2	NA	2	2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 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 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:						4/25/2018	6/19/2018	11/14/2018	4/24/2019	10/8/2019	10/8/2019	4/14/2020	10/21/2020	4/13/2021	
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS							Field Dup			
<b>Appendix III</b>															
Boron	ug/L	NC	NA	51	NA	--	62.6	62.5	51	68	65	59	57	50	
Calcium	mg/L	NC	NA	46	NA	--	5.8	6.0	5.4	5.4	5.1	5.10	8.99	6.13	
Chloride	mg/L	250*	NA	43	NA	--	3.1	3.5	2.1	< 2.0	< 2.0	1.53	1.82	2.80	
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	--	12.5	14.4	12	15	15	11.5	15.7	11.8	
Total Dissolved Solids	mg/L	500*	NA	258	NA	--	50	< 50.0	< 50	54	56	52	NA <sup>(4)</sup>	248	
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA	6.0 <sup>(1)</sup>	6.0	5.9	5.9	6.1	--	5.4	5.8	5.2	
<b>Appendix IV</b>															
Antimony	ug/L	6	NA	2	6	1.7	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	
Arsenic	ug/L	10	NA	1	10	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	
Barium	ug/L	2,000	NA	35	2,000	5.3	5.5	6.0	5.5	6.5	6.6	13	6	6	
Beryllium	ug/L	4	NA	1	4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 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	< 0.2	
Chromium	ug/L	100	NA	2	100	< 1.0	< 1.0	< 1.0	1.2	< 1.0	< 1.0	< 1	< 1	< 1	
Cobalt	ug/L	NC	6	15	15	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 6.0	< 15	< 15	< 6	
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	< 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	< 0.2	< 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	< 5	
Radium-226	pCi/L	NC	NA	NA	NA	< 0.775	< 0.514	< 0.688	< 0.0948	0.133	< 0.134	< 0.208	< 0.295	< 0.138	
Radium-228	pCi/L	NC	NA	NA	NA	< 0.804	< 1.04	< 0.786	< 0.381	< 0.384	< 0.308	< 0.436	< 0.386	< 0.393	
Radium-226/228	pCi/L	5	NA	1.93	5	< 1.58	< 1.55	< 1.47	< 0.381	< 0.384	< 0.308	< 0.436	< 0.386	< 0.393	
Selenium	ug/L	50	NA	5	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	
Thallium	ug/L	2	NA	2	2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 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 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:						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	4/14/2021
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS						Field Dup				
<b>Appendix III</b>															
Boron	ug/L	NC	NA	51	NA	--	111	78.2	91	--	--	78	64	60	52
Calcium	mg/L	NC	NA	46	NA	--	90.5	66.6	98	--	--	84	70.4	65.7	56.8
Chloride	mg/L	250*	NA	43	NA	--	27.1	20.00	23.00	--	--	24	15.0	10.9	9.07
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
Sulfate	mg/L	250*	NA	14	NA	--	26.7	18.8	24	--	--	25	21.1	19.6	17.5
Total Dissolved Solids	mg/L	500*	NA	258	NA	--	342	274	360	--	--	370	300	NA <sup>(4)</sup>	240
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA	8.0 <sup>(1)</sup>	7.0	7.3	7.2	7.1	--	7.2	7.2	7.2	7.3
<b>Appendix IV</b>															
Antimony	ug/L	6	NA	2	6	< 1.0	< 1.0	< 1.0	< 1.0	--	--	< 1.0	< 1	< 1	< 1
Arsenic	ug/L	10	NA	1	10	< 1.0	< 1.0	< 1.0	< 1.0	--	--	< 1.0	< 1	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000	17.4	18.1	12.3	17	--	--	16	17	13	12
Beryllium	ug/L	4	NA	1	4	< 1.0	< 1.0	< 1.0	< 1.0	--	--	< 1.0	< 1	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5	< 0.20	< 0.20	< 0.20	< 0.20	--	--	< 0.20	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100	4.8	< 1.0	< 1.0	290 <sup>(2)(3)</sup>	1.8 <sup>(3)</sup>	2.5 <sup>(3)</sup>	4.4	< 1	< 1	< 1
Cobalt	ug/L	NC	6	15	15	< 15.0	< 15.0	< 6.0	< 6.0	--	--	< 6.0	< 15	< 15	< 6
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
Lead	ug/L	NC	15	1	15	< 1.0	< 1.0	< 1.0	< 1.0	--	--	< 1.0	< 1	< 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	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100	< 5.0	< 5.0	< 5.0	11	--	--	< 5.0	< 5	< 5	< 5
Radium-226	pCi/L	NC	NA	NA	NA	< 0.733	< 0.548	< 0.850	< 0.101	--	--	0.203	< 0.217	< 0.647	< 0.125
Radium-228	pCi/L	NC	NA	NA	NA	0.937	1.27	< 0.914	< 0.357	--	--	< 0.567	0.560	< 0.440	< 0.425
