



# 2021 Annual Groundwater Monitoring and Corrective Action Report

**JH Campbell Power Plant  
Pond A**

**West Olive, Michigan**

January 2022

A handwritten signature in black ink, appearing to read "Sarah B. Holmstrom".

---

Sarah B. Holmstrom, P.G.  
Project Manager/Sr. Hydrogeologist

**Prepared For:**

Consumers Energy

**Prepared By:**

TRC  
1540 Eisenhower Place  
Ann Arbor, Michigan 48108

A handwritten signature in black ink, appearing to read "Graham Crockford".

---

Graham Crockford, C.P.G.  
Program Manager

---

## TABLE OF CONTENTS

<b>1.0</b>	<b>Program Summary</b> .....	<b>1</b>
<b>2.0</b>	<b>Groundwater Monitoring</b> .....	<b>2</b>
2.1	Monitoring Well Network.....	2
2.2	First Semiannual Monitoring Event .....	3
2.3	Second Semiannual Monitoring Event .....	3
<b>3.0</b>	<b>Corrective Action</b> .....	<b>4</b>
3.1	Nature and Extent Groundwater Sampling.....	4
3.2	Assessment of Corrective Measures .....	4
3.3	Remedy Selection .....	4

## APPENDICES

Appendix A	Pond A Well Decommissioning and Replacement
Appendix B	Groundwater Monitoring System Certification JH Campbell Pond A
Appendix C	First Semiannual Monitoring Report
Appendix D	Second Semiannual Monitoring Report
Appendix E	Nature and Extent Data Summary
Appendix F	Semiannual Progress Report

## 1.0 Program Summary

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) Pond A CCR Unit at the JH Campbell Power Plant Site (JHC Pond A). 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 JHC Pond A to cover the period of January 1, 2021 to December 31, 2021.

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, Pond A 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-15006, JHC-MW-15007, JHC-MW-15008, JHC-MW-15009, JHC-MW-15010, and JHC-MW-15011; and
- Sulfate at JHC-MW-15006, JHC-MW-15007, JHC-MW-15008, JHC-MW-15009, JHC-MW-15010, and JHC-MW-15011.

On April 25, 2018, Consumers Energy entered assessment monitoring at Pond A upon determining that an Alternate Source Demonstration for the Appendix III constituents was not successful. During the statistical evaluation of the initial assessment monitoring event (June 2018), arsenic was present in downgradient monitoring well JHC-MW-15011 at statistically significant levels exceeding the Groundwater Protection Standard (GWPS). Therefore, Consumers Energy initiated an Assessment of Corrective Measures (ACM) on April 14, 2019, within 90 days from when the Appendix IV exceedance was determined. The ACM was completed on September 11, 2019. Consumers Energy will continue to evaluate corrective measures per §257.96 and §257.97 and is continuing semiannual assessment monitoring in accordance with §257.95. Pond A was in assessment monitoring at the beginning and at the end of the period covered by this report. Data that have been collected and evaluated in 2021 are presented in this report.

The groundwater management remedy for Pond A will be selected as soon as feasible to, at a minimum, meet the federal standards of §257.97(b) of the CCR Rule. Consumers Energy will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98. The next semiannual assessment monitoring event is tentatively scheduled for the second calendar quarter of 2022.

## 2.0 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 all constituents in Appendix III and those constituents in Appendix IV of the CCR Rule that were detected during prior sampling. The 2021 semiannual assessment monitoring events at Pond A were completed in April and October 2021 to comply with both the CCR Rule and the Michigan Department of Environment, Great Lakes, and Energy (EGLE)-approved monitoring program established for Pond A in 2019. Given the congruencies between the two programs, data collected and evaluated under both programs are presented together in the semiannual reports. In addition to the semiannual assessment monitoring data, samples were collected from the Pond A monitoring well network from February 22 through 24, 2021 and from August 16 through 18, 2021 to comply with the EGLE-approved monitoring program requirement for quarterly monitoring. The quarterly data are consistent with the semiannual assessment monitoring events and are used in the statistical evaluation.

### 2.1 Monitoring Well Network

Consumers Energy initially established a groundwater monitoring system for the JHC Pond A in 2015 consisting of 12 monitoring wells (six background monitoring wells and six downgradient monitoring wells) screened in the uppermost aquifer. The initial installation for the Pond A monitoring well network was positioned to capture downgradient groundwater flow from the water table at a time where mounding was observed in the vicinity of Pond A. Since the permanent discontinuation of hydraulic loading in June 2018 and completion of the final cover installation in 2019, mounding is no longer present and the groundwater has equilibrated to a lower static water elevation. As documented in the Closure Certification Report approved by the EGLE on November 25, 2019, the cover construction was completed in summer 2019, eliminating infiltration at Pond A. This has caused the groundwater flow direction to shift to the south-southeast and the water levels to drop below the screened intervals for JHC-MW-15007, JHC-MW-15009, and JHC-MW-15010, and drop within a foot of the bottom of the screen at JHC-MW-15011 making it difficult to collect a sample. Consequently, JHC-MW-15010 was no longer located downgradient from Pond A and groundwater samples could not reliably be collected from JHC-MW-15007, JHC-MW-15009, and JHC-MW-15011.

On June 4, 2021, TRC, on behalf of Consumers Energy, submitted the *Pond A Monitoring Well Decommissioning and Replacement* letter to EGLE to request approval to decommission and replace monitoring wells JHC-MW-15007, JHC-MW-15009, and JHC-MW-15011, and remove monitoring well JHC-MW-15010 from the groundwater monitoring system. EGLE approved the proposed changes to groundwater monitoring system by email on June 4, 2021. On July 19, 2021, TRC field staff mobilized to the site to install replacement monitoring wells JHC-MW-15007R, JHC-MW-15009R, and JHC-MW-15011R and decommission JHC-MW-15007, JHC-MW-15009, JHC-MW-15010, and JHC-MW-15011. Documentation of the well decommissioning and well replacement activities are provided in the October 7, 2021 *Summary of Pond A Monitoring Well Decommissioning and Replacement* letter provided in Appendix A.



---

The groundwater monitoring network for Pond A now consists of 11 monitoring wells (six background monitoring wells and five downgradient monitoring wells) screened in the uppermost aquifer. 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). The five downgradient wells (JHC-MW-15006, JHC-MW-15007R, JHC-MW-15008R, JHC-MW-15009R, and JHC-MW-15011R) are located south and southeast of Pond A. An updated groundwater monitoring network certification is included as Appendix B.

## **2.2 First Semiannual Monitoring Event**

A summary of the first semiannual groundwater monitoring event is provided in Appendix C.

## **2.3 Second Semiannual Monitoring Event**

A summary of the second semiannual groundwater monitoring event is provided in Appendix D.

### 3.0 Corrective Action

#### 3.1 Nature and Extent Groundwater Sampling

Per §257.95(g)(1), in the event that the facility determines, pursuant to §257.93(h), that there is a statistical exceedance of the GWPSs for one or more of the Appendix IV constituents, the facility must characterize the nature and extent of the release of CCR as well as any site conditions that may affect the remedy selected. A technical memorandum summarizing the nature and extent groundwater data collected in 2021 for Pond A is included in Appendix E.

#### 3.2 Assessment of Corrective Measures

The ACM was completed on September 11, 2019 as a step towards developing a final remedy.

Several groundwater remediation alternatives evaluated in the ACM are considered technically feasible to reduce on-site groundwater concentrations. The following corrective measures were retained for further evaluation in conjunction with closure in place for Pond A:

- Groundwater Monitoring and Institutional Controls;
- Post Source Control/Removal Monitoring;
- Groundwater Capture/Control;
- Impermeable Barrier with Groundwater Capture/Control;
- Active Geochemical Sequestration; and
- Passive Geochemical Sequestration.

Consumers Energy plans to utilize an adaptive management strategy for selecting the final groundwater remedy for Pond A in coordination with the specified CCR source material management strategies discussed in the ACM. Under this remedy selection strategy, measures that remove source material, reduce infiltration, and/or minimize the potential for future migration during the closure process may be implemented to address existing conditions followed by monitoring and evaluation of the performance after closure. Adjustments will be made to the corrective measure remedy, as needed, to achieve the remedial goals.

#### 3.3 Remedy Selection

Remedy selection for Pond A, prescribed by the CCR Rule, is being undertaken in coordination with the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Consent Agreement WMRPD No. 115-01-2018, which was executed on December 28, 2018. The January 2022 semiannual progress report describing the progress in selecting and designing the remedy required pursuant to §257.97(a) is included in Appendix F. Pond A has been closed according to the *JH Campbell Generating Facility Pond A Closure Plan, West Olive, Michigan* (Golder, October 2016) and the updated closure plan detailing the final cover system that was submitted to the EGLE in February 2019. Pond A was closed with waste in place in accordance with the requirements for CCR landfills under RCRA (§257.102(d)). Cover construction was completed in summer 2019 and the Closure Certification Report was approved by the EGLE on November 25, 2019.

Changes in groundwater chemistry continue to be evaluated following the completion of capping at Pond A. The arsenic exceedance at MW-15011 which initially triggered corrective action continues to attenuate following the completion of the final cover for Pond A. Since the installation of the final cover, groundwater monitoring data for several other constituents indicate an observable influence from immediately adjacent, upgradient, closed, pre-existing units. A formal demonstration of this influence is in development. Remedial action for the upgradient units is being taken under Consent Agreement WMRPD No. 115-01-2018.

# **Appendix A**

## **Pond A Well Decommissioning and Replacement**

October 7, 2021

*via email: WaltersK7@michigan.gov*

Mr. Kent Walters, Geologist  
Material Management Division (MMD)  
Michigan Department of Environment, Great Lakes, and Energy (EGLE)  
Grand Rapids District Office  
350 Ottawa Avenue NW, Unit 10  
Grand Rapids, Michigan 49503-2341

**Subject:** Summary of Pond A Monitoring Well Decommissioning and Replacement at the Consumers Energy JH Campbell Solid Waste Management Area, West Olive, Michigan

Dear Mr. Walters:

TRC was retained by Consumers Energy to decommission monitoring wells JHC-MW-15007, JHC-MW-15009, JHC-MW-15010, and JHC-MW-15011 and install replacement monitoring wells JHC-MW-15007R, JHC-MW-15009R, and JHC-MW-15011R at the Consumers Energy JHC Campbell Solid Waste Management Area, Pond A (Pond A), located in West Olive, Michigan. These activities were completed as described in the notification letter titled Pond A Monitoring Well Decommissioning and Replacement at the Consumers Energy JH Campbell Solid Waste Management Area, West Olive, Michigan (June 4, 2021), approved by the EGLE via email on June 4, 2021. The well decommissioning and installation activities were completed to remove one well no longer down gradient of Pond A and reposition three monitoring well screen intervals to a lower elevation in order to capture groundwater which has equilibrated to a lower static water elevation. The locations of the four decommissioned monitoring wells and the three replacement wells are illustrated on Figure 1. This letter provides a detailed summary of the monitoring well installation and decommissioning procedures conducted at the site.

On July 19, 2021, TRC field staff mobilized to the site to install replacement monitoring wells JHC-MW-15007R, JHC-MW-15009R, and JHC-MW-15011R and decommission JHC-MW-15007, JHC-MW-15009, JHC-MW-15010, and JHC-MW-15011. Cascade Drilling of Flint, Michigan was retained by TRC to provide the well drilling and decommissioning services.

All monitoring wells were installed using a Boart Longyear LS 250 rotary sonic drill rig. Prior to well installation, the top five feet of each boring was hand cleared and soil samples were collected continuously to the remaining total depth for classification by TRC field staff using the Unified Soil Classification System and to verify the depth to groundwater. The soil boring logs are provided in Attachment A.

The monitoring wells are constructed using 2-inch inside diameter PVC casing with a 10-foot screen. The bottom of the well screen was set approximately 6 feet below the water table. The filter pack is comprised of medium washed silica sand and extends approximately 2 to 3 feet above the top of the screen. Following placement of the well screen and sand pack, the well annulus was sealed with 2 to 3 feet of bentonite chips, and the remaining annulus sealed with a bentonite grout slurry to approximately

Mr. Kent Walters  
EGLE  
October 7, 2021  
Page 2

1 foot below ground surface (ft bgs). The sand pack and bentonite were pressure grouted into the borehole from the top of the drill casing. The well was finished with a 4"x 4" square, above-ground painted protective metal cover, which was set in a 1-foot thick concrete surface seal. The well was secured with two bollards placed between the monitoring well and the adjacent service road, finished with a vented and locking well cap, and clearly labeled for identification by modifying well IDs on existing signs. Soil cuttings were thin spread around the monitoring well and development water was managed onsite. Nederveld Inc. surveyors completed horizontal and vertical survey of the monitoring wells on July 23, 2021. Well construction forms are provided in Attachment A.

Monitoring wells, JHC-MW-15007, JHC-MW-15009, JHC-MW-15010, and JHC-MW-15011, were decommissioned by removing the concrete pad, removing the protective steel cover, and removing the two protective steel bollards. Each well was cut off to two ft bgs, backfilled with bentonite grout to two ft bgs, sealed with bentonite chips to one ft bgs, then filled with surrounding sand to grade. Monitoring well decommissioning logs are included as Attachment B.

If you have any questions or comments, please feel free to contact me by phone at (734) 585-7818.

Sincerely,

TRC



Sarah Holmstrom, P.G.  
Project Manager/Senior Hydrogeologist



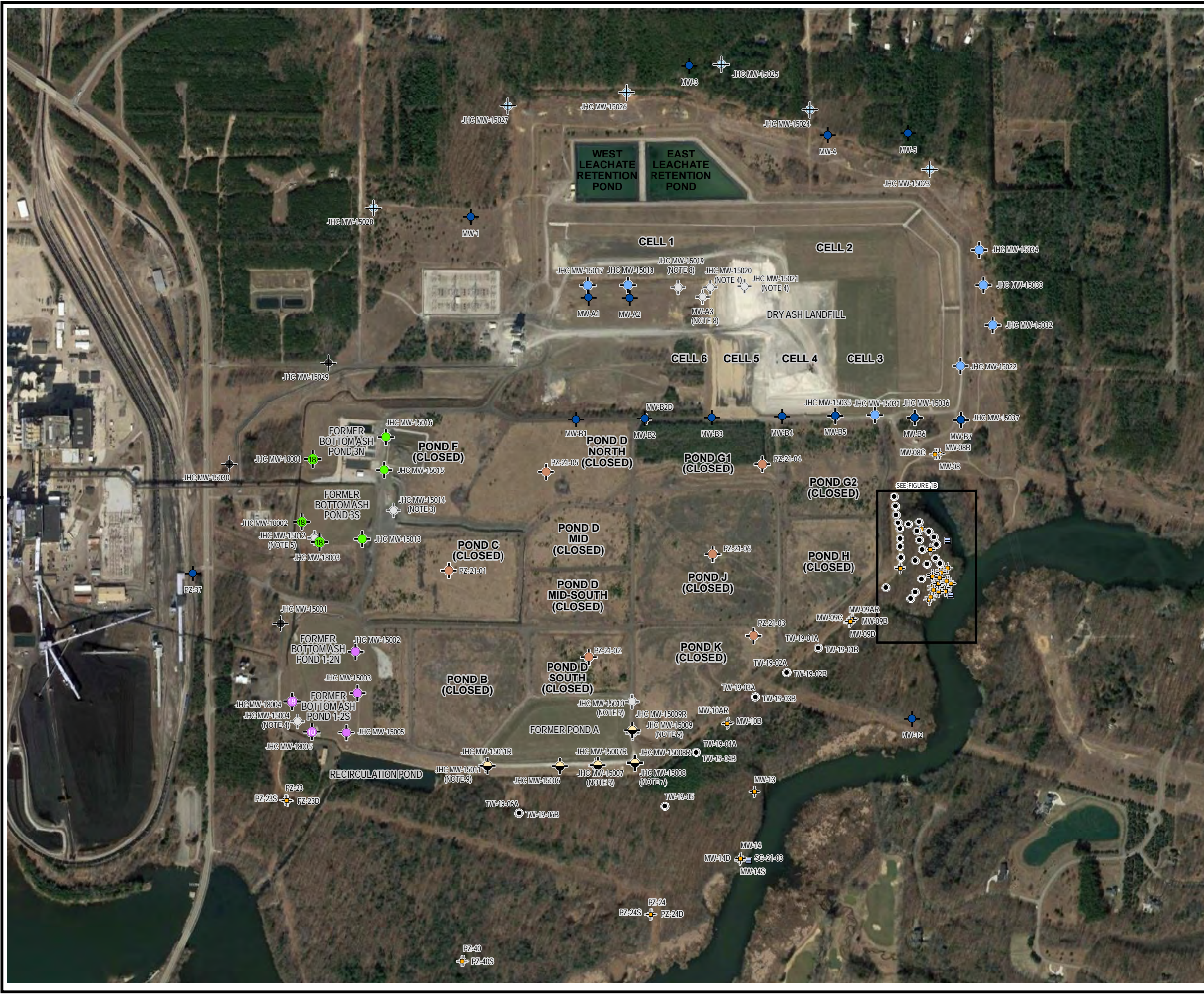
Brian Yelen  
Project Geologist

Attachments:     Figure 1 – Site Layout and Monitoring Locations  
                          Attachment A – Soil Boring Logs and Well Construction Diagrams  
                          Attachment B – Monitoring Well Decommissioning Logs

cc: Bethany Swanberg, Consumers Energy Company

# Figure





**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. MONITORING WELLS DECOMMISSIONED MAY 25, 2021.
9. MONITORING WELLS DECOMMISSIONED JULY, 2021.

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>SITE PLAN</b>	
DRAWN BY:	A. FOJTIK	PROJ NO.:	418422-0003
CHECKED BY:	B. YELEN	<b>FIGURE 1A</b>	
APPROVED BY:	S. HOLMSTROM		
DATE:	SEPTEMBER 2021		

TRC

1540 Eisenhower Place  
Ann Arbor, MI 48108-3284  
Phone: 734.971.7080  
www.trccompanies.com

FILE NO.: 418422-003-000.mxd



# **Attachment A**

## **Soil Boring Log and Well Construction Diagram**



**WELL CONSTRUCTION LOG**

**WELL NO. JHC MW-15007R**

Facility/Project Name: <b>Consumers Energy Company: JH Campbell</b>		Date Drilling Started: <b>7/20/2021</b>	Date Drilling Completed: <b>7/21/2021</b>	Project Number: <b>418422.0003</b>	
Drilling Firm: <b>Cascade Drilling</b>	Drilling Method: <b>Rotary Sonic</b>	Surface Elev. (ft) <b>625.7</b>	TOC Elevation (ft) <b>628.26</b>	Total Depth (ft bgs) <b>40.0</b>	Borehole Dia. (in) <b>2.5 / 6</b>
Boring Location: <b>South of Pond A.</b>		Personnel Logged By - <b>Brian Yelen</b> Driller - <b>Chris Bond</b>		Drilling Equipment: <b>Boart Longyear LS 250</b>	
State Plane N: 517541.9 E: 12635758.6					
Civil Town/City/or Village: <b>West Olive</b>	County: <b>Ottawa</b>	State: <b>MI</b>	Water Level Observations: While Drilling: Date/Time <b>7/21/21 00:00</b> ▽ Depth (ft, bgs) <b>30</b> After Drilling: Date/Time <b>7/23/21 00:00</b> ▾ Depth (ft, bgs) <b>33.61</b>		

SAMPLE	NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
					<b>TOPSOIL</b>				
	1	100		5	<b>SAND</b> Mostly fine to medium sand, trace silt, brownish yellow (10 YR 6/6), no odor, dry-moist, loose.	SW			
					<b>COAL ASH</b>				
	2	100		10	<b>SAND</b> Mostly fine to medium sand, trace silt, brownish yellow (10 YR 6/6), no odor, dry-moist, loose.  Change to trace to few silt, few gravel, dark brown (10 YR 3/3), moist at 8.0 feet below ground surface.				
					Change to trace silt, brownish yellow (10 YR 6/6), no gravel at 10.0 feet below ground surface.				
	3	100		25	Change to yellowish red (5 YR 4/6) at 22.5 feet below ground surface.				
					Change to brownish yellow (10 YR 6/6) at 27.5 feet below ground surface.				

SOIL BORING-WELL CONSTRUCTION LOG 418422.0003.0004 - COPY.GPJ 9/23/21


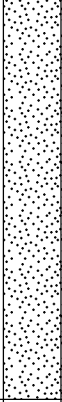
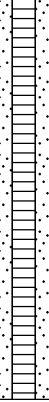
Signature: Firm: TRC Phone 734-971-7080  
1540 Eisenhower Place Ann Arbor, Michigan Fax 734-971-9022

Checked By: Jennifer Reed



WELL CONSTRUCTION LOG

WELL NO. JHC MW-15007R

SAMPLE		BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
NUMBER AND TYPE	RECOVERY (%)							
R <sub>S</sub> <sup>4</sup>	100		35	Change to few to little coarse sand, wet at 30.0 feet below ground surface.  Change to no coarse sand at 32.0 feet below ground surface.  	SW			
			40	End of boring at 40.0 feet below ground surface.				
			45					
			50					
			55					
			60					
			65					



**WELL CONSTRUCTION LOG**

**WELL NO. JHC MW-15009R**

Facility/Project Name: <b>Consumers Energy Company: JH Campbell</b>		Date Drilling Started: <b>7/19/2021</b>	Date Drilling Completed: <b>7/20/2021</b>	Project Number: <b>418422.0003</b>	
Drilling Firm: <b>Cascade Drilling</b>	Drilling Method: <b>Rotary Sonic</b>	Surface Elev. (ft) <b>632.2</b>	TOC Elevation (ft) <b>635.05</b>	Total Depth (ft bgs) <b>50.0</b>	Borehole Dia. (in) <b>2.5 / 6</b>
Boring Location: <b>East of Pond A.</b>		Personnel Logged By - <b>Brian Yelen</b> Driller - <b>Chris Bond</b>		Drilling Equipment: <b>Boart Longyear LS 250</b>	
State Plane N: 517799.3 E: 12636013.6					
Civil Town/City/or Village: <b>West Olive</b>	County: <b>Ottawa</b>	State: <b>MI</b>	Water Level Observations: While Drilling: Date/Time <b>7/20/21 00:00</b> ▽ Depth (ft, bgs) <b>40</b> After Drilling: Date/Time <b>7/23/21 00:00</b> ▼ Depth (ft, bgs) <b>40.23</b>		

SAMPLE		BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
NUMBER AND TYPE	RECOVERY (%)							
1 RS	100		5	<b>TOPSOIL</b> <b>SAND</b> Mostly fine to medium sand, trace silt, brownish yellow (10 YR 6/6), no odor, dry-moist, loose.  Change to moist at 5.0 feet below ground surface.	SW			
			10	<b>COAL ASH</b> <b>SAND</b> Mostly fine to medium sand, trace silt, brownish yellow (10 YR 6/6), no odor, moist, loose.				
			25	Change to trace to few silt, brown (10 YR 4/3) at 28.0 feet below ground surface.				

SOIL BORING-WELL CONSTRUCTION LOG 418422.0003.0004 - COPY.GPJ 9/23/21

Signature:	Firm: TRC 1540 Eisenhower Place Ann Arbor, Michigan	Phone 734-971-7080 Fax 734-971-9022
------------	--	--

Checked By: Jennifer Reed



WELL CONSTRUCTION LOG

WELL NO. JHC MW-15009R

SAMPLE		BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
NUMBER AND TYPE	RECOVERY (%)							
RS 4	100		35	Change to brownish yellow (10 YR 6/6) at 30.0 feet below ground surface				
			40	▼ Change to wet at 40.0 feet below ground surface.	SW			
RS 5	100		45					
			50	End of boring at 50.0 feet below ground surface.				
			55					
			60					
			65					

SOIL BORING WELL CONSTRUCTION LOG 418422.0003.0004 - COPY.GPJ 9/23/21



**WELL CONSTRUCTION LOG**

**WELL NO. JHC MW-15011R**

Facility/Project Name: <b>Consumers Energy Company: JH Campbell</b>		Date Drilling Started: <b>7/21/2021</b>	Date Drilling Completed: <b>7/22/2022</b>	Project Number: <b>418422.0003</b>	
Drilling Firm: <b>Cascade Drilling</b>	Drilling Method: <b>Rotary Sonic</b>	Surface Elev. (ft) <b>627.7</b>	TOC Elevation (ft) <b>629.79</b>	Total Depth (ft bgs) <b>43.0</b>	Borehole Dia. (in) <b>2.5 / 6</b>
Boring Location: <b>Southwest of Pond A</b>		Personnel Logged By - <b>Brian Yelen</b> Driller - <b>Chris Bond</b>		Drilling Equipment: <b>Boart Longyear LS 250</b>	
State Plane N: 517538.2 E: 12634946.9					
Civil Town/City/or Village: <b>West Olive</b>	County: <b>Ottawa</b>	State: <b>MI</b>	Water Level Observations: While Drilling: Date/Time <b>7/22/21 00:00</b> ▽ Depth (ft, bgs) <b>35.5</b> After Drilling: Date/Time <b>7/23/21 00:00</b> ▼ Depth (ft, bgs) <b>36.64</b>		

SAMPLE	NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
					<b>TOPSOIL</b>				
	1	100		5	<b>SAND</b> Mostly fine to medium sand, trace silt, brownish yellow (10 YR 6/6), no odor, dry-moist, loose.  Change to trace to few silt, very dark brown (10 YR 2/2), dry, loose to medium density at 4.5 feet below ground surface.  Change to trace silt, brownish yellow (10 YR 6/6), dry-moist, loose at 7.5 feet below ground surface.	SW			
	2	100		15	<b>COAL ASH</b>				
	3	100		25	<b>SAND</b> Mostly fine to medium sand, trace silt, brownish yellow (10 YR 6/6), no odor, moist, loose.	SW			

SOIL BORING-WELL CONSTRUCTION LOG 418422.0003.0004 - COPY.GPJ 9/23/21

Signature:	Firm: TRC 1540 Eisenhower Place Ann Arbor, Michigan	Phone 734-971-7080 Fax 734-971-9022
------------	--	--

Checked By: Jennifer Reed



WELL CONSTRUCTION LOG

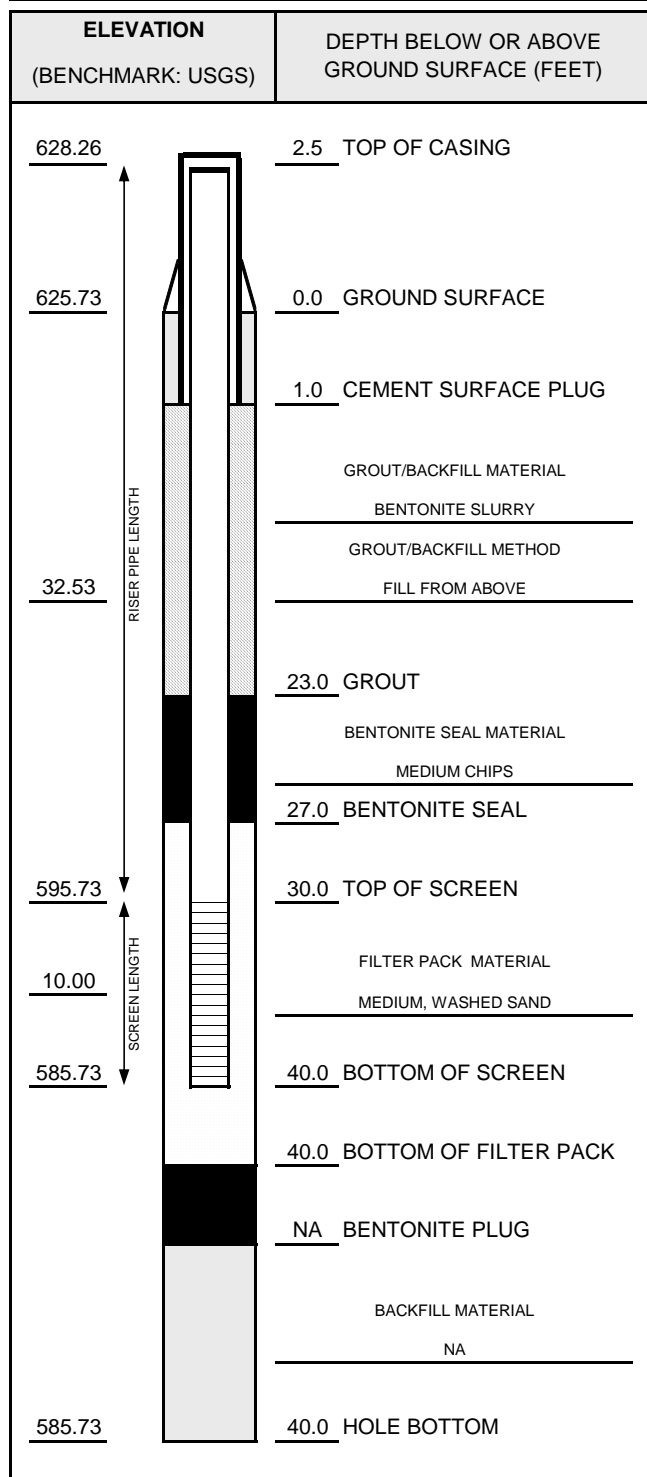
WELL NO. JHC MW-15011R

SAMPLE		BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
NUMBER AND TYPE	RECOVERY (%)							
4 RS	100			Change to brown (10 YR 4/3) at 30.0 feet below ground surface.	SW			
			35	SAND with SILT Mostly fine to medium sand, little to some silt, dark gray (10 YR 4/1), organic odor, moist, loose. ▽ Large wood piece at 35.0 feet below ground surface. ▼ Change to trace silt, wet at 35.5 feet below ground surface.	SW			
5 RS	100		40	SAND Mostly fine to medium sand, trace silt, brownish yellow (10 YR 6/6), no odor, wet, loose.	SW			
			45	End of boring at 43.0 feet below ground surface.				
			50					
			55					
			60					
			65					



## WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Consumers Energy JH Campbell Pond A	WELL ID: JHC MW-15007R
PROJ. NO: 418422.0003	DATE INSTALLED: 7/21/2021 INSTALLED BY: Brian Yelen CHECKED BY: J. Krenz



CASING AND SCREEN DETAILS	
<b>TYPE OF RISER:</b>	<u>2-INCH PVC</u>
PIPE SCHEDULE:	<u>40</u>
PIPE JOINTS:	<u>THREADED O-RINGS</u>
<b>SCREEN TYPE:</b>	<u>2-INCH PVC</u>
SCR. SLOT SIZE:	<u>0.01-INCH</u>
BOREHOLE DIAMETER:	<u>6</u> IN. FROM <u>0</u> TO <u>40</u> FT. <u>      </u> IN. FROM <u>      </u> TO <u>      </u> FT.
SURF. CASING DIAMETER:	<u>      </u> IN. FROM <u>      </u> TO <u>      </u> FT. <u>      </u> IN. FROM <u>      </u> TO <u>      </u> FT.

WELL DEVELOPMENT	
DEVELOPMENT METHOD:	<u>SURGE AND PUMP</u>
TIME DEVELOPING:	<u>1</u> HOURS
WATER REMOVED:	<u>100</u> GALLONS
WATER ADDED:	<u>0</u> GALLONS
WATER CLARITY BEFORE / AFTER DEVELOPMENT	
CLARITY BEFORE:	<u>Turbid</u>
COLOR BEFORE:	<u>Brown</u>
CLARITY AFTER:	<u>Clear</u>
COLOR AFTER:	<u>Clear</u>
ODOR (IF PRESENT):	<u>None</u>

WATER LEVEL SUMMARY				
	MEASUREMENT (FEET)		DATE	TIME
DTB BEFORE DEVELOPING:	43.10	T/PVC	7/23/2021	10:06
DTB AFTER DEVELOPING:	43.10	T/PVC	7/23/2021	16:25
SWL BEFORE DEVELOPING:	36.18	T/PVC	7/23/2021	10:06
SWL AFTER DEVELOPING:	36.14	T/PVC	7/23/2021	16:25
OTHER SWL:		T/PVC		
OTHER SWL:		T/PVC		

NOTES:

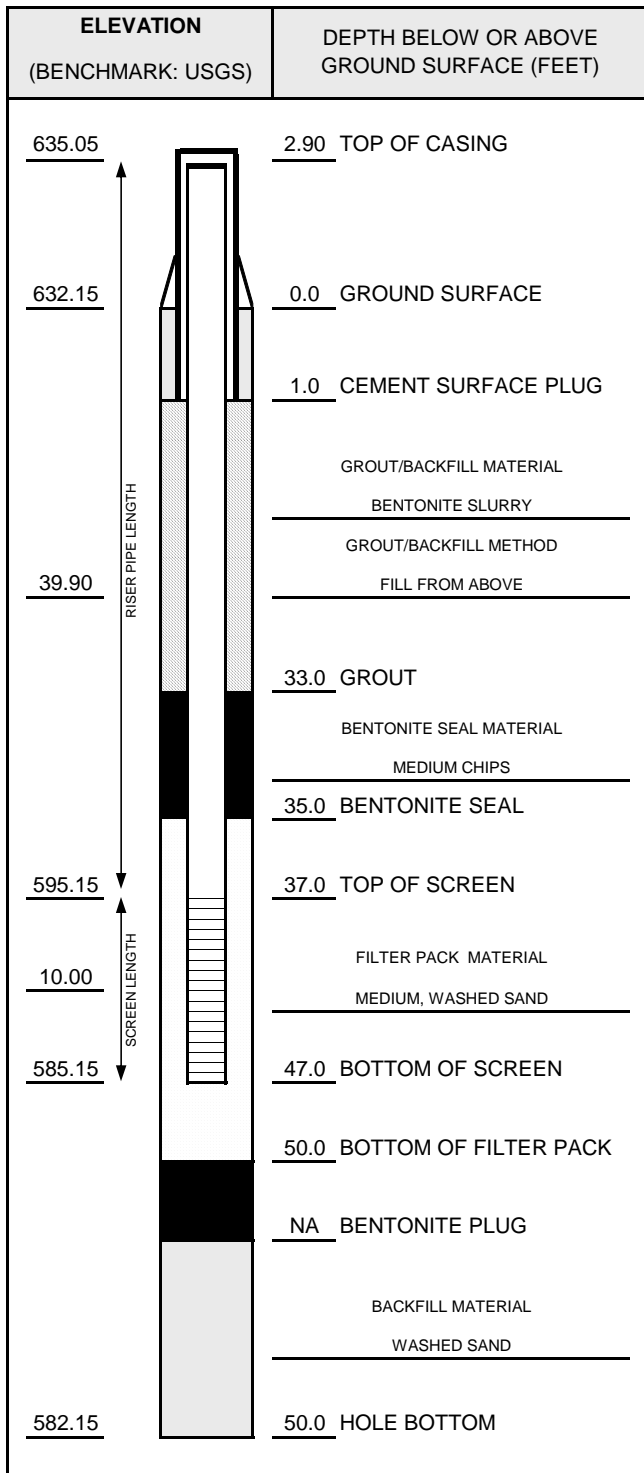
PROTECTIVE CASING DETAILS		
PERMANENT, LEGIBLE WELL LABEL ADDED?	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
PROTECTIVE COVER AND LOCK INSTALLED?	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
LOCK KEY NUMBER:	<u>Consumers Energy Lock</u>	





# WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Consumers Energy JH Campbell Pond A	WELL ID: <b>JHC MW-15009R</b>
PROJ. NO: 418422.0003	DATE INSTALLED: 7/20/2021    INSTALLED BY: Brian Yelen    CHECKED BY: J. Krenz



CASING AND SCREEN DETAILS	
<b>TYPE OF RISER:</b>	<u>2-INCH PVC</u>
PIPE SCHEDULE:	<u>40</u>
PIPE JOINTS:	<u>THREADED O-RINGS</u>
<b>SCREEN TYPE:</b>	<u>2-INCH PVC</u>
SCR. SLOT SIZE:	<u>0.01-INCH</u>
BOREHOLE DIAMETER:	<u>6</u> IN. FROM <u>0</u> TO <u>50</u> FT. <u>      </u> IN. FROM <u>      </u> TO <u>      </u> FT.
SURF. CASING DIAMETER:	<u>      </u> IN. FROM <u>      </u> TO <u>      </u> FT. <u>      </u> IN. FROM <u>      </u> TO <u>      </u> FT.

WELL DEVELOPMENT	
DEVELOPMENT METHOD:	<u>SURGE AND PUMP</u>
TIME DEVELOPING:	<u>1</u> HOURS
WATER REMOVED:	<u>120</u> GALLONS
WATER ADDED:	<u>0</u> GALLONS
WATER CLARITY BEFORE / AFTER DEVELOPMENT	
CLARITY BEFORE:	<u>Turbid</u>
COLOR BEFORE:	<u>Brown</u>
CLARITY AFTER:	<u>Clear</u>
COLOR AFTER:	<u>Clear</u>
ODOR (IF PRESENT):	<u>None</u>

WATER LEVEL SUMMARY				
	MEASUREMENT (FEET)		DATE	TIME
DTB BEFORE DEVELOPING:	50.70	T/PVC	7/23/2021	9:05
DTB AFTER DEVELOPING:	50.80	T/PVC	7/23/2021	14:44
SWL BEFORE DEVELOPING:	43.10	T/PVC	7/23/2021	9:05
SWL AFTER DEVELOPING:	43.13	T/PVC	7/23/2021	14:44
OTHER SWL:		T/PVC		
OTHER SWL:		T/PVC		

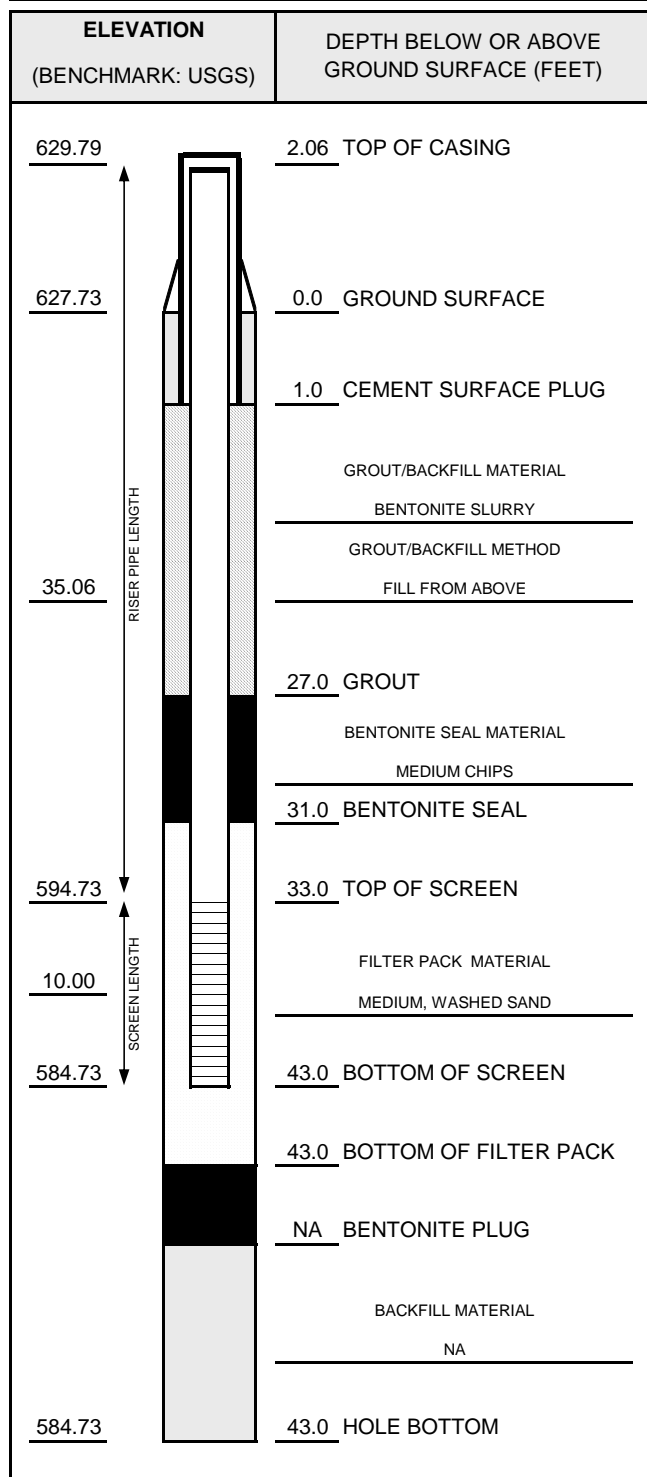
NOTES:

PROTECTIVE CASING DETAILS		
PERMANENT, LEGIBLE WELL LABEL ADDED?	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
PROTECTIVE COVER AND LOCK INSTALLED?	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
LOCK KEY NUMBER:	<u>Consumers Energy Lock</u>	



# WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Consumers Energy JH Campbell Pond A	WELL ID: JHC MW-15011R
PROJ. NO: 418422.0003	DATE INSTALLED: 7/22/2021 INSTALLED BY: Brian Yelen CHECKED BY: J. Krenz



CASING AND SCREEN DETAILS	
TYPE OF RISER:	2-INCH PVC
PIPE SCHEDULE:	40
PIPE JOINTS:	THREADED O-RINGS
SCREEN TYPE:	2-INCH PVC
SCR. SLOT SIZE:	0.01-INCH
BOREHOLE DIAMETER:	6 IN. FROM 0 TO 43 FT. _____ IN. FROM _____ TO _____ FT.
SURF. CASING DIAMETER:	_____ IN. FROM _____ TO _____ FT. _____ IN. FROM _____ TO _____ FT.

WELL DEVELOPMENT	
DEVELOPMENT METHOD:	SURGE AND PUMP
TIME DEVELOPING:	1 HOURS
WATER REMOVED:	100 GALLONS
WATER ADDED:	0 GALLONS
WATER CLARITY BEFORE / AFTER DEVELOPMENT	
CLARITY BEFORE:	Turbid
COLOR BEFORE:	Brown
CLARITY AFTER:	Clear
COLOR AFTER:	Clear
ODOR (IF PRESENT):	None

WATER LEVEL SUMMARY			
	MEASUREMENT (FEET)	DATE	TIME
DTB BEFORE DEVELOPING:	45.20 T/PVC	7/23/2021	10:09
DTB AFTER DEVELOPING:	45.20 T/PVC	7/23/2021	16:21
SWL BEFORE DEVELOPING:	37.70 T/PVC	7/23/2021	10:09
SWL AFTER DEVELOPING:	38.70 T/PVC	7/23/2021	16:21
OTHER SWL:	T/PVC		
OTHER SWL:	T/PVC		

NOTES:

PROTECTIVE CASING DETAILS	
PERMANENT, LEGIBLE WELL LABEL ADDED?	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
PROTECTIVE COVER AND LOCK INSTALLED?	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
LOCK KEY NUMBER:	Consumers Energy Lock

# **Attachment B**

## **Monitoring Well Decommissioning Log**



## MONITORING WELL DECOMMISSIONING LOG

PROJECT NAME: JH Campbell Pond A Well Replacement		<b>MONITORING WELL ID: JHC MW-15007</b>	
PROJECT NUMBER: 418422.0003	DATE: 07/21/2021	LOCATION: South of Pond A	LOCATION COORDINATES:
OBSERVED BY: Brian Yelen			N: 517540.502
DRILLING CONTRACTOR: CASCADE DRILLING			E: 12635742.72
CREW CHIEF: Chris Bond		TOP OF CASING ELEV.: 627.70	SURFACE ELEV.: 624.82

PROTECTIVE COVER TYPE:	<input checked="" type="checkbox"/> STICK-UP	<input type="checkbox"/> FLUSH MOUNT	<input type="checkbox"/> TRAF. BOX	<input type="checkbox"/> OTHER _____
PROTECTIVE COVER DIAMETER:	<input checked="" type="checkbox"/> 4"	<input type="checkbox"/> 8"	<input type="checkbox"/> 9"	<input type="checkbox"/> 10" <input type="checkbox"/> 12" <input type="checkbox"/> OTHER _____
WELL MATERIAL:	<input checked="" type="checkbox"/> PVC	<input type="checkbox"/> SS	<input type="checkbox"/> IRON	<input type="checkbox"/> GALVANIZED STEEL <input type="checkbox"/> OTHER _____
WELL CASING DIAMETER:	<input type="checkbox"/> 1"	<input checked="" type="checkbox"/> 2"	<input type="checkbox"/> 4"	<input type="checkbox"/> 6" <input type="checkbox"/> 8" <input type="checkbox"/> OTHER _____
WELL SCREEN MATERIAL:	<input checked="" type="checkbox"/> PVC	<input type="checkbox"/> SS	<input type="checkbox"/> IRON	<input type="checkbox"/> GALVANIZED STEEL <input type="checkbox"/> OTHER _____
WELL SCREEN LENGTH:	<input type="checkbox"/> 5-FT	<input checked="" type="checkbox"/> 10-FT	<input type="checkbox"/> UNKNOWN	<input type="checkbox"/> OTHER _____
WELL SCREEN SLOT SIZE:	<input checked="" type="checkbox"/> 0.01"	<input type="checkbox"/> 0.02"	<input type="checkbox"/> UNKNOWN	<input type="checkbox"/> OTHER _____
			<b>DTW:</b> DRY	T/ PVC
			<b>DTB:</b> 34.71	T/ PVC

<b>DECOMMISSIONING PROCEDURE:</b>
<b>NOTES:</b> Well casing filled with bentonite slurry. Pro-cover, concrete pad, and bollards removed. Well casing cut off at 2 feet below grade. Remaining hole backfilled and brought to grade with the surrounding surface sand.

<b>GROUTING PROCEDURE:</b>	<b>NOTES:</b>
GROUT TYPE: BENTONITE SLURRY	
GROUT MIX: Bentonite grout	
GROUT INTERVAL: 2 FT-BGS TO 32 FT-BGS	
BENTONITE SEAL: MEDIUM CHIPS	
SEAL INTERVAL: 1 FT-BGS TO 2 FT-BGS	

<b>ADDITIONAL COMMENTS:</b>
-----------------------------

\_\_\_\_\_  
 SIGNED DATE

\_\_\_\_\_  
 CHECKED DATE



# MONITORING WELL DECOMMISSIONING LOG

PROJECT NAME: JH Campbell Pond A Well Replacement		MONITORING WELL ID: JHC MW-15009	
PROJECT NUMBER: 418422.0003	DATE: 07/20/2021	LOCATION: East of Pond A	LOCATION COORDINATES:
OBSERVED BY: Brian Yelen		N: 517779.126	
DRILLING CONTRACTOR: CASCADE DRILLING		E: 12636014.8	
CREW CHIEF: Chris Bond		TOP OF CASING ELEV.: 635.32	SURFACE ELEV.: 632.33

PROTECTIVE COVER TYPE:	<input checked="" type="checkbox"/> STICK-UP	<input type="checkbox"/> FLUSH MOUNT	<input type="checkbox"/> TRAF. BOX	<input type="checkbox"/> OTHER _____
PROTECTIVE COVER DIAMETER:	<input checked="" type="checkbox"/> 4"	<input type="checkbox"/> 8"	<input type="checkbox"/> 9"	<input type="checkbox"/> 10" <input type="checkbox"/> 12" <input type="checkbox"/> OTHER _____
WELL MATERIAL:	<input checked="" type="checkbox"/> PVC	<input type="checkbox"/> SS	<input type="checkbox"/> IRON	<input type="checkbox"/> GALVANIZED STEEL <input type="checkbox"/> OTHER _____
WELL CASING DIAMETER:	<input type="checkbox"/> 1"	<input checked="" type="checkbox"/> 2"	<input type="checkbox"/> 4"	<input type="checkbox"/> 6" <input type="checkbox"/> 8" <input type="checkbox"/> OTHER _____
WELL SCREEN MATERIAL:	<input checked="" type="checkbox"/> PVC	<input type="checkbox"/> SS	<input type="checkbox"/> IRON	<input type="checkbox"/> GALVANIZED STEEL <input type="checkbox"/> OTHER _____
WELL SCREEN LENGTH:	<input type="checkbox"/> 5-FT	<input checked="" type="checkbox"/> 10-FT	<input type="checkbox"/> UNKNOWN	<input type="checkbox"/> OTHER _____
WELL SCREEN SLOT SIZE:	<input checked="" type="checkbox"/> 0.01"	<input type="checkbox"/> 0.02"	<input type="checkbox"/> UNKNOWN	<input type="checkbox"/> OTHER _____
				DTW: DRY T/ PVC
				DTB: 42.85 T/ PVC

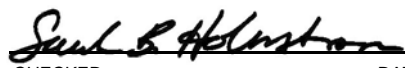
**DECOMMISSIONING PROCEDURE:**

**NOTES:**  
Well casing filled with bentonite slurry. Pro-cover, concrete pad, and bollards removed. Well casing cut off at 2 feet below grade. Remaining hole backfilled and brought to grade with the surrounding surface sand.

<b>GROUTING PROCEDURE:</b>	<b>NOTES:</b>
GROUT TYPE: BENTONITE SLURRY	
GROUT MIX: Bentonite grout	
GROUT INTERVAL: 2 FT-BGS TO 40 FT-BGS	
BENTONITE SEAL: MEDIUM CHIPS	
SEAL INTERVAL: 1 FT-BGS TO 2 FT-BGS	

**ADDITIONAL COMMENTS:**

  
 SIGNED \_\_\_\_\_ DATE \_\_\_\_\_

  
 CHECKED \_\_\_\_\_ DATE \_\_\_\_\_



# MONITORING WELL DECOMMISSIONING LOG

PROJECT NAME: JH Campbell Pond A Well Replacement		MONITORING WELL ID: JHC MW-15010	
PROJECT NUMBER: 418422.0003	DATE: 07/21/2021	LOCATION: Southwest of Pond A	LOCATION COORDINATES:
OBSERVED BY: Brian Yelen		N: 518009.361	
DRILLING CONTRACTOR: CASCADE DRILLING		E: 12636011.46	
CREW CHIEF: Chris Bond		TOP OF CASING ELEV.: 635.57	SURFACE ELEV.: 632.55

PROTECTIVE COVER TYPE:	<input checked="" type="checkbox"/> STICK-UP	<input type="checkbox"/> FLUSH MOUNT	<input type="checkbox"/> TRAF. BOX	<input type="checkbox"/> OTHER _____
PROTECTIVE COVER DIAMETER:	<input checked="" type="checkbox"/> 4"	<input type="checkbox"/> 8"	<input type="checkbox"/> 9"	<input type="checkbox"/> 10" <input type="checkbox"/> 12" <input type="checkbox"/> OTHER _____
WELL MATERIAL:	<input checked="" type="checkbox"/> PVC	<input type="checkbox"/> SS	<input type="checkbox"/> IRON	<input type="checkbox"/> GALVANIZED STEEL <input type="checkbox"/> OTHER _____
WELL CASING DIAMETER:	<input type="checkbox"/> 1"	<input checked="" type="checkbox"/> 2"	<input type="checkbox"/> 4"	<input type="checkbox"/> 6" <input type="checkbox"/> 8" <input type="checkbox"/> OTHER _____
WELL SCREEN MATERIAL:	<input checked="" type="checkbox"/> PVC	<input type="checkbox"/> SS	<input type="checkbox"/> IRON	<input type="checkbox"/> GALVANIZED STEEL <input type="checkbox"/> OTHER _____
WELL SCREEN LENGTH:	<input type="checkbox"/> 5-FT	<input checked="" type="checkbox"/> 10-FT	<input type="checkbox"/> UNKNOWN	<input type="checkbox"/> OTHER _____
WELL SCREEN SLOT SIZE:	<input checked="" type="checkbox"/> 0.01"	<input type="checkbox"/> 0.02"	<input type="checkbox"/> UNKNOWN	<input type="checkbox"/> OTHER _____
				DTW: DRY T/ PVC
				DTB: 42.88 T/ PVC

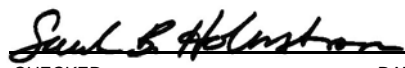
**DECOMMISSIONING PROCEDURE:**

**NOTES:**  
Well casing filled with bentonite slurry. Pro-cover, concrete pad, and bollards removed. Well casing cut off at 2 feet below grade. Remaining hole backfilled and brought to grade with the surrounding surface sand.

<b>GROUTING PROCEDURE:</b>	<b>NOTES:</b>
GROUT TYPE: BENTONITE SLURRY	
GROUT MIX: Bentonite grout	
GROUT INTERVAL: 2 FT-BGS TO 40 FT-BGS	
BENTONITE SEAL: MEDIUM CHIPS	
SEAL INTERVAL: 1 FT-BGS TO 2 FT-BGS	

**ADDITIONAL COMMENTS:**

  
 SIGNED \_\_\_\_\_ DATE \_\_\_\_\_

  
 CHECKED \_\_\_\_\_ DATE \_\_\_\_\_



# MONITORING WELL DECOMMISSIONING LOG

PROJECT NAME: JH Campbell Pond A Well Replacement		MONITORING WELL ID: JHC MW-15011	
PROJECT NUMBER: 418422.0003	DATE: 07/21/2021	LOCATION: Northeast of Pond A	LOCATION COORDINATES:
OBSERVED BY: Brian Yelen		N: 517540.496	
DRILLING CONTRACTOR: CASCADE DRILLING		E: 12634931.59	
CREW CHIEF: Chris Bond		TOP OF CASING ELEV.: 630.83	SURFACE ELEV.: 627.71

PROTECTIVE COVER TYPE:	<input checked="" type="checkbox"/> STICK-UP	<input type="checkbox"/> FLUSH MOUNT	<input type="checkbox"/> TRAF. BOX	<input type="checkbox"/> OTHER _____
PROTECTIVE COVER DIAMETER:	<input checked="" type="checkbox"/> 4"	<input type="checkbox"/> 8"	<input type="checkbox"/> 9"	<input type="checkbox"/> 10"
WELL MATERIAL:	<input checked="" type="checkbox"/> PVC	<input type="checkbox"/> SS	<input type="checkbox"/> IRON	<input type="checkbox"/> GALVANIZED STEEL
WELL CASING DIAMETER:	<input type="checkbox"/> 1"	<input checked="" type="checkbox"/> 2"	<input type="checkbox"/> 4"	<input type="checkbox"/> 6"
WELL SCREEN MATERIAL:	<input checked="" type="checkbox"/> PVC	<input type="checkbox"/> SS	<input type="checkbox"/> IRON	<input type="checkbox"/> GALVANIZED STEEL
WELL SCREEN LENGTH:	<input type="checkbox"/> 5-FT	<input checked="" type="checkbox"/> 10-FT	<input type="checkbox"/> UNKNOWN	<input type="checkbox"/> OTHER _____
WELL SCREEN SLOT SIZE:	<input checked="" type="checkbox"/> 0.01"	<input type="checkbox"/> 0.02"	<input type="checkbox"/> UNKNOWN	<input type="checkbox"/> OTHER _____
				DTW: 38.71 T/ PVC
				DTB: 40.10 T/ PVC

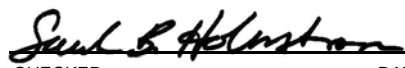
**DECOMMISSIONING PROCEDURE:**

**NOTES:**  
Well casing filled with bentonite slurry. Pro-cover, concrete pad, and bollards removed. Well casing cut off at 2 feet below grade. Remaining hole backfilled and brought to grade with the surrounding surface sand.

<b>GROUTING PROCEDURE:</b>	<b>NOTES:</b>
GROUT TYPE: BENTONITE SLURRY	
GROUT MIX: Bentonite grout	
GROUT INTERVAL: 2 FT-BGS TO 37 FT-BGS	
BENTONITE SEAL: MEDIUM CHIPS	
SEAL INTERVAL: 1 FT-BGS TO 2 FT-BGS	

**ADDITIONAL COMMENTS:**

  
 SIGNED \_\_\_\_\_ DATE 7/21/21

  
 CHECKED \_\_\_\_\_ DATE 10/5/21

**Appendix B**  
**Groundwater Monitoring System Certification JH**  
**Campbell Pond A**





A CMS Energy Company

Date: October 27, 2021

To: Operating Record

From: Harold D. Register, Jr., P.E.

RE: Groundwater Monitoring System Certification, §257.91(f)  
JH Campbell Power Plant, Pond A

### **Introduction**

According to Title 40 Code of Federal Regulations (40 CFR) Part 257, Subpart D, §257.91(f); the owner or operator of a Coal Combustion Residual (CCR) management unit must obtain a certification from a qualified professional engineer stating that the groundwater monitoring system at the CCR management unit has been designed and constructed to meet the requirements of §257.91. Additionally, §257.91(a) details a performance standard requiring the system monitor the uppermost aquifer and include a minimum of at least one upgradient and three downgradient monitoring wells, and that if the uppermost aquifer monitoring system includes the minimum number of wells, the basis supporting use of only the minimum.

### **Groundwater Monitoring System**

A groundwater monitoring system has been established for the JH Campbell Pond A, which established the following locations for determining background groundwater quality and detection monitoring.

Background:

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

Downgradient Monitoring Wells:

JHC-MW-15006	JHC-MW-15009R
JHC-MW-15007R	JHC-MW-15011R
JHC-MW-15008R	

Provided herein, as required by §257.91(f), is certification from a qualified professional engineer that the groundwater monitoring system at Consumers Energy JH Campbell Pond A meets the requirements of §257.91.

**CERTIFICATION**

Professional Engineer Certification Statement [40 CFR 257.94(e)2]

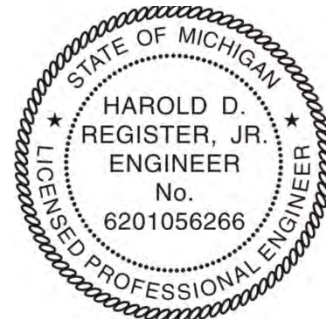
I hereby certify that having reviewed the *Pond A Monitoring Well Decommissioning and Replacement* letter to request the Michigan Department of Environment, Great Lakes, and Energy (EGLE) approval to decommission and replace monitoring wells JHC-MW-15007, JHC-MW-15009, and JHC-MW-15011, and remove monitoring well JHC-MW-15010 from the groundwater monitoring system (submitted to and approved by the EGLE on June 4, 2021) and the documentation of the well decommissioning and well replacement activities submitted to the EGLE on the October 7, 2021 in the *Summary of Pond A Monitoring Well Decommissioning and Replacement* letter for JH Campbell Pond A, and being familiar with the provisions of Title 40 of the Code of Federal Regulations §257.91 (40 CFR Part 257.91), I attest that this Groundwater Monitoring System has been designed and constructed to meet the requirements of 40 CFR 257.91. The report is accurate and has been prepared in accordance with good engineering practices, including the consideration of applicable industry standards, and with the requirements of 40 CFR Part 257.91.

Harold D. Register, Jr.  
Signature

October 27, 2021  
Date of Certification

Harold D. Register, Jr., P.E.  
Name

6201056266  
Professional Engineer Certification Number



10/27/2021

# **Appendix C**

## **First Semiannual Monitoring Report**



# 2021 Semiannual Groundwater Monitoring Report and Second Quarter 2021 Hydrogeological Monitoring Report

JH Campbell Power Plant  
Pond A CCR Unit

West Olive, Michigan

July 2021

A handwritten signature in black ink, appearing to read "Sarah B. Holmstrom".

---

Sarah B. Holmstrom, P.G.  
Project Manager/Hydrogeologist

**Prepared For:**

Consumers Energy

**Prepared By:**

TRC  
1540 Eisenhower Place  
Ann Arbor, Michigan 48108

A handwritten signature in black ink, appearing to read "Kristin Lowery".

---

Kristin Lowery, E.I.T.  
Project Engineer

## TABLE OF CONTENTS

<b>1.0</b>	<b>Introduction.....</b>	<b>1</b>
1.1	Statement of Adherence to Approved Hydrogeological Monitoring Plan .....	1
1.2	Program Summary .....	1
1.3	Site Overview .....	2
1.4	Geology/Hydrogeology .....	3
<b>2.0</b>	<b>Groundwater Monitoring .....</b>	<b>4</b>
2.1	Monitoring Well Network.....	4
2.2	April 2021 Assessment Monitoring .....	4
	2.2.1 Analytical Data and Relevant Screening Criteria .....	6
	2.2.2 Data Quality Review.....	6
	2.2.3 Groundwater Flow Rate and Direction.....	6
<b>3.0</b>	<b>Statistical Evaluation.....</b>	<b>7</b>
3.1	Establishing Groundwater Protection Standards.....	7
3.2	Data Comparison to Groundwater Protection Standards .....	7
3.3	GSI Compliance Monitoring Trends.....	8
<b>4.0</b>	<b>Conclusions and Recommendations .....</b>	<b>10</b>
<b>5.0</b>	<b>References .....</b>	<b>11</b>

### TABLES

Table 1	Summary of Groundwater Elevation Data – Second Quarter 2021
Table 2	Summary of Field Parameter Results – Second Quarter 2021
Table 3	Summary of Background Well Groundwater Sampling Results (Analytical) – Second Quarter 2021
Table 4	Summary of Groundwater Sampling Results (Analytical) – Second Quarter 2021
Table 5	Summary of Groundwater Sampling Results (Analytical) – Second Quarter 2021 (GSI Monitoring Wells)
Table 6	Summary of Groundwater Protection Standard Exceedances – Second Quarter 2021
Table 7	Summary of Groundwater Exceedances – Second Quarter 2021

### FIGURES

Figure 1	Site Location Map
Figure 2	Site Plan with CCR Monitoring Well Locations
Figure 3	Groundwater Contour Map – April 2021

## **APPENDICES**

Appendix A	Data Quality Review
Appendix B	April 2021 Assessment Monitoring Statistical Evaluation
Appendix C	GSI Time Series Charts
Appendix D	April 2021 Laboratory Reports
Appendix E	April 2021 Field Notes

## 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 Pond A CCR Unit at the JH Campbell Power Plant Site (JHC Pond A).

On December 28, 2018, the State of Michigan enacted Public Act No. 640 of 2018 (PA 640) to amend the Natural Resources and Environmental Protection Act, also known as Part 115 of PA 451 of 1994, as amended (a.k.a., Michigan Part 115 Solid Waste Management). On March 18, 2019, Consumers Energy submitted the *Pond A Hydrogeological Monitoring Plan, JH Campbell Power Plant, West Olive, Michigan* (Pond A HMP) (TRC, March 2019; Revised July 2019), which includes the *Pond A Assessment Monitoring Plan* (Pond A AMP), to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) to comply with the requirements of Part 115, Rule 299.4905 and the December 21, 2018 Consent Agreement No. 115-01-2018. The Pond A HMP and AMP were revised per EGLE comments on July 30, 2019 and approved by EGLE on August 13, 2019.

On behalf of Consumers Energy, TRC has prepared this 2021 Semiannual Groundwater Monitoring Report and Second Quarter 2021 Hydrogeological Monitoring Report for the JH Campbell Pond A CCR Unit (Semiannual Report) to cover the semiannual groundwater monitoring conducted in February 2021 to comply with the CCR Rule and the Pond A HMP and AMP. Given the alignment of PA 640 to comply with the CCR Rule and the congruencies between the two programs, data collected and evaluated under both programs are presented together in this report. Pond A remains in assessment monitoring.

### 1.1 Statement of Adherence to Approved Hydrogeological Monitoring Plan

This Semiannual Report has been prepared by TRC on behalf of Consumers Energy to present groundwater monitoring data collected from the JH Campbell Pond A. This report was prepared in accordance with the items listed in Appendix A (Solid Waste Monitoring Submittal Components) of the May 15, 2015 Michigan Department of Environmental Quality - Office of Waste Management and Radiological Protection (MDEQ-OWMRP), now the EGLE Materials Management Division (MMD) communication prescribing the format for solid waste disposal facility monitoring submittals as published in OWMRP-115-29, dated July 5, 2013 Format for Solid Waste Disposal Monitoring Submittals. All references herein to the EGLE are inclusive of the MDEQ. Information contained in this report was prepared in adherence to the July 2019 Pond A HMP and AMP, approved by the EGLE on August 13, 2019.

### 1.2 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, Pond A 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-15006, JHC-MW-15007, JHC-MW-15008, JHC-MW-15009, JHC-MW-15010, and JHC-MW-15011; and
- Sulfate at JHC-MW-15006, JHC-MW-15007, JHC-MW-15008, JHC-MW-15009, JHC-MW-15010, and JHC-MW-15011.

As discussed in the *2018 Annual Groundwater Monitoring Report for the JH Campbell Power Plant Pond A CCR Unit* (2018 Annual Report) (TRC, January 2019), Consumers Energy initiated an Assessment Monitoring Program for Pond A 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. After subsequent sampling for Appendix IV constituents, Consumers Energy provided notification that arsenic was present at statistically significant levels above the federal groundwater protection standards (GWPS) established at 10 ug/L (TRC, 2019) in one out of six downgradient monitoring wells at Pond A as follows:

- Arsenic at JHC-MW-15011.

The CCR Rule 40 CFR §257.96(a) requires that an owner or operator initiate an assessment of corrective measures (ACM) to prevent further release, to remediate any releases, and to restore impacted areas to original conditions if any Appendix IV constituent has been detected at a statistically significant level exceeding a GWPS. The *Assessment of Corrective Measures* (ACM) (TRC, September 2019) was initiated on April 15, 2019 and was certified and submitted to the EGLE on September 11, 2019 in accordance with the schedule in §257.96. In addition, Consumers Energy is preparing a site-wide remedial action plan (RAP) for the JH Campbell site per the Consent Agreement No. 115-01-2018 executed by Consumers Energy and the EGLE on December 21, 2018.

Consumers Energy will continue to evaluate corrective measures in accordance with §257.96 and §257.97 as outlined in the ACM and will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98, which includes semiannual assessment monitoring in accordance with §257.95. In addition, quarterly monitoring is performed in accordance with the Pond A HMP and AMP under Part 115 since fourth quarter 2019. The initial implementation of the Pond A HMP and AMP was presented in the *2019 Annual Groundwater Monitoring and Corrective Action Report and Fourth Quarter 2019 Hydrogeological Monitoring Report* (2019 Annual Report) (TRC, January 2020). This Semiannual Report presents the results of the second quarter 2021 Pond A HMP and AMP event, which also serves as the first semiannual assessment monitoring event for 2021 conducted in accordance with §257.95.

### 1.3 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.

#### **1.4 Geology/Hydrogeology**

The upgradient/background wells are located to the north-northwest of the JHC Dry Ash Landfill. Groundwater is typically encountered around 30 to 35 feet below ground surface (ft bgs), except in the recently excavated areas of Bottom Ash Ponds 1-2 and Bottom Ash Pond 3 South where groundwater is now within 5 to 10 ft bgs due to grade changes, and generally flows to the south-southeast 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

Consumers Energy established a groundwater monitoring system for the JHC Pond A, which consists of 12 monitoring wells (six background monitoring wells and six 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). The six downgradient wells (JHC-MW-15006, JHC-MW-15007, JHC-MW-15008R, JHC-MW-15009, JHC-MW-15010, and JHC-MW-15011) are located south and southeast of Pond A.

As shown on Figure 2, monitoring wells JHC-MW-15029 and JHC-MW-15030 are used for water level measurements only.

### 2.2 April 2021 Assessment Monitoring

Consumers Energy personnel performed gauging and sampling of monitoring wells associated with Pond A from April 12 through 14, 2021. Groundwater monitoring was performed in accordance with the approved Pond A HMP and AMP and the *Sample and Analysis Plan for JH Campbell Power Plan Pond A (SAP)* (TRC, January 2021). Groundwater samples collected during the April 2021 event were submitted to Consumers Energy Laboratory Services in Jackson, Michigan, for analysis of the total metals and inorganic indicator constituents. Radium analysis was performed by Eurofins TestAmerica in St Louis, Missouri. Semi-annual monitoring constituents include:

Section 11511a(3)(c) – Detection Monitoring Constituents	Section 11519b(2) – Assessment Monitoring Constituents
Boron Calcium Chloride Fluoride Iron pH Sulfate Total Dissolved Solids (TDS)	Antimony Arsenic Barium Beryllium Cadmium Chromium, total Cobalt Copper Fluoride Lead Lithium Mercury

Section 11511a(3)(c) – Detection Monitoring Constituents	Section 11519b(2) – Assessment Monitoring Constituents
	Molybdenum Nickel Radium 226 and 228 Selenium Silver Thallium Vanadium Zinc

Static water level measurements were collected at all locations after equilibration to atmospheric pressure. The depth to water was measured according to ASTM D 4750, “Standard Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well” and recorded to the nearest 0.01 foot. Static water elevation data are included in the attached field records (Appendix E) and summarized in Table 1.

Groundwater samples were collected using a peristaltic pump or submersible pump in accordance with low flow sampling protocol and were not field filtered to allow for total metals analysis. In addition, field parameters including dissolved oxygen, oxidation reduction potential, specific conductivity, temperature, and turbidity were collected at each well as shown on Table 2. All samples were collected in vendor-provided, nitric acid pre-preserved (metals only) and unpreserved sample containers and submitted to the laboratory for analysis. Consumers Energy followed chain of custody procedures to document the sample handling.

Monitoring wells JHC-MW-15007, JHC-MW-15009, JHC-MW-15010, and MW-13 had an insufficient amount of groundwater present to collect samples during the April 2021 sampling event. Static water level data indicate that the groundwater table is re-equilibrating at a lower elevation subsequent to the closure of Pond A. As a result, Consumers Energy replaced monitoring wells JHC-MW-15007, JHC-MW-15009, and JHC-MW-15011 in July 2021 and removed monitoring well JHC-MW-15010 from the monitoring well network, as described in the June 4, 2021 *Pond A Monitoring Well Decommissioning and Replacement*, approved by EGLE on June 4, 2021. Details on the July 2021 well replacement activities will be provided in the next quarterly monitoring report.

Consumers Energy collected quality assurance/quality control (QA/QC) samples during the April 2021 groundwater sampling event. The QA/QC samples consisted of two field blanks, two equipment blanks, three field duplicates (JHC-MW-15008R, JHC-MW-15028, and MW-14S), and two field matrix spike/matrix spike duplicate (MS/MSD) samples collected from JHC-MW-15006 and JHC-MW-15025.

### **2.2.1 Analytical Data and Relevant Screening Criteria**

Analytical results from the second quarter 2021 monitoring event are included in the attached laboratory reports (Appendix D). Second quarter 2021 groundwater analytical data is summarized in Table 3 (background monitoring wells), Table 4 (downgradient monitoring wells), and Table 5 (GSI monitoring wells), as well as the associated Part 201 generic drinking water criteria and generic GSI criteria.

### **2.2.2 Data Quality Review**

Data 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 Pond A HMP and AMP program. The data quality reviews for the Pond A network wells are summarized in Appendix A.

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

Groundwater elevations measured across the Site during the April 2021 event using several wells throughout the RCRA CCR well network are provided on Table 1. April 2021 groundwater elevations were used to construct the groundwater contour map provided on Figure 3. The average hydraulic gradient of 0.0038 ft/ft was calculated using the following well pairs: JHC-MW-15029/JHC-MW-15030, JHC-MW-15029/JHC-MW-15005, JHC-MW-15019/JHC-MW-15035 and JHC-MW-15023/JHC-MW-15037 (Figure 2). Using the mean hydraulic conductivity of 62 ft/day (ARCADIS, 2016) and an assumed effective porosity of 0.4, the estimated average seepage velocity is approximately 0.59 ft/day or 215 ft/year for the April 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 constituents that could potentially migrate from Pond A.

### 3.0 Statistical Evaluation

Assessment monitoring is continuing at Pond A in accordance with the AMP and §257.95 while corrective measures are further evaluated in accordance with §257.96 and §257.97 as outlined in the ACM. The following section summarizes the statistical approach applied to assess the second quarter 2021 groundwater data in accordance with the assessment monitoring program. The statistical evaluation details are provided in Appendix B (*Statistical Evaluation of April 2021 Assessment Monitoring Sampling Event*).

#### 3.1 Establishing Groundwater Protection Standards

The GWPSs are used to assess constituent concentrations present in groundwater as a result of CCR Unit operations by statistically comparing concentrations in the downgradient wells to the GWPSs for each detection and assessment monitoring constituent. The calculation of the Appendix IV GWPSs is documented in the *Groundwater Protection Standards* technical memorandum included in Appendix C of the 2018 Annual Report. Pursuant to the Pond A AMP, GWPSs were established for the Appendix III constituents and the Part 115 Section 11511a(3) constituents not included in Appendix III of the CCR Rule (i.e. iron) and Section 11519b(2) constituents not included in Appendix IV of the CCR Rule (i.e. copper, nickel, silver, vanadium, and zinc) in accordance with 40 CFR 257.95(h), as amended. The calculation of the Appendix III GWPSs is documented in the *Groundwater Protection Standards* technical memorandum included in Appendix G of the 2019 Annual Report. The calculation of the additional Part 115-specific constituent GWPSs is documented in the *PA 640 Constituent Groundwater Protection Standards* technical memorandum included in Appendix B of the *Third Quarter 2020 Hydrogeological Monitoring Report* (TRC, October 2020).

#### 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 documented in the January 14, 2019 *Notification of Appendix IV Constituent Exceeding Groundwater Protection Standard per §257.95(g)*, arsenic was present at statistically significant levels above the GWPSs in one of the six downgradient wells (JHC-MW-15011) at Pond A based on the statistical data comparison for the first semiannual assessment monitoring event (June 2018), included as Appendix D of the 2019 Annual Report.

The second quarter 2021 statistical evaluation indicates that arsenic at JHC-MW-15011, in addition to the statistically evaluated Part 115 constituents boron at JHC-MW-15010 and JHC-MW-15011 and vanadium at JHC-MW-15006 and JHC-MW-15011, are present at statistically significant levels above the GWPSs. Arsenic was identified at downgradient monitoring well JHC-MW-15011 at statistically significant levels exceeding the GWPS during the initial assessment monitoring event conducted in June 2018. As shown in the data tables and trend tests included in Appendix B, arsenic concentrations at JHC-MW-15011 have begun to decline in 2020 and 2021 but remain slightly above the GWPS. Boron at JHC-MW-15010 was identified at statistically significant levels exceeding the GWPS in the third quarter 2020 monitoring event,

but has not been able to be sampled since then due to continued stabilization of the groundwater table at an elevation below the well screen. Boron concentrations at monitoring well JHC-MW-15010 showed an initial increase in 2019, around the timing of the completion of Pond A capping activities and have remained generally stable in 2019 and 2020. Vanadium concentrations at JHC-MW-15006 and JHC-MW-15011 have been generally stable at levels above the GWPS since monitoring for vanadium began in fourth quarter 2019. Boron at JHC-MW-15011 is a new exceedance of the GWPS identified in second quarter 2021. Boron concentrations at monitoring well JHC-MW-15011 showed an initial increase in 2019, around the timing of the completion of Pond A capping activities and have remained generally stable in 2019 and 2020.

No other constituents were observed at statistically significant levels exceeding the GWPSs in downgradient monitoring wells at the JHC Pond A during the second quarter 2021. A summary of the confidence intervals for April 2021 are provided in Table 6. Table 7 provides a summary of the statistically significant GWPS exceedances over the most recent four monitoring events.

Groundwater chemistry is currently changing as a result of closure activities performed at Pond A. As discussed in the ACM, Pond A has been decommissioned with final cover in place in the summer of 2019, and groundwater flow direction has changed such that groundwater generally flows to the south-southeast and mounding is no longer observed as it had been when hydraulic loading was actively taking place. The cessation of hydraulic loading and recharge of the aquifer are expected to have an influence on groundwater conditions as geochemistry changes occur and groundwater from other potential upgradient CCR sources reaches the Pond A well network, and many Appendix III and Appendix IV, and Part 115-specific constituents may be affected by this change. Groundwater conditions will continue to be monitored while corrective measures continue to be evaluated and a remedy is selected. Continued groundwater monitoring may reduce uncertainty surrounding the potential changes in groundwater oxidation-reduction conditions and the effect on contaminant transport. These observations will be critical for the comparison of corrective measures alternatives.

### **3.3 GSI Compliance Monitoring Trends**

Pursuant to the AMP, trend tests will be used to evaluate groundwater quality at the GSI monitoring wells. The GSI monitoring wells will be evaluated for detected constituents (antimony, arsenic, barium, chromium (total), lithium, molybdenum, and selenium) that, based on monitoring data from Pond A, have the potential to exceed generic GSI criteria at the Pond A downgradient monitoring wells as detailed in the AMP. Groundwater data collected from the Pond A wells indicates the presence of TDS and vanadium above generic GSI criterion in one or more of the Pond A wells (Table 4). Given that TDS and vanadium data at the Pond A monitoring wells are above the generic GSI criterion for several consecutive quarterly events, vanadium and TDS have been added to the list of constituents evaluated at the GSI compliance wells associated with the Pond A AMP.

Separately, TDS and vanadium were analyzed at the GSI compliance wells in the first quarter as part of supplemental sampling in support of the site-wide RAP. As such, the TDS and vanadium data have been included in the second quarter data summary table (Table 5) and

show that concentrations in groundwater are detected at levels below or slightly above the laboratory reporting limit, well below the GSI criteria. Although boron concentrations have shown an increase at several of the Pond A wells subsequent to capping activities (discussed above in Section 3.2), the boron concentrations at the Pond A boundary remain well below the associated GSI criterion (Table 4).

Time-series plots for the GSI monitoring wells MW-13, MW-14S, PZ-24S, and PZ-40S, including assessment monitoring data collected from June 2018 through April 2021<sup>1</sup> for the aforementioned GSI monitoring constituents detailed in the Pond A AMP, are included in Appendix C. In accordance with the Pond A AMP, the detected constituents at the GSI monitoring wells were evaluated using trend analysis. Specifically, the Mann-Kendall test for trend was performed at a significance level ( $\alpha$ ) of 0.01 per tail for each constituent/sampling point dataset to assess trends over the past 8 monitoring events (April 2019 through April 2021). Sen's Slope estimator was used to assess the magnitude of the slope and the Mann-Kendall test was used to determine if the slope was statistically significant. Trend analysis was not performed on constituent/sampling point datasets that were primarily not detected. The trend analysis shows that there are no statistically significant increasing trends at the GSI wells. A statistically significant decreasing trend is observed for barium at PZ-40S.

All of the constituent concentrations at the GSI monitoring wells are below their respective Part 201 generic GSI criteria in April 2021 (Table 5) and there are no statistically significant trends based on the trend analysis (Appendix C).

---

<sup>1</sup> An insufficient amount of groundwater was present in February and April 2020 to collect samples for total metals for MW-13. Select dissolved metal results collected at MW-13 in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP) are included in the time-series plots for February and April 2020.



## 4.0 Conclusions and Recommendations

Assessment monitoring is ongoing at Pond A while corrective action continues to be assessed. Pond A has been decommissioned and the final cover has been placed. The statistical evaluations have confirmed that arsenic is the only Appendix IV constituent present at statistically significant levels above the GWPSs and arsenic concentrations continue to show improvement post-closure. In addition, boron and vanadium are present at statistically significant levels above the GWPSs established under the Part 115-specific program. Compliance for the GSI pathway is currently met based on data collected from the GSI monitoring wells located downgradient from Pond A.

As part of the development of the Remedial Action Plan under Agreement No. 115-01-2018, wetlands between Pond A and the Pigeon River were field delineated in May 2021. Water quality monitoring for the wetlands as GSI receptors will be incorporated into the monitoring program for the site-wide RAP. The ACM also documents that groundwater nature and extent of arsenic has been defined, as required in §257.95(g)(1). Although arsenic concentrations had exceeded the GWPS in on-site groundwater, an evaluation of risk demonstrates that there are currently no adverse effects on human health or the environment from either surface water or groundwater due to CCR management at Pond A.

Consumers Energy also completed the final cover for Pond A in summer of 2019. The ACM report provided a high-level assessment of groundwater remediation technologies that could potentially address site-specific constituents of concern (i.e. arsenic) under known groundwater conditions. Changes in groundwater chemistry continue to be evaluated following the completion of capping at Pond A. Groundwater monitoring in 2021 will reduce uncertainty surrounding potential changes in groundwater oxidation-reduction conditions and the effect on contaminant transport. These observations will be critical for the comparison of corrective measures alternatives.

Consumers Energy will continue to evaluate corrective measures in accordance with §257.96 and §257.97. The groundwater management remedy for the JH Campbell Pond A will be selected as soon as feasible to, at a minimum, meet the federal standards of §257.97(b) of the CCR Rule. Consumers Energy will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98. The next quarterly Pond A HMP and AMP monitoring event is scheduled for the third calendar quarter of 2021.



## 5.0 References

- ARCADIS. May 13, 2016. Summary of Monitoring Well Design, Installation, and Development – Pond A. JH Campbell Electric Generation Facility – West Olive, Michigan. Prepared for Consumers Energy Company.
- ARCADIS. May 18, 2016. Electric Generation Facilities RCRA CCR Detection Monitoring Program. JH Campbell Monitoring Program Sample and Analysis Plan, West Olive, Michigan. Prepared for Consumers Energy Company.
- Consumers Power Company. September 1996. Hydrogeological Monitoring Plan for JH Campbell Ash Storage Facility, Consumers Power Company, Solid Waste Disposal Area, Coal Ash, Type III
- TRC. October 2017. Groundwater Statistical Evaluation Plan – JH Campbell Power Plant, Pond A, West Olive, Michigan. Prepared for Consumers Energy Company.
- TRC. January 2018. Annual Groundwater Monitoring Report, JH Campbell Power Plant, Pond A CCR Unit, West Olive, Michigan. Prepared for Consumers Energy Company.
- TRC. October 15, 2018. Groundwater Protection Standards, Consumers Energy, JH Campbell Site, Pond A CCR Unit, technical memorandum prepared for Consumers Energy Company.
- TRC. January 2019. 2018 Annual Groundwater Monitoring Report, JH Campbell Power Plant, Pond A CCR Unit, West Olive, Michigan. Prepared for Consumers Energy Company.
- TRC. March 2019; Revised July 2019. Pond A Hydrogeological Monitoring Plan, JH Campbell Power Plant, West Olive, Michigan. Prepared for Consumers Energy Company.
- TRC. September 2019. Assessment of Corrective Measures, JH Campbell Ponds 1-2 North and 1-2 South and Pond A Coal Combustion Residual Units, West Olive, Michigan. Prepared for Consumers Energy Company.
- TRC. January 2020. 2019 Annual Groundwater Monitoring and Corrective Action Report and Fourth Quarter 2019 Hydrogeological Monitoring Report, JH Campbell Power Plant, Pond A CCR Unit, West Olive, Michigan. Prepared for Consumers Energy.
- TRC. April 2020. First Quarter 2020 Hydrogeological Monitoring Report, JH Campbell Power Plant, Pond A CCR Unit, West Olive, Michigan. Prepared for Consumers Energy.
- TRC. October 2020. Third Quarter 2020 Hydrogeological Monitoring Report, JH Campbell Power Plant, Pond A CCR Unit, West Olive, Michigan. Prepared for Consumers Energy.
- USEPA. 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance. Office of Conservation and Recovery. EPA 530/R-09-007.
- USEPA. April 2015. 40 CFR Parts 257 and 261. Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule. 80 Federal Register 74 (April 17, 2015), pp. 21301-21501 (80 FR 21301).