Radium-226/228	pCi/L	5	NA	1.93	5	< 1.41	1.63	< 1.76	< 0.357	--	--	< 0.567	0.687	< 0.647	< 0.425
Selenium	ug/L	50	NA	5	50	< 1.0	< 1.0	< 1.0	< 1.0	--	--	< 1.0	1	2	2
Thallium	ug/L	2	NA	2	2	< 2.0	< 2.0	< 2.0	< 2.0	--	--	< 2.0	< 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 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:						4/27/2018	6/20/2018	11/14/2018	4/24/2019	10/8/2019	4/14/2020	10/22/2020	4/14/2021
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS								
<b>Appendix III</b>													
Boron	ug/L	NC	NA	51	NA	--	88.3	79.2	80	71	77	81	80
Calcium	mg/L	NC	NA	46	NA	--	64.8	51.6	50	55	51.1	59.3	52.1
Chloride	mg/L	250*	NA	43	NA	--	24.3	14.7	14	13	8.51	10.4	9.50
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
Sulfate	mg/L	250*	NA	14	NA	--	26.1	20.0	19	24	17.4	21.9	21.0
Total Dissolved Solids	mg/L	500*	NA	258	NA	--	278	216	220	320	221	NA <sup>(4)</sup>	229
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA	8.1 <sup>(1)</sup>	7.1	7.4	7.4	7.5	7.3	7.3	7.1
<b>Appendix IV</b>													
Antimony	ug/L	6	NA	2	6	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Arsenic	ug/L	10	NA	1	10	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000	8.9	11.5	8.2	8.4	9.4	9	9	8
Beryllium	ug/L	4	NA	1	4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Cobalt	ug/L	NC	6	15	15	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 15	< 15	< 6
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
Lead	ug/L	NC	15	1	15	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 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	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5	< 5	< 5
Radium-226	pCi/L	NC	NA	NA	NA	< 0.618	< 0.555	0.812	< 0.0882	0.160	< 0.198	< 0.554	< 0.138
Radium-228	pCi/L	NC	NA	NA	NA	< 0.626	< 0.743	< 0.670	< 0.384	< 0.441	0.581	< 0.367	< 0.486
Radium-226/228	pCi/L	5	NA	1.93	5	< 1.24	< 1.30	0.874	< 0.384	0.442	0.659	< 0.554	< 0.486
Selenium	ug/L	50	NA	5	50	1.6	< 1.0	< 1.0	< 1.0	1.9	< 1	< 1	< 1
Thallium	ug/L	2	NA	2	2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 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 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:						4/27/2018	6/20/2018	11/14/2018	4/24/2019	10/8/2019	4/14/2020	10/22/2020	4/14/2021
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS								
<b>Appendix III</b>													
Boron	ug/L	NC	NA	51	NA	--	153	221	150	280	266	185	112
Calcium	mg/L	NC	NA	46	NA	--	72.6	103	73	110	100	93.4	59.0
Chloride	mg/L	250*	NA	43	NA	--	7.9	8.2	6.3	4.4	2.65	7.52	21.3
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
Sulfate	mg/L	250*	NA	14	NA	--	36.3	50.1	22	46	25.9	53.5	17.2
Total Dissolved Solids	mg/L	500*	NA	258	NA	--	360	406	270	400	385	NA <sup>(4)</sup>	254
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA	7.9 <sup>(1)</sup>	7.1	7.3	7.3	7.3	7.1	7.0	6.7
<b>Appendix IV</b>													
Antimony	ug/L	6	NA	2	6	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Arsenic	ug/L	10	NA	1	10	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000	11.5	11.7	14.3	9.7	14	15	14	10
Beryllium	ug/L	4	NA	1	4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100	< 1.0	< 1.0	1.6	1.7	1.2	< 1	< 1	< 1
Cobalt	ug/L	NC	6	15	15	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 15	< 15	< 6
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
Lead	ug/L	NC	15	1	15	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 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	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5	< 5	< 5
Radium-226	pCi/L	NC	NA	NA	NA	< 0.549	< 0.648	< 0.578	< 0.0813	0.232	< 0.177	< 0.535	< 0.117
Radium-228	pCi/L	NC	NA	NA	NA	< 0.699	< 0.804	< 0.729	< 0.342	< 0.518	< 0.449	< 0.400	< 0.465
Radium-226/228	pCi/L	5	NA	1.93	5	< 1.25	< 1.45	< 1.31	0.403	< 0.518	< 0.449	< 0.535	< 0.465
Selenium	ug/L	50	NA	5	50	1.1	9.9	21.1	3.8	16	10	12	4
Thallium	ug/L	2	NA	2	2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 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.
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- \* - 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.