---

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

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

## Tables

Table 1  
 Summary of Groundwater Elevation Data – Second Quarter 2021  
 JH Campbell – Assessment 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		
					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
JHC-MW-15024	613.79	616.62	Sand	606.8 to 596.8		12.92	603.70
JHC-MW-15025	614.14	617.17	Sand	607.1 to 597.1		12.12	605.05
JHC-MW-15026	615.09	618.04	Sand	607.1 to 597.1		13.85	604.19
JHC-MW-15027	614.77	617.30	Sand	604.8 to 594.8		14.22	603.08
JHC-MW-15028	611.02	613.80	Sand	603.0 to 593.0		14.03	599.77
JHC-MW-15029	608.08	610.95	Sand	600.1 to 590.1		11.55	599.40
JHC-MW-15030	604.05	607.17	Sand	600.1 to 590.1		9.58	597.59
<b>Pond 1N, 1S, 2N, 2S</b>							
JHC-MW-15001	607.02	609.53	Sand	603.5 to 598.5		11.49	598.04
JHC-MW-15002	618.18	621.27	Sand	590.2 to 580.2		25.16	596.11
JHC-MW-15003	623.16	627.20	Sand	595.2 to 585.2		33.31	593.89
JHC-MW-15005	606.22	609.99	Sand	579.2 to 569.2		18.50	591.49
JHC-MW-18004	602.92	605.72	Sand	596.9 to 586.9		12.37	593.35
JHC-MW-18005	600.30	603.16	Sand	595.3 to 585.3		10.50	592.66
<b>Pond 3N, 3S</b>							
JHC-MW-15013	632.40	635.25	Sand	604.4 to 594.4		35.75	599.50
JHC-MW-15015	632.46	635.20	Sand	604.5 to 594.5		35.07	600.13
JHC-MW-15016	631.81	632.52	Sand	603.8 to 593.8		32.44	600.08
JHC-MW-18001	609.09	611.98	Sand	603.1 to 593.1		12.52	599.46
JHC-MW-18002	605.53	608.93	Sand	602.0 to 592.0		9.48	599.45
JHC-MW-18003	605.36	608.78	Sand	601.9 to 591.9		9.38	599.40
<b>Landfill</b>							
JHC-MW-15017	613.69	616.61	Sand	603.7 to 593.7		15.57	601.04 <sup>(2)</sup>
JHC-MW-15018	614.26	617.02	Sand	604.3 to 594.3		16.30	600.72 <sup>(2)</sup>
JHC-MW-15019	609.81	612.86	Sand	603.8 to 593.8		12.64	600.22 <sup>(2)</sup>
JHC-MW-15022	620.92	623.79	Sand	597.9 to 587.9		28.76	595.03 <sup>(3)</sup>
JHC-MW-15031	632.94	635.87	Sand	599.9 to 589.9		43.31	592.56 <sup>(3)</sup>
JHC-MW-15032	611.32	614.29	Sand	598.3 to 588.3		16.98	597.31 <sup>(2)</sup>
JHC-MW-15033	618.08	620.99	Sand	602.1 to 592.1		21.82	599.17 <sup>(2)</sup>
JHC-MW-15034	612.90	615.97	Sand	601.9 to 591.9		15.71	600.26 <sup>(2)</sup>
JHC-MW-15035	632.53	634.28	Sand	599.5 to 589.5		40.75	593.53
JHC-MW-15036	617.94	618.34	Sand	597.9 to 587.9		26.70	591.64
JHC-MW-15037	614.28	616.06	Sand	591.3 to 586.3		25.05	591.01
<b>Pond A</b>							
JHC-MW-15006	624.74	627.58	Sand	599.7 to 589.7		35.22	592.36
JHC-MW-15007	624.82	627.70	Sand	602.8 to 592.8		Dry	
JHC-MW-15008	632.43	635.30	Sand	604.4 to 594.4		Decommissioned	
JHC-MW-15008R <sup>(1)</sup>	632.32	634.67	Sand	597.3 to 587.3		43.24	591.43
JHC-MW-15009	632.33	635.32	Sand	602.3 to 592.3		Dry	
JHC-MW-15010	632.55	635.57	Sand	602.6 to 592.6		Dry	
JHC-MW-15011	627.71	630.83	Sand	600.7 to 590.7		38.87	591.96
<b>Downgradient Wells</b>							
MW-13	593.40	595.37	Clayey Silt	587.9 to 585.4		Dry	
MW-14S	587.36	590.98	Sand	582.9 to 577.9		9.60	581.38
PZ-23S	602.84	604.97	Sand	591.8 to 586.8		15.96	589.01
PZ-24S	586.56	590.15	Sand	584.6 to 579.6		7.23	582.92
PZ-40S	589.51	593.25	Sand	585.5 to 575.5		10.83	582.42
TW-19-04A	608.15	611.44	Sand	591.2 to 586.2		22.34	589.10
TW-19-05	603.44	606.36	Sand	592.8 to 587.8		16.03	590.33
TW-19-06A	599.61	602.54	Sand	592.3 to 587.3		13.18	589.36

**Notes:**

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

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

TOC: Top of well casing.

ft BTOC: Feet below top of well casing.

--: Not measured

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

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

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

**Table 2**  
 Summary of Field Parameters: Second Quarter 2021  
 JH Campbell Pond A - Assessment 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	3.4
JHC-MW-15024	4/13/2021	0.43	171.4	6.8	322	9.3	3.4
JHC-MW-15025	4/13/2021	1.53	209.8	6.7	254	7.5	2.5
JHC-MW-15026	4/13/2021	3.12	224.3	5.6	84	8.5	5.0
JHC-MW-15027	4/13/2021	1.75	130.7	5.7	76	7.9	5.7
JHC-MW-15028	4/12/2021	5.16	166.8	7.6	114	9.2	5.3
<b>Pond A</b>							
JHC-MW-15006	4/13/2021	0.27	-6.9	7.7	793	18.0	4.3
JHC-MW-15007	4/13/2021 <sup>(1)</sup>	--	--	--	--	--	--
JHC-MW-15008R	4/13/2021	0.50	55.6	7.1	800	18.7	7.4
JHC-MW-15009	4/13/2021 <sup>(1)</sup>	--	--	--	--	--	--
JHC-MW-15010	4/13/2021 <sup>(1)</sup>	--	--	--	--	--	--
JHC-MW-15011	4/13/2021	0.42	43.0	7.2	563	14.1	5.0
<b>Pond A GSI</b>							
MW-13	4/12/2021 <sup>(1)</sup>	--	--	--	--	--	--
MW-14S	4/14/2021	0.70	146.7	5.5	25	8.4	2.3
PZ-24S	4/14/2021	3.03	117.3	5.6	22	7.5	4.7
PZ-40S	4/14/2021	0.49	180.4	5.2	20	6.9	4.6

**Notes:**

mg/L - Milligrams per Liter.

mV - Millivolts.

SU - Standard Units.

umhos/cm - Micromhos per centimeter.

°C - Degrees Celsius.

NTU - Nephelometric Turbidity Unit.

-- - Not measured.

(1) Not sampled; insufficient amount of groundwater present to collect sample.

**Table 3**  
 Summary of Groundwater Sampling Results (Analytical): Second Quarter 2021  
 JH Campbell Background – Assessment Monitoring Program  
 West Olive, Michigan

Sample Location:						JHC-MW-15023	JHC-MW-15024	JHC-MW-15025	JHC-MW-15026	JHC-MW-15027	JHC-MW-15028
Sample Date:						4/12/2021	4/13/2021	4/13/2021	4/13/2021	4/13/2021	4/12/2021
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI <sup>^</sup>	Background					
<b>Appendix III<sup>(1)</sup></b>											
Boron	ug/L	NC	500	500	7,200	50	21	20	< 20	< 20	< 20
Calcium	mg/L	NC	NC	NC	500 <sup>EE</sup>	11.1	36.8	19.8	9.23	10.9	14.0
Chloride	mg/L	250**	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	2.64	21.5	19.5	4.05	< 1.00	< 1.00
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250**	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	12.2	8.14	9.02	6.88	7.09	5.99
Total Dissolved Solids	mg/L	500**	500 <sup>E</sup>	500 <sup>E</sup>	500	66	175	135	51	56	65
pH, Field	SU	<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>5.3</b>	6.8	6.7	<b>5.6</b>	<b>5.7</b>	7.6
<b>Appendix IV<sup>(1)</sup></b>											
Antimony	ug/L	6	6.0	6.0	130	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	10	10	10	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	2,000	2,000	820	17	17	6	10	8	5
Beryllium	ug/L	4	4.0	4.0	18	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	5.0	5.0	3.5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	100	100	11	< 1	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	NC	40	100	100	< 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
Lead	ug/L	NC	4.0	4.0	39	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	170	350	440	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	2.0	2.0	0.20 <sup>#</sup>	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	73	210	3,200	< 5	< 5	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NC	NC	NC	NC	< 0.120	< 0.146	< 0.115	< 0.125	< 0.129	< 0.115
Radium-228	pCi/L	NC	NC	NC	NC	0.478	< 0.472	< 0.414	< 0.434	< 0.434	< 0.435
Radium-226/228	pCi/L	5	NC	NC	NC	0.501	< 0.472	< 0.414	0.449	< 0.434	< 0.435
Selenium	ug/L	50	50	50	5.0	< 1	< 1	< 1	< 1	< 1	< 1
Thallium	ug/L	2	2.0	2.0	3.7	< 2	< 2	< 2	< 2	< 2	< 2
<b>Additional MI Part 115<sup>(2)</sup></b>											
Iron	ug/L	<b>300**</b>	<b>300<sup>E</sup></b>	<b>300<sup>E</sup></b>	500,000 <sup>EE</sup>	< 20	67	< 20	< 20	<b>343</b>	< 20
Copper	ug/L	1,000**	1,000 <sup>E</sup>	1,000 <sup>E</sup>	15	1	< 1	< 1	< 1	< 1	< 1
Nickel	ug/L	NC	100	100	86	< 2	< 2	< 2	< 2	< 2	< 2
Silver	ug/L	100**	34	98	0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	ug/L	NC	4.5	62	27	< 2	< 2	< 2	< 2	< 2	< 2
Zinc	ug/L	5,000**	2,400	5,000 <sup>E</sup>	190	< 10	< 10	< 10	< 10	< 10	< 10

**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 30, 2013.

\*\* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.

<sup>^</sup> - 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).

<sup>#</sup> - 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.

<sup>E</sup> - Criterion is the aesthetic drinking water value per footnote (E).

<sup>EE</sup> - Criterion is based on the total dissolved solids GSI value per footnote (EE).

**BOLD** value indicates an exceedance of one or more of the listed criteria.

**RED** value indicates an exceedance of the MCL.

All metals were analyzed as total unless otherwise specified.

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

(2) Per Michigan Part 115 Amendments - Public Act No. 640 of 2018 Section 11511a(3)(c) and 11519b(2) additional detection monitoring constituents (iron) and assessment monitoring constituents (copper, nickel, silver, vanadium, and zinc) are reported.

**Table 4**  
 Summary of Groundwater Sampling Results (Analytical): Second Quarter 2021  
 JH Campbell Pond A – Assessment Monitoring Program  
 West Olive, Michigan

						Sample Location:	JHC-MW-15006	JHC-MW-15007	JHC-MW-15008R	JHC-MW-15009	JHC-MW-15010	JHC-MW-15011
						Sample Date:	4/13/2021	4/13/2021 <sup>(3)</sup>	4/13/2021	4/13/2021 <sup>(3)</sup>	4/13/2021 <sup>(3)</sup>	4/13/2021
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI <sup>^</sup>	downgradient						
<b>Appendix III<sup>(1)</sup></b>												
Boron	ug/L	NC	<b>500</b>	<b>500</b>	7,200	288	--	352	--	--	--	<b>5,070</b>
Calcium	mg/L	NC	NC	NC	500 <sup>EE</sup>	82.0	--	85.4	--	--	--	78.7
Chloride	mg/L	250**	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	22.9	--	17.2	--	--	--	2.65
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	--	< 1,000	--	--	--	< 1,000
Sulfate	mg/L	<b>250**</b>	<b>250<sup>E</sup></b>	<b>250<sup>E</sup></b>	500 <sup>EE</sup>	<b>257</b>	--	185	--	--	--	113
Total Dissolved Solids	mg/L	<b>500**</b>	<b>500<sup>E</sup></b>	<b>500<sup>E</sup></b>	<b>500</b>	497	--	<b>517</b>	--	--	--	359
pH, Field	SU	6.5 - 8.5**	6.5 - 8.5 <sup>E</sup>	6.5 - 8.5 <sup>E</sup>	6.5 - 9.0	7.7	--	7.1	--	--	--	7.2
<b>Appendix IV<sup>(1)</sup></b>												
Antimony	ug/L	6	6.0	6.0	130	< 1	--	1	--	--	--	< 1
Arsenic	ug/L	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	3	--	< 1	--	--	--	<b>13</b>
Barium	ug/L	2,000	2,000	2,000	820	188	--	200	--	--	--	399
Beryllium	ug/L	4	4.0	4.0	18	< 1	--	< 1	--	--	--	< 1
Cadmium	ug/L	5	5.0	5.0	3.5	< 0.2	--	< 0.2	--	--	--	0.8
Chromium	ug/L	100	100	100	<b>11</b>	3	--	<b>41</b>	--	--	--	5
Cobalt	ug/L	NC	40	100	100	< 6	--	< 6	--	--	--	< 6
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	--	< 1,000	--	--	--	< 1,000
Lead	ug/L	NC	4.0	4.0	39	< 1	--	< 1	--	--	--	< 1
Lithium	ug/L	NC	170	350	440	12	--	20	--	--	--	14
Mercury	ug/L	2	2.0	2.0	0.20 <sup>#</sup>	< 0.2	--	< 0.2	--	--	--	< 0.2
Molybdenum	ug/L	NC	73	210	3,200	54	--	17	--	--	--	8
Radium-226	pCi/L	NC	NC	NC	NC	0.241	--	0.272	--	--	--	0.165
Radium-228	pCi/L	NC	NC	NC	NC	0.432	--	< 0.491	--	--	--	0.758
Radium-226/228	pCi/L	5	NC	NC	NC	0.673	--	0.496	--	--	--	0.923
Selenium	ug/L	<b>50</b>	<b>50</b>	<b>50</b>	<b>5.0</b>	< 1	--	<b>6</b>	--	--	--	<b>143</b>
Thallium	ug/L	2	2.0	2.0	3.7	< 2	--	2	--	--	--	< 2
<b>Additional MI Part 115<sup>(2)</sup></b>												
Iron	ug/L	<b>300**</b>	<b>300<sup>E</sup></b>	<b>300<sup>E</sup></b>	500,000 <sup>EE</sup>	41	--	<b>347</b>	--	--	--	57
Copper	ug/L	1,000**	1,000 <sup>E</sup>	1,000 <sup>E</sup>	15	4	--	5	--	--	--	2
Nickel	ug/L	NC	100	100	86	2	--	38	--	--	--	8
Silver	ug/L	100**	34	98	0.2	< 0.2	--	< 0.2	--	--	--	< 0.2
Vanadium	ug/L	NC	<b>4.5</b>	62	<b>27</b>	<b>7</b>	--	< 2	--	--	--	<b>34</b>
Zinc	ug/L	5,000**	2,400	5,000 <sup>E</sup>	190	< 10	--	< 10	--	--	--	< 10

**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; -- - not analyzed.

\* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.

\*\* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.

<sup>^</sup> - 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).

<sup>#</sup> - 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.

<sup>E</sup> - Criterion is the aesthetic drinking water value per footnote (E).

<sup>EE</sup> - Criterion is based on the total dissolved solids GSI value per footnote (EE).

**BOLD** value indicates an exceedance of one or more of the listed criteria.

**RED** value indicates an exceedance of the MCL.

All metals were analyzed as total unless otherwise specified.

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

(2) Per Michigan Part 115 Amendments - Public Act No. 640 of 2018 Section 11511a(3)(c) and 11519b(2) additional detection monitoring constituents (iron) and assessment monitoring constituents (copper, nickel, silver, vanadium, and zinc) are reported.

(3) Not sampled; insufficient amount of groundwater present to collect sample.

**Table 5**  
 Summary of Groundwater Sampling Results (Analytical): Second Quarter 2021  
 JH Campbell Pond A GSI Wells – Assessment Monitoring Program  
 West Olive, Michigan

		Sample Location:				MW-13	MW-14S	PZ-24S	PZ-40S
		Sample Date:				4/12/2021 <sup>(3)</sup>	4/14/2021	4/14/2021	4/14/2021
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI <sup>^</sup>	downgradient			
<b>Appendix III<sup>(1)</sup></b>									
Total Dissolved Solids	mg/L	500**	500 <sup>E</sup>	500 <sup>E</sup>	500	--	35	40	45
<b>Appendix IV<sup>(1)</sup></b>									
Antimony	ug/L	6	6.0	6.0	130	--	< 1	< 1	< 1
Arsenic	ug/L	10	10	10	10	--	< 1	< 1	< 1
Barium	ug/L	2,000	2,000	2,000	820	--	10	23	16
Chromium	ug/L	100	100	100	11	--	< 1	1	1
Lithium	ug/L	NC	170	350	440	--	< 10	< 10	< 10
Molybdenum	ug/L	NC	73	210	3,200	--	< 5	< 5	< 5
Selenium	ug/L	50	50	50	5.0	--	< 1	< 1	< 1
<b>Additional MI Part 115<sup>(2)</sup></b>									
Vanadium	ug/L	NC	4.5	62	27	--	< 2	2	< 2

**Notes:**

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

NC - no criteria;

-- - not analyzed.

\* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.

\*\* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.

<sup>^</sup> - 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).

<sup>E</sup> - Criterion is the aesthetic drinking water value per footnote (E).

**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.

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

(2) Per Michigan Part 115 Amendments - Public Act No. 640 of 2018 Section 11511a(3)(c) and 11519b(2) additional detection monitoring constituents (iron) and assessment monitoring constituents (copper, nickel, silver, vanadium, and zinc) are reported.

(3) Not sampled; insufficient amount of groundwater present to collect sample.



Table 6  
 Summary of Groundwater Protection Standard Exceedances – Second Quarter 2021  
 JH Campbell Pond A – Assessment Monitoring Program  
 West Olive, Michigan

Constituent	Units	GWPS	JHC-MW-15006		JHC-MW-15007		JHC-MW-15008R		JHC-MW-15009		JHC-MW-15010		JHC-MW-15011	
			LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
<b>Appendix IV</b>														
Arsenic	ug/L	10	--	--	--	--	--	--	--	--	--	--	14	37
Chromium	ug/L	100	--	--	--	--	--	--	--	--	1.0	370	--	--
Selenium	ug/L	50	--	--	--	--	6.0	110	1.7	69	6.0	180	2.3	210
<b>Additional Michigan Part 115 Parameters</b>														
Boron*	ug/L	500	--	--	--	--	160	460	92	560	530	2,700	970	4,600
Sulfate*	mg/L	250	130	280	--	--	--	--	--	--	--	--	--	--
TDS*	mg/L	500	400	560	--	--	430	570	--	--	--	--	350	610
Iron*	ug/L	870	22	310	--	--	--	--	--	--	0.029	44,000	--	--
Nickel*	ug/L	100	--	--	--	--	--	--	--	--	1.0	200	--	--
Vanadium*	ug/L	4.5	6.3	16	--	--	--	--	--	--	4.0	5.5	22	48

**Notes:**

ug/L - micrograms per Liter

mg/L - milligrams per Liter

SU - standard units; pH is a field parameter.

-- - Not Applicable; well/parameter pair did not directly exceed the GWPS and was not included in further analysis.

NC - Not Calculated; insufficient data to calculate confidence limits.

GWPS - Groundwater Protection Standard as established in TRC's Technical Memoranda dated October 15, 2018 and December 23, 2019.

UCL - Upper Confidence Limit ( $\alpha = 0.01$ ) of the downgradient data set.

LCL - Lower Confidence Limit ( $\alpha = 0.01$ ) of the downgradient data set.

\*Statistically evaluated per Michigan Part 115.

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

Table 7  
Summary of Groundwater Exceedances  
Second Quarter 2021  
JH Campbell Plant Pond A, West Olive, Michigan

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY  
SUMMARY OF STATISTICAL EXCEEDANCES

Data is in (X) ug/L or  
( ) mg/L  
unless otherwise stated

Facility: JH Campbell – WDS# 395496

Well #	Location	Parameter	Part 201 GRCC	Statistical Limit (or 'CC' for Control Charts)	2 Qtr. 2021 (bold >201)	1 Qtr. 2021 (bold >201)	4 Qtr. 2020 (bold >201)	3 Qtr. 2020 (bold >201)
JHC-MW-15010	Downgradient	Boron	500	LCL	NS	NS	NS	<b>2,130</b>
JHC-MW-15011	Downgradient	Boron	500	LCL	<b>5,070</b>	<b>4,720<sup>(1)</sup></b>	<b>4,120<sup>(1)</sup></b>	<b>2,720<sup>(1)</sup></b>
JHC-MW-15011	Downgradient	Arsenic	10	LCL	<b>13</b>	<b>14</b>	<b>22</b>	<b>22</b>
JHC-MW-15006	Downgradient	Vanadium	4.5	LCL	<b>7</b>	<b>7</b>	<b>19</b>	<b>15<sup>(1)</sup></b>
JHC-MW-15011	Downgradient	Vanadium	4.5	LCL	<b>34</b>	<b>35</b>	<b>49</b>	<b>30<sup>(1)</sup></b>

**Notes:**

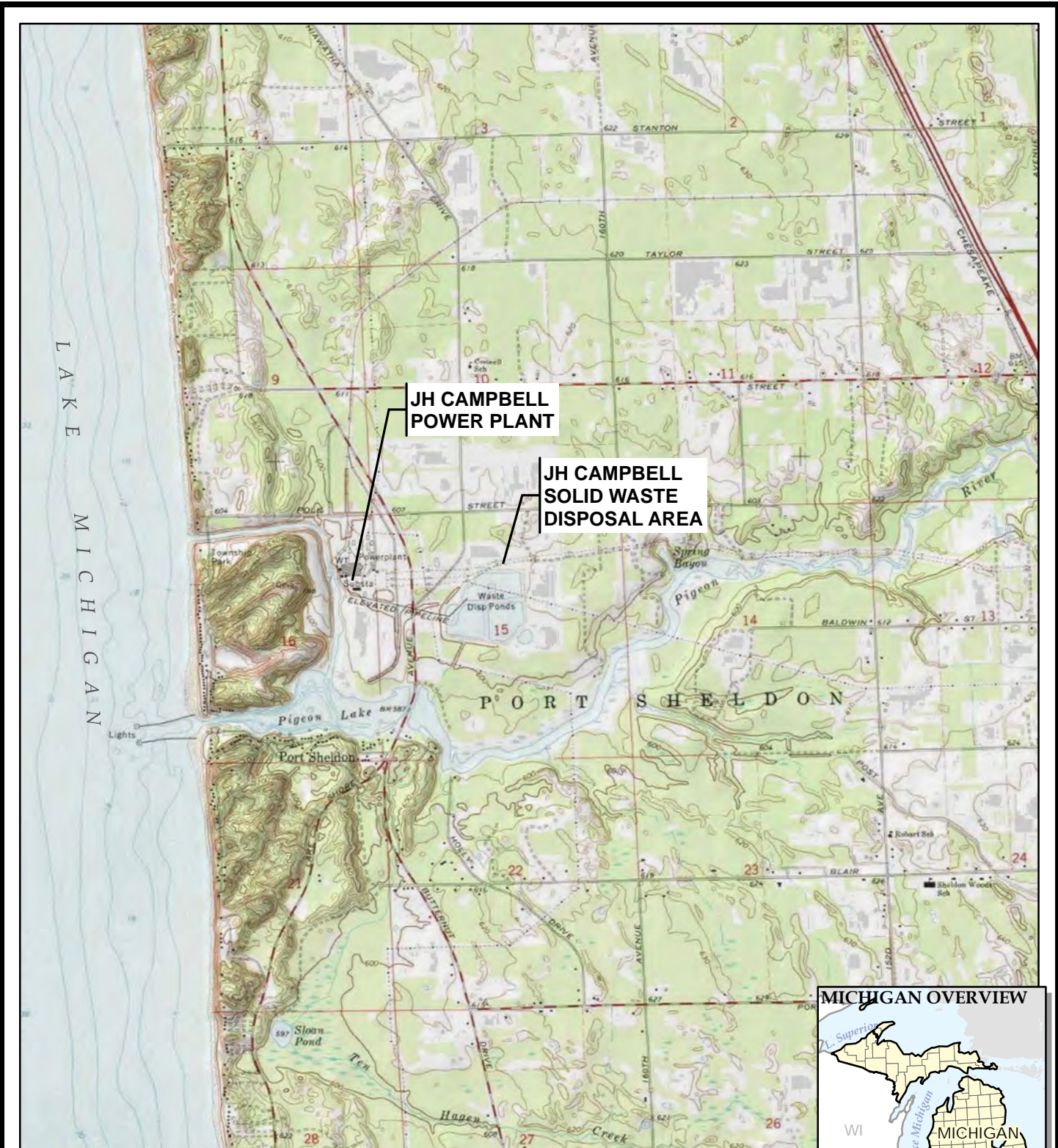
Table summarizes statistically significant Groundwater Protection Standards (GWPSs) exceedances as determined using confidence intervals.

LCL - Lower confidence limit

NS - Not sampled; insufficient amount of groundwater present to collect sample.

(1) - Exceeded Part 201 Generic Residential Cleanup Criteria (GRCC) but did not result in a statistically significant GWPS exceedance.

## Figures



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.




1540 Eisenhower Place  
Ann Arbor, MI 48108-3284  
Phone: 734.971.7080  
www.trccompanies.com

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

TITLE: **SITE LOCATION MAP**

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

**FIGURE 1**



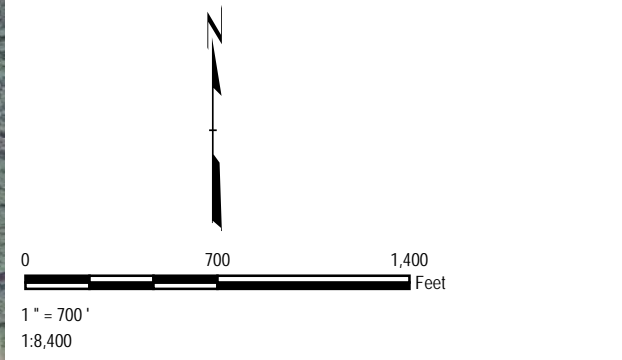


**LEGEND**

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

**NOTES**

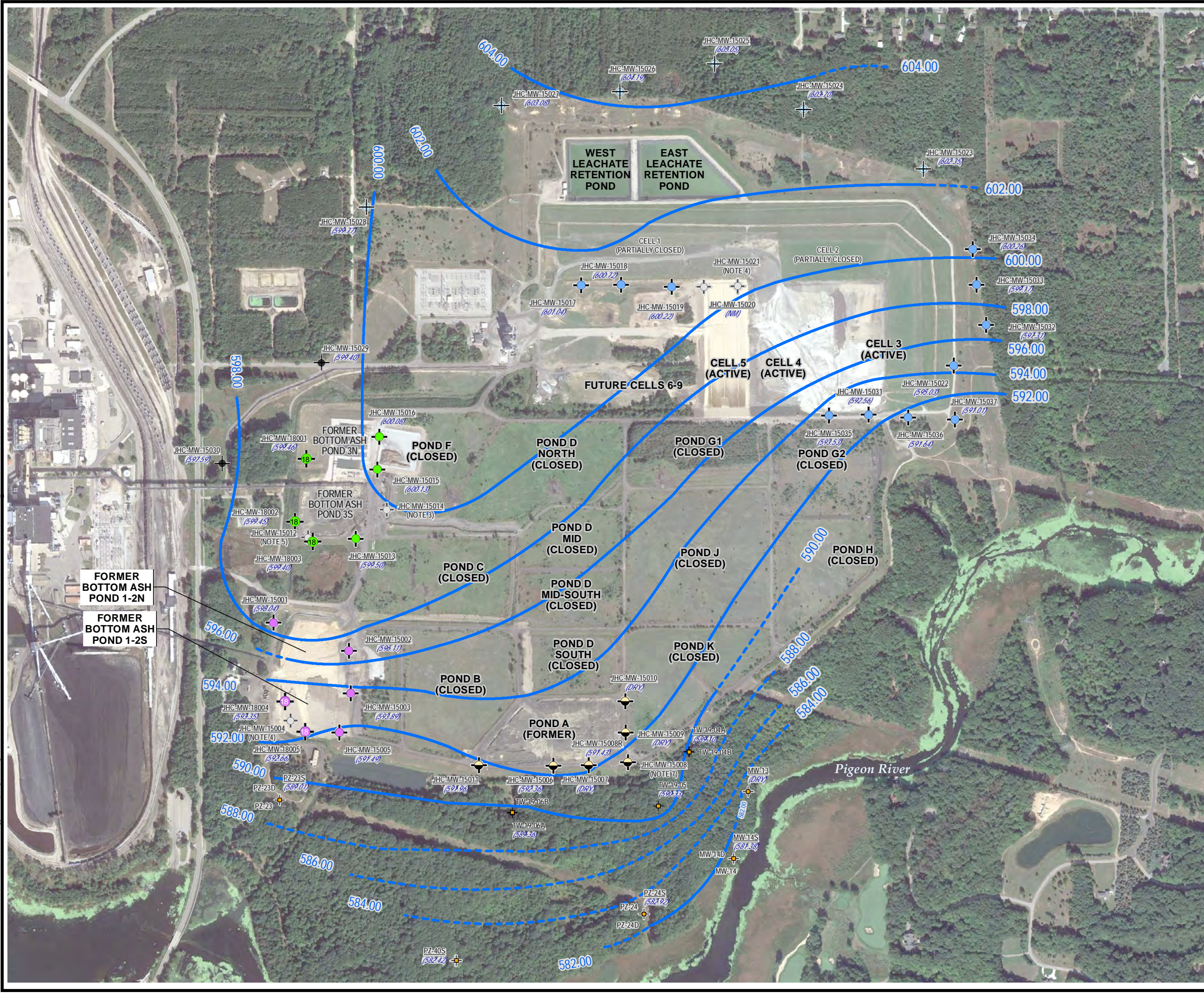
1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
2. WELL LOCATIONS BASED ON SURVEY DATA THROUGH 12/07/2018.
3. MONITORING WELL DECOMMISSIONED NOVEMBER 13, 2017.
4. MONITORING WELL DECOMMISSIONED JUNE 14, 2018.
5. MONITORING WELL DECOMMISSIONED OCTOBER 10, 2018.
6. JHC-MW-1800X MONITORING WELLS INSTALLED IN DECEMBER 2018.
7. MONITORING WELL DECOMMISSIONED JUNE 24, 2019.
8. JHC-MW-15008R AND TW-19-XX MONITORING WELLS INSTALLED IN JUNE 2019.



<b>PROJECT:</b>		<b>CONSUMERS ENERGY COMPANY JH CAMPBELL POWER PLANT WEST OLIVE, MICHIGAN</b>	
<b>TITLE:</b>		<b>SITE PLAN WITH CCR MONITORING WELL LOCATIONS</b>	
<b>DRAWN BY:</b>	S. MAJOR	<b>PROJ NO.:</b>	367390.0000.0000
<b>CHECKED BY:</b>	B. YELEN	<b>FIGURE 2</b>	
<b>APPROVED BY:</b>	S. HOLMSTROM		
<b>DATE:</b>	JANUARY 2021		
		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trccompanies.com	
<b>FILE NO.:</b>		367390-001-002.mxd	



Plot Date: 7/16/2021 06:23:30 AM by ADAIR -- LAYOUT: ANSI B(11"x17")  
 Path: S:\PROJECTS\Consumers\_Energy\_Company\Michigan\CCR\_GW\2017\_2697672\_JHC2021\_MXD\2021\_002\_APRIL\18422\_200\_003.mxd  
 Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)  
 Map Rotation: 0  
 TRC - GIS

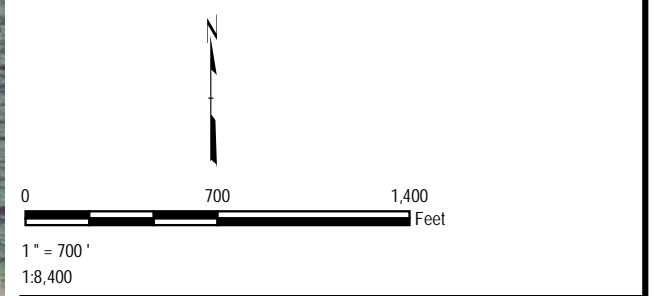


### LEGEND

- BACKGROUND MONITORING WELL
- BOTTOM ASH POND 1/2 N/S MONITORING WELL
- BOTTOM ASH POND 3 N/S MONITORING WELL
- 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
- BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
  - WELL LOCATIONS BASED ON SURVEY DATA THROUGH 12/07/2018.
  - MONITORING WELL DECOMMISSIONED NOVEMBER 13, 2017.
  - MONITORING WELL DECOMMISSIONED JUNE 14, 2018.
  - MONITORING WELL DECOMMISSIONED OCTOBER 10, 2018.
  - JHC-MW-1800X MONITORING WELLS INSTALLED IN DECEMBER 2018.
  - MONITORING WELL DECOMMISSIONED JUNE 24, 2019.
  - JHC-MW-15008R AND TW-19-XX MONITORING WELLS INSTALLED IN JUNE 2019.
  - STATIC WATER ELEVATIONS IN NORTH AMERICAN VERTICAL DATUM 1988, NAVD 88.



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		

TRC

1540 Eisenhower Place  
 Ann Arbor, MI 48108-3284  
 Phone: 734.971.7080  
 www.trccompanies.com

FILE NO.: 418422\_200\_003.mxd



# Appendix A

## 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 as well as iron, copper, nickel, silver, vanadium, and zinc will be utilized for the purposes of an assessment monitoring program.
- Data are usable for the purposes of the assessment monitoring program.
- When the data are evaluated through an assessment monitoring statistical program, findings below may be used to support the removal of outliers.

## **QA/QC Sample Summary**

- A method blank was analyzed with each analytical batch for radium. Radium 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 CEC JH Campbell Pond A

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) 21-0445R and 160-41804-1 Revision 1.

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

- JHC-MW-15006
- JHC-MW-15008R
- JHC-MW-15011

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

Analyte Group	Method
Anions (Fluoride, Chloride, Sulfate)	EPA 300.0
Total Dissolved Solids (TDS)	SM 2540C
Total Metals	SW-846 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 LCSs were not provided for review by CE Laboratory Services. Therefore, potential contamination arising from laboratory sample preparation and/or analytical procedures and the accuracy of the analytical method using a clean matrix could not be evaluated for 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**

- A method blank was analyzed with each analytical batch for radium. Radium was 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 these blank samples.
- All samples were analyzed 12 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-15006 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 sample was DUP-01/JHC-MW-15008R. All criteria were met with the following exception.
  - The RPD for chromium (31%) was above the acceptance criteria. Therefore, potential uncertainty exists for the positive results for chromium in wells JHC-MW-15006, JHC-MW-15008R, and JHC-MW-15011, as shown in the attached table, Attachment A.
- Carrier recoveries, where applicable, were within 40-110%.

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

<b>Samples</b>	<b>Collection Date</b>	<b>Analyte</b>	<b>Non-Conformance/Issue</b>
JHC-MW-15006	4/13/2021	Alkalinity	Analysis run outside of holding time; results are potentially biased low
JHC-MW-15008R	4/13/2021		
JHC-MW-15011	4/13/2021		
DUP-01	4/13/2021		
JHC-MW-15006	4/13/2021	Chromium	Field duplicate variability; potential uncertainty exists.
JHC-MW-15008R	4/13/2021		
JHC-MW-15011	4/13/2021		
DUP-01	4/13/2021		



# **Appendix B**

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

## Technical Memorandum

---

**Date:** July 20, 2021

**To:** Bethany Swanberg, Consumers Energy

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

**Project No.:** 418422.0000.0000 Phase 1 Task 3

**Subject:** Statistical Evaluation of April 2021 Assessment Monitoring Sampling Event, JH Campbell Pond A, Consumers Energy, West Olive, Michigan

---

Consumers Energy is conducting quarterly groundwater monitoring at Pond A in accordance with the Pond A Hydrogeological Monitoring Plan (HMP) and Assessment Monitoring Plan (AMP) and semiannual monitoring in accordance with the CCR Rule per the JH Campbell Monitoring Program Sample Analysis Plan (SAP) (ARCADIS, May 2016). The second quarter 2021 monitoring event was conducted on April 12 through 14, 2021. In accordance with the Pond A AMP, the assessment monitoring data must be compared to groundwater protection standards (GWPSs) to determine whether or not Appendix III and Appendix IV constituents, and additional Michigan Part 115 (as amended by PA 640) Section 11511a(3) and Section 11519b(2) constituents, are detected at statistically significant levels above the GWPSs. GWPSs were established as follows:

- Appendix IV GWPSs were established in accordance with §257.95(h), as detailed in the October 15, 2018, Groundwater Protection Standards technical memorandum, included as Appendix C of the 2018 Annual Groundwater Monitoring Report (TRC, January 2019).
- Appendix III GWPSs were established in accordance with §257.95(h) and the HMP, as detailed in the December 23, 2019, Groundwater Protection technical memorandum, included as Appendix G of the 2019 Annual Groundwater Monitoring Report (TRC, January 2020).
- GWPSs were established for additional Section 11511a(3) constituent (iron) and Section 11519b(2) constituents (copper, nickel, silver, vanadium, and zinc) in accordance with §257.95(h) and the HMP, as detailed in the 2020 PA 640 Constituent Groundwater Protection Standards technical memorandum that was included in the Third Quarter 2020 Hydrogeological Monitoring Report (TRC, October 2020).

The following narrative describes the methods that were employed for the comparisons to the GWPSs. The results obtained and the Sanitas™ output files are included as an attachment.

The statistical evaluation of the second quarter 2021 event data indicates that the following constituents are present at statistically significant levels exceeding the GWPS in downgradient monitoring wells at the JHC Pond A CCR Unit:

## Technical Memorandum

<b>Constituent</b>	<b>GWPS</b>	<b># Downgradient Wells Observed</b>
Arsenic	10 ug/L	1 of 6
Boron	500 ug/L	2 of 6
Vanadium	4.5 ug/L	2 of 6

The results of the assessment monitoring statistical evaluation for the downgradient wells are consistent with the results of the previous assessment monitoring data statistical evaluations, indicating arsenic, boron, and vanadium are present at statistically significant concentrations above the GWPS.

### Assessment Monitoring Statistical Evaluation

The downgradient compliance well network at the JHC Pond A consists of six wells (JHC-MW-15006 through JHC-MW-15011) located south and east of Pond A. During the second quarter 2021 sampling event, JHC-MW-15007, JHC-MW-15009, and JHC-MW-15010 had an insufficient amount of groundwater present for samples to be collected.

Following the second quarter 2021 sampling event, compliance well data for JHC Pond A were evaluated in accordance with the Groundwater Statistical Evaluation Plan (Stats Plan) (TRC, October 2017) and the Pond A HMP and AMP. The assessment monitoring program evaluates concentrations of CCR constituents present in the uppermost aquifer relative to acceptable levels (i.e., GWPSs). To evaluate whether or not a new 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>1</sup>, the preferred method for comparisons to a fixed standard are confidence limits. 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), upper and lower confidence limits are calculated. The actual mean concentration of the population, with 99 percent confidence, will fall between and lower and upper confidence limits.

For constituents at monitoring wells that have no previously identified statistically significant GWPS exceedances, 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<sup>2</sup>. 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 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

---

<sup>1</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>2</sup> For pH, an exceedance occurs when the lower confidence level exceeds the upper GWPS or the upper confidence level is below the lower GWPS.

## Technical Memorandum

methodologies built into the CCR Rule, and numerous other federal rules, are key in determining whether or not individually measured data points represent a concentration increase over the baseline or a fixed standard (such as a GWPS in an assessment monitoring program).

For each detected constituent, the concentrations from each well were first compared directly to the GWPS, as shown on Table B1. Constituent-well combinations that included a direct exceedance of the GWPS within the past eight monitoring events for Appendix III and Appendix IV (April 2019 to April 2021 for JHC-MW-15006 and JHC-MW-15011, August 2017 to October 2020 for JHC-MW-15007 and JHC-MW-15009, August 2019 to April 2021 for JHC-MW-15008/R, and September 2017 to October 2020 for JHC-MW-15010) and the past seven events for the additional Section 11511a(3) constituents (iron) and Section 11519b(2) (copper, nickel, silver, vanadium, and zinc) (October 2019 through April 2021) were retained for further analysis (Attachment 1). Direct comparison GWPS exceedances include the following constituent well combinations:

- Sulfate, total dissolved solids (TDS), iron, and vanadium in JHC-MW-15006;
- Vanadium in JHC-MW-15007<sup>3</sup>;
- Boron, TDS, and selenium in JHC-MW-15008/R;
- Boron and selenium in JHC-MW-15009;
- Boron, chromium, selenium, iron, nickel, and vanadium in JHC-MW-15010; and
- Boron, TDS, arsenic, selenium, and vanadium in JHC-MW-15011.

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

The statistical data evaluation included the following steps:

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

---

<sup>3</sup> JHC-MW-15007 was not sampled in October 2019, October 2020, and February and April 2021 due to an insufficient quantity of groundwater present. Therefore, only three sampling events have been completed for vanadium at JHC-MW-15007 and there is insufficient data for statistical analysis. Per the AMP, a confidence interval will be calculated following the collection of a minimum of four data points.

## Technical Memorandum

- Calculation of the confidence intervals for each cumulative dataset.

The results of these evaluations are presented and discussed below.

Initially, results for the past eight events were observed visually for potential trends and outliers (time-series plots in Attachment 1). Potential outliers were noted for chromium, iron, and nickel in JHC-MW-15010 in October 2019. A potential increasing trend was noted for boron in JHC-MW-15011 and a potential decreasing trend was noted for arsenic in JHC-MW-15011 (trend tests in Attachment 1). Groundwater conditions are re-equilibrating following capping activities at JHC Pond A that were completed in Summer 2019. Because hydrogeologic conditions are in the process of stabilizing, temporary trending and sporadic outlier data are not unexpected.

Data from each round were evaluated for completeness, overall quality, and usability and were deemed appropriate for the purposes of the CCR assessment monitoring program. The Sanitas™ software was then used to test compliance at the downgradient monitoring wells using the confidence interval method for the most recent eight sampling events. Eight independent sampling events provide an appropriate density of data as recommended per the Unified Guidance yet are collected recently enough to provide an indication of current conditions. For the Section 11511a(3) constituents (iron) and Section 11519b(2) (copper, nickel, silver, vanadium, and zinc), the most recent seven sampling events were used to calculate confidence intervals. These data sets will increase each event until there are a total of eight data points, which will then become a rolling window of the most recent eight data points moving forward, for confidence interval analysis. The tests were run with a per-well significance of  $\alpha = 0.01$ . The software outputs are included in Attachment 1 along with data reports showing the values used for the evaluation. The percentage of non-detect observations are also included in Attachment 1. Non-detect data were handled in accordance with the Stats Plan for the purposes of calculating the confidence intervals.

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

Distribution	Constituent-Well Combinations
Normal	Boron in JHC-MW-15008R and JHC-MW-15011 TDS in JHC-MW-15011 Arsenic in JHC-MW-15011 Selenium in JHC-MW-15010 and JHC-MW-15011 Vanadium in JHC-MW-15006 and JHC-MW-15011
Lognormal	Iron in JHC-MW-15006 and JHC-MW-15010 (Aitchison's adjustment)
Normalized by exponential transformation	Boron in JHC-MW-15010 (3 <sup>rd</sup> power) Sulfate in JHC-MW-15006 (2 <sup>nd</sup> power) TDS in JHC-MW-15006 (5 <sup>th</sup> power) and JHC-MW-15008R (6 <sup>th</sup> power)

## Technical Memorandum

Distribution	Constituent-Well Combinations
Normalized by square root transformation	Boron in JHC-MW-15009 Selenium in JHC-MW-15009
Non-Parametric (not able to be normalized)	Chromium in JHC-MW-15010 Selenium in JHC-MW-15008R Nickel in JHC-MW-15010 Vanadium in JHC-MW-15010

The confidence interval test compares the lower confidence limit to the GWPS. The results of the assessment monitoring statistical evaluation for the downgradient wells are consistent with the results of the previous assessment monitoring data statistical evaluations, indicating arsenic, boron, and vanadium are present at statistically significant concentrations above the GWPS. Arsenic was identified at downgradient monitoring well JHC-MW-15011 at statistically significant levels exceeding the GWPS during the initial assessment monitoring event conducted in June 2018. As shown in Table B1 and Attachment 1, arsenic concentrations in this well have begun to decline in 2020 but remain above the GWPS. Boron at JHC-MW-15010 was identified at statistically significant levels exceeding the GWPS in July 2020. Boron concentrations at monitoring well JHC-MW-15010 showed an increase in 2019 and have remained generally stable in 2019 and 2020. Boron at JHC-MW-15011 was not previously observed at statistically significant levels above the GWPS; however, concentrations have been trending upward since 2019 and have been consistently above the GWPS since October 2019. Vanadium at JHC-MW-15006 and JHC-MW-15011 were identified at statistically significant levels exceeding the GWPS in October 2020. Vanadium concentrations at these monitoring wells have consistently been above the GWPS since monitoring for vanadium under the Pond A HMP and AMP began in October 2019. As discussed above, completion of JHC Pond A capping activities occurred in Summer 2019 and groundwater conditions are re-equilibrating. Consumers Energy will continue to monitor changes in groundwater chemistry and the assessment of corrective measures per the Pond A HMP and AMP and §257.95(g).

### Attachments

Table B1	Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
Attachment 1	Sanitas™ Output

# Table



**Table B1**  
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation  
JH Campbell Pond A - HMP/AMP  
West Olive, Michigan

Sample Location:									JHC-MW-15006											
Sample Date:									4/24/2019	10/10/2019	2/12/2020	4/14/2020	7/16/2020	10/22/2020	10/22/2020	2/23/2021	4/13/2021			
Constituent	Unit	EPA MCL	EPA RSL	MI Residential*	MI Non-Residential*	MI GSI <sup>^</sup>	UTL	GWPS	Downgradient											
<b>Appendix III<sup>(1)</sup></b>																		Field Dup		
Boron	ug/L	NC	NA	500	500	7,200	54	<b>500</b>	240	230	247	284	242	272	331	301	288			
Calcium	mg/L	NC	NA	NC	NC	500 <sup>EE</sup>	40	500	41	35	101	102	91.4	87.2	84.3	89.0	82.0			
Chloride	mg/L	250**	NA	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	70	250	21	22	21.0	24.9	27.7	22.0	22.2	21.2	22.9			
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000			
Sulfate	mg/L	250**	NA	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	13	<b>250</b>	75	55	217	<b>260</b>	195	<b>253</b>	<b>251</b>	<b>276</b>	<b>257</b>			
Total Dissolved Solids	mg/L	500**	NA	500 <sup>E</sup>	500 <sup>E</sup>	500	240	<b>500</b>	240	190	<b>542</b>	<b>562</b>	<b>521</b>	<b>515</b>	<b>511</b>	<b>556</b>	497			
pH, Field	SU	6.5 - 8.5**	NA	6.5 - 8.5 <sup>E</sup>	6.5 - 8.5 <sup>E</sup>	6.5 - 9.0	5.5 - 8.8	5.5 - 8.8	7.6	7.8	7.6	7.2	7.4	7.5	--	7.7	7.7			
<b>Appendix IV<sup>(1)</sup></b>																				
Antimony	ug/L	6	NA	6.0	6.0	130	2	6	< 1.0	< 1.0	< 1	1	< 1	1	< 1	< 1	< 1			
Arsenic	ug/L	10	NA	10	10	10	1	<b>10</b>	5.1	4.3	6	5	5	9	6	4	3			
Barium	ug/L	2,000	NA	2,000	2,000	820	35	2,000	230	180	326	353	291	382	194	227	188			
Beryllium	ug/L	4	NA	4.0	4.0	18	1	4	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1			
Cadmium	ug/L	5	NA	5.0	5.0	3.5	0.2	5	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2			
Chromium	ug/L	100	NA	100	100	11	2	<b>100</b>	4.1	< 1.0	2	1	18	5	1	< 1	3			
Cobalt	ug/L	NC	6	40	100	100	15	15	< 6.0	< 6.0	< 6	< 15	< 6	< 6	< 6	< 6	< 6			
Fluoride	ug/L	4,000	NA	NC	NC	NC	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	4.0	4.0	39	1	15	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1			
Lithium	ug/L	NC	40	170	350	440	10	40	< 10	< 10	13	13	13	15	14	13	12			
Mercury	ug/L	2	NA	2.0	2.0	0.20 <sup>#</sup>	0.2	2	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2			
Molybdenum	ug/L	NC	100	73	210	3,200	5	100	10	9.1	13	16	22	38	37	37	54			
Radium-226	pCi/L	NC	NA	NC	NC	NC	NA	NA	0.234	0.310	--	0.426	--	0.289	< 0.345	--	0.241			
Radium-228	pCi/L	NC	NA	NC	NC	NC	NA	NA	< 0.343	< 0.524	--	0.518	--	< 0.274	< 0.399	--	0.432			
Radium-226/228	pCi/L	5	NA	NC	NC	NC	1.93	5	0.488	< 0.524	--	0.944	--	0.318	0.453	--	0.673			
Selenium	ug/L	50	NA	50	50	5.0	5	<b>50</b>	< 1.0	1.3	8	9	5	2	1	1	< 1			
Thallium	ug/L	2	NA	2.0	2.0	3.7	2	2	< 2.0	< 2.0	< 2	< 2	< 2	< 2	< 2	< 2	< 2			
<b>MI Part 115 Parameters<sup>(2)</sup></b>																				
Iron	ug/L	300**	NA	300 <sup>E</sup>	300 <sup>E</sup>	500,000 <sup>EE</sup>	870	<b>870</b>	--	43	189	26	128	<b>929</b>	213	43	41			
Copper	ug/L	1,000**	NA	1,000 <sup>E</sup>	1,000 <sup>E</sup>	15	2.1	1,000	--	< 1.0	2	1	11	4	4	1	4			
Nickel	ug/L	NC	NA	100	100	86	2	<b>100</b>	--	< 2.0	14	1	13	5	< 2	< 2	2			
Silver	ug/L	100**	NA	34	98	0.20	0.2	34	--	< 0.20	< 0.2	< 0.4	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2			
Vanadium	ug/L	NC	NA	4.5	62	27	2	<b>4.5</b>	--	<b>8</b>	<b>16</b>	<b>10</b>	<b>15</b>	<b>19</b>	<b>9</b>	<b>7</b>	<b>7</b>			
Zinc	ug/L	5,000**	NA	2,400	5,000 <sup>E</sup>	190	18	2,400	--	< 10	< 10	< 10	< 30	11	23	< 10	< 10			

**Notes:**

- ug/L - micrograms per liter; mg/L - milligrams per liter.
- pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.
- NA - not applicable.
- 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. Appendix IV GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018. Appendix III and MI Part 115 Parameter GWPS is the most restrictive of the MCL/Part 201 criteria, or the UTL if the UTL exceeds the applicable criteria as established in TRC's Technical Memorandum dated December 23, 2019.
- \* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.
- \*\* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
- <sup>^</sup> - 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).
- <sup>#</sup> - If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and EGLE policy and procedure 09-014 dated June 20, 2012.
- <sup>E</sup> - Criterion is the aesthetic drinking water value per footnote (E).
- <sup>EE</sup> - Criterion is based on the total dissolved solids GSI value per footnote (EE).
- 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) 40 CFR Part 257 Appendix III Detection Monitoring Constituents and Appendix IV Assessment Monitoring Constituents.
- (2) Per Michigan Part 115 Amendments - Public Act No. 640 of 2018 Section 11511a(3)(c) and 11519b(2) additional detection monitoring constituents (iron) and assessment monitoring constituents (copper, nickel, silver, vanadium, and zinc) are reported.
- (3) JHC-MW-15008 was decommissioned on June 24, 2019. Replacement well JHC-MW-15008R was installed on June 25, 2019.
- (4) Not sampled; insufficient amount of groundwater present to collect sample.
- (5) pH value potentially biased high due to groundwater quality meter malfunction.

Table B1  
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation  
JH Campbell Pond A - HMP/AMP  
West Olive, Michigan

Sample Location:									JHC-MW-15007												
Sample Date:									8/15/2017	9/26/2017	4/26/2018	6/20/2018	11/15/2018	4/24/2019	10/9/2019 <sup>(4)</sup>	2/12/2020	4/14/2020	7/16/2020	10/22/2020 <sup>(4)</sup>	2/23/2021 <sup>(4)</sup>	4/13/2021 <sup>(4)</sup>
Constituent	Unit	EPA MCL	EPA RSL	MI Residential*	MI Non-Residential*	MI GSI <sup>^</sup>	UTL	GWPS	Downgradient												
<b>Appendix III<sup>(1)</sup></b>																					
Boron	ug/L	NC	NA	500	500	7,200	54	<b>500</b>	141	98	--	157	142	190	--	147	242	162	--	--	
Calcium	mg/L	NC	NA	NC	NC	500 <sup>EE</sup>	40	500	32.1	32.2	--	38.7	42.6	79	--	55.2	62.1	52.8	--	--	
Chloride	mg/L	250**	NA	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	70	250	17.5	17.3	--	17.5	20.6	23	--	9.10	14.1	9.16	--	--	
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	--	< 1,000	< 1,000	< 1,000	--	--	
Sulfate	mg/L	250**	NA	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	13	<b>250</b>	31.6	32.3	--	26.2	19.2	54	--	31.9	83.0	68.3	--	--	
Total Dissolved Solids	mg/L	500**	NA	500 <sup>E</sup>	500 <sup>E</sup>	500	240	<b>500</b>	170	188	--	298	166	360	--	312	336	357	--	--	
pH, Field	SU	6.5 - 8.5**	NA	6.5 - 8.5 <sup>E</sup>	6.5 - 8.5 <sup>E</sup>	6.5 - 9.0	5.5 - 8.8	5.5 - 8.8	7.4	7.3	--	8.4 <sup>(5)</sup>	7.4	7.6	--	7.4	7.0	7.1	--	--	
<b>Appendix IV<sup>(1)</sup></b>																					
Antimony	ug/L	6	NA	6.0	6.0	130	2	6	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1	< 1	< 1	--	--	
Arsenic	ug/L	10	NA	10	10	10	1	<b>10</b>	4.0	--	3.3	2.9	4.0	4.0	--	3	3	3	--	--	
Barium	ug/L	2,000	NA	2,000	2,000	820	35	2,000	130	--	121	115	177	320	--	231	266	248	--	--	
Beryllium	ug/L	4	NA	4.0	4.0	18	1	4	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1	< 1	< 1	--	--	
Cadmium	ug/L	5	NA	5.0	5.0	3.5	0.2	5	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	--	< 0.2	< 0.2	< 0.2	--	--	
Chromium	ug/L	100	NA	100	100	11	2	<b>100</b>	1.1	--	< 1.0	1.2	31.3	35	--	3	2	2	--	--	
Cobalt	ug/L	NC	6	40	100	100	15	15	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	--	< 6	< 15	< 6	--	--	
Fluoride	ug/L	4,000	NA	NC	NC	NC	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	4.0	4.0	39	1	15	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1	< 1	< 1	--	--	
Lithium	ug/L	NC	40	170	350	440	10	40	16	--	11	15	16	12	--	15	14	13	--	--	
Mercury	ug/L	2	NA	2.0	2.0	0.20#	0.2	2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	--	< 0.2	< 0.2	< 0.2	--	--	
Molybdenum	ug/L	NC	100	73	210	3,200	5	100	6.1	--	< 5.0	< 5.0	7.6	7.2	--	< 5	< 5	< 5	--	--	
Radium-226	pCi/L	NC	NA	NC	NC	NC	NA	NA	< 0.430	--	< 1.03	< 0.736	0.864	0.217	--	--	0.197	--	--	--	
Radium-228	pCi/L	NC	NA	NC	NC	NC	NA	NA	< 0.904	--	< 1.02	< 1.12	< 0.688	0.392	--	--	< 0.456	--	--	--	
Radium-226/228	pCi/L	5	NA	NC	NC	NC	1.93	5	< 1.33	--	< 2.05	< 1.86	1.40	0.609	--	--	< 0.456	--	--	--	
Selenium	ug/L	50	NA	50	50	5.0	5	<b>50</b>	1.1	--	< 1.0	1.3	< 1.0	4.1	--	23	22	22	--	--	
Thallium	ug/L	2	NA	2.0	2.0	3.7	2	2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	--	< 2	< 2	< 2	--	--	
<b>MI Part 115 Parameters<sup>(2)</sup></b>																					
Iron	ug/L	300**	NA	300 <sup>E</sup>	300 <sup>E</sup>	500,000 <sup>EE</sup>	870	<b>870</b>	--	--	--	--	--	--	--	71	< 20	< 20	--	--	
Copper	ug/L	1,000**	NA	1,000 <sup>E</sup>	1,000 <sup>E</sup>	15	2.1	1,000	--	--	--	--	--	--	--	2	1	< 1	--	--	
Nickel	ug/L	NC	NA	100	100	86	2	<b>100</b>	--	--	--	--	--	--	--	7	< 1	< 2	--	--	
Silver	ug/L	100**	NA	34	98	0.20	0.2	34	--	--	--	--	--	--	--	< 0.2	< 0.2	< 0.2	--	--	
Vanadium	ug/L	NC	NA	4.5	62	27	2	<b>4.5</b>	--	--	--	--	--	--	--	<b>16</b>	<b>14</b>	<b>15</b>	--	--	
Zinc	ug/L	5,000**	NA	2,400	5,000 <sup>E</sup>	190	18	2,400	--	--	--	--	--	--	--	10	< 10	< 30	--	--	

**Notes:**

- ug/L - micrograms per liter; mg/L - milligrams per liter.
- pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.
- NA - not applicable.
- 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. Appendix IV GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018. Appendix III and MI Part 115 Parameter GWPS is the most restrictive of the MCL/Part 201 criteria, or the UTL if the UTL exceeds the applicable criteria as established in TRC's Technical Memorandum dated December 23, 2019.
- \* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.
- \*\* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
- ^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using site-specific hardness of 180 mg CaCO3/L as measured at surface water sample SW-01 collected on April 9, 2018 from the Pigeon River. Chromium GSI criterion based on hexavalent chromium per footnote (H).
- # - If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and EGLE policy and procedure 09-014 dated June 20, 2012.
- <sup>E</sup> - Criterion is the aesthetic drinking water value per footnote (E).
- <sup>EE</sup> - Criterion is based on the total dissolved solids GSI value per footnote (EE).
- 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) 40 CFR Part 257 Appendix III Detection Monitoring Constituents and Appendix IV Assessment Monitoring Constituents.
- (2) Per Michigan Part 115 Amendments - Public Act No. 640 of 2018 Section 11511a(3)(c) and 11519b(2) additional detection monitoring constituents (iron) and assessment monitoring constituents (copper, nickel, silver, vanadium, and zinc) are reported.
- (3) JHC-MW-15008 was decommissioned on June 24, 2019. Replacement well JHC-MW-15008R was installed on June 25, 2019.
- (4) Not sampled; insufficient amount of groundwater present to collect sample.
- (5) pH value potentially biased high due to groundwater quality meter malfunction.

Table B1  
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation  
JH Campbell Pond A - HMP/AMP  
West Olive, Michigan

Sample Location:									JHC-MW-15008R <sup>(3)</sup>										
Sample Date:									8/13/2019	10/9/2019	10/9/2019	2/12/2020	4/14/2020	7/16/2020	10/22/2020	2/23/2021	4/13/2021	4/13/2021	
Constituent	Unit	EPA MCL	EPA RSL	MI Residential <sup>*</sup>	MI Non-Residential <sup>*</sup>	MI GSI <sup>^</sup>	UTL	GWPS	Downgradient										
<b>Appendix III<sup>(1)</sup></b>											Field Dup								Field Dup
Boron	ug/L	NC	NA	500	500	7,200	54	<b>500</b>	93	130	130	423	<b>505</b>	384	285	326	352	360	
Calcium	mg/L	NC	NA	NC	NC	500 <sup>EE</sup>	40	500	33	100	100	94.7	99.9	79.8	109	105	85.4	87.0	
Chloride	mg/L	250 <sup>**</sup>	NA	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	70	250	2.2	16	16	22.4	25.0	25.4	18.8	17.2	17.2	17.1	
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	170	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	
Sulfate	mg/L	250 <sup>**</sup>	NA	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	13	<b>250</b>	20	220	220	219	235	183	215	197	185	186	
Total Dissolved Solids	mg/L	500 <sup>**</sup>	NA	500 <sup>E</sup>	500 <sup>E</sup>	500	240	<b>500</b>	150	< 50	430	<b>556</b>	<b>566</b>	<b>536</b>	<b>577</b>	<b>548</b>	<b>517</b>	<b>512</b>	
pH, Field	SU	6.5 - 8.5 <sup>**</sup>	NA	6.5 - 8.5 <sup>E</sup>	6.5 - 8.5 <sup>E</sup>	6.5 - 9.0	5.5 - 8.8	5.5 - 8.8	7.4	7.3	--	7.3	6.9	7.1	7.0	7.0	7.1	--	
<b>Appendix IV<sup>(1)</sup></b>																			
Antimony	ug/L	6	NA	6.0	6.0	130	2	6	1.2	< 1.0	< 1.0	< 1	1	< 1	1	< 1	1	< 1	
Arsenic	ug/L	10	NA	10	10	10	1	<b>10</b>	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	
Barium	ug/L	2,000	NA	2,000	2,000	820	35	2,000	110	340	320	291	252	219	216	250	200	195	
Beryllium	ug/L	4	NA	4.0	4.0	18	1	4	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	
Cadmium	ug/L	5	NA	5.0	5.0	3.5	0.2	5	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	
Chromium	ug/L	100	NA	100	100	11	2	<b>100</b>	3.8	4.5	4.5	7	< 1	< 1	< 1	2	41	56	
Cobalt	ug/L	NC	6	40	100	100	15	15	< 6.0	< 6.0	< 6.0	< 6	< 15	< 6	< 6	< 6	< 6	< 6	
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	170	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	
Lead	ug/L	NC	15	4.0	4.0	39	1	15	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	
Lithium	ug/L	NC	40	170	350	440	10	40	10	15	15	18	19	17	19	20	20	21	
Mercury	ug/L	2	NA	2.0	2.0	0.20 <sup>#</sup>	0.2	2	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	
Molybdenum	ug/L	NC	100	73	210	3,200	5	100	6.8	< 5.0	< 5.0	< 5	< 5	< 5	5	9	17	19	
Radium-226	pCi/L	NC	NA	NC	NC	NC	NA	NA	0.183	0.449	0.751	--	0.180	--	0.553	--	0.272	0.351	
Radium-228	pCi/L	NC	NA	NC	NC	NC	NA	NA	0.468	0.817	0.744	--	< 0.429	--	0.330	--	< 0.491	< 0.512	
Radium-226/228	pCi/L	5	NA	NC	NC	NC	1.93	5	0.651	1.27	1.49	--	0.549	--	0.883	--	0.496	0.780	
Selenium	ug/L	50	NA	50	50	5.0	5	<b>50</b>	12	<b>110</b>	<b>110</b>	11	6	13	<b>68</b>	16	6	6	
Thallium	ug/L	2	NA	2.0	2.0	3.7	2	2	< 2.0	< 2.0	< 2.0	< 2	< 2	2	< 2	2	2	< 2	
<b>MI Part 115 Parameters<sup>(2)</sup></b>																			
Iron	ug/L	300 <sup>**</sup>	NA	300 <sup>E</sup>	300 <sup>E</sup>	500,000 <sup>EE</sup>	870	<b>870</b>	--	99	150	164	134	48	56	41	347	419	
Copper	ug/L	1,000 <sup>**</sup>	NA	1,000 <sup>E</sup>	1,000 <sup>E</sup>	15	2.1	1,000	--	< 1.0	1.1	2	2	2	2	2	5	5	
Nickel	ug/L	NC	NA	100	100	86	2	<b>100</b>	--	2.7	2.6	8	< 1	< 2	< 2	3	38	48	
Silver	ug/L	100 <sup>**</sup>	NA	34	98	0.20	0.2	34	--	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	
Vanadium	ug/L	NC	NA	4.5	62	27	2	<b>4.5</b>	--	< 2.0	< 2.0	< 2	< 2	< 2	< 2	< 2	< 2	< 2	
Zinc	ug/L	5,000 <sup>**</sup>	NA	2,400	5,000 <sup>E</sup>	190	18	2,400	--	< 10	< 10	< 10	< 10	< 30	< 10	< 10	< 10	< 10	

**Notes:**

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

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

NA - not applicable.

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. Appendix IV GWPS is the higher of the MCL/RSL and UTL as established in TRC's

Technical Memorandum dated October 15, 2018. Appendix III and MI Part 115 Parameter GWPS is the most restrictive of the MCL/Part 201 criteria, or the UTL

if the UTL exceeds the applicable criteria as established in TRC's Technical Memorandum dated December 23, 2019.

\* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.

\*\* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.

^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using

site-specific hardness of 180 mg 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 EGLE 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).

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

(2) Per Michigan Part 115 Amendments - Public Act No. 640 of 2018 Section 11511a(3)(c) and 11519b(2) additional detection

monitoring constituents (iron) and assessment monitoring constituents (copper, nickel, silver, vanadium, and zinc) are reported.

(3) JHC-MW-15008 was decommissioned on June 24, 2019. Replacement well JHC-MW-15008R was installed on June 25, 2019.

(4) Not sampled; insufficient amount of groundwater present to collect sample.

(5) pH value potentially biased high due to groundwater quality meter malfunction.

Table B1  
 Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation  
 JH Campbell Pond A - HMP/AMP  
 West Olive, Michigan

Sample Location:									JHC-MW-15009																	
Sample Date:									8/15/2017	9/26/2017	4/26/2018	4/26/2018	6/20/2018	11/15/2018	11/15/2018	4/24/2019	4/24/2019	10/9/2019 <sup>(4)</sup>	2/12/2020	4/14/2020	4/14/2020	7/16/2020	10/22/2020 <sup>(4)</sup>	2/23/2021 <sup>(4)</sup>	4/13/2021 <sup>(4)</sup>	
Constituent	Unit	EPA MCL	EPA RSL	MI Residential*	MI Non-Residential*	MI GSI <sup>^</sup>	UTL	GWPS	Downgradient																	
<b>Appendix III<sup>(1)</sup></b>												Field Dup				Field Dup			Field Dup				Field Dup			
Boron	ug/L	NC	NA	500	500	7,200	54	<b>500</b>	156	144	--	--	91.4	188	187	200	190	--	468	<b>874</b>	<b>881</b>	401	--	--	--	
Calcium	mg/L	NC	NA	NC	NC	500 <sup>EE</sup>	40	500	41.2	34.3	--	--	41.2	46.2	46.4	92	89	--	74.5	78.7	79.9	84.2	--	--	--	
Chloride	mg/L	250**	NA	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	70	250	20.1	17.7	--	--	22.9	17.7	17.7	17	16	--	10.7	6.95	6.78	6.18	--	--	--	
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	--	< 1,000	< 1,000	< 1,000	< 1,000	--	--	--	
Sulfate	mg/L	250**	NA	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	13	<b>250</b>	31.6	32.7	--	--	18.2	26.9	27.1	130	130	--	40.5	49.1	49.9	64.4	--	--	--	
Total Dissolved Solids	mg/L	500**	NA	500 <sup>E</sup>	500 <sup>E</sup>	500	240	<b>500</b>	208	178	--	--	214	234	202	430	440	--	332	354	341	397	--	--	--	
pH, Field	SU	6.5 - 8.5**	NA	6.5 - 8.5 <sup>E</sup>	6.5 - 8.5 <sup>E</sup>	6.5 - 9.0	5.5 - 8.8	5.5 - 8.8	7.5	7.4	8.4 <sup>(5)</sup>	--	7.7	7.6	--	7.4	--	--	7.5	7.2	--	7.2	--	--	--	
<b>Appendix IV<sup>(1)</sup></b>																										
Antimony	ug/L	6	NA	6.0	6.0	130	2	6	< 1.0	--	< 1.0	< 1.0	< 1.0	1.2	< 1.0	< 1.0	< 1.0	--	< 1	1	1	< 1	--	--	--	
Arsenic	ug/L	10	NA	10	10	10	1	<b>10</b>	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1	< 1	< 1	< 1	--	--	--	
Barium	ug/L	2,000	NA	2,000	2,000	820	35	2,000	198	--	130	125	130	178	181	360	360	--	287	307	298	290	--	--	--	
Beryllium	ug/L	4	NA	4.0	4.0	18	1	4	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1	< 1	< 1	< 1	--	--	--	
Cadmium	ug/L	5	NA	5.0	5.0	3.5	0.2	5	< 0.20	--	< 0.20	< 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	100	100	11	2	<b>100</b>	6.6	--	1.3	1.3	< 1.0	14.1	11.8	17	14	--	31	1	1	1	--	--	--	
Cobalt	ug/L	NC	6	40	100	100	15	15	< 15.0	--	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 6.0	--	< 6	< 15	< 15	< 6	--	--	--	
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	--	< 1,000	< 1,000	< 1,000	< 1,000	--	--	--	
Lead	ug/L	NC	15	4.0	4.0	39	1	15	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1	< 1	< 1	< 1	--	--	--	
Lithium	ug/L	NC	40	170	350	440	10	40	11	--	< 10	< 10	< 10	14	14	11	11	--	14	14	14	14	--	--	--	
Mercury	ug/L	2	NA	2.0	2.0	0.20#	0.2	2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--	< 0.2	< 0.2	< 0.2	< 0.2	--	--	--	
Molybdenum	ug/L	NC	100	73	210	3,200	5	100	7.4	--	5.5	5.5	< 5.0	6.1	6.1	5.7	5.6	--	15	< 5	< 5	6	--	--	--	
Radium-226	pCi/L	NC	NA	NC	NC	NC	NA	NA	< 0.455	--	< 0.169	< 0.709	< 0.631	< 0.896	< 0.705	0.351	0.289	--	--	0.394	0.307	--	--	--	--	
Radium-228	pCi/L	NC	NA	NC	NC	NC	NA	NA	1.04	--	< 1.26	< 1.14	< 0.634	0.800	< 0.663	0.674	0.509	--	--	0.573	0.459	--	--	--	--	
Radium-226/228	pCi/L	5	NA	NC	NC	NC	1.93	5	< 1.40	--	< 1.43	< 1.85	< 1.27	< 1.47	< 1.37	1.02	0.798	--	--	0.967	0.767	--	--	--	--	
Selenium	ug/L	50	NA	50	50	5.0	5	<b>50</b>	< 1.0	--	< 1.0	1.0	10.3	12.6	12.6	<b>61</b>	<b>63</b>	--	20	<b>77</b>	<b>79</b>	<b>76</b>	--	--	--	
Thallium	ug/L	2	NA	2.0	2.0	3.7	2	2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	--	< 2	< 2	< 2	< 2	--	--	--	
<b>MI Part 115 Parameters<sup>(2)</sup></b>																										
Iron	ug/L	300**	NA	300 <sup>E</sup>	300 <sup>E</sup>	500,000 <sup>EE</sup>	870	<b>870</b>	--	--	--	--	--	--	--	--	--	--	--	420	< 20	< 20	34	--	--	--
Copper	ug/L	1,000**	NA	1,000 <sup>E</sup>	1,000 <sup>E</sup>	15	2.1	1,000	--	--	--	--	--	--	--	--	--	--	--	4	1	2	3	--	--	--
Nickel	ug/L	NC	NA	100	100	86	2	<b>100</b>	--	--	--	--	--	--	--	--	--	--	--	41	< 1	1	< 2	--	--	--
Silver	ug/L	100**	NA	34	98	0.20	0.2	34	--	--	--	--	--	--	--	--	--	--	--	< 0.2	< 0.2	< 0.2	< 0.2	--	--	--
Vanadium	ug/L	NC	NA	4.5	62	27	2	<b>4.5</b>	--	--	--	--	--	--	--	--	--	--	--	3	< 2	< 2	< 2	--	--	--
Zinc	ug/L	5,000**	NA	2,400	5,000 <sup>E</sup>	190	18	2,400	--	--	--	--	--	--	--	--	--	--	--	< 10	< 10	< 10	< 30	--	--	--

**Notes:**

- ug/L - micrograms per liter; mg/L - milligrams per liter.
- pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.
- NA - not applicable.
- 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. Appendix IV GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018. Appendix III and MI Part 115 Parameter GWPS is the most restrictive of the MCL/Part 201 criteria, or the UTL if the UTL exceeds the applicable criteria as established in TRC's Technical Memorandum dated December 23, 2019.
- \* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.
- \*\* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
- ^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using site-specific hardness of 180 mg CaCO3/L as measured at surface water sample SW-01 collected on April 9, 2018 from the Pigeon River. Chromium GSI criterion based on hexavalent chromium per footnote (H).
- # - If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and EGLE policy and procedure 09-014 dated June 20, 2012.
- 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).
- 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) 40 CFR Part 257 Appendix III Detection Monitoring Constituents and Appendix IV Assessment Monitoring Constituents.
- (2) Per Michigan Part 115 Amendments - Public Act No. 640 of 2018 Section 11511a(3)(c) and 11519b(2) additional detection monitoring constituents (iron) and assessment monitoring constituents (copper, nickel, silver, vanadium, and zinc) are reported.
- (3) JHC-MW-15008 was decommissioned on June 24, 2019. Replacement well JHC-MW-15008R was installed on June 25, 2019.
- (4) Not sampled; insufficient amount of groundwater present to collect sample.
- (5) pH value potentially biased high due to groundwater quality meter malfunction.

**Table B1**  
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation  
JH Campbell Pond A - HMP/AMP  
West Olive, Michigan

Sample Location:									JHC-MW-15010																			
Sample Date:									9/26/2017	4/26/2018	6/20/2018	11/14/2018	4/23/2019	10/9/2019	2/11/2020	2/11/2020	4/14/2020	7/16/2020	10/22/2020 <sup>(4)</sup>	2/23/2021 <sup>(4)</sup>	4/13/2021 <sup>(4)</sup>							
Constituent	Unit	EPA MCL	EPA RSL	MI Residential*	MI Non-Residential*	MI GSI^	UTL	GWPS	Downgradient																			
<b>Appendix III<sup>(1)</sup></b>																												
Boron	ug/L	NC	NA	500	500	7,200	54	<b>500</b>	109	--	98.4	120	<b>2,800</b>	<b>2,800</b>	<b>2,390</b>	<b>2,390</b>	<b>2,350</b>	<b>2,130</b>	--	--	--							
Calcium	mg/L	NC	NA	NC	NC	500 <sup>EE</sup>	40	500	33.0	--	40.9	59.6	58	84	82.9	88.0	82.7	78.1	--	--	--							
Chloride	mg/L	250**	NA	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	70	250	17.8	--	22.2	7.9	2.0	< 2.0	2.59	2.61	3.20	1.94	--	--	--							
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	--	--	--							
Sulfate	mg/L	250**	NA	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	13	<b>250</b>	32.6	--	39.9	33.3	24	32	30.7	31.2	35.9	39.8	--	--	--							
Total Dissolved Solids	mg/L	500**	NA	500 <sup>E</sup>	500 <sup>E</sup>	500	240	<b>500</b>	220	--	294	262	270	330	280	319	333	361	--	--	--							
pH, Field	SU	6.5 - 8.5**	NA	6.5 - 8.5 <sup>E</sup>	6.5 - 8.5 <sup>E</sup>	6.5 - 9.0	5.5 - 8.8	5.5 - 8.8	7.2	8.0 <sup>(5)</sup>	7.3	7.5	6.6	6.9	7.0	--	6.6	6.6	--	--	--							
<b>Appendix IV<sup>(1)</sup></b>																												
Antimony	ug/L	6	NA	6.0	6.0	130	2	6	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	--	--	--							
Arsenic	ug/L	10	NA	10	10	10	1	<b>10</b>	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	--	--	--							
Barium	ug/L	2,000	NA	2,000	2,000	820	35	2,000	--	137	122	211	250	270	266	267	276	290	--	--	--							
Beryllium	ug/L	4	NA	4.0	4.0	18	1	4	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	--	--	--							
Cadmium	ug/L	5	NA	5.0	5.0	3.5	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	100	100	11	2	<b>100</b>	--	1.4	1.1	1.5	1.2	<b>370</b>	4	5	1	1	--	--	--							
Cobalt	ug/L	NC	6	40	100	100	15	15	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 6	< 6	< 15	< 6	--	--	--							
Fluoride	ug/L	4,000	NA	NC	NC	NC	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	4.0	4.0	39	1	15	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	--	--	--							
Lithium	ug/L	NC	40	170	350	440	10	40	--	10	< 10	12	13	17	20	20	20	19	--	--	--							
Mercury	ug/L	2	NA	2.0	2.0	0.20#	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	73	210	3,200	5	100	--	11.0	7.6	5.0	< 5.0	14	< 5	< 5	< 5	< 5	--	--	--							
Radium-226	pCi/L	NC	NA	NC	NC	NC	NA	NA	--	0.505	< 0.489	< 0.858	0.198	0.643	--	--	0.270	--	--	--	--							
Radium-228	pCi/L	NC	NA	NC	NC	NC	NA	NA	--	< 1.03	< 0.655	0.814	< 0.326	1.12	--	--	0.752	--	--	--	--							
Radium-226/228	pCi/L	5	NA	NC	NC	NC	1.93	5	--	< 1.20	< 1.14	< 1.43	0.515	1.76	--	--	1.02	--	--	--	--							
Selenium	ug/L	50	NA	50	50	5.0	5	<b>50</b>	--	3.0	11.0	34.1	32	<b>210</b>	<b>126</b>	<b>126</b>	<b>158</b>	<b>179</b>	--	--	--							
Thallium	ug/L	2	NA	2.0	2.0	3.7	2	2	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2	< 2	< 2	--	--	--							
<b>MI Part 115 Parameters<sup>(2)</sup></b>																												
Iron	ug/L	300**	NA	300 <sup>E</sup>	300 <sup>E</sup>	500,000 <sup>EE</sup>	870	<b>870</b>	--	--	--	--	--	<b>2,100</b>	25	31	< 20	27	--	--	--							
Copper	ug/L	1,000**	NA	1,000 <sup>E</sup>	1,000 <sup>E</sup>	15	2.1	1,000	--	--	--	--	--	12	2	2	1	2	--	--	--							
Nickel	ug/L	NC	NA	100	100	86	2	<b>100</b>	--	--	--	--	--	<b>200</b>	2	2	< 1	< 2	--	--	--							
Silver	ug/L	100**	NA	34	98	0.20	0.2	34	--	--	--	--	--	0.48	< 0.2	< 0.2	< 0.2	< 0.2	--	--	--							
Vanadium	ug/L	NC	NA	4.5	62	27	2	<b>4.5</b>	--	--	--	--	--	<b>5.5</b>	4	4	4	4	--	--	--							
Zinc	ug/L	5,000**	NA	2,400	5,000 <sup>E</sup>	190	18	2,400	--	--	--	--	--	< 10	11	12	< 10	< 30	--	--	--							

**Notes:**  
 ug/L - micrograms per liter; mg/L - milligrams per liter.  
 pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.  
 NA - not applicable.  
 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. Appendix IV GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018. Appendix III and MI Part 115 Parameter GWPS is the most restrictive of the MCL/Part 201 criteria, or the UTL if the UTL exceeds the applicable criteria as established in TRC's Technical Memorandum dated December 23, 2019.  
 \* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.  
 \*\* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.  
 ^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using site-specific hardness of 180 mg CaCO3/L as measured at surface water sample SW-01 collected on April 9, 2018 from the Pigeon River. Chromium GSI criterion based on hexavalent chromium per footnote (H).  
 # - If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and EGLE policy and procedure 09-014 dated June 20, 2012.  
 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).  
**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) 40 CFR Part 257 Appendix III Detection Monitoring Constituents and Appendix IV Assessment Monitoring Constituents.  
 (2) Per Michigan Part 115 Amendments - Public Act No. 640 of 2018 Section 11511a(3)(c) and 11519b(2) additional detection monitoring constituents (iron) and assessment monitoring constituents (copper, nickel, silver, vanadium, and zinc) are reported.  
 (3) JHC-MW-15008 was decommissioned on June 24, 2019. Replacement well JHC-MW-15008R was installed on June 25, 2019.  
 (4) Not sampled; insufficient amount of groundwater present to collect sample.  
 (5) pH value potentially biased high due to groundwater quality meter malfunction.