# **Appendix D**

## **October 2021 Assessment Monitoring Statistical Evaluation**

## Technical Memorandum

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**Date:** January 28, 2022

**To:** Bethany Swanberg, Consumers Energy

**From:** Sarah Holmstrom, TRC  
Kristin Lowery, TRC

**Project No.:** 418422.0001.0000 Phase 1 Task 3

**Subject:** Statistical Evaluation of October 2021 Assessment Monitoring Sampling Event  
JH Campbell Dry Ash Landfill, Consumers Energy Company, West Olive, Michigan

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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<sup>1</sup> at the JH Campbell Power Plant (JHC) Dry Ash Landfill. The second semiannual assessment monitoring event for 2022 was conducted on October 19 through 22, 2021. 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 2021 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 ten monitoring wells (JHC-MW-15017, JHC-MW-15018, JHC-MW-15022, and JHC-MW-15031 through JHC-MW-15037)

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<sup>1</sup> 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.

## Technical Memorandum

located on the south and east perimeters of the landfill Cells 1 through 4. Former downgradient monitoring well JHC-MW-15019 was decommissioned in May 2021 to accommodate Cell 6 construction.

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<sup>2</sup>, the preferred method for comparisons to a fixed standard is 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 sample mean, the sample 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 (June 2018 through October 2021) for data that met project data quality objectives<sup>3</sup>. Therefore, no confidence limits were calculated for the Dry Ash Landfill.

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

<sup>3</sup> 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 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.

## Technical Memorandum

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 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 D1**  
 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:						6/20/2018	11/13/2018	4/23/2019	10/8/2019	4/14/2020	10/21/2020	4/13/2021	4/13/2021	10/21/2021	
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS										
<b>Appendix III</b>															
Boron	ug/L	NC	NA	51	NA	245	274	340	350	243	210	148	151	167	
Calcium	mg/L	NC	NA	46	NA	44	60.9	81	77	64.4	54.9	61.1	60.4	58.5	
Chloride	mg/L	250*	NA	43	NA	97	170	120	60	36.0	37.4	31.0	30.8	29.9	
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	60.6	72.0	100	92	69	63	43.6	43.4	46.4	
Total Dissolved Solids	mg/L	500*	NA	258	NA	348	474	520	280	339	NA <sup>(3)</sup>	296	303	292	
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA	6.0	6.1	6.1	6.3	5.6	5.9	6.1	--	6.5	
<b>Appendix IV</b>															
Antimony	ug/L	6	NA	2	6	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	
Arsenic	ug/L	10	NA	1	10	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	
Barium	ug/L	2,000	NA	35	2,000	80.0	85.5	70	47	34	22	25	25	28	
Beryllium	ug/L	4	NA	1	4	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	
Cadmium	ug/L	5	NA	0.2	5	0.54	0.60	0.57	0.24	0.4	< 0.2	< 0.2	< 0.2	< 0.2	
Chromium	ug/L	100	NA	2	100	< 1.0	< 1.0	12	< 1.0	< 1	1	< 1	< 1	< 1	
Cobalt	ug/L	NC	6	15	15	< 15.0	< 6.0	< 6.0	< 6.0	< 15	< 15	< 6	< 6	< 6	
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	< 1	< 1	< 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	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	
Molybdenum	ug/L	NC	100	5	100	6.2	28.5	11	10	16	21	5	5	< 5	
Radium-226	pCi/L	NC	NA	NA	NA	< 0.785	< 1.05	0.176	0.259	< 0.209	0.335	< 0.0986	< 0.106	< 0.170	
Radium-228	pCi/L	NC	NA	NA	NA	2.74	< 0.910	0.827	0.384	0.566	< 0.414	< 0.354	< 0.497	0.584	
Radium-226/228	pCi/L	5	NA	1.93	5	3.02	< 1.96	1.00	0.643	0.618	0.574	< 0.354	< 0.497	0.660	
Selenium	ug/L	50	NA	5	50	18.5	18.8	16	14	16	15	14	13	20	
Thallium	ug/L	2	NA	2	2	< 2.0	< 2.0	< 2.0	< 2.0	< 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.
- 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) April 2019 result not used for assessment monitoring.
- (2) 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.
- (3) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

**Table D1**  
 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:						6/20/2018	11/13/2018	4/23/2019	10/8/2019	4/14/2020	4/14/2020	10/21/2020	10/21/2020	4/13/2021	10/21/2021
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS						Field Dup		Field Dup		
<b>Appendix III</b>															
Boron	ug/L	NC	NA	51	NA	117	115	130	170	142	148	167	165	258	327
Calcium	mg/L	NC	NA	46	NA	44.8	37.6	58	48	50.6	50.7	65.0	68.1	85.2	62.7
Chloride	mg/L	250*	NA	43	NA	31.9	33.2	43	44	28.5	28.3	35.9	34.5	34.2	25.9
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	< 1,000
Sulfate	mg/L	250*	NA	14	NA	62.3	51.1	61	84	52.8	52.9	59.0	55.7	56.7	73.2
Total Dissolved Solids	mg/L	500*	NA	258	NA	194	276	320	370	405	287	441	NA <sup>(3)</sup>	375	329
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA	6.1	6.3	6.4	6.0	6.2	--	6.0	--	5.9	6.0
<b>Appendix IV</b>															
Antimony	ug/L	6	NA	2	6	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	NA	1	10	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000	76.5	79.6	80	130	96	95	77	78	57	61
Beryllium	ug/L	4	NA	1	4	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5	< 0.20	< 0.20	< 0.20	0.29	0.2	0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100	< 1.0	< 1.0	< 1.0	< 1.0	< 1	3	< 1	< 1	< 1	< 1
Cobalt	ug/L	NC	6	15	15	< 15.0	< 6.0	< 6.0	< 6.0	< 15	< 15	< 15	< 15	< 6	< 6
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	< 1	< 1	< 1	< 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	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100	19.7	6.7	< 5.0	< 5.0	< 5	< 5	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NC	NA	NA	NA	< 0.692	< 0.760	0.217	0.348	< 0.209	< 0.220	< 0.367	< 0.684	0.115	0.227
Radium-228	pCi/L	NC	NA	NA	NA	< 1.14	< 0.918	< 0.476	0.390	< 0.575	< 0.561	< 0.632	< 0.427	< 0.439	< 0.401
Radium-226/228	pCi/L	5	NA	1.93	5	< 1.83	< 1.68	< 0.476	0.739	< 0.575	< 0.561	0.747	0.926	< 0.439	0.616
Selenium	ug/L	50	NA	5	50	9.9	8.2	12	15	12	13	14	13	21	20
Thallium	ug/L	2	NA	2	2	< 2.0	< 2.0	< 2.0	< 2.0	< 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.
- 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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- (2) 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.
- (3) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

**Table D1**  
 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:						6/20/2018	11/14/2018	11/14/2018	4/24/2019	4/24/2019	6/21/2019	10/9/2019	4/14/2020	10/21/2020	4/14/2021	10/21/2021
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS			Field Dup		Field Dup						
<b>Appendix III</b>																
Boron	ug/L	NC	NA	51	NA	315	376	374	360	360	--	330	311	146	250	197
Calcium	mg/L	NC	NA	46	NA	109	109	106	110	110	--	130	119	66.9	87.7	85.3
Chloride	mg/L	250*	NA	43	NA	3.5	3.7	3.8	2.7	2.7	--	< 2.0	< 1.00	5.39	1.28	1.46
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	26	40.6	40.7	37	37	--	37	14.2	33.3	25.8	32.8
Total Dissolved Solids	mg/L	500*	NA	258	NA	414	358	400	410	400	--	540	405	NA <sup>(3)</sup>	371	361
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA	6.9	7.0	--	7.0	--	7.1	7.0	6.8	7.0	6.4	6.9
<b>Appendix IV</b>																
Antimony	ug/L	6	NA	2	6	< 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	< 1	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000	21.2	21.3	22.6	23	22	--	26	23	14	21	21
Beryllium	ug/L	4	NA	1	4	< 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	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100	< 1.0	1.7	1.5	82 <sup>(1)(2)</sup>	63 <sup>(2)</sup>	2.2 <sup>(2)</sup>	5.9	< 1	1	< 1	< 1
Cobalt	ug/L	NC	6	15	15	< 15.0	< 6.0	< 6.0	< 6.0	< 6.0	--	< 6.0	< 15	< 15	< 6	< 6
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	< 1	< 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	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100	< 5.0	6.5	6.0	7.2	6.4	--	5.2	< 5	18	< 5	9
Radium-226	pCi/L	NC	NA	NA	NA	< 0.673	< 0.692	< 0.924	< 0.0968	< 0.0955	--	0.190	< 0.281	< 0.386	< 0.121	< 0.182
Radium-228	pCi/L	NC	NA	NA	NA	< 0.697	0.999	< 0.849	< 0.505	< 0.470	--	< 0.480	< 0.443	< 0.304	< 0.432	< 0.417
Radium-226/228	pCi/L	5	NA	1.93	5	< 1.37	< 1.35	< 1.77	< 0.505	< 0.470	--	< 0.480	< 0.443	< 0.386	< 0.432	< 0.417
Selenium	ug/L	50	NA	5	50	2.8	5.6	5.2	7.2	7.4	--	6.4	3	7	8	10
Thallium	ug/L	2	NA	2	2	< 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) April 2019 result not used for assessment monitoring.
- (2) 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.
- (3) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