Table B1  
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation  
JH Campbell Pond A - HMP/AMP  
West Olive, Michigan

Sample Location:									JHC-MW-15011										
Sample Date:									4/23/2019	10/10/2019	2/12/2020	4/15/2020	7/16/2020	10/22/2020	2/23/2021	2/23/2021	4/13/2021		
Constituent	Unit	EPA MCL	EPA RSL	MI Residential*	MI Non-Residential*	MI GSI <sup>^</sup>	UTL	GWPS	Downgradient										
<b>Appendix III<sup>(1)</sup></b>																		Field Dup	
Boron	ug/L	NC	NA	500	500	7,200	54	<b>500</b>	440	<b>690</b>	<b>1,910</b>	<b>2,870</b>	<b>2,720</b>	<b>4,120</b>	<b>4,720</b>	<b>4,530</b>	<b>5,070</b>		
Calcium	mg/L	NC	NA	NC	NC	500 <sup>EE</sup>	40	500	43	110	122	112	86.7	122	93.5	92.1	78.7		
Chloride	mg/L	250**	NA	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	70	250	18	9.4	5.71	4.16	10.4	3.79	1.78	1.80	2.65		
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000		
Sulfate	mg/L	250**	NA	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	13	<b>250</b>	86	180	192	183	136	141	119	121	113		
Total Dissolved Solids	mg/L	500**	NA	500 <sup>E</sup>	500 <sup>E</sup>	500	240	<b>500</b>	280	<b>550</b>	<b>654</b>	<b>542</b>	499	<b>546</b>	429	421	359		
pH, Field	SU	6.5 - 8.5**	NA	6.5 - 8.5 <sup>E</sup>	6.5 - 8.5 <sup>E</sup>	6.5 - 9.0	5.5 - 8.8	5.5 - 8.8	8.8	8.4	8.0	7.6	7.7	7.6	7.3	--	7.2		
<b>Appendix IV<sup>(1)</sup></b>																			
Antimony	ug/L	6	NA	6.0	6.0	130	2	6	< 1.0	< 1.0	2	4	2	2	< 1	< 1	< 1		
Arsenic	ug/L	10	NA	10	10	10	1	<b>10</b>	<b>36</b>	<b>44</b>	<b>31</b>	<b>25</b>	<b>22</b>	<b>22</b>	<b>14</b>	<b>13</b>	<b>13</b>		
Barium	ug/L	2,000	NA	2,000	2,000	820	35	2,000	170	360	563	514	419	430	455	434	399		
Beryllium	ug/L	4	NA	4.0	4.0	18	1	4	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1		
Cadmium	ug/L	5	NA	5.0	5.0	3.5	0.2	5	< 0.20	< 0.20	< 0.2	0.2	< 0.2	0.5	0.7	0.8	0.8		
Chromium	ug/L	100	NA	100	100	11	2	<b>100</b>	9.0	1.4	1	< 1	< 1	< 1	< 1	< 1	5		
Cobalt	ug/L	NC	6	40	100	100	15	15	< 6.0	< 6.0	< 6	< 6	< 6	< 6	< 6	< 6	< 6		
Fluoride	ug/L	4,000	NA	NC	NC	NC	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	4.0	4.0	39	1	15	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1		
Lithium	ug/L	NC	40	170	350	440	10	40	< 10	14	22	21	20	17	17	16	14		
Mercury	ug/L	2	NA	2.0	2.0	0.20 <sup>#</sup>	0.2	2	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2		
Molybdenum	ug/L	NC	100	73	210	3,200	5	100	21	11	12	7	28	< 5	6	6	8		
Radium-226	pCi/L	NC	NA	NC	NC	NC	NA	NA	0.0720	0.2980	--	0.242	--	0.344	--	--	0.165		
Radium-228	pCi/L	NC	NA	NC	NC	NC	NA	NA	< 0.343	0.665	--	0.606	--	< 0.264	--	--	0.758		
Radium-226/228	pCi/L	5	NA	NC	NC	NC	1.93	5	< 0.343	0.963	--	0.848	--	0.497	--	--	0.923		
Selenium	ug/L	50	NA	50	50	5.0	5	<b>50</b>	13	<b>76</b>	<b>104</b>	29	20	<b>308</b>	<b>166</b>	<b>161</b>	<b>143</b>		
Thallium	ug/L	2	NA	2.0	2.0	3.7	2	2	< 2.0	< 2.0	< 2	< 2	< 2	< 2	< 2	< 2	< 2		
<b>MI Part 115 Parameters<sup>(2)</sup></b>																			
Iron	ug/L	300**	NA	300 <sup>E</sup>	300 <sup>E</sup>	500,000 <sup>EE</sup>	870	<b>870</b>	--	120	178	145	115	< 20	< 20	< 20	57		
Copper	ug/L	1,000**	NA	1,000 <sup>E</sup>	1,000 <sup>E</sup>	15	2.1	1,000	--	< 1.0	1	1	2	1	2	3	2		
Nickel	ug/L	NC	NA	100	100	86	2	<b>100</b>	--	< 2.0	4	< 2	< 2	< 2	< 2	< 2	8		
Silver	ug/L	100**	NA	34	98	0.20	0.2	34	--	< 0.20	< 0.2	< 0.4	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2		
Vanadium	ug/L	NC	NA	4.5	62	27	2	<b>4.5</b>	--	<b>14</b>	<b>42</b>	<b>40</b>	<b>30</b>	<b>49</b>	<b>35</b>	<b>34</b>	<b>34</b>		
Zinc	ug/L	5,000**	NA	2,400	5,000 <sup>E</sup>	190	18	2,400	--	< 10	< 10	< 10	< 30	< 10	< 10	< 10	< 10		

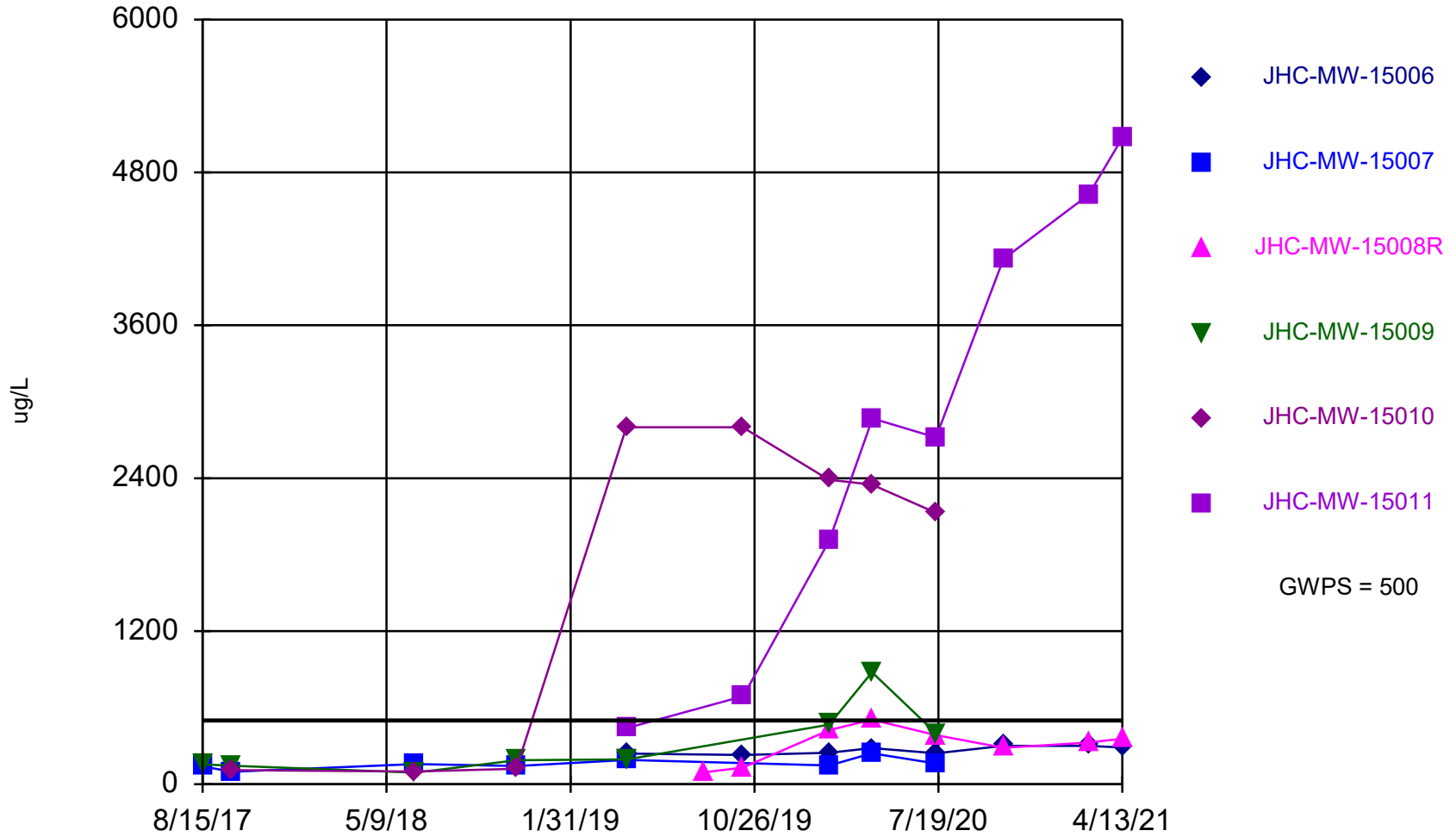
**Notes:**

- ug/L - micrograms per liter; mg/L - milligrams per liter.
- pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.
- NA - not applicable.
- 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. Appendix IV GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018. Appendix III and MI Part 115 Parameter GWPS is the most restrictive of the MCL/Part 201 criteria, or the UTL if the UTL exceeds the applicable criteria as established in TRC's Technical Memorandum dated December 23, 2019.
- \* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.
- \*\* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
- <sup>^</sup> - 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).
- <sup>#</sup> - If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and EGLE policy and procedure 09-014 dated June 20, 2012.
- <sup>E</sup> - Criterion is the aesthetic drinking water value per footnote (E).
- <sup>EE</sup> - Criterion is based on the total dissolved solids GSI value per footnote (EE).
- 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) 40 CFR Part 257 Appendix III Detection Monitoring Constituents and Appendix IV Assessment Monitoring Constituents.
- (2) Per Michigan Part 115 Amendments - Public Act No. 640 of 2018 Section 11511a(3)(c) and 11519b(2) additional detection monitoring constituents (iron) and assessment monitoring constituents (copper, nickel, silver, vanadium, and zinc) are reported.
- (3) JHC-MW-15008 was decommissioned on June 24, 2019. Replacement well JHC-MW-15008R was installed on June 25, 2019.
- (4) Not sampled; insufficient amount of groundwater present to collect sample.
- (5) pH value potentially biased high due to groundwater quality meter malfunction.

# **Attachment 1**

## **Sanitas™ Output**

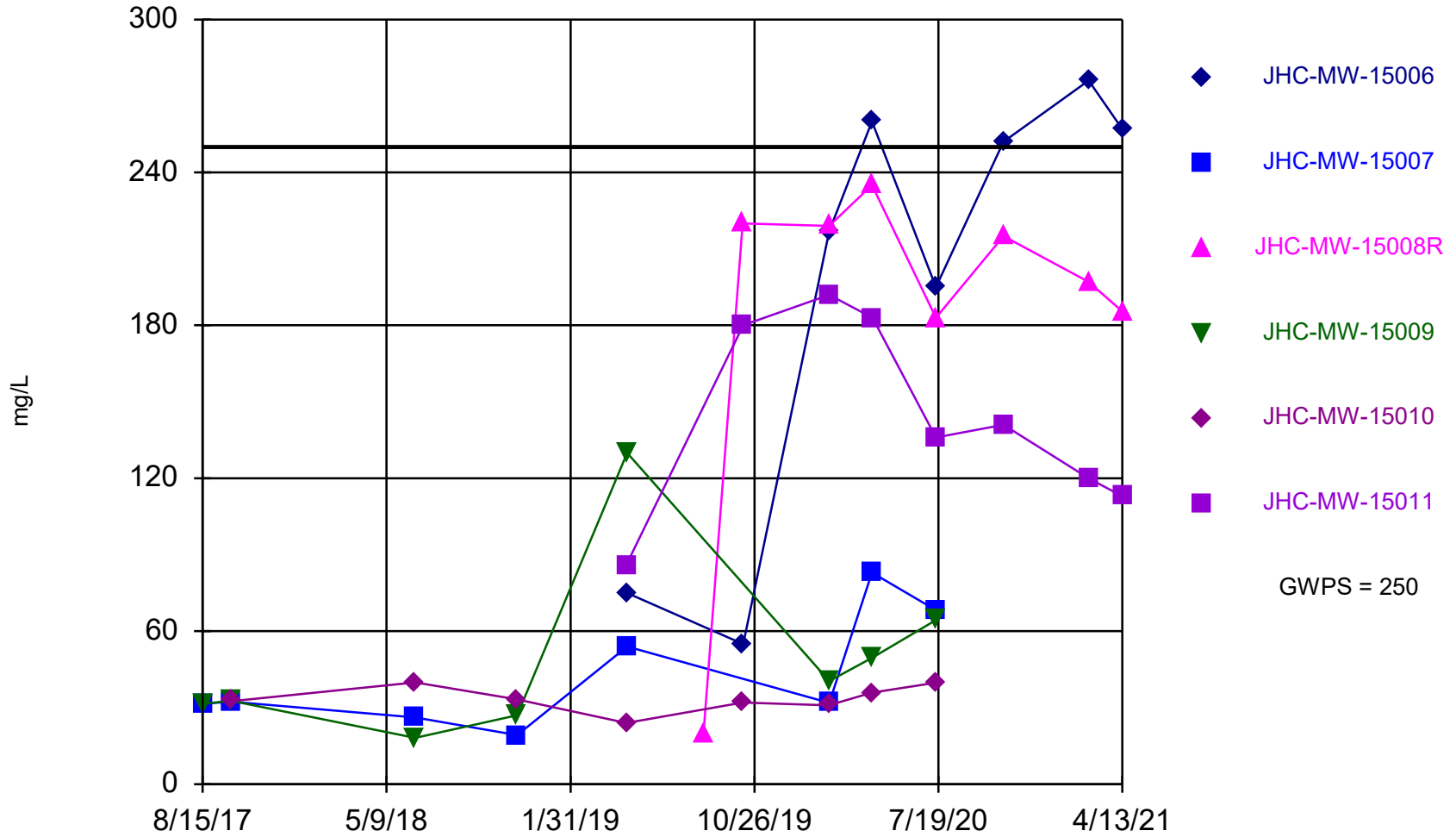
### Boron Comparison to GWPS



Time Series Analysis Run 6/11/2021 9:13 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

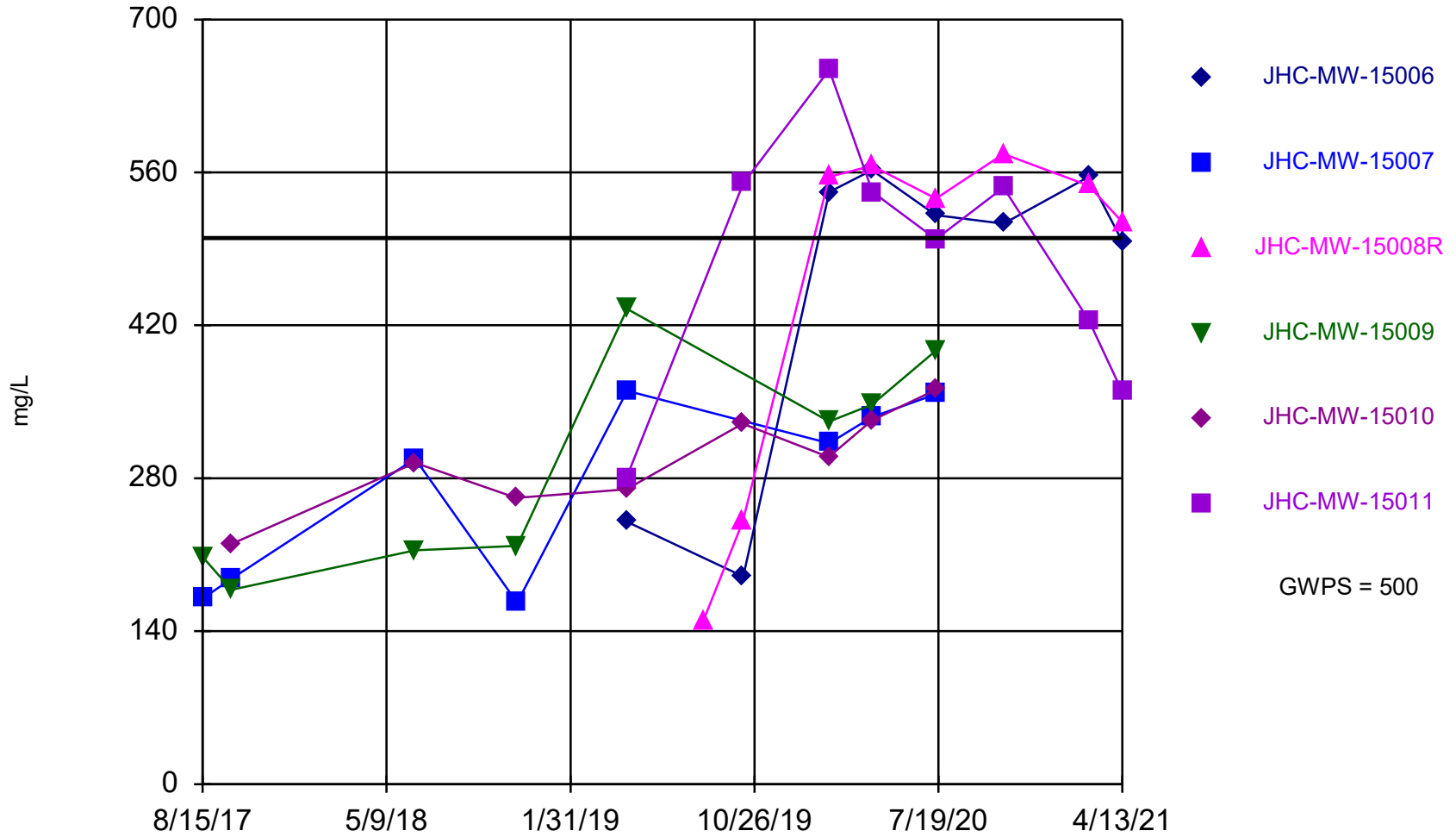


### Sulfate Comparison to GWPS



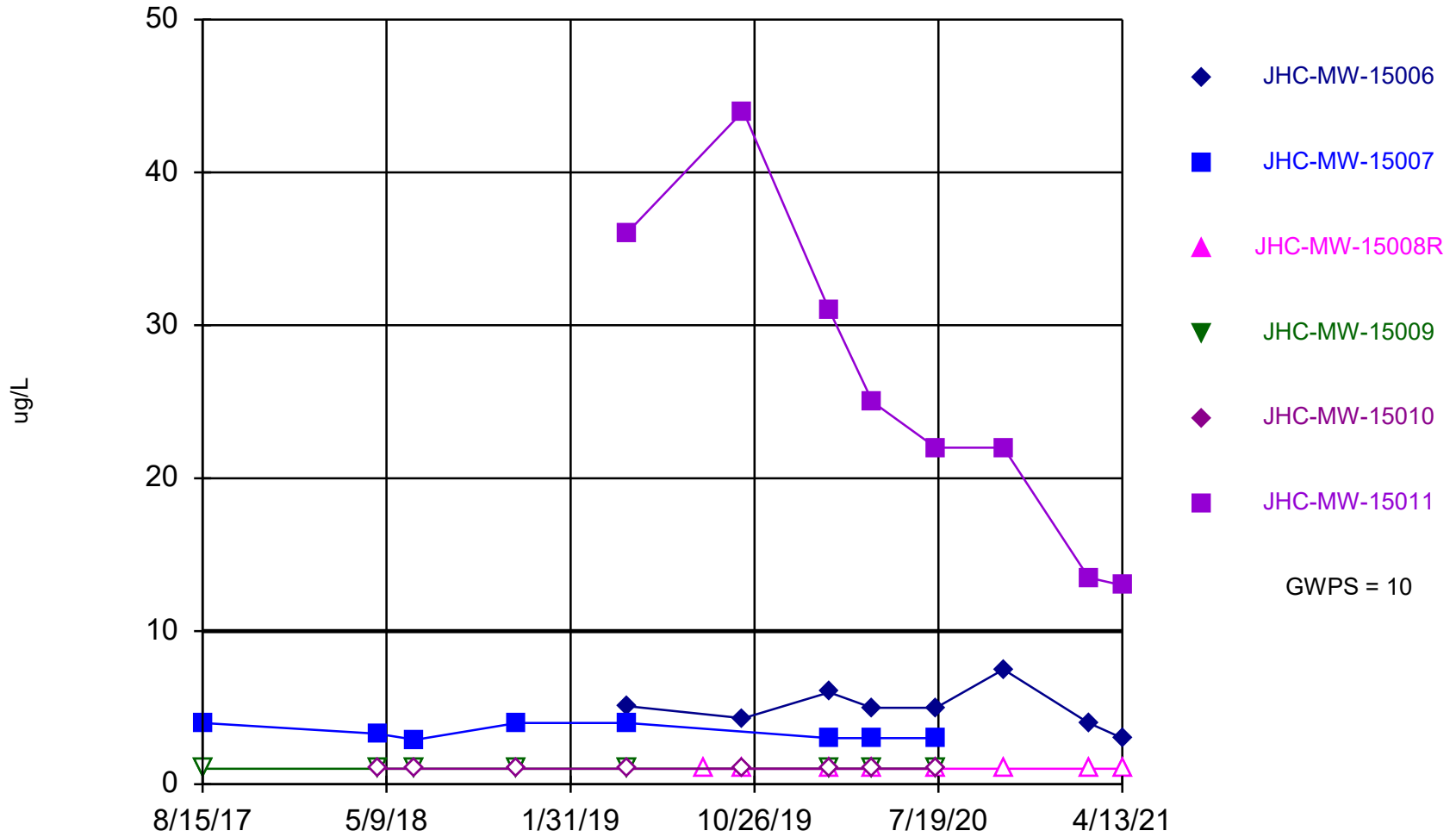
Time Series Analysis Run 6/11/2021 9:15 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

### Total Dissolved Solids Comparison to GWPS



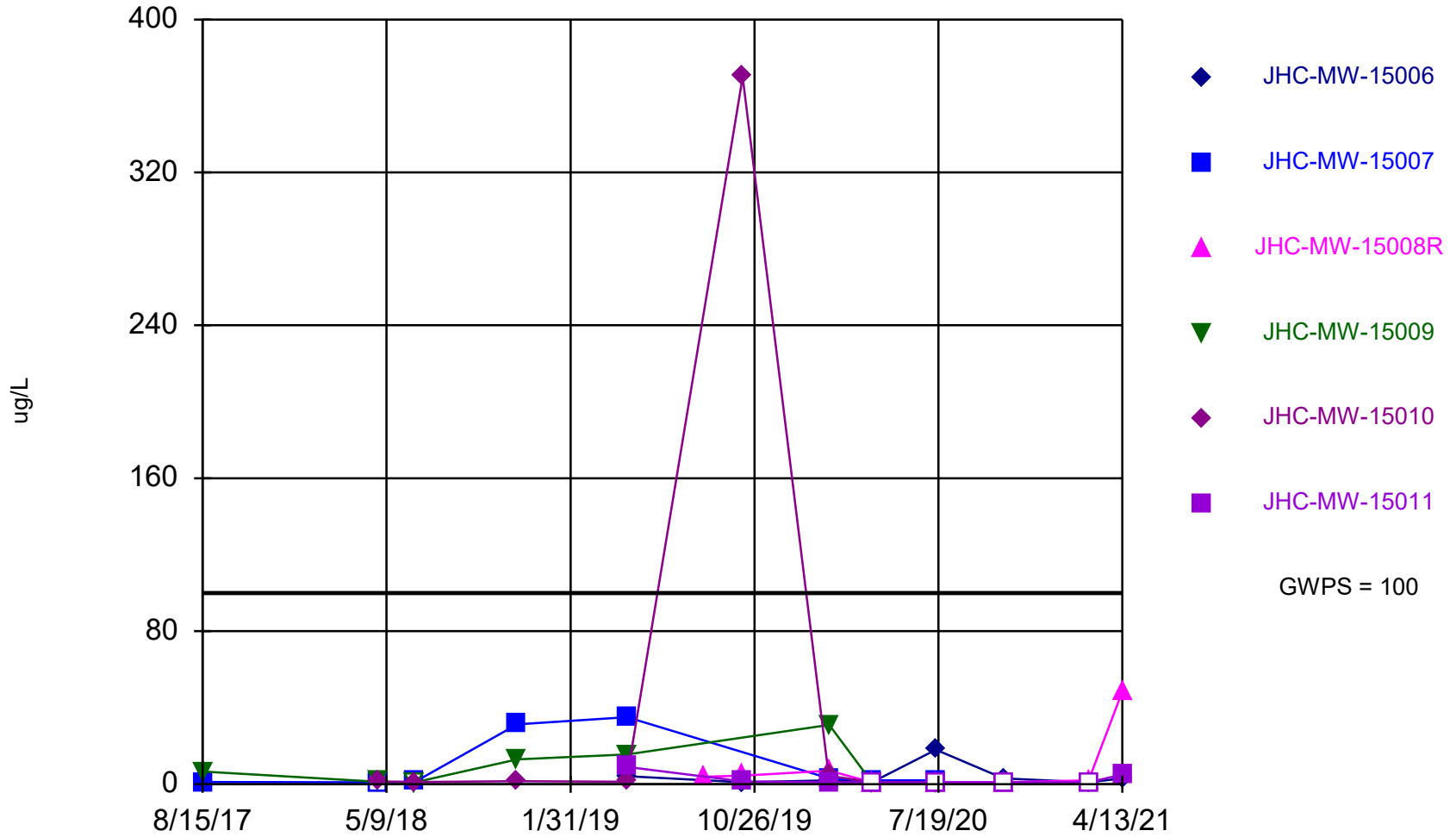
Time Series Analysis Run 6/11/2021 9:16 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

### Arsenic Comparison to GWPS



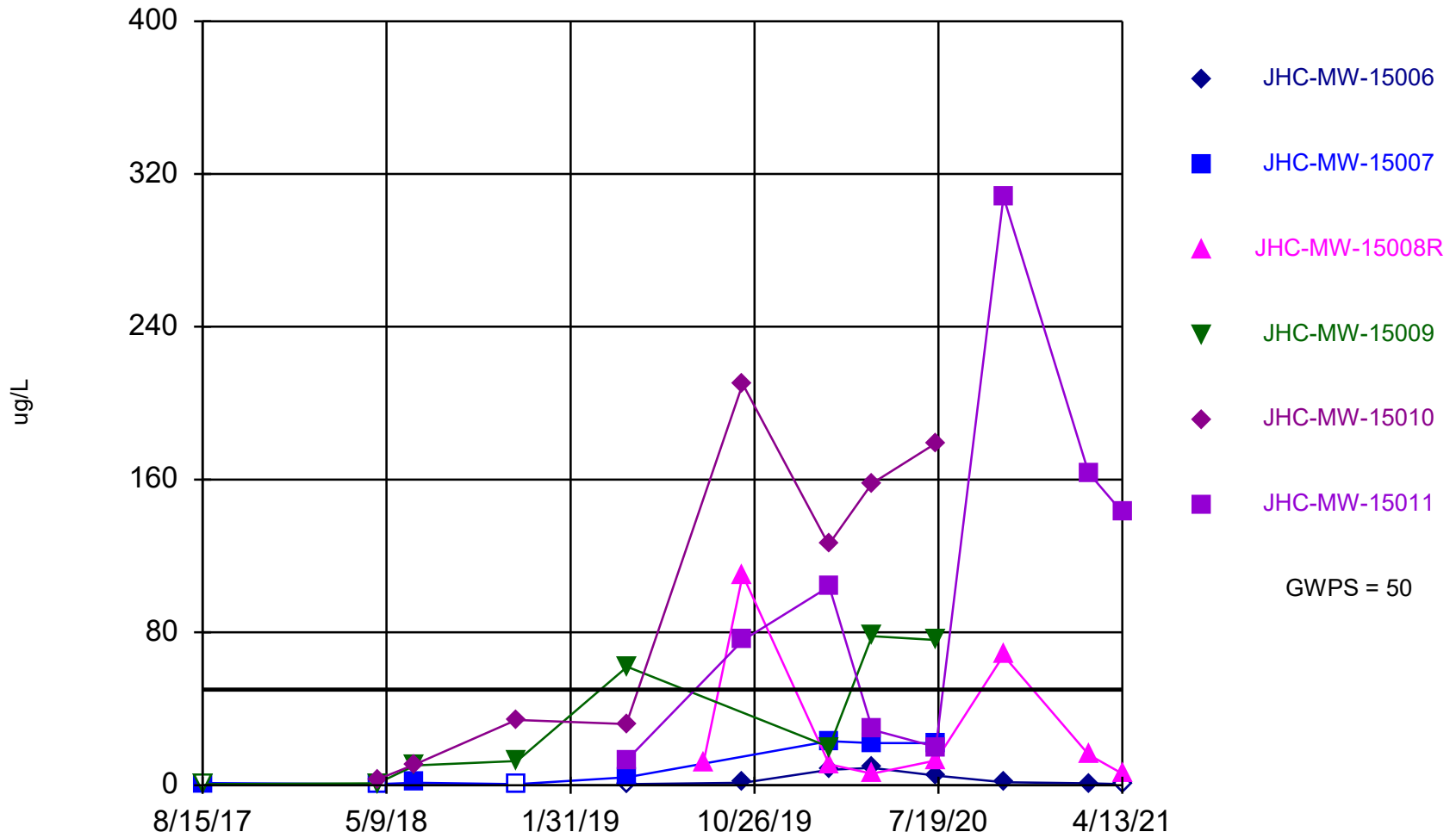
Time Series Analysis Run 6/11/2021 9:17 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

### Chromium Comparison to GWPS



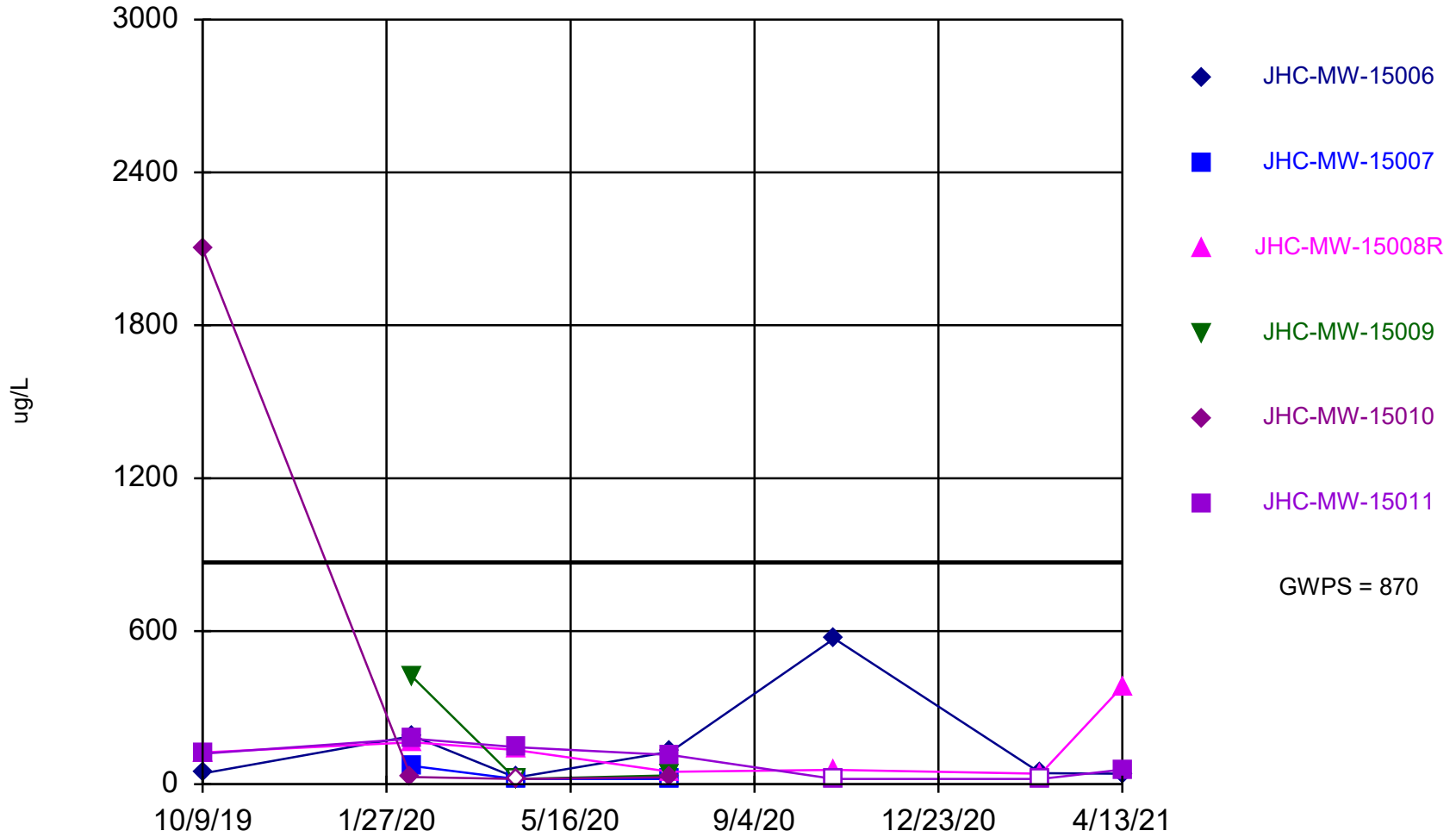
Time Series Analysis Run 6/11/2021 9:18 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

### Selenium Comparison to GWPS



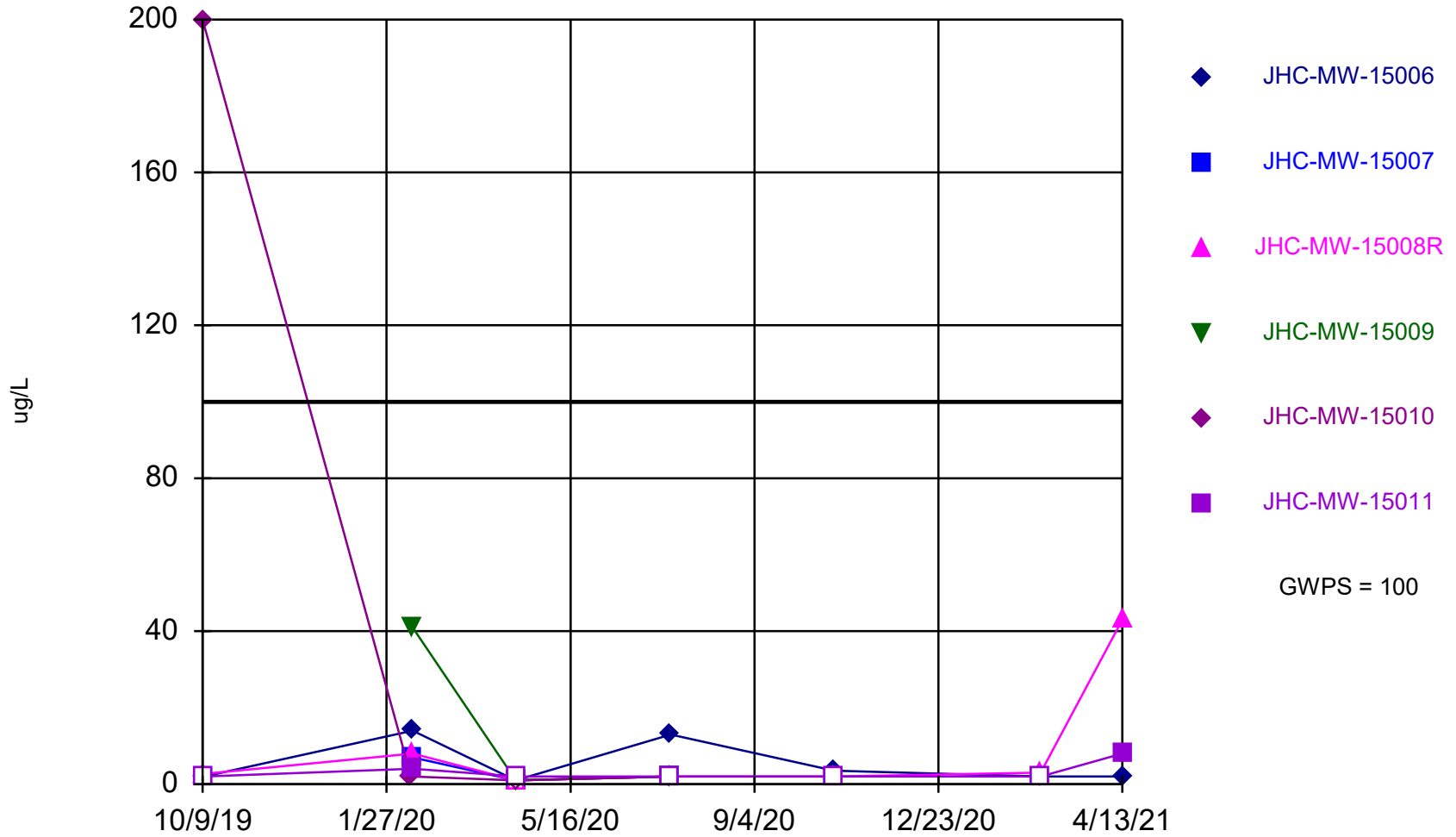
Time Series Analysis Run 6/11/2021 9:20 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

### Iron Comparison to GWPS



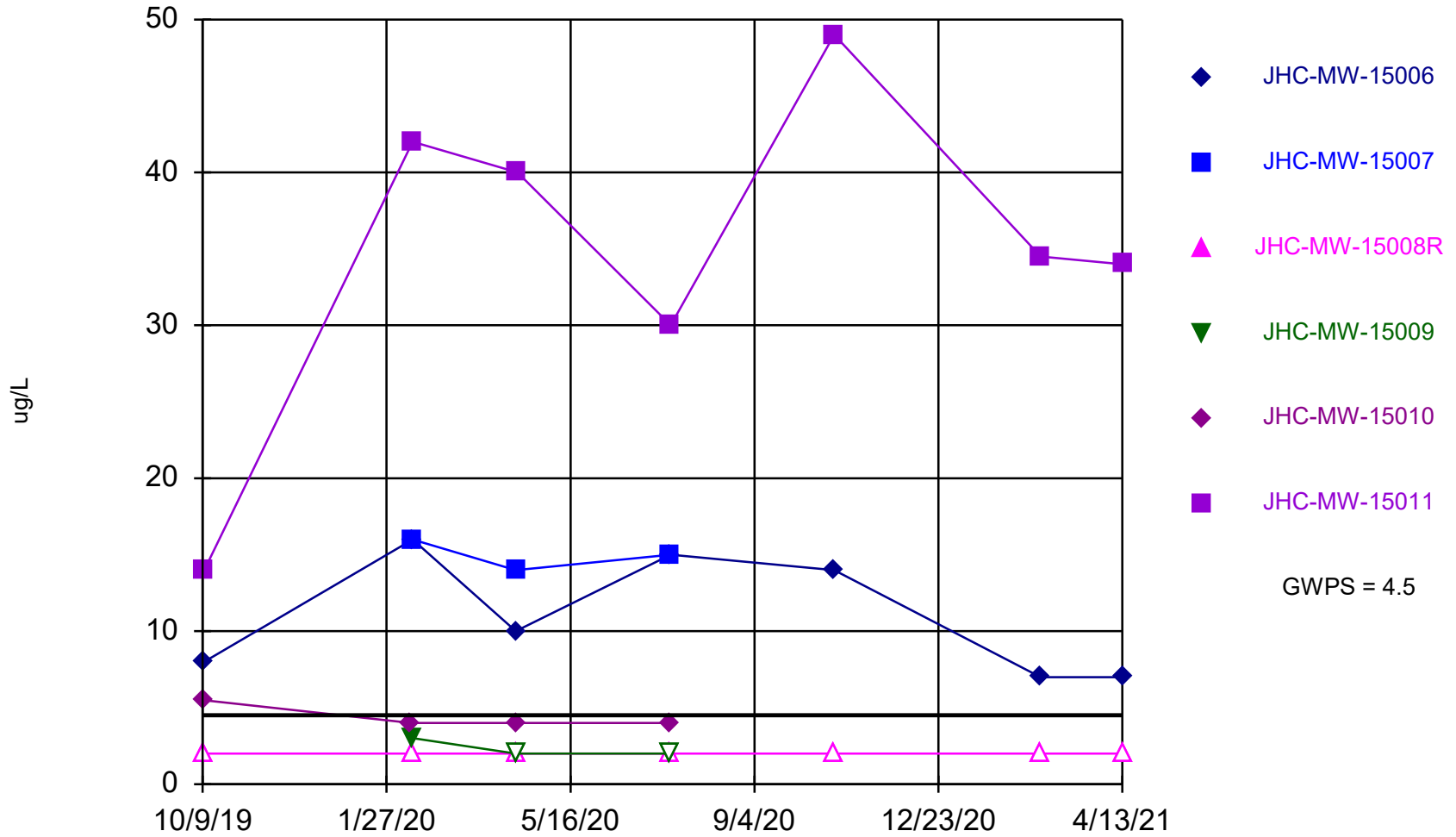
Time Series Analysis Run 6/11/2021 9:21 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

### Nickel Comparison to GWPS



Time Series Analysis Run 6/11/2021 9:22 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

### Vanadium Comparison to GWPS



Time Series Analysis Run 6/11/2021 9:23 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21



# Summary Report

Constituent: Boron, Total    Analysis Run 6/11/2021 9:26 AM  
 Client: Consumers Energy    Data: JHC CCR\_Sanitas Data\_1SA21

For observations made between 8/15/2017 and 4/13/2021, a summary of the selected data set:

Observations = 48  
 ND/Trace = 0  
 Wells = 6  
 Minimum Value = 91.4  
 Maximum Value = 5070  
 Mean Value = 909.9  
 Median Value = 286.5  
 Standard Deviation = 1294  
 Coefficient of Variation = 1.423  
 Skewness = 1.792

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	8	0	230	301.5	266.7	265.5	29.76	0.1116	0.03705
JHC-MW-15007	8	0	98	242	159.9	152	41.98	0.2626	0.6808
JHC-MW-15008R	8	0	93	505	312.8	341	140.8	0.4501	-0.4296
JHC-MW-15009	8	0	91.4	877.5	315.1	191.3	262.5	0.8332	1.335
JHC-MW-15010	8	0	98.4	2800	1600	2240	1254	0.7842	-0.4187
JHC-MW-15011	8	0	440	5070	2806	2795	1734	0.6181	-0.1032

# Summary Report

Constituent: Sulfate Analysis Run 6/11/2021 9:27 AM  
 Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

For observations made between 8/15/2017 and 4/13/2021, a summary of the selected data set:

Observations = 48  
 ND/Trace = 0  
 Wells = 6  
 Minimum Value = 18.2  
 Maximum Value = 276  
 Mean Value = 108.8  
 Median Value = 71.65  
 Standard Deviation = 84.52  
 Coefficient of Variation = 0.777  
 Skewness = 0.5366

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	8	0	55	276	198.4	234.5	86.41	0.4356	-0.8902
JHC-MW-15007	8	0	19.2	83	43.31	32.1	22.6	0.5219	0.7388
JHC-MW-15008R	8	0	20	235	184.3	206	68.82	0.3734	-1.962
JHC-MW-15009	8	0	18.2	130	49.24	36.6	35.6	0.723	1.62
JHC-MW-15010	8	0	24	39.9	33.56	32.95	5.158	0.1537	-0.4268
JHC-MW-15011	8	0	86	192	143.9	138.5	37.98	0.2639	-0.05274

# Summary Report

Constituent: Total Dissolved Solids Analysis Run 6/11/2021 9:27 AM  
 Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

For observations made between 8/15/2017 and 4/13/2021, a summary of the selected data set:

Observations = 48  
 ND/Trace = 0  
 Wells = 6  
 Minimum Value = 150  
 Maximum Value = 654  
 Mean Value = 376  
 Standard Deviation = 352.3  
 Standard Deviation = 143.7  
 Coefficient of Variation = 0.3822  
 Skewness = 0.1261

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	8	0	190	562	452.6	517	148.9	0.3289	-1.11
JHC-MW-15007	8	0	166	360	273.4	305	84.53	0.3092	-0.357
JHC-MW-15008R	8	0	150	577	460.9	542	167	0.3622	-1.182
JHC-MW-15009	8	0	178	435	291.2	275	98.39	0.3379	0.245
JHC-MW-15010	8	0	220	361	296.2	296.8	45.31	0.153	-0.2287
JHC-MW-15011	8	0	280	654	481.9	520.5	120.3	0.2497	-0.3825

# Summary Report

Constituent: Arsenic, Total    Analysis Run 6/11/2021 9:28 AM  
 Client: Consumers Energy    Data: JHC CCR\_Sanitas Data\_1SA21

For observations made between 8/15/2017 and 4/13/2021, a summary of the selected data set:

Observations = 48  
 ND/Trace = 24  
 Wells = 6  
 Minimum Value = 1  
 Maximum Value = 44  
 Mean Value = 6.2  
 Median Value = 1.95  
 Standard Deviation = 9.917  
 Coefficient of Variation = 1.599  
 Skewness = 2.367

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	8	0	3	7.5	4.988	5	1.35	0.2706	0.4822
JHC-MW-15007	8	0	2.9	4	3.4	3.15	0.5099	0.15	0.3801
JHC-MW-15008R	8	8	1	1	1	1	0	0	NaN
JHC-MW-15009	8	8	1	1	1	1	0	0	NaN
JHC-MW-15010	8	8	1	1	1	1	0	0	NaN
JHC-MW-15011	8	0	13	44	25.81	23.5	10.74	0.416	0.3864

# Summary Report

Constituent: Chromium, Total Analysis Run 6/11/2021 9:29 AM  
 Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

For observations made between 8/15/2017 and 4/13/2021, a summary of the selected data set:

Observations = 48  
 ND/Trace = 11  
 Wells = 6  
 Minimum Value = 1  
 Maximum Value = 370  
 Mean Value = 13.56  
 Median Value = 1.45  
 Standard Deviation = 53.53  
 Coefficient of Variation = 3.947  
 Skewness = 6.349

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	8	2	1	18	4.138	2.5	5.718	1.382	2.09
JHC-MW-15007	8	1	1	35	9.575	2	14.6	1.525	1.164
JHC-MW-15008R	8	3	1	48.5	8.6	2.9	16.26	1.891	2.192
JHC-MW-15009	8	1	1	31	8.794	3.95	10.68	1.215	1.187
JHC-MW-15010	8	0	1	370	47.71	1.3	130.2	2.729	2.267
JHC-MW-15011	8	4	1	9	2.55	1	2.951	1.157	1.563

# Summary Report

Constituent: Selenium, Total Analysis Run 6/11/2021 9:29 AM  
 Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

For observations made between 8/15/2017 and 4/13/2021, a summary of the selected data set:

Observations = 48  
 ND/Trace = 5  
 Wells = 6  
 Minimum Value = 0.5  
 Maximum Value = 308  
 Mean Value = 46.11  
 Median Value = 13  
 Standard Deviation = 67.29  
 Coefficient of Variation = 1.459  
 Skewness = 1.964

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	8	2	0.5	9	3.35	1.4	3.498	1.044	0.7534
JHC-MW-15007	8	2	0.5	23	9.313	2.7	10.85	1.165	0.4872
JHC-MW-15008R	8	0	6	110	30.25	12.5	38.11	1.26	1.411
JHC-MW-15009	8	1	0.5	78	32.55	16.3	33.58	1.032	0.4686
JHC-MW-15010	8	0	3	210	94.14	80.05	83.15	0.8833	0.1783
JHC-MW-15011	8	0	13	308	107.1	90	98.81	0.9229	1.004

# Summary Report

Constituent: Iron, Total    Analysis Run 6/11/2021 9:31 AM  
 Client: Consumers Energy    Data: JHC CCR\_Sanitas Data\_1SA21

For observations made between 10/9/2019 and 4/13/2021, a summary of the selected data set:

Observations = 31  
 ND/Trace = 6  
 Wells = 6  
 Minimum Value = 20  
 Maximum Value = 2100  
 Mean Value = 174.4  
 Median Value = 56  
 Standard Deviation = 380.2  
 Coefficient of Variation = 2.18  
 Skewness = 4.425

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	7	0	26	571	148.7	43	195.5	1.315	1.683
JHC-MW-15007	3	2	20	71	37	20	29.44	0.7958	0.7071
JHC-MW-15008R	7	0	41	383	135.8	124.5	119.1	0.8771	1.395
JHC-MW-15009	3	1	20	420	158	34	227	1.437	0.7041
JHC-MW-15010	4	1	20	2100	543.8	27.5	1038	1.908	1.155
JHC-MW-15011	7	2	20	178	93.57	115	62.04	0.663	-0.05972

# Summary Report

Constituent: Nickel, Total    Analysis Run 6/11/2021 9:31 AM  
 Client: Consumers Energy    Data: JHC CCR\_Sanitas Data\_1SA21

For observations made between 10/9/2019 and 4/13/2021, a summary of the selected data set:

Observations = 31  
 ND/Trace = 15  
 Wells = 6  
 Minimum Value = 1  
 Maximum Value = 200  
 Mean Value = 12.26  
 Median Value = 2  
 Standard Deviation = 36.29  
 Coefficient of Variation = 2.96  
 Skewness = 4.709

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	7	2	1	14	5.357	2	5.618	1.049	0.9031
JHC-MW-15007	3	2	1	7	3.333	2	3.215	0.9644	0.6309
JHC-MW-15008R	7	3	1	43	8.807	2.65	15.25	1.731	1.952
JHC-MW-15009	3	1	1	41	14.67	2	22.81	1.555	0.7056
JHC-MW-15010	4	2	1	200	51.25	2	99.17	1.935	1.155
JHC-MW-15011	7	5	2	8	3.143	2	2.268	0.7216	1.663



# Summary Report

Constituent: Vanadium, Total Analysis Run 6/11/2021 9:31 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

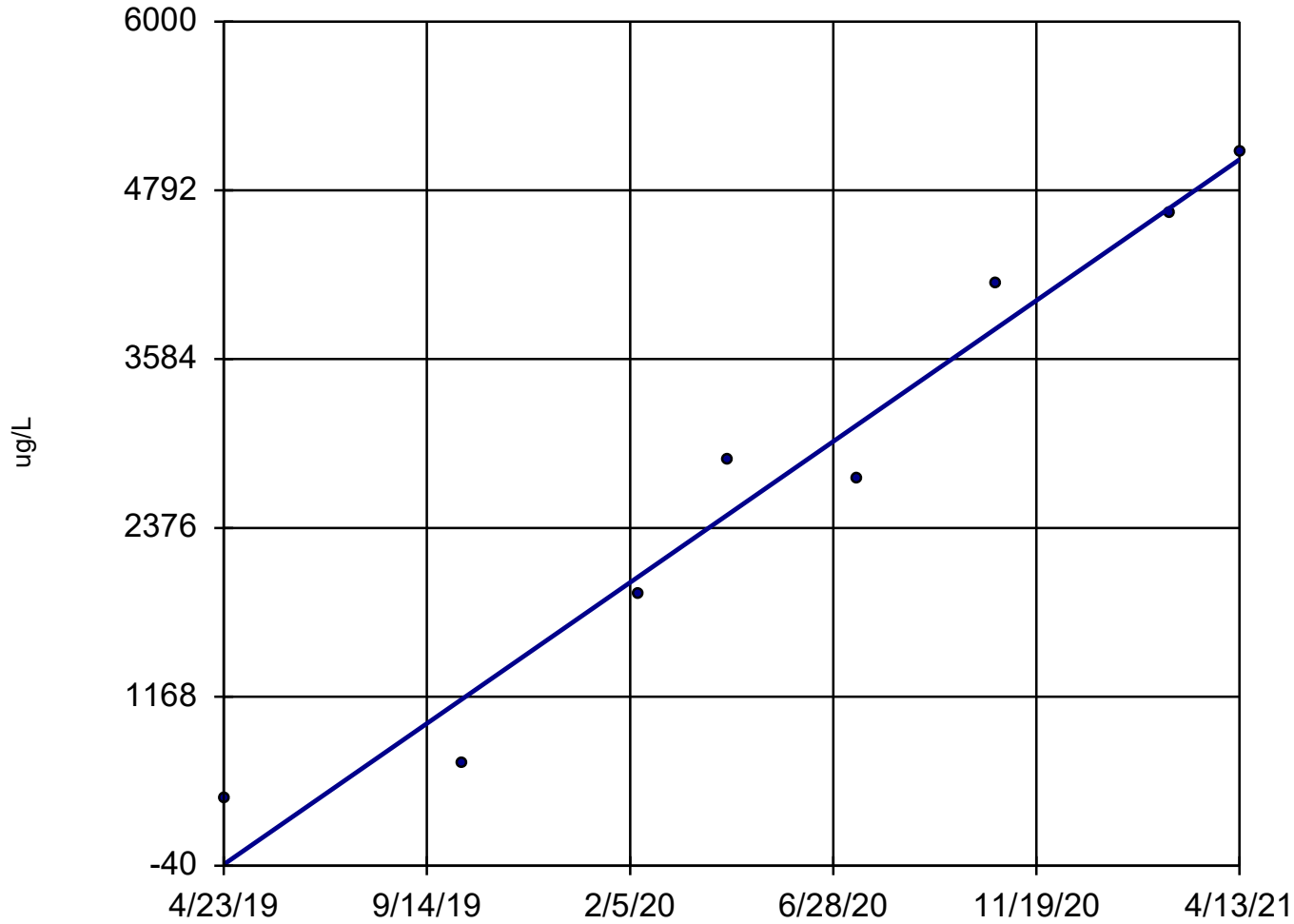
---

For observations made between 10/9/2019 and 4/13/2021, a summary of the selected data set:

Observations = 31  
ND/Trace = 9  
Wells = 6  
Minimum Value = 2  
Maximum Value = 49  
Mean Value = 13.03  
Median Value = 7  
Standard Deviation = 13.76  
Coefficient of Variation = 1.056  
Skewness = 1.277

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	7	0	7	16	11	10	3.916	0.356	0.1799
JHC-MW-15007	3	0	14	16	15	15	1	0.06667	0
JHC-MW-15008R	7	7	2	2	2	2	0	0	NaN
JHC-MW-15009	3	2	2	3	2.333	2	0.5774	0.2474	0.7071
JHC-MW-15010	4	0	4	5.5	4.375	4	0.75	0.1714	1.155
JHC-MW-15011	7	0	14	49	34.79	34.5	11.08	0.3186	-0.754

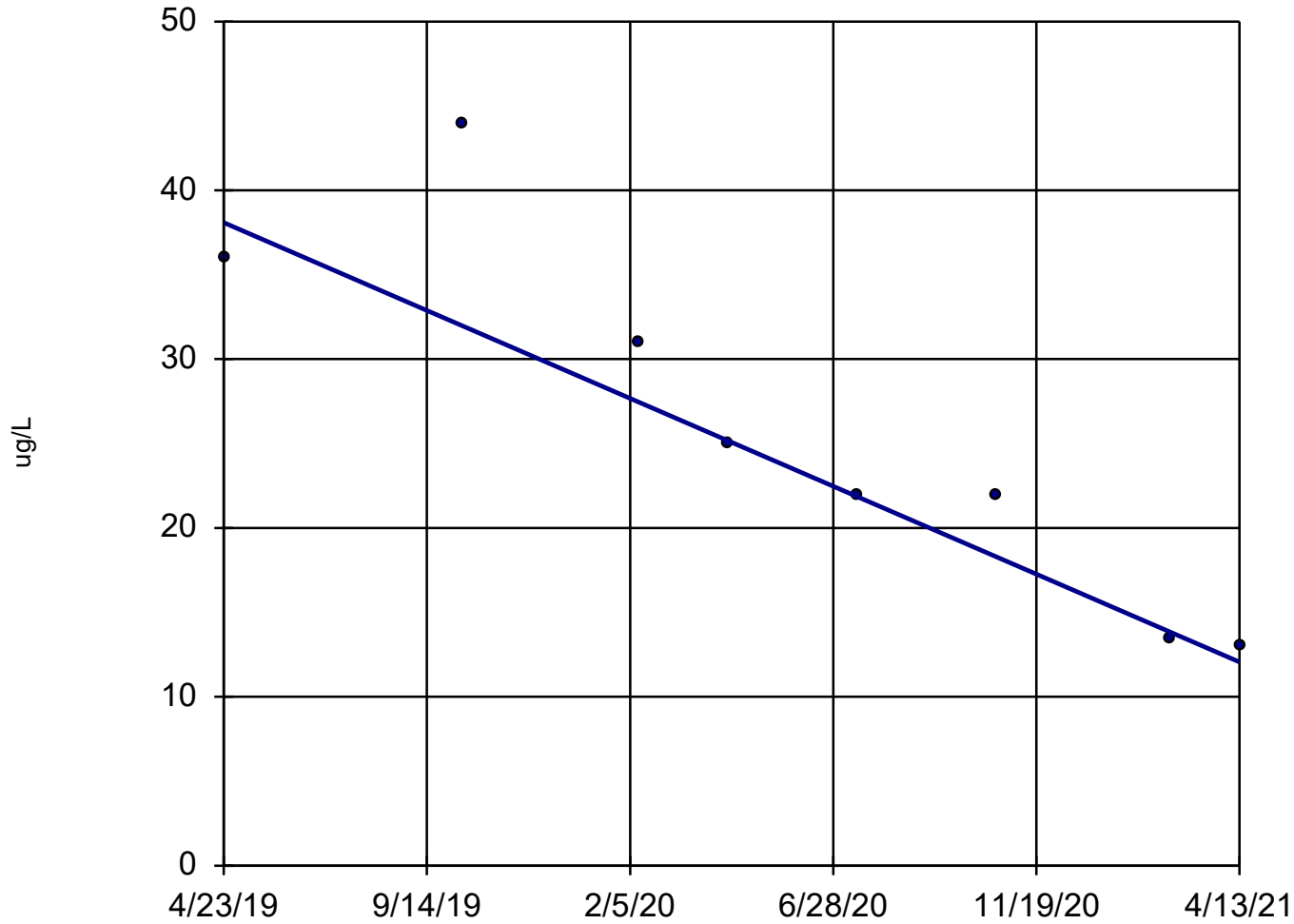
### Boron, Total JHC-MW-15011



n = 8  
Slope = 2553  
units per year.  
Mann-Kendall  
statistic = 26  
critical = 17  
Increasing trend  
significant at 95%  
confidence level  
( $\alpha = 0.025$  per  
tail).

Sen's Slope Estimator Analysis Run 6/11/2021 9:31 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

### Arsenic, Total JHC-MW-15011

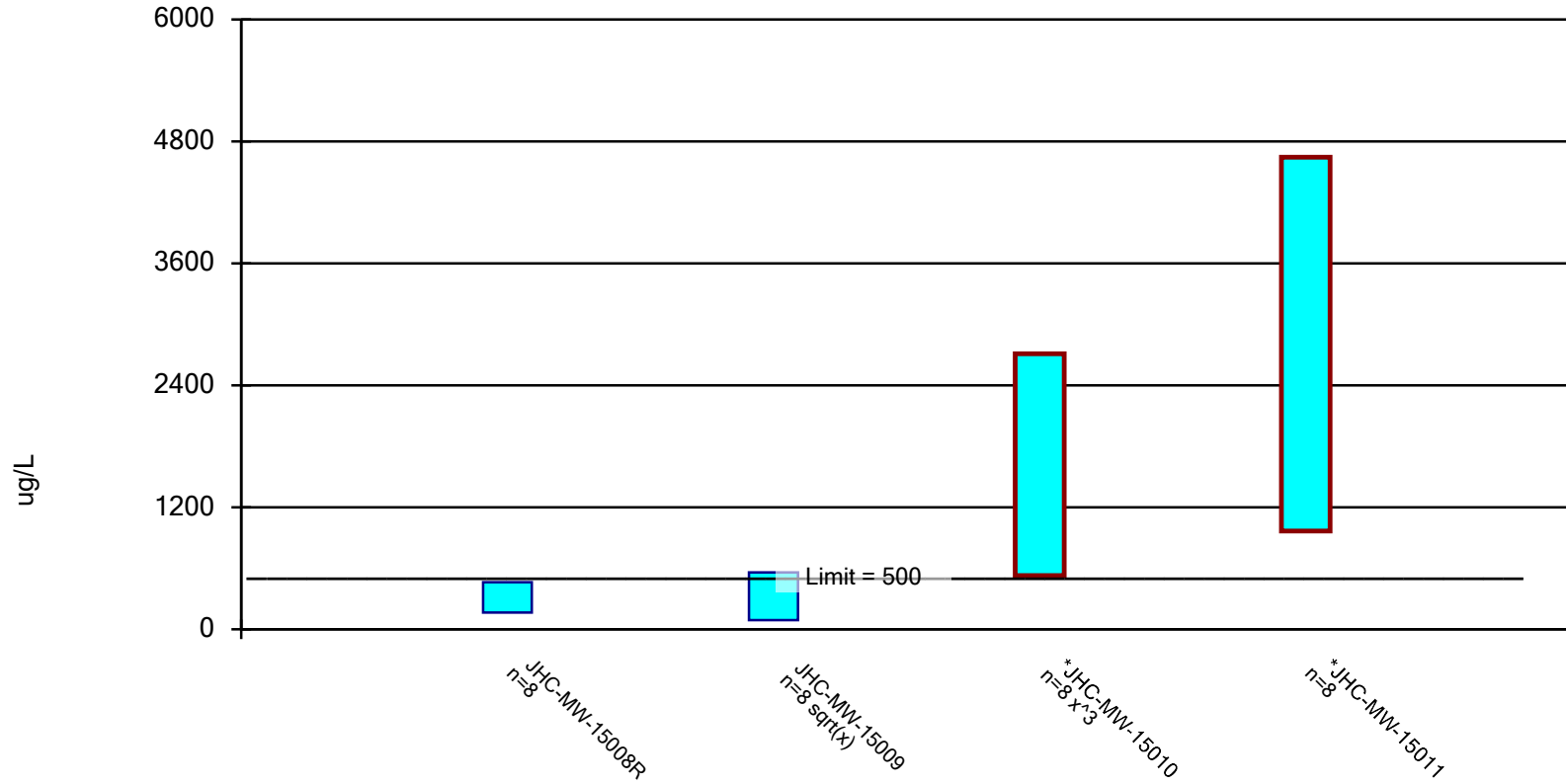


n = 8  
Slope = -13.18  
units per year.  
Mann-Kendall  
statistic = -25  
critical = -17  
Decreasing trend  
significant at 95%  
confidence level  
( $\alpha = 0.025$  per  
tail).

Sen's Slope Estimator Analysis Run 6/11/2021 9:31 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

## Parametric Confidence Interval

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



Constituent: Boron, Total    Analysis Run 6/11/2021 9:40 AM  
Client: Consumers Energy    Data: JHC CCR\_Sanitas Data\_1SA21

# Confidence Interval

Constituent: Boron, Total (ug/L) Analysis Run 6/11/2021 9:41 AM

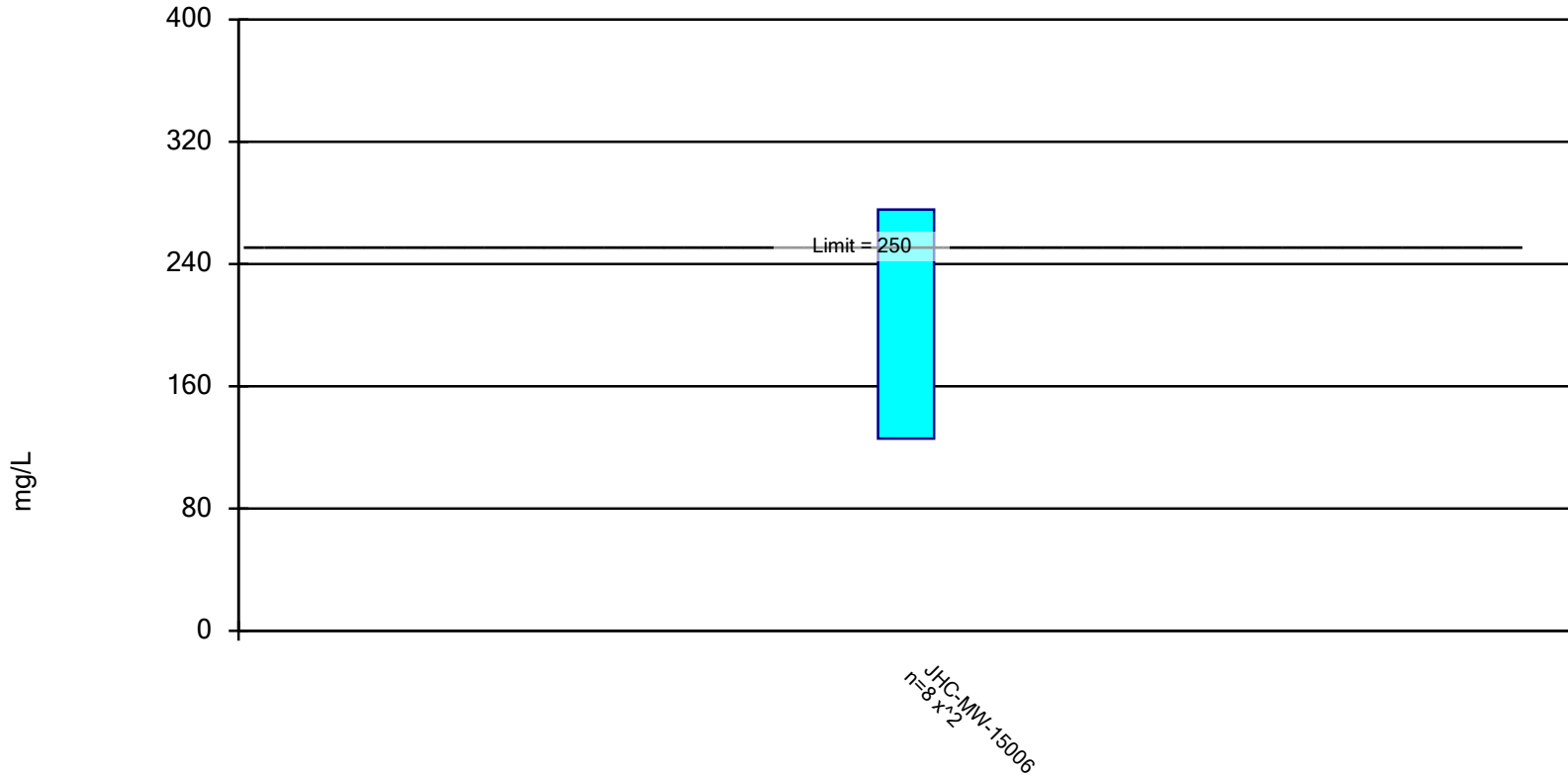
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

---

	JHC-MW-15008R	JHC-MW-15009	JHC-MW-15010	JHC-MW-15011
8/15/2017		156		
9/26/2017		144	109	
6/20/2018		91.4	98.4	
11/14/2018			120	
11/15/2018		187.5 (D)		
4/23/2019			2800	440
4/24/2019		195 (D)		
8/13/2019	93			
10/9/2019	130 (D)		2800	
10/10/2019				690
2/11/2020			2390 (D)	
2/12/2020	423	468		1910
4/14/2020	505	877.5 (D)	2350	
4/15/2020				2870
7/16/2020	384	401	2130	2720
10/22/2020	285			4120
2/23/2021	326			4625 (D)
4/13/2021	356 (D)			5070
Mean	312.8	315.1	1600	2806
Std. Dev.	140.8	262.5	1254	1734
Upper Lim.	461.9	560.4	2710	4644
Lower Lim.	163.6	91.66	528.2	967.5

### Parametric Confidence Interval

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



Constituent: Sulfate Analysis Run 6/11/2021 9:39 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

# Confidence Interval

Constituent: Sulfate (mg/L) Analysis Run 6/11/2021 9:40 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

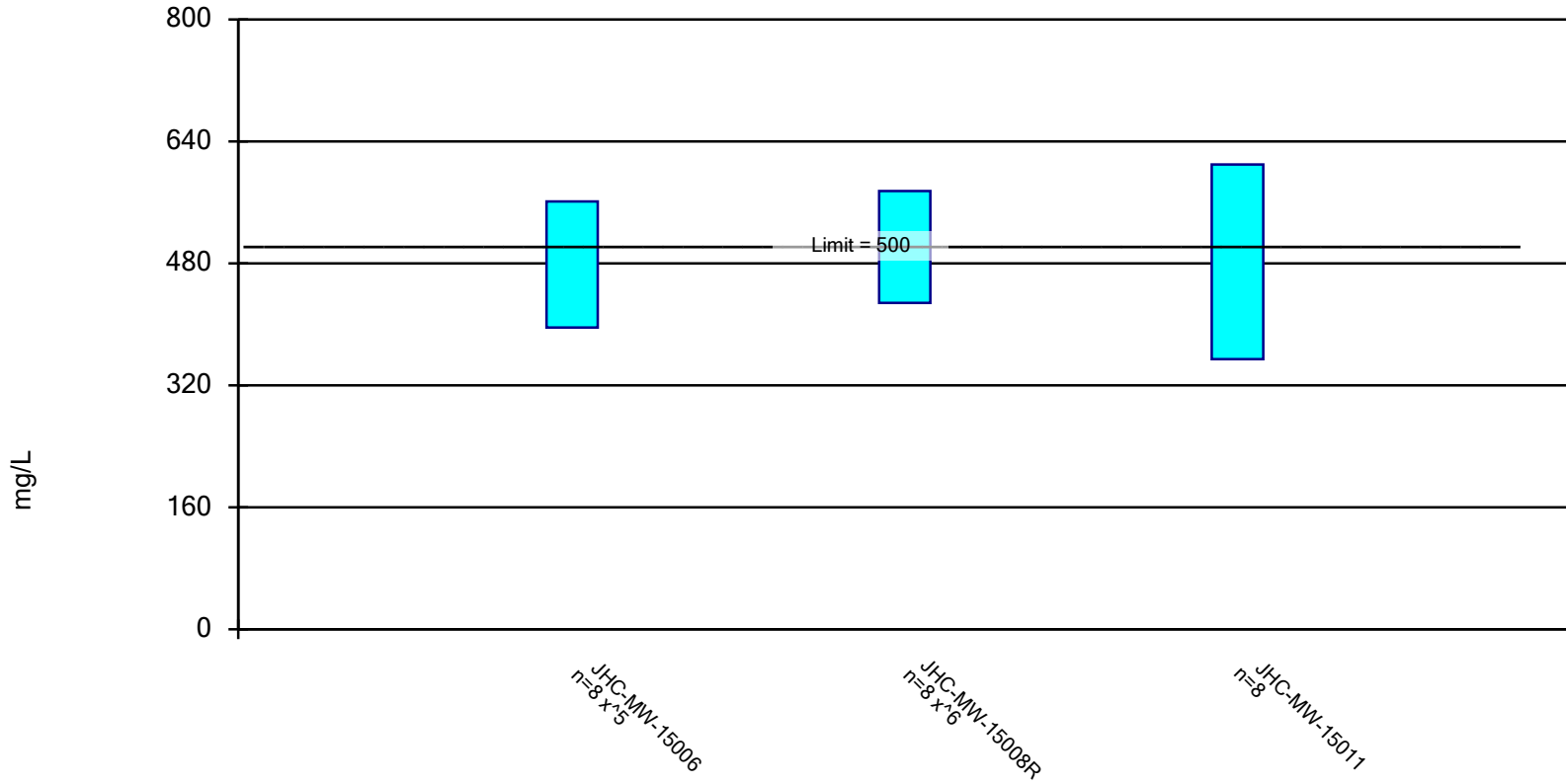
---

JHC-MW-15006

4/24/2019	75
10/10/2019	55
2/12/2020	217
4/14/2020	260
7/16/2020	195
10/22/2020	252 (D)
2/23/2021	276
4/13/2021	257
Mean	198.4
Std. Dev.	86.41
Upper Lim.	275.6
Lower Lim.	125.8

### Parametric Confidence Interval

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



Constituent: Total Dissolved Solids Analysis Run 6/11/2021 9:39 AM

Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21



# Confidence Interval

Constituent: Total Dissolved Solids (mg/L) Analysis Run 6/11/2021 9:40 AM

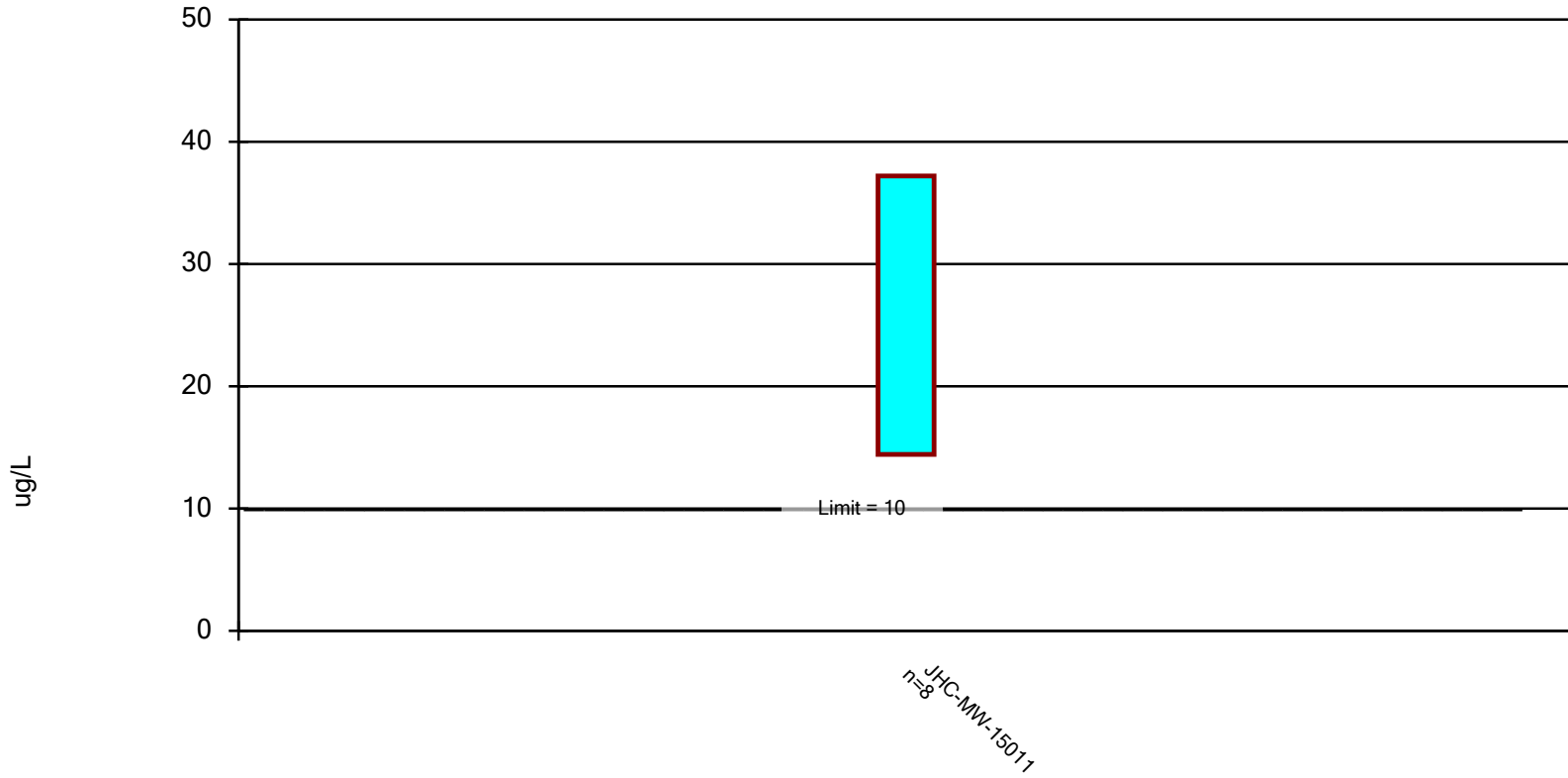
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

---

	JHC-MW-15006	JHC-MW-15008R	JHC-MW-15011
4/23/2019			280
4/24/2019	240		
8/13/2019		150	
10/9/2019		240 (D)	
10/10/2019	190		550
2/12/2020	542	556	654
4/14/2020	562	566	
4/15/2020			542
7/16/2020	521	536	499
10/22/2020	513 (D)	577	546
2/23/2021	556	548	425 (D)
4/13/2021	497	514.5 (D)	359
Mean	452.6	460.9	481.9
Std. Dev.	148.9	167	120.3
Upper Lim.	561.1	574.8	609.4
Lower Lim.	395.8	428.2	354.3

### Parametric Confidence Interval

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



Constituent: Arsenic, Total Analysis Run 6/11/2021 9:39 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

# Confidence Interval

Constituent: Arsenic, Total (ug/L) Analysis Run 6/11/2021 9:40 AM

Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

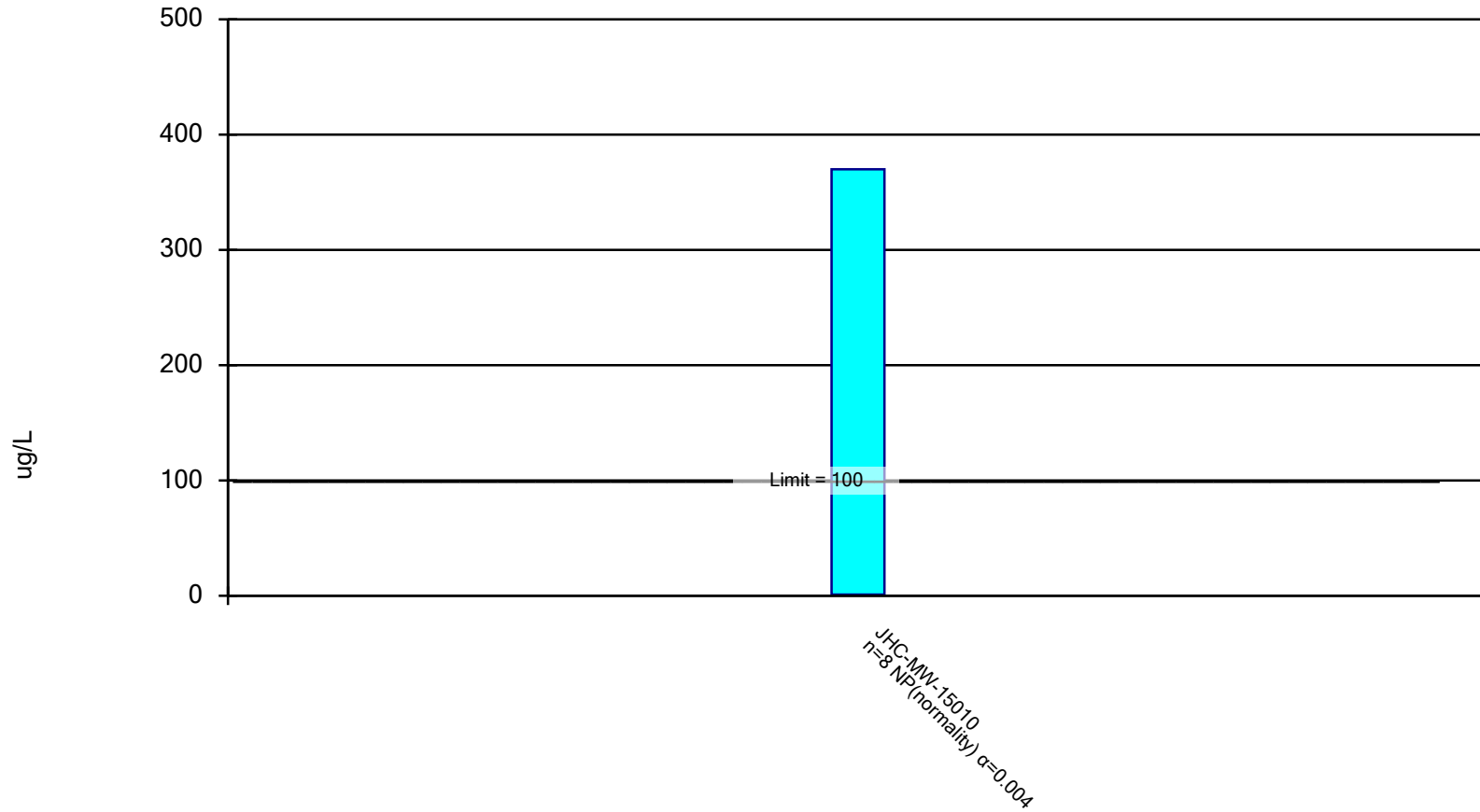
---

JHC-MW-15011

4/23/2019	36
10/10/2019	44
2/12/2020	31
4/15/2020	25
7/16/2020	22
10/22/2020	22
2/23/2021	13.5 (D)
4/13/2021	13
Mean	25.81
Std. Dev.	10.74
Upper Lim.	37.19
Lower Lim.	14.43

## Non-Parametric Confidence Interval

Compliance Limit is not exceeded.