**Table D1**  
 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:						6/20/2018	11/14/2018	4/24/2019	10/9/2019	4/14/2020	10/21/2020	4/13/2021	10/22/2021
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS								
<b>Appendix III</b>													
Boron	ug/L	NC	NA	51	NA	108	104	79	85	75	114	51	64
Calcium	mg/L	NC	NA	46	NA	66.9	63.3	59	57	49.8	56.1	49.7	54.2
Chloride	mg/L	250*	NA	43	NA	38.9	33.4	24	28	20.1	25.0	9.49	7.56
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
Sulfate	mg/L	250*	NA	14	NA	40	34.7	25	26	23.5	35.1	27.7	21.3
Total Dissolved Solids	mg/L	500*	NA	258	NA	352	268	280	220	266	NA <sup>(3)</sup>	180	< 10
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA	6.8	6.7	6.9	6.9	6.7	6.4	7.1	7.3
<b>Appendix IV</b>													
Antimony	ug/L	6	NA	2	6	< 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	< 1	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000	18.9	21.4	14	17	17	20	15	15
Beryllium	ug/L	4	NA	1	4	< 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	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100	< 1.0	24.6	5.4	1.9	< 1	3	< 1	< 1
Cobalt	ug/L	NC	6	15	15	< 15.0	< 6.0	< 6.0	< 6.0	< 15	< 15	< 6	< 6
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
Lead	ug/L	NC	15	1	15	< 1.0	1.3	< 1.0	< 1.0	< 1	< 1	< 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	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100	< 5.0	< 5.0	< 5.0	< 5.0	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NC	NA	NA	NA	< 0.638	0.849	0.102	0.199	< 0.210	< 0.358	< 0.146	< 0.184
Radium-228	pCi/L	NC	NA	NA	NA	< 1.02	< 0.773	< 0.427	0.600	< 0.412	< 0.412	< 0.502	< 0.435
Radium-226/228	pCi/L	5	NA	1.93	5	< 1.66	< 1.50	0.466	0.798	< 0.412	< 0.412	< 0.502	< 0.435
Selenium	ug/L	50	NA	5	50	3.0	2.4	< 1.0	< 1.0	2	3	3	3
Thallium	ug/L	2	NA	2	2	< 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) April 2019 result not used for assessment monitoring.
- (2) 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.
- (3) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