Constituent: Chromium, Total Analysis Run 6/11/2021 9:38 AM

Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

# Confidence Interval

Constituent: Chromium, Total (ug/L) Analysis Run 6/11/2021 9:39 AM

Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

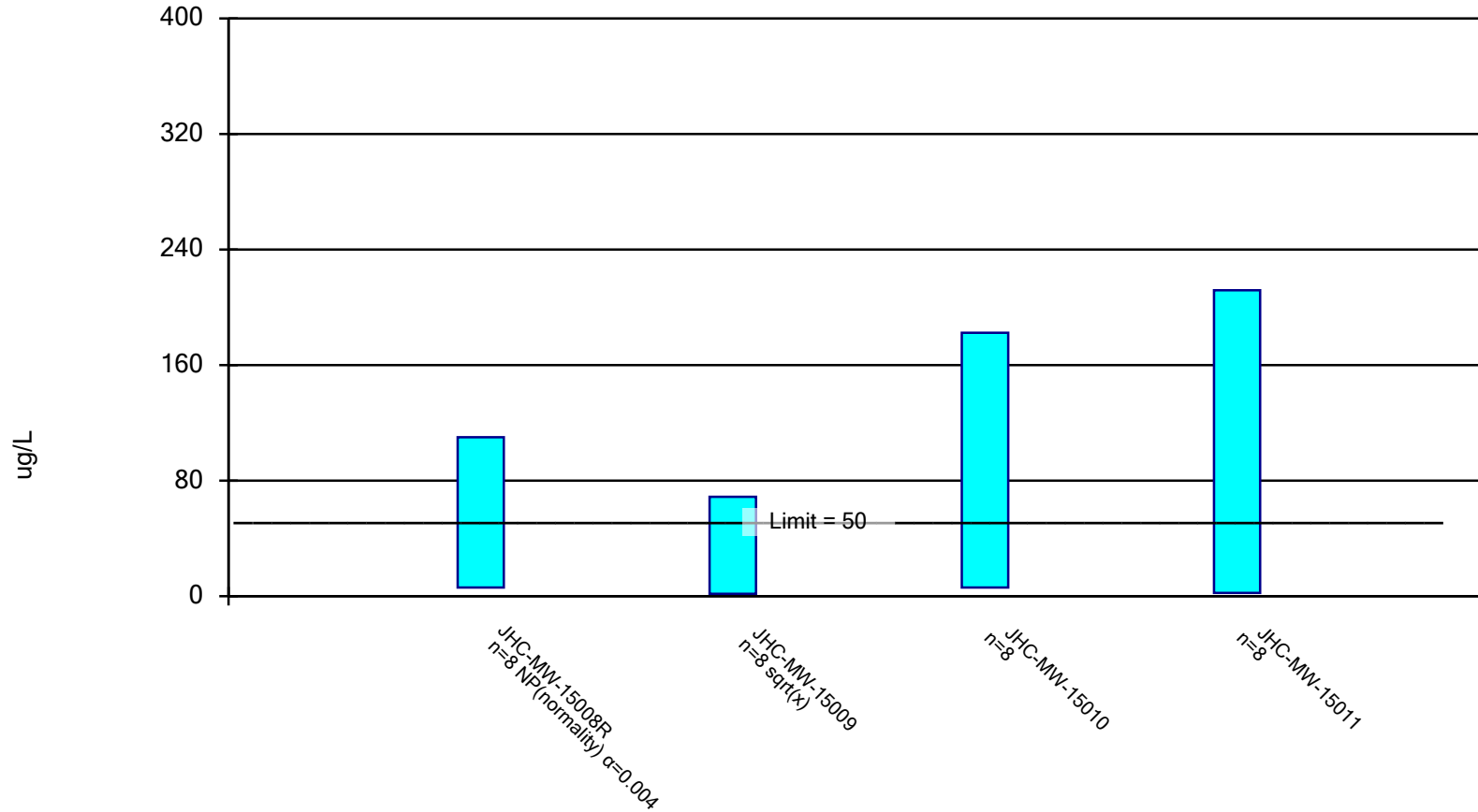
---

JHC-MW-15010

4/26/2018	1.4
6/20/2018	1.1
11/14/2018	1.5
4/23/2019	1.2
10/9/2019	370
2/11/2020	4.5 (D)
4/14/2020	1
7/16/2020	1
Mean	47.71
Std. Dev.	130.2
Upper Lim.	370
Lower Lim.	1

## Parametric and Non-Parametric (NP) Confidence Interval

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



Constituent: Selenium, Total Analysis Run 6/11/2021 9:41 AM

Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

# Confidence Interval

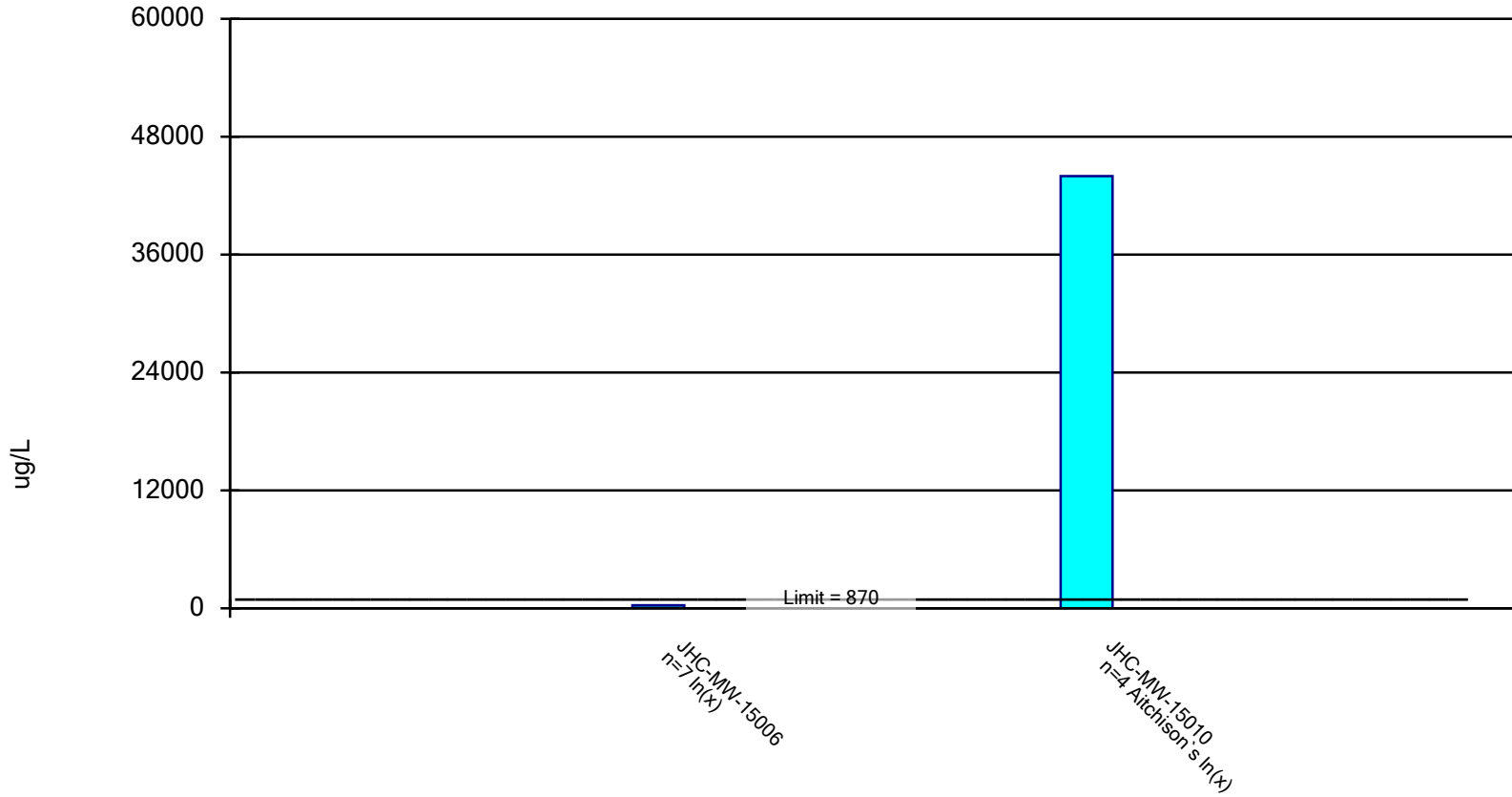
Constituent: Selenium, Total (ug/L) Analysis Run 6/11/2021 9:42 AM

Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

	JHC-MW-15008R	JHC-MW-15009	JHC-MW-15010	JHC-MW-15011
8/15/2017		<1		
4/26/2018		1 (D)	3	
6/20/2018		10.3	11	
11/14/2018			34.1	
11/15/2018		12.6 (D)		
4/23/2019			32	13
4/24/2019		62 (D)		
8/13/2019	12			
10/9/2019	110 (D)		210	
10/10/2019				76
2/11/2020			126 (D)	
2/12/2020	11	20		104
4/14/2020	6	78 (D)	158	
4/15/2020				29
7/16/2020	13	76	179	20
10/22/2020	68			308
2/23/2021	16			163.5 (D)
4/13/2021	6 (D)			143
Mean	30.25	32.55	94.14	107.1
Std. Dev.	38.11	33.58	83.15	98.81
Upper Lim.	110	68.86	182.3	211.8
Lower Lim.	6	1.67	5.999	2.327

### Parametric Confidence Interval

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



Constituent: Iron, Total    Analysis Run 6/11/2021 9:43 AM  
Client: Consumers Energy    Data: JHC CCR\_Sanitas Data\_1SA21



# Confidence Interval

Constituent: Iron, Total (ug/L) Analysis Run 6/11/2021 9:43 AM

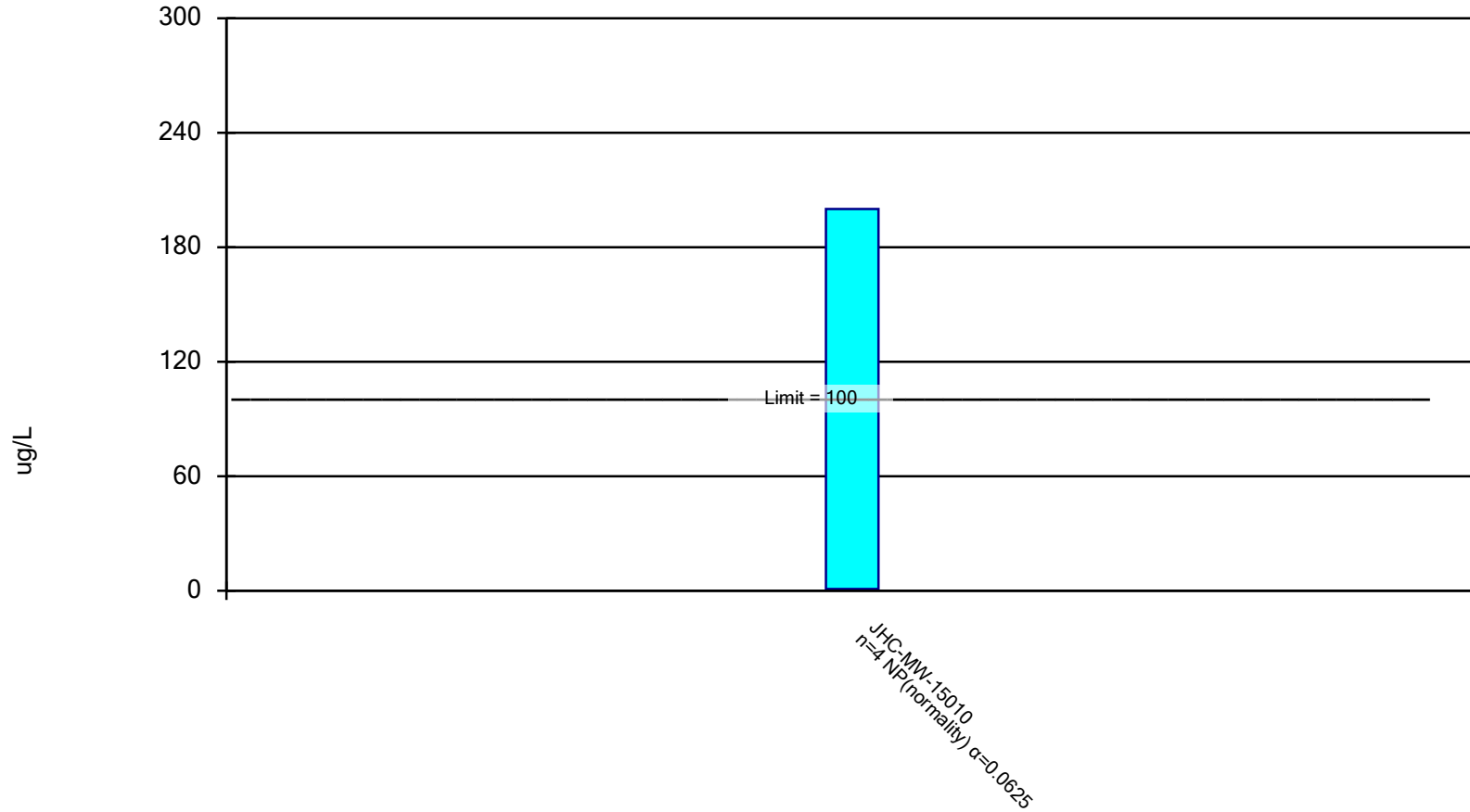
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

---

	JHC-MW-15006	JHC-MW-15010
10/9/2019		2100
10/10/2019	43	
2/11/2020		28 (D)
2/12/2020	189	
4/14/2020	26	<20
7/16/2020	128	27
10/22/2020	571 (D)	
2/23/2021	43	
4/13/2021	41	
Mean	148.7	541.3
Std. Dev.	195.5	1039
Upper Lim.	307.6	43972
Lower Lim.	22.41	0.02865

## Non-Parametric Confidence Interval

Compliance Limit is not exceeded.



Constituent: Nickel, Total Analysis Run 6/11/2021 9:43 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

# Confidence Interval

Constituent: Nickel, Total (ug/L) Analysis Run 6/11/2021 9:43 AM

Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

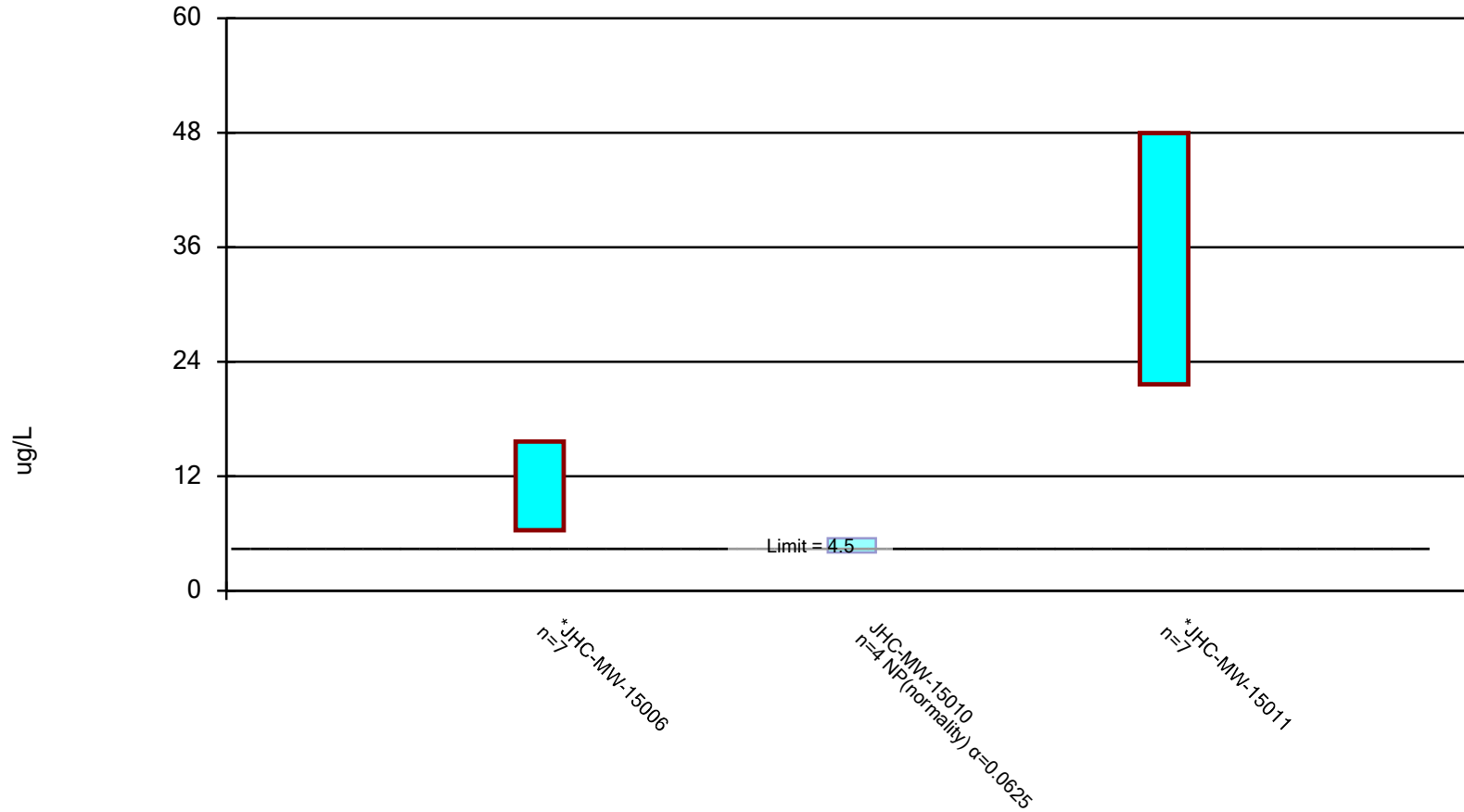
---

JHC-MW-15010

10/9/2019	200
2/11/2020	2 (D)
4/14/2020	<1
7/16/2020	<2
Mean	51.25
Std. Dev.	99.17
Upper Lim.	200
Lower Lim.	1

## Parametric and Non-Parametric (NP) Confidence Interval

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



Constituent: Vanadium, Total Analysis Run 6/11/2021 9:43 AM

Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

# Confidence Interval

Constituent: Vanadium, Total (ug/L) Analysis Run 6/11/2021 9:43 AM

Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

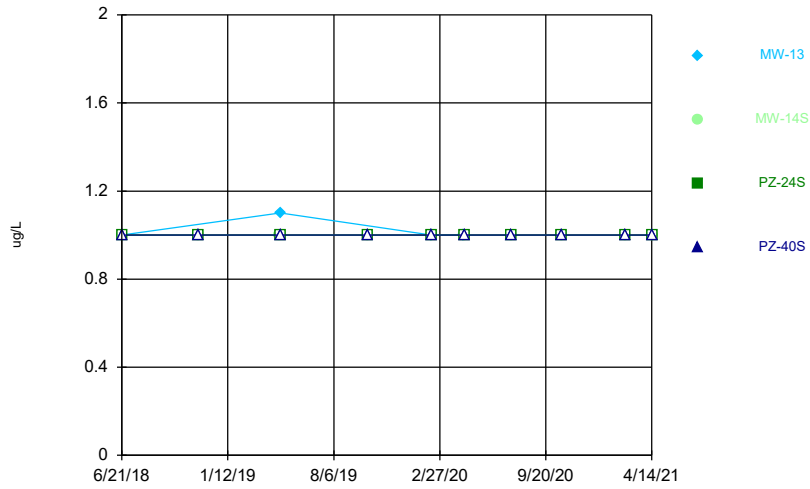
---

	JHC-MW-15006	JHC-MW-15010	JHC-MW-15011
10/9/2019		5.5	
10/10/2019	8		14
2/11/2020		4 (D)	
2/12/2020	16		42
4/14/2020	10	4	
4/15/2020			40
7/16/2020	15	4	30
10/22/2020	14 (D)		49
2/23/2021	7		34.5 (D)
4/13/2021	7		34
Mean	11	4.375	34.79
Std. Dev.	3.916	0.75	11.08
Upper Lim.	15.65	5.5	47.95
Lower Lim.	6.349	4	21.62

## Appendix C

# GSI Time Series Charts

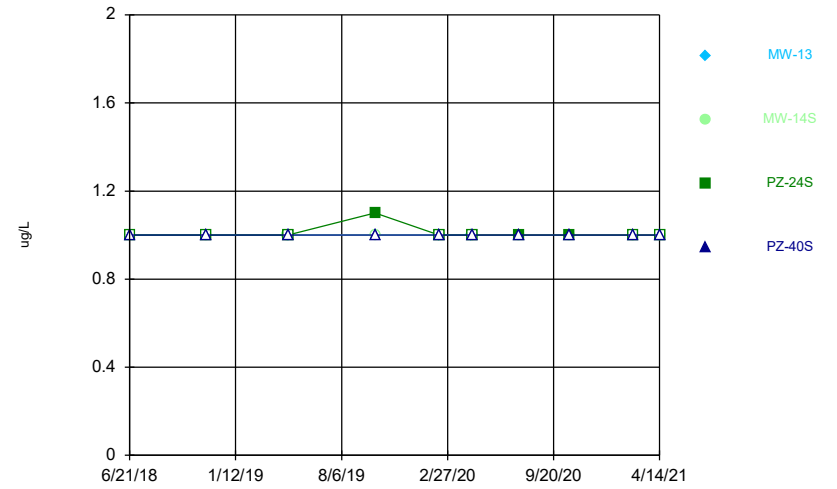
### Antimony, Total



Time Series Analysis Run 6/11/2021 11:00 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved antimony result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

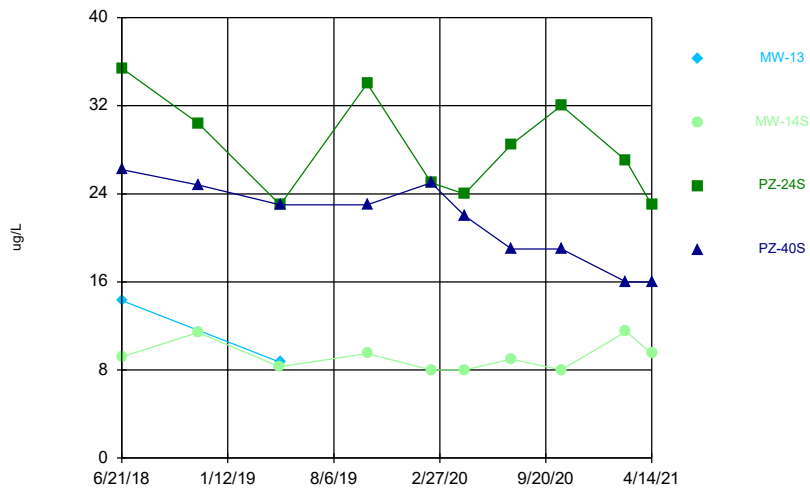
### Arsenic, Total



Time Series Analysis Run 6/11/2021 11:00 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

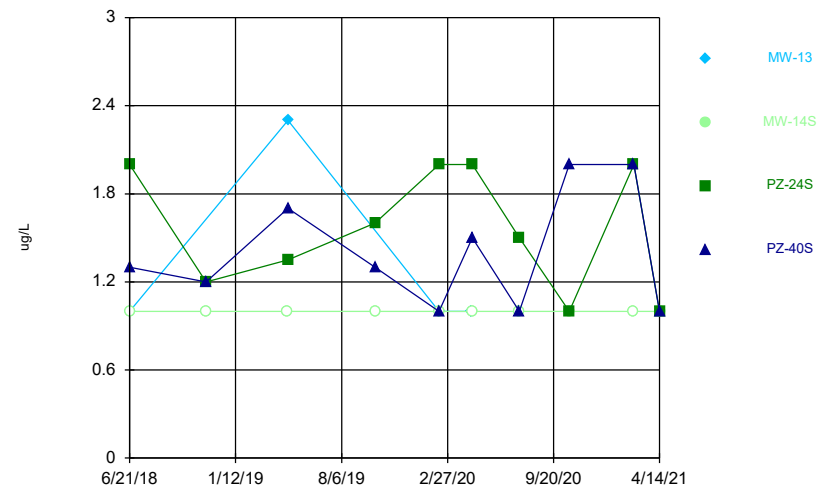
Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved arsenic result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

### Barium, Total



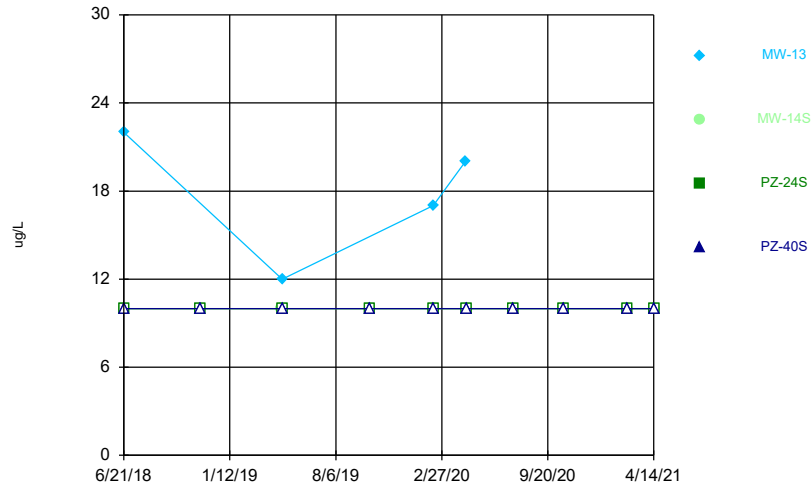
Time Series Analysis Run 6/11/2021 11:00 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

### Chromium, Total



Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved chromium result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

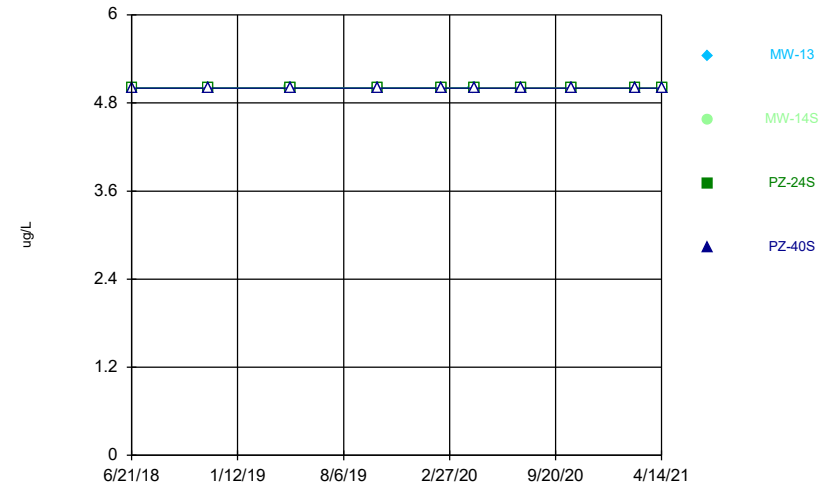
### Lithium, Total



Time Series Analysis Run 6/11/2021 11:00 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved lithium result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

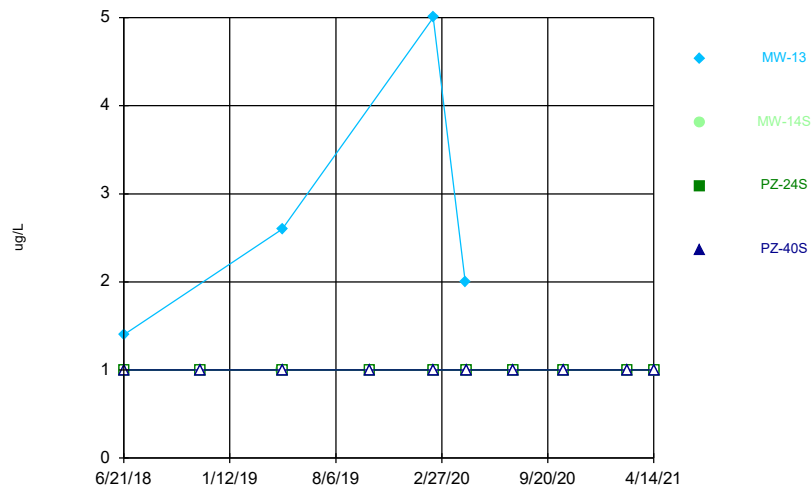
### Molybdenum, Total



Time Series Analysis Run 6/11/2021 11:00 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

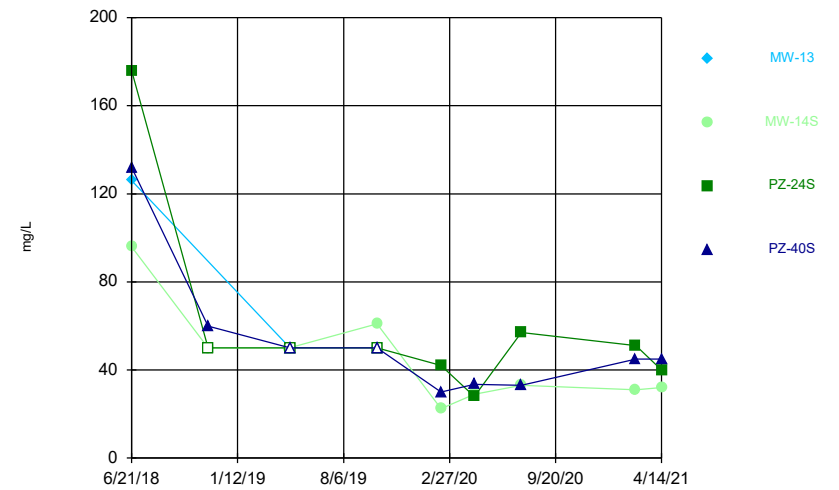
Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved molybdenum result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

### Selenium, Total



Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved selenium result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

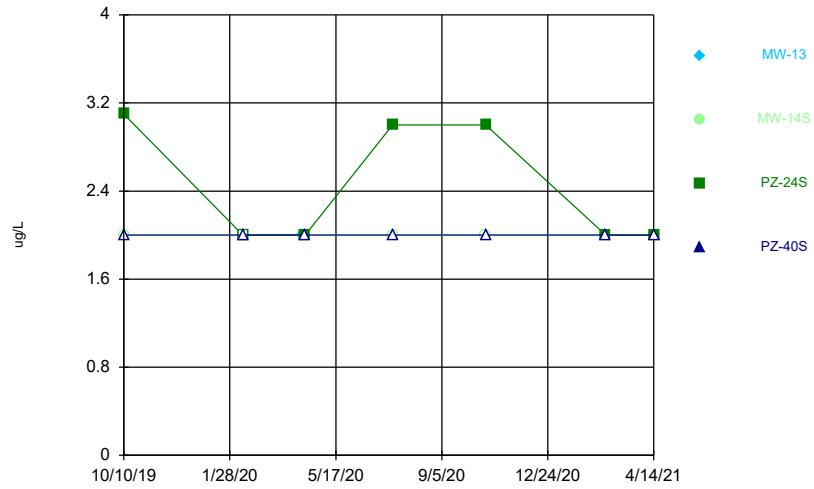
### Total Dissolved Solids



Time Series Analysis Run 6/11/2021 11:00 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21



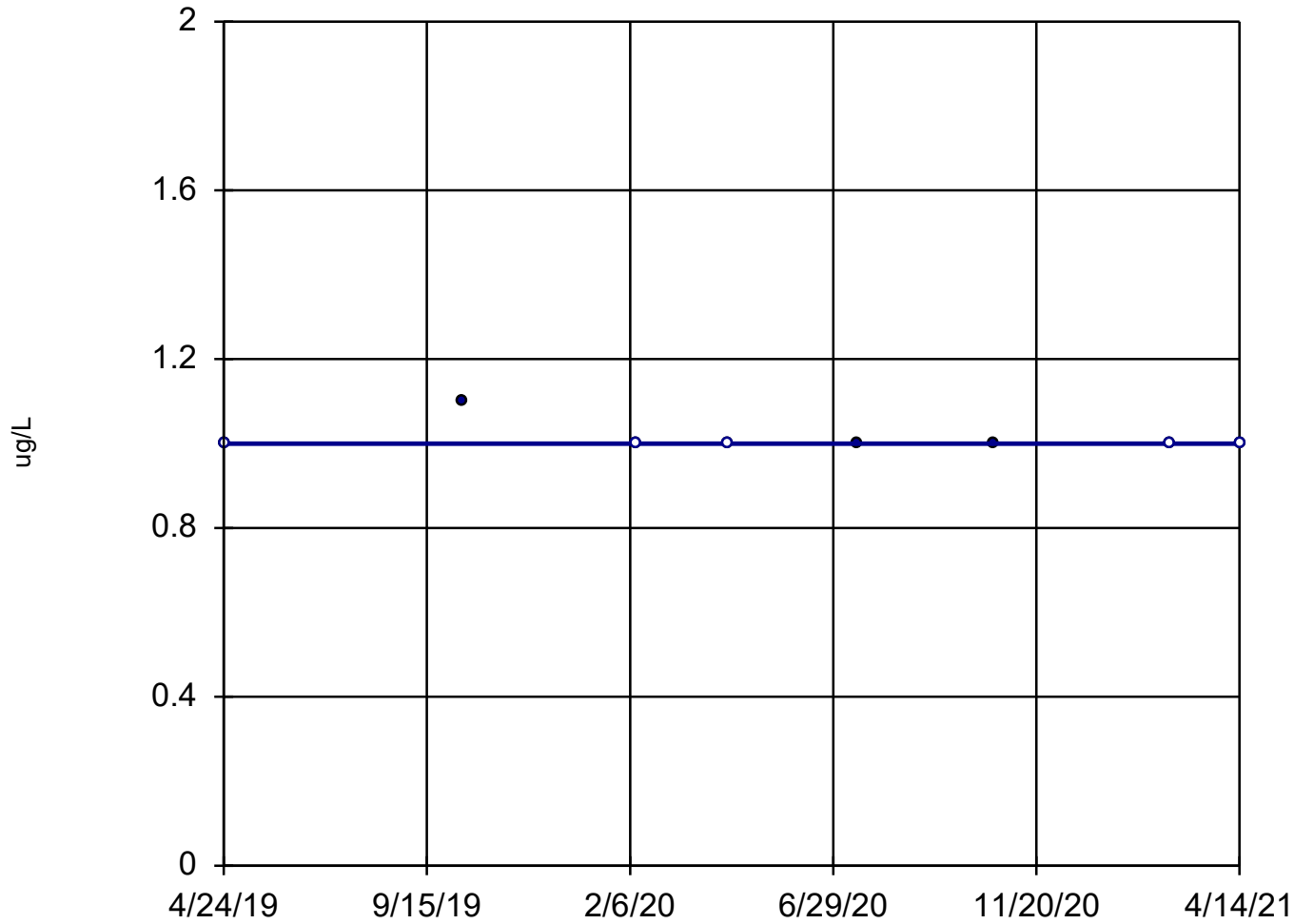
### Vanadium, Total



Time Series Analysis Run 6/11/2021 11:00 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

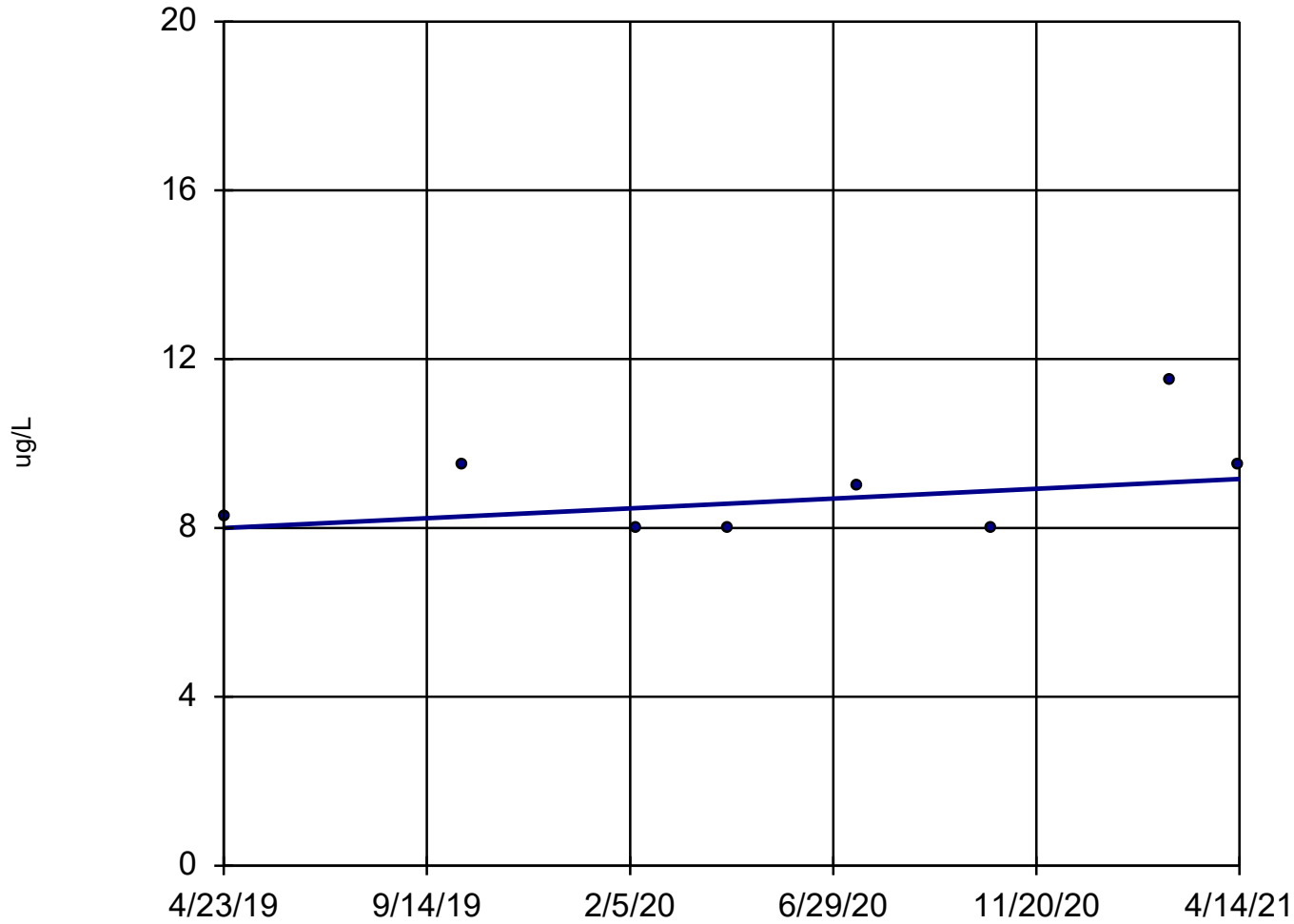
Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved vanadium result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

## Arsenic, Total PZ-24S



n = 8  
Slope = 0  
units per year.  
Mann-Kendall  
statistic = -5  
critical = -20  
Trend not sig-  
nificant at 98%  
confidence level  
( $\alpha = 0.01$  per  
tail).

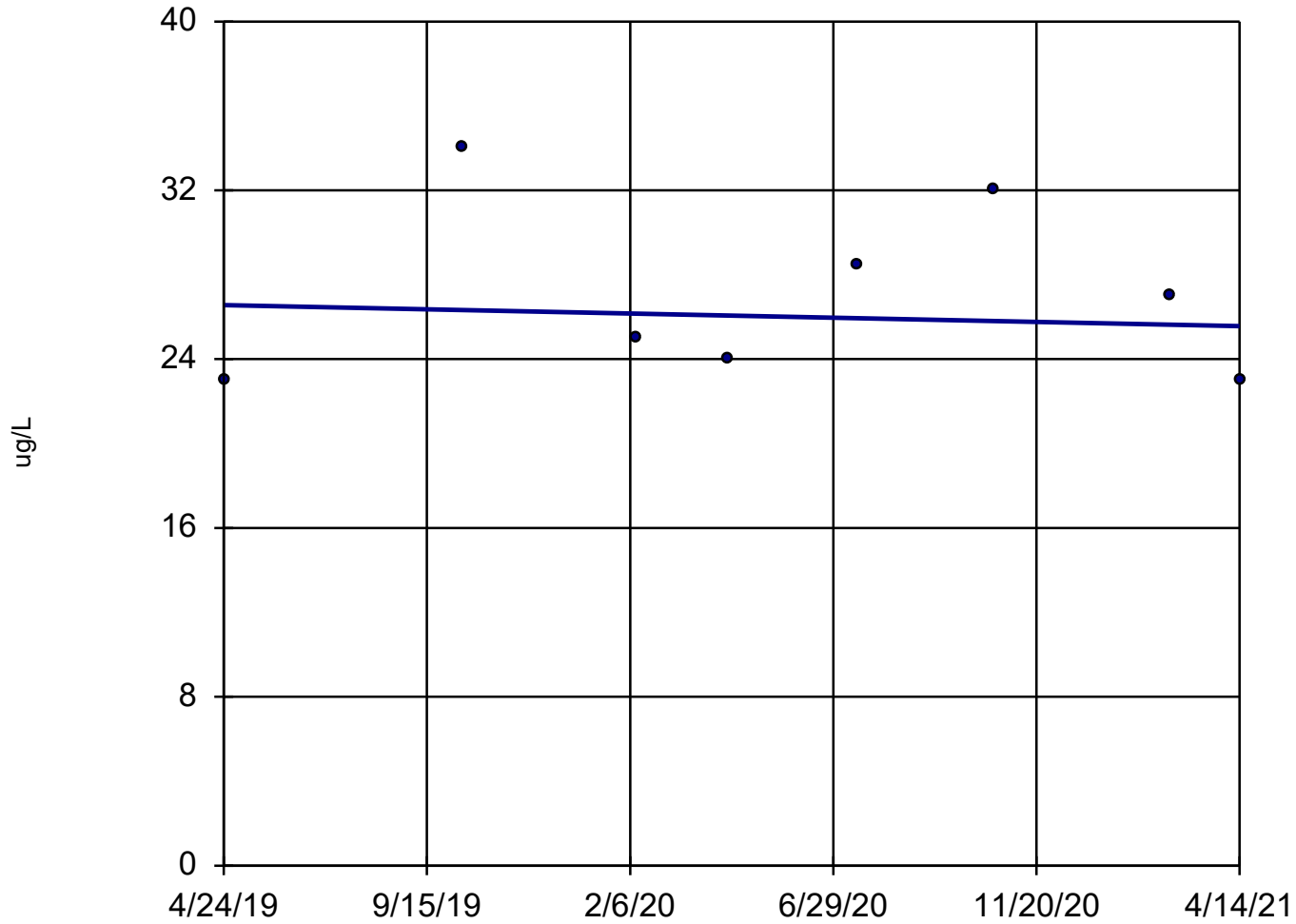
### Barium, Total MW-14S



n = 8  
Slope = 0.5872  
units per year.  
Mann-Kendall  
statistic = 6  
critical = 20  
Trend not sig-  
nificant at 98%  
confidence level  
( $\alpha = 0.01$  per  
tail).

Sen's Slope Estimator Analysis Run 6/11/2021 11:06 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

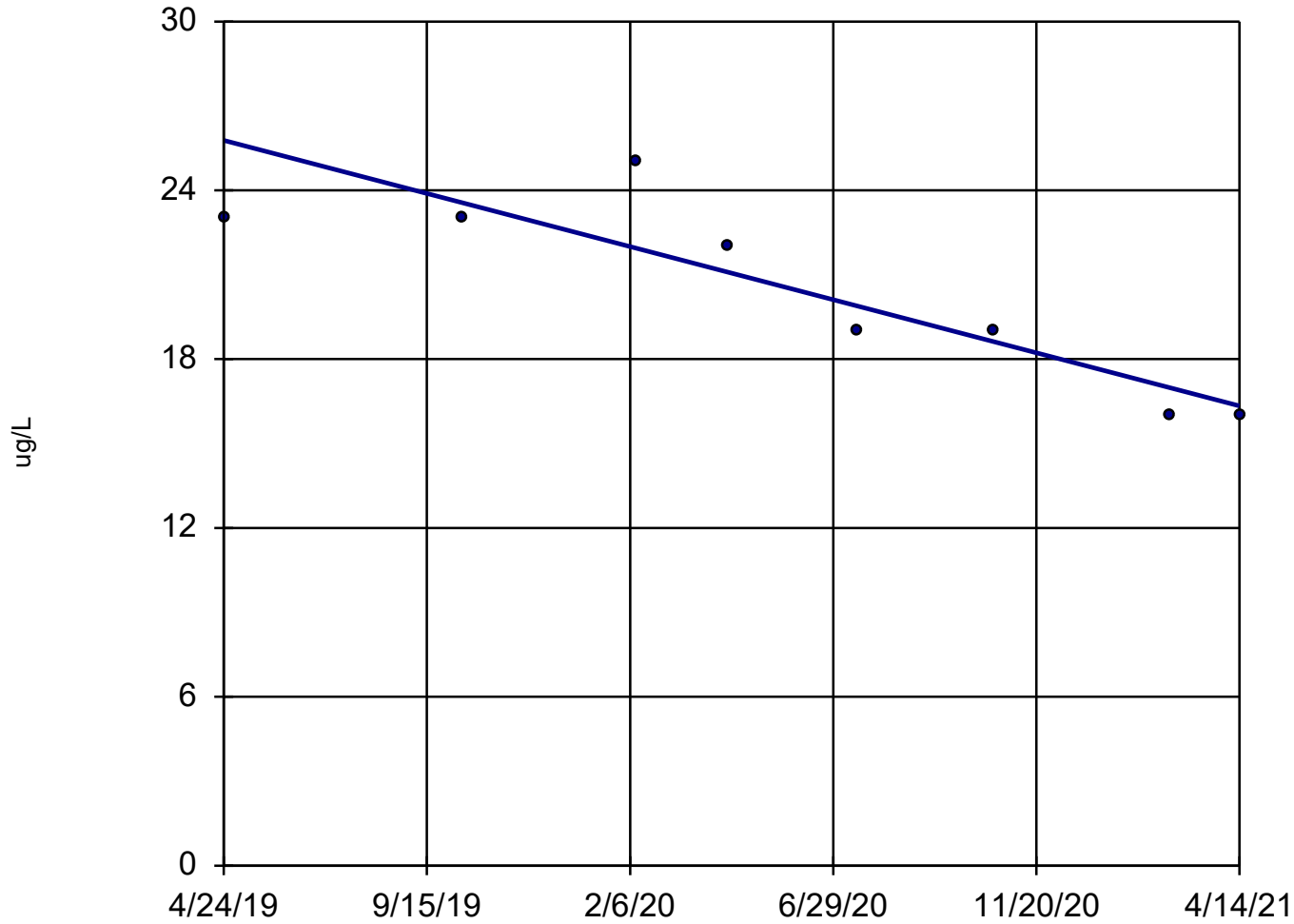
### Barium, Total PZ-24S



n = 8  
Slope = -0.5028  
units per year.  
Mann-Kendall  
statistic = -1  
critical = -20  
Trend not sig-  
nificant at 98%  
confidence level  
( $\alpha = 0.01$  per  
tail).

Sen's Slope Estimator Analysis Run 6/11/2021 11:06 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

### Barium, Total PZ-40S

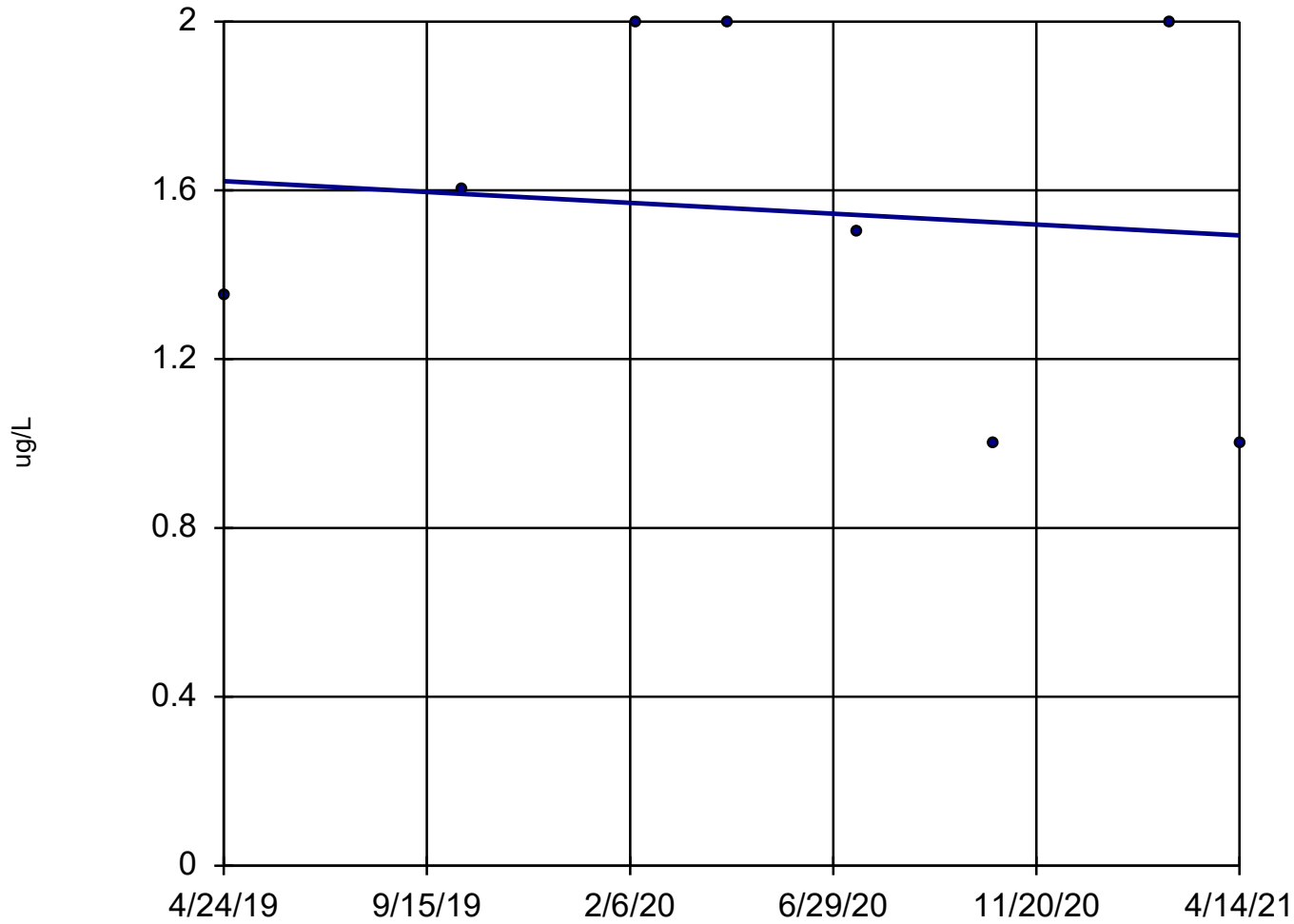


n = 8  
Slope = -4.781  
units per year.  
Mann-Kendall  
statistic = -21  
critical = -20  
Decreasing trend  
significant at 98%  
confidence level  
( $\alpha = 0.01$  per  
tail).

Sen's Slope Estimator Analysis Run 6/11/2021 11:06 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

# Chromium, Total

PZ-24S

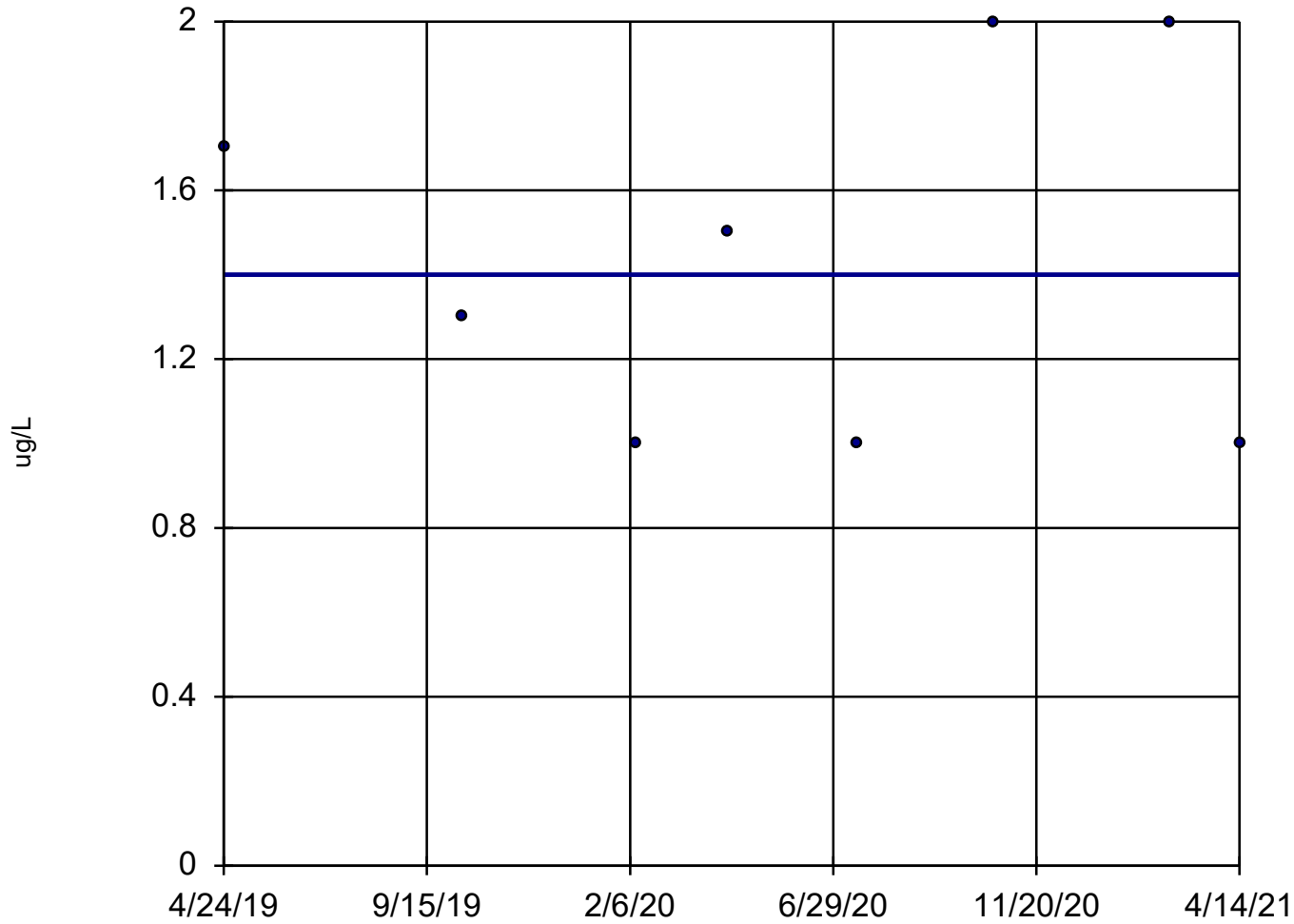


n = 8  
Slope = -0.06518  
units per year.  
Mann-Kendall  
statistic = -4  
critical = -20  
Trend not sig-  
nificant at 98%  
confidence level  
( $\alpha = 0.01$  per  
tail).

Sen's Slope Estimator Analysis Run 6/11/2021 11:06 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

# Chromium, Total

## PZ-40S



n = 8  
Slope = 0  
units per year.  
Mann-Kendall  
statistic = 0  
critical = 20  
Trend not sig-  
nificant at 98%  
confidence level  
( $\alpha = 0.01$  per  
tail).

Sen's Slope Estimator Analysis Run 6/11/2021 11:06 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_1SA21

# **Appendix D**

## **April 2021 Laboratory Reports**



To: CDBatts, JH Campbell Complex

From: EBlaj, T-258

Date: May 03, 2021

Subject: JH CAMPBELL SOLID WASTE DISPOSAL AREA – GROUNDWATER MONITORING  
2<sup>nd</sup> Quarter, 2021 – Background Wells

CC: BLSwanberg, P22-119  
BTRunkel, P22-120  
HDRegister, P22-521

Sarah Holmstrom, Project Manager  
TRC Companies, Inc.  
1540 Eisenhower Place  
Ann Arbor, MI 48108

---

**Chemistry Project: 21-0446**

CE Laboratory Services conducted groundwater monitoring on 04/12/2021 through 04/15/2021 at the JH Campbell Solid Waste Disposal Area, for the 2<sup>nd</sup> Quarter monitoring requirements. The samples were received for analysis by the Chemistry department on 04/15/2021.

Samples for Radium analysis have been subcontracted to Eurofins/TestAmerica, Inc. and their results are being reported separately. Please note that the subcontracted work is not reported under the CE laboratory scope of accreditation.

With the exception noted above, the report that follows presents the results of the requested analytical testing; the results apply only to the samples, as received. All samples have been analyzed in accordance with the 2016 TNI Standard and the applicable A2LA accreditation scope for Laboratory Services. Any exceptions to applicable test method criteria and standard compliance are noted in the Case Narrative, or flagged with applicable qualifiers in the analytical results section.

Reviewed and approved by:

Emil Blaj  
Sr. Technical Analyst  
Project Lead



*Testing performed in accordance with the A2LA scope of accreditation specified in the listed certificate. The information contained in this report is the sole property of Consumers Energy. It cannot be reproduced except in full, and with consent from Consumers Energy, or the customer for which this report was issued.*

## CASE NARRATIVE

### I. Sample Receipt

All samples were received within hold time and in good conditions; no anomalies were noted on the Sample Log-In Shipment Inspection Form during sample check-in. Identification of all samples included in the work order/project is provided in the sample summary section. Sample preservation upon receipt was verified by the sample custodian and confirmed to meet method requirements.

### II. Methodology

Unless otherwise indicated, sample preparation and analysis was performed in accordance with the corresponding test methods from “Methods for the Determination of Inorganic Substances in Environmental Samples (EPA/600/R-93/100); SW-846, “Test Methods for Evaluating Solid Waste – Physical/Chemical Methods”, USEPA (latest revisions), and Standard Methods for the Examination of Water and Wastewater, APHA-AWWA-WPCF, 22<sup>nd</sup> Edition, 2012.

### III. Results/Quality Control

Analytical results for this report are presented by laboratory sample ID, container & aliquot number. Results for the field blanks, field duplicates, and percent recoveries of the field matrix spike & matrix spike duplicate samples are included in the results section. Unless specifically noted in the case narrative, all method quality control requirements have been met. If any results are qualified, the corresponding data flags/qualifiers are listed on the last page of the results section. Any additional information on method performance, when applicable, is presented in this section of the case narrative. When data flags are not needed, the qualifiers text box on the last page is left blank, and a statement confirms that no exceptions occurred.

## DEFINITIONS / QUALIFIERS

The following qualifiers and/or acronyms are used in the report where applicable:

<u>Acronym</u>	<u>Description</u>
RL	Reporting Limit
ND	Result not detected or below Reporting Limit
NT	Not a TNI Analyte
LCS	Laboratory Control Sample
LRB	Laboratory Reagent Blank (also referred to as Method Blank)
DUP	Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
TDL	Target Detection Limit
SM	Standard Methods Compendium

<u>Qualifier</u>	<u>Description</u>
*	Generic data flag, applicable description added in the corresponding notes section
B	The analyte was detected in the LRB at a level which is significant relative to sample result

D	Reporting limit elevated due to dilution
E	Estimated due to result exceeding the linear range of the analyzer
H	The maximum recommended hold time was exceeded
I	Dilution required due to matrix interference; reporting limit elevated
J	Estimated due to result found above MDL but below PQL (or RL)
K	Reporting limit raised due to matrix interference
M	The precision for duplicate analysis was not met; RPD outside acceptance criteria
N	Non-homogeneous sample made analysis questionable
PI	Possible interference may have affected the accuracy of the laboratory result
Q	Matrix Spike or Matrix Spike Duplicate recovery outside acceptance criteria
R	Result confirmed by new sample preparation and reanalysis
X	Other notation required; comment listed in sample notes and/or case narrative

## Work Order Sample Summary

---

**Customer Name:** JH Campbell Complex  
**Work Order ID:** Q2-2021 Background Wells  
**Date Received:** 4/15/2021  
**Chemistry Project:** 21-0446

<u>Sample #</u>	<u>Field Sample ID</u>	<u>Matrix</u>	<u>Sample Date</u>	<u>Site</u>
21-0446-01	JHC-MW-15023	Groundwater	04/12/2021 07:08 PM	JHC RCRA GW Monitoring - Background Wells
21-0446-02	JHC-MW-15024	Groundwater	04/13/2021 12:04 PM	JHC RCRA GW Monitoring - Background Wells
21-0446-03	JHC-MW-15025	Groundwater	04/13/2021 11:11 AM	JHC RCRA GW Monitoring - Background Wells
21-0446-04	JHC-MW-15026	Groundwater	04/13/2021 09:43 AM	JHC RCRA GW Monitoring - Background Wells
21-0446-05	JHC-MW-15027	Groundwater	04/13/2021 08:55 AM	JHC RCRA GW Monitoring - Background Wells
21-0446-06	JHC-MW-15028	Groundwater	04/12/2021 06:06 PM	JHC RCRA GW Monitoring - Background Wells
21-0446-07	DUP-02	Groundwater	04/12/2021 12:00 AM	JHC RCRA GW Monitoring - Background Wells
21-0446-08	FB-02	Water	04/13/2021 11:00 AM	JHC RCRA GW Monitoring - Background Wells
21-0446-09	EB-02	Water	04/13/2021 12:16 PM	JHC RCRA GW Monitoring - Background Wells
21-0446-10	JHC-MW-15025 Field MS	Groundwater	04/13/2021 11:11 AM	JHC RCRA GW Monitoring - Background Wells
21-0446-11	JHC-MW-15025 Field MSD	Groundwater	04/13/2021 11:11 AM	JHC RCRA GW Monitoring - Background Wells

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
 Field Sample ID: **JHC-MW-15023**  
 Lab Sample ID: 21-0446-01  
 Matrix: Groundwater

Laboratory Project: **21-0446**  
 Collect Date: 04/12/2021  
 Collect Time: 07:08 PM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0446-01-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/22/2021	AB21-0422-10

### Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 21-0446-01-C02-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2021	AB21-0427-17
Arsenic	ND		ug/L	1	04/27/2021	AB21-0427-17
Barium	17		ug/L	5	04/27/2021	AB21-0427-17
Beryllium	ND		ug/L	1	04/27/2021	AB21-0427-17
Boron	50		ug/L	20	04/27/2021	AB21-0427-17
Cadmium	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Calcium	11100		ug/L	1000	04/27/2021	AB21-0427-17
Chromium	ND		ug/L	1	04/27/2021	AB21-0427-17
Cobalt	ND		ug/L	6	04/27/2021	AB21-0427-17
Copper	1		ug/L	1	04/27/2021	AB21-0427-17
Iron	ND		ug/L	20	04/27/2021	AB21-0427-17
Lead	ND		ug/L	1	04/27/2021	AB21-0427-17
Lithium	ND		ug/L	10	04/27/2021	AB21-0427-17
Molybdenum	ND		ug/L	5	04/27/2021	AB21-0427-17
Nickel	ND		ug/L	2	04/27/2021	AB21-0427-17
Selenium	ND		ug/L	1	04/27/2021	AB21-0427-17
Silver	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Thallium	ND		ug/L	2	04/27/2021	AB21-0427-17
Vanadium	ND		ug/L	2	04/27/2021	AB21-0427-17
Zinc	ND		ug/L	10	04/27/2021	AB21-0427-17

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 21-0446-01-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	2640		ug/L	1000	04/22/2021	AB21-0422-06
Fluoride	ND		ug/L	1000	04/22/2021	AB21-0422-06
Sulfate	12200		ug/L	1000	04/22/2021	AB21-0422-06

### Total Dissolved Solids by SM 2540C

Aliquot: 21-0446-01-C04-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	66		mg/L	10	04/16/2021	AB21-0416-04

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
 Field Sample ID: **JHC-MW-15024**  
 Lab Sample ID: 21-0446-02  
 Matrix: Groundwater

Laboratory Project: **21-0446**  
 Collect Date: 04/13/2021  
 Collect Time: 12:04 PM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0446-02-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/22/2021	AB21-0422-10

### Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 21-0446-02-C02-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2021	AB21-0427-17
Arsenic	ND		ug/L	1	04/27/2021	AB21-0427-17
Barium	17		ug/L	5	04/27/2021	AB21-0427-17
Beryllium	ND		ug/L	1	04/27/2021	AB21-0427-17
Boron	21		ug/L	20	04/27/2021	AB21-0427-17
Cadmium	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Calcium	36800		ug/L	1000	04/27/2021	AB21-0427-17
Chromium	ND		ug/L	1	04/27/2021	AB21-0427-17
Cobalt	ND		ug/L	6	04/27/2021	AB21-0427-17
Copper	ND		ug/L	1	04/27/2021	AB21-0427-17
Iron	67		ug/L	20	04/27/2021	AB21-0427-17
Lead	ND		ug/L	1	04/27/2021	AB21-0427-17
Lithium	ND		ug/L	10	04/27/2021	AB21-0427-17
Molybdenum	ND		ug/L	5	04/27/2021	AB21-0427-17
Nickel	ND		ug/L	2	04/27/2021	AB21-0427-17
Selenium	ND		ug/L	1	04/27/2021	AB21-0427-17
Silver	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Thallium	ND		ug/L	2	04/27/2021	AB21-0427-17
Vanadium	ND		ug/L	2	04/27/2021	AB21-0427-17
Zinc	ND		ug/L	10	04/30/2021	AB21-0427-17

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 21-0446-02-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	21500		ug/L	1000	04/22/2021	AB21-0422-06
Fluoride	ND		ug/L	1000	04/22/2021	AB21-0422-06
Sulfate	8140		ug/L	1000	04/22/2021	AB21-0422-06

### Total Dissolved Solids by SM 2540C

Aliquot: 21-0446-02-C04-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	175		mg/L	10	04/16/2021	AB21-0416-04

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
 Field Sample ID: **JHC-MW-15025**  
 Lab Sample ID: 21-0446-03  
 Matrix: Groundwater

Laboratory Project: **21-0446**  
 Collect Date: 04/13/2021  
 Collect Time: 11:11 AM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0446-03-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/22/2021	AB21-0422-10

### Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 21-0446-03-C02-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2021	AB21-0427-17
Arsenic	ND		ug/L	1	04/27/2021	AB21-0427-17
Barium	6		ug/L	5	04/27/2021	AB21-0427-17
Beryllium	ND		ug/L	1	04/27/2021	AB21-0427-17
Boron	20		ug/L	20	04/27/2021	AB21-0427-17
Cadmium	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Calcium	19800		ug/L	1000	04/27/2021	AB21-0427-17
Chromium	ND		ug/L	1	04/27/2021	AB21-0427-17
Cobalt	ND		ug/L	6	04/27/2021	AB21-0427-17
Copper	ND		ug/L	1	04/27/2021	AB21-0427-17
Iron	ND		ug/L	20	04/27/2021	AB21-0427-17
Lead	ND		ug/L	1	04/27/2021	AB21-0427-17
Lithium	ND		ug/L	10	04/27/2021	AB21-0427-17
Molybdenum	ND		ug/L	5	04/27/2021	AB21-0427-17
Nickel	ND		ug/L	2	04/27/2021	AB21-0427-17
Selenium	ND		ug/L	1	04/27/2021	AB21-0427-17
Silver	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Thallium	ND		ug/L	2	04/27/2021	AB21-0427-17
Vanadium	ND		ug/L	2	04/27/2021	AB21-0427-17
Zinc	ND		ug/L	10	04/30/2021	AB21-0427-17

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 21-0446-03-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	19500		ug/L	1000	04/22/2021	AB21-0422-06
Fluoride	ND		ug/L	1000	04/22/2021	AB21-0422-06
Sulfate	9020		ug/L	1000	04/22/2021	AB21-0422-06

### Total Dissolved Solids by SM 2540C

Aliquot: 21-0446-03-C04-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	135		mg/L	10	04/16/2021	AB21-0416-04



# Analytical Report

Report Date: 05/03/21

## Laboratory Services A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
Field Sample ID: **JHC-MW-15026**  
Lab Sample ID: 21-0446-04  
Matrix: Groundwater

Laboratory Project: **21-0446**  
Collect Date: 04/13/2021  
Collect Time: 09:43 AM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0446-04-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/22/2021	AB21-0422-10

### Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 21-0446-04-C02-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2021	AB21-0427-17
Arsenic	ND		ug/L	1	04/27/2021	AB21-0427-17
Barium	10		ug/L	5	04/27/2021	AB21-0427-17
Beryllium	ND		ug/L	1	04/27/2021	AB21-0427-17
Boron	ND		ug/L	20	04/27/2021	AB21-0427-17
Cadmium	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Calcium	9230		ug/L	1000	04/27/2021	AB21-0427-17
Chromium	ND		ug/L	1	04/27/2021	AB21-0427-17
Cobalt	ND		ug/L	6	04/27/2021	AB21-0427-17
Copper	ND		ug/L	1	04/27/2021	AB21-0427-17
Iron	ND		ug/L	20	04/27/2021	AB21-0427-17
Lead	ND		ug/L	1	04/27/2021	AB21-0427-17
Lithium	ND		ug/L	10	04/27/2021	AB21-0427-17
Molybdenum	ND		ug/L	5	04/27/2021	AB21-0427-17
Nickel	ND		ug/L	2	04/27/2021	AB21-0427-17
Selenium	ND		ug/L	1	04/27/2021	AB21-0427-17
Silver	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Thallium	ND		ug/L	2	04/27/2021	AB21-0427-17
Vanadium	ND		ug/L	2	04/27/2021	AB21-0427-17
Zinc	ND		ug/L	10	04/27/2021	AB21-0427-17

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 21-0446-04-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	4050		ug/L	1000	04/22/2021	AB21-0422-06
Fluoride	ND		ug/L	1000	04/22/2021	AB21-0422-06
Sulfate	6880		ug/L	1000	04/22/2021	AB21-0422-06

### Total Dissolved Solids by SM 2540C

Aliquot: 21-0446-04-C04-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	51		mg/L	10	04/16/2021	AB21-0416-04



## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
 Field Sample ID: **JHC-MW-15027**  
 Lab Sample ID: 21-0446-05  
 Matrix: Groundwater

Laboratory Project: **21-0446**  
 Collect Date: 04/13/2021  
 Collect Time: 08:55 AM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0446-05-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/22/2021	AB21-0422-10

### Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 21-0446-05-C02-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2021	AB21-0427-17
Arsenic	ND		ug/L	1	04/27/2021	AB21-0427-17
Barium	8		ug/L	5	04/27/2021	AB21-0427-17
Beryllium	ND		ug/L	1	04/27/2021	AB21-0427-17
Boron	ND		ug/L	20	04/27/2021	AB21-0427-17
Cadmium	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Calcium	10900		ug/L	1000	04/27/2021	AB21-0427-17
Chromium	ND		ug/L	1	04/27/2021	AB21-0427-17
Cobalt	ND		ug/L	6	04/27/2021	AB21-0427-17
Copper	ND		ug/L	1	04/27/2021	AB21-0427-17
Iron	343		ug/L	20	04/27/2021	AB21-0427-17
Lead	ND		ug/L	1	04/27/2021	AB21-0427-17
Lithium	ND		ug/L	10	04/27/2021	AB21-0427-17
Molybdenum	ND		ug/L	5	04/27/2021	AB21-0427-17
Nickel	ND		ug/L	2	04/27/2021	AB21-0427-17
Selenium	ND		ug/L	1	04/27/2021	AB21-0427-17
Silver	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Thallium	ND		ug/L	2	04/27/2021	AB21-0427-17
Vanadium	ND		ug/L	2	04/27/2021	AB21-0427-17
Zinc	ND		ug/L	10	04/30/2021	AB21-0427-17

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 21-0446-05-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	ND		ug/L	1000	04/22/2021	AB21-0422-06
Fluoride	ND		ug/L	1000	04/22/2021	AB21-0422-06
Sulfate	7090		ug/L	1000	04/22/2021	AB21-0422-06

### Total Dissolved Solids by SM 2540C

Aliquot: 21-0446-05-C04-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	56		mg/L	10	04/16/2021	AB21-0416-04



# Analytical Report

Report Date: 05/03/21

## Laboratory Services A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
 Field Sample ID: **JHC-MW-15028**  
 Lab Sample ID: 21-0446-06  
 Matrix: Groundwater

Laboratory Project: **21-0446**  
 Collect Date: 04/12/2021  
 Collect Time: 06:06 PM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0446-06-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/22/2021	AB21-0422-10

### Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 21-0446-06-C02-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2021	AB21-0427-17
Arsenic	ND		ug/L	1	04/27/2021	AB21-0427-17
Barium	5		ug/L	5	04/27/2021	AB21-0427-17
Beryllium	ND		ug/L	1	04/27/2021	AB21-0427-17
Boron	ND		ug/L	20	04/27/2021	AB21-0427-17
Cadmium	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Calcium	14000		ug/L	1000	04/27/2021	AB21-0427-17
Chromium	ND		ug/L	1	04/27/2021	AB21-0427-17
Cobalt	ND		ug/L	6	04/27/2021	AB21-0427-17
Copper	ND		ug/L	1	04/27/2021	AB21-0427-17
Iron	ND		ug/L	20	04/27/2021	AB21-0427-17
Lead	ND		ug/L	1	04/27/2021	AB21-0427-17
Lithium	ND		ug/L	10	04/27/2021	AB21-0427-17
Molybdenum	ND		ug/L	5	04/27/2021	AB21-0427-17
Nickel	ND		ug/L	2	04/27/2021	AB21-0427-17
Selenium	ND		ug/L	1	04/27/2021	AB21-0427-17
Silver	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Thallium	ND		ug/L	2	04/27/2021	AB21-0427-17
Vanadium	ND		ug/L	2	04/27/2021	AB21-0427-17
Zinc	ND		ug/L	10	04/27/2021	AB21-0427-17

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 21-0446-06-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	ND		ug/L	1000	04/22/2021	AB21-0422-06
Fluoride	ND		ug/L	1000	04/22/2021	AB21-0422-06
Sulfate	5990		ug/L	1000	04/22/2021	AB21-0422-06

### Total Dissolved Solids by SM 2540C

Aliquot: 21-0446-06-C04-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	65		mg/L	10	04/16/2021	AB21-0416-04

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
 Field Sample ID: **DUP-02**  
 Lab Sample ID: 21-0446-07  
 Matrix: Groundwater

Laboratory Project: **21-0446**  
 Collect Date: 04/12/2021  
 Collect Time: 12:00 AM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0446-07-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/22/2021	AB21-0422-10

### Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 21-0446-07-C02-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2021	AB21-0427-17
Arsenic	ND		ug/L	1	04/27/2021	AB21-0427-17
Barium	5		ug/L	5	04/27/2021	AB21-0427-17
Beryllium	ND		ug/L	1	04/27/2021	AB21-0427-17
Boron	ND		ug/L	20	04/27/2021	AB21-0427-17
Cadmium	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Calcium	14700		ug/L	1000	04/27/2021	AB21-0427-17
Chromium	ND		ug/L	1	04/27/2021	AB21-0427-17
Cobalt	ND		ug/L	6	04/27/2021	AB21-0427-17
Copper	ND		ug/L	1	04/27/2021	AB21-0427-17
Iron	ND		ug/L	20	04/27/2021	AB21-0427-17
Lead	ND		ug/L	1	04/27/2021	AB21-0427-17
Lithium	ND		ug/L	10	04/27/2021	AB21-0427-17
Molybdenum	ND		ug/L	5	04/27/2021	AB21-0427-17
Nickel	ND		ug/L	2	04/27/2021	AB21-0427-17
Selenium	ND		ug/L	1	04/27/2021	AB21-0427-17
Silver	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Thallium	ND		ug/L	2	04/27/2021	AB21-0427-17
Vanadium	ND		ug/L	2	04/27/2021	AB21-0427-17
Zinc	ND		ug/L	10	04/27/2021	AB21-0427-17

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 21-0446-07-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	ND		ug/L	1000	04/22/2021	AB21-0422-06
Fluoride	ND		ug/L	1000	04/22/2021	AB21-0422-06
Sulfate	6530		ug/L	1000	04/22/2021	AB21-0422-06

### Total Dissolved Solids by SM 2540C

Aliquot: 21-0446-07-C04-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	64		mg/L	10	04/16/2021	AB21-0416-04

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
 Field Sample ID: **FB-02**  
 Lab Sample ID: 21-0446-08  
 Matrix: Water

Laboratory Project: **21-0446**  
 Collect Date: 04/13/2021  
 Collect Time: 11:00 AM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0446-08-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/22/2021	AB21-0422-10

### Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 21-0446-08-C02-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2021	AB21-0427-17
Arsenic	ND		ug/L	1	04/27/2021	AB21-0427-17
Barium	ND		ug/L	5	04/27/2021	AB21-0427-17
Beryllium	ND		ug/L	1	04/27/2021	AB21-0427-17
Boron	ND		ug/L	20	04/27/2021	AB21-0427-17
Cadmium	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Calcium	ND		ug/L	1000	04/27/2021	AB21-0427-17
Chromium	ND		ug/L	1	04/27/2021	AB21-0427-17
Cobalt	ND		ug/L	6	04/27/2021	AB21-0427-17
Copper	ND		ug/L	1	04/27/2021	AB21-0427-17
Iron	ND		ug/L	20	04/27/2021	AB21-0427-17
Lead	ND		ug/L	1	04/27/2021	AB21-0427-17
Lithium	ND		ug/L	10	04/27/2021	AB21-0427-17
Molybdenum	ND		ug/L	5	04/27/2021	AB21-0427-17
Nickel	ND		ug/L	2	04/27/2021	AB21-0427-17
Selenium	ND		ug/L	1	04/27/2021	AB21-0427-17
Silver	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Thallium	ND		ug/L	2	04/27/2021	AB21-0427-17
Vanadium	ND		ug/L	2	04/27/2021	AB21-0427-17
Zinc	ND		ug/L	10	04/27/2021	AB21-0427-17

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 21-0446-08-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	ND		ug/L	1000	04/22/2021	AB21-0422-06
Fluoride	ND		ug/L	1000	04/22/2021	AB21-0422-06
Sulfate	ND		ug/L	1000	04/22/2021	AB21-0422-06

### Total Dissolved Solids by SM 2540C

Aliquot: 21-0446-08-C04-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	ND		mg/L	10	04/16/2021	AB21-0416-04

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
 Field Sample ID: **EB-02**  
 Lab Sample ID: 21-0446-09  
 Matrix: Water

Laboratory Project: **21-0446**  
 Collect Date: 04/13/2021  
 Collect Time: 12:16 PM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0446-09-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/22/2021	AB21-0422-10

### Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 21-0446-09-C02-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2021	AB21-0427-17
Arsenic	ND		ug/L	1	04/27/2021	AB21-0427-17
Barium	ND		ug/L	5	04/27/2021	AB21-0427-17
Beryllium	ND		ug/L	1	04/27/2021	AB21-0427-17
Boron	ND		ug/L	20	04/27/2021	AB21-0427-17
Cadmium	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Calcium	ND		ug/L	1000	04/27/2021	AB21-0427-17
Chromium	ND		ug/L	1	04/27/2021	AB21-0427-17
Cobalt	ND		ug/L	6	04/27/2021	AB21-0427-17
Copper	ND		ug/L	1	04/27/2021	AB21-0427-17
Iron	ND		ug/L	20	04/27/2021	AB21-0427-17
Lead	ND		ug/L	1	04/27/2021	AB21-0427-17
Lithium	ND		ug/L	10	04/27/2021	AB21-0427-17
Molybdenum	ND		ug/L	5	04/27/2021	AB21-0427-17
Nickel	ND		ug/L	2	04/27/2021	AB21-0427-17
Selenium	ND		ug/L	1	04/27/2021	AB21-0427-17
Silver	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Thallium	ND		ug/L	2	04/27/2021	AB21-0427-17
Vanadium	ND		ug/L	2	04/27/2021	AB21-0427-17
Zinc	ND		ug/L	10	04/27/2021	AB21-0427-17

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 21-0446-09-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	ND		ug/L	1000	04/22/2021	AB21-0422-06
Fluoride	ND		ug/L	1000	04/22/2021	AB21-0422-06
Sulfate	ND		ug/L	1000	04/22/2021	AB21-0422-06

### Total Dissolved Solids by SM 2540C

Aliquot: 21-0446-09-C04-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	ND		mg/L	10	04/16/2021	AB21-0416-04

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
 Field Sample ID: **JHC-MW-15025 Field MS**  
 Lab Sample ID: 21-0446-10  
 Matrix: Groundwater

Laboratory Project: **21-0446**  
 Collect Date: 04/13/2021  
 Collect Time: 11:11 AM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0446-10-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	97.6		%	0.2	04/22/2021	AB21-0422-10

### Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 21-0446-10-C02-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	103		%	1	04/27/2021	AB21-0427-17
Arsenic	106		%	1	04/27/2021	AB21-0427-17
Barium	103		%	5	04/27/2021	AB21-0427-17
Beryllium	102		%	1	04/27/2021	AB21-0427-17
Boron	101		%	20	04/27/2021	AB21-0427-17
Cadmium	103		%	0.2	04/27/2021	AB21-0427-17
Calcium	113		%	1000	04/27/2021	AB21-0427-17
Chromium	94		%	1	04/27/2021	AB21-0427-17
Cobalt	96		%	6	04/27/2021	AB21-0427-17
Copper	95		%	1	04/27/2021	AB21-0427-17
Iron	100		%	20	04/27/2021	AB21-0427-17
Lead	100		%	1	04/27/2021	AB21-0427-17
Lithium	98		%	10	04/27/2021	AB21-0427-17
Molybdenum	103		%	5	04/27/2021	AB21-0427-17
Nickel	95		%	2	04/27/2021	AB21-0427-17
Selenium	105		%	1	04/27/2021	AB21-0427-17
Silver	99.3		%	0.2	04/27/2021	AB21-0427-17
Thallium	100		%	2	04/27/2021	AB21-0427-17
Vanadium	96		%	2	04/27/2021	AB21-0427-17
Zinc	95		%	10	04/27/2021	AB21-0427-17

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 21-0446-10-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	98		%	1000	04/22/2021	AB21-0422-06
Fluoride	94		%	1000	04/22/2021	AB21-0422-06
Sulfate	95		%	1000	04/22/2021	AB21-0422-06

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
 Field Sample ID: **JHC-MW-15025 Field MSD**  
 Lab Sample ID: 21-0446-11  
 Matrix: Groundwater

Laboratory Project: **21-0446**  
 Collect Date: 04/13/2021  
 Collect Time: 11:11 AM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0446-11-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	85.3		%	0.2	04/22/2021	AB21-0422-10

### Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 21-0446-11-C02-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	103		%	1	04/27/2021	AB21-0427-17
Arsenic	104		%	1	04/27/2021	AB21-0427-17
Barium	103		%	5	04/27/2021	AB21-0427-17
Beryllium	101		%	1	04/27/2021	AB21-0427-17
Boron	101		%	20	04/27/2021	AB21-0427-17
Cadmium	101		%	0.2	04/27/2021	AB21-0427-17
Calcium	110		%	1000	04/27/2021	AB21-0427-17
Chromium	95		%	1	04/27/2021	AB21-0427-17
Cobalt	96		%	6	04/27/2021	AB21-0427-17
Copper	94		%	1	04/27/2021	AB21-0427-17
Iron	97		%	20	04/27/2021	AB21-0427-17
Lead	98		%	1	04/27/2021	AB21-0427-17
Lithium	98		%	10	04/27/2021	AB21-0427-17
Molybdenum	104		%	5	04/27/2021	AB21-0427-17
Nickel	95		%	2	04/27/2021	AB21-0427-17
Selenium	107		%	1	04/27/2021	AB21-0427-17
Silver	98.1		%	0.2	04/27/2021	AB21-0427-17
Thallium	100		%	2	04/27/2021	AB21-0427-17
Vanadium	95		%	2	04/27/2021	AB21-0427-17
Zinc	100		%	10	04/27/2021	AB21-0427-17

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 21-0446-11-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	98		%	1000	04/22/2021	AB21-0422-06
Fluoride	94		%	1000	04/22/2021	AB21-0422-06
Sulfate	95		%	1000	04/22/2021	AB21-0422-06

---

Data Qualifiers	Exception Summary
-----------------	-------------------

---

No exceptions occurred.

---



**TITLE: SAMPLE LOG-IN – SHIPMENT INSPECTION FORM**

Project Log-In Number: 21-0446

Inspection Date: 04/15/21 Inspection By: CWH

Sample Origin/Project Name: JHC Q2-2021 Background

Shipment Delivered By: Enter the type of shipment carrier.

Pony \_\_\_\_\_ FedEx \_\_\_\_\_ UPS \_\_\_\_\_ USPS \_\_\_\_\_ Airborne \_\_\_\_\_  
Other/Hand Carry (whom) DMW - CONSUMERS  
Tracking Number: \_\_\_\_\_ Shipping Form Attached: Yes \_\_\_\_\_ No \_\_\_\_\_

Shipping Containers: Enter the type and number of shipping containers received.

Cooler (2) Cardboard Box \_\_\_\_\_ Custom Case \_\_\_\_\_ Envelope/Mailer \_\_\_\_\_  
Loose/Unpackaged Containers \_\_\_\_\_ Other \_\_\_\_\_

Condition of Shipment: Enter the as-received condition of the shipment container.

Damaged Shipment Observed: None  Dented \_\_\_\_\_ Leaking \_\_\_\_\_  
Other \_\_\_\_\_

Shipment Security: Enter if any of the shipping containers were opened before receipt.

Shipping Containers Received: Opened \_\_\_\_\_ Sealed

Enclosed Documents: Enter the type of documents enclosed with the shipment.

CoC  Work Request \_\_\_\_\_ Air Data Sheet \_\_\_\_\_ Other \_\_\_\_\_

Temperature of Containers: Measure the temperature of several sample containers.

As-Received Temperature Range 0.4 - 2.2°C Samples Received on Ice: Yes  No \_\_\_\_\_

M&TE # and Expiration 015484

Number and Type of Containers: Enter the total number of sample containers received.

Container Type	Water	Soil	Other	Broken	Leaking
VOA (40mL or 60mL)	_____	_____	_____	_____	_____
Quart/Liter (g/p)	<u>18</u>	_____	_____	_____	_____
9-oz (amber glass jar)	_____	_____	_____	_____	_____
2-oz (amber glass)	_____	_____	_____	_____	_____
125 mL (plastic)	<u>22</u>	_____	_____	_____	_____
24 mL vial (glass)	_____	_____	_____	_____	_____
<del>250</del> mL (plastic)	<u>9</u>	_____	_____	_____	_____
Other	_____	_____	_____	_____	_____

# CHAIN OF CUSTODY

## CONSUMERS ENERGY COMPANY – LABORATORY SERVICES



135 WEST TRAIL ST., JACKSON, MI 49201 • (517) 788-1251 • FAX (517) 788-2533

SAMPLING SITE: JHC Q2-2021 RCRA GW Monitoring Background Wells				PROJECT NUMBER: <b>21-0446</b>			ANALYSIS REQUESTED						PAGE 1 OF 1				
SAMPLING TEAM: CET / DMW / CLH				DATE SHIPPED		SITE SKETCHED ATTACHED? CIRCLE ONE: <b>NO</b>		Metals, Total	Anions	TDS	Radium	SEND REPORT TO: Caleb Batts					
REMARKS												Beth Swanberg, TRC					
PHONE: _____												REMARKS					
CE CONTROL #	SAMPLE DATE	SAMPLE TIME	SAMPLE MATRIX	SAMPLE DESCRIPTION / LOCATION	DEPTH	# OF CONTAINERS											
21-0446-01	4.12.21	1908	GW	JHC-MW-15023	--	5	X	X	X	X					Dmbo		
-02	4.13.21	1204	GW	JHC-MW-15024	--	5	X	X	X	X					Dmbo		
-03	↓	1111	GW	JHC-MW-15025	--	5	X	X	X	X					Dmbo		
-04	↓	0943	GW	JHC-MW-15026	--	5	X	X	X	X					Dmbo		
-05	↓	0855	GW	JHC-MW-15027	--	5	X	X	X	X					Dmbo		
-06	4.12.21	1806	GW	JHC-MW-15028	--	5	X	X	X	X					Dmbo		
-07	↓	—	GW	DUP-02	--	5	X	X	X	X					Dmbo		
-08	4.13.21	1100	W	FB-02	--	5	X	X	X	X					Dmbo		
-09	↓	1216	W	EB-02	--	5	X	X	X	X					Dmbo		
-10	↓	1111	GW	JHC-MW-15025 Field MS	--	2	X	X							Dmbo		
↓ -11	↓	↓	GW	JHC-MW-15025 Field MSD	--	2	X	X							Dmbo		
RELINQUISHED BY: (SIGNATURE) <i>Dawn Williams</i>				DATE/TIME 4.15.21 1045am		RECEIVED BY: (SIGNATURE) <i>[Signature]</i>				COMMENTS Temp: <del>21.9</del> 0154804 4.15.21 0.6-2.2°C							
RELINQUISHED BY: (SIGNATURE)				DATE/TIME:		RECEIVED BY: (SIGNATURE)				ORIGINAL TO LAB COPY TO CUSTOMER							

## ANALYTICAL REPORT

Eurofins TestAmerica, St. Louis  
13715 Rider Trail North  
Earth City, MO 63045  
Tel: (314)298-8566

Laboratory Job ID: 160-41801-1  
Laboratory Sample Delivery Group: 21-0446  
Client Project/Site: JH Campbell Background Wells

For:  
Consumers Energy  
135 W Trail Street  
Jackson, Michigan 49201

Attn: Emil Blaj



Authorized for release by:  
5/24/2021 2:34:19 PM

Jayna Awalt, Project Manager II  
(314)298-8566  
[Jayna.Awalt@Eurofinset.com](mailto:Jayna.Awalt@Eurofinset.com)

### LINKS

Review your project  
results through  
**TotalAccess**

Have a Question?



Visit us at:  
[www.eurofinsus.com/Env](http://www.eurofinsus.com/Env)

*This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.*

*Results relate only to the items tested and the sample(s) as received by the laboratory.*



# Table of Contents

Cover Page . . . . .	1
Table of Contents . . . . .	2
Case Narrative . . . . .	3
Chain of Custody . . . . .	5
Receipt Checklists . . . . .	6
Definitions/Glossary . . . . .	7
Method Summary . . . . .	8
Sample Summary . . . . .	9
Client Sample Results . . . . .	10
QC Sample Results . . . . .	16
QC Association Summary . . . . .	19
Tracer Carrier Summary . . . . .	20



# Case Narrative

Client: Consumers Energy  
Project/Site: JH Campbell Background Wells

Job ID: 160-41801-1  
SDG: 21-0446

**Job ID: 160-41801-1**

**Laboratory: Eurofins TestAmerica, St. Louis**

**Narrative**

## CASE NARRATIVE

**Client: Consumers Energy**

**Project: JH Campbell Background Wells**

**Report Number: 160-41801-1**

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Eurofins TestAmerica, St. Louis attests to the validity of the laboratory data generated by Eurofins TestAmerica facilities reported herein. All analyses performed by Eurofins TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Eurofins TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

This laboratory report is confidential and is intended for the sole use of Eurofins TestAmerica and its client.

### **RECEIPT**

The samples were received on 04/22/2021; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 14.6 C.

### **RADIUM-226 (GFPC)**

Samples JHC-MW-15023 (160-41801-1), JHC-MW-15024 (160-41801-2), JHC-MW-15025 (160-41801-3), JHC-MW-15026 (160-41801-4), JHC-MW-15027 (160-41801-5), JHC-MW-15028 (160-41801-6), DUP-02 (160-41801-7), FB-02 (160-41801-8) and EB-02 (160-41801-9)

# Case Narrative

Client: Consumers Energy  
Project/Site: JH Campbell Background Wells

Job ID: 160-41801-1  
SDG: 21-0446

## **Job ID: 160-41801-1 (Continued)**

### **Laboratory: Eurofins TestAmerica, St. Louis (Continued)**

were analyzed for Radium-226 (GFPC) in accordance with EPA Method 903.0. The samples were prepared on 04/28/2021 and 04/29/2021 and analyzed on 05/20/2021 and 05/21/2021.

Insufficient sample volume was available to perform a sample duplicate (DUP) for the following samples: JHC-MW-15023 (160-41801-1), JHC-MW-15024 (160-41801-2), JHC-MW-15025 (160-41801-3), JHC-MW-15026 (160-41801-4), JHC-MW-15027 (160-41801-5) and JHC-MW-15028 (160-41801-6). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) was prepared to demonstrate batch precision.

Insufficient sample volume was available to perform a sample duplicate (DUP) for the following samples: DUP-02 (160-41801-7), FB-02 (160-41801-8) and EB-02 (160-41801-9). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) was prepared to demonstrate batch precision.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

### **RADIUM-228 (GFPC)**

Samples JHC-MW-15023 (160-41801-1), JHC-MW-15024 (160-41801-2), JHC-MW-15025 (160-41801-3), JHC-MW-15026 (160-41801-4), JHC-MW-15027 (160-41801-5), JHC-MW-15028 (160-41801-6), DUP-02 (160-41801-7), FB-02 (160-41801-8) and EB-02 (160-41801-9) were analyzed for Radium-228 (GFPC) in accordance with EPA 904. The samples were prepared on 04/28/2021 and 04/29/2021 and analyzed on 05/13/2021.

Insufficient sample volume was available to perform a sample duplicate (DUP) for the following samples: JHC-MW-15023 (160-41801-1), JHC-MW-15024 (160-41801-2), JHC-MW-15025 (160-41801-3), JHC-MW-15026 (160-41801-4), JHC-MW-15027 (160-41801-5) and JHC-MW-15028 (160-41801-6). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) was prepared to demonstrate batch precision.

Insufficient sample volume was available to perform a sample duplicate (DUP) for the following samples: DUP-02 (160-41801-7), FB-02 (160-41801-8) and EB-02 (160-41801-9). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) was prepared to demonstrate batch precision.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

### **COMBINED RADIUM-226 AND RADIUM-228**

Samples JHC-MW-15023 (160-41801-1), JHC-MW-15024 (160-41801-2), JHC-MW-15025 (160-41801-3), JHC-MW-15026 (160-41801-4), JHC-MW-15027 (160-41801-5), JHC-MW-15028 (160-41801-6), DUP-02 (160-41801-7), FB-02 (160-41801-8) and EB-02 (160-41801-9) were analyzed for Combined Radium-226 and Radium-228 in accordance with EPA 903 Radium 226/EPA 904 Radium 228. The samples were analyzed on 05/21/2021.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

# Chain of Custody Record



TestAmerica Laboratories, Inc. d/b/a Eurofins TestAmerica

Regulatory Program:  DW  NPDES  RCRA  Other:

**Project Manager:** Emil Blaj  
 Email: Emil.Blaj@cmsenergy.com  
 Tel/Fax: 517-788-5888

**Client Contact**  
 Consumers Energy, Laboratory Services  
 135 W. Trail Street  
 Jackson, MI 49201  
 517-788-5888 FAX

**Analysis Turnaround Time**  
 CALENDAR DAYS  WORKING DAYS  
 TAT if different from Below \_\_\_\_\_  
 2 weeks  
 1 week  
 2 days  
 1 day

Project Name: JH Campbell Background Wells  
 Project #: 21-0446  
 P O # 21046494

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Preservative	
						Perform MS / MSD (Y / N)	Radium 226 (EPA 903.1)
JHC-MW-15023	4/12/21	1908	G	GW	2	N	X
JHC-MW-15024	4/13/21	1204	G	GW	2	N	X
JHC-MW-15025	4/13/21	1111	G	GW	2	N	X
JHC-MW-15026	4/13/21	0943	G	GW	2	N	X
JHC-MW-15027	4/13/21	0855	G	GW	2	N	X
JHC-MW-15028	4/12/21	1806	G	GW	2	N	X
DUP-02	--	--	G	GW	2	N	X
FB-02	4/13/21	1100	G	DI	2	N	X
EB-02	4/13/21	1216	G	DI	2	N	X



160-41801 Chain of Custody

**Preservation Used:** 1= Ice, 2= HCl, 3= H2SO4, 4= HNO3, 5= NaOH, 6= Other

**Possible Hazard Identification:**  
 Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.  
 Non-Hazardous  Flammable  Skin Irritant  Poison B  Unknown

**Special Instructions/QC Requirements & Comments:**

**Site Contact:** **Bathany Swanberg** Date: \_\_\_\_\_  
**Lab Contact:** **Emil Blaj** Carrier: \_\_\_\_\_

**COC No:** 1 of 1 COCs  
**Sampler:** CLH/DMW/CET  
**For Lab Use Only:**  
 Walk-in Client: \_\_\_\_\_  
 Lab Sampling: \_\_\_\_\_  
 Job / SDG No.: \_\_\_\_\_

**Sample Specific Notes:**

**Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)**  
 Return to Client  Disposal by Lab  Archive for \_\_\_\_\_ Months

**Received by:** WPS Date/Time: 4/22/2021 13:00  
**Received in Laboratory by:** WPS Date/Time: 4/22/2021 13:00

**Cooler Temp. (°C):** Obs'd: \_\_\_\_\_ Cor'd: \_\_\_\_\_ Therm ID No.: \_\_\_\_\_  
**Company:** CE - Trail St - Lab  
**Company:** WPS  
**Company:** WPS

**Custody Seal No.:** \_\_\_\_\_  
**Company:** CE - Trail St - Lab  
**Company:** WPS  
**Company:** WPS



## Login Sample Receipt Checklist

Client: Consumers Energy

Job Number: 160-41801-1

SDG Number: 21-0446

**Login Number: 41801**

**List Number: 1**

**Creator: Korrinhizer, Micha L**

**List Source: Eurofins TestAmerica, St. Louis**

Question	Answer	Comment
Radioactivity wasn't checked or is <math>\leq</math> background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <math><6\text{mm}</math> (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	



# Definitions/Glossary

Client: Consumers Energy  
Project/Site: JH Campbell Background Wells

Job ID: 160-41801-1  
SDG: 21-0446

## Qualifiers

### Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

## Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

# Method Summary

Client: Consumers Energy  
Project/Site: JH Campbell Background Wells

Job ID: 160-41801-1  
SDG: 21-0446

Method	Method Description	Protocol	Laboratory
903.0	Radium-226 (GFPC)	EPA	TAL SL
904.0	Radium-228 (GFPC)	EPA	TAL SL
Ra226_Ra228	Combined Radium-226 and Radium-228	TAL-STL	TAL SL
PrecSep_0	Preparation, Precipitate Separation	None	TAL SL
PrecSep-21	Preparation, Precipitate Separation (21-Day In-Growth)	None	TAL SL

**Protocol References:**

- EPA = US Environmental Protection Agency
- None = None
- TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

**Laboratory References:**

- TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566



# Sample Summary

Client: Consumers Energy  
Project/Site: JH Campbell Background Wells

Job ID: 160-41801-1  
SDG: 21-0446

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
160-41801-1	JHC-MW-15023	Water	04/12/21 19:08	04/22/21 13:00	
160-41801-2	JHC-MW-15024	Water	04/13/21 12:04	04/22/21 13:00	
160-41801-3	JHC-MW-15025	Water	04/13/21 11:11	04/22/21 13:00	
160-41801-4	JHC-MW-15026	Water	04/13/21 09:43	04/22/21 13:00	
160-41801-5	JHC-MW-15027	Water	04/13/21 08:55	04/22/21 13:00	
160-41801-6	JHC-MW-15028	Water	04/12/21 18:06	04/22/21 13:00	
160-41801-7	DUP-02	Water	04/19/21 00:00	04/22/21 13:00	
160-41801-8	FB-02	Water	04/13/21 11:00	04/22/21 13:00	
160-41801-9	EB-02	Water	04/13/21 12:16	04/22/21 13:00	

# Client Sample Results

Client: Consumers Energy  
Project/Site: JH Campbell Background Wells

Job ID: 160-41801-1  
SDG: 21-0446

**Client Sample ID: JHC-MW-15023**

**Lab Sample ID: 160-41801-1**

Date Collected: 04/12/21 19:08

Matrix: Water

Date Received: 04/22/21 13:00

**Method: 903.0 - Radium-226 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0230	U	0.0632	0.0633	1.00	0.120	pCi/L	04/28/21 13:36	05/20/21 06:58	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	82.4		40 - 110					04/28/21 13:36	05/20/21 06:58	1

**Method: 904.0 - Radium-228 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.478		0.283	0.286	1.00	0.427	pCi/L	04/28/21 14:41	05/13/21 13:39	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	82.4		40 - 110					04/28/21 14:41	05/13/21 13:39	1
Y Carrier	85.6		40 - 110					04/28/21 14:41	05/13/21 13:39	1

**Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.501		0.290	0.293	5.00	0.427	pCi/L		05/21/21 21:06	1

**Client Sample ID: JHC-MW-15024**

**Lab Sample ID: 160-41801-2**

Date Collected: 04/13/21 12:04

Matrix: Water

Date Received: 04/22/21 13:00

**Method: 903.0 - Radium-226 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0592	U	0.0859	0.0861	1.00	0.146	pCi/L	04/28/21 13:36	05/20/21 06:58	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	77.9		40 - 110					04/28/21 13:36	05/20/21 06:58	1

**Method: 904.0 - Radium-228 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.00788	U	0.264	0.264	1.00	0.472	pCi/L	04/28/21 14:41	05/13/21 13:39	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	77.9		40 - 110					04/28/21 14:41	05/13/21 13:39	1
Y Carrier	86.7		40 - 110					04/28/21 14:41	05/13/21 13:39	1

# Client Sample Results

Client: Consumers Energy  
Project/Site: JH Campbell Background Wells

Job ID: 160-41801-1  
SDG: 21-0446

**Client Sample ID: JHC-MW-15024**

**Lab Sample ID: 160-41801-2**

Date Collected: 04/13/21 12:04

Matrix: Water

Date Received: 04/22/21 13:00

**Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.0670	U	0.278	0.278	5.00	0.472	pCi/L		05/21/21 21:06	1

**Client Sample ID: JHC-MW-15025**

**Lab Sample ID: 160-41801-3**

Date Collected: 04/13/21 11:11

Matrix: Water

Date Received: 04/22/21 13:00

**Method: 903.0 - Radium-226 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0496	U	0.0682	0.0683	1.00	0.115	pCi/L	04/28/21 13:36	05/20/21 06:58	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Ba Carrier	88.5		40 - 110					04/28/21 13:36	05/20/21 06:58	1

**Method: 904.0 - Radium-228 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0685	U	0.237	0.237	1.00	0.414	pCi/L	04/28/21 14:41	05/13/21 13:39	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Ba Carrier	88.5		40 - 110					04/28/21 14:41	05/13/21 13:39	1
Y Carrier	87.5		40 - 110					04/28/21 14:41	05/13/21 13:39	1

**Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.118	U	0.247	0.247	5.00	0.414	pCi/L		05/21/21 21:06	1

**Client Sample ID: JHC-MW-15026**

**Lab Sample ID: 160-41801-4**

Date Collected: 04/13/21 09:43

Matrix: Water

Date Received: 04/22/21 13:00

**Method: 903.0 - Radium-226 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0872	U	0.0816	0.0819	1.00	0.125	pCi/L	04/28/21 13:36	05/20/21 06:58	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Ba Carrier	82.4		40 - 110					04/28/21 13:36	05/20/21 06:58	1

# Client Sample Results

Client: Consumers Energy  
Project/Site: JH Campbell Background Wells

Job ID: 160-41801-1  
SDG: 21-0446

**Client Sample ID: JHC-MW-15026**

**Lab Sample ID: 160-41801-4**

Date Collected: 04/13/21 09:43

Matrix: Water

Date Received: 04/22/21 13:00

**Method: 904.0 - Radium-228 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.361	U	0.276	0.278	1.00	0.434	pCi/L	04/28/21 14:41	05/13/21 13:39	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	82.4		40 - 110					04/28/21 14:41	05/13/21 13:39	1
Y Carrier	86.7		40 - 110					04/28/21 14:41	05/13/21 13:39	1

**Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.449		0.288	0.290	5.00	0.434	pCi/L		05/21/21 21:06	1

**Client Sample ID: JHC-MW-15027**

**Lab Sample ID: 160-41801-5**

Date Collected: 04/13/21 08:55

Matrix: Water

Date Received: 04/22/21 13:00

**Method: 903.0 - Radium-226 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0345	U	0.0716	0.0717	1.00	0.129	pCi/L	04/28/21 13:36	05/20/21 06:58	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	85.2		40 - 110					04/28/21 13:36	05/20/21 06:58	1

**Method: 904.0 - Radium-228 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.231	U	0.215	0.216	1.00	0.434	pCi/L	04/28/21 14:41	05/13/21 13:39	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	85.2		40 - 110					04/28/21 14:41	05/13/21 13:39	1
Y Carrier	83.0		40 - 110					04/28/21 14:41	05/13/21 13:39	1

**Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	-0.197	U	0.227	0.228	5.00	0.434	pCi/L		05/21/21 21:06	1

# Client Sample Results

Client: Consumers Energy  
Project/Site: JH Campbell Background Wells

Job ID: 160-41801-1  
SDG: 21-0446

**Client Sample ID: JHC-MW-15028**

**Lab Sample ID: 160-41801-6**

Date Collected: 04/12/21 18:06

Matrix: Water

Date Received: 04/22/21 13:00

**Method: 903.0 - Radium-226 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0863	U	0.0770	0.0774	1.00	0.115	pCi/L	04/28/21 13:36	05/20/21 06:58	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	86.1		40 - 110					04/28/21 13:36	05/20/21 06:58	1

**Method: 904.0 - Radium-228 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.175	U	0.224	0.225	1.00	0.435	pCi/L	04/28/21 14:41	05/13/21 13:39	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	86.1		40 - 110					04/28/21 14:41	05/13/21 13:39	1
Y Carrier	84.5		40 - 110					04/28/21 14:41	05/13/21 13:39	1

**Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	-0.0892	U	0.237	0.238	5.00	0.435	pCi/L		05/21/21 21:06	1

**Client Sample ID: DUP-02**

**Lab Sample ID: 160-41801-7**

Date Collected: 04/19/21 00:00

Matrix: Water

Date Received: 04/22/21 13:00

**Method: 903.0 - Radium-226 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.00716	U	0.0580	0.0580	1.00	0.114	pCi/L	04/29/21 09:25	05/21/21 09:19	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	92.4		40 - 110					04/29/21 09:25	05/21/21 09:19	1

**Method: 904.0 - Radium-228 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0880	U	0.192	0.192	1.00	0.332	pCi/L	04/29/21 10:28	05/13/21 13:41	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	92.4		40 - 110					04/29/21 10:28	05/13/21 13:41	1
Y Carrier	87.1		40 - 110					04/29/21 10:28	05/13/21 13:41	1

# Client Sample Results

Client: Consumers Energy  
Project/Site: JH Campbell Background Wells

Job ID: 160-41801-1  
SDG: 21-0446

**Client Sample ID: DUP-02**  
Date Collected: 04/19/21 00:00  
Date Received: 04/22/21 13:00

**Lab Sample ID: 160-41801-7**  
Matrix: Water

**Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.0952	U	0.201	0.201	5.00	0.332	pCi/L		05/21/21 21:05	1

**Client Sample ID: FB-02**  
Date Collected: 04/13/21 11:00  
Date Received: 04/22/21 13:00

**Lab Sample ID: 160-41801-8**  
Matrix: Water

**Method: 903.0 - Radium-226 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.00798	U	0.0611	0.0611	1.00	0.125	pCi/L	04/29/21 09:25	05/21/21 09:19	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Ba Carrier	93.0		40 - 110					04/29/21 09:25	05/21/21 09:19	1

**Method: 904.0 - Radium-228 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0150	U	0.212	0.212	1.00	0.378	pCi/L	04/29/21 10:28	05/13/21 13:41	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Ba Carrier	93.0		40 - 110					04/29/21 10:28	05/13/21 13:41	1
Y Carrier	88.6		40 - 110					04/29/21 10:28	05/13/21 13:41	1

**Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.00699	U	0.221	0.221	5.00	0.378	pCi/L		05/21/21 21:05	1

**Client Sample ID: EB-02**  
Date Collected: 04/13/21 12:16  
Date Received: 04/22/21 13:00

**Lab Sample ID: 160-41801-9**  
Matrix: Water

**Method: 903.0 - Radium-226 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0191	U	0.0684	0.0684	1.00	0.128	pCi/L	04/29/21 09:25	05/21/21 09:19	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Ba Carrier	93.0		40 - 110					04/29/21 09:25	05/21/21 09:19	1



# Client Sample Results

Client: Consumers Energy  
 Project/Site: JH Campbell Background Wells

Job ID: 160-41801-1  
 SDG: 21-0446

**Client Sample ID: EB-02**  
**Date Collected: 04/13/21 12:16**  
**Date Received: 04/22/21 13:00**

**Lab Sample ID: 160-41801-9**  
**Matrix: Water**

**Method: 904.0 - Radium-228 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0113	U	0.222	0.222	1.00	0.397	pCi/L	04/29/21 10:28	05/13/21 13:41	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Ba Carrier	93.0		40 - 110					04/29/21 10:28	05/13/21 13:41	1
Y Carrier	86.4		40 - 110					04/29/21 10:28	05/13/21 13:41	1

**Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.0304	U	0.232	0.232	5.00	0.397	pCi/L		05/21/21 21:05	1

# QC Sample Results

Client: Consumers Energy  
Project/Site: JH Campbell Background Wells

Job ID: 160-41801-1  
SDG: 21-0446

## Method: 903.0 - Radium-226 (GFPC)

**Lab Sample ID: MB 160-507512/23-A**  
**Matrix: Water**  
**Analysis Batch: 510658**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 507512**

Analyte	MB		Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	MB Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-226	0.003416	U	0.0860	0.0860	1.00	0.174	pCi/L	04/28/21 13:36	05/20/21 06:58	1
Carrier	MB		Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	%Yield	MB Qualifier	40 - 110					04/28/21 13:36	05/20/21 06:58	1
	79.7									

**Lab Sample ID: LCS 160-507512/1-A**  
**Matrix: Water**  
**Analysis Batch: 510661**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 507512**

Analyte	Spike Added	LCS Result	LCS Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits	
				Uncert. (2σ+/-)						
Radium-226	15.1	16.09		1.69	1.00	0.173	pCi/L	106	75 - 125	
Carrier	LCS	LCS								
Ba Carrier	%Yield	Qualifier	Limits							
	83.9		40 - 110							

**Lab Sample ID: LCSD 160-507512/2-A**  
**Matrix: Water**  
**Analysis Batch: 510661**

**Client Sample ID: Lab Control Sample Dup**  
**Prep Type: Total/NA**  
**Prep Batch: 507512**

Analyte	Spike Added	LCSD Result	LCSD Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits	RER	Limit	
				Uncert. (2σ+/-)								
Radium-226	15.1	15.77		1.67	1.00	0.181	pCi/L	104	75 - 125	0.1	1	
Carrier	LCSD	LCSD										
Ba Carrier	%Yield	Qualifier	Limits									
	83.6		40 - 110									

**Lab Sample ID: MB 160-507675/23-A**  
**Matrix: Water**  
**Analysis Batch: 511016**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 507675**

Analyte	MB		Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	MB Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-226	0.02967	U	0.0559	0.0560	1.00	0.101	pCi/L	04/29/21 09:25	05/21/21 09:25	1
Carrier	MB		Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	%Yield	MB Qualifier	40 - 110					04/29/21 09:25	05/21/21 09:25	1
	89.4									

**Lab Sample ID: LCS 160-507675/1-A**  
**Matrix: Water**  
**Analysis Batch: 511015**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 507675**

Analyte	Spike Added	LCS Result	LCS Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Radium-226	11.3	11.16		1.16	1.00	0.124	pCi/L	98	75 - 125

# QC Sample Results

Client: Consumers Energy  
Project/Site: JH Campbell Background Wells

Job ID: 160-41801-1  
SDG: 21-0446

## Method: 903.0 - Radium-226 (GFPC) (Continued)

Lab Sample ID: LCS 160-507675/1-A  
Matrix: Water  
Analysis Batch: 511015

Client Sample ID: Lab Control Sample  
Prep Type: Total/NA  
Prep Batch: 507675

Carrier	LCS %Yield	LCS Qualifier	Limits
Ba Carrier	90.6		40 - 110

Lab Sample ID: LCSD 160-507675/2-A  
Matrix: Water  
Analysis Batch: 511015

Client Sample ID: Lab Control Sample Dup  
Prep Type: Total/NA  
Prep Batch: 507675

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec.		RER	Limit
									Limits	RER		
Radium-226	11.3	10.87		1.13	1.00	0.120	pCi/L	96	75 - 125	0.13	1	

Carrier	LCSD %Yield	LCSD Qualifier	Limits
Ba Carrier	85.5		40 - 110

## Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-507517/23-A  
Matrix: Water  
Analysis Batch: 509517

Client Sample ID: Method Blank  
Prep Type: Total/NA  
Prep Batch: 507517

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared		Analyzed	Dil Fac
								Time	Time		
Radium-228	0.3832	U	0.378	0.379	1.00	0.612	pCi/L	04/28/21 14:41	05/13/21 13:39	1	

Carrier	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	79.7		40 - 110	04/28/21 14:41	05/13/21 13:39	1
Y Carrier	84.9		40 - 110	04/28/21 14:41	05/13/21 13:39	1

Lab Sample ID: LCS 160-507517/1-A  
Matrix: Water  
Analysis Batch: 509526

Client Sample ID: Lab Control Sample  
Prep Type: Total/NA  
Prep Batch: 507517

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec.	
									Limits	RER
Radium-228	9.62	9.964		1.26	1.00	0.605	pCi/L	104	75 - 125	

Carrier	LCS %Yield	LCS Qualifier	Limits
Ba Carrier	83.9		40 - 110
Y Carrier	88.2		40 - 110

Lab Sample ID: LCSD 160-507517/2-A  
Matrix: Water  
Analysis Batch: 509526

Client Sample ID: Lab Control Sample Dup  
Prep Type: Total/NA  
Prep Batch: 507517

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec.		RER	Limit
									Limits	RER		
Radium-228	9.62	10.04		1.26	1.00	0.581	pCi/L	104	75 - 125	0.03	1	

# QC Sample Results

Client: Consumers Energy  
Project/Site: JH Campbell Background Wells

Job ID: 160-41801-1  
SDG: 21-0446

## Method: 904.0 - Radium-228 (GFPC) (Continued)

**Lab Sample ID: LCSD 160-507517/2-A**  
**Matrix: Water**  
**Analysis Batch: 509526**

**Client Sample ID: Lab Control Sample Dup**  
**Prep Type: Total/NA**  
**Prep Batch: 507517**

Carrier	LCSD		Limits
	%Yield	Qualifier	
Ba Carrier	83.6		40 - 110
Y Carrier	88.2		40 - 110

**Lab Sample ID: MB 160-507679/23-A**  
**Matrix: Water**  
**Analysis Batch: 509482**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 507679**

Analyte	MB		Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared		Analyzed		Dil Fac
	Result	Qualifier										
Radium-228	0.2507	U	0.248	0.249	1.00	0.402	pCi/L	04/29/21 10:28	05/13/21 13:46			1

Carrier	MB		Limits	Prepared		Analyzed		Dil Fac
	%Yield	Qualifier						
Ba Carrier	89.4		40 - 110	04/29/21 10:28	05/13/21 13:46			1
Y Carrier	86.0		40 - 110	04/29/21 10:28	05/13/21 13:46			1

**Lab Sample ID: LCS 160-507679/1-A**  
**Matrix: Water**  
**Analysis Batch: 509517**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 507679**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	
									Radium-228	7.21

Carrier	LCS		Limits
	%Yield	Qualifier	
Ba Carrier	90.6		40 - 110
Y Carrier	86.7		40 - 110

**Lab Sample ID: LCSD 160-507679/2-A**  
**Matrix: Water**  
**Analysis Batch: 509517**

**Client Sample ID: Lab Control Sample Dup**  
**Prep Type: Total/NA**  
**Prep Batch: 507679**

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		RER	Limit
									Radium-228	7.21	7.865	

Carrier	LCSD		Limits
	%Yield	Qualifier	
Ba Carrier	85.5		40 - 110
Y Carrier	86.7		40 - 110

# QC Association Summary

Client: Consumers Energy  
 Project/Site: JH Campbell Background Wells

Job ID: 160-41801-1  
 SDG: 21-0446

## Rad

### Prep Batch: 507512

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-41801-1	JHC-MW-15023	Total/NA	Water	PrecSep-21	
160-41801-2	JHC-MW-15024	Total/NA	Water	PrecSep-21	
160-41801-3	JHC-MW-15025	Total/NA	Water	PrecSep-21	
160-41801-4	JHC-MW-15026	Total/NA	Water	PrecSep-21	
160-41801-5	JHC-MW-15027	Total/NA	Water	PrecSep-21	
160-41801-6	JHC-MW-15028	Total/NA	Water	PrecSep-21	
MB 160-507512/23-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-507512/1-A	Lab Control Sample	Total/NA	Water	PrecSep-21	
LCSD 160-507512/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep-21	

### Prep Batch: 507517

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-41801-1	JHC-MW-15023	Total/NA	Water	PrecSep_0	
160-41801-2	JHC-MW-15024	Total/NA	Water	PrecSep_0	
160-41801-3	JHC-MW-15025	Total/NA	Water	PrecSep_0	
160-41801-4	JHC-MW-15026	Total/NA	Water	PrecSep_0	
160-41801-5	JHC-MW-15027	Total/NA	Water	PrecSep_0	
160-41801-6	JHC-MW-15028	Total/NA	Water	PrecSep_0	
MB 160-507517/23-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-507517/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-507517/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

### Prep Batch: 507675

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-41801-7	DUP-02	Total/NA	Water	PrecSep-21	
160-41801-8	FB-02	Total/NA	Water	PrecSep-21	
160-41801-9	EB-02	Total/NA	Water	PrecSep-21	
MB 160-507675/23-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-507675/1-A	Lab Control Sample	Total/NA	Water	PrecSep-21	
LCSD 160-507675/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep-21	

### Prep Batch: 507679

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-41801-7	DUP-02	Total/NA	Water	PrecSep_0	
160-41801-8	FB-02	Total/NA	Water	PrecSep_0	
160-41801-9	EB-02	Total/NA	Water	PrecSep_0	
MB 160-507679/23-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-507679/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-507679/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

# Tracer/Carrier Summary

Client: Consumers Energy  
 Project/Site: JH Campbell Background Wells

Job ID: 160-41801-1  
 SDG: 21-0446

## Method: 903.0 - Radium-226 (GFPC)

Matrix: Water

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Yield (Acceptance Limits)	
		Ba (40-110)	
160-41801-1	JHC-MW-15023	82.4	
160-41801-2	JHC-MW-15024	77.9	
160-41801-3	JHC-MW-15025	88.5	
160-41801-4	JHC-MW-15026	82.4	
160-41801-5	JHC-MW-15027	85.2	
160-41801-6	JHC-MW-15028	86.1	
160-41801-7	DUP-02	92.4	
160-41801-8	FB-02	93.0	
160-41801-9	EB-02	93.0	
LCS 160-507512/1-A	Lab Control Sample	83.9	
LCS 160-507675/1-A	Lab Control Sample	90.6	
LCSD 160-507512/2-A	Lab Control Sample Dup	83.6	
LCSD 160-507675/2-A	Lab Control Sample Dup	85.5	
MB 160-507512/23-A	Method Blank	79.7	
MB 160-507675/23-A	Method Blank	89.4	

**Tracer/Carrier Legend**

Ba = Ba Carrier

## Method: 904.0 - Radium-228 (GFPC)

Matrix: Water

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Yield (Acceptance Limits)	
		Ba (40-110)	Y (40-110)
160-41801-1	JHC-MW-15023	82.4	85.6
160-41801-2	JHC-MW-15024	77.9	86.7
160-41801-3	JHC-MW-15025	88.5	87.5
160-41801-4	JHC-MW-15026	82.4	86.7
160-41801-5	JHC-MW-15027	85.2	83.0
160-41801-6	JHC-MW-15028	86.1	84.5
160-41801-7	DUP-02	92.4	87.1
160-41801-8	FB-02	93.0	88.6
160-41801-9	EB-02	93.0	86.4
LCS 160-507517/1-A	Lab Control Sample	83.9	88.2
LCS 160-507679/1-A	Lab Control Sample	90.6	86.7
LCSD 160-507517/2-A	Lab Control Sample Dup	83.6	88.2
LCSD 160-507679/2-A	Lab Control Sample Dup	85.5	86.7
MB 160-507517/23-A	Method Blank	79.7	84.9
MB 160-507679/23-A	Method Blank	89.4	86.0

**Tracer/Carrier Legend**

Ba = Ba Carrier

Y = Y Carrier

To: CDBatts, JH Campbell Complex

From: EBlaj, T-258

Date: May 03, 2021

Subject: JH CAMPBELL SOLID WASTE DISPOSAL AREA – GROUNDWATER MONITORING  
2<sup>nd</sup> Quarter, 2021 – Pond A Wells

CC: BLSwanberg, P22-119  
BTRunkel, P22-120  
HDRregister, P22-521

Sarah Holmstrom, Project Manager  
TRC Companies, Inc.  
1540 Eisenhower Place  
Ann Arbor, MI 48108

---

**Chemistry Project: 21-0445**

CE Laboratory Services conducted groundwater monitoring on 04/12/2021 through 04/15/2021 at the JH Campbell Solid Waste Disposal Area, for the 2<sup>nd</sup> Quarter monitoring requirements. Samples were not collected from MW-15007, MW-15009, and MW-15010, the wells were dry. All other samples were received for analysis by the Chemistry department on 04/15/2021.

Samples for Radium analysis have been subcontracted to Eurofins/TestAmerica, Inc. and their results are being reported separately. Please note that the subcontracted work is not reported under the CE laboratory scope of accreditation.

With the exception noted above, the report that follows presents the results of the requested analytical testing; the results apply only to the samples, as received. All samples have been analyzed in accordance with the 2016 TNI Standard and the applicable A2LA accreditation scope for Laboratory Services. Any exceptions to applicable test method criteria and standard compliance are noted in the Case Narrative, or flagged with applicable qualifiers in the analytical results section.

Reviewed and approved by:

Emil Blaj  
Sr. Technical Analyst  
Project Lead



*Testing performed in accordance with the A2LA scope of accreditation specified in the listed certificate. The information contained in this report is the sole property of Consumers Energy. It cannot be reproduced except in full, and with consent from Consumers Energy, or the customer for which this report was issued.*

## CASE NARRATIVE

### I. Sample Receipt

All samples were received within hold time and in good conditions; no anomalies were noted on the Sample Log-In Shipment Inspection Form during sample check-in. Identification of all samples included in the work order/project is provided in the sample summary section. Sample preservation upon receipt was verified by the sample custodian and confirmed to meet method requirements.

### II. Methodology

Unless otherwise indicated, sample preparation and analysis was performed in accordance with the corresponding test methods from “Methods for the Determination of Inorganic Substances in Environmental Samples (EPA/600/R-93/100); SW-846, “Test Methods for Evaluating Solid Waste – Physical/Chemical Methods”, USEPA (latest revisions), and Standard Methods for the Examination of Water and Wastewater, APHA-AWWA-WPCF, 22<sup>nd</sup> Edition, 2012.

### III. Results/Quality Control

Analytical results for this report are presented by laboratory sample ID, container & aliquot number. Results for the field blanks, field duplicates, and percent recoveries of the field matrix spike & matrix spike duplicate samples are included in the results section. Unless specifically noted in the case narrative, all method quality control requirements have been met. If any results are qualified, the corresponding data flags/qualifiers are listed on the last page of the results section. Any additional information on method performance, when applicable, is presented in this section of the case narrative. When data flags are not needed, the qualifiers text box on the last page is left blank, and a statement confirms that no exceptions occurred.

## DEFINITIONS / QUALIFIERS

The following qualifiers and/or acronyms are used in the report where applicable:

<u>Acronym</u>	<u>Description</u>
RL	Reporting Limit
ND	Result not detected or below Reporting Limit
NT	Not a TNI Analyte
LCS	Laboratory Control Sample
LRB	Laboratory Reagent Blank (also referred to as Method Blank)
DUP	Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
TDL	Target Detection Limit
SM	Standard Methods Compendium

<u>Qualifier</u>	<u>Description</u>
*	Generic data flag, applicable description added in the corresponding notes section
B	The analyte was detected in the LRB at a level which is significant relative to sample result



D	Reporting limit elevated due to dilution
E	Estimated due to result exceeding the linear range of the analyzer
H	The maximum recommended hold time was exceeded
I	Dilution required due to matrix interference; reporting limit elevated
J	Estimated due to result found above MDL but below PQL (or RL)
K	Reporting limit raised due to matrix interference
M	The precision for duplicate analysis was not met; RPD outside acceptance criteria
N	Non-homogeneous sample made analysis questionable
PI	Possible interference may have affected the accuracy of the laboratory result
Q	Matrix Spike or Matrix Spike Duplicate recovery outside acceptance criteria
R	Result confirmed by new sample preparation and reanalysis
X	Other notation required; comment listed in sample notes and/or case narrative

## Work Order Sample Summary

---

**Customer Name:** JH Campbell Complex  
**Work Order ID:** Q2-2021 Pond A Wells  
**Date Received:** 4/15/2021  
**Chemistry Project:** 21-0445

<u>Sample #</u>	<u>Field Sample ID</u>	<u>Matrix</u>	<u>Sample Date</u>	<u>Site</u>
21-0445-01	JHC-MW-15006	Groundwater	04/13/2021 06:37 PM	JHC RCRA GW Monitoring - Pond A Unit
21-0445-02	JHC-MW-15007	Not Collected, well was dry		JHC RCRA GW Monitoring - Pond A Unit
21-0445-03	JHC-MW-15008R	Groundwater	04/13/2021 09:21 AM	JHC RCRA GW Monitoring - Pond A Unit
21-0445-04	JHC-MW-15009	Not Collected, well was dry		JHC RCRA GW Monitoring - Pond A Unit
21-0445-05	JHC-MW-15010	Not Collected, well was dry		JHC RCRA GW Monitoring - Pond A Unit
21-0445-06	JHC-MW-15011	Groundwater	04/13/2021 07:23 PM	JHC RCRA GW Monitoring - Pond A Unit
21-0445-07	DUP-01	Groundwater	04/13/2021 12:00 AM	JHC RCRA GW Monitoring - Pond A Unit
21-0445-08	EB-01	Water	04/13/2021 09:29 AM	JHC RCRA GW Monitoring - Pond A Unit
21-0445-09	FB-01	Water	04/13/2021 08:10 AM	JHC RCRA GW Monitoring - Pond A Unit
21-0445-10	JHC-MW-15006 Field MS	Groundwater	04/13/2021 06:37 PM	JHC RCRA GW Monitoring - Pond A Unit
21-0445-11	JHC-MW-15006 Field MSD	Groundwater	04/13/2021 06:37 PM	JHC RCRA GW Monitoring - Pond A Unit



# Analytical Report

Report Date: 05/03/21

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**  
 Field Sample ID: **JHC-MW-15006**  
 Lab Sample ID: 21-0445-01  
 Matrix: Groundwater

Laboratory Project: **21-0445**  
 Collect Date: 04/13/2021  
 Collect Time: 06:37 PM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0445-01-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/22/2021	AB21-0422-10

### Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 21-0445-01-C02-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2021	AB21-0427-17
Arsenic	3		ug/L	1	04/27/2021	AB21-0427-17
Barium	188		ug/L	5	04/27/2021	AB21-0427-17
Beryllium	ND		ug/L	1	04/27/2021	AB21-0427-17
Boron	288		ug/L	20	04/27/2021	AB21-0427-17
Cadmium	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Calcium	82000		ug/L	1000	04/27/2021	AB21-0427-17
Chromium	3		ug/L	1	04/27/2021	AB21-0427-17
Cobalt	ND		ug/L	6	04/27/2021	AB21-0427-17
Copper	4		ug/L	1	04/27/2021	AB21-0427-17
Iron	41		ug/L	20	04/27/2021	AB21-0427-17
Lead	ND		ug/L	1	04/27/2021	AB21-0427-17
Lithium	12		ug/L	10	04/27/2021	AB21-0427-17
Molybdenum	54		ug/L	5	04/27/2021	AB21-0427-17
Nickel	2		ug/L	2	04/27/2021	AB21-0427-17
Selenium	ND		ug/L	1	04/27/2021	AB21-0427-17
Silver	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Thallium	ND		ug/L	2	04/27/2021	AB21-0427-17
Vanadium	7		ug/L	2	04/27/2021	AB21-0427-17
Zinc	ND		ug/L	10	04/30/2021	AB21-0427-17

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 21-0445-01-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	22900		ug/L	1000	04/21/2021	AB21-0421-02
Fluoride	ND		ug/L	1000	04/21/2021	AB21-0421-02
Sulfate	257000		ug/L	1000	04/27/2021	AB21-0421-02

### Total Dissolved Solids by SM 2540C

Aliquot: 21-0445-01-C04-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	497		mg/L	10	04/19/2021	AB21-0419-04

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**  
 Field Sample ID: **JHC-MW-15008R**  
 Lab Sample ID: 21-0445-03  
 Matrix: Groundwater

Laboratory Project: **21-0445**  
 Collect Date: 04/13/2021  
 Collect Time: 09:21 AM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0445-03-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/22/2021	AB21-0422-10

### Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 21-0445-03-C02-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	1		ug/L	1	04/27/2021	AB21-0427-17
Arsenic	ND		ug/L	1	04/27/2021	AB21-0427-17
Barium	200		ug/L	5	04/27/2021	AB21-0427-17
Beryllium	ND		ug/L	1	04/27/2021	AB21-0427-17
Boron	352		ug/L	20	04/27/2021	AB21-0427-17
Cadmium	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Calcium	85400		ug/L	1000	04/27/2021	AB21-0427-17
Chromium	41		ug/L	1	04/27/2021	AB21-0427-17
Cobalt	ND		ug/L	6	04/27/2021	AB21-0427-17
Copper	5		ug/L	1	04/27/2021	AB21-0427-17
Iron	347		ug/L	20	04/27/2021	AB21-0427-17
Lead	ND		ug/L	1	04/27/2021	AB21-0427-17
Lithium	20		ug/L	10	04/27/2021	AB21-0427-17
Molybdenum	17		ug/L	5	04/27/2021	AB21-0427-17
Nickel	38		ug/L	2	04/27/2021	AB21-0427-17
Selenium	6		ug/L	1	04/27/2021	AB21-0427-17
Silver	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Thallium	2		ug/L	2	04/27/2021	AB21-0427-17
Vanadium	ND		ug/L	2	04/27/2021	AB21-0427-17
Zinc	ND		ug/L	10	04/27/2021	AB21-0427-17

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 21-0445-03-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	17200		ug/L	1000	04/21/2021	AB21-0421-02
Fluoride	ND		ug/L	1000	04/21/2021	AB21-0421-02
Sulfate	185000		ug/L	1000	04/21/2021	AB21-0421-02

### Total Dissolved Solids by SM 2540C

Aliquot: 21-0445-03-C04-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	517		mg/L	10	04/19/2021	AB21-0419-04



# Analytical Report

Report Date: 05/03/21

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**  
 Field Sample ID: **JHC-MW-15011**  
 Lab Sample ID: 21-0445-06  
 Matrix: Groundwater

Laboratory Project: **21-0445**  
 Collect Date: 04/13/2021  
 Collect Time: 07:23 PM

### Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 21-0445-06-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2021	AB21-0427-17
Arsenic	13		ug/L	1	04/27/2021	AB21-0427-17
Barium	399		ug/L	5	04/27/2021	AB21-0427-17
Beryllium	ND		ug/L	1	04/27/2021	AB21-0427-17
Boron	5070		ug/L	20	04/27/2021	AB21-0427-17
Cadmium	0.8		ug/L	0.2	04/27/2021	AB21-0427-17
Calcium	78700		ug/L	1000	04/27/2021	AB21-0427-17
Chromium	5		ug/L	1	04/27/2021	AB21-0427-17
Cobalt	ND		ug/L	6	04/27/2021	AB21-0427-17
Copper	2		ug/L	1	04/27/2021	AB21-0427-17
Iron	57		ug/L	20	04/27/2021	AB21-0427-17
Lead	ND		ug/L	1	04/27/2021	AB21-0427-17
Lithium	14		ug/L	10	04/27/2021	AB21-0427-17
Molybdenum	8		ug/L	5	04/27/2021	AB21-0427-17
Nickel	8		ug/L	2	04/27/2021	AB21-0427-17
Selenium	143		ug/L	1	04/27/2021	AB21-0427-17
Silver	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Thallium	ND		ug/L	2	04/27/2021	AB21-0427-17
Vanadium	34		ug/L	2	04/27/2021	AB21-0427-17
Zinc	ND		ug/L	10	04/30/2021	AB21-0427-17

### Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0445-06-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/22/2021	AB21-0422-10

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 21-0445-06-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	2650		ug/L	1000	04/21/2021	AB21-0421-02
Fluoride	ND		ug/L	1000	04/21/2021	AB21-0421-02
Sulfate	113000		ug/L	1000	04/21/2021	AB21-0421-02

### Total Dissolved Solids by SM 2540C

Aliquot: 21-0445-06-C04-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	359		mg/L	10	04/19/2021	AB21-0419-04

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**  
 Field Sample ID: **DUP-01**  
 Lab Sample ID: 21-0445-07  
 Matrix: Groundwater

Laboratory Project: **21-0445**  
 Collect Date: 04/13/2021  
 Collect Time: 12:00 AM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0445-07-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/22/2021	AB21-0422-10

### Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 21-0445-07-C02-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2021	AB21-0427-17
Arsenic	ND		ug/L	1	04/27/2021	AB21-0427-17
Barium	195		ug/L	5	04/27/2021	AB21-0427-17
Beryllium	ND		ug/L	1	04/27/2021	AB21-0427-17
Boron	360		ug/L	20	04/27/2021	AB21-0427-17
Cadmium	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Calcium	87000		ug/L	1000	04/27/2021	AB21-0427-17
Chromium	56		ug/L	1	04/27/2021	AB21-0427-17
Cobalt	ND		ug/L	6	04/27/2021	AB21-0427-17
Copper	5		ug/L	1	04/27/2021	AB21-0427-17
Iron	419		ug/L	20	04/27/2021	AB21-0427-17
Lead	ND		ug/L	1	04/27/2021	AB21-0427-17
Lithium	21		ug/L	10	04/27/2021	AB21-0427-17
Molybdenum	19		ug/L	5	04/27/2021	AB21-0427-17
Nickel	48		ug/L	2	04/27/2021	AB21-0427-17
Selenium	6		ug/L	1	04/27/2021	AB21-0427-17
Silver	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Thallium	ND		ug/L	2	04/27/2021	AB21-0427-17
Vanadium	ND		ug/L	2	04/27/2021	AB21-0427-17
Zinc	ND		ug/L	10	04/30/2021	AB21-0427-17

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 21-0445-07-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	17100		ug/L	1000	04/21/2021	AB21-0421-02
Fluoride	ND		ug/L	1000	04/21/2021	AB21-0421-02
Sulfate	186000		ug/L	1000	04/21/2021	AB21-0421-02

### Total Dissolved Solids by SM 2540C

Aliquot: 21-0445-07-C04-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	512		mg/L	10	04/19/2021	AB21-0419-04



# Analytical Report

Report Date: 05/03/21

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**  
 Field Sample ID: **EB-01**  
 Lab Sample ID: 21-0445-08  
 Matrix: Water

Laboratory Project: **21-0445**  
 Collect Date: 04/13/2021  
 Collect Time: 09:29 AM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0445-08-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/22/2021	AB21-0422-10

### Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 21-0445-08-C02-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2021	AB21-0427-17
Arsenic	ND		ug/L	1	04/27/2021	AB21-0427-17
Barium	ND		ug/L	5	04/27/2021	AB21-0427-17
Beryllium	ND		ug/L	1	04/27/2021	AB21-0427-17
Boron	ND		ug/L	20	04/27/2021	AB21-0427-17
Cadmium	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Calcium	ND		ug/L	1000	04/27/2021	AB21-0427-17
Chromium	ND		ug/L	1	04/27/2021	AB21-0427-17
Cobalt	ND		ug/L	6	04/27/2021	AB21-0427-17
Copper	ND		ug/L	1	04/27/2021	AB21-0427-17
Iron	ND		ug/L	20	04/27/2021	AB21-0427-17
Lead	ND		ug/L	1	04/27/2021	AB21-0427-17
Lithium	ND		ug/L	10	04/27/2021	AB21-0427-17
Molybdenum	ND		ug/L	5	04/27/2021	AB21-0427-17
Nickel	ND		ug/L	2	04/27/2021	AB21-0427-17
Selenium	ND		ug/L	1	04/27/2021	AB21-0427-17
Silver	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Thallium	ND		ug/L	2	04/27/2021	AB21-0427-17
Vanadium	ND		ug/L	2	04/27/2021	AB21-0427-17
Zinc	ND		ug/L	10	04/30/2021	AB21-0427-17

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 21-0445-08-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	ND		ug/L	1000	04/21/2021	AB21-0421-02
Fluoride	ND		ug/L	1000	04/21/2021	AB21-0421-02
Sulfate	ND		ug/L	1000	04/21/2021	AB21-0421-02

### Total Dissolved Solids by SM 2540C

Aliquot: 21-0445-08-C04-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	ND		mg/L	10	04/19/2021	AB21-0419-04



# Analytical Report

Report Date: 05/03/21

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**  
 Field Sample ID: **FB-01**  
 Lab Sample ID: 21-0445-09  
 Matrix: Water

Laboratory Project: **21-0445**  
 Collect Date: 04/13/2021  
 Collect Time: 08:10 AM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0445-09-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/22/2021	AB21-0422-10

### Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 21-0445-09-C02-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2021	AB21-0427-17
Arsenic	ND		ug/L	1	04/27/2021	AB21-0427-17
Barium	ND		ug/L	5	04/27/2021	AB21-0427-17
Beryllium	ND		ug/L	1	04/27/2021	AB21-0427-17
Boron	ND		ug/L	20	04/27/2021	AB21-0427-17
Cadmium	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Calcium	ND		ug/L	1000	04/27/2021	AB21-0427-17
Chromium	ND		ug/L	1	04/27/2021	AB21-0427-17
Cobalt	ND		ug/L	6	04/27/2021	AB21-0427-17
Copper	ND		ug/L	1	04/27/2021	AB21-0427-17
Iron	ND		ug/L	20	04/27/2021	AB21-0427-17
Lead	ND		ug/L	1	04/27/2021	AB21-0427-17
Lithium	ND		ug/L	10	04/27/2021	AB21-0427-17
Molybdenum	ND		ug/L	5	04/27/2021	AB21-0427-17
Nickel	ND		ug/L	2	04/27/2021	AB21-0427-17
Selenium	ND		ug/L	1	04/27/2021	AB21-0427-17
Silver	ND		ug/L	0.2	04/27/2021	AB21-0427-17
Thallium	ND		ug/L	2	04/27/2021	AB21-0427-17
Vanadium	ND		ug/L	2	04/27/2021	AB21-0427-17
Zinc	ND		ug/L	10	04/27/2021	AB21-0427-17

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 21-0445-09-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	ND		ug/L	1000	04/21/2021	AB21-0421-02
Fluoride	ND		ug/L	1000	04/21/2021	AB21-0421-02
Sulfate	ND		ug/L	1000	04/21/2021	AB21-0421-02

### Total Dissolved Solids by SM 2540C

Aliquot: 21-0445-09-C04-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	ND		mg/L	10	04/19/2021	AB21-0419-04





# Analytical Report

Report Date: 05/03/21

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**  
 Field Sample ID: **JHC-MW-15006 Field MS**  
 Lab Sample ID: 21-0445-10  
 Matrix: Groundwater

Laboratory Project: **21-0445**  
 Collect Date: 04/13/2021  
 Collect Time: 06:37 PM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0445-10-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	108		%	0.2	04/22/2021	AB21-0422-10

### Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 21-0445-10-C02-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	104		%	1	04/27/2021	AB21-0427-17
Arsenic	106		%	1	04/27/2021	AB21-0427-17
Barium	103		%	5	04/27/2021	AB21-0427-17
Beryllium	103		%	1	04/27/2021	AB21-0427-17
Boron	102		%	20	04/27/2021	AB21-0427-17
Cadmium	103		%	0.2	04/27/2021	AB21-0427-17
Calcium	113		%	1000	04/27/2021	AB21-0427-17
Chromium	95		%	1	04/27/2021	AB21-0427-17
Cobalt	97		%	6	04/27/2021	AB21-0427-17
Copper	95		%	1	04/27/2021	AB21-0427-17
Iron	95		%	20	04/27/2021	AB21-0427-17
Lead	96		%	1	04/27/2021	AB21-0427-17
Lithium	101		%	10	04/27/2021	AB21-0427-17
Molybdenum	104		%	5	04/27/2021	AB21-0427-17
Nickel	98		%	2	04/27/2021	AB21-0427-17
Selenium	107		%	1	04/27/2021	AB21-0427-17
Silver	98.0		%	0.2	04/27/2021	AB21-0427-17
Thallium	98		%	2	04/27/2021	AB21-0427-17
Vanadium	98		%	2	04/27/2021	AB21-0427-17
Zinc	97		%	10	04/27/2021	AB21-0427-17

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 21-0445-10-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	99		%	1000	04/21/2021	AB21-0421-02
Fluoride	93		%	1000	04/21/2021	AB21-0421-02
Sulfate	101		%	1000	04/27/2021	AB21-0421-02

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**  
 Field Sample ID: **JHC-MW-15006 Field MSD**  
 Lab Sample ID: 21-0445-11  
 Matrix: Groundwater

Laboratory Project: **21-0445**  
 Collect Date: 04/13/2021  
 Collect Time: 06:37 PM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0445-11-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	92.2		%	0.2	04/22/2021	AB21-0422-10

### Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 21-0445-11-C02-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	106		%	1	04/27/2021	AB21-0427-17
Arsenic	106		%	1	04/27/2021	AB21-0427-17
Barium	104		%	5	04/27/2021	AB21-0427-17
Beryllium	103		%	1	04/27/2021	AB21-0427-17
Boron	104		%	20	04/27/2021	AB21-0427-17
Cadmium	105		%	0.2	04/27/2021	AB21-0427-17
Calcium	111		%	1000	04/27/2021	AB21-0427-17
Chromium	95		%	1	04/27/2021	AB21-0427-17
Cobalt	99		%	6	04/27/2021	AB21-0427-17
Copper	94		%	1	04/27/2021	AB21-0427-17
Iron	95		%	20	04/27/2021	AB21-0427-17
Lead	96		%	1	04/27/2021	AB21-0427-17
Lithium	101		%	10	04/27/2021	AB21-0427-17
Molybdenum	105		%	5	04/27/2021	AB21-0427-17
Nickel	98		%	2	04/27/2021	AB21-0427-17
Selenium	107		%	1	04/27/2021	AB21-0427-17
Silver	100		%	0.2	04/27/2021	AB21-0427-17
Thallium	98		%	2	04/27/2021	AB21-0427-17
Vanadium	98		%	2	04/27/2021	AB21-0427-17
Zinc	101		%	10	04/27/2021	AB21-0427-17

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 21-0445-11-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	97		%	1000	04/21/2021	AB21-0421-02
Fluoride	91		%	1000	04/21/2021	AB21-0421-02
Sulfate	97		%	1000	04/27/2021	AB21-0421-02



# Analytical Report

Report Date: 05/03/21

**Laboratory Services**  
A CENTURY OF EXCELLENCE

Data Qualifiers	Exception Summary
-----------------	-------------------

No exceptions occurred.

**TITLE: SAMPLE LOG-IN – SHIPMENT INSPECTION FORM**

Project Log-In Number: 21-0445

Inspection Date: 04.15.21 Inspection By: WLT

Sample Origin/Project Name: JHC Q2-2021 POND A

Shipment Delivered By: Enter the type of shipment carrier.

Pony \_\_\_\_\_ FedEx \_\_\_\_\_ UPS \_\_\_\_\_ USPS \_\_\_\_\_ Airborne \_\_\_\_\_  
Other/Hand Carry (whom) CUT / CET - CONSUMERS  
Tracking Number: \_\_\_\_\_ Shipping Form Attached: Yes \_\_\_\_\_ No \_\_\_\_\_

Shipping Containers: Enter the type and number of shipping containers received.

Cooler 2 Cardboard Box \_\_\_\_\_ Custom Case \_\_\_\_\_ Envelope/Mailer \_\_\_\_\_  
Loose/Unpackaged Containers \_\_\_\_\_ Other \_\_\_\_\_

Condition of Shipment: Enter the as-received condition of the shipment container.

Damaged Shipment Observed: None  Dented \_\_\_\_\_ Leaking \_\_\_\_\_  
Other \_\_\_\_\_

Shipment Security: Enter if any of the shipping containers were opened before receipt.

Shipping Containers Received: Opened \_\_\_\_\_ Sealed

Enclosed Documents: Enter the type of documents enclosed with the shipment

CoC  Work Request \_\_\_\_\_ Air Data Sheet \_\_\_\_\_ Other \_\_\_\_\_

Temperature of Containers: Measure the temperature of several sample containers.

As-Received Temperature Range 3.1-5.6°C Samples Received on Ice: Yes  No \_\_\_\_\_

M&TE # and Expiration 015402  
6.4.21

Number and Type of Containers: Enter the total number of sample containers received.


Container Type	Water	Soil	Other	Broken	Leaking
VOA (40mL or 60mL)	_____	_____	_____	_____	_____
Quart/Liter (g/d)	<u>12</u>	_____	_____	_____	_____
9-oz (amber glass jar)	_____	_____	_____	_____	_____
2-oz (amber glass)	_____	_____	_____	_____	_____
125 mL (plastic)	<u>16</u>	_____	_____	_____	_____
24 mL vial (glass)	_____	_____	_____	_____	_____
<del>250</del> 500 mL (plastic)	<u>6</u>	_____	_____	_____	_____
Other	_____	_____	_____	_____	_____

# CHAIN OF CUSTODY

## CONSUMERS ENERGY COMPANY – LABORATORY SERVICES



135 WEST TRAIL ST., JACKSON, MI 49201 • (517) 788-1251 • FAX (517) 788-2533

SAMPLING SITE				PROJECT NUMBER			ANALYSIS REQUESTED						PAGE 1 OF 1	
JHC Q2-2021 RCRA GW Monitoring Pond A Wells				21-0445			Metals, Total	Anions	TDS	Radium				SEND REPORT TO Caleb Batts
SAMPLING TEAM				DATE SHIPPED	SITE SKETCHED ATTACHED? CIRCLE ONE									REMARKS
CET / DMW / CLH					NO								PHONE _____	
CE CONTROL #	SAMPLE DATE	SAMPLE TIME	SAMPLE MATRIX	SAMPLE DESCRIPTION / LOCATION	DEPTH	# OF CONTAINERS								
21-0445-01	4.13.21	1837	GW	JHC-MW-15006	--	5	X	X	X	X				
-02	_____	_____	GW	JHC-MW-15007	--	5	X	X	X	X				Dry
-03	4.13.21	0921	GW	JHC-MW-15008R	--	5	X	X	X	X				
-04	_____	_____	GW	JHC-MW-15009	--	5	X	X	X	X				Dry
-05	_____	_____	GW	JHC-MW-15010	--	5	X	X	X	X				Dry
-06	4.13.21	1923	GW	JHC-MW-15011	--	5	X	X	X	X				
-07	4.13.21	1200	GW	DUP-01	--	5	X	X	X	X				
-08	4.13.21	0929	W	FB-01	--	5	X	X	X	X				
-09	4.13.21	0810	W	EB-01	--	5	X	X	X	X				
-10	4.13.21	1837	GW	JHC-MW-15007 Field MS <sup>no</sup>		2	X	X						
-11	4.13.21	1837	GW	JHC-MW-15007 Field MSD <sup>no</sup>		2	X	X						
RELINQUISHED BY (SIGNATURE)				DATE/TIME		RECEIVED BY (SIGNATURE)		COMMENTS						
Casey Hansen				4.15.21 0800				3.1-5.6°C fcl						
RELINQUISHED BY (SIGNATURE)				DATE/TIME		RECEIVED BY (SIGNATURE)								

ORIGINAL TO LAB COPY TO CUSTOMER

## ANALYTICAL REPORT

Eurofins TestAmerica, St. Louis  
13715 Rider Trail North  
Earth City, MO 63045  
Tel: (314)298-8566

Laboratory Job ID: 160-41804-1  
Laboratory Sample Delivery Group: 21-0445  
Client Project/Site: JH Campbell Pond A Walls

For:  
Consumers Energy  
135 W Trail Street  
Jackson, Michigan 49201

Attn: Emil Blaj



Authorized for release by:  
5/24/2021 5:24:23 PM

Jayna Awalt, Project Manager II  
(314)298-8566  
[Jayna.Awalt@Eurofinset.com](mailto:Jayna.Awalt@Eurofinset.com)

### LINKS

Review your project  
results through  
**TotalAccess**

Have a Question?



Visit us at:  
[www.eurofinsus.com/Env](http://www.eurofinsus.com/Env)

*This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.*

*Results relate only to the items tested and the sample(s) as received by the laboratory.*



# Table of Contents

Cover Page . . . . .	1
Table of Contents . . . . .	2
Case Narrative . . . . .	3
Chain of Custody . . . . .	5
Receipt Checklists . . . . .	6
Definitions/Glossary . . . . .	7
Method Summary . . . . .	8
Sample Summary . . . . .	9
Client Sample Results . . . . .	10
QC Sample Results . . . . .	14
QC Association Summary . . . . .	16
Tracer Carrier Summary . . . . .	17

# Case Narrative

Client: Consumers Energy  
Project/Site: JH Campbell Pond A Walls

Job ID: 160-41804-1  
SDG: 21-0445

**Job ID: 160-41804-1**

**Laboratory: Eurofins TestAmerica, St. Louis**

**Narrative**

## CASE NARRATIVE

**Client: Consumers Energy**

**Project: JH Campbell Pond A Walls**

**Report Number: 160-41804-1**

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Eurofins TestAmerica, St. Louis attests to the validity of the laboratory data generated by Eurofins TestAmerica facilities reported herein. All analyses performed by Eurofins TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Eurofins TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

This laboratory report is confidential and is intended for the sole use of Eurofins TestAmerica and its client.

### RECEIPT

The samples were received on 04/22/2021; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 7.7 C.

### RADIUM-226 (GFPC)

Samples JHC-MW-15006 (160-41804-1), JHC-MW-15008R (160-41804-2), JHC-MW-15011 (160-41804-3), DUP-01 (160-41804-4), FB-01 (160-41804-5) and EB-01 (160-41804-6) were analyzed for Radium-226 (GFPC) in accordance with EPA Method 903.0. The samples were



# Case Narrative

Client: Consumers Energy  
Project/Site: JH Campbell Pond A Walls

Job ID: 160-41804-1  
SDG: 21-0445

---

## Job ID: 160-41804-1 (Continued)

---

### Laboratory: Eurofins TestAmerica, St. Louis (Continued)

prepared on 04/29/2021 and analyzed on 05/21/2021.

Insufficient sample volume was available to perform a sample duplicate (DUP) for the following samples: JHC-MW-15006 (160-41804-1), JHC-MW-15008R (160-41804-2), JHC-MW-15011 (160-41804-3), FB-01 (160-41804-5) and EB-01 (160-41804-6). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared to demonstrate batch precision.

The following sample was prepared at a reduced aliquot due to Matrix: DUP-01 (160-41804-4). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared to demonstrate batch precision.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

### **RADIUM-228 (GFPC)**

Samples JHC-MW-15006 (160-41804-1), JHC-MW-15008R (160-41804-2), JHC-MW-15011 (160-41804-3), DUP-01 (160-41804-4), FB-01 (160-41804-5) and EB-01 (160-41804-6) were analyzed for Radium-228 (GFPC) in accordance with EPA 904. The samples were prepared on 04/29/2021 and analyzed on 05/13/2021.

Insufficient sample volume was available to perform a sample duplicate (DUP) for the following samples: JHC-MW-15006 (160-41804-1), JHC-MW-15008R (160-41804-2), JHC-MW-15011 (160-41804-3), FB-01 (160-41804-5) and EB-01 (160-41804-6). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared to demonstrate batch precision.

The following sample was prepared at a reduced aliquot due to Matrix: DUP-01 (160-41804-4). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared to demonstrate batch precision.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

### **COMBINED RADIUM-226 AND RADIUM-228**

Samples JHC-MW-15006 (160-41804-1), JHC-MW-15008R (160-41804-2), JHC-MW-15011 (160-41804-3), DUP-01 (160-41804-4), FB-01 (160-41804-5) and EB-01 (160-41804-6) were analyzed for Combined Radium-226 and Radium-228 in accordance with EPA 903 Radium 226/EPA 904 Radium 228. The samples were analyzed on 05/21/2021.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.



# Login Sample Receipt Checklist

Client: Consumers Energy

Job Number: 160-41804-1

SDG Number: 21-0445

**Login Number: 41804**

**List Number: 1**

**Creator: Korrinhizer, Micha L**

**List Source: Eurofins TestAmerica, St. Louis**

Question	Answer	Comment
Radioactivity wasn't checked or is <math>\leq</math> background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <math><6\text{mm}</math> (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	



# Definitions/Glossary

Client: Consumers Energy  
Project/Site: JH Campbell Pond A Walls

Job ID: 160-41804-1  
SDG: 21-0445

## Qualifiers

### Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

## Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

# Method Summary

Client: Consumers Energy  
Project/Site: JH Campbell Pond A Walls

Job ID: 160-41804-1  
SDG: 21-0445

Method	Method Description	Protocol	Laboratory
903.0	Radium-226 (GFPC)	EPA	TAL SL
904.0	Radium-228 (GFPC)	EPA	TAL SL
Ra226_Ra228	Combined Radium-226 and Radium-228	TAL-STL	TAL SL
PrecSep_0	Preparation, Precipitate Separation	None	TAL SL
PrecSep-21	Preparation, Precipitate Separation (21-Day In-Growth)	None	TAL SL

**Protocol References:**

- EPA = US Environmental Protection Agency
- None = None
- TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

**Laboratory References:**

- TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566



# Sample Summary

Client: Consumers Energy  
Project/Site: JH Campbell Pond A Walls

Job ID: 160-41804-1  
SDG: 21-0445

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
160-41804-1	JHC-MW-15006	Water	04/13/21 18:37	04/22/21 13:00	
160-41804-2	JHC-MW-15008R	Water	04/13/21 09:21	04/22/21 13:00	
160-41804-3	JHC-MW-15011	Water	04/13/21 19:23	04/22/21 13:00	
160-41804-4	DUP-01	Water	04/19/21 00:00	04/22/21 13:00	
160-41804-5	FB-01	Water	04/13/21 09:29	04/22/21 13:00	
160-41804-6	EB-01	Water	04/13/21 08:10	04/22/21 13:00	

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12

# Client Sample Results

Client: Consumers Energy  
Project/Site: JH Campbell Pond A Walls

Job ID: 160-41804-1  
SDG: 21-0445

**Client Sample ID: JHC-MW-15006**

**Lab Sample ID: 160-41804-1**

Date Collected: 04/13/21 18:37

Matrix: Water

Date Received: 04/22/21 13:00

**Method: 903.0 - Radium-226 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.241		0.0969	0.0993	1.00	0.102	pCi/L	04/29/21 09:25	05/21/21 09:20	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	90.3		40 - 110					04/29/21 09:25	05/21/21 09:20	1

**Method: 904.0 - Radium-228 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.432		0.277	0.280	1.00	0.426	pCi/L	04/29/21 10:28	05/13/21 13:41	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	90.3		40 - 110					04/29/21 10:28	05/13/21 13:41	1
Y Carrier	85.6		40 - 110					04/29/21 10:28	05/13/21 13:41	1

**Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.673		0.293	0.297	5.00	0.426	pCi/L		05/21/21 21:05	1

**Client Sample ID: JHC-MW-15008R**

**Lab Sample ID: 160-41804-2**

Date Collected: 04/13/21 09:21

Matrix: Water

Date Received: 04/22/21 13:00

**Method: 903.0 - Radium-226 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.272		0.104	0.107	1.00	0.106	pCi/L	04/29/21 09:25	05/21/21 09:20	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	87.9		40 - 110					04/29/21 09:25	05/21/21 09:20	1

**Method: 904.0 - Radium-228 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.224	U	0.295	0.296	1.00	0.491	pCi/L	04/29/21 10:28	05/13/21 13:41	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	87.9		40 - 110					04/29/21 10:28	05/13/21 13:41	1
Y Carrier	84.9		40 - 110					04/29/21 10:28	05/13/21 13:41	1

# Client Sample Results

Client: Consumers Energy  
Project/Site: JH Campbell Pond A Walls

Job ID: 160-41804-1  
SDG: 21-0445

**Client Sample ID: JHC-MW-15008R**

**Lab Sample ID: 160-41804-2**

Date Collected: 04/13/21 09:21

Matrix: Water

Date Received: 04/22/21 13:00

**Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.496		0.313	0.315	5.00	0.491	pCi/L		05/21/21 21:05	1

**Client Sample ID: JHC-MW-15011**

**Lab Sample ID: 160-41804-3**

Date Collected: 04/13/21 19:23

Matrix: Water

Date Received: 04/22/21 13:00

**Method: 903.0 - Radium-226 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.165		0.0889	0.0901	1.00	0.112	pCi/L	04/29/21 09:25	05/21/21 09:20	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Ba Carrier	88.8		40 - 110					04/29/21 09:25	05/21/21 09:20	1

**Method: 904.0 - Radium-228 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.758		0.308	0.316	1.00	0.435	pCi/L	04/29/21 10:28	05/13/21 13:42	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Ba Carrier	88.8		40 - 110					04/29/21 10:28	05/13/21 13:42	1
Y Carrier	85.2		40 - 110					04/29/21 10:28	05/13/21 13:42	1

**Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.923		0.321	0.329	5.00	0.435	pCi/L		05/21/21 21:05	1

**Client Sample ID: DUP-01**

**Lab Sample ID: 160-41804-4**

Date Collected: 04/19/21 00:00

Matrix: Water

Date Received: 04/22/21 13:00

**Method: 903.0 - Radium-226 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.351		0.132	0.136	1.00	0.130	pCi/L	04/29/21 09:25	05/21/21 09:20	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Ba Carrier	92.4		40 - 110					04/29/21 09:25	05/21/21 09:20	1



# Client Sample Results

Client: Consumers Energy  
Project/Site: JH Campbell Pond A Walls

Job ID: 160-41804-1  
SDG: 21-0445

**Client Sample ID: DUP-01**

**Lab Sample ID: 160-41804-4**

Date Collected: 04/19/21 00:00

Matrix: Water

Date Received: 04/22/21 13:00

**Method: 904.0 - Radium-228 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.429	U	0.326	0.329	1.00	0.512	pCi/L	04/29/21 10:28	05/13/21 13:42	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Ba Carrier	92.4		40 - 110					04/29/21 10:28	05/13/21 13:42	1
Y Carrier	86.7		40 - 110					04/29/21 10:28	05/13/21 13:42	1

**Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.780		0.352	0.356	5.00	0.512	pCi/L		05/21/21 21:05	1

**Client Sample ID: FB-01**

**Lab Sample ID: 160-41804-5**

Date Collected: 04/13/21 09:29

Matrix: Water

Date Received: 04/22/21 13:00

**Method: 903.0 - Radium-226 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.0322	U	0.0418	0.0419	1.00	0.105	pCi/L	04/29/21 09:25	05/21/21 09:21	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Ba Carrier	90.9		40 - 110					04/29/21 09:25	05/21/21 09:21	1

**Method: 904.0 - Radium-228 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.118	U	0.209	0.209	1.00	0.400	pCi/L	04/29/21 10:28	05/13/21 13:42	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Ba Carrier	90.9		40 - 110					04/29/21 10:28	05/13/21 13:42	1
Y Carrier	84.9		40 - 110					04/29/21 10:28	05/13/21 13:42	1

**Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	-0.151	U	0.213	0.213	5.00	0.400	pCi/L		05/21/21 21:05	1

# Client Sample Results

Client: Consumers Energy  
Project/Site: JH Campbell Pond A Walls

Job ID: 160-41804-1  
SDG: 21-0445

**Client Sample ID: EB-01**  
Date Collected: 04/13/21 08:10  
Date Received: 04/22/21 13:00

**Lab Sample ID: 160-41804-6**  
Matrix: Water

## Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.00929	U	0.0560	0.0560	1.00	0.111	pCi/L	04/29/21 09:25	05/21/21 09:21	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	85.8		40 - 110					04/29/21 09:25	05/21/21 09:21	1

## Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.0642	U	0.232	0.232	1.00	0.430	pCi/L	04/29/21 10:28	05/13/21 13:45	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	85.8		40 - 110					04/29/21 10:28	05/13/21 13:45	1
Y Carrier	83.7		40 - 110					04/29/21 10:28	05/13/21 13:45	1

## Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	-0.0549	U	0.239	0.239	5.00	0.430	pCi/L		05/21/21 21:05	1

# QC Sample Results

Client: Consumers Energy  
Project/Site: JH Campbell Pond A Walls

Job ID: 160-41804-1  
SDG: 21-0445

## Method: 903.0 - Radium-226 (GFPC)

**Lab Sample ID: MB 160-507675/23-A**  
**Matrix: Water**  
**Analysis Batch: 511016**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 507675**

Analyte	MB		Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	MB Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-226	0.02967	U	0.0559	0.0560	1.00	0.101	pCi/L	04/29/21 09:25	05/21/21 09:25	1
Carrier	MB %Yield	MB Qualifier	Limits		Prepared	Analyzed	Dil Fac			
Ba Carrier	89.4		40 - 110					04/29/21 09:25	05/21/21 09:25	1

**Lab Sample ID: LCS 160-507675/1-A**  
**Matrix: Water**  
**Analysis Batch: 511015**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 507675**

Analyte	Spike Added	LCS Result	LCS Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Radium-226	11.3	11.16		1.16	1.00	0.124	pCi/L	98	75 - 125
Carrier	LCS %Yield	LCS Qualifier	Limits		Prepared	Analyzed	Dil Fac		
Ba Carrier	90.6		40 - 110					04/29/21 09:25	05/21/21 09:25

**Lab Sample ID: LCSD 160-507675/2-A**  
**Matrix: Water**  
**Analysis Batch: 511015**

**Client Sample ID: Lab Control Sample Dup**  
**Prep Type: Total/NA**  
**Prep Batch: 507675**

Analyte	Spike Added	LCSD Result	LCSD Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits	RER	Limit
				Uncert. (2σ+/-)							
Radium-226	11.3	10.87		1.13	1.00	0.120	pCi/L	96	75 - 125	0.13	1
Carrier	LCSD %Yield	LCSD Qualifier	Limits		Prepared	Analyzed	Dil Fac				
Ba Carrier	85.5		40 - 110					04/29/21 10:28	05/13/21 13:46	1	

## Method: 904.0 - Radium-228 (GFPC)

**Lab Sample ID: MB 160-507679/23-A**  
**Matrix: Water**  
**Analysis Batch: 509482**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 507679**

Analyte	MB		Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	MB Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-228	0.2507	U	0.248	0.249	1.00	0.402	pCi/L	04/29/21 10:28	05/13/21 13:46	1
Carrier	MB %Yield	MB Qualifier	Limits		Prepared	Analyzed	Dil Fac			
Ba Carrier	89.4		40 - 110					04/29/21 10:28	05/13/21 13:46	1
Y Carrier	86.0		40 - 110		04/29/21 10:28	05/13/21 13:46	1			

# QC Sample Results

Client: Consumers Energy  
 Project/Site: JH Campbell Pond A Walls

Job ID: 160-41804-1  
 SDG: 21-0445

## Method: 904.0 - Radium-228 (GFPC) (Continued)

**Lab Sample ID: LCS 160-507679/1-A**  
**Matrix: Water**  
**Analysis Batch: 509517**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 507679**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	
									75	125
Radium-228	7.21	7.610		0.936	1.00	0.374	pCi/L	105	75	125
<b>LCS LCS</b>										
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>							
Ba Carrier	90.6		40 - 110							
Y Carrier	86.7		40 - 110							

**Lab Sample ID: LCSD 160-507679/2-A**  
**Matrix: Water**  
**Analysis Batch: 509517**

**Client Sample ID: Lab Control Sample Dup**  
**Prep Type: Total/NA**  
**Prep Batch: 507679**

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		RER	Limit
									75	125	0.13	1
Radium-228	7.21	7.865		0.973	1.00	0.376	pCi/L	109	75	125	0.13	1
<b>LCSD LCSD</b>												
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>									
Ba Carrier	85.5		40 - 110									
Y Carrier	86.7		40 - 110									

# QC Association Summary

Client: Consumers Energy  
Project/Site: JH Campbell Pond A Walls

Job ID: 160-41804-1  
SDG: 21-0445

## Rad

### Prep Batch: 507675

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-41804-1	JHC-MW-15006	Total/NA	Water	PrecSep-21	
160-41804-2	JHC-MW-15008R	Total/NA	Water	PrecSep-21	
160-41804-3	JHC-MW-15011	Total/NA	Water	PrecSep-21	
160-41804-4	DUP-01	Total/NA	Water	PrecSep-21	
160-41804-5	FB-01	Total/NA	Water	PrecSep-21	
160-41804-6	EB-01	Total/NA	Water	PrecSep-21	
MB 160-507675/23-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-507675/1-A	Lab Control Sample	Total/NA	Water	PrecSep-21	
LCSD 160-507675/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep-21	

### Prep Batch: 507679

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-41804-1	JHC-MW-15006	Total/NA	Water	PrecSep_0	
160-41804-2	JHC-MW-15008R	Total/NA	Water	PrecSep_0	
160-41804-3	JHC-MW-15011	Total/NA	Water	PrecSep_0	
160-41804-4	DUP-01	Total/NA	Water	PrecSep_0	
160-41804-5	FB-01	Total/NA	Water	PrecSep_0	
160-41804-6	EB-01	Total/NA	Water	PrecSep_0	
MB 160-507679/23-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-507679/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-507679/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

# Tracer/Carrier Summary

Client: Consumers Energy  
Project/Site: JH Campbell Pond A Walls

Job ID: 160-41804-1  
SDG: 21-0445

## Method: 903.0 - Radium-226 (GFPC)

Matrix: Water

Prep Type: Total/NA

### Percent Yield (Acceptance Limits)

Lab Sample ID	Client Sample ID	Ba (40-110)
160-41804-1	JHC-MW-15006	90.3
160-41804-2	JHC-MW-15008R	87.9
160-41804-3	JHC-MW-15011	88.8
160-41804-4	DUP-01	92.4
160-41804-5	FB-01	90.9
160-41804-6	EB-01	85.8
LCS 160-507675/1-A	Lab Control Sample	90.6
LCSD 160-507675/2-A	Lab Control Sample Dup	85.5
MB 160-507675/23-A	Method Blank	89.4

#### Tracer/Carrier Legend

Ba = Ba Carrier

## Method: 904.0 - Radium-228 (GFPC)

Matrix: Water

Prep Type: Total/NA

### Percent Yield (Acceptance Limits)

Lab Sample ID	Client Sample ID	Ba (40-110)	Y (40-110)
160-41804-1	JHC-MW-15006	90.3	85.6
160-41804-2	JHC-MW-15008R	87.9	84.9
160-41804-3	JHC-MW-15011	88.8	85.2
160-41804-4	DUP-01	92.4	86.7
160-41804-5	FB-01	90.9	84.9
160-41804-6	EB-01	85.8	83.7
LCS 160-507679/1-A	Lab Control Sample	90.6	86.7
LCSD 160-507679/2-A	Lab Control Sample Dup	85.5	86.7
MB 160-507679/23-A	Method Blank	89.4	86.0

#### Tracer/Carrier Legend

Ba = Ba Carrier

Y = Y Carrier

To: CDBatts, JH Campbell Complex

From: EBlaj, T-258

Date: July 14, 2021

Subject: JH CAMPBELL SOLID WASTE DISPOSAL AREA – GROUNDWATER MONITORING  
2<sup>nd</sup> Quarter, 2021 – GSI Wells

CC: BLSwanberg, P22-119  
BTRunkel, P22-120  
HDRegister, P22-521

Sarah Holmstrom, Project Manager  
TRC Companies, Inc.  
1540 Eisenhower Place  
Ann Arbor, MI 48108

---

**Chemistry Project: 21-0454**

CE Laboratory Services conducted groundwater monitoring on 04/12/2021 through 04/15/2021 at the JH Campbell Solid Waste Disposal Area, for the 2<sup>nd</sup> Quarter monitoring requirements. Samples were not collected from MW-10AR; the well was dry. All other samples were received for analysis by the Chemistry department on 04/15/2021.

The report that follows presents the results of the requested analytical testing; the results apply only to the samples, as received. All samples have been analyzed in accordance with the 2016 TNI Standard and the applicable A2LA accreditation scope for Laboratory Services. Any exceptions to applicable test method criteria and standard compliance are noted in the Case Narrative, or flagged with applicable qualifiers in the analytical results section.

Reviewed and approved by:

Emil Blaj  
Sr. Technical Analyst  
Project Lead



*Testing performed in accordance with the A2LA scope of accreditation specified in the listed certificate. The information contained in this report is the sole property of Consumers Energy. It cannot be reproduced except in full, and with consent from Consumers Energy, or the customer for which this report was issued.*

## CASE NARRATIVE

### I. Sample Receipt

All samples were received within hold time and in good conditions; no anomalies were noted on the Sample Log-In Shipment Inspection Form during sample check-in. Identification of all samples included in the work order/project is provided in the sample summary section. Sample preservation upon receipt was verified by the sample custodian and confirmed to meet method requirements.

### II. Methodology

Unless otherwise indicated, sample preparation and analysis was performed in accordance with the corresponding test methods from “Methods for the Determination of Inorganic Substances in Environmental Samples (EPA/600/R-93/100); SW-846, “Test Methods for Evaluating Solid Waste – Physical/Chemical Methods”, USEPA (latest revisions), and Standard Methods for the Examination of Water and Wastewater, APHA-AWWA-WPCF, 22<sup>nd</sup> Edition, 2012.

### III. Results/Quality Control

Analytical results for this report are presented by laboratory sample ID, container & aliquot number. Results for the field blanks, field duplicates, and percent recoveries of the field matrix spike & matrix spike duplicate samples are included in the results section. Unless specifically noted in the case narrative, all method quality control requirements have been met. If any results are qualified, the corresponding data flags/qualifiers are listed on the last page of the results section. Any additional information on method performance, when applicable, is presented in this section of the case narrative. When data flags are not needed, the qualifiers text box on the last page is left blank, and a statement confirms that no exceptions occurred.