**Table D1**  
 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:						6/19/2018	6/19/2018	11/14/2018	4/24/2019	10/8/2019	4/14/2020	10/21/2020	4/13/2021	10/21/2021	
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		Field Dup								
<b>Appendix III</b>															
Boron	ug/L	NC	NA	51	NA	45.7	44.6	49.4	< 50	58	45	45	40	75	
Calcium	mg/L	NC	NA	46	NA	8.8	8.4	8.1	9.4	7.9	8.76	10.8	7.70	9.99	
Chloride	mg/L	250*	NA	43	NA	3.4	3.4	4.2	2.6	2.3	1.76	1.66	1.12	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	
Sulfate	mg/L	250*	NA	14	NA	11.8	11.6	11.9	11	12	9.60	11.3	10.8	13.9	
Total Dissolved Solids	mg/L	500*	NA	258	NA	64	< 50.0	< 50.0	53	68	101	NA <sup>(3)</sup>	43	62	
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA	6.3	--	6.2	6.3	6.3	6.1	5.8	5.6	5.5	
<b>Appendix IV</b>															
Antimony	ug/L	6	NA	2	6	< 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	< 1	< 1	< 1	
Barium	ug/L	2,000	NA	35	2,000	8.8	8.7	7.7	8.3	7.9	8	8	8	13	
Beryllium	ug/L	4	NA	1	4	< 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	< 0.2	< 0.2	< 0.2	< 0.2	
Chromium	ug/L	100	NA	2	100	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	
Cobalt	ug/L	NC	6	15	15	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 15	< 15	< 6	< 6	
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	< 1	< 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	< 0.2	< 0.2	< 0.2	< 0.2	
Molybdenum	ug/L	NC	100	5	100	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5	< 5	< 5	< 5	
Radium-226	pCi/L	NC	NA	NA	NA	< 0.464	< 0.722	< 0.748	< 0.118	0.157	< 0.228	< 0.407	< 0.129	< 0.216	
Radium-228	pCi/L	NC	NA	NA	NA	< 0.721	< 1.17	< 0.812	< 0.395	< 0.347	< 0.473	< 0.422	< 0.573	< 0.320	
Radium-226/228	pCi/L	5	NA	1.93	5	< 1.19	< 1.89	< 1.56	< 0.395	0.427	< 0.473	< 0.422	< 0.573	< 0.320	
Selenium	ug/L	50	NA	5	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	
Thallium	ug/L	2	NA	2	2	< 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) April 2019 result not used for assessment monitoring.
- (2) 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.
- (3) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