## DEFINITIONS / QUALIFIERS

The following qualifiers and/or acronyms are used in the report where applicable:

<u>Acronym</u>	<u>Description</u>
RL	Reporting Limit
ND	Result not detected or below Reporting Limit
NT	Not a TNI Analyte
LCS	Laboratory Control Sample
LRB	Laboratory Reagent Blank (also referred to as Method Blank)
DUP	Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
TDL	Target Detection Limit
SM	Standard Methods Compendium

<u>Qualifier</u>	<u>Description</u>
*	Generic data flag, applicable description added in the corresponding notes section
B	The analyte was detected in the LRB at a level which is significant relative to sample result



D	Reporting limit elevated due to dilution
E	Estimated due to result exceeding the linear range of the analyzer
H	The maximum recommended hold time was exceeded
I	Dilution required due to matrix interference; reporting limit elevated
J	Estimated due to result found above MDL but below PQL (or RL)
K	Reporting limit raised due to matrix interference
M	The precision for duplicate analysis was not met; RPD outside acceptance criteria
N	Non-homogeneous sample made analysis questionable
PI	Possible interference may have affected the accuracy of the laboratory result
Q	Matrix Spike or Matrix Spike Duplicate recovery outside acceptance criteria
R	Result confirmed by new sample preparation and reanalysis
X	Other notation required; comment listed in sample notes and/or case narrative

## Work Order Sample Summary

**Customer Name:** JH Campbell Complex  
**Work Order ID:** Q2-2021 RCRA GW Monitoring N&E / HMP / GSI / Supplemental  
**Date Received:** 4/15/2021  
**Chemistry Project:** 21-0454

<u>Sample #</u>	<u>Field Sample ID</u>	<u>Matrix</u>	<u>Sample Date</u>	<u>Site</u>
21-0454-01	MW-14S	Groundwater	04/14/2021 11:31 AM	JHC RCRA GW Monitoring - N&E/AMP/GSI/Supp Wells
21-0454-02	PZ-24S	Groundwater	04/14/2021 06:59 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI/Supp Wells
21-0454-03	PZ-40S	Groundwater	04/14/2021 08:59 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI/Supp Wells
21-0454-04	TW-19-04A	Groundwater	04/14/2021 02:18 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI/Supp Wells
21-0454-05	TW-19-05	Groundwater	04/14/2021 03:54 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI/Supp Wells
21-0454-06	TW-19-06A	Groundwater	04/14/2021 04:51 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI/Supp Wells
21-0454-07	DUP-08	Groundwater	04/14/2021 12:00 AM	JHC RCRA GW Monitoring - N&E/AMP/GSI/Supp Wells
21-0454-08	FB-08	Water	04/14/2021 07:10 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI/Supp Wells
21-0454-09	EB-08	Water	04/14/2021 08:30 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI/Supp Wells
21-0454-10	TW-19-04A Field MS	Groundwater	04/14/2021 02:18 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI/Supp Wells
21-0454-11	TW-19-04A Field MSD	Groundwater	04/14/2021 02:18 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI/Supp Wells
21-0454-12	PZ-23S	Groundwater	04/14/2021 06:16 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI/Supp Wells
21-0454-13	PZ-24	Groundwater	04/14/2021 06:07 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI/Supp Wells
21-0454-14	PZ-40	Groundwater	04/14/2021 08:17 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI/Supp Wells
21-0454-15	DUP-09	Groundwater	04/14/2021 12:00 AM	JHC RCRA GW Monitoring - N&E/AMP/GSI/Supp Wells
21-0454-16	MW-9AR	Groundwater	04/14/2021 10:06 AM	JHC RCRA GW Monitoring - N&E/AMP/GSI/Supp Wells
21-0454-17	MW-10AR	Not Collected, well was dry		JHC RCRA GW Monitoring - N&E/AMP/GSI/Supp Wells
21-0454-18	TW-19-01A	Groundwater	04/14/2021 12:21 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI/Supp Wells
21-0454-19	TW-19-02A	Groundwater	04/14/2021 01:06 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI/Supp Wells
21-0454-20	TW-19-03A	Groundwater	04/14/2021 01:41 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI/Supp Wells



# Analytical Report

Report Date: 07/14/21

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - N&E/AMP/GSI/Supp Wells (395496)** Laboratory Project: **21-0454**  
Field Sample ID: **MW-14S** Collect Date: 04/14/2021  
Lab Sample ID: 21-0454-01 Collect Time: 11:31 AM  
Matrix: Groundwater

### Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 21-0454-01-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2021	AB21-0427-17
Arsenic	ND		ug/L	1	04/27/2021	AB21-0427-17
Barium	10		ug/L	5	04/27/2021	AB21-0427-17
Chromium	ND		ug/L	1	04/27/2021	AB21-0427-17
Lithium	ND		ug/L	10	04/27/2021	AB21-0427-17
Molybdenum	ND		ug/L	5	04/27/2021	AB21-0427-17
Selenium	ND		ug/L	1	04/27/2021	AB21-0427-17
Vanadium	ND		ug/L	2	04/27/2021	AB21-0427-17

### Total Dissolved Solids by SM 2540C

Aliquot: 21-0454-01-C03-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	35		mg/L	10	04/19/2021	AB21-0419-05

**Laboratory Services**  
A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - N&E/AMP/GSI/Supp Wells (395496)** Laboratory Project: **21-0454**  
 Field Sample ID: **PZ-24S** Collect Date: 04/14/2021  
 Lab Sample ID: 21-0454-02 Collect Time: 06:59 PM  
 Matrix: Groundwater

**Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring**

Aliquot: 21-0454-02-C01-A02 Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2021	AB21-0427-17
Arsenic	ND		ug/L	1	04/27/2021	AB21-0427-17
Barium	23		ug/L	5	04/27/2021	AB21-0427-17
Chromium	1		ug/L	1	04/27/2021	AB21-0427-17
Lithium	ND		ug/L	10	04/27/2021	AB21-0427-17
Molybdenum	ND		ug/L	5	04/27/2021	AB21-0427-17
Selenium	ND		ug/L	1	04/27/2021	AB21-0427-17
Vanadium	2		ug/L	2	04/27/2021	AB21-0427-17

**Total Dissolved Solids by SM 2540C**

Aliquot: 21-0454-02-C03-A01 Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	40		mg/L	10	04/19/2021	AB21-0419-05

**Laboratory Services**  
A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - N&E/AMP/GSI/Supp Wells (395496)** Laboratory Project: **21-0454**  
 Field Sample ID: **PZ-40S** Collect Date: 04/14/2021  
 Lab Sample ID: 21-0454-03 Collect Time: 08:59 PM  
 Matrix: Groundwater

**Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring**

Aliquot: 21-0454-03-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2021	AB21-0427-17
Arsenic	ND		ug/L	1	04/27/2021	AB21-0427-17
Barium	16		ug/L	5	04/27/2021	AB21-0427-17
Chromium	1		ug/L	1	04/27/2021	AB21-0427-17
Lithium	ND		ug/L	10	04/27/2021	AB21-0427-17
Molybdenum	ND		ug/L	5	04/27/2021	AB21-0427-17
Selenium	ND		ug/L	1	04/27/2021	AB21-0427-17
Vanadium	ND		ug/L	2	04/27/2021	AB21-0427-17

**Total Dissolved Solids by SM 2540C**

Aliquot: 21-0454-03-C03-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	45		mg/L	10	04/19/2021	AB21-0419-05

---

Data Qualifiers	Exception Summary
-----------------	-------------------

---

No exceptions occurred.

---

**TITLE: SAMPLE LOG-IN – SHIPMENT INSPECTION FORM**

Project Log-In Number: 21-0454

Inspection Date: 04-15-21 Inspection By: CUH

Sample Origin/Project Name: JHC Q2-2021 Supplemental

Shipment Delivered By: Enter the type of shipment carrier.

Pony \_\_\_\_\_ FedEx \_\_\_\_\_ UPS \_\_\_\_\_ USPS \_\_\_\_\_ Airborne \_\_\_\_\_

Other/Hand Carry (whom) CET | DMW | CUH

Tracking Number: \_\_\_\_\_ Shipping Form Attached: Yes \_\_\_\_\_ No \_\_\_\_\_

Shipping Containers: Enter the type and number of shipping containers received.

Cooler 4 Cardboard Box \_\_\_\_\_ Custom Case \_\_\_\_\_ Envelope/Mailer \_\_\_\_\_

Loose/Unpackaged Containers \_\_\_\_\_ Other \_\_\_\_\_

Condition of Shipment: Enter the as-received condition of the shipment container.

Damaged Shipment Observed: None  Dented \_\_\_\_\_ Leaking \_\_\_\_\_

Other \_\_\_\_\_

Shipment Security: Enter if any of the shipping containers were opened before receipt.

Shipping Containers Received: Opened \_\_\_\_\_ Sealed

Enclosed Documents: Enter the type of documents enclosed with the shipment.

CoC  Work Request \_\_\_\_\_ Air Data Sheet \_\_\_\_\_ Other \_\_\_\_\_

Temperature of Containers: Measure the temperature of several sample containers.

As-Received Temperature Range 0.6-2.2°C Samples Received on Ice: Yes  No \_\_\_\_\_

M&TE # and Expiration 015484  
10-1-21

Number and Type of Containers: Enter the total number of sample containers received.

Container Type	Water	Soil	Other	Broken	Leaking
VOA (40mL or 60mL)	_____	_____	_____	_____	_____
Quart/Liter (g/p)	<u>12</u>	_____	_____	_____	_____
9-oz (amber glass jar)	_____	_____	_____	_____	_____
2-oz (amber glass)	_____	_____	_____	_____	_____
125 mL (plastic)	<u>4+3=44</u>	_____	_____	_____	_____
24 mL vial (glass)	_____	_____	_____	_____	_____
<del>2500</del> 500 mL (plastic)	<u>12</u>	_____	_____	_____	_____
Other	_____	_____	_____	_____	_____



# CHAIN OF CUSTODY

## CONSUMERS ENERGY COMPANY – LABORATORY SERVICES



135 WEST TRAIL ST., JACKSON, MI 49201 • (517) 788-1251 • FAX (517) 788-2533

SAMPLING SITE: JHC Q2-2021 RCRA GW Monitoring N&E / AMP / GSI Wells				PROJECT NUMBER: <b>21-0454</b>			ANALYSIS REQUESTED					PAGE <u>1</u> OF <u>2</u> SEND REPORT TO: Caleb Batts		
SAMPLING TEAM: CET / DMW / CLH				DATE SHIPPED		SITE SKETCHED ATTACHED? CIRCLE ONE: <b>NO</b>		Metals, Total	Anions	TDS	Radium	Dissolved Metals	Beth Swanberg, TRC	
													PHONE: _____	
CE CONTROL #	SAMPLE DATE	SAMPLE TIME	SAMPLE MATRIX	SAMPLE DESCRIPTION / LOCATION	DEPTH	# OF CONTAINERS								
21-0454-01	4.14.21	1131	GW	MW-14S		5	X	X	X	X	X		CLH	
-02	↓	1859	GW	PZ-24S		5	X	X	X	X	X		CET	
-03		2059	GW	PZ-40S		5	X	X	X	X	X		CET	
-04		1418	GW	TW-19-04A		5	X	X	X	X			Dmw	
-05		1554	GW	TW-19-05		5	X	X	X	X			Dmw	
-06		1651	GW	TW-19-06A		5	X	X	X	X			Dmw	
-07		—	GW	DUP-08		5	X	X	X	X			CLH	
-08		1910	GW	FB-08		5	X	X	X	X			CET	
-09		2030	GW	EB-08		5	X	X	X	X			CET	
-10		1418	GW	TW-19-04A Field MS		2	X	X					Dmw	
-11		↓	↓	AQ	TW-19-04A Field MSD		2	X	X				Dmw	

RELINQUISHED BY: (SIGNATURE) <i>Dawn Williams</i>	DATE/TIME 4.15.21 1045 am	RECEIVED BY: (SIGNATURE) <i>J.</i>	COMMENTS Temp: 01584 0.6-2.2°C
RELINQUISHED BY: (SIGNATURE)	DATE/TIME:	RECEIVED BY: (SIGNATURE)	

ORIGINAL TO LAB COPY TO CUSTOMER



# CHAIN OF CUSTODY

## CONSUMERS ENERGY COMPANY – LABORATORY SERVICES



135 WEST TRAIL ST., JACKSON, MI 49201 • (517) 788-1251 • FAX (517) 788-2533

SAMPLING SITE: JHC Q2-2021 RCRA GW Monitoring N&E / AMP / Supplemental				PROJECT NUMBER: <b>21-0454</b>			ANALYSIS REQUESTED					PAGE 2 OF 2 SEND REPORT TO: Caleb Batts		
SAMPLING TEAM: CET / DMW / CLH				DATE SHIPPED		SITE SKETCHED ATTACHED? CIRCLE ONE: <b>NO</b>		Metals, Total	Anions	TDS	Radium	Metals, Dissolved	Beth Swanberg, TRC	
													PHONE: _____	
CE CONTROL #	SAMPLE DATE	SAMPLE TIME	SAMPLE MATRIX	SAMPLE DESCRIPTION / LOCATION	DEPTH	# OF CONTAINERS								
21-0454-12	4.14.21	1816	GW	PZ-23S		6	X	X	X	X	X		DMW	
-13	↓	1807	GW	PZ-24		5	X	X	X	X			CET	
-14		2017	GW	PZ-40		5	X	X	X	X			CET	
-15		—	GW	DUP-09		2	X				X		DMW	
-16		1006	GW	MW-9AR		2	X				X		CLH	
-17		—	GW	MW-10AR		2	X				X		CLH	
-18		1221	GW	TW-19-01A		2	X				X		DMW	
-19		1306	GW	TW-19-02A		2	X				X		DMW	
-20	1341	GW	TW-19-03A		2	X				X		DMW		
RELINQUISHED BY: (SIGNATURE)				DATE/TIME		RECEIVED BY: (SIGNATURE)				COMMENTS				
RELINQUISHED BY: (SIGNATURE)				DATE/TIME		RECEIVED BY: (SIGNATURE)								
Dawn Williams				4.15.21 1045am		[Signature]				ORIGINAL TO LAB COPY TO CUSTOMER				

# **Appendix E**

## **April 2021 Field Notes**



Consumers Energy Company  
Monitoring Well Sampling Worksheet

Well ID JHC MW-15024 Date 4.13.21 Control Number 21-0446-02  
 Location JH Campbell Well Material:  PVC  SS  Iron  Galv. Steel  
 Purge Method:  Peristaltic  Submersible  Fultz  Bailer  
 Depth to Water Tape: Solinst S/N: 379851

QC SAMPLE:  MS/MSD  DUP- Sonde ID:  11M  15H  19M  20G

Depth-to-water T/PVC (ft) 12.94 Depth-To-Bottom T/PVC (ft) \_\_\_\_\_ Completed by kmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	<0.33	+/- 10%

Stabilization parameters for the last three readings

1127								12.94	
1128	6.85	9.2	353.1	42.2	462	+219.5	200	12.94	12.03
1133	7.13	9.1	358.7	6.1	0.69	+204.5	200	12.94	3.90
1138	7.11	9.2	354.4	4.6	0.52	+198.0	200	12.94	3.11
1143	6.92	9.2	334.6	3.9	0.44	+191.1	200	12.94	3.23
1148	6.84	9.1	325.0	3.8	0.43	+186.9	200	12.94	3.18
1153	6.79	9.3	323.2	4.0	0.45	+178.8	200	12.94	3.41
1158	6.76	9.2	319.4	3.9	0.44	+173.3	200	12.94	3.33
1203	6.76	9.3	321.5	3.9	0.43	+171.4	200	12.94	3.37
1204									

Total Pump Time (min): 37 Total Purge Volume (gal): 2.0 Reviewed by: [Signature]

Weather: Sunny; 46°F 04-24-21

Comments:

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F -							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
2	1L	HDPE	B	N					
1	125ml		B	N					
1	↓		A	N					
1	250ml		A	N					

\* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.



Consumers Energy Company  
Monitoring Well Sampling Worksheet

Well ID JHC MW-15023 Date 4.12.21 Control Number 21-0446-01  
 Location JH Campbell Well Material:  PVC  SS  Iron  Galv. Steel  
 Purge Method:  Peristaltic  Submersible  Fultz  Bailor  
 Depth to Water Tape: Solinst S/N: 379851

QC SAMPLE:  MS/MSD  DUP- Sonde ID:  11M  15H  19M  20G

Depth-to-water T/PVC (ft) 17.62 Depth-To-Bottom T/PVC (ft) \_\_\_\_\_ Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	<0.33	+/- 10%

Stablization parameters for the last three readings

1841								17.62	
1842	5.74	11.1	94.3	23.1	2.39	+219.6	200	17.62	3.34
1847	5.34	10.9	94.0	7.8	0.85	+236.3	200	17.62	3.60
1852	5.25	10.9	96.6	6.8	0.74	+242.1	200	17.62	3.40
1857	5.27	10.8	104.8	6.5	0.70	+243.5	200	17.62	3.41
1902	5.28	10.8	106.8	6.6	0.71	+243.6	200	17.62	3.52
1907	5.31	10.8	108.1	6.6	0.71	+242.9	200	17.62	3.41
1908									

Total Pump Time (min): 27 Total Purge Volume (gal): 1.4 Reviewed by: [Signature]

Weather: Sunny; 52°F

Comments:

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F -							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
2	1L	HDPE	B	N					
1	125ml	↓	B	N					
1	↓	↓	A	N					
1	250ml	↓	A	N					

\* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.



Consumers Energy Company  
 Monitoring Well Sampling Worksheet

Well ID JHC MW-15025 Date 4.13.21 Control Number 21-0446-03/10/11  
 Location JH Campbell Well Material:  PVC  SS  Iron  Galv. Steel  
 Purge Method:  Peristaltic  Submersible  Fultz  Bailor  
 Depth to Water Tape: Solinst S/N: 379851

QC SAMPLE:  MS/MSD  DUP- Sonde ID:  11M  15H  19M  20G

Depth-to-water T/PVC (ft) 12.12 Depth-To-Bottom T/PVC (ft) \_\_\_\_\_ Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	< 0.33	+/- 10%

Stabilization parameters for the last three readings

1024								12.12	
1025	6.59	7.7	378.9	24.7	2.77	+246.7	200	12.12	2.43
1030	6.98	7.8	381.2	1.05 ← → 8.8		+239.8	200	12.12	2.41
1035	7.25	7.6	372.3	5.4	0.63	+230.7	200	12.12	2.43
1040	6.87	7.5	265.6	7.5	0.89	+220.6	200	12.12	2.41
1045	6.80	7.5	258.0	8.5	1.00	+218.8	200	12.12	2.44
1050	6.76	7.5	253.3	10.1	1.21	+215.7	200	12.12	2.53
1055	6.73	7.5	251.0	10.9	1.29	+213.3	200	12.12	2.71
1100	6.72	7.5	249.9	12.4	1.46	+211.6	200	12.12	2.48
1105	6.72	7.5	251.4	12.7	1.50	+210.2	200	12.12	2.51
1110	6.72	7.5	254.3	13.0	1.53	+209.8	200	12.12	2.53
1111									

Total Pump Time (min): 47 Total Purge Volume (gal): 2.5 Reviewed by: [Signature]

Weather: Sunny; 46°F

Comments: \_\_\_\_\_

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
6	125 ml	HDPK	B	N					
3	125 ml	↓	A	N					
3	250 ml								

\* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.



Consumers Energy Company  
 Monitoring Well Sampling Worksheet

Well ID JHC MW-15026 Date 4.13.21 Control Number 21-0446-04  
 Location JH Campbell Well Material:  PVC  SS  Iron  Galv. Steel  
 Purge Method:  Peristaltic  Submersible  Fultz  Bailor  
 Depth to Water Tape: Solinst S/N: 379851

QC SAMPLE:  MS/MSD  DUP- Sonde ID:  11M  15H  19M  20G

Depth-to-water T/PVC (ft) 13.85 Depth-To-Bottom T/PVC (ft) \_\_\_\_\_ Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	< 0.33	+/- 10%

Stablization parameters for the last three readings

0916								13.85	
0917	5.79	8.7	96.7	51.6	5.43	+165.3	200	13.85	5.34
0922	5.68	8.6	88.9	28.5	3.26	+187.0	200	13.85	4.59
0927	5.62	8.5	82.6	27.1	3.11	+205.7	200	13.85	4.27
0932	5.60	8.5	83.2	26.9	3.10	+215.1	200	13.85	5.21
0937	5.61	8.5	83.9	27.0	3.11	+220.8	200	13.85	4.87
0942	5.62	8.5	84.1	27.1	3.12	+224.3	200	13.85	5.01
0943									

Total Pump Time (min): 27 Total Purge Volume (gal): 1.4 Reviewed by: [Signature]

Weather: Sunny; 44°F

Comments: \_\_\_\_\_

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
2	1L	HDPG	B	N					
1	125ml	↓	B	N					
1	↓	↓	A	N					
1	250ml	↓	A	N					

\* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.



Consumers Energy Company  
 Monitoring Well Sampling Worksheet

Well ID JHC MW-15027 Date 4.13.21 Control Number 21-0446-05  
 Location JH Campbell Well Material:  PVC  SS  Iron  Galv. Steel  
 Purge Method:  Peristaltic  Submersible  Fultz  Bailor  
 Depth to Water Tape: Solinst S/N: 379851

QC SAMPLE:  MS/MSD  DUP- Sonde ID:  11M  15H  19M  20G

Depth-to-water T/PVC (ft) 14.22 Depth-To-Bottom T/PVC (ft) \_\_\_\_\_ Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	< 0.33	+/- 10%

Stabilization parameters for the last three readings

0813								14.22	
0814	4.91	8.0	21.2	41.1	4.73	+188.2	200	14.22	69.10
0819	4.67	8.0	23.0	23.2	2.69	+210.5	200	14.22	28.14
0824	5.27	8.0	47.5	18.3	2.13	+170.1	200	14.22	8.04
0829	5.35	8.0	51.8	17.6	2.05	+165.8	200	14.22	7.84
0834	5.51	8.0	62.3	16.3	1.89	+149.3	200	14.22	5.32
0839	5.61	8.0	68.5	15.7	1.82	+140.7	200	14.22	5.64
0844	5.68	8.0	74.1	15.2	1.79	+132.4	200	14.22	5.77
0849	5.72	8.0	75.0	15.1	1.76	+132.6	200	14.22	5.66
0854	5.74	7.9	75.7	15.1	1.75	+130.7	200	14.22	5.71
0855									

Total Pump Time (min): 37 Total Purge Volume (gal): 2.0 Reviewed by: f

Weather: Sunny; 43°F

Comments: \_\_\_\_\_

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
2	1L	HOPE ↓	B	N					
1	125ml		B	N					
1	↓		A	N					
1	250ml		A	N					

\* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.



Consumers Energy Company  
 Monitoring Well Sampling Worksheet

Well ID JHC-MW15028 Date 4.12.21 Control Number 21-0446-06/-07  
 Location JH Campbell Well Material:  PVC  SS  Iron  Galv. Steel  
 Purge Method:  Peristaltic  Submersible  Fultz  Bailor  
 Depth to Water Tape: Solinst S/N: 379851  
 QC SAMPLE:  MS/MSD  DUP- 02 Sonde ID:  11M  15H  19M  20G

Depth-to-water T/PVC (ft) 14.02 Depth-To-Bottom T/PVC (ft) \_\_\_\_\_ Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	< 0.33	+/- 10%

Stabilization parameters for the last three readings

1719								14.02	
1720	8.60	9.9	137.6	44.1	4.85	+211.0	200	14.02	8.12
1725	8.23	9.5	133.6	39.6	4.41	+198.5	200	14.02	6.39
1730	8.16	9.4	131.0	40.3	4.50	+185.3	200	14.02	4.97
1735	8.10	9.3	127.9	41.2	4.61	+181.4	200	14.02	4.76
1740	7.92	9.3	122.5	42.9	4.80	+176.7	200	14.02	4.90
1745	7.73	9.4	118.3	44.5	4.98	+171.3	200	14.02	5.16
1750	7.64	9.3	116.7	45.2	5.06	+170.3	200	14.02	5.22
1755	7.61	9.4	115.3	46.5	5.19	+167.7	200	14.02	5.31
1800	7.56	9.2	114.4	46.0	5.16	+166.8	200	14.02	5.29
1801									

Total Pump Time (min): 42 Total Purge Volume (gal): 2.2 Reviewed by: [Signature]

Weather: Sunny; 57°F

Comments: \_\_\_\_\_

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
4	1L	HDPE	B	N					
2	125 ml	↓	B	N					
2	↓	↓	A	N					
2	250 ml	↓	A	N					

\* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.









Consumers Energy Company  
 Monitoring Well Sampling Worksheet

Well ID MW-15006 Date 4-13-21 Control Number 21-0445-01  
 Location JHC Well Material:  PVC  SS  Iron  Galv. Steel  
 Purge Method:  Peristaltic  Submersible  Fultz  Bailor  
 Depth to Water Tape: Solinst S/N: 122004547-1

QC SAMPLE:  MS/MSD  DUP- Sonde ID:  11M  15H  19M  20G

Depth-to-water T/PVC (ft) 35.21 Depth-To-Bottom T/PVC (ft) \_\_\_\_\_ Completed by CE5

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	< 0.33	+/- 10%

Stabilization parameters for the last three readings

1744							200	35.21	
1746	7.55	15.1	784	13.6	1.37	64.0	200	35.21	125.50
1751	7.58	15.3	783	12.3	1.22	52.6	200	35.21	110.36
1756	7.56	19.0	784	11.2	1.04	43.4	200	35.21	59.88
1801	7.57	23.5	780	8.6	0.73	56.0	200	35.21	26.52
1806	7.60	22.8	780	7.2	0.62	58.0	200	35.21	14.57
1811	7.59	23.7	777	6.1	0.52	60.0	200	35.21	10.69
1816	7.60	23.9	777	5.5	0.46	59.5	200	35.21	8.84
1821	7.61	24.3	785	4.2	0.35	46.3	200	35.21	8.03
1826	7.64	21.4	792	3.3	0.29	0.4	200	35.21	5.66
1831	7.65	18.4	790	2.8	0.25	-0.2	200	35.21	4.69
1836	7.66	18.0	793	2.9	0.27	-6.9	200	35.21	4.29
1837									
1846									

Total Pump Time (min): 62 Total Purge Volume (gal): 2.75 gal Reviewed by: JF

Weather: \_\_\_\_\_ Date: 04-24-21

Comments: \_\_\_\_\_

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
2	100 mL	HDPE	E	N					
1	500 mL	I	A	I					
3	125 mL	I	E	I					
3	I	I	A	I					

\* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.





Consumers Energy Company  
Monitoring Well Sampling Worksheet

Well ID JHC-MW-1800R Date 4.13.2021 Control Number 21-0445-03  
 Location JHC-Pond A Well Material:  PVC  SS  Iron  Galv. Steel  
 Purge Method:  Peristaltic  Submersible  Fultz  Bailor  
 Depth to Water Tape: Geotech S/N: 1003  
 QC SAMPLE:  MS/MSD  DUP- 01 Sonde ID:  11M  15H  19M  20G

Depth-to-water T/PVC (ft) 43.23 Depth-To-Bottom T/PVC (ft) 47.60 Completed by UWH

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	<0.33	+/- 10%

Stabilization parameters for the last three readings

0820							120	43.23	
0830	7.06	14.6	799	10.8	1.10	-22.5	120	43.23	60.43
0835	7.06	14.2	797	11.4	1.17	+7.3	120	43.23	37.14
0840	7.06	15.6	793	12.0	1.19	+17.7	120	43.23	29.63
0845	7.06	15.4	790	12.2	1.21	+23.9	120	43.23	21.60
0850	7.05	16.6	800	11.8	1.14	+45.8	120	43.23	18.63
0855	7.05	15.3	804	11.5	1.14	+46.9	120	43.23	18.95
0900	pump stopped pumping						120	43.23	16.41
0910	7.06	18.5	801	6.3	0.59	+50.6	120	43.23	9.41
0915	7.06	18.6	801	6.0	0.53	+53.1	120	43.23	8.63
0920	collected sample								
0921	7.06	18.7	800	5.9	0.50	+55.6	120	43.23	7.41

Total Pump Time (min): 61 Total Purge Volume (gal): 2.0 Reviewed by: [Signature]

Weather: 90°F, sunny, windy 04-24-21

Comments: silty purge water collected DUP-01 Pump @ max speed (255)

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F -							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
2	125mL	HDPE	B	N					
2	↓	↓	A	↓					
2	250mL	↓	A	↓					
4	1-L	↓	B	↓					

\* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.









Consumers Energy Company  
 Monitoring Well Sampling Worksheet

Well ID MW-15011 Date 4-13-21 Control Number 21-0445-06  
 Location JHC Well Material:  PVC  SS  Iron  Galv. Steel  
 Purge Method:  Peristaltic  Submersible  Fultz  Bailer  
 Depth to Water Tape: Schmidt S/N: 122004547-1

QC SAMPLE:  MS/MSD  DUP- Sonde ID:  11M  15H  19M  20G

Depth-to-water T/PVC (ft) 38.87 Depth-To-Bottom T/PVC (ft) \_\_\_\_\_ Completed by CE5

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	<0.33	+/- 10%

Stablization parameters for the last three readings

1901							400	38.87	
1902	7.65	15.8	577	16.0	1.48	86.7	400	38.87	2.39
1907	7.19	14.1	577	4.3	0.44	62.1	400	38.87	5.15
1912	7.18	14.1	572	4.0	0.43	52.7	400	38.87	4.90
1917	7.18	14.1	568	4.0	0.41	48.1	400	38.87	5.18
1922	7.17	14.1	563	4.1	0.42	43.0	400	38.87	5.00
1923									
1928									

Total Pump Time (min): 27 Total Purge Volume (gal): ≈ 2.25 gal Reviewed by: J

Weather: \_\_\_\_\_ Date: 04-24-21

Comments: \_\_\_\_\_

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125ml	HDPE	E	N					
1			F						
1	500ml		I						
2	1000ml		E						

\* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.













Consumers Energy Company  
 Monitoring Well Sampling Worksheet

Well ID P2-245 Date 4-14-21 Control Number 21-0454-02  
 Location JHC Well Material:  PVC  SS  Iron  Galv. Steel  
 Purge Method:  Peristaltic  Submersible  Fultz  Bailor  
 Depth to Water Tape: Solinst S/N: 122004547-1

QC SAMPLE:  MS/MSD  DUP- Sonde ID:  11M  15H  19M  20G

Depth-to-water T/PVC (ft) 7.34 Depth-To-Bottom T/PVC (ft) \_\_\_\_\_ Completed by CE

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	< 0.33	+/- 10%

Stablization parameters for the last three readings

1826							240	7.41	
1828	7.03	7.7	38.6	27.0	3.23	-19.3	240	7.41	2.53
1833	5.86	7.6	32.5	32.4	3.86	107.7	240	7.41	2.24
1838	5.56	7.5	20.4	26.8	3.21	132.5	240	7.41	2.60
1843	5.54	7.6	20.9	26.2	3.14	131.3	<del>240</del> 240	7.41	3.74
1848	5.54	7.5	21.2	25.7	3.08	126.9	240	7.41	3.74
1853	5.55	7.6	21.8	25.1	3.01	119.6	240	7.41	3.33
1858	5.56	7.5	22.0	25.3	3.03	117.3	240	7.41	4.70
1859									
1910									

Total Pump Time (min): 44 Total Purge Volume (gal): ≈ 2.0 gal Reviewed by: [Signature]

Weather: \_\_\_\_\_ Date: 04-24-21

Comments: \_\_\_\_\_

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125ml	HDPE	E	Y	2	1000ml	HDPE	E	N
1	1	1	E	N					
1	1	1	A	1					
1	250ml	1	A	1					

\* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company  
 Monitoring Well Sampling Worksheet

Well ID PZ-405 Date 4-14-20 Control Number 21-0454-03  
 Location JHC Well Material:  PVC  SS  Iron  Galv. Steel  
 Purge Method:  Peristaltic  Submersible  Fultz  Bailer  
 Depth to Water Tape: solinst S/N: 122004547-1

QC SAMPLE:  MS/MSD  DUP- Sonde ID:  11M  15H  19M  20G

Depth-to-water T/PVC (ft) 10.70 Depth-To-Bottom T/PVC (ft) \_\_\_\_\_ Completed by CE

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	< 0.33	+/- 10%

Stablization parameters for the last three readings

2031							240	10.71	
2035	5.58	7.0	29.0	24.8	2.88	152.4	240	10.71	9.50
2038	5.22	7.1	22.4	4.8	0.58	174.1	240	10.71	6.71
2043	5.22	7.0	21.7	4.3	0.55	176.1	240	10.71	5.17
2048	5.21	6.9	20.4	4.3	0.52	178.2	240	10.71	4.63
2053	5.22	6.9	20.1	4.1	0.48	179.3	240	10.71	4.78
2058	5.21	6.9	19.6	4.1	0.49	180.4	240	10.71	4.57
2059									
2112									

Total Pump Time (min): 4/1 Total Purge Volume (gal): ~ 2.0 gal Reviewed by: f

Weather: \_\_\_\_\_ Date: 04-24-21

Comments: \_\_\_\_\_

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
2	100 mL	HDPE	E	N					
1	250 mL	I	A	I					
1	125 mL	I	E	I					
1	I	I	A	I					

\* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.



# **Appendix D**

## **Second Semiannual Monitoring Report**



# 2021 Semiannual Groundwater Monitoring Report and Fourth Quarter 2021 Hydrogeological Monitoring Report

JH Campbell Power Plant  
Pond A CCR Unit

West Olive, Michigan

January 2022

A handwritten signature in black ink, appearing to read "Sarah B. Holmstrom".

Sarah B. Holmstrom, P.G.  
Project Manager/Hydrogeologist

**Prepared For:**

Consumers Energy

**Prepared By:**

TRC  
1540 Eisenhower Place  
Ann Arbor, Michigan 48108

A handwritten signature in black ink, appearing to read "Kristin Lowery".

Kristin Lowery, E.I.T.  
Project Engineer



## TABLE OF CONTENTS

<b>1.0</b>	<b>Introduction.....</b>	<b>1</b>
1.1	Statement of Adherence to Approved Hydrogeological Monitoring Plan .....	1
1.2	Program Summary .....	1
1.3	Site Overview .....	2
1.4	Geology/Hydrogeology .....	3
<b>2.0</b>	<b>Groundwater Monitoring .....</b>	<b>4</b>
2.1	Monitoring Well Network.....	4
2.2	October 2021 Assessment Monitoring.....	4
2.2.1	<i>Analytical Data and Relevant Screening Criteria .....</i>	5
2.2.2	<i>Data Quality Review.....</i>	6
2.2.3	<i>Groundwater Flow Rate and Direction.....</i>	6
<b>3.0</b>	<b>Statistical Evaluation.....</b>	<b>7</b>
3.1	Establishing Groundwater Protection Standards.....	7
3.2	Data Comparison to Groundwater Protection Standards .....	7
3.3	GSI Compliance Monitoring Trends.....	9
<b>4.0</b>	<b>Conclusions and Recommendations .....</b>	<b>10</b>
<b>5.0</b>	<b>References .....</b>	<b>11</b>

### TABLES

Table 1	Summary of Groundwater Elevation Data – Fourth Quarter 2021
Table 2	Summary of Field Parameter Results – Fourth Quarter 2021
Table 3	Summary of Background Well Groundwater Sampling Results (Analytical) – Fourth Quarter 2021
Table 4	Summary of Groundwater Sampling Results (Analytical) – Fourth Quarter 2021
Table 5	Summary of Groundwater Sampling Results (Analytical) – Fourth Quarter 2021 (GSI Monitoring Wells)
Table 6	Summary of Groundwater Protection Standard Exceedances – Fourth Quarter 2021
Table 7	Summary of Groundwater Exceedances – Fourth Quarter 2021

### FIGURES

Figure 1	Site Location Map
Figure 2	Site Plan with CCR Monitoring Well Locations
Figure 3	Groundwater Contour Map – October 2021

## APPENDICES

Appendix A	Data Quality Review
Appendix B	October 2021 Assessment Monitoring Statistical Evaluation
Appendix C	GSI Time Series Charts
Appendix D	October 2021 Laboratory Reports
Appendix E	October 2021 Field Notes

## 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 Pond A CCR Unit at the JH Campbell Power Plant Site (JHC Pond A).

On December 28, 2018, the State of Michigan enacted Public Act No. 640 of 2018 (PA 640) to amend the Natural Resources and Environmental Protection Act, also known as Part 115 of PA 451 of 1994, as amended (a.k.a., Michigan Part 115 Solid Waste Management). On March 18, 2019, Consumers Energy submitted the *Pond A Hydrogeological Monitoring Plan, JH Campbell Power Plant, West Olive, Michigan* (Pond A HMP) (TRC, March 2019; Revised July 2019), which includes the *Pond A Assessment Monitoring Plan* (Pond A AMP), to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) to comply with the requirements of Part 115, Rule 299.4905 and the December 21, 2018 Consent Agreement No. 115-01-2018. The Pond A HMP and AMP were revised per EGLE comments on July 30, 2019 and approved by EGLE on August 13, 2019.

On behalf of Consumers Energy, TRC has prepared this 2021 Semiannual Groundwater Monitoring Report and Fourth Quarter 2021 Hydrogeological Monitoring Report for the JH Campbell Pond A CCR Unit (Semiannual Report) to cover the semiannual groundwater monitoring conducted in October 2021 to comply with the CCR Rule and the Pond A HMP and AMP. Given the alignment of PA 640 to comply with the CCR Rule and the congruencies between the two programs, data collected and evaluated under both programs are presented together in this report. Pond A remains in assessment monitoring.

### 1.1 Statement of Adherence to Approved Hydrogeological Monitoring Plan

This Semiannual Report has been prepared by TRC on behalf of Consumers Energy to present groundwater monitoring data collected from the JH Campbell Pond A. This report was prepared in accordance with the items listed in Appendix A (Solid Waste Monitoring Submittal Components) of the May 15, 2015 Michigan Department of Environmental Quality - Office of Waste Management and Radiological Protection (MDEQ-OWMRP), now the EGLE Materials Management Division (MMD) communication prescribing the format for solid waste disposal facility monitoring submittals as published in OWMRP-115-29, dated July 5, 2013 Format for Solid Waste Disposal Monitoring Submittals. All references herein to the EGLE are inclusive of the MDEQ. Information contained in this report was prepared in adherence to the July 2019 Pond A HMP and AMP, approved by the EGLE on August 13, 2019.

### 1.2 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, Pond A 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-15006, JHC-MW-15007, JHC-MW-15008, JHC-MW-15009, JHC-MW-15010, and JHC-MW-15011; and
- Sulfate at JHC-MW-15006, JHC-MW-15007, JHC-MW-15008, JHC-MW-15009, JHC-MW-15010, and JHC-MW-15011.

As discussed in the *2018 Annual Groundwater Monitoring Report for the JH Campbell Power Plant Pond A CCR Unit* (2018 Annual Report) (TRC, January 2019), Consumers Energy initiated an Assessment Monitoring Program for Pond A 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. After subsequent sampling for Appendix IV constituents, Consumers Energy provided notification that arsenic was present at statistically significant levels above the federal groundwater protection standards (GWPS) established at 10 ug/L (TRC, 2019) in one out of six downgradient monitoring wells at Pond A as follows:

- Arsenic at JHC-MW-15011.

The CCR Rule 40 CFR §257.96(a) requires that an owner or operator initiate an assessment of corrective measures (ACM) to prevent further release, to remediate any releases, and to restore impacted areas to original conditions if any Appendix IV constituent has been detected at a statistically significant level exceeding a GWPS. The *Assessment of Corrective Measures* (ACM) (TRC, September 2019) was initiated on April 14, 2019 and was certified and submitted to the EGLE on September 11, 2019 in accordance with the schedule in §257.96. In addition, Consumers Energy submitted a site-wide remedial action plan (RAP) for the JH Campbell site on September 30, 2021, per the Consent Agreement No. 115-01-2018 executed by Consumers Energy and the EGLE on December 21, 2018.

Consumers Energy will continue to evaluate corrective measures in accordance with §257.96 and §257.97 as outlined in the ACM and will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98, which includes semiannual assessment monitoring in accordance with §257.95. In addition, quarterly monitoring is performed in accordance with the Pond A HMP and AMP under Part 115 since fourth quarter 2019. The initial implementation of the Pond A HMP and AMP was presented in the *2019 Annual Groundwater Monitoring and Corrective Action Report and Fourth Quarter 2019 Hydrogeological Monitoring Report* (2019 Annual Report) (TRC, January 2020). This Semiannual Report presents the results of the fourth quarter 2021 Pond A HMP and AMP event, which also serves as the second semiannual assessment monitoring event for 2021 conducted in accordance with §257.95.

### 1.3 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.

#### **1.4 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

The established groundwater monitoring network for Pond A currently consists of 11 monitoring wells (six background monitoring wells and five downgradient monitoring wells) 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). The five downgradient wells (JHC-MW-15006, JHC-MW-15007R, JHC-MW-15008R, JHC-MW-15009R, and JHC-MW-15011R) are located south and southeast of Pond A.

As shown on Figure 2, monitoring wells JHC-MW-15029 and JHC-MW-15030 are used for water level measurements only.

### 2.2 October 2021 Assessment Monitoring

Consumers Energy personnel performed gauging and sampling of monitoring wells associated with Pond A from October 19 through 22, 2021. Groundwater monitoring was performed in accordance with the approved Pond A HMP and AMP and the *Sample and Analysis Plan* for JH Campbell Power Plant Pond A (SAP) (TRC, January 2021). Groundwater samples collected during the October 2021 event were submitted to Consumers Energy Laboratory Services in Jackson, Michigan, for analysis of the total metals and inorganic indicator constituents. Radium analysis was performed by Eurofins TestAmerica in St Louis, Missouri. Semiannual monitoring constituents include:

Section 11511a(3)(c) – Detection Monitoring Constituents	Section 11519b(2) – Assessment Monitoring Constituents
Boron Calcium Chloride Fluoride Iron pH Sulfate Total Dissolved Solids (TDS)	Antimony Arsenic Barium Beryllium Cadmium Chromium, total Cobalt Copper Fluoride Lead Lithium Mercury Molybdenum



Section 11511a(3)(c) – Detection Monitoring Constituents	Section 11519b(2) – Assessment Monitoring Constituents
	Nickel Radium 226/228 Selenium Silver Thallium Vanadium Zinc

Static water level measurements were collected at all locations after equilibration to atmospheric pressure. The depth to water was measured according to ASTM D 4750, “Standard Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well” and recorded to the nearest 0.01 foot. Static water elevation data are included in the attached field records (Appendix E) and summarized in Table 1.

Groundwater samples were collected using a peristaltic pump or submersible pump in accordance with low flow sampling protocol and were not field filtered to allow for total metals analysis. In addition, field parameters including dissolved oxygen, oxidation reduction potential, specific conductivity, temperature, and turbidity were collected at each well as shown on Table 2. All samples were collected in vendor-provided, nitric acid pre-preserved (metals only) and unpreserved sample containers and submitted to the laboratory for analysis. Consumers Energy followed chain of custody procedures to document the sample handling.

Monitoring well MW-13 had an insufficient amount of groundwater present to collect a sample during the October 2021 sampling event.

Consumers Energy collected quality assurance/quality control (QA/QC) samples during the October 2021 groundwater sampling event. The QA/QC samples consisted of one field blank, one equipment blank, two field duplicates (JHC-MW-15028 and JHC-MW-15007R), and two field matrix spike/matrix spike duplicate (MS/MSD) samples collected from JHC-MW-15008R and JHC-MW-15025.

### **2.2.1 Analytical Data and Relevant Screening Criteria**

Analytical results from the fourth quarter 2021 monitoring event are included in the attached laboratory reports (Appendix D). Fourth quarter 2021 groundwater analytical data is summarized in Table 3 (background monitoring wells), Table 4 (downgradient monitoring wells), and Table 5 (GSI monitoring wells), as well as the associated Part 201 generic drinking water criteria and generic GSI criteria.

---

### **2.2.2 Data Quality Review**

Data 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 Pond A HMP and AMP program. The data quality reviews for the Pond A network wells are summarized in Appendix A.

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

Groundwater elevations measured across the Site during the October 2021 event using several wells throughout the RCRA CCR well network are provided on Table 1. October 2021 groundwater elevations were used to construct the groundwater contour map provided on Figure 3. The average hydraulic gradient of 0.0036 ft/ft was calculated using the following well pairs: JHC-MW-15026/PZ-23S, JHC-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 0.56 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 constituents that could potentially migrate from Pond A.

### 3.0 Statistical Evaluation

Assessment monitoring is continuing at Pond A in accordance with the AMP and §257.95 while corrective measures are further evaluated in accordance with §257.96 and §257.97 as outlined in the ACM. The following section summarizes the statistical approach applied to assess the fourth quarter 2021 groundwater data in accordance with the assessment monitoring program. The statistical evaluation details are provided in Appendix B (*Statistical Evaluation of October 2021 Assessment Monitoring Sampling Event*).

#### 3.1 Establishing Groundwater Protection Standards

The GWPSs are used to assess constituent concentrations present in groundwater as a result of CCR Unit operations by statistically comparing concentrations in the downgradient wells to the GWPSs for each detection and assessment monitoring constituent. The calculation of the Appendix IV GWPSs is documented in the *Groundwater Protection Standards* technical memorandum included in Appendix C of the 2018 Annual Report. Pursuant to the Pond A AMP, GWPSs were established for the Appendix III constituents and the Part 115 Section 11511a(3) constituents not included in Appendix III of the CCR Rule (i.e. iron) and Section 11519b(2) constituents not included in Appendix IV of the CCR Rule (i.e. copper, nickel, silver, vanadium, and zinc) in accordance with 40 CFR 257.95(h), as amended. The calculation of the Appendix III GWPSs is documented in the *Groundwater Protection Standards* technical memorandum included in Appendix G of the 2019 Annual Report. The calculation of the additional Part 115-specific constituent GWPSs is documented in the *PA 640 Constituent Groundwater Protection Standards* technical memorandum included in Appendix B of the *Third Quarter 2020 Hydrogeological Monitoring Report* (TRC, October 2020).

#### 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 documented in the January 14, 2019 *Notification of Appendix IV Constituent Exceeding Groundwater Protection Standard per §257.95(g)*, arsenic was present at statistically significant levels above the GWPSs in one of the six downgradient wells (JHC-MW-15011) at Pond A based on the statistical data comparison for the first semiannual assessment monitoring event (June 2018), included as Appendix D of the 2019 Annual Report.

For the fourth quarter monitoring event, the replacement monitoring well data was pooled with the existing data set from each of the original respective monitoring wells for the purpose of statistical evaluation. Reference to the pooled data sets are denoted with the original well name followed by "/R" (e.g. JHC-MW-15011/R) to indicate that data from both the original and replacement well were used in the evaluation.

In general, the fourth quarter groundwater concentrations at the Pond A monitoring wells were generally consistent with or lower compared to previous quarters, in wells that were replaced and ones that were not. The following statistical evaluation is based on the confidence interval

analysis using a “rolling” data set collected over the past most recent eight events.

The fourth quarter 2021 statistical evaluation indicates that the statistically evaluated Part 115 constituents boron at JHC-MW-15011/R and vanadium at JHC-MW-15006 and JHC-MW-15011/R are present at statistically significant levels above the GWPSs.

- Arsenic was identified at downgradient monitoring well JHC-MW-15011 at statistically significant levels exceeding the GWPS during the initial assessment monitoring event conducted in June 2018. Arsenic at JHC-MW-15011/R continued to be present at statistically significant levels at or above the GWPS through second quarter 2021. As shown in the data tables and trend tests included in Appendix B, arsenic concentrations at JHC-MW-15011/R have begun to decline in 2020 and 2021 such that the arsenic concentration at JHC-MW-15011R decreased to below the GWPS in third and fourth quarter 2021 and the lower confidence limit for JHC-MW-15011/R was below the GWPS in third and fourth quarter 2021.
- Vanadium concentrations at JHC-MW-15006 and JHC-MW-15011 have been generally stable at levels above the GWPS since monitoring for vanadium began in fourth quarter 2019. The vanadium concentration at replacement well JHC-MW-15011R decreased to below the GWPS in third and fourth quarter 2021; however, the lower confidence limit for the JHC-MW-15011/R dataset remained above the GWPS.
- Boron at JHC-MW-15011 was a new exceedance of the GWPS identified in second quarter 2021 and was confirmed in third quarter 2021 with the JHC-MW-15011/R dataset. Boron concentrations at monitoring well JHC-MW-15011 showed an initial increase in 2019, around the timing of the completion of Pond A capping activities and have remained generally stable in 2019 through 2021. A similar increasing boron concentration and statistically significant level above the GWPS was previously identified at JHC-MW-15010 following the Pond A cap installation. In June 2021, EGLE approval was obtained to remove JHC-MW-15010 from the Pond A monitoring program since it is no longer positioned hydraulically downgradient from Pond A. Both of these wells are located on the ends of Pond A and are most susceptible to influence from other potential upgradient CCR sources.

No other constituents were observed at statistically significant levels exceeding the GWPSs in downgradient monitoring wells at Pond A during the fourth quarter 2021. A summary of the confidence intervals for October 2021 are provided in Table 6. Table 7 provides a summary of the statistically significant GWPS exceedances over the most recent four monitoring events.

Groundwater chemistry is currently changing as a result of closure activities performed at Pond A. As discussed in the ACM, Pond A has been decommissioned with final cover in place in the summer of 2019, and the groundwater flow direction has changed such that groundwater generally flows to the south-southeast and mounding is no longer observed as it had been when hydraulic loading was actively taking place. The cessation of hydraulic loading and recharge of the aquifer are expected to have an influence on groundwater conditions as geochemistry changes occur and groundwater from other potential upgradient CCR sources reaches the Pond A well network, and many Appendix III and Appendix IV, and Part 115-specific constituents may be affected by this change, which, as discussed above, was observed with boron at JHC-MW-15010. Continued groundwater monitoring may reduce uncertainty surrounding the potential

changes in groundwater oxidation-reduction conditions and the effect on contaminant transport. These observations will be critical for the comparison of corrective measures alternatives.

### 3.3 GSI Compliance Monitoring Trends

Pursuant to the AMP, trend tests are used to evaluate groundwater quality at the GSI monitoring wells. The GSI monitoring wells will be evaluated for detected constituents (antimony, arsenic, barium, chromium (total), lithium, molybdenum, and selenium) that, based on monitoring data from Pond A, have the potential to exceed generic GSI criteria at the Pond A downgradient monitoring wells as detailed in the AMP. Groundwater data collected from the Pond A wells indicates the presence of TDS and vanadium above generic GSI criteria in one or more of the Pond A wells (Table 4). Given that TDS and vanadium data at the Pond A monitoring wells are above the generic GSI criteria for several consecutive quarterly events, vanadium and TDS have been added to the list of constituents evaluated at the GSI compliance wells associated with the Pond A AMP. A summary of the GSI monitoring data are provided in Table 5.

Time-series plots for the GSI monitoring wells MW-13, MW-14S, PZ-24S, and PZ-40S, including assessment monitoring data collected from February 2020 through October 2021<sup>1</sup> for the aforementioned GSI monitoring constituents detailed in the Pond A AMP, are included in Appendix C. In accordance with the Pond A AMP, the detected constituents at the GSI monitoring wells were evaluated using trend analysis. Specifically, the Mann-Kendall test for trend was performed at a significance level ( $\alpha$ ) of 0.01 per tail for each constituent/sampling point dataset to assess trends over the past 8 monitoring events (February 2020 through October 2021). Sen's Slope estimator was used to assess the magnitude of the slope and the Mann-Kendall test was used to determine if the slope was statistically significant. Trend analysis was not performed on constituent/sampling point datasets that were primarily not detected. The trend analysis shows that there are no statistically significant trends at the GSI wells. Trends were not calculated for TDS and vanadium because less than 8 monitoring events have been performed since these parameters were added to the GSI parameter list in second quarter 2021. Trend analysis will be performed accordingly once at least 5 more GSI sampling events have been conducted (8 monitoring events total).

All of the constituent concentrations at the GSI monitoring wells are below their respective Part 201 generic GSI criteria in October 2021 (Table 5) and there are no statistically significant trends based on the trend analysis (Appendix C).

---

<sup>1</sup> An insufficient amount of groundwater was present in February and April 2020 to collect samples for total metals for MW-13. Select dissolved metal results collected at MW-13 in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP) are included in the time-series plots for February and April 2020.

## 4.0 Conclusions and Recommendations

Assessment monitoring is ongoing at Pond A while corrective action continues to be assessed. Pond A has been decommissioned and the final cover has been placed. The statistical evaluations have confirmed that arsenic is the only Appendix IV constituent present at statistically significant levels above the GWPSs and arsenic concentrations continue to show improvement post-closure. In addition, boron and vanadium are present at statistically significant levels above the GWPSs established under the Part 115-specific program. Compliance for the GSI pathway is currently met based on data collected from the GSI monitoring wells located downgradient from Pond A.

As part of the development of the Remedial Action Plan under Agreement No. 115-01-2018, wetlands between Pond A and the Pigeon River were field delineated in May 2021. Water quality monitoring for the wetlands as GSI receptors will be incorporated into the monitoring program for the site-wide RAP. The ACM also documents that groundwater nature and extent of arsenic has been defined, as required in §257.95(g)(1). Although arsenic concentrations had exceeded the GWPS in on-site groundwater, an evaluation of risk demonstrates that there are currently no adverse effects on human health or the environment from either surface water or groundwater due to CCR management at Pond A.

Consumers Energy also completed the final cover for Pond A in summer of 2019. The ACM report provided a high-level assessment of groundwater remediation technologies that could potentially address site-specific constituents of concern (i.e. arsenic) under known groundwater conditions. Changes in groundwater chemistry continue to be evaluated following the completion of capping at Pond A. The cessation of hydraulic loading and recharge of the aquifer are expected to have an influence on groundwater conditions as geochemistry changes occur and groundwater from other potential upgradient CCR sources reaches the Pond A well network, and many Appendix III and Appendix IV, and Part 115-specific constituents may be affected by this change. Groundwater monitoring will continue to reduce uncertainty surrounding potential changes in groundwater oxidation-reduction conditions and the effect on contaminant transport. These observations will be critical for the comparison of corrective measures alternatives.

The groundwater management remedy for the JH Campbell Pond A will be selected as soon as feasible to, at a minimum, meet the federal standards of §257.97(b) of the CCR Rule. Consumers Energy will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98. The next quarterly Pond A HMP and AMP monitoring event is scheduled for the first calendar quarter of 2022. The next semiannual assessment monitoring event in accordance with §257.95 is scheduled for the second calendar quarter of 2022.



## 5.0 References

- ARCADIS. May 18, 2016. Electric Generation Facilities RCRA CCR Detection Monitoring Program. JH Campbell Monitoring Program Sample and Analysis Plan, West Olive, Michigan. Prepared for Consumers Energy Company.
- Consumers Power Company. September 1996. Hydrogeological Monitoring Plan for JH Campbell Ash Storage Facility, Consumers Power Company, Solid Waste Disposal Area, Coal Ash, Type III
- TRC. October 2017. Groundwater Statistical Evaluation Plan – JH Campbell Power Plant, Pond A, West Olive, Michigan. Prepared for Consumers Energy Company.
- TRC. January 2018. Annual Groundwater Monitoring Report, JH Campbell Power Plant, Pond A CCR Unit, West Olive, Michigan. Prepared for Consumers Energy Company.
- TRC. October 15, 2018. Groundwater Protection Standards, Consumers Energy, JH Campbell Site, Pond A CCR Unit, technical memorandum prepared for Consumers Energy Company.
- TRC. January 2019. 2018 Annual Groundwater Monitoring Report, JH Campbell Power Plant, Pond A CCR Unit, West Olive, Michigan. Prepared for Consumers Energy Company.
- TRC. March 2019; Revised July 2019. Pond A Hydrogeological Monitoring Plan, JH Campbell Power Plant, West Olive, Michigan. Prepared for Consumers Energy Company.
- TRC. September 2019. Assessment of Corrective Measures, JH Campbell Ponds 1-2 North and 1-2 South and Pond A Coal Combustion Residual Units, West Olive, Michigan. Prepared for Consumers Energy Company.
- TRC. January 2020. 2019 Annual Groundwater Monitoring and Corrective Action Report and Fourth Quarter 2019 Hydrogeological Monitoring Report, JH Campbell Power Plant, Pond A CCR Unit, West Olive, Michigan. Prepared for Consumers Energy.
- TRC. April 2020. First Quarter 2020 Hydrogeological Monitoring Report, JH Campbell Power Plant, Pond A CCR Unit, West Olive, Michigan. Prepared for Consumers Energy.
- TRC. October 2020. Third Quarter 2020 Hydrogeological Monitoring Report, JH Campbell Power Plant, Pond A CCR Unit, West Olive, Michigan. Prepared for Consumers Energy.
- TRC. January 2021. Sample and Analysis Plan, Electric Generation Facilities RCRA CCR Assessment Monitoring Program, JH Campbell Power Plant Pond A, West Olive, Michigan. Prepared for Consumers Energy.
- TRC. April 2021. First Quarter 2021 Hydrogeological Monitoring Report, JH Campbell Power Plant, Pond A CCR Unit, West Olive, Michigan. Prepared for Consumers Energy.
- TRC. October 2021. Third Quarter 2021 Hydrogeological Monitoring Report, JH Campbell Power Plant, Pond A CCR Unit, West Olive, Michigan. Prepared for Consumers Energy.



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

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

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

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

## Tables

Table 1  
Summary of Groundwater Elevation Data – Fourth Quarter 2021  
JH Campbell – Assessment Monitoring Program  
West Olive, Michigan

Well Location	Ground Surface Elevation (ft)	TOC Elevation (ft)	Geologic Unit of Screen Interval	Screen Interval Elevation (ft)	October 19, 2021		
					Depth to Water (ft BTOC)	Groundwater Elevation (ft)	
<b>Background</b>							
JHC-MW-15023	617.01	619.98	Sand	603.0 to 593.0	19.00	600.98	
JHC-MW-15024	613.79	616.62	Sand	606.8 to 596.8	14.15	602.47	
JHC-MW-15025	614.14	617.17	Sand	607.1 to 597.1	13.36	603.81	
JHC-MW-15026	615.09	618.04	Sand	607.1 to 597.1	15.11	602.93	
JHC-MW-15027	614.77	617.30	Sand	604.8 to 594.8	15.47	601.83	
JHC-MW-15028	611.02	613.80	Sand	603.0 to 593.0	15.06	598.74	
JHC-MW-15029	608.08	610.95	Sand	600.1 to 590.1	12.11	598.84	
JHC-MW-15030	604.05	607.17	Sand	600.1 to 590.1	10.32	596.85	
<b>Pond 1N, 1S, 2N, 2S</b>							
JHC-MW-15001	607.02	609.53	Sand	603.5 to 598.5	Dry		
JHC-MW-15002	618.18	621.27	Sand	590.2 to 580.2	25.35	595.92	
JHC-MW-15003	623.16	627.20	Sand	595.2 to 585.2	33.47	593.73	
JHC-MW-15005	606.22	609.99	Sand	579.2 to 569.2	18.50	591.49	
JHC-MW-18004	602.92	605.72	Sand	596.9 to 586.9	12.69	593.03	
JHC-MW-18005	600.30	603.16	Sand	595.3 to 585.3	11.90	591.26	
<b>Pond 3N, 3S</b>							
JHC-MW-15013	632.40	635.25	Sand	604.4 to 594.4	35.91	599.34	
JHC-MW-15015	632.46	635.20	Sand	604.5 to 594.5	35.30	599.90	
JHC-MW-15016	631.81	632.52	Sand	603.8 to 593.8	33.71	598.81 <sup>(3)</sup>	
JHC-MW-18001	609.09	611.98	Sand	603.1 to 593.1	12.85	599.13	
JHC-MW-18002	605.53	608.93	Sand	602.0 to 592.0	9.67	599.26	
JHC-MW-18003	605.36	608.78	Sand	601.9 to 591.9	9.61	599.17	
<b>Landfill</b>							
JHC-MW-15017	613.69	616.61	Sand	603.7 to 593.7	16.40	600.21	
JHC-MW-15018	614.26	617.02	Sand	604.3 to 594.3	17.05	599.97	
JHC-MW-15019	609.81	612.86	Sand	603.8 to 593.8	Decommissioned		
JHC-MW-15022	620.92	623.79	Sand	597.9 to 587.9	29.53	594.26	
JHC-MW-15031	632.94	635.87	Sand	599.9 to 589.9	43.65	592.22	
JHC-MW-15032	611.32	614.29	Sand	598.3 to 588.3	17.99	596.30	
JHC-MW-15033	618.08	620.99	Sand	602.1 to 592.1	23.03	597.96	
JHC-MW-15034	612.90	615.97	Sand	601.9 to 591.9	16.97	599.00	
JHC-MW-15035	632.53	634.28	Sand	599.5 to 589.5	41.11	593.17	
JHC-MW-15036	617.94	618.34	Sand	597.9 to 587.9	27.13	591.21	
JHC-MW-15037	614.28	616.06	Sand	591.3 to 586.3	25.55	590.51	
<b>Pond A</b>							
JHC-MW-15006	624.74	627.58	Sand	599.7 to 589.7	35.91	591.67	
JHC-MW-15007	624.82	627.70	Sand	602.8 to 592.8	Decommissioned		
JHC-MW-15007R <sup>(2)</sup>	625.73	628.26	Sand	595.7 to 585.7	37.00	591.26	
JHC-MW-15008R <sup>(1)</sup>	632.32	634.67	Sand	597.3 to 587.3	44.04	590.63	
JHC-MW-15009	632.33	635.32	Sand	602.3 to 592.3	Decommissioned		
JHC-MW-15009R <sup>(2)</sup>	632.15	635.05	Sand	595.2 to 585.2	43.87	591.18	
JHC-MW-15010	632.55	635.57	Sand	602.6 to 592.6	Decommissioned		
JHC-MW-15011	627.71	630.83	Sand	600.7 to 590.7	Decommissioned		
JHC-MW-15011R <sup>(2)</sup>	627.73	629.79	Sand	594.7 to 584.7	38.29	591.50	
<b>Downgradient Wells</b>							
MW-13	593.40	595.37	Clayey Silt	587.9 to 585.4	Dry		
MW-14S	587.36	590.98	Sand	582.9 to 577.9	10.02	580.96	
PZ-23S	602.84	604.97	Sand	591.8 to 586.8	15.61	589.36	
PZ-24S	586.56	590.15	Sand	584.6 to 579.6	8.59	581.56	
PZ-40S	589.51	593.25	Sand	585.5 to 575.5	11.99	581.26	
TW-19-04A	608.15	611.44	Sand	591.2 to 586.2	23.00	588.44	
TW-19-05	603.44	606.36	Sand	592.8 to 587.8	17.09	589.27	
TW-19-06A	599.61	602.54	Sand	592.3 to 587.3	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 October 20, 2021.

**Table 2**  
 Summary of Field Parameters: Fourth Quarter 2021  
 JH Campbell Pond A - Assessment 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	10/20/2021	0.93	208.3	5.8	91	13.8	2.1
JHC-MW-15024	10/20/2021	0.79	124.8	7.0	422	12.4	4.5
JHC-MW-15025	10/19/2021	0.74	144.5	7.8	340	13.1	4.5
JHC-MW-15026	10/19/2021	0.50	181.6	5.7	45	14.5	2.3
JHC-MW-15027	10/19/2021	0.63	69.4	5.9	107	16.0	8.3
JHC-MW-15028	10/19/2021	2.32	52.6	8.3	159	14.8	4.9
<b>Pond A</b>							
JHC-MW-15006	10/21/2021	0.57	-4.7	7.8	783	22.6	5.7
JHC-MW-15007R	10/21/2021	0.47	-107.4	8.0	684	20.7	4.0
JHC-MW-15008R	10/21/2021	0.98	74.0	7.2	719	14.6	0.0
JHC-MW-15009R	10/21/2021	3.79	-42.5	7.1	498	13.5	0.5
JHC-MW-15011R	10/21/2021	0.70	-138.9	8.0	503	20.1	8.1
<b>Pond A GSI</b>							
MW-13	10/19/2021 <sup>(1)</sup>	--	--	--	--	--	--
MW-14S	10/21/2021	0.47	145.5	5.5	26	14.7	2.7
PZ-24S	10/20/2021	1.14	81.6	5.6	34	15.0	2.9
PZ-40S	10/20/2021	0.27	188.1	5.1	24	12.8	3.6

**Notes:**

mg/L - Milligrams per Liter.

mV - Millivolts.

SU - Standard Units.

umhos/cm - Micromhos per centimeter.

°C - Degrees Celsius.

NTU - Nephelometric Turbidity Unit.

-- - not measured.

(1) Not sampled; insufficient amount of groundwater present to collect sample.

**Table 3**  
 Summary of Groundwater Sampling Results (Analytical): Fourth Quarter 2021  
 JH Campbell Background – Assessment Monitoring Program  
 West Olive, Michigan

						Sample Location:	JHC-MW-15023	JHC-MW-15024	JHC-MW-15025	JHC-MW-15026	JHC-MW-15027	JHC-MW-15028
						Sample Date:	10/20/2021	10/20/2021	10/19/2021	10/19/2021	10/19/2021	10/19/2021
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	Background						
<b>Appendix III<sup>(1)</sup></b>												
Boron	ug/L	NC	500	500	7,200	41	< 20	< 20	< 20	< 20	< 20	< 20
Calcium	mg/L	NC	NC	NC	500 <sup>EE</sup>	10.7	40.2	24.2	4.01	13.4	20.0	20.0
Chloride	mg/L	250**	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	3.60	47.1	23.3	1.09	< 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
Sulfate	mg/L	250**	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	11.8	7.53	8.98	5.81	7.89	5.90	5.90
Total Dissolved Solids	mg/L	500**	500 <sup>E</sup>	500 <sup>E</sup>	500	77	242	259	34	71	203	203
pH, Field	SU	<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>5.8</b>	7.0	7.8	<b>5.7</b>	<b>5.9</b>	8.3	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
Arsenic	ug/L	10	10	10	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	2,000	2,000	820	21	25	6	8	15	8	8
Beryllium	ug/L	4	4.0	4.0	18	< 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
Chromium	ug/L	100	100	100	11	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	NC	40	100	100	< 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
Lead	ug/L	NC	4.0	4.0	39	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	170	350	440	< 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
Molybdenum	ug/L	NC	73	210	3,200	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NC	NC	NC	NC	< 0.148	< 0.144	< 0.155	< 0.154	< 0.131	< 0.127	< 0.127
Radium-228	pCi/L	NC	NC	NC	NC	< 0.407	< 0.349	< 0.434	0.449	< 0.380	< 0.393	< 0.393
Radium-226/228	pCi/L	5	NC	NC	NC	< 0.407	0.364	< 0.434	0.573	< 0.380	< 0.393	< 0.393
Selenium	ug/L	50	50	50	5.0	< 1	2	< 1	< 1	< 1	< 1	< 1
Thallium	ug/L	2	2.0	2.0	3.7	< 2	< 2	< 2	< 2	< 2	< 2	< 2
<b>Additional MI Part 115<sup>(2)</sup></b>												
Iron	ug/L	<b>300**</b>	<b>300<sup>E</sup></b>	<b>300<sup>E</sup></b>	500,000 <sup>EE</sup>	86	119	47	28	<b>1,430</b>	41	41
Copper	ug/L	1,000**	1,000 <sup>E</sup>	1,000 <sup>E</sup>	15	< 1	1	< 1	< 1	< 1	< 1	< 1
Nickel	ug/L	NC	100	100	86	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Silver	ug/L	100**	34	98	0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	ug/L	NC	4.5	62	27	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Zinc	ug/L	5,000**	2,400	5,000 <sup>E</sup>	190	< 10	< 10	< 10	< 10	< 10	< 10	< 10

**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 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) Per Michigan Part 115 Amendments - Public Act No. 640 of 2018 Section 11511a(3)(c) and 11519b(2) additional detection monitoring constituents (iron) and assessment monitoring constituents (copper, nickel, silver, vanadium, and zinc) are reported.

**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): Fourth Quarter 2021  
 JH Campbell Pond A – Assessment Monitoring Program  
 West Olive, Michigan

		Sample Location:				JHC-MW-15006	JHC-MW-15007R	JHC-MW-15008R	JHC-MW-15009R	JHC-MW-15011R
		Sample Date:				10/21/2021	10/21/2021	10/21/2021	10/21/2021	10/21/2021
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	downgradient				
<b>Appendix III<sup>(1)</sup></b>										
Boron	ug/L	NC	<b>500</b>	<b>500</b>	7,200	371	<b>956</b>	<b>786</b>	<b>1,680</b>	<b>2,150</b>
Calcium	mg/L	NC	NC	NC	500 <sup>EE</sup>	84.5	68.5	77.2	58.7	51.0
Chloride	mg/L	250**	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	19.6	13.9	15.7	12.1	13.5
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250**	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	217	101	112	25.7	45.0
Total Dissolved Solids	mg/L	500**	500 <sup>E</sup>	500 <sup>E</sup>	500	485	418	443	301	195
pH, Field	SU	6.5 - 8.5**	6.5 - 8.5 <sup>E</sup>	6.5 - 8.5 <sup>E</sup>	6.5 - 9.0	7.8	8.0	7.2	7.1	8.0
<b>Appendix IV<sup>(1)</sup></b>										
Antimony	ug/L	6	6.0	6.0	130	< 1	< 1	1	< 1	< 1
Arsenic	ug/L	10	10	10	10	6	7	< 1	1	3
Barium	ug/L	2,000	2,000	2,000	820	211	219	167	286	131
Beryllium	ug/L	4	4.0	4.0	18	< 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
Chromium	ug/L	100	100	100	11	2	1	< 1	< 1	< 1
Cobalt	ug/L	NC	40	100	100	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	4.0	4.0	39	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	170	350	440	13	13	19	15	< 10
Mercury	ug/L	2	2.0	2.0	0.20#	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	73	210	3,200	48	16	26	5	13
Radium-226	pCi/L	NC	NC	NC	NC	0.277	0.309	0.281	0.374	0.157
Radium-228	pCi/L	NC	NC	NC	NC	< 0.387	< 0.394	< 0.397	< 0.376	0.428
Radium-226/228	pCi/L	5	NC	NC	NC	0.634	0.583	0.661	0.728	0.585
Selenium	ug/L	<b>50</b>	<b>50</b>	<b>50</b>	<b>5.0</b>	1	4	<b>20</b>	<b>62</b>	4
Thallium	ug/L	2	2.0	2.0	3.7	< 2	< 2	< 2	< 2	< 2
<b>Additional MI Part 115<sup>(2)</sup></b>										
Iron	ug/L	<b>300**</b>	<b>300<sup>E</sup></b>	<b>300<sup>E</sup></b>	500,000 <sup>EE</sup>	185	151	150	<b>1,090</b>	264
Copper	ug/L	1,000**	1,000 <sup>E</sup>	1,000 <sup>E</sup>	15	3	4	1	< 1	1
Nickel	ug/L	NC	100	100	86	5	< 2	< 2	< 2	< 2
Silver	ug/L	100**	34	98	0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	ug/L	NC	<b>4.5</b>	62	27	<b>12</b>	<b>8</b>	< 2	3	< 2
Zinc	ug/L	5,000**	2,400	5,000 <sup>E</sup>	190	53	21	< 10	< 10	< 10

**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 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) Per Michigan Part 115 Amendments - Public Act No. 640 of 2018 Section 11511a(3)(c) and 11519b(2) additional detection monitoring constituents (iron) and assessment monitoring constituents (copper, nickel, silver, vanadium, and zinc) are reported.

**BOLD** value indicates an exceedance of one or more of the listed criteria.

**RED** value indicates an exceedance of the MCL.

All metals were analyzed as total unless otherwise specified.



**Table 5**  
 Summary of Groundwater Sampling Results (Analytical): Fourth Quarter 2021  
 JH Campbell Pond A GSI – Assessment Monitoring Program  
 West Olive, Michigan

		Sample Location:				MW-13	MW-14S	PZ-24S	PZ-40S
		Sample Date:				10/19/2021 <sup>(3)</sup>	10/21/2021	10/20/2021	10/20/2021
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI <sup>^</sup>				
<b>Appendix III<sup>(1)</sup></b>									
Total Dissolved Solids	mg/L	500**	500 <sup>E</sup>	500 <sup>E</sup>	500	--	57	46	37
<b>Appendix IV<sup>(1)</sup></b>									
Antimony	ug/L	6	6.0	6.0	130	--	< 1	< 1	< 1
Arsenic	ug/L	10	10	10	10	--	< 1	2	< 1
Barium	ug/L	2,000	2,000	2,000	820	--	11	20	27
Chromium	ug/L	100	100	100	11	--	< 1	2	1
Lithium	ug/L	NC	170	350	440	--	< 10	< 10	< 10
Molybdenum	ug/L	NC	73	210	3,200	--	< 5	< 5	< 5
Selenium	ug/L	50	50	50	5.0	--	< 1	< 1	< 1
<b>Additional MI Part 115<sup>(2)</sup></b>									
Vanadium	ug/L	NC	<b>4.5</b>	62	27	--	< 2	<b>5</b>	< 2

**Notes:**

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

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

NC - no criteria; -- - not analyzed.

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

\*\* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.

<sup>^</sup> - 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).

<sup>E</sup> - Criterion is the aesthetic drinking water value per footnote (E).

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

(2) Per Michigan Part 115 Amendments - Public Act No. 640 of 2018 Section 11511a(3)(c) and 11519b(2) additional detection monitoring constituents (iron) and assessment monitoring constituents (copper, nickel, silver, vanadium, and zinc) are reported.

(3) Not sampled; insufficient amount of groundwater present to collect sample.

**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 6**  
 Summary of Groundwater Protection Standard Exceedances – Fourth Quarter 2021  
 JH Campbell Pond A – Assessment Monitoring Program  
 West Olive, Michigan

Constituent	Units	GWPS	JHC-MW-15006		JHC-MW-15007/R		JHC-MW-15008R		JHC-MW-15009/R		JHC-MW-15011/R	
			LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
<b>Appendix IV</b>												
Arsenic	ug/L	10	--	--	--	--	--	--	--	--	5.4	27
Selenium	ug/L	50	--	--	--	--	3.5	34	15	75	-14	210
<b>Additional Michigan Part 115 Parameters</b>												
Boron*	ug/L	500	--	--	140	980	290	580	26	1,300	2,200	4,900
Sulfate*	mg/L	250	200	270	--	--	--	--	--	--	--	--
TDS*	mg/L	500	490	550	240	460	440	580	--	--	320	660
Iron*	ug/L	870	27	320	--	--	--	--	-240	1,100	16	560
Vanadium*	ug/L	4.5	7.7	15	1.9	20	--	--	--	--	17	44

**Notes:**

ug/L - micrograms per Liter

mg/L - milligrams per Liter

SU - standard units; pH is a field parameter.

-- - Not Applicable; well/parameter pair did not directly exceed the GWPS and was not included in further analysis.

NC - Not Calculated; insufficient data to calculate confidence limits.

GWPS - Groundwater Protection Standard as established in TRC's Technical Memoranda dated October 15, 2018 and December 23, 2019.

UCL - Upper Confidence Limit ( $\alpha = 0.01$ ) of the downgradient data set.

LCL - Lower Confidence Limit ( $\alpha = 0.01$ ) of the downgradient data set.

\*Statistically evaluated per Michigan Part 115.

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

Table 7  
 Summary of Groundwater Exceedances  
 Fourth Quarter 2021  
 JH Campbell Plant Pond A, West Olive, Michigan

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY  
 SUMMARY OF STATISTICAL EXCEEDANCES

Data is in (X) ug/L or  
 ( ) mg/L  
 unless otherwise stated

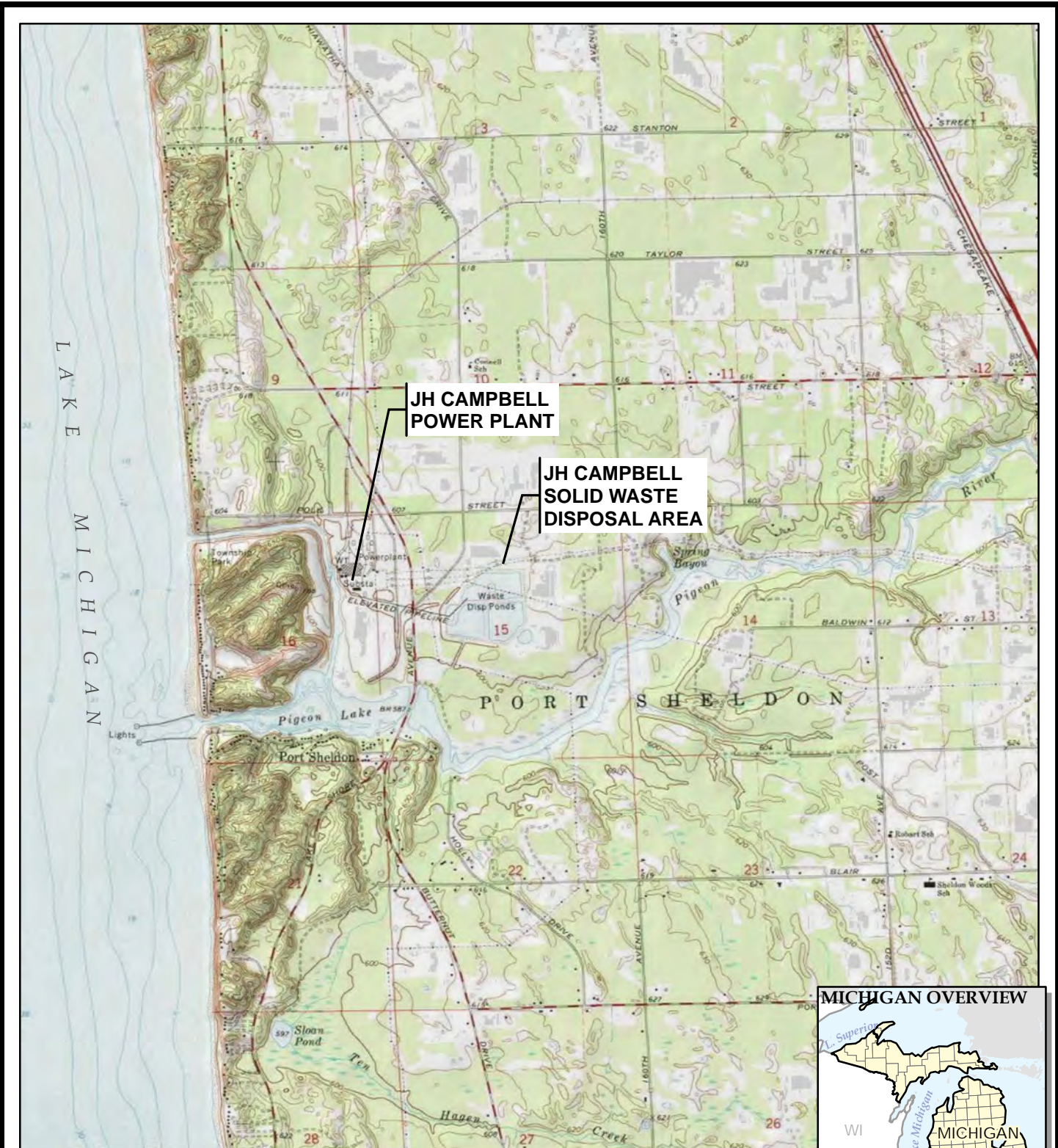
Facility: JH Campbell – WDS# 395496

Well #	Location	Parameter	Part 201 GRCC	Statistical Limit (or 'CC' for Control Charts)	4 Qtr. 2021 (bold >201)	3 Qtr. 2021 (bold >201)	2 Qtr. 2021 (bold >201)	1 Qtr. 2021 (bold >201)
JHC-MW-15011/R	Downgradient	Boron	500	LCL	<b>2,150</b>	<b>4,860</b>	<b>5,070</b>	<b>4,720<sup>(1)</sup></b>
JHC-MW-15011/R	Downgradient	Arsenic	10	LCL	3	2	13	14
JHC-MW-15006	Downgradient	Vanadium	4.5	LCL	12	10	7	7
JHC-MW-15011/R	Downgradient	Vanadium	4.5	LCL	< 2	< 2	34	35

**Notes:**

Table summarizes statistically significant Groundwater Protection Standards (GWPSs) exceedances as determined using confidence intervals.  
 LCL - Lower confidence limit  
 NS - Not sampled; insufficient amount of groundwater present to collect sample.  
 (1) - Exceeded Part 201 Generic Residential Cleanup Criteria (GRCC) but did not result in a statistically significant GWPS exceedance.

## Figures



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.




1540 Eisenhower Place  
Ann Arbor, MI 48108-3284  
Phone: 734.971.7080  
www.trccompanies.com

PROJECT:	<b>CONSUMERS ENERGY COMPANY JH CAMPBELL POWER PLANT WEST OLIVE, MICHIGAN</b>
TITLE:	<b>SITE LOCATION MAP</b>

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

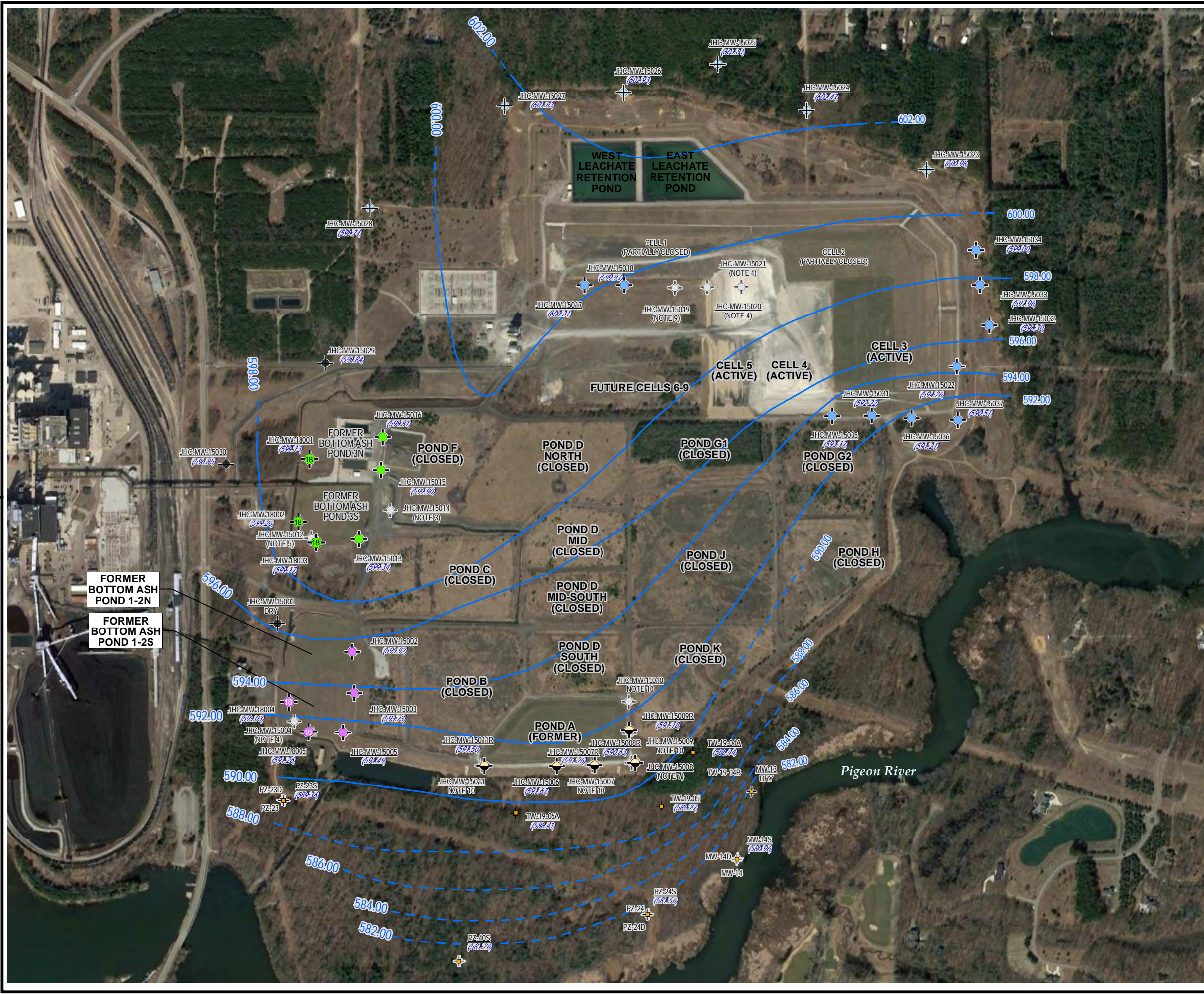
**FIGURE 1**







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\Map\Map\Water\004\_F\1418422-003-002\_of.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.



PROJECT:		<b>CONSUMERS ENERGY COMPANY JH CAMPBELL POWER PLANT WEST OLIVE, MICHIGAN</b>	
TITLE:		<b>GROUNDWATER CONTOUR MAP OCTOBER 2021</b>	
DRAWN BY:	A. FOJTIK	PROJ NO.:	418422-0000
CHECKED BY:	B. YELEN	<b>FIGURE 3</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_of.mxd	



# Appendix A

## Data Quality Review

# Laboratory Data Quality Review Groundwater Monitoring Event October 2021 CEC JH Campbell Pond A

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the October 2021 sampling event. Samples were analyzed for total metals, anions, alkalinity, and total dissolved solids (TDS) by CE Laboratory Services in Jackson, Michigan. The laboratory analytical results were reported in laboratory sample delivery group (SDG) 21-1280R.

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

- JHC-MW-15006
- JHC-MW-15007R
- JHC-MW-15008R
- JHC-MW-15009R
- JHC-MW-15011R

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

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

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

## Data Usability Review Procedure

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

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

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

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

- MS and MSD analyses were performed on sample JHC-MW-15008R for total 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-05/JHC-MW-15007R. All criteria were met with the following exception.
  - The RPD for chromium (66.7%) was above the acceptance criteria. Therefore, potential uncertainty exists for the positive results for chromium in groundwater samples, as summarized in the attached table, Attachment A. However, results are consistent with historical results; therefore, data usability is not affected.

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

<b>Samples</b>	<b>Collection Date</b>	<b>Analyte</b>	<b>Non-Conformance/Issue</b>
JHC-MW-15006	10/21/2021	Chromium	Field duplicate variability; potential uncertainty exists. However, results are consistent with historical results; therefore, data usability is not affected.
JHC-MW-15007R	10/21/2021		
DUP-05	10/21/2021		

**Laboratory Data Quality Review  
Groundwater Monitoring Event October 2021  
CEC JH Campbell Pond A**

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) 160-43809-1.

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

- JHC-MW-15006
- JHC-MW-15007R
- JHC-MW-15008R
- JHC-MW-15009R
- JHC-MW-15011R

Each sample was analyzed for one or more of 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.
- Field and equipment blanks were not submitted with this sample set.
- 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-05/JHC-MW-15007R. All criteria were met.
- Carrier recoveries were within 40-110%.



## 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	Total Dissolved Solids	Field duplicate variability; potential uncertainty exists.
JHC-MW-15024	10/20/2021		
JHC-MW-15025	10/19/2021		
JHC-MW-15026	10/19/2021		
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%.



# **Appendix B**

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

## Technical Memorandum

---

**Date:** January 28, 2022

**To:** Bethany Swanberg, Consumers Energy

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

**Project No.:** 418422.0000.0000 Phase 1 Task 3

**Subject:** Statistical Evaluation of October 2021 Assessment Monitoring Sampling Event, JH Campbell Pond A, Consumers Energy, West Olive, Michigan

---

Consumers Energy is conducting quarterly groundwater monitoring at Pond A in accordance with the Pond A Hydrogeological Monitoring Plan (HMP) and Assessment Monitoring Plan (AMP) and semiannual monitoring in accordance with the CCR Rule per the *Sample and Analysis Plan* for JH Campbell Power Plant Pond A (SAP) (TRC, January 2021). The fourth quarter 2021 monitoring event was conducted on October 19 through 22, 2021. In accordance with the Pond A AMP, the assessment monitoring data must be compared to groundwater protection standards (GWPSs) to determine whether or not Appendix III and Appendix IV constituents, and additional Michigan Part 115 (as amended by PA 640) Section 11511a(3) and Section 11519b(2) constituents, are detected at statistically significant levels above the GWPSs. GWPSs were established as follows:

- Appendix IV GWPSs were established in accordance with §257.95(h), as detailed in the October 15, 2018, Groundwater Protection Standards technical memorandum, included as Appendix C of the 2018 Annual Groundwater Monitoring Report (TRC, January 2019).
- Appendix III GWPSs were established in accordance with §257.95(h) and the HMP, as detailed in the December 23, 2019, Groundwater Protection technical memorandum, included as Appendix G of the 2019 Annual Groundwater Monitoring Report (TRC, January 2020).
- GWPSs were established for additional Section 11511a(3) constituent (iron) and Section 11519b(2) constituents (copper, nickel, silver, vanadium, and zinc) in accordance with §257.95(h) and the HMP, as detailed in the October 27, 2020 PA 640 Constituent Groundwater Protection Standards technical memorandum that was included in the Third Quarter 2020 Hydrogeological Monitoring Report (TRC, October 2020).

The following narrative describes the methods that were employed for the comparisons to the GWPSs. The results obtained and the Sanitas™ output files are included as an attachment.

The statistical evaluation of the fourth quarter 2021 event data indicates that the following constituents are present at statistically significant levels exceeding the GWPS in downgradient monitoring wells at the JHC Pond A CCR Unit:

## Technical Memorandum

<b>Constituent</b>	<b>GWPS</b>	<b># Downgradient Wells Observed</b>
Boron	500 ug/L	1 of 5
Vanadium	4.5 ug/L	2 of 5

The results of the assessment monitoring statistical evaluation for the downgradient wells are consistent with the results of the previous assessment monitoring data statistical evaluations, indicating boron and vanadium are present at statistically significant concentrations above the GWPS and arsenic concentrations continue to show improvement.

### Assessment Monitoring Statistical Evaluation

The downgradient compliance well network at the JHC Pond A consists of five wells (JHC-MW-15006 through JHC-MW-15009/R and JHC-MW-150011/R) located south and east of Pond A. As discussed in the October 7, 2021 *Summary of Pond A Monitoring Well Decommissioning and Replacement* letter, monitoring wells JHC-MW-15007, JHC-MW-15009, and JHC-MW-15011 were decommissioned and replacement monitoring wells JHC-MW-15007R, JHC-MW-15009R, and JHC-MW-15011R were installed in July 2021. For the purposes of statistical evaluation, the data sets from the replacement monitoring wells have been pooled with the former monitoring wells given that the wells were replaced to reset the screens at a lower elevation and data integrity was maintained before and after replacement. However, the monitoring wells are in a different screened interval and a slightly different location adjacent to the original well location. As such, as additional data are collected from the replacement monitoring wells, the datasets will be evaluated to determine if groundwater concentrations at the replacement wells are significantly different from the former wells and if shortening the datasets for statistical evaluation is appropriate.

Following the fourth quarter 2021 sampling event, compliance well data for JHC Pond A were evaluated in accordance with the Groundwater Statistical Evaluation Plan (Stats Plan) (TRC, October 2017) and the Pond A HMP and AMP. The assessment monitoring program evaluates concentrations of CCR constituents present in the uppermost aquifer relative to acceptable levels (i.e., GWPSs). To evaluate whether or not a new 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>1</sup>, the preferred method for comparisons to a fixed standard is confidence limits. 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), upper and lower confidence limits are calculated. The actual mean concentration of the population, with 99 percent confidence, will fall between and lower and upper confidence limits.

For constituents at monitoring wells that have no previously identified statistically significant GWPS exceedances, 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

---

<sup>1</sup> USEPA. 2009. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance*. Office of Conservation and Recovery. EPA 530/R-09-007

## Technical Memorandum

the GWPS<sup>2</sup>. 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 no compelling evidence that the measured concentration is a result of a release from the CCR unit versus the inherent variability of the sample data. This statistical approach is consistent with the statistical methods for assessment monitoring presented in §257.93(f) and (g). Statistical evaluation methodologies built into the CCR Rule, and numerous other federal rules, are key in determining whether or not individually measured data points represent a concentration increase over the baseline or a fixed standard (such as a GWPS in an assessment monitoring program).

For each detected constituent, the concentrations from each well were first compared directly to the GWPS, as shown on Table B1. Constituent-well combinations that included a direct exceedance of the GWPS within the past eight monitoring events for Appendix III and Appendix IV (February 2020 through October 2021 for JHC-MW-15006, JHC-MW-15008R, and JHC-MW-15011/R, and June 2018 through October 2021 for JHC-MW-15007/R and JHC-MW-15009/R) and the past five (JHC-MW-15007/R and JHC-MW-15009/R) or eight events (JHC-MW-15006, JHC-MW-15008R, and JHC-MW-15011/R), as data are available, for the additional Section 11511a(3) constituents (iron) and Section 11519b(2) (copper, nickel, silver, vanadium, and zinc) (February 2020 through October 2021) were retained for further analysis (Attachment 1). Direct comparison GWPS exceedances include the following constituent well combinations:

- Sulfate, total dissolved solids (TDS), iron, and vanadium in JHC-MW-15006;
- Boron, TDS, and vanadium in JHC-MW-15007/R;
- Boron, TDS, and selenium in JHC-MW-15008R;
- Boron, selenium, and iron in JHC-MW-15009/R; and
- Boron, TDS, arsenic, selenium, iron, and vanadium in JHC-MW-15011/R.

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

The statistical data evaluation included the following steps:

- Review of data quality checklists for the data sets;
- Graphical representation of the monitoring data as time versus concentration by well-constituent pair;

---

<sup>2</sup> For pH, an exceedance occurs when the lower confidence level exceeds the upper GWPS or the upper confidence level is below the lower GWPS.

## Technical Memorandum

- Outlier testing of individual data points that appear from the graphical representations as potential outliers;
- Evaluation of visual trends apparent in the graphical representations for statistical significance;
- Evaluation of percentage of non-detects for each well-constituent pair;
- Distribution of the data; and
- Calculation of the confidence intervals for each cumulative dataset.

The results of these evaluations are presented and discussed below.

Initially, results for the past eight events were observed visually for potential trends and outliers (time-series plots in Attachment 1). A decreasing trend was noted for arsenic in JHC-MW-15011/R (trend tests in Attachment 1). Groundwater conditions are re-equilibrating following capping activities at JHC Pond A that were completed in Summer 2019. Because hydrogeologic conditions are in the process of stabilizing, temporary trending and sporadic outlier data are not unexpected.

Data from each round were evaluated for completeness, overall quality, and usability and were deemed appropriate for the purposes of the CCR assessment monitoring program. The Sanitas™ software was then used to test compliance at the downgradient monitoring wells using the confidence interval method for the most recent eight sampling events. Eight independent sampling events provide an appropriate density of data as recommended per the Unified Guidance yet are collected recently enough to provide an indication of current conditions. For the Section 11511a(3) constituents (iron) and Section 11519b(2) (copper, nickel, silver, vanadium, and zinc) at JHC-MW-15007/R and JHC-MW-15009/R, the most recent five sampling events were used to calculate confidence intervals. These data sets will increase each event until there are a total of eight data points, which will then become a rolling window of the most recent eight data points moving forward, for confidence interval analysis. The tests were run with a per-well significance of  $\alpha = 0.01$ . The software outputs are included in Attachment 1 along with data reports showing the values used for the evaluation. The percentage of non-detect observations are also included in Attachment 1. Non-detect data were handled in accordance with the Stats Plan for the purposes of calculating the confidence intervals.

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

Distribution	Constituent-Well Combinations
Normal	Boron at JHC-MW-15009/R and JHC-MW-15011/R Sulfate at JHC-MW-15006 TDS at JHC-MW-15006, JHC-MW-15007/R, and JHC-MW-15011/R Arsenic at JHC-MW-15011/R Selenium at JHC-MW-15009/R and JHC-MW-15011/R Iron at JHC-MW-15009/R (Kaplan-Meier) Vanadium at JHC-MW-15006 and JHC-MW-15007/R

## Technical Memorandum

Distribution	Constituent-Well Combinations
Normalized by power transformation	Boron at JHC-MW-15008R (1/3 power) TDS at JHC-MW-15008R (2 <sup>nd</sup> power) Selenium at JHC-MW-15008R (1/3 power) Iron at JHC-MW-15011/R (1/3 power, Kaplan-Meier) Vanadium at JHC-MW-15011/R (2 <sup>nd</sup> power, Kaplan-Meier)
Normalized by square root transformation	Iron at JHC-MW-15006
Non-Parametric (not able to be normalized)	Boron at JHC-MW-15007/R

The confidence interval test compares the lower confidence limit to the GWPS. The results of the assessment monitoring statistical evaluation for the downgradient wells are consistent with the results of the previous assessment monitoring data statistical evaluations, indicating boron and vanadium are present at statistically significant concentrations above the GWPS. Arsenic was identified at downgradient monitoring well JHC-MW-15011 at statistically significant levels exceeding the GWPS during the initial assessment monitoring event conducted in June 2018. As shown in Table B1 and Attachment 1, arsenic concentrations in this well have declined in 2020 and 2021 and the lower confidence limit was below the GWPS during fourth quarter 2021. Boron at JHC-MW-15011/R was observed at statistically significant levels above the GWPS for the first time in second quarter 2021; however, concentrations have been trending upward since 2019 and have been consistently above the GWPS since October 2019. Vanadium at JHC-MW-15006 and JHC-MW-15011/R were identified at statistically significant levels exceeding the GWPS in October 2020. Vanadium concentrations at these monitoring wells have consistently been above the GWPS since monitoring for vanadium under the Pond A HMP and AMP began in October 2019. As discussed above, completion of JHC Pond A capping activities occurred in Summer 2019 and groundwater conditions are re-equilibrating. Consumers Energy will continue to monitor changes in groundwater chemistry and the assessment of corrective measures per the Pond A HMP and AMP and §257.95(g).

### Attachments

Table B1	Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
Attachment 1	Sanitas™ Output



# Table

Table B1  
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation  
JH Campbell Pond A - HMP/AMP  
West Olive, Michigan

Sample Location:									JHC-MW-15006								
Sample Date:									2/12/2020	4/14/2020	7/16/2020	10/22/2020	10/22/2020	2/23/2021	4/13/2021	8/17/2021	10/21/2021
Constituent	Unit	EPA MCL	EPA RSL	MI Residential*	MI Non-Residential*	MI GSI^	UTL	GWPS					Field Dup				
<b>Appendix III<sup>(1)</sup></b>																	
Boron	ug/L	NC	NA	500	500	7,200	54	500	247	284	242	272	331	301	288	358	371
Calcium	mg/L	NC	NA	NC	NC	500 <sup>EE</sup>	40	500	101	102	91.4	87.2	84.3	89.0	82.0	71.5	84.5
Chloride	mg/L	250**	NA	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	70	250	21.0	24.9	27.7	22.0	22.2	21.2	22.9	20.1	19.6
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250**	NA	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	13	250	217	260	195	253	251	276	257	184	217
Total Dissolved Solids	mg/L	500**	NA	500 <sup>E</sup>	500 <sup>E</sup>	500	240	500	542	562	521	515	511	556	497	501	485
pH, Field	SU	6.5 - 8.5**	NA	6.5 - 8.5 <sup>E</sup>	6.5 - 8.5 <sup>E</sup>	6.5 - 9.0	5.5 - 8.8	5.5 - 8.8	7.6	7.2	7.4	7.5	--	7.7	7.7	7.5	7.8
<b>Appendix IV<sup>(1)</sup></b>																	
Antimony	ug/L	6	NA	6.0	6.0	130	2	6	< 1	1	< 1	1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	NA	10	10	10	1	10	6	5	5	9	6	4	3	5	6
Barium	ug/L	2,000	NA	2,000	2,000	820	35	2,000	326	353	291	382	194	227	188	175	211
Beryllium	ug/L	4	NA	4.0	4.0	18	1	4	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	NA	5.0	5.0	3.5	0.2	5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	100	100	11	2	100	2	1	18	5	1	< 1	3	6	2
Cobalt	ug/L	NC	6	40	100	100	15	15	< 6	< 15	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	NA	NC	NC	NC	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	4.0	4.0	39	1	15	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	40	170	350	440	10	40	13	13	13	15	14	13	12	12	13
Mercury	ug/L	2	NA	2.0	2.0	0.20#	0.2	2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	73	210	3,200	5	100	13	16	22	38	37	37	54	43	48
Radium-226	pCi/L	NC	NA	NC	NC	NC	NA	NA	--	0.426	--	0.289	< 0.345	--	0.241	--	0.277
Radium-228	pCi/L	NC	NA	NC	NC	NC	NA	NA	--	0.518	--	< 0.274	< 0.399	--	0.432	--	< 0.387
Radium-226/228	pCi/L	5	NA	NC	NC	NC	1.93	5	--	0.944	--	0.318	0.453	--	0.673	--	0.634
Selenium	ug/L	50	NA	50	50	5.0	5	50	8	9	5	2	1	1	< 1	2	1
Thallium	ug/L	2	NA	2.0	2.0	3.7	2	2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
<b>MI Part 115 Parameters<sup>(2)</sup></b>																	
Iron	ug/L	300**	NA	300 <sup>E</sup>	300 <sup>E</sup>	500,000 <sup>EE</sup>	870	870	189	26	128	929	213	43	41	137	185
Copper	ug/L	1,000**	NA	1,000 <sup>E</sup>	1,000 <sup>E</sup>	15	2.1	1,000	2	1	11	4	4	1	4	2	3
Nickel	ug/L	NC	NA	100	100	86	2	100	14	1	13	5	< 2	< 2	2	6	5
Silver	ug/L	100**	NA	34	98	0.20	0.2	34	< 0.2	< 0.4	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	ug/L	NC	NA	4.5	62	27	2	4.5	16	10	15	19	9	7	7	10	12
Zinc	ug/L	5,000**	NA	2,400	5,000 <sup>E</sup>	190	18	2,400	< 10	< 10	< 30	11	23	< 10	< 10	< 10	53

**Notes:**

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

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

NA - not applicable.

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. Appendix IV GWPS is the higher of the MCL/RSL and UTL as established in TRC's

Technical Memorandum dated October 15, 2018. Appendix III and MI Part 115 Parameter GWPS is the most restrictive of the MCL/Part 201 criteria, or the UTL

if the UTL exceeds the applicable criteria as established in TRC's Technical Memorandum dated December 23, 2019.

\* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.

\*\* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.

^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using

site-specific hardness of 180 mg 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 EGLE policy and procedure 09-014 dated June 20, 2012.

<sup>E</sup> - Criterion is the aesthetic drinking water value per footnote (E).

<sup>EE</sup> - Criterion is based on the total dissolved solids GSI value per footnote (EE).

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

(2) Per Michigan Part 115 Amendments - Public Act No. 640 of 2018 Section 11511a(3)(c) and 11519b(2) additional detection

monitoring constituents (iron) and assessment monitoring constituents (copper, nickel, silver, vanadium, and zinc) are reported.

(3) JHC-MW-15008 was decommissioned on June 24, 2019. Replacement well JHC-MW-15008R was installed on June 25, 2019.

(4) Not sampled; insufficient amount of groundwater present to collect sample.

(5) JHCW-MW-15007, JHC-MW-15009, and JHC-MW-15011 were decommissioned in July 2021. Replacement wells

JHC-MW-15007R, JHC-MW-15009R, and JHC-MW-15011R were installed on July 20-22, 2021.

Table B1  
 Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation  
 JH Campbell Pond A - HMP/AMP  
 West Olive, Michigan

Sample Location:									JHC-MW-15007 <sup>(5)</sup>									JHC-MW-15007R <sup>(5)</sup>				
Sample Date:									6/20/2018	11/15/2018	4/24/2019	10/9/2019 <sup>(4)</sup>	2/12/2020	4/14/2020	7/16/2020	10/22/2020 <sup>(4)</sup>	2/23/2021 <sup>(4)</sup>	4/13/2021 <sup>(4)</sup>	8/17/2021	8/17/2021	10/21/2021	10/21/2021
Constituent	Unit	EPA MCL	EPA RSL	MI Residential*	MI Non-Residential*	MI GSI <sup>^</sup>	UTL	GWPS											Field Dup		Field Dup	
<b>Appendix III<sup>(1)</sup></b>																						
Boron	ug/L	NC	NA	500	500	7.200	54	<b>500</b>	157	142	190	--	147	242	162	--	--	--	373	409	<b>956</b>	<b>1,000</b>
Calcium	mg/L	NC	NA	NC	NC	500 <sup>EE</sup>	40	500	38.7	42.6	79	--	55.2	62.1	52.8	--	--	--	76.9	80.4	68.5	72.6
Chloride	mg/L	250**	NA	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	70	250	17.5	20.6	23	--	9.10	14.1	9.16	--	--	--	15.8	16.0	13.9	14.2
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	--	< 1,000	< 1,000	< 1,000	--	--	--	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250**	NA	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	13	<b>250</b>	26.2	19.2	54	--	31.9	83.0	68.3	--	--	--	170	172	101	104
Total Dissolved Solids	mg/L	500**	NA	500 <sup>E</sup>	500 <sup>E</sup>	500	240	<b>500</b>	298	166	360	--	312	336	357	--	--	--	<b>530</b>	<b>559</b>	418	419
pH, Field	SU	6.5 - 8.5**	NA	6.5 - 8.5 <sup>E</sup>	6.5 - 8.5 <sup>E</sup>	6.5 - 9.0	5.5 - 8.8	5.5 - 8.8	7.4	7.6	7.4	--	7.4	7.0	7.1	--	--	--	7.7	--	8.0	--
<b>Appendix IV<sup>(1)</sup></b>																						
Antimony	ug/L	6	NA	6.0	6.0	130	2	6	< 1.0	< 1.0	< 1.0	--	< 1	< 1	< 1	--	--	--	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	NA	10	10	10	1	<b>10</b>	2.9	4.0	4.0	--	3	3	3	--	--	--	6	6	7	7
Barium	ug/L	2,000	NA	2,000	2,000	820	35	2,000	115	177	320	--	231	266	248	--	--	--	250	265	219	224
Beryllium	ug/L	4	NA	4.0	4.0	18	1	4	< 1.0	< 1.0	< 1.0	--	< 1	< 1	< 1	--	--	--	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	NA	5.0	5.0	3.5	0.2	5	< 0.20	< 0.20	< 0.20	--	< 0.2	< 0.2	< 0.2	--	--	--	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	100	100	11	2	100	1.2	31.3	35	--	3	2	2	--	--	--	< 1	< 1	1	2
Cobalt	ug/L	NC	6	40	100	100	15	15	< 15.0	< 6.0	< 6.0	--	< 6	< 15	< 6	--	--	--	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	NA	NC	NC	NC	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	4.0	4.0	39	1	15	< 1.0	< 1.0	< 1.0	--	< 1	< 1	< 1	--	--	--	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	40	170	350	440	10	40	15	16	12	--	15	14	13	--	--	--	13	14	13	13
Mercury	ug/L	2	NA	2.0	2.0	0.20#	0.2	2	< 0.20	< 0.20	< 0.20	--	< 0.2	< 0.2	< 0.2	--	--	--	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	73	210	3,200	5	100	< 5.0	7.6	7.2	--	< 5	< 5	< 5	--	--	--	22	23	16	16
Radium-226	pCi/L	NC	NA	NC	NC	NC	NA	NA	< 0.736	0.864	0.217	--	--	0.197	--	--	--	--	--	--	0.309	0.302
Radium-228	pCi/L	NC	NA	NC	NC	NC	NA	NA	< 1.12	< 0.688	0.392	--	--	< 0.456	--	--	--	--	--	--	< 0.394	< 0.381
Radium-226/228	pCi/L	5	NA	NC	NC	NC	1.93	5	< 1.86	1.40	0.609	--	--	< 0.456	--	--	--	--	--	--	0.583	0.483
Selenium	ug/L	50	NA	50	50	5.0	5	<b>50</b>	1.3	< 1.0	4.1	--	23	22	22	--	--	--	7	7	4	4
Thallium	ug/L	2	NA	2.0	2.0	3.7	2	2	< 2.0	< 2.0	< 2.0	--	< 2	< 2	< 2	--	--	--	< 2	< 2	< 2	< 2
<b>MI Part 115 Parameters<sup>(2)</sup></b>																						
Iron	ug/L	300**	NA	300 <sup>E</sup>	300 <sup>E</sup>	500,000 <sup>EE</sup>	870	<b>870</b>	--	--	--	--	71	< 20	< 20	--	--	--	36	33	151	165
Copper	ug/L	1,000**	NA	1,000 <sup>E</sup>	1,000 <sup>E</sup>	15	2.1	1,000	--	--	--	--	2	1	< 1	--	--	--	1	1	4	4
Nickel	ug/L	NC	NA	100	100	86	2	100	--	--	--	--	7	< 1	< 2	--	--	--	< 2	< 2	< 2	2
Silver	ug/L	100**	NA	34	98	0.20	0.2	34	--	--	--	--	< 0.2	< 0.2	< 0.2	--	--	--	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	ug/L	NC	NA	4.5	62	27	2	<b>4.5</b>	--	--	--	--	<b>16</b>	<b>14</b>	<b>15</b>	--	--	--	3	3	<b>8</b>	<b>8</b>
Zinc	ug/L	5,000**	NA	2,400	5,000 <sup>E</sup>	190	18	2,400	--	--	--	--	10	< 10	< 30	--	--	--	< 10	< 10	21	20

**Notes:**  
 ug/L - micrograms per liter; mg/L - milligrams per liter.  
 pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.  
 NA - not applicable.  
 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. Appendix IV GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018. Appendix III and MI Part 115 Parameter GWPS is the most restrictive of the MCL/Part 201 criteria, or the UTL if the UTL exceeds the applicable criteria as established in TRC's Technical Memorandum dated December 23, 2019.  
 \* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.  
 \*\* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.  
 ^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using site-specific hardness of 180 mg CaCO3/L as measured at surface water sample SW-01 collected on April 9, 2018 from the Pigeon River. Chromium GSI criterion based on hexavalent chromium per footnote (H).  
 # - If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and EGLE policy and procedure 09-014 dated June 20, 2012.  
 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).  
**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) 40 CFR Part 257 Appendix III Detection Monitoring Constituents and Appendix IV Assessment Monitoring Constituents.  
 (2) Per Michigan Part 115 Amendments - Public Act No. 640 of 2018 Section 11511a(3)(c) and 11519b(2) additional detection monitoring constituents (iron) and assessment monitoring constituents (copper, nickel, silver, vanadium, and zinc) are reported.  
 (3) JHC-MW-15008 was decommissioned on June 24, 2019. Replacement well JHC-MW-15008R was installed on June 25, 2019.  
 (4) Not sampled; insufficient amount of groundwater present to collect sample.  
 (5) JHCW-MW-15007, JHC-MW-15009, and JHC-MW-15011 were decommissioned in July 2021. Replacement wells JHC-MW-15007R, JHC-MW-15009R, and JHC-MW-15011R were installed on July 20-22, 2021.

Table B1  
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation  
JH Campbell Pond A - HMP/AMP  
West Olive, Michigan

Sample Location:									JHC-MW-15008R <sup>(3)</sup>								
Sample Date:									2/12/2020	4/14/2020	7/16/2020	10/22/2020	2/23/2021	4/13/2021	4/13/2021	8/18/2021	10/21/2021
Constituent	Unit	EPA MCL	EPA RSL	MI Residential*	MI Non-Residential*	MI GSI <sup>^</sup>	UTL	GWPS									
<b>Appendix III<sup>(1)</sup></b>																	
Boron	ug/L	NC	NA	500	500	7,200	54	<b>500</b>	423	<b>505</b>	384	285	326	352	360	364	<b>786</b>
Calcium	mg/L	NC	NA	NC	NC	500 <sup>EE</sup>	40	500	94.7	99.9	79.8	109	105	85.4	87.0	62.3	77.2
Chloride	mg/L	250**	NA	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	70	250	22.4	25.0	25.4	18.8	17.2	17.2	17.1	13.2	15.7
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250**	NA	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	13	<b>250</b>	219	235	183	215	197	185	186	90.8	112
Total Dissolved Solids	mg/L	500**	NA	500 <sup>E</sup>	500 <sup>E</sup>	500	240	<b>500</b>	<b>556</b>	<b>566</b>	<b>536</b>	<b>577</b>	<b>548</b>	<b>517</b>	<b>512</b>	365	443
pH, Field	SU	6.5 - 8.5**	NA	6.5 - 8.5 <sup>E</sup>	6.5 - 8.5 <sup>E</sup>	6.5 - 9.0	5.5 - 8.8	5.5 - 8.8	7.3	6.9	7.1	7.0	7.0	7.1	--	7.1	7.2
<b>Appendix IV<sup>(1)</sup></b>																	
Antimony	ug/L	6	NA	6.0	6.0	130	2	6	< 1	1	< 1	1	< 1	1	< 1	< 1	1
Arsenic	ug/L	10	NA	10	10	10	1	<b>10</b>	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	NA	2,000	2,000	820	35	2,000	291	252	219	216	250	200	195	137	167
Beryllium	ug/L	4	NA	4.0	4.0	18	1	4	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	NA	5.0	5.0	3.5	0.2	5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	100	100	11	2	100	7	< 1	< 1	< 1	2	41	56	< 1	< 1
Cobalt	ug/L	NC	6	40	100	100	15	15	< 6	< 15	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	NA	NC	NC	NC	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	4.0	4.0	39	1	15	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	40	170	350	440	10	40	18	19	17	19	20	20	21	17	19
Mercury	ug/L	2	NA	2.0	2.0	0.20#	0.2	2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	73	210	3,200	5	100	< 5	< 5	< 5	5	9	17	19	21	26
Radium-226	pCi/L	NC	NA	NC	NC	NC	NA	NA	--	0.180	--	0.553	--	0.272	0.351	--	0.281
Radium-228	pCi/L	NC	NA	NC	NC	NC	NA	NA	--	< 0.429	--	0.330	--	< 0.491	< 0.512	--	< 0.397
Radium-226/228	pCi/L	5	NA	NC	NC	NC	1.93	5	--	0.549	--	0.883	--	0.496	0.780	--	0.661
Selenium	ug/L	50	NA	50	50	5.0	5	<b>50</b>	11	6	13	<b>68</b>	16	6	6	3	20
Thallium	ug/L	2	NA	2.0	2.0	3.7	2	2	< 2	< 2	2	< 2	2	2	< 2	< 2	< 2
<b>MI Part 115 Parameters<sup>(2)</sup></b>																	
Iron	ug/L	300**	NA	300 <sup>E</sup>	300 <sup>E</sup>	500,000 <sup>EE</sup>	870	<b>870</b>	164	134	48	56	41	347	419	24	150
Copper	ug/L	1,000**	NA	1,000 <sup>E</sup>	1,000 <sup>E</sup>	15	2.1	1,000	2	2	2	2	2	5	5	1	1
Nickel	ug/L	NC	NA	100	100	86	2	100	8	< 1	< 2	< 2	3	38	48	6	< 2
Silver	ug/L	100**	NA	34	98	0.20	0.2	34	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	ug/L	NC	NA	4.5	62	27	2	<b>4.5</b>	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Zinc	ug/L	5,000**	NA	2,400	5,000 <sup>E</sup>	190	18	2,400	< 10	< 10	< 30	< 10	< 10	< 10	< 10	< 10	< 10

**Notes:**

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

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

NA - not applicable.

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. Appendix IV GWPS is the higher of the MCL/RSL and UTL as established in TRC's

Technical Memorandum dated October 15, 2018. Appendix III and MI Part 115 Parameter GWPS is the most restrictive of the MCL/Part 201 criteria, or the UTL

if the UTL exceeds the applicable criteria as established in TRC's Technical Memorandum dated December 23, 2019.

\* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.

\*\* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.

<sup>^</sup> - 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 EGLE policy and procedure 09-014 dated June 20, 2012.

<sup>E</sup> - Criterion is the aesthetic drinking water value per footnote (E).

<sup>EE</sup> - Criterion is based on the total dissolved solids GSI value per footnote (EE).

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

(2) Per Michigan Part 115 Amendments - Public Act No. 640 of 2018 Section 11511a(3)(c) and 11519b(2) additional detection

monitoring constituents (iron) and assessment monitoring constituents (copper, nickel, silver, vanadium, and zinc) are reported.

(3) JHC-MW-15008 was decommissioned on June 24, 2019. Replacement well JHC-MW-15008R was installed on June 25, 2019.

(4) Not sampled; insufficient amount of groundwater present to collect sample.

(5) JHCW-MW-15007, JHC-MW-15009, and JHC-MW-15011 were decommissioned in July 2021. Replacement wells

JHC-MW-15007R, JHC-MW-15009R, and JHC-MW-15011R were installed on July 20-22, 2021.

Table B1  
 Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation  
 JH Campbell Pond A - HMP/AMP  
 West Olive, Michigan

Sample Location:									JHC-MW-15009 <sup>(5)</sup>												JHC-MW-15009R <sup>(5)</sup>		
Sample Date:									6/20/2018	11/15/2018	11/15/2018	4/24/2019	4/24/2019	10/9/2019 <sup>(4)</sup>	2/12/2020	4/14/2020	4/14/2020	7/16/2020	10/22/2020 <sup>(4)</sup>	2/23/2021 <sup>(4)</sup>	4/13/2021 <sup>(4)</sup>	8/16/2021	10/21/2021
Constituent	Unit	EPA MCL	EPA RSL	MI Residential <sup>*</sup>	MI Non-Residential <sup>*</sup>	MI GSI <sup>^</sup>	UTL	GWPS			Field Dup		Field Dup				Field Dup						
<b>Appendix III<sup>(1)</sup></b>																							
Boron	ug/L	NC	NA	500	500	7,200	54	<b>500</b>	91.4	188	187	200	190	--	468	<b>874</b>	<b>881</b>	401	--	--	--	<b>1440</b>	<b>1,680</b>
Calcium	mg/L	NC	NA	NC	NC	500 <sup>EE</sup>	40	500	41.2	46.2	46.4	92	89	--	74.5	78.7	79.9	84.2	--	--	--	67.1	58.7
Chloride	mg/L	250 <sup>**</sup>	NA	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	70	250	22.9	17.7	17.7	17	16	--	10.7	6.95	6.78	6.18	--	--	--	6.73	12.1
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	--	< 1,000	< 1,000	< 1,000	< 1,000	--	--	--	< 1,000	< 1,000
Sulfate	mg/L	250 <sup>**</sup>	NA	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	13	<b>250</b>	18.2	26.9	27.1	130	130	--	40.5	49.1	49.9	64.4	--	--	--	25.2	25.7
Total Dissolved Solids	mg/L	500 <sup>**</sup>	NA	500 <sup>E</sup>	500 <sup>E</sup>	500	240	<b>500</b>	214	234	202	430	440	--	332	354	341	397	--	--	--	83	301
pH, Field	SU	6.5 - 8.5 <sup>**</sup>	NA	6.5 - 8.5 <sup>E</sup>	6.5 - 8.5 <sup>E</sup>	6.5 - 9.0	5.5 - 8.8	5.5 - 8.8	7.7	7.6	--	7.4	--	--	7.5	7.2	--	7.2	--	--	--	6.5	7.1
<b>Appendix IV<sup>(1)</sup></b>																							
Antimony	ug/L	6	NA	6.0	6.0	130	2	6	< 1.0	1.2	< 1.0	< 1.0	< 1.0	--	< 1	1	1	< 1	--	--	--	< 1	< 1
Arsenic	ug/L	10	NA	10	10	10	1	<b>10</b>	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1	< 1	< 1	< 1	--	--	--	< 1	1
Barium	ug/L	2,000	NA	2,000	2,000	820	35	2,000	130	178	181	360	360	--	287	307	298	290	--	--	--	237	286
Beryllium	ug/L	4	NA	4.0	4.0	18	1	4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1	< 1	< 1	< 1	--	--	--	< 1	< 1
Cadmium	ug/L	5	NA	5.0	5.0	3.5	0.2	5	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--	< 0.2	< 0.2	< 0.2	< 0.2	--	--	--	< 0.2	< 0.2
Chromium	ug/L	100	NA	100	100	11	2	100	< 1.0	14.1	11.8	17	14	--	31	1	1	1	--	--	--	< 1	< 1
Cobalt	ug/L	NC	6	40	100	100	15	15	< 15.0	< 6.0	< 6.0	< 6.0	< 6.0	--	< 6	< 15	< 15	< 6	--	--	--	< 6	< 6
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	--	< 1,000	< 1,000	< 1,000	< 1,000	--	--	--	< 1,000	< 1,000
Lead	ug/L	NC	15	4.0	4.0	39	1	15	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1	< 1	< 1	< 1	--	--	--	< 1	< 1
Lithium	ug/L	NC	40	170	350	440	10	40	< 10	14	14	11	11	--	14	14	14	14	--	--	--	13	15
Mercury	ug/L	2	NA	2.0	2.0	0.20 <sup>#</sup>	0.2	2	< 0.20	< 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	73	210	3,200	5	100	< 5.0	6.1	6.1	5.7	5.6	--	15	< 5	< 5	6	--	--	--	7	5
Radium-226	pCi/L	NC	NA	NC	NC	NC	NA	NA	< 0.631	< 0.896	< 0.705	0.351	0.289	--	--	0.394	0.307	--	--	--	--	--	0.374
Radium-228	pCi/L	NC	NA	NC	NC	NC	NA	NA	< 0.634	0.800	< 0.663	0.674	0.509	--	--	0.573	0.459	--	--	--	--	--	< 0.376
Radium-226/228	pCi/L	5	NA	NC	NC	NC	1.93	5	< 1.27	< 1.47	< 1.37	1.02	0.798	--	--	0.967	0.767	--	--	--	--	--	0.728
Selenium	ug/L	50	NA	50	50	5.0	5	<b>50</b>	10.3	12.6	12.6	<b>61</b>	<b>63</b>	--	20	<b>77</b>	<b>79</b>	<b>76</b>	--	--	--	37	<b>62</b>
Thallium	ug/L	2	NA	2.0	2.0	3.7	2	2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	--	< 2	< 2	< 2	< 2	--	--	--	< 2	< 2
<b>MI Part 115 Parameters<sup>(2)</sup></b>																							
Iron	ug/L	300 <sup>**</sup>	NA	300 <sup>E</sup>	300 <sup>E</sup>	500,000 <sup>EE</sup>	870	<b>870</b>	--	--	--	--	--	--	420	< 20	< 20	34	--	--	--	496	<b>1,090</b>
Copper	ug/L	1,000 <sup>**</sup>	NA	1,000 <sup>E</sup>	1,000 <sup>E</sup>	15	2.1	1,000	--	--	--	--	--	--	4	1	2	3	--	--	--	4	< 1
Nickel	ug/L	NC	NA	100	100	86	2	100	--	--	--	--	--	--	41	< 1	1	< 2	--	--	--	< 2	< 2
Silver	ug/L	100 <sup>**</sup>	NA	34	98	0.20	0.2	34	--	--	--	--	--	--	< 0.2	< 0.2	< 0.2	< 0.2	--	--	--	< 0.2	< 0.2
Vanadium	ug/L	NC	NA	4.5	62	27	2	<b>4.5</b>	--	--	--	--	--	--	3	< 2	< 2	< 2	--	--	--	< 2	3
Zinc	ug/L	5,000 <sup>**</sup>	NA	2,400	5,000 <sup>E</sup>	190	18	2,400	--	--	--	--	--	--	< 10	< 10	< 10	< 30	--	--	--	12	< 10

**Notes:**  
 ug/L - micrograms per liter; mg/L - milligrams per liter.  
 pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.  
 NA - not applicable.  
 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. Appendix IV GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018. Appendix III and MI Part 115 Parameter GWPS is the most restrictive of the MCL/Part 201 criteria, or the UTL if the UTL exceeds the applicable criteria as established in TRC's Technical Memorandum dated December 23, 2019.  
<sup>\*</sup> - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.  
<sup>\*\*</sup> - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.  
<sup>^</sup> - 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).  
<sup>#</sup> - If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and EGLE policy and procedure 09-014 dated June 20, 2012.  
<sup>E</sup> - Criterion is the aesthetic drinking water value per footnote (E).  
<sup>EE</sup> - Criterion is based on the total dissolved solids GSI value per footnote (EE).  
**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) 40 CFR Part 257 Appendix III Detection Monitoring Constituents and Appendix IV Assessment Monitoring Constituents.  
 (2) Per Michigan Part 115 Amendments - Public Act No. 640 of 2018 Section 11511a(3)(c) and 11519b(2) additional detection monitoring constituents (iron) and assessment monitoring constituents (copper, nickel, silver, vanadium, and zinc) are reported.  
 (3) JHC-MW-15008 was decommissioned on June 24, 2019. Replacement well JHC-MW-15008R was installed on June 25, 2019.  
 (4) Not sampled; insufficient amount of groundwater present to collect sample.  
 (5) JHCW-MW-15007, JHC-MW-15009, and JHC-MW-15011 were decommissioned in July 2021. Replacement wells JHC-MW-15007R, JHC-MW-15009R, and JHC-MW-15011R were installed on July 20-22, 2021.

Table B1  
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation  
JH Campbell Pond A - HMP/AMP  
West Olive, Michigan

Constituent	Unit	EPA MCL	EPA RSL	MI Residential*	MI Non-Residential*	MI GSI <sup>^</sup>	UTL	GWPS	Sample Location: JHC-MW-15011 <sup>(5)</sup>							JHC-MW-15011R <sup>(5)</sup>		
									Sample Date:	2/12/2020	4/15/2020	7/16/2020	10/22/2020	2/23/2021	2/23/2021	4/13/2021	8/17/2021	10/21/2021
<b>Appendix III<sup>(1)</sup></b>																		
Boron	ug/L	NC	NA	500	500	7,200	54	<b>500</b>	<b>1,910</b>	<b>2,870</b>	<b>2,720</b>	<b>4,120</b>	<b>4,720</b>	<b>4,530</b>	<b>5,070</b>	<b>4,860</b>	<b>2,150</b>	
Calcium	mg/L	NC	NA	NC	NC	500 <sup>EE</sup>	40	500	122	112	86.7	122	93.5	92.1	78.7	76.7	51.0	
Chloride	mg/L	250**	NA	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	70	250	5.71	4.16	10.4	3.79	1.78	1.80	2.65	6.94	13.5	
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	
Sulfate	mg/L	250**	NA	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	13	<b>250</b>	192	183	136	141	119	121	113	82.9	45.0	
Total Dissolved Solids	mg/L	500**	NA	500 <sup>E</sup>	500 <sup>E</sup>	500	240	<b>500</b>	<b>654</b>	<b>542</b>	499	<b>546</b>	429	421	359	<b>676</b>	195	
pH, Field	SU	6.5 - 8.5**	NA	6.5 - 8.5 <sup>E</sup>	6.5 - 8.5 <sup>E</sup>	6.5 - 9.0	5.5 - 8.8	5.5 - 8.8	8.0	7.6	7.7	7.6	7.3	--	7.2	7.3	8.0	
<b>Appendix IV<sup>(1)</sup></b>																		
Antimony	ug/L	6	NA	6.0	6.0	130	2	6	2	4	2	2	< 1	< 1	< 1	< 1	< 1	
Arsenic	ug/L	10	NA	10	10	10	1	<b>10</b>	<b>31</b>	<b>25</b>	<b>22</b>	<b>22</b>	<b>14</b>	<b>13</b>	<b>13</b>	2	3	
Barium	ug/L	2,000	NA	2,000	2,000	820	35	2,000	563	514	419	430	455	434	399	142	131	
Beryllium	ug/L	4	NA	4.0	4.0	18	1	4	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	
Cadmium	ug/L	5	NA	5.0	5.0	3.5	0.2	5	< 0.2	0.2	< 0.2	0.5	0.7	0.8	0.8	< 0.2	< 0.2	
Chromium	ug/L	100	NA	100	100	11	2	100	1	< 1	< 1	< 1	< 1	< 1	5	2	< 1	
Cobalt	ug/L	NC	6	40	100	100	15	15	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	
Fluoride	ug/L	4,000	NA	NC	NC	NC	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	4.0	4.0	39	1	15	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	
Lithium	ug/L	NC	40	170	350	440	10	40	22	21	20	17	17	16	14	17	< 10	
Mercury	ug/L	2	NA	2.0	2.0	0.20 <sup>#</sup>	0.2	2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	
Molybdenum	ug/L	NC	100	73	210	3,200	5	100	12	7	28	< 5	6	6	8	17	13	
Radium-226	pCi/L	NC	NA	NC	NC	NC	NA	NA	--	0.242	--	0.344	--	--	0.165	--	0.157	
Radium-228	pCi/L	NC	NA	NC	NC	NC	NA	NA	--	0.606	--	< 0.264	--	--	0.758	--	0.428	
Radium-226/228	pCi/L	5	NA	NC	NC	NC	1.93	5	--	0.848	--	0.497	--	--	0.923	--	0.585	
Selenium	ug/L	50	NA	50	50	5.0	5	<b>50</b>	<b>104</b>	29	20	<b>308</b>	<b>166</b>	<b>161</b>	<b>143</b>	12	4	
Thallium	ug/L	2	NA	2.0	2.0	3.7	2	2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	
<b>MI Part 115 Parameters<sup>(2)</sup></b>																		
Iron	ug/L	300**	NA	300 <sup>E</sup>	300 <sup>E</sup>	500,000 <sup>EE</sup>	870	<b>870</b>	178	145	115	< 20	< 20	< 20	57	<b>1,610</b>	264	
Copper	ug/L	1,000**	NA	1,000 <sup>E</sup>	1,000 <sup>E</sup>	15	2.1	1,000	1	1	2	1	2	3	2	< 1	1	
Nickel	ug/L	NC	NA	100	100	86	2	100	4	< 2	< 2	< 2	< 2	< 2	8	< 2	< 2	
Silver	ug/L	100**	NA	34	98	0.20	0.2	34	< 0.2	< 0.4	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	
Vanadium	ug/L	NC	NA	4.5	62	27	2	<b>4.5</b>	<b>42</b>	<b>40</b>	<b>30</b>	<b>49</b>	<b>35</b>	<b>34</b>	<b>34</b>	< 2	< 2	
Zinc	ug/L	5,000**	NA	2,400	5,000 <sup>E</sup>	190	18	2,400	< 10	< 10	< 30	< 10	< 10	< 10	< 10	< 10	< 10	

**Notes:**

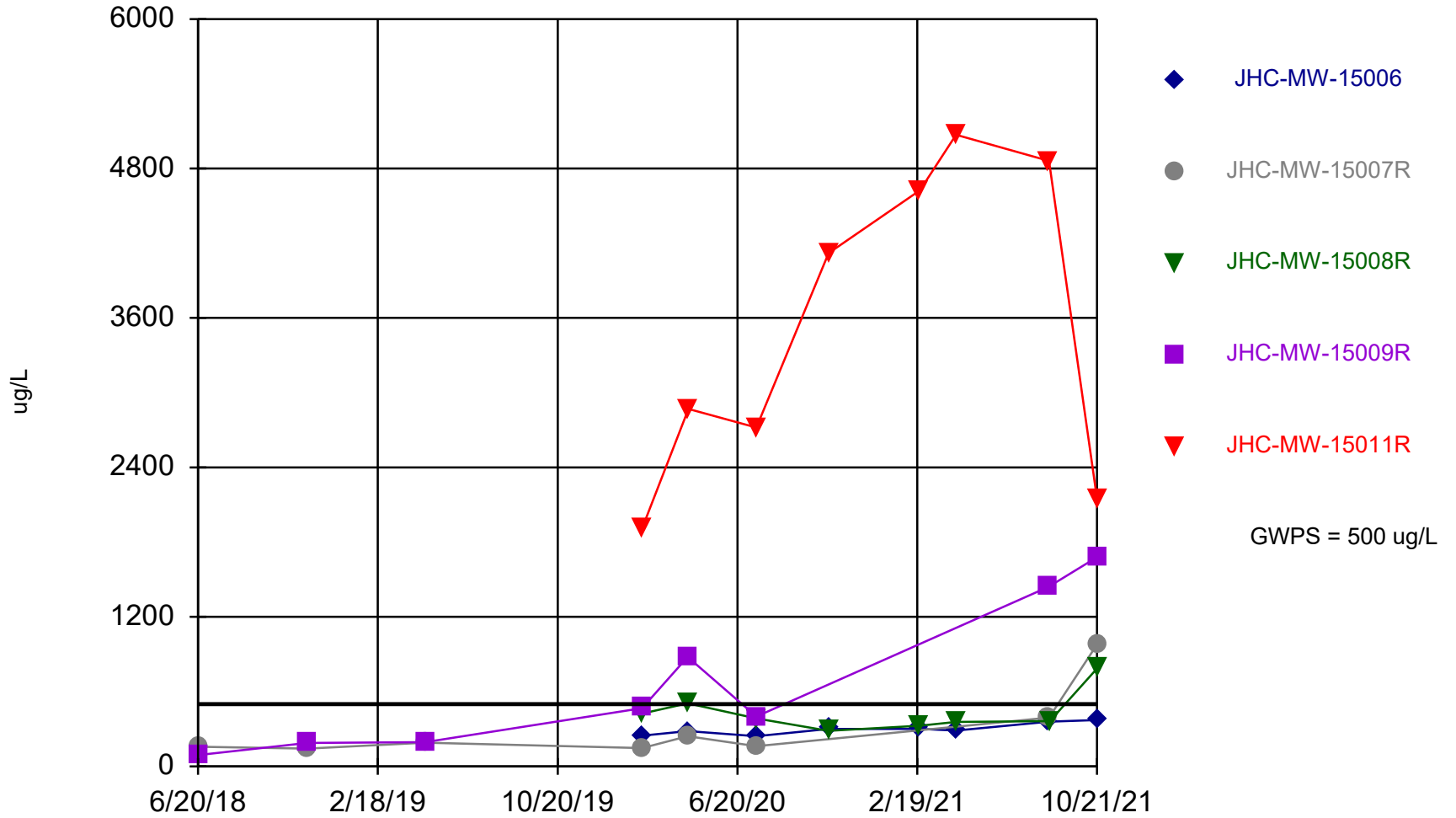
- ug/L - micrograms per liter; mg/L - milligrams per liter.
- pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.
- NA - not applicable.
- NC - no criteria.
- - not analyzed.
- MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
- RSL - Regional Screening Level from 83 FR 36435.
- UTL - Upper Tolerance Limit (95%) of the background data set.
- GWPS - Groundwater Protection Standard. Appendix IV GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018. Appendix III and MI Part 115 Parameter GWPS is the most restrictive of the MCL/Part 201 criteria, or the UTL if the UTL exceeds the applicable criteria as established in TRC's Technical Memorandum dated December 23, 2019.
- \* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.
- \*\* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
- <sup>^</sup> - 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).
- <sup>#</sup> - If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and EGLE policy and procedure 09-014 dated June 20, 2012.
- <sup>E</sup> - Criterion is the aesthetic drinking water value per footnote (E).
- <sup>EE</sup> - Criterion is based on the total dissolved solids GSI value per footnote (EE).
- 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) 40 CFR Part 257 Appendix III Detection Monitoring Constituents and Appendix IV Assessment Monitoring Constituents.
- (2) Per Michigan Part 115 Amendments - Public Act No. 640 of 2018 Section 11511a(3)(c) and 11519b(2) additional detection monitoring constituents (iron) and assessment monitoring constituents (copper, nickel, silver, vanadium, and zinc) are reported.
- (3) JHC-MW-15008 was decommissioned on June 24, 2019. Replacement well JHC-MW-15008R was installed on June 25, 2019.
- (4) Not sampled; insufficient amount of groundwater present to collect sample.
- (5) JHCW-MW-15007, JHC-MW-15009, and JHC-MW-15011 were decommissioned in July 2021. Replacement wells JHC-MW-15007R, JHC-MW-15009R, and JHC-MW-15011R were installed on July 20-22, 2021.



# **Attachment 1**

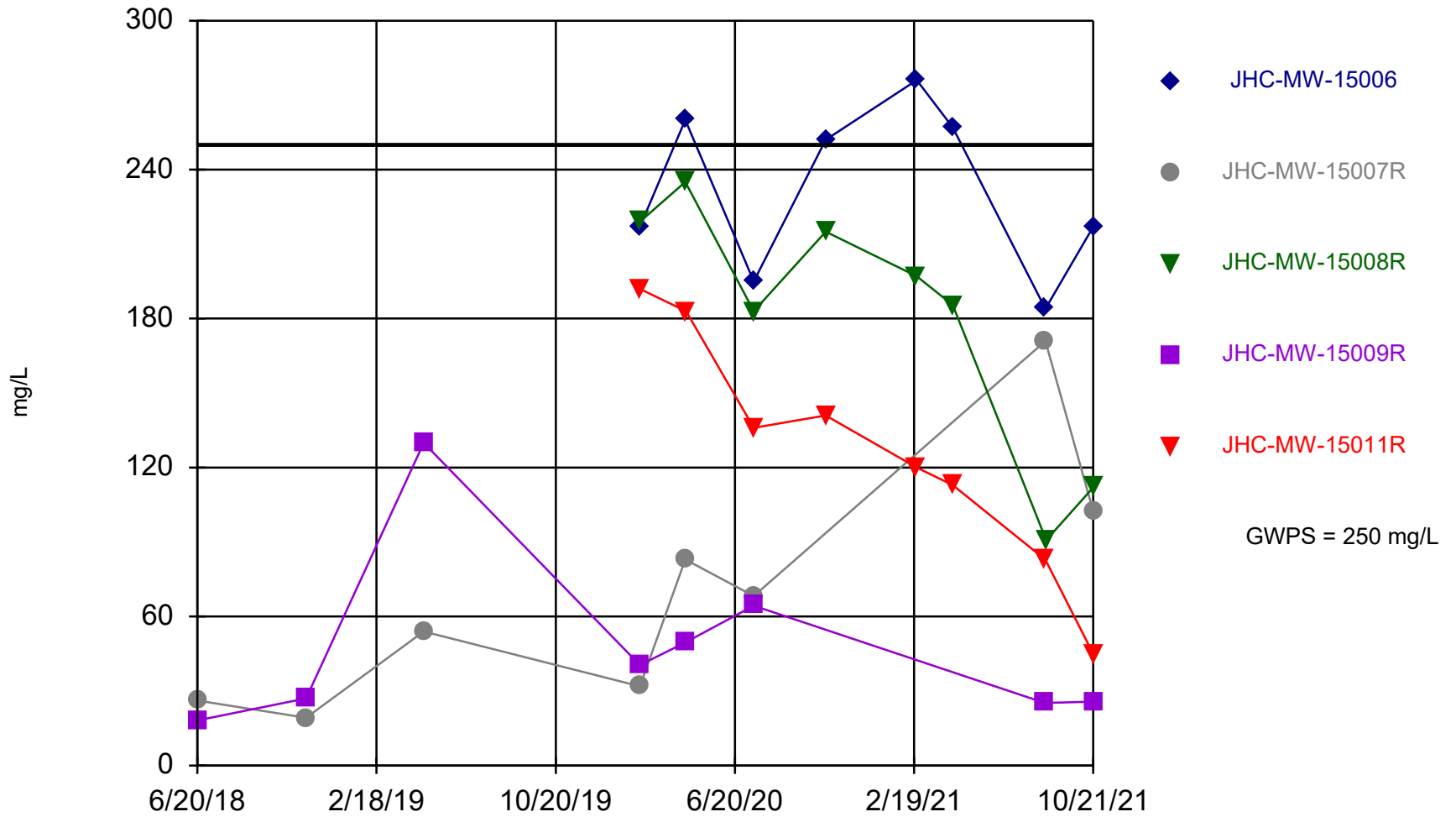
## **Sanitas™ Output**

### Boron Comparison to GWPS



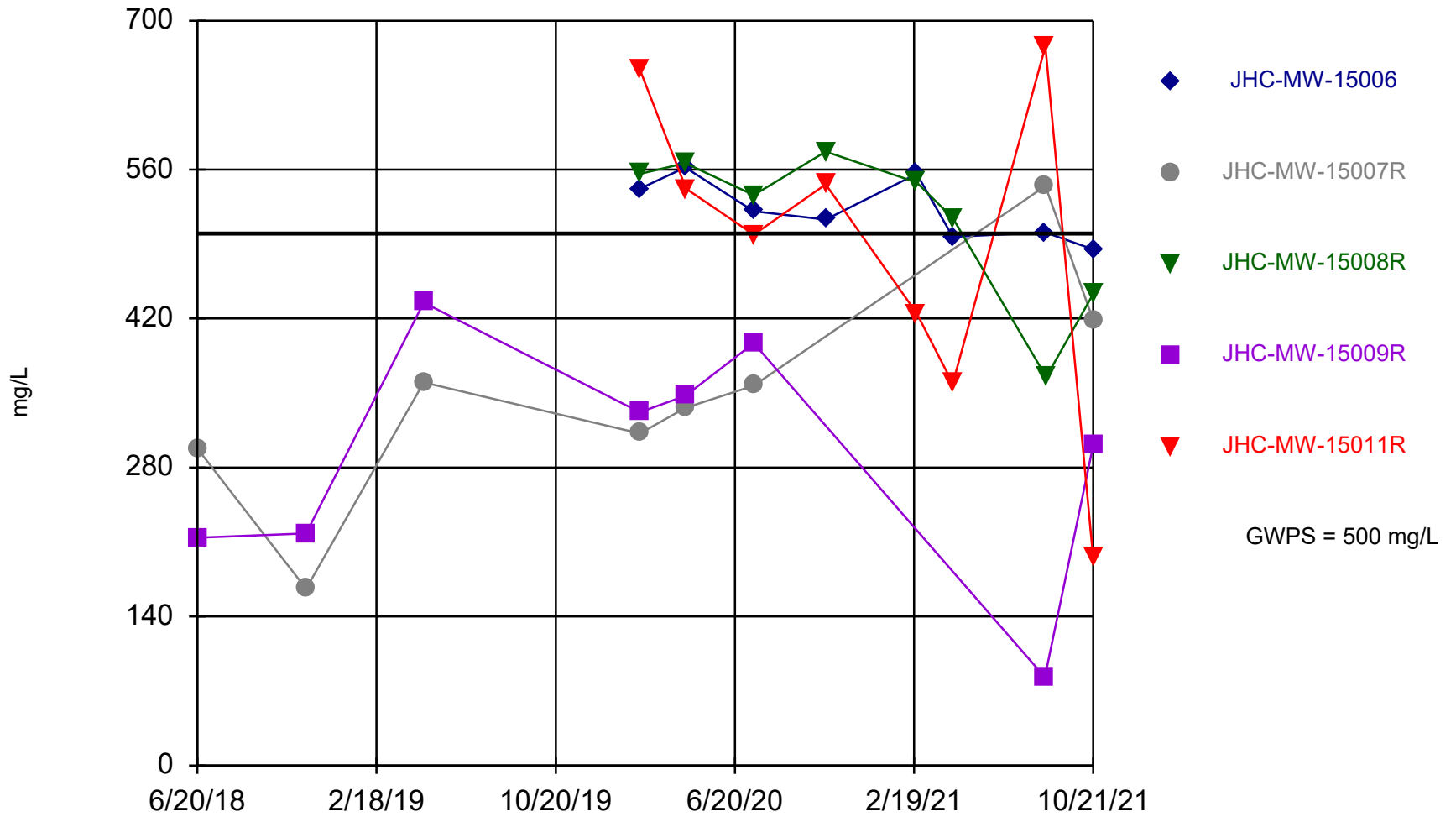
Time Series Analysis Run 12/2/2021 4:05 PM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

### Sulfate Comparison to GWPS



Time Series Analysis Run 12/2/2021 4:06 PM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

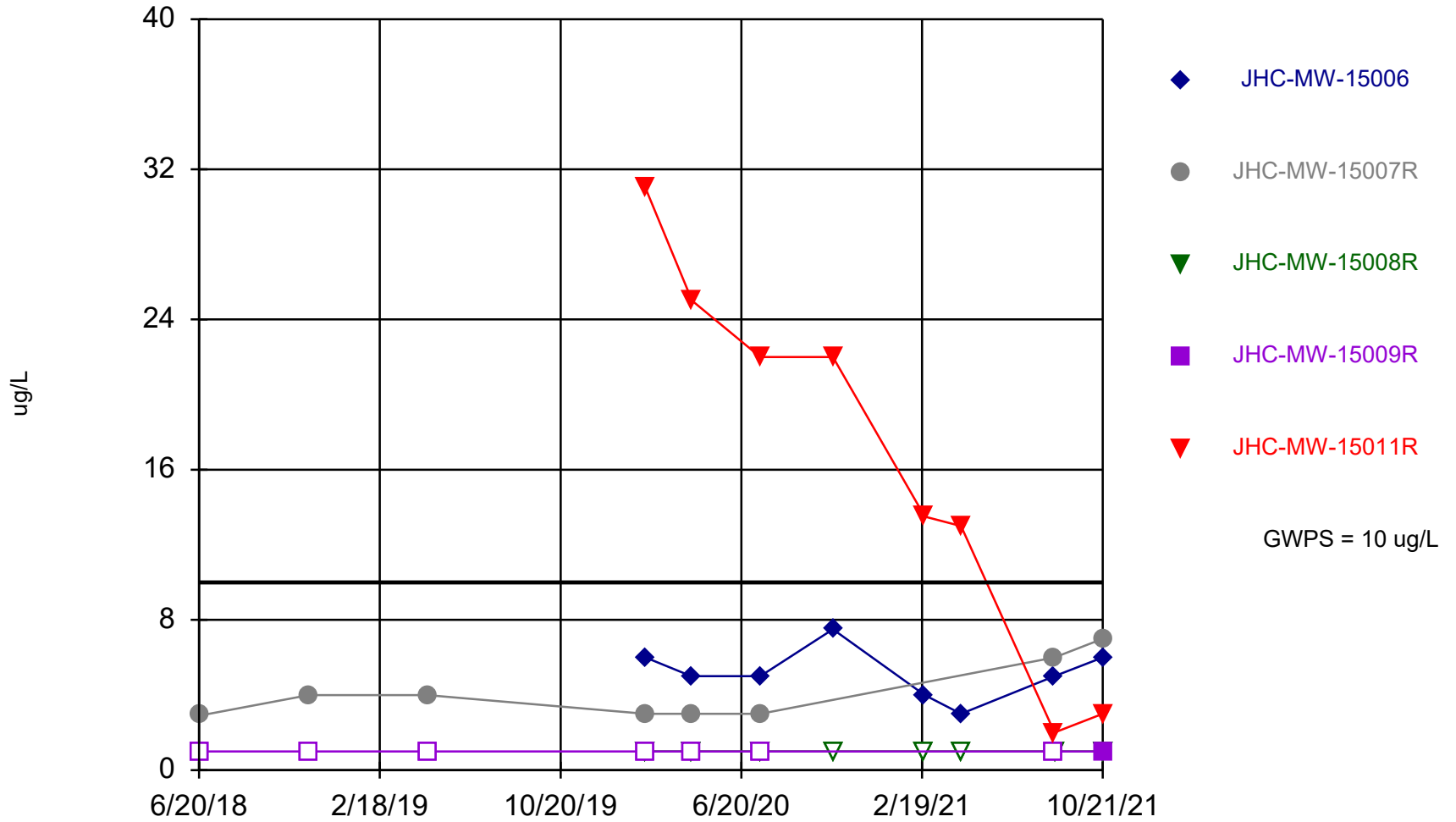
### Total Dissolved Solids Comparison to GWPS



Time Series Analysis Run 12/2/2021 4:07 PM

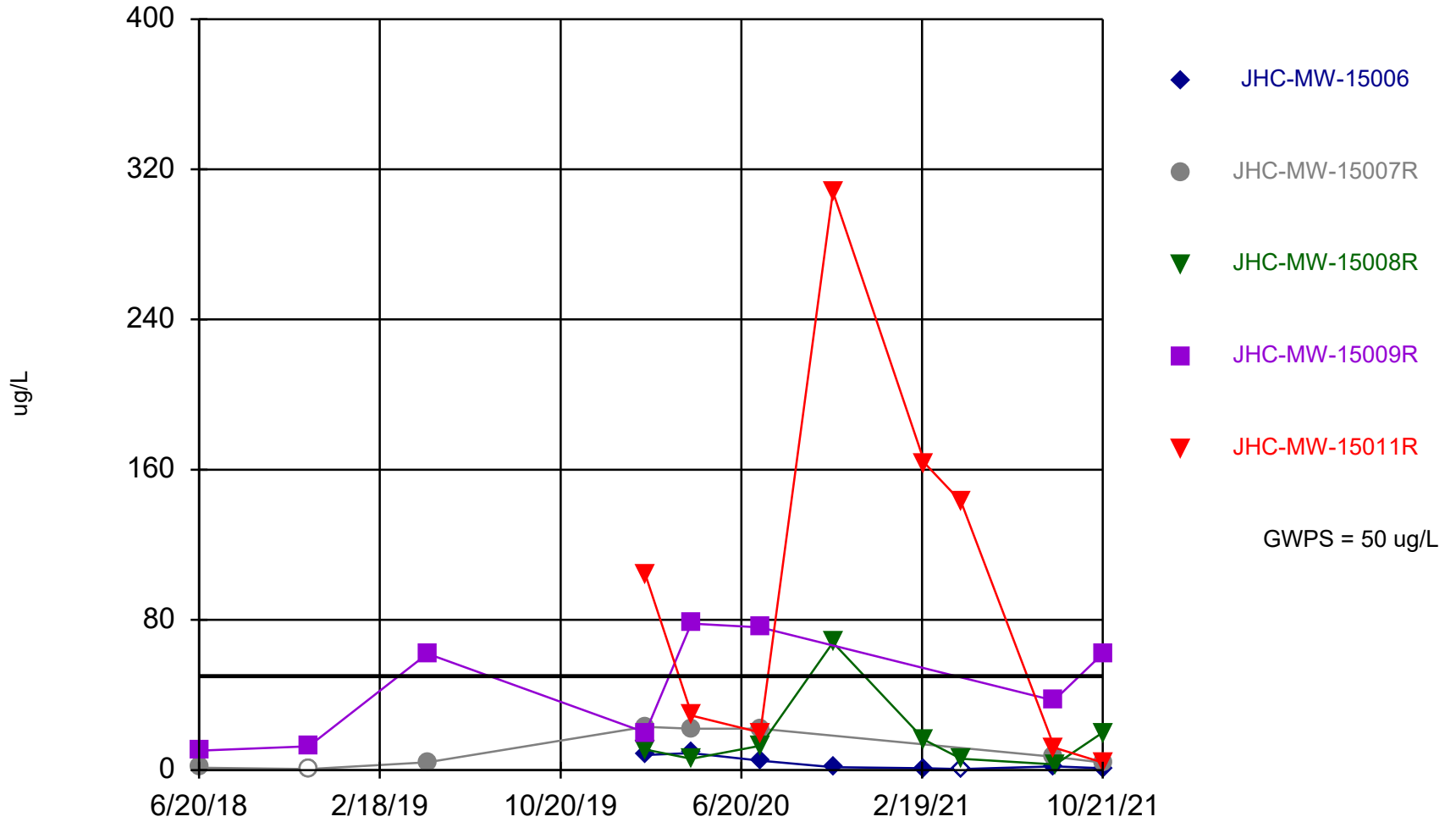
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

### Arsenic Comparison to GPWS



Time Series Analysis Run 12/2/2021 4:09 PM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

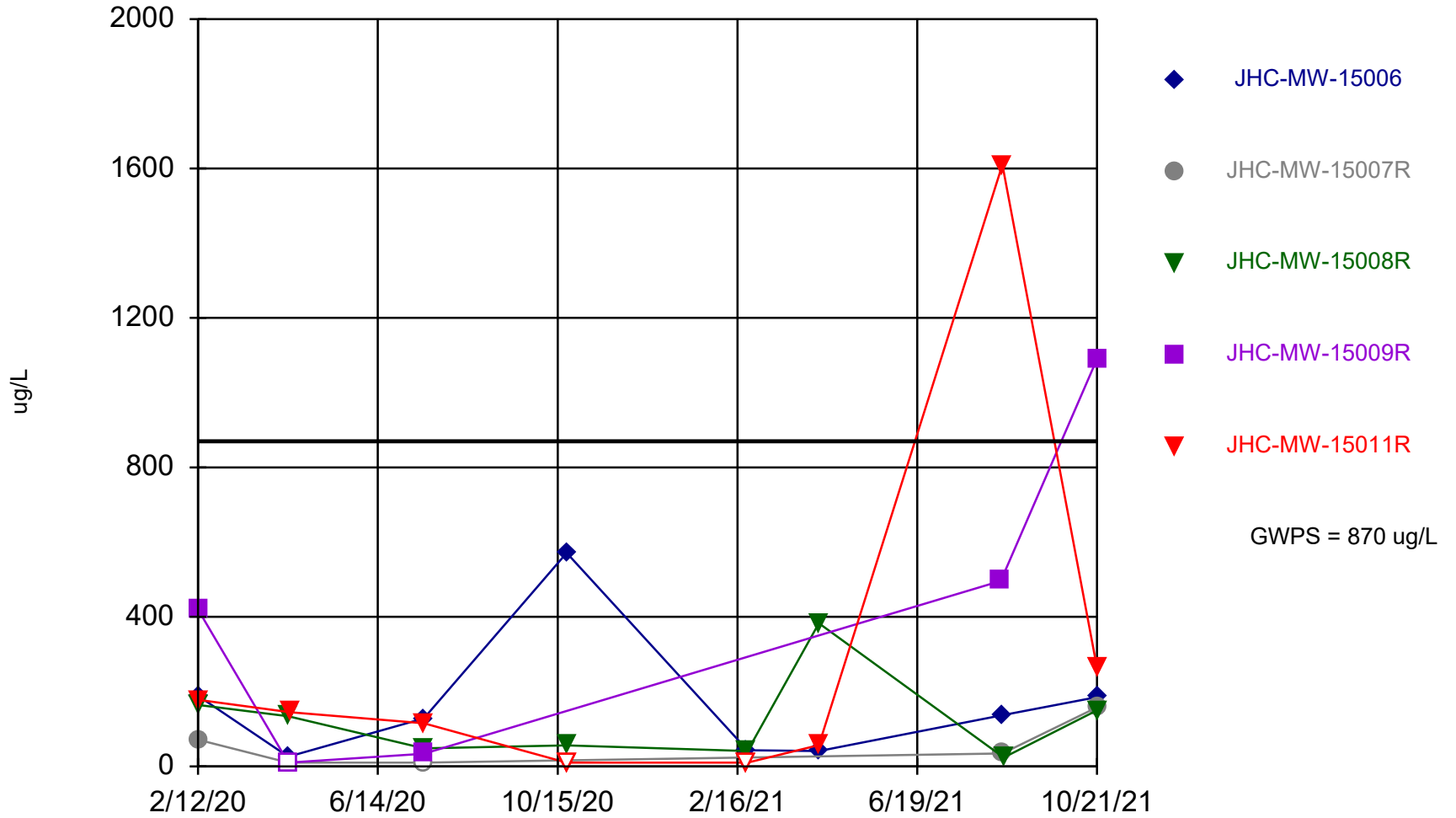
## Selenium Comparison to GWPS



Time Series Analysis Run 12/2/2021 4:10 PM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

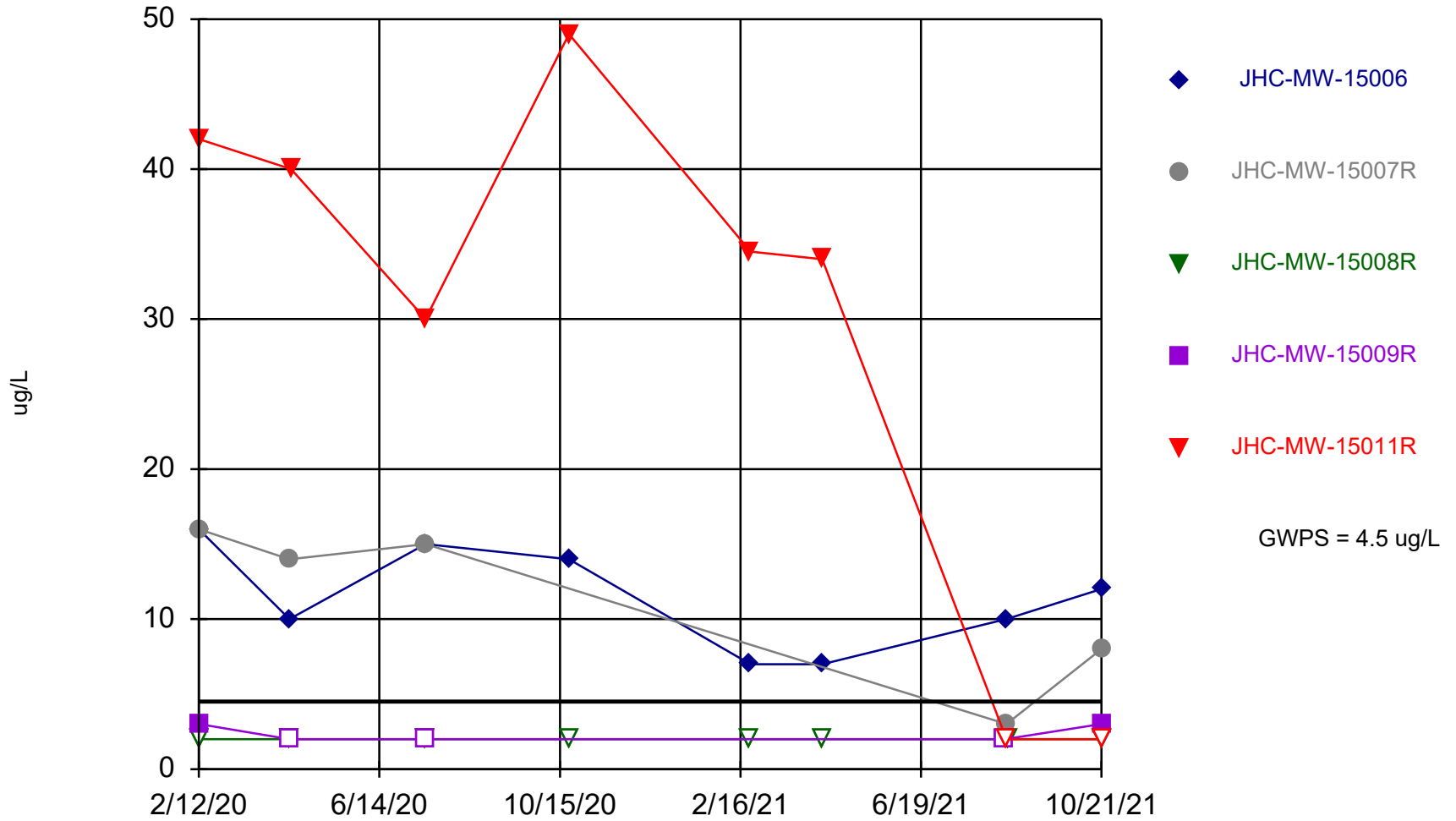


### Iron Comparison to GWPS



Time Series Analysis Run 12/2/2021 4:13 PM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

### Vanadium Comparison to GWPS



Time Series Analysis Run 12/2/2021 4:12 PM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

# Summary Report

Constituent: Boron, Total Analysis Run 12/2/2021 4:09 PM  
 Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

For observations made between 6/20/2018 and 10/21/2021, a summary of the selected data set:

Observations = 40  
 ND/Trace = 0  
 Wells = 5  
 Minimum Value = 91.4  
 Maximum Value = 5070  
 Mean Value = 1047  
 Median Value = 367.5  
 Standard Deviation = 1410  
 Coefficient of Variation = 1.346  
 Skewness = 1.815

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	8	0	242	371	299.1	294.5	46.25	0.1547	0.3787
JHC-MW-15007R	8	0	142	978	301.1	176	285.7	0.9487	1.938
JHC-MW-15008R	8	0	285	786	428.6	374	158.6	0.3701	1.58
JHC-MW-15009R	8	0	91.4	1680	667.6	434.5	605	0.9063	0.7404
JHC-MW-15011R	8	0	1910	5070	3541	3495	1271	0.359	-0.03985

# Summary Report

Constituent: Sulfate Analysis Run 12/2/2021 4:08 PM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

---

For observations made between 6/20/2018 and 10/21/2021, a summary of the selected data set:

Observations = 40  
ND/Trace = 0  
Wells = 5  
Minimum Value = 18.2  
Maximum Value = 276  
Mean Value = 131.1  
Median Value = 125  
Standard Deviation = 81.21  
Coefficient of Variation = 0.6193  
Skewness = 0.1118

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	8	0	184	276	232.3	234.5	33.53	0.1443	-0.1748
JHC-MW-15007R	8	0	19.2	171	69.51	61.15	50.19	0.722	0.9881
JHC-MW-15008R	8	0	90.8	235	179.7	191.3	51.66	0.2875	-0.8105
JHC-MW-15009R	8	0	18.2	130	47.56	33.75	36.64	0.7703	1.581
JHC-MW-15011R	8	0	45	192	126.6	128	48.62	0.384	-0.2222

# Summary Report

Constituent: Total Dissolved Solids Analysis Run 12/2/2021 4:08 PM  
 Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

For observations made between 6/20/2018 and 10/21/2021, a summary of the selected data set:

Observations = 40  
 ND/Trace = 0  
 Wells = 5  
 Minimum Value = 83  
 Maximum Value = 676  
 Mean Value = 432.5  
 Median Value = 464  
 Standard Deviation = 138.4  
 Coefficient of Variation = 0.3201  
 Skewness = -0.5696

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	8	0	485	562	522.1	517	28.47	0.05452	0.2178
JHC-MW-15007R	8	0	166	544.5	349	346.5	107.5	0.308	0.184
JHC-MW-15008R	8	0	365	577	513.2	542	73.01	0.1423	-1.201
JHC-MW-15009R	8	0	83	435	290.9	316.5	114.3	0.3929	-0.5521
JHC-MW-15011R	8	0	195	676	487	520.5	158.5	0.3254	-0.5931

# Summary Report

Constituent: Arsenic, Total    Analysis Run 12/2/2021 4:10 PM  
 Client: Consumers Energy    Data: JHC CCR\_Sanitas Data\_4Q21

For observations made between 6/20/2018 and 10/21/2021, a summary of the selected data set:

Observations = 40  
 ND/Trace = 15  
 Wells = 5  
 Minimum Value = 1  
 Maximum Value = 31  
 Mean Value = 5.548  
 Median Value = 3  
 Standard Deviation = 7.31  
 Coefficient of Variation = 1.318  
 Skewness = 2.129

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	8	0	3	7.5	5.188	5	1.361	0.2624	0.07736
JHC-MW-15007R	8	0	2.9	7	4.113	3.5	1.563	0.3801	0.9946
JHC-MW-15008R	8	8	1	1	1	1	0	0	NaN
JHC-MW-15009R	8	7	1	1	1	1	0	0	NaN
JHC-MW-15011R	8	0	2	31	16.44	17.75	10.4	0.6325	-0.1959



# Summary Report

Constituent: Selenium, Total Analysis Run 12/2/2021 4:11 PM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

---

For observations made between 6/20/2018 and 10/21/2021, a summary of the selected data set:

Observations = 40  
ND/Trace = 2  
Wells = 5  
Minimum Value = 0.5  
Maximum Value = 308  
Mean Value = 34.91  
Median Value = 12.3  
Standard Deviation = 58.73  
Coefficient of Variation = 1.682  
Skewness = 3.039

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	8	1	0.5	9	3.5	1.75	3.391	0.9689	0.7489
JHC-MW-15007R	8	1	0.5	23	10.49	5.55	10.01	0.9541	0.4059
JHC-MW-15008R	8	0	3	68	17.88	12	21.03	1.176	1.953
JHC-MW-15009R	8	0	10.3	78	44.74	49.5	28.21	0.6305	-0.08158
JHC-MW-15011R	8	0	4	308	97.94	66.5	105.2	1.075	0.9667

# Summary Report

Constituent: Iron, Total    Analysis Run 12/2/2021 4:12 PM  
Client: Consumers Energy    Data: JHC CCR\_Sanitas Data\_4Q21

---

For observations made between 2/12/2020 and 10/21/2021, a summary of the selected data set:

Observations = 34  
ND/Trace = 5  
Wells = 5  
Minimum Value = 10  
Maximum Value = 1610  
Mean Value = 207.1  
Median Value = 121.5  
Standard Deviation = 329  
Coefficient of Variation = 1.589  
Skewness = 2.976

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	8	0	26	571	165	132.5	176.3	1.068	1.685
JHC-MW-15007R	5	2	10	158	56.7	34.5	61.89	1.092	0.9761
JHC-MW-15008R	8	0	24	383	125	95	117.6	0.9405	1.395
JHC-MW-15009R	5	1	10	1090	410	420	439.1	1.071	0.6533
JHC-MW-15011R	8	2	10	1610	298.6	130	536.9	1.798	2.153

# Summary Report

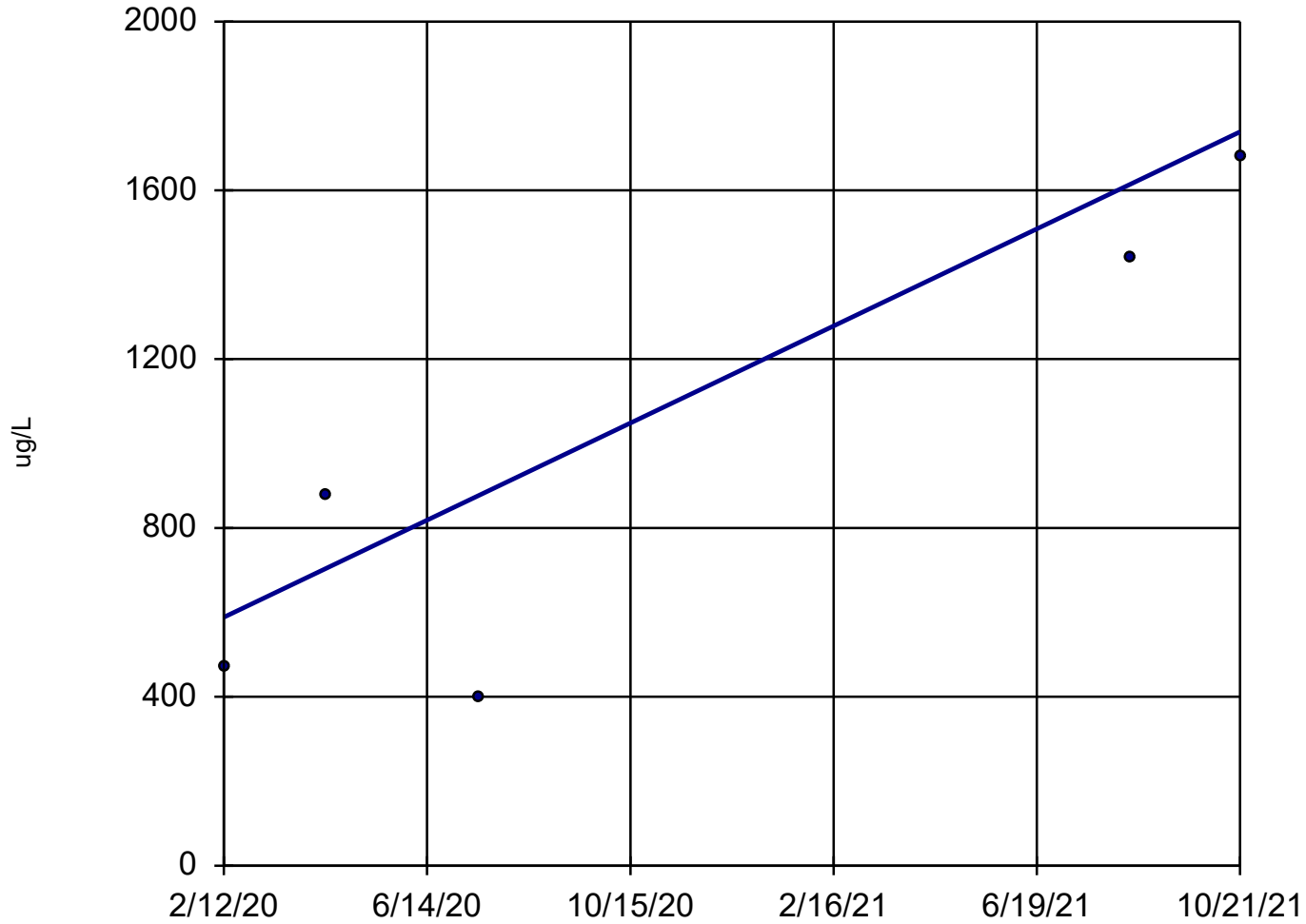
Constituent: Vanadium, Total Analysis Run 12/2/2021 4:13 PM  
 Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

For observations made between 2/12/2020 and 10/21/2021, a summary of the selected data set:

Observations = 34  
 ND/Trace = 13  
 Wells = 5  
 Minimum Value = 2  
 Maximum Value = 49  
 Mean Value = 12.01  
 Median Value = 7  
 Standard Deviation = 13.53  
 Coefficient of Variation = 1.126  
 Skewness = 1.389

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	8	0	7	16	11.38	11	3.462	0.3043	-0.02865
JHC-MW-15007R	5	0	3	16	11.2	14	5.541	0.4947	-0.6519
JHC-MW-15008R	8	8	2	2	2	2	0	0	NaN
JHC-MW-15009R	5	3	2	3	2.4	2	0.5477	0.2282	0.4082
JHC-MW-15011R	8	2	2	49	29.19	34.25	17.74	0.6079	-0.7869

### Boron, Total JHC-MW-15009R

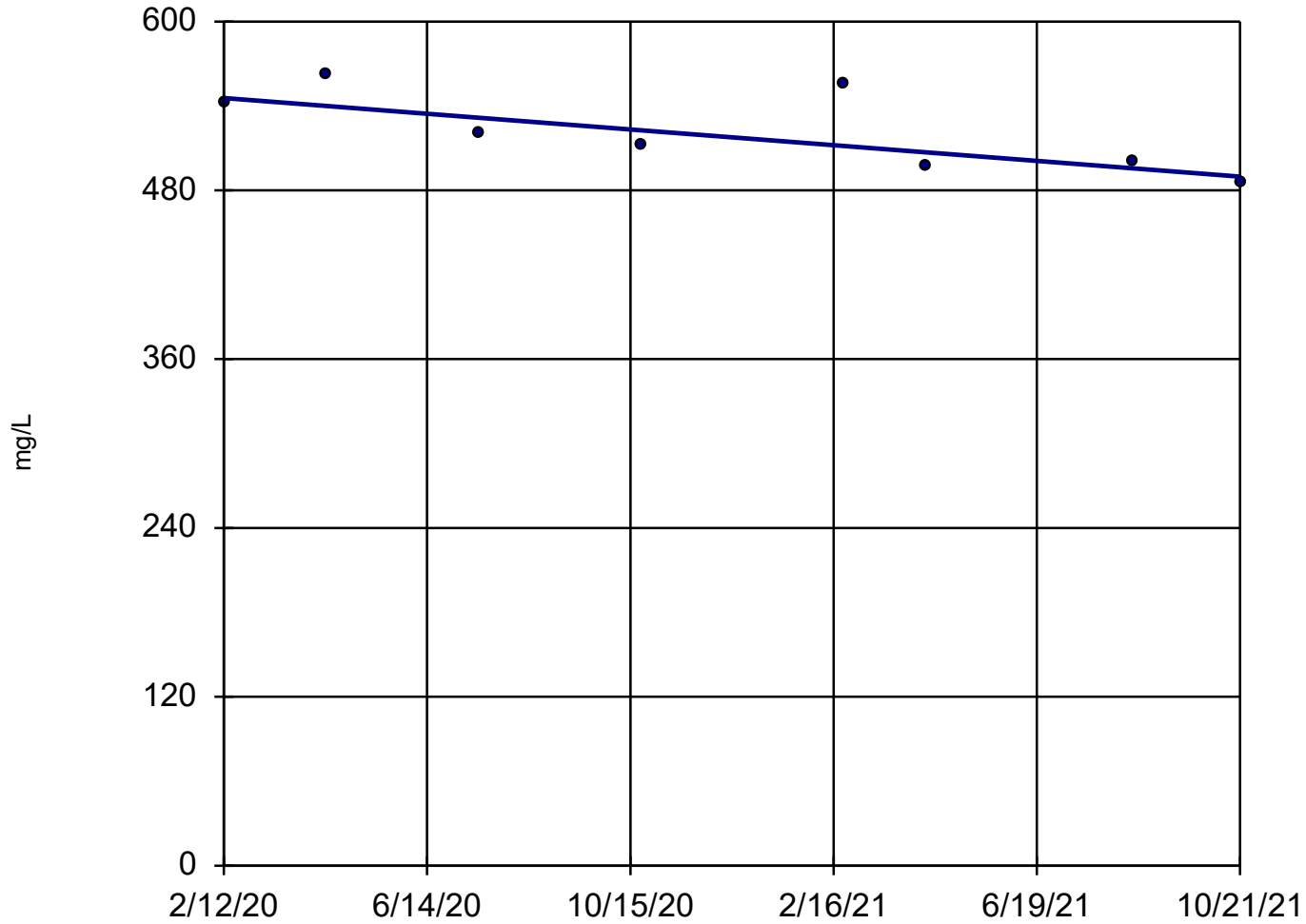


n = 5  
Slope = 680.4  
units per year.  
Mann-Kendall  
statistic = 6  
critical = 10  
Trend not sig-  
nificant at 98%  
confidence level  
( $\alpha = 0.01$  per  
tail).