**Table D1**  
 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:						6/19/2018	11/14/2018	4/24/2019	10/8/2019	4/14/2020	10/21/2020	4/13/2021	10/21/2021
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS								
<b>Appendix III</b>													
Boron	ug/L	NC	NA	51	NA	33	41.8	< 50	51	51	54	46	43
Calcium	mg/L	NC	NA	46	NA	9	10.0	10	11	12.0	14.2	11.2	9.81
Chloride	mg/L	250*	NA	43	NA	3.4	3.2	< 2.0	2.6	1.41	2.65	1.61	< 1.00
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
Sulfate	mg/L	250*	NA	14	NA	8.1	9.2	9.5	12	10.8	11.0	10.0	7.38
Total Dissolved Solids	mg/L	500*	NA	258	NA	68	< 50.0	58	71	59	NA <sup>(3)</sup>	50	58
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA	6.7	6.7	6.7	6.9	6.6	6.4	6.2	6.3
<b>Appendix IV</b>													
Antimony	ug/L	6	NA	2	6	< 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	< 1	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000	5.2	6.1	< 5.0	5.4	6	6	< 5	< 5
Beryllium	ug/L	4	NA	1	4	< 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	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1
Cobalt	ug/L	NC	6	15	15	< 15.0	< 6.0	< 6.0	< 6.0	< 15	< 15	< 6	< 6
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
Lead	ug/L	NC	15	1	15	< 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
Mercury	ug/L	2	NA	0.2	2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100	< 5.0	< 5.0	< 5.0	< 5.0	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NC	NA	NA	NA	< 0.570	< 0.766	< 0.0696	0.167	< 0.294	< 0.346	< 0.128	< 0.174
Radium-228	pCi/L	NC	NA	NA	NA	< 0.845	< 0.729	< 0.306	< 0.333	0.498	< 0.397	< 0.397	0.845
Radium-226/228	pCi/L	5	NA	1.93	5	< 1.42	< 1.50	< 0.306	< 0.333	< 0.487	< 0.397	< 0.397	0.939
Selenium	ug/L	50	NA	5	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1
Thallium	ug/L	2	NA	2	2	< 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.
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**Table D1**  
 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:						6/19/2018	11/14/2018	4/24/2019	10/8/2019	10/8/2019	4/14/2020	10/21/2020	4/13/2021	10/21/2021	10/21/2021
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS					Field Dup					Field Dup
<b>Appendix III</b>															
Boron	ug/L	NC	NA	51	NA	62.6	62.5	51	68	65	59	57	50	46	43
Calcium	mg/L	NC	NA	46	NA	5.8	6.0	5.4	5.4	5.1	5.10	8.99	6.13	4.91	4.99
Chloride	mg/L	250*	NA	43	NA	3.1	3.5	2.1	< 2.0	< 2.0	1.53	1.82	2.80	2.06	1.96
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	12.5	14.4	12	15	15	11.5	15.7	11.8	12.1	11.8
Total Dissolved Solids	mg/L	500*	NA	258	NA	50	< 50.0	< 50	54	56	52	NA <sup>(3)</sup>	248	< 10	< 10
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA	6.0	5.9	5.9	6.1	--	5.4	5.8	5.2	5.5	--
<b>Appendix IV</b>															
Antimony	ug/L	6	NA	2	6	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	NA	1	10	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000	5.5	6.0	5.5	6.5	6.6	13	6	6	6	6
Beryllium	ug/L	4	NA	1	4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100	< 1.0	< 1.0	1.2	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	NC	6	15	15	< 15.0	< 6.0	< 6.0	< 6.0	< 6.0	< 15	< 15	< 6	< 6	< 6
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	< 1	< 1	< 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	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NC	NA	NA	NA	< 0.514	< 0.688	< 0.0948	0.133	< 0.134	< 0.208	< 0.295	< 0.138	< 0.183	< 0.209
Radium-228	pCi/L	NC	NA	NA	NA	< 1.04	< 0.786	< 0.381	< 0.384	< 0.308	< 0.436	< 0.386	< 0.393	< 0.390	< 0.490
Radium-226/228	pCi/L	5	NA	1.93	5	< 1.55	< 1.47	< 0.381	< 0.384	< 0.308	< 0.436	< 0.386	< 0.393	< 0.390	< 0.490
Selenium	ug/L	50	NA	5	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1
Thallium	ug/L	2	NA	2	2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 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.
- 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.
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- \* - 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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**Table D1**  
 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:						6/20/2018	11/14/2018	4/24/2019	6/21/2019	6/21/2019	10/9/2019	4/14/2020	10/22/2020	4/14/2021	10/22/2021
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS					Field Dup					
<b>Appendix III</b>															
Boron	ug/L	NC	NA	51	NA	111	78.2	91	--	--	78	64	60	52	73
Calcium	mg/L	NC	NA	46	NA	90.5	66.6	98	--	--	84	70.4	65.7	56.8	82.0
Chloride	mg/L	250*	NA	43	NA	27.1	20.00	23.00	--	--	24	15.0	10.9	9.07	14.0
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
Sulfate	mg/L	250*	NA	14	NA	26.7	18.8	24	--	--	25	21.1	19.6	17.5	26.2
Total Dissolved Solids	mg/L	500*	NA	258	NA	342	274	360	--	--	370	300	NA <sup>(3)</sup>	240	365
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA	7.0	7.3	7.2	7.1	--	7.2	7.2	7.2	7.3	7.2
<b>Appendix IV</b>															
Antimony	ug/L	6	NA	2	6	< 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	< 1	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000	18.1	12.3	17	--	--	16	17	13	12	19
Beryllium	ug/L	4	NA	1	4	< 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	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100	< 1.0	< 1.0	290 <sup>(1)(2)</sup>	1.8 <sup>(2)</sup>	2.5 <sup>(2)</sup>	4.4	< 1	< 1	< 1	< 1
Cobalt	ug/L	NC	6	15	15	< 15.0	< 6.0	< 6.0	--	--	< 6.0	< 15	< 15	< 6	< 6
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
Lead	ug/L	NC	15	1	15	< 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
Mercury	ug/L	2	NA	0.2	2	< 0.20	< 0.20	< 0.20	--	--	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100	< 5.0	< 5.0	11	--	--	< 5.0	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NC	NA	NA	NA	< 0.548	< 0.850	< 0.101	--	--	0.203	< 0.217	< 0.647	< 0.125	0.353
Radium-228	pCi/L	NC	NA	NA	NA	1.27	< 0.914	< 0.357	--	--	< 0.567	0.560	< 0.440	< 0.425	0.375
Radium-226/228	pCi/L	5	NA	1.93	5	1.63	< 1.76	< 0.357	--	--	< 0.567	0.687	< 0.647	< 0.425	0.728
Selenium	ug/L	50	NA	5	50	< 1.0	< 1.0	< 1.0	--	--	< 1.0	1	2	2	2
Thallium	ug/L	2	NA	2	2	< 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) April 2019 result not used for assessment monitoring.
- (2) 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.
- (3) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

**Table D1**  
 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:						6/20/2018	11/14/2018	4/24/2019	10/8/2019	4/14/2020	10/22/2020	4/14/2021	10/22/2021
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS								
<b>Appendix III</b>													
Boron	ug/L	NC	NA	51	NA	88.3	79.2	80	71	77	81	80	76
Calcium	mg/L	NC	NA	46	NA	64.8	51.6	50	55	51.1	59.3	52.1	39.5
Chloride	mg/L	250*	NA	43	NA	24.3	14.7	14	13	8.51	10.4	9.50	5.71
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
Sulfate	mg/L	250*	NA	14	NA	26.1	20.0	19	24	17.4	21.9	21.0	14.5
Total Dissolved Solids	mg/L	500*	NA	258	NA	278	216	220	320	221	NA <sup>(3)</sup>	229	169
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA	7.1	7.4	7.4	7.5	7.3	7.3	7.1	7.6
<b>Appendix IV</b>													
Antimony	ug/L	6	NA	2	6	< 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	< 1	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000	11.5	8.2	8.4	9.4	9	9	8	7
Beryllium	ug/L	4	NA	1	4	< 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	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1
Cobalt	ug/L	NC	6	15	15	< 15.0	< 6.0	< 6.0	< 6.0	< 15	< 15	< 6	< 6
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
Lead	ug/L	NC	15	1	15	< 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
Mercury	ug/L	2	NA	0.2	2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100	< 5.0	< 5.0	< 5.0	< 5.0	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NC	NA	NA	NA	< 0.555	0.812	< 0.0882	0.160	< 0.198	< 0.554	< 0.138	< 0.209
Radium-228	pCi/L	NC	NA	NA	NA	< 0.743	< 0.670	< 0.384	< 0.441	0.581	< 0.367	< 0.486	0.387
Radium-226/228	pCi/L	5	NA	1.93	5	< 1.30	0.874	< 0.384	0.442	0.659	< 0.554	< 0.486	< 0.386
Selenium	ug/L	50	NA	5	50	< 1.0	< 1.0	< 1.0	1.9	< 1	< 1	< 1	1
Thallium	ug/L	2	NA	2	2	< 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) April 2019 result not used for assessment monitoring.
- (2) 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.
- (3) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

**Table D1**  
 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:						6/20/2018	11/14/2018	4/24/2019	10/8/2019	4/14/2020	10/22/2020	4/14/2021	10/22/2021
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS								
<b>Appendix III</b>													
Boron	ug/L	NC	NA	51	NA	153	221	150	280	266	185	112	118
Calcium	mg/L	NC	NA	46	NA	72.6	103	73	110	100	93.4	59.0	61.7
Chloride	mg/L	250*	NA	43	NA	7.9	8.2	6.3	4.4	2.65	7.52	21.3	7.05
Fluoride	ug/L	4,000	NA	1,000	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,490
Sulfate	mg/L	250*	NA	14	NA	36.3	50.1	22	46	25.9	53.5	17.2	17.7
Total Dissolved Solids	mg/L	500*	NA	258	NA	360	406	270	400	385	NA <sup>(3)</sup>	254	249
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA	7.1	7.3	7.3	7.3	7.1	7.0	6.7	7.2
<b>Appendix IV</b>													
Antimony	ug/L	6	NA	2	6	< 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	< 1	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000	11.7	14.3	9.7	14	15	14	10	11
Beryllium	ug/L	4	NA	1	4	< 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	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100	< 1.0	1.6	1.7	1.2	< 1	< 1	< 1	< 1
Cobalt	ug/L	NC	6	15	15	< 15.0	< 6.0	< 6.0	< 6.0	< 15	< 15	< 6	< 6
Fluoride	ug/L	4,000	NA	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,490
Lead	ug/L	NC	15	1	15	< 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
Mercury	ug/L	2	NA	0.2	2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100	< 5.0	< 5.0	< 5.0	< 5.0	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NC	NA	NA	NA	< 0.648	< 0.578	< 0.0813	0.232	< 0.177	< 0.535	< 0.117	< 0.235
Radium-228	pCi/L	NC	NA	NA	NA	< 0.804	< 0.729	< 0.342	< 0.518	< 0.449	< 0.400	< 0.465	< 0.397
Radium-226/228	pCi/L	5	NA	1.93	5	< 1.45	< 1.31	0.403	< 0.518	< 0.449	< 0.535	< 0.465	< 0.397
Selenium	ug/L	50	NA	5	50	9.9	21.1	3.8	16	10	12	4	5
Thallium	ug/L	2	NA	2	2	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2	< 2	< 2

**Notes:**

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- mg/L - milligrams per liter.
- SU - standard units; pH is a field parameter.
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