Sen's Slope Estimator Analysis Run 12/2/2021 4:20 PM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

# Total Dissolved Solids

JHC-MW-15006

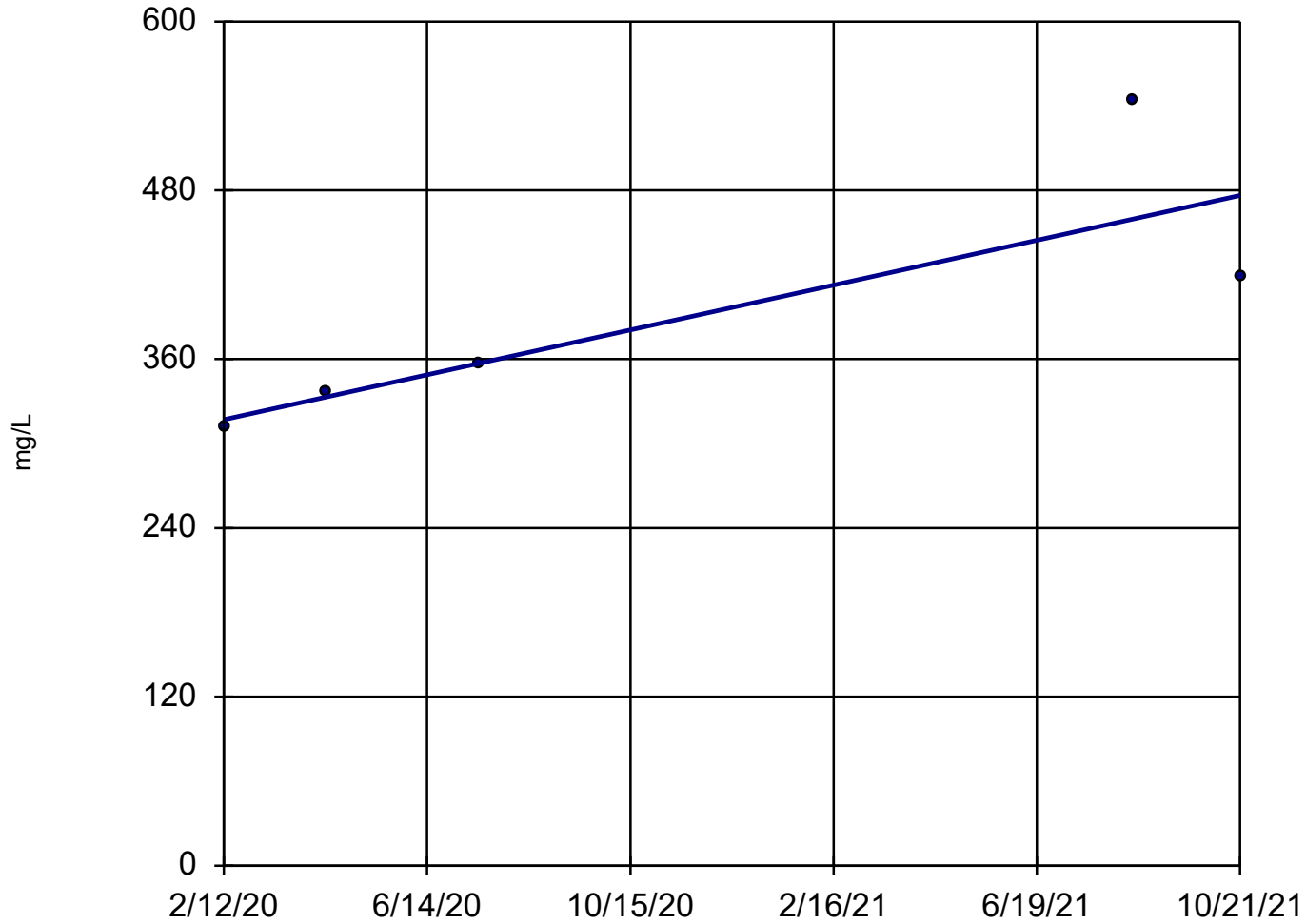


n = 8  
Slope = -33.02 units per year.  
Mann-Kendall statistic = -18  
critical = -20  
Trend not significant at 98% confidence level ( $\alpha = 0.01$  per tail).

Sen's Slope Estimator Analysis Run 12/2/2021 4:19 PM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

# Total Dissolved Solids

JHC-MW-15007R

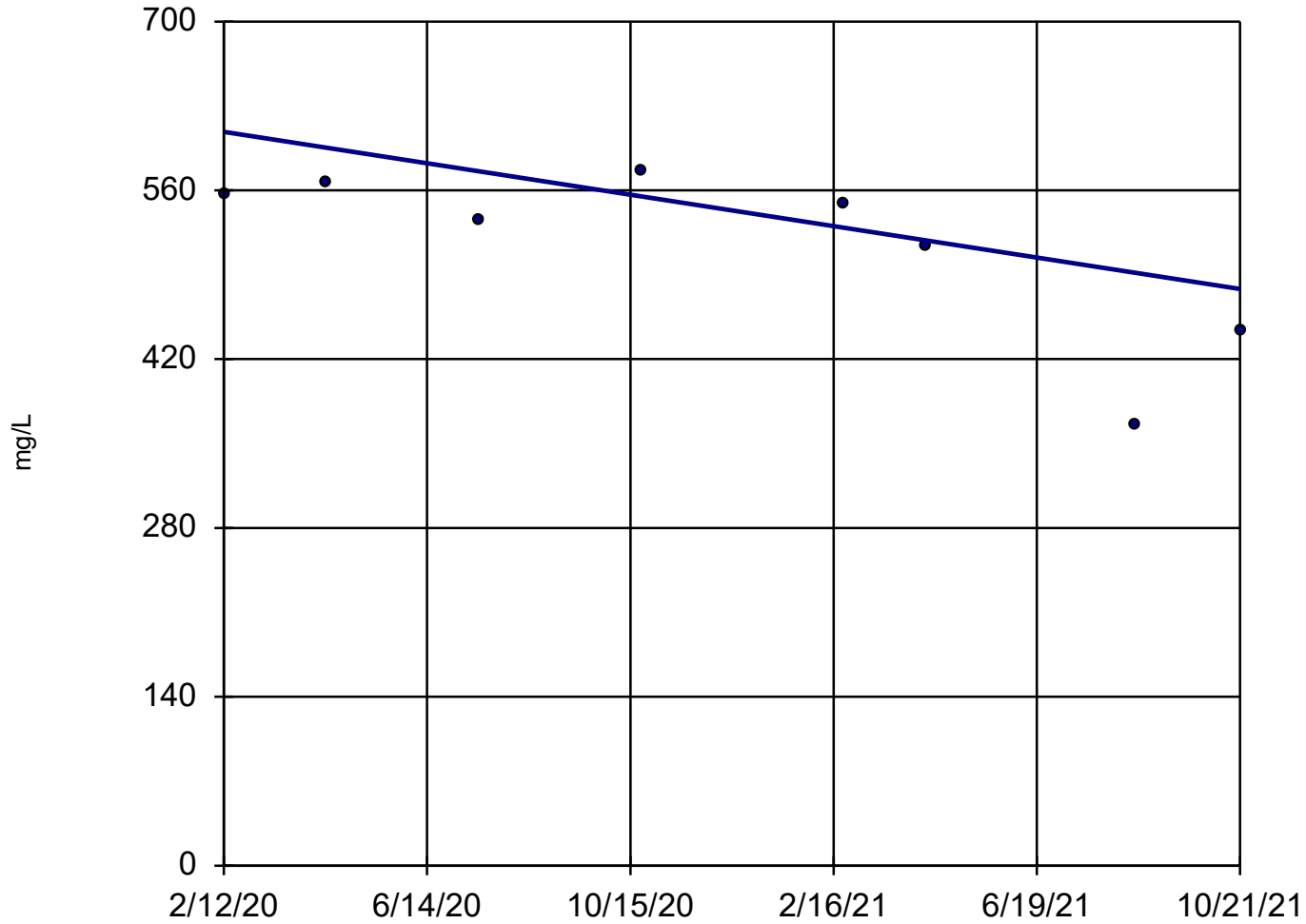


n = 5  
Slope = 94.19 units per year.  
Mann-Kendall statistic = 8  
critical = 10  
Trend not significant at 98% confidence level ( $\alpha = 0.01$  per tail).

Sen's Slope Estimator Analysis Run 12/2/2021 4:20 PM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

# Total Dissolved Solids

## JHC-MW-15008R

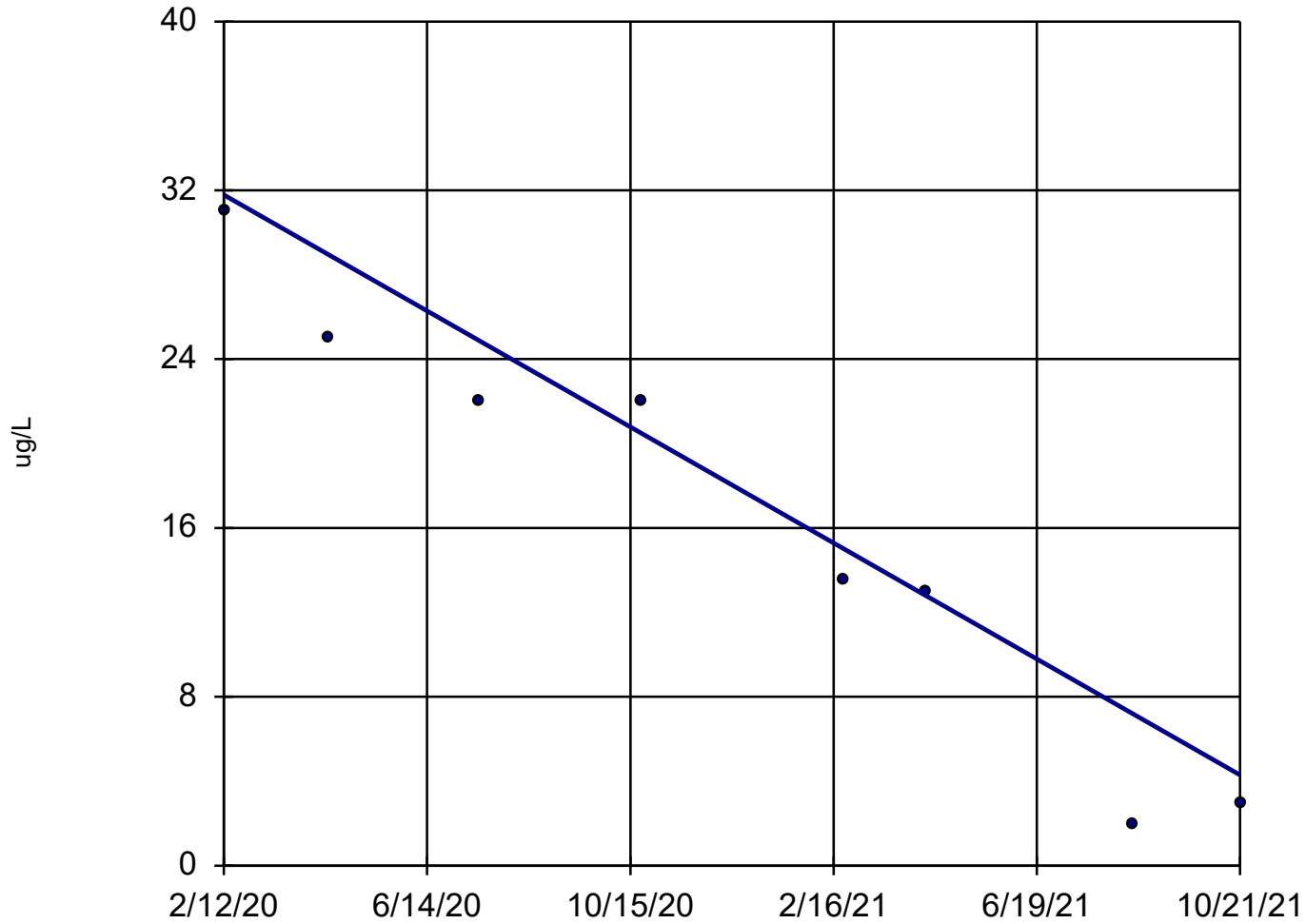


n = 8  
Slope = -77.18  
units per year.  
Mann-Kendall  
statistic = -16  
critical = -20  
Trend not sig-  
nificant at 98%  
confidence level  
( $\alpha = 0.01$  per  
tail).

Sen's Slope Estimator Analysis Run 12/2/2021 4:19 PM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

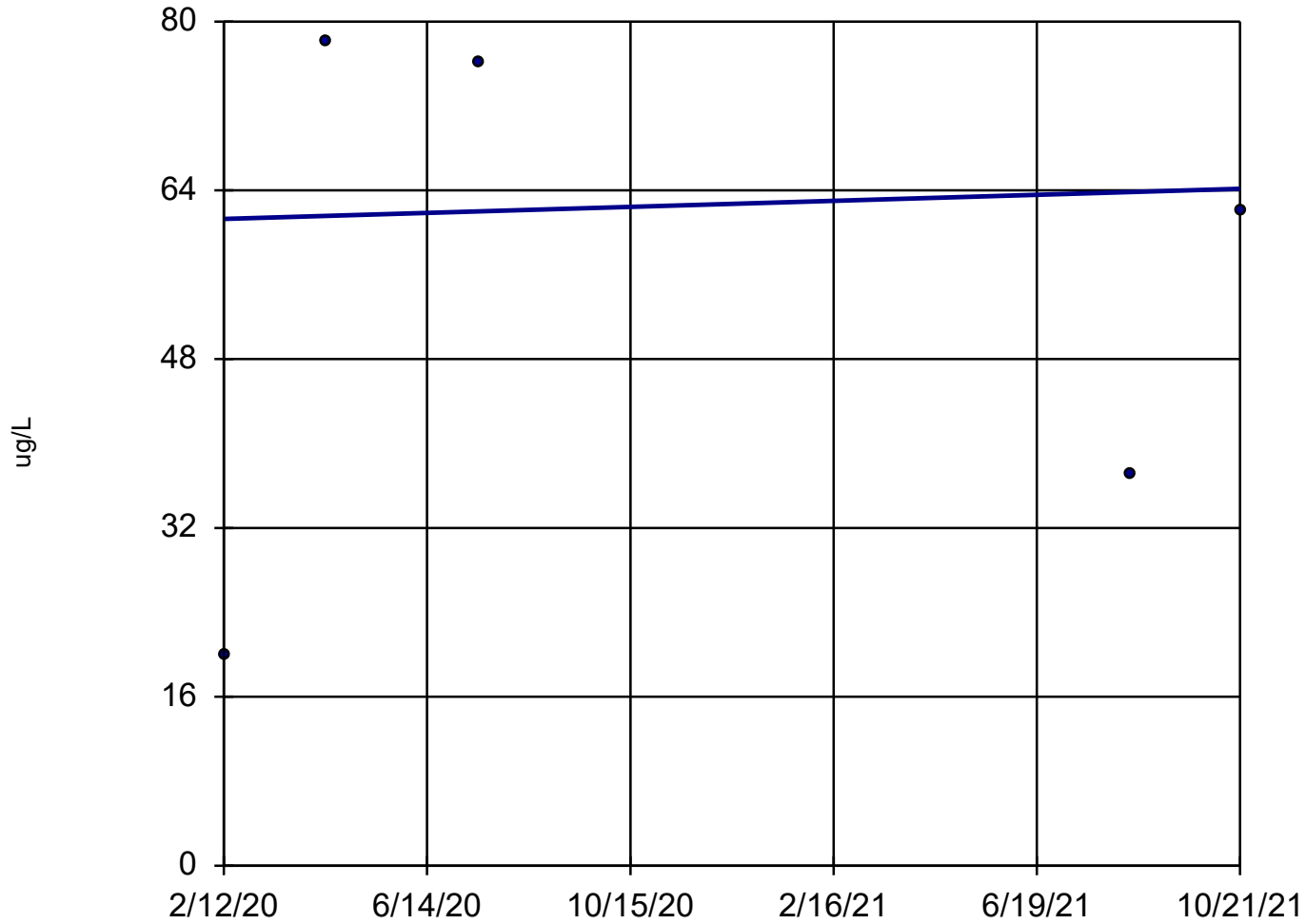


### Arsenic, Total JHC-MW-15011R



Sen's Slope Estimator Analysis Run 12/2/2021 4:19 PM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

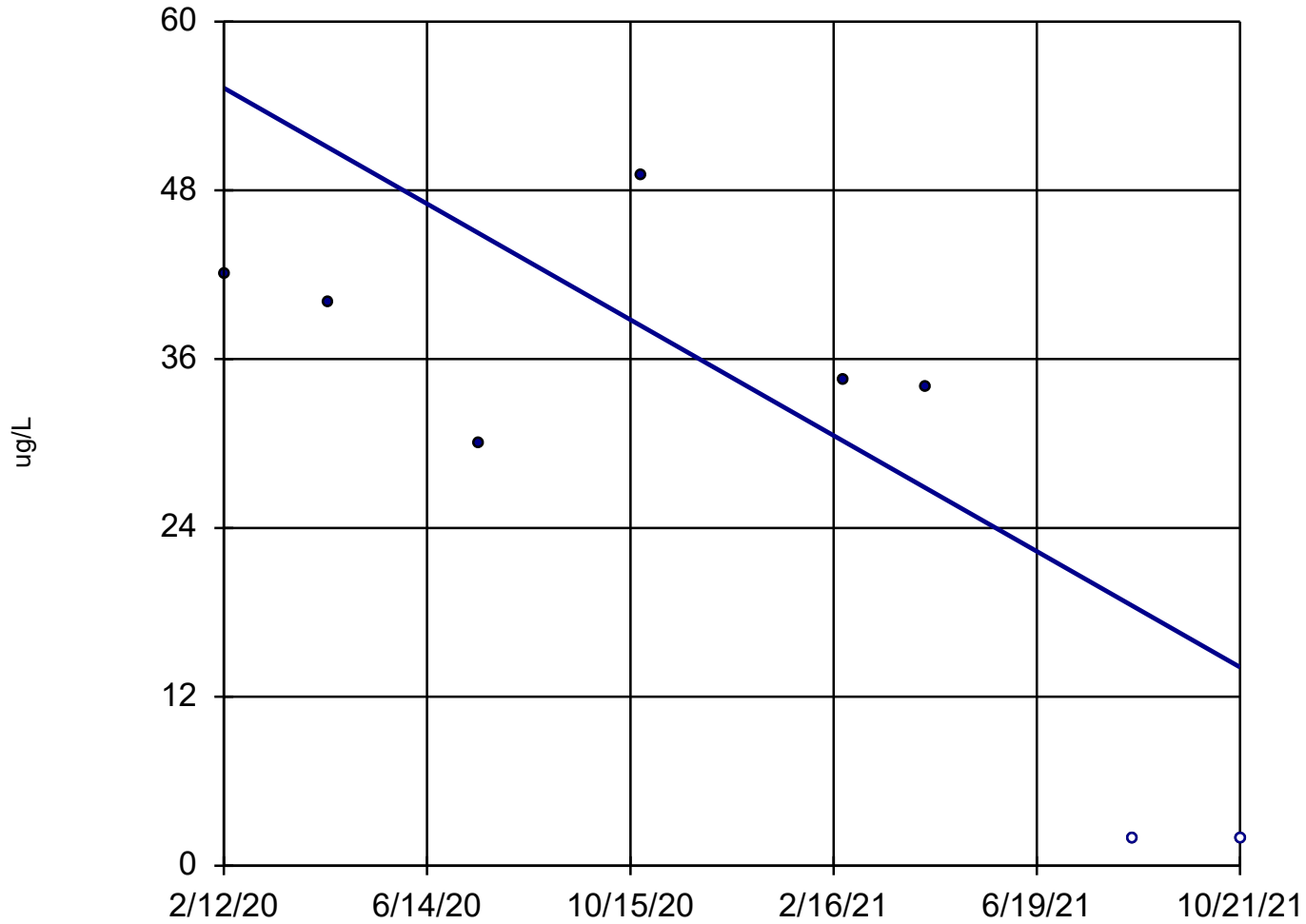
## Selenium, Total JHC-MW-15009R



n = 5  
Slope = 1.706  
units per year.  
Mann-Kendall  
statistic = 0  
critical = 10  
Trend not sig-  
nificant at 98%  
confidence level  
( $\alpha = 0.01$  per  
tail).

Sen's Slope Estimator Analysis Run 12/2/2021 4:20 PM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

### Vanadium, Total JHC-MW-15011R

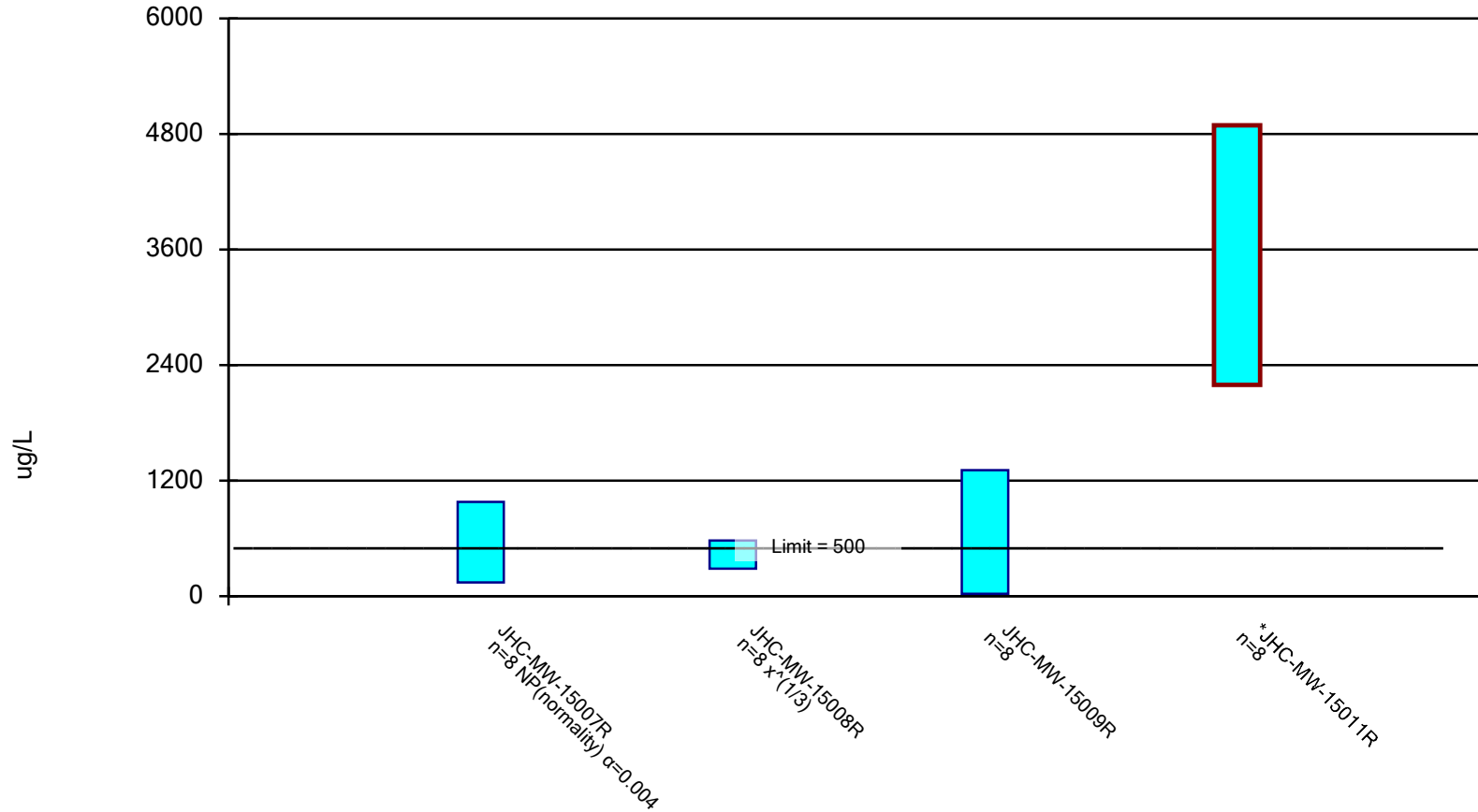


n = 8  
Slope = -24.35  
units per year.  
Mann-Kendall  
statistic = -17  
critical = -20  
Trend not sig-  
nificant at 98%  
confidence level  
( $\alpha = 0.01$  per  
tail).

Sen's Slope Estimator Analysis Run 12/2/2021 4:19 PM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

## Parametric and Non-Parametric (NP) Confidence Interval

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



Constituent: Boron, Total Analysis Run 12/3/2021 12:42 PM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

# Confidence Interval

Constituent: Boron, Total (ug/L) Analysis Run 12/3/2021 12:44 PM

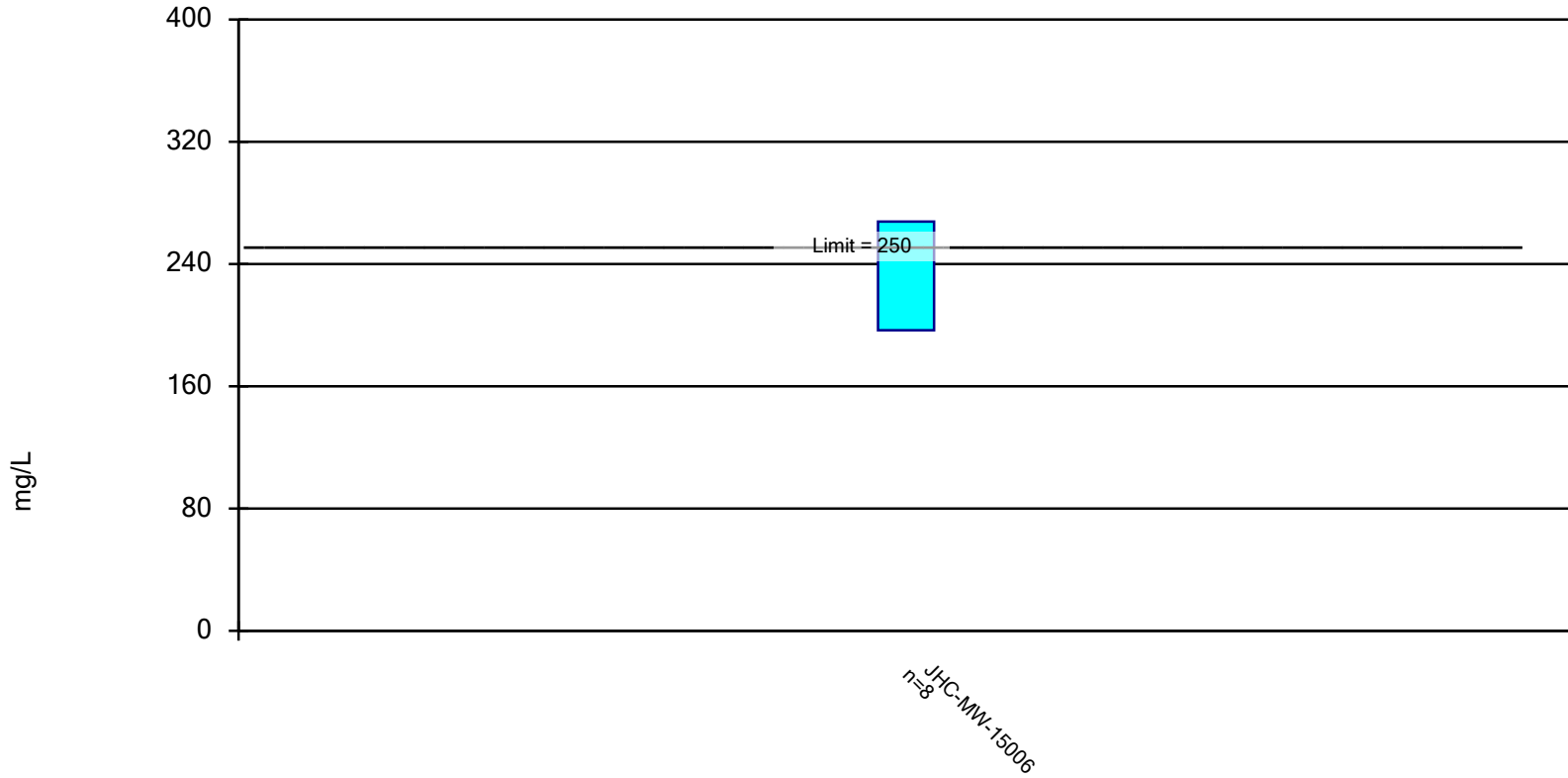
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

---

	JHC-MW-15007R	JHC-MW-15008R	JHC-MW-15009R	JHC-MW-15011R
6/20/2018	157		91.4	
11/15/2018	142		187.5 (D)	
4/24/2019	190		195 (D)	
2/12/2020	147	423	468	1910
4/14/2020	242	505	877.5 (D)	
4/15/2020				2870
7/16/2020	162	384	401	2720
10/22/2020		285		4120
2/23/2021		326		4625 (D)
4/13/2021		356 (D)		5070
8/16/2021			1440	
8/17/2021	391 (D)			4860
8/18/2021		364		
10/21/2021	978 (D)	786	1680	2150
Mean	301.1	428.6	667.6	3541
Std. Dev.	285.7	158.6	605	1271
Upper Lim.	978	578.4	1309	4888
Lower Lim.	142	285.2	26.26	2193

### Parametric Confidence Interval

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



Constituent: Sulfate Analysis Run 12/3/2021 12:42 PM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

# Confidence Interval

Constituent: Sulfate (mg/L) Analysis Run 12/3/2021 12:44 PM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

---

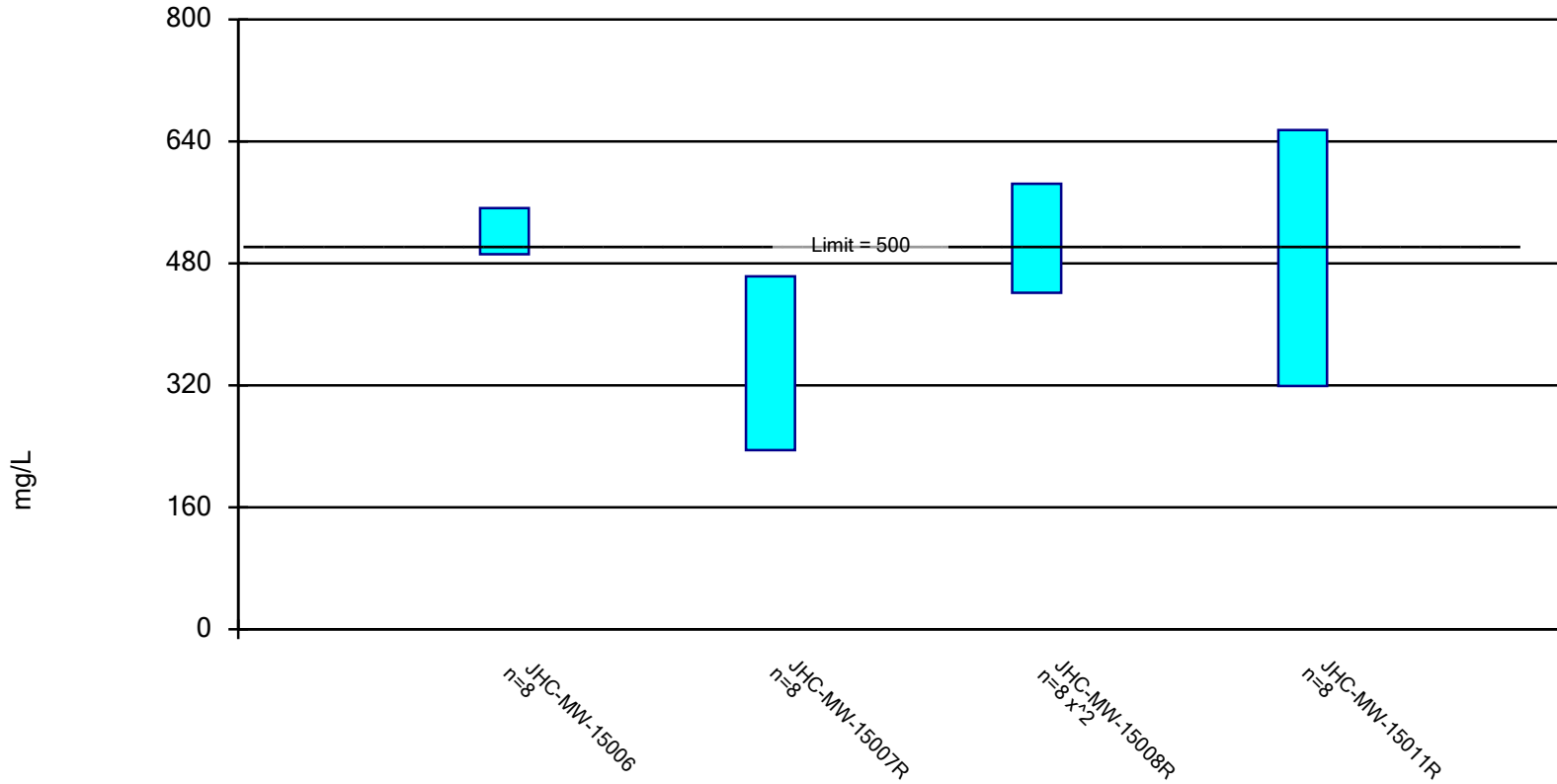
JHC-MW-15006

2/12/2020	217
4/14/2020	260
7/16/2020	195
10/22/2020	252 (D)
2/23/2021	276
4/13/2021	257
8/17/2021	184
10/21/2021	217
Mean	232.3
Std. Dev.	33.53
Upper Lim.	267.8
Lower Lim.	196.7



### Parametric Confidence Interval

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



Constituent: Total Dissolved Solids Analysis Run 12/3/2021 12:42 PM

Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

# Confidence Interval

Constituent: Total Dissolved Solids (mg/L) Analysis Run 12/3/2021 12:44 PM

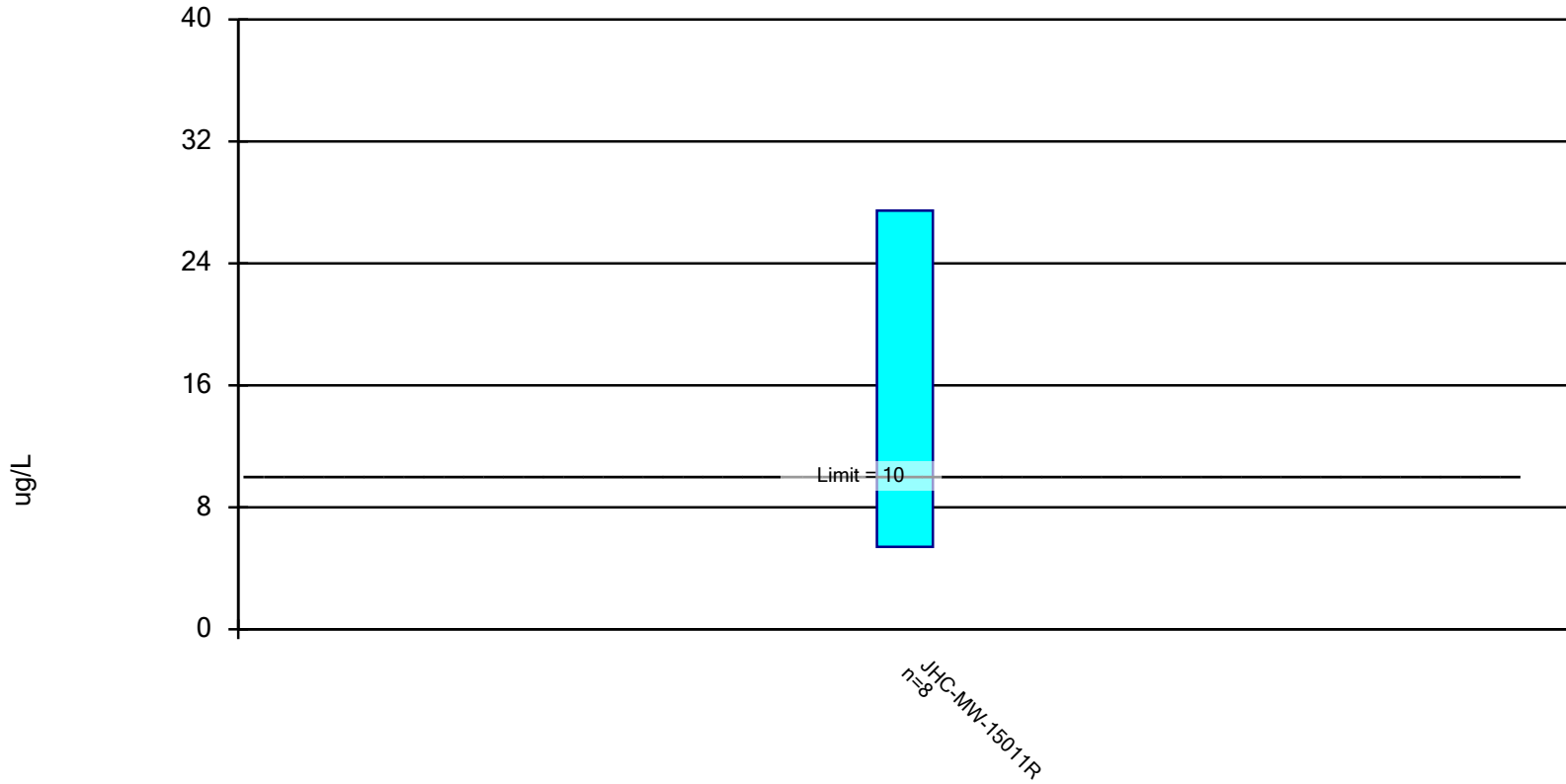
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

---

	JHC-MW-15006	JHC-MW-15007R	JHC-MW-15008R	JHC-MW-15011R
6/20/2018		298		
11/15/2018		166		
4/24/2019		360		
2/12/2020	542	312	556	654
4/14/2020	562	336	566	
4/15/2020				542
7/16/2020	521	357	536	499
10/22/2020	513 (D)		577	546
2/23/2021	556		548	425 (D)
4/13/2021	497		514.5 (D)	359
8/17/2021	501	544.5 (D)		676
8/18/2021			365	
10/21/2021	485	418.5 (D)	443	195
Mean	522.1	349	513.2	487
Std. Dev.	28.47	107.5	73.01	158.5
Upper Lim.	552.3	462.9	584.1	655
Lower Lim.	492	235.1	441.4	319

### Parametric Confidence Interval

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



Constituent: Arsenic, Total    Analysis Run 12/3/2021 12:42 PM  
Client: Consumers Energy    Data: JHC CCR\_Sanitas Data\_4Q21

# Confidence Interval

Constituent: Arsenic, Total (ug/L) Analysis Run 12/3/2021 12:44 PM

Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

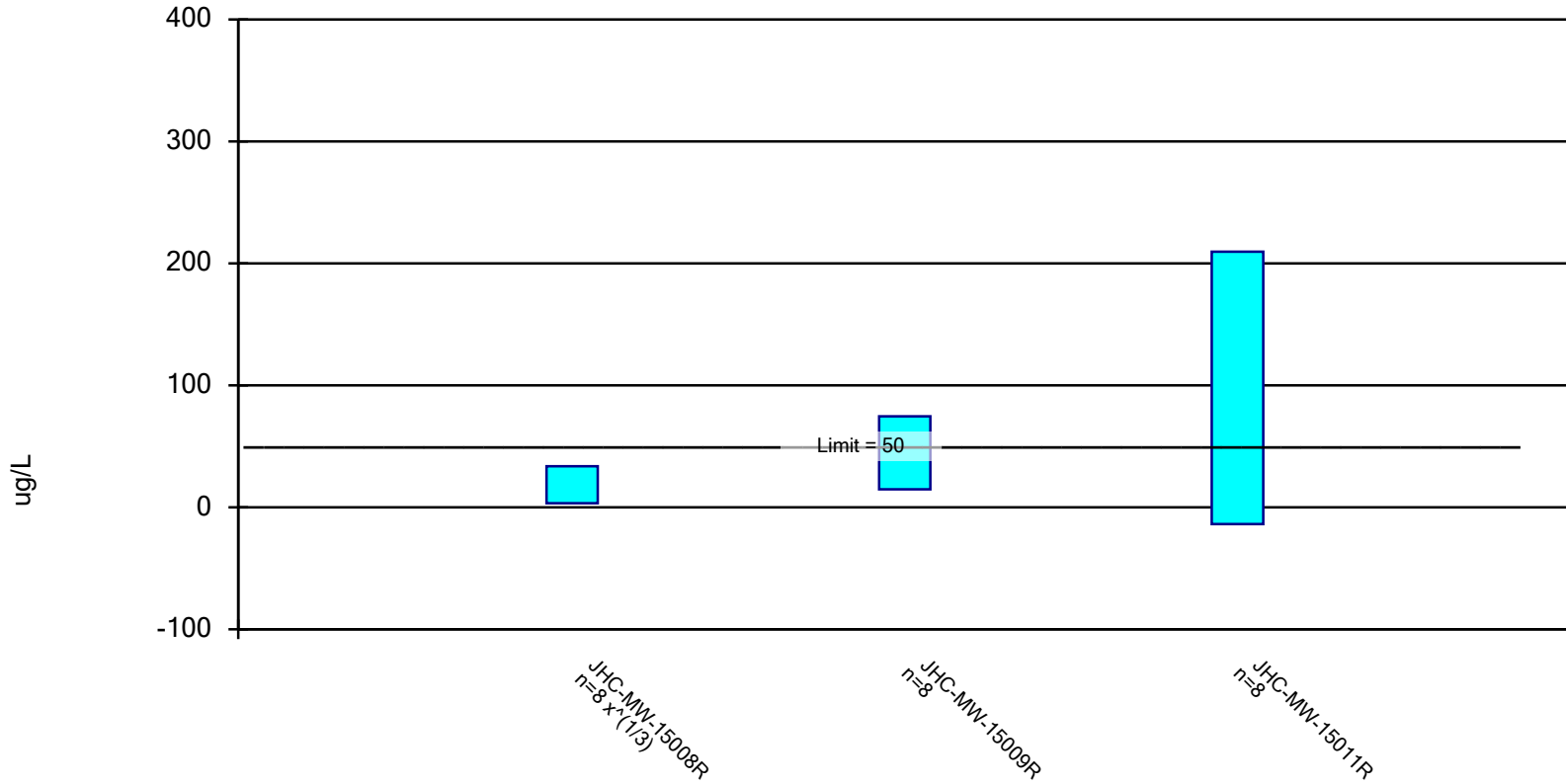
---

JHC-MW-15011R

2/12/2020	31
4/15/2020	25
7/16/2020	22
10/22/2020	22
2/23/2021	13.5 (D)
4/13/2021	13
8/17/2021	2
10/21/2021	3
Mean	16.44
Std. Dev.	10.4
Upper Lim.	27.46
Lower Lim.	5.417

### Parametric Confidence Interval

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



Constituent: Selenium, Total    Analysis Run 12/3/2021 12:42 PM  
Client: Consumers Energy    Data: JHC CCR\_Sanitas Data\_4Q21

# Confidence Interval

Constituent: Selenium, Total (ug/L) Analysis Run 12/3/2021 12:44 PM

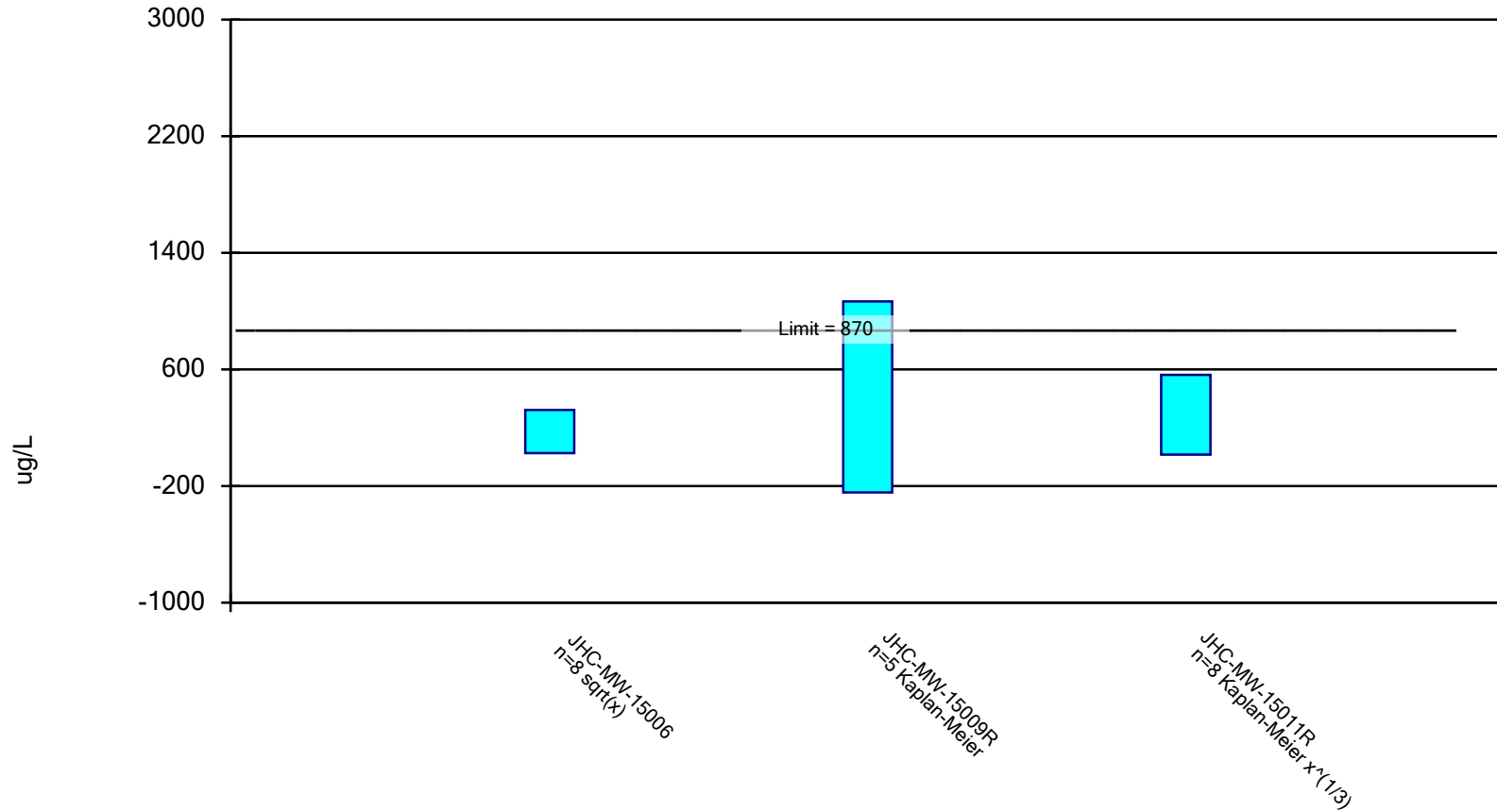
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

---

	JHC-MW-15008R	JHC-MW-15009R	JHC-MW-15011R
6/20/2018		10.3	
11/15/2018		12.6 (D)	
4/24/2019		62 (D)	
2/12/2020	11	20	104
4/14/2020	6	78 (D)	
4/15/2020			29
7/16/2020	13	76	20
10/22/2020	68		308
2/23/2021	16		163.5 (D)
4/13/2021	6 (D)		143
8/16/2021		37	
8/17/2021			12
8/18/2021	3		
10/21/2021	20	62	4
Mean	17.88	44.74	97.94
Std. Dev.	21.03	28.21	105.2
Upper Lim.	33.6	74.64	209.5
Lower Lim.	3.478	14.84	-13.61

## Parametric Confidence Interval

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



Constituent: Iron, Total Analysis Run 12/3/2021 12:42 PM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21



# Confidence Interval

Constituent: Iron, Total (ug/L) Analysis Run 12/3/2021 12:44 PM

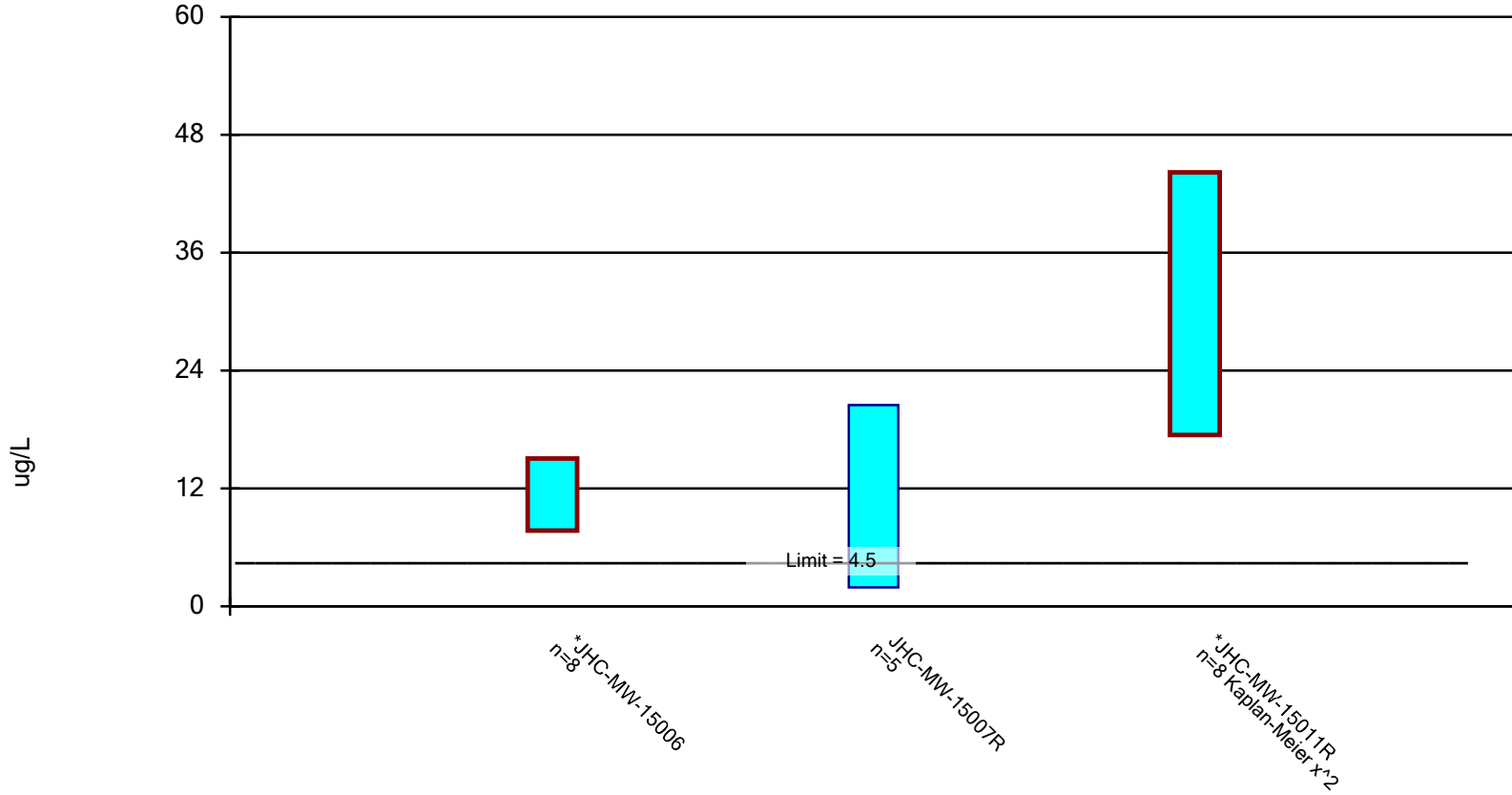
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

---

	JHC-MW-15006	JHC-MW-15009R	JHC-MW-15011R
2/12/2020	189	420	178
4/14/2020	26	<20 (D)	
4/15/2020			145
7/16/2020	128	34	115
10/22/2020	571 (D)		<20
2/23/2021	43		<20 (D)
4/13/2021	41		57
8/16/2021		496	
8/17/2021	137		1610
10/21/2021	185	1090	264
Mean	165	410	298.6
Std. Dev.	176.3	439.1	536.9
Upper Lim.	321.6	1067	562
Lower Lim.	26.51	-242.7	16.31

### Parametric Confidence Interval

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



Constituent: Vanadium, Total    Analysis Run 12/3/2021 12:42 PM  
Client: Consumers Energy    Data: JHC CCR\_Sanitas Data\_4Q21

# Confidence Interval

Constituent: Vanadium, T Total (ug/L) Analysis Run 12/3/2021 12:44 PM

Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

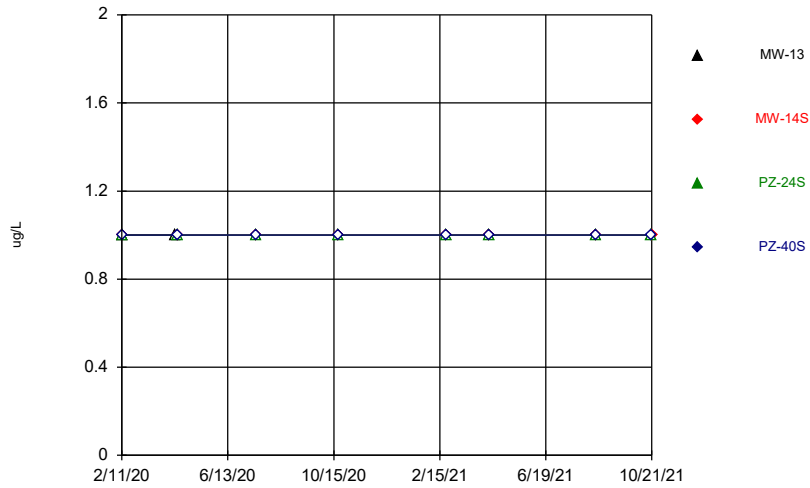
---

	JHC-MW-15006	JHC-MW-15007R	JHC-MW-15011R
2/12/2020	16	16	42
4/14/2020	10	14	
4/15/2020			40
7/16/2020	15	15	30
10/22/2020	14 (D)		49
2/23/2021	7		34.5 (D)
4/13/2021	7		34
8/17/2021	10	3 (D)	<2
10/21/2021	12	8 (D)	<2
Mean	11.38	11.2	28.94
Std. Dev.	3.462	5.541	18.18
Upper Lim.	15.04	20.48	44.17
Lower Lim.	7.706	1.915	17.43

## **Appendix C**

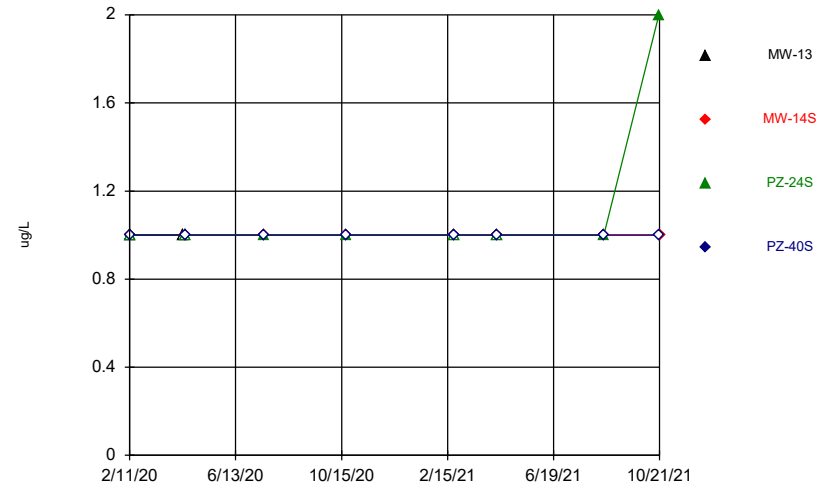
# **GSI Time Series Charts**

### Antimony, Total



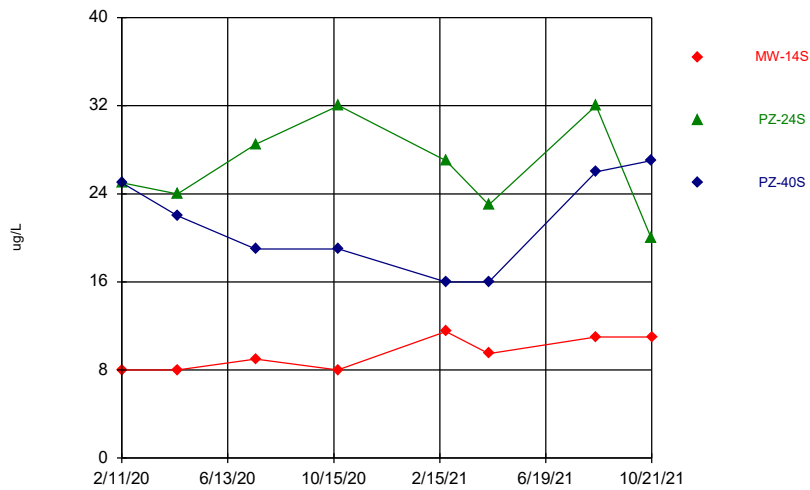
Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved antimony result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

### Arsenic, Total



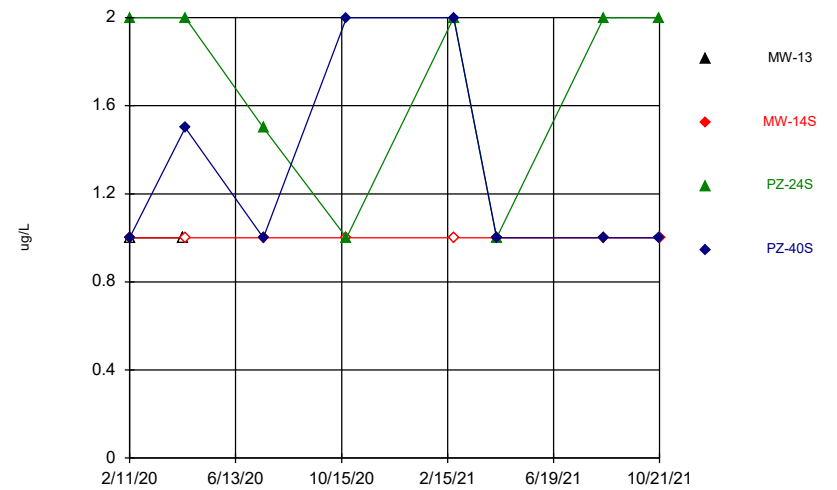
Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved arsenic result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

### Barium, Total



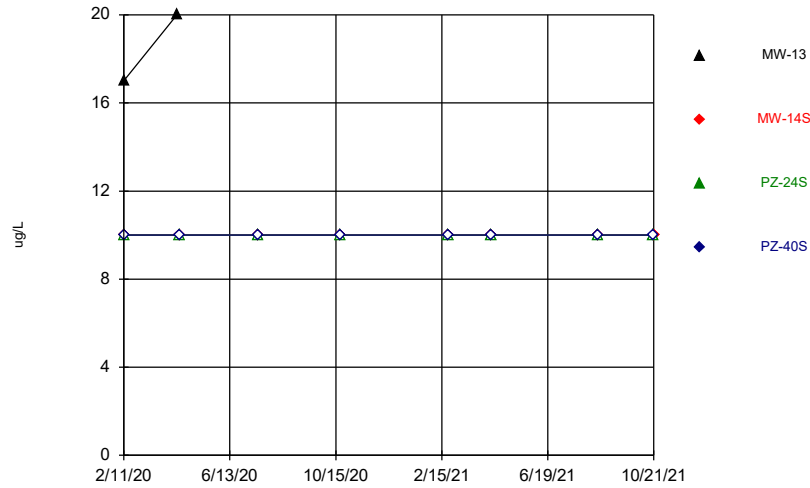
Time Series Analysis Run 12/6/2021 10:55 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

### Chromium, Total



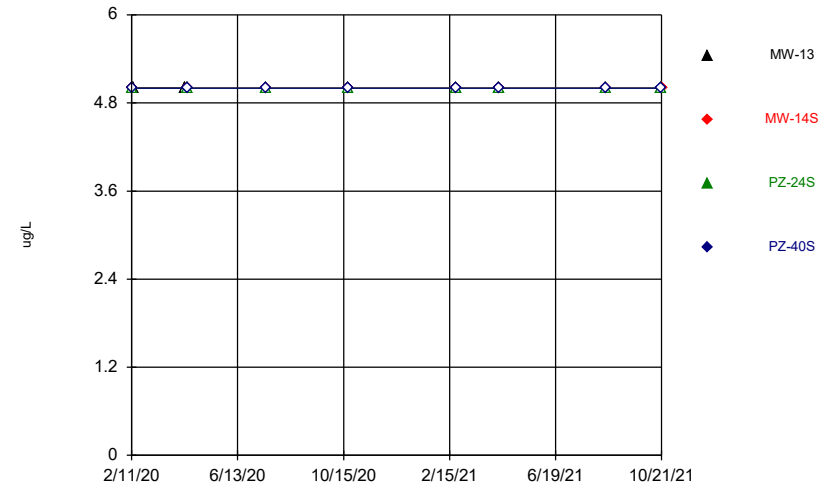
Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved chromium result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

### Lithium, Total



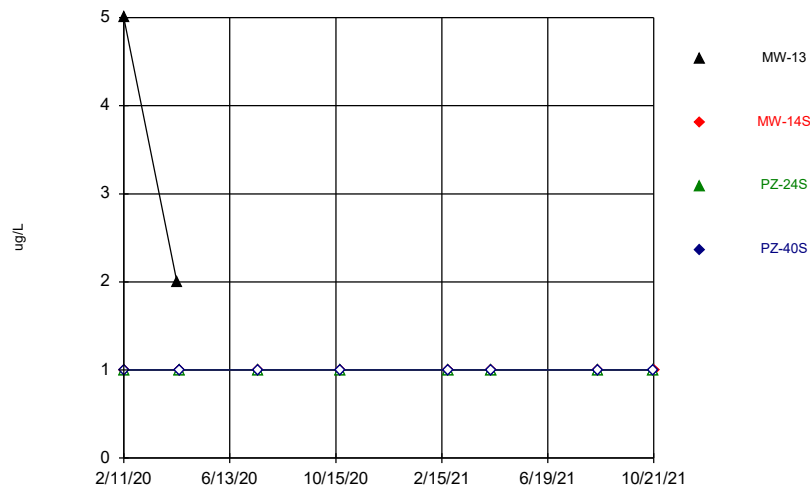
Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved lithium result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

### Molybdenum, Total



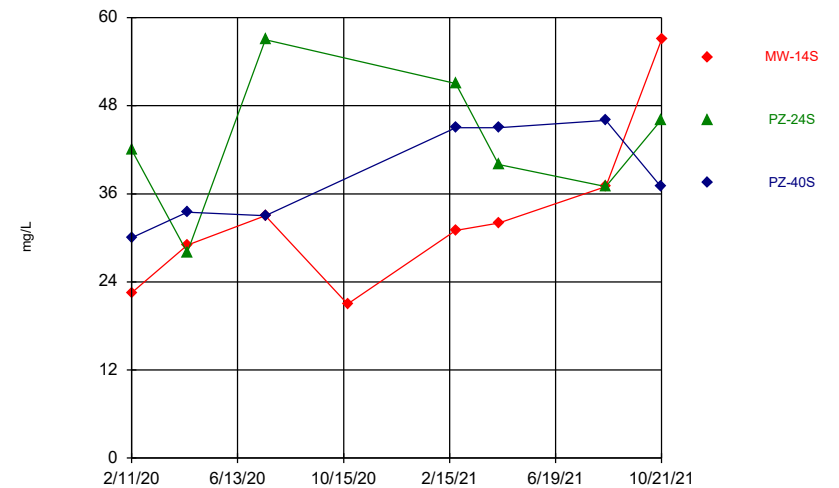
Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved molybdenum result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

### Selenium, Total

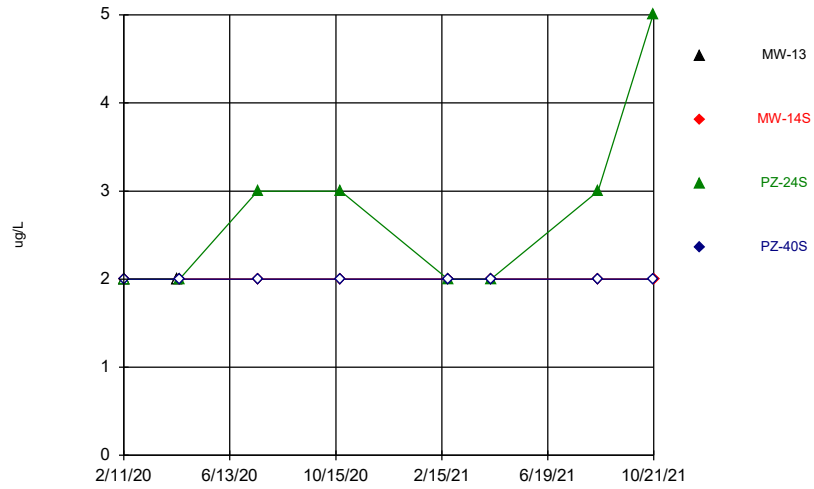


Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved selenium result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

### Total Dissolved Solids



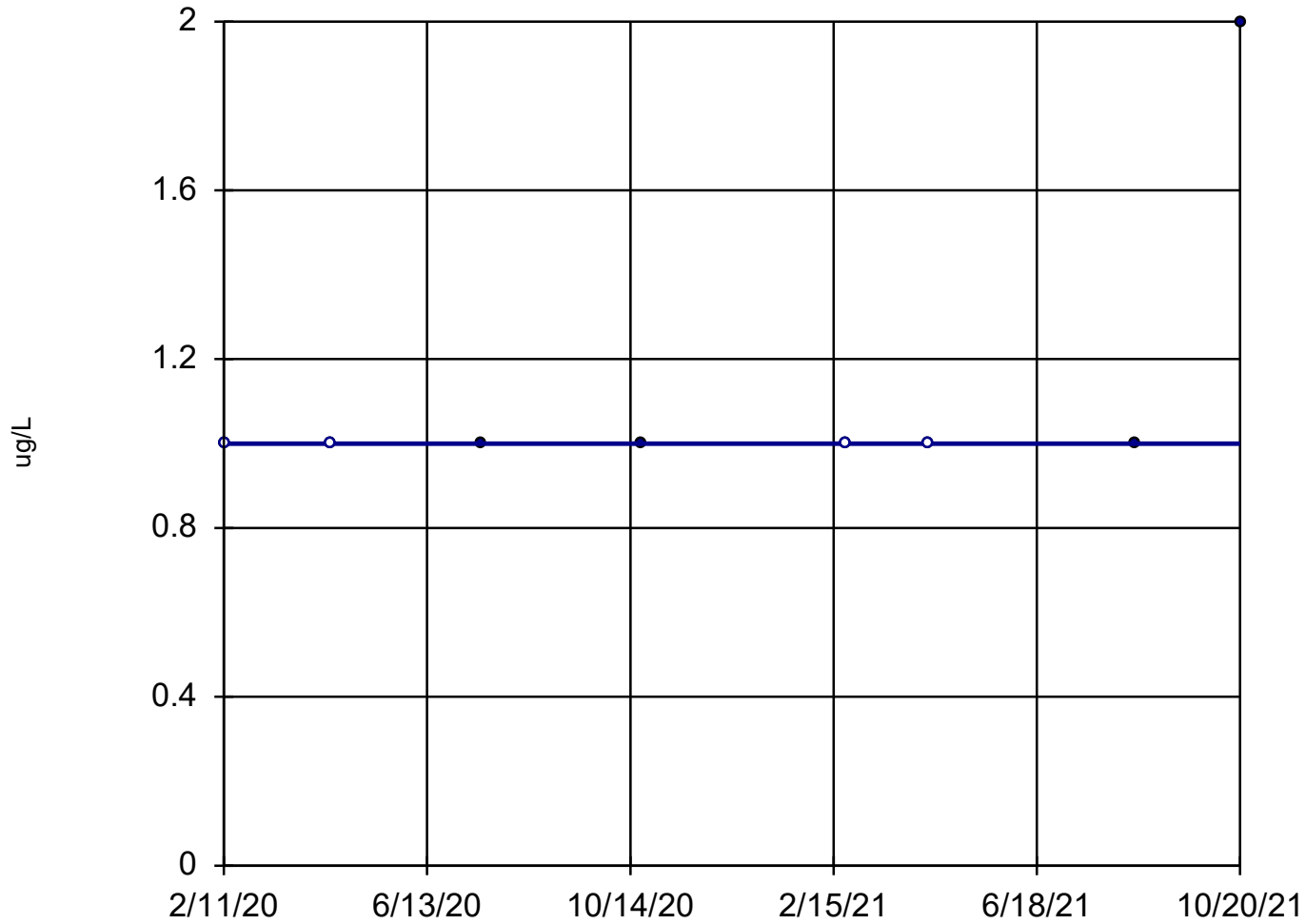
### Vanadium, Total



Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved vanadium result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

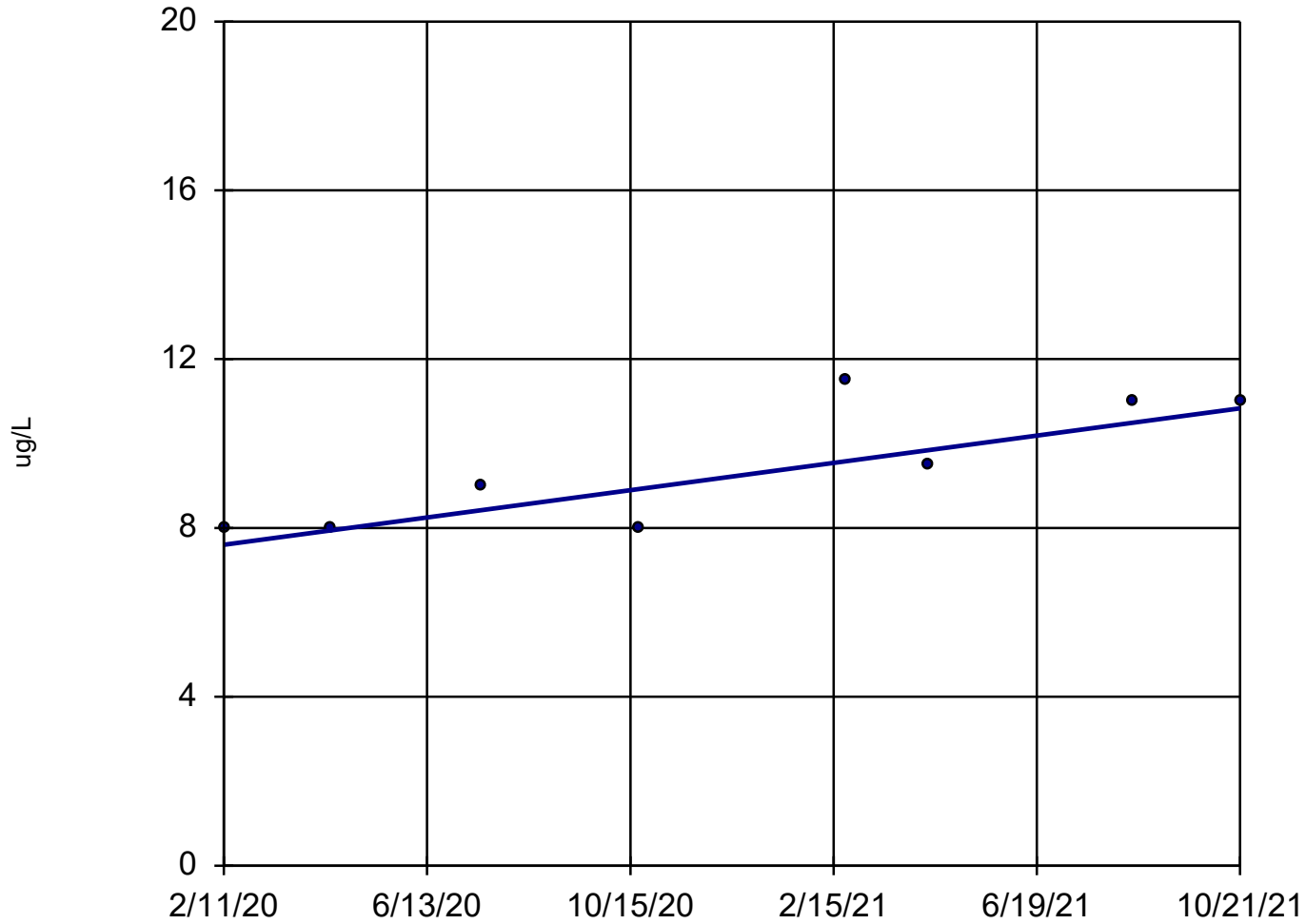


### Arsenic, Total PZ-24S



n = 8  
Slope = 0  
units per year.  
Mann-Kendall  
statistic = 7  
critical = 20  
Trend not sig-  
nificant at 98%  
confidence level  
( $\alpha = 0.01$  per  
tail).

## Barium, Total MW-14S

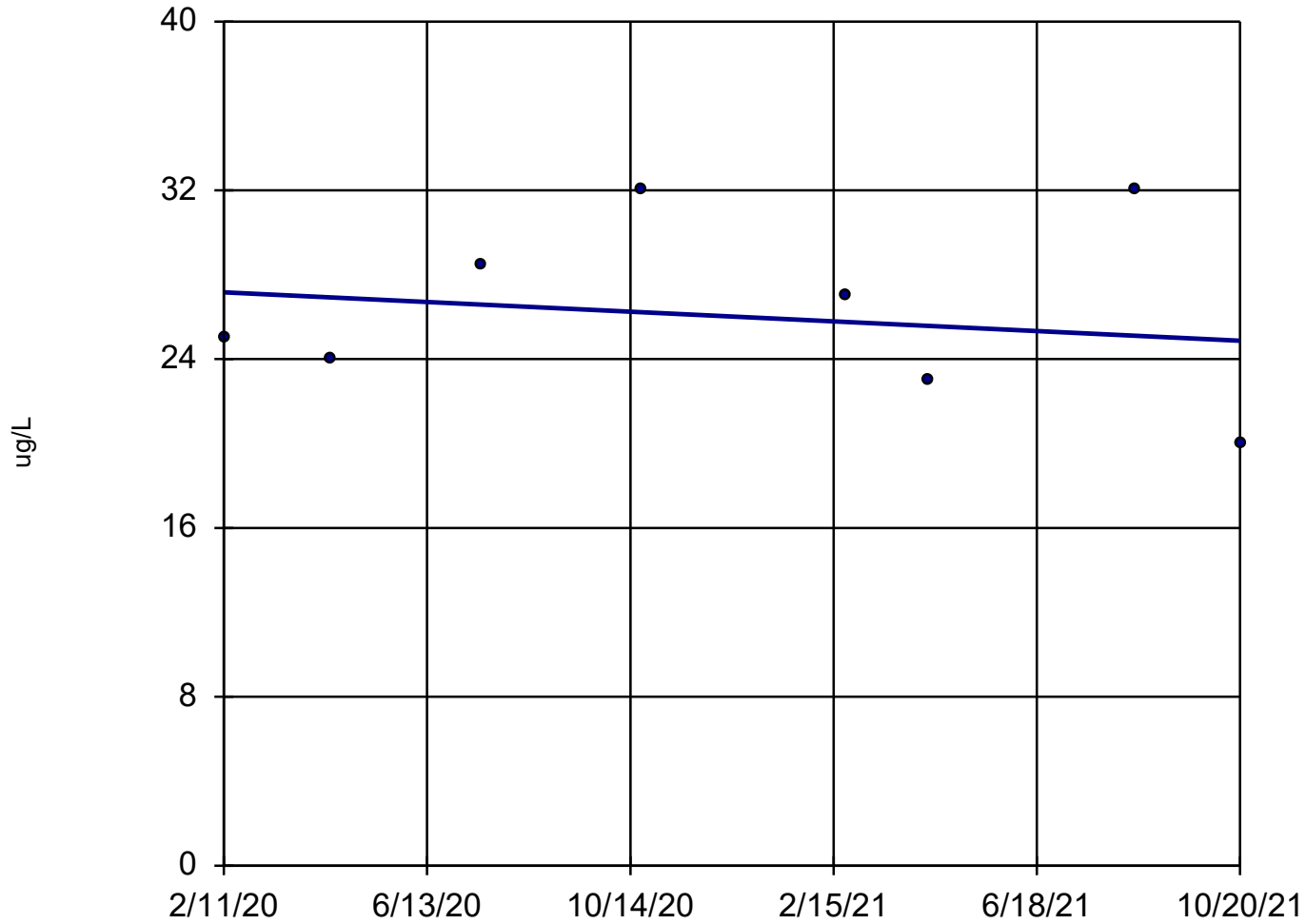


n = 8  
Slope = 1.909  
units per year.  
Mann-Kendall  
statistic = 16  
critical = 20  
Trend not sig-  
nificant at 98%  
confidence level  
( $\alpha = 0.01$  per  
tail).

Sen's Slope Estimator Analysis Run 12/6/2021 10:59 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

# Barium, Total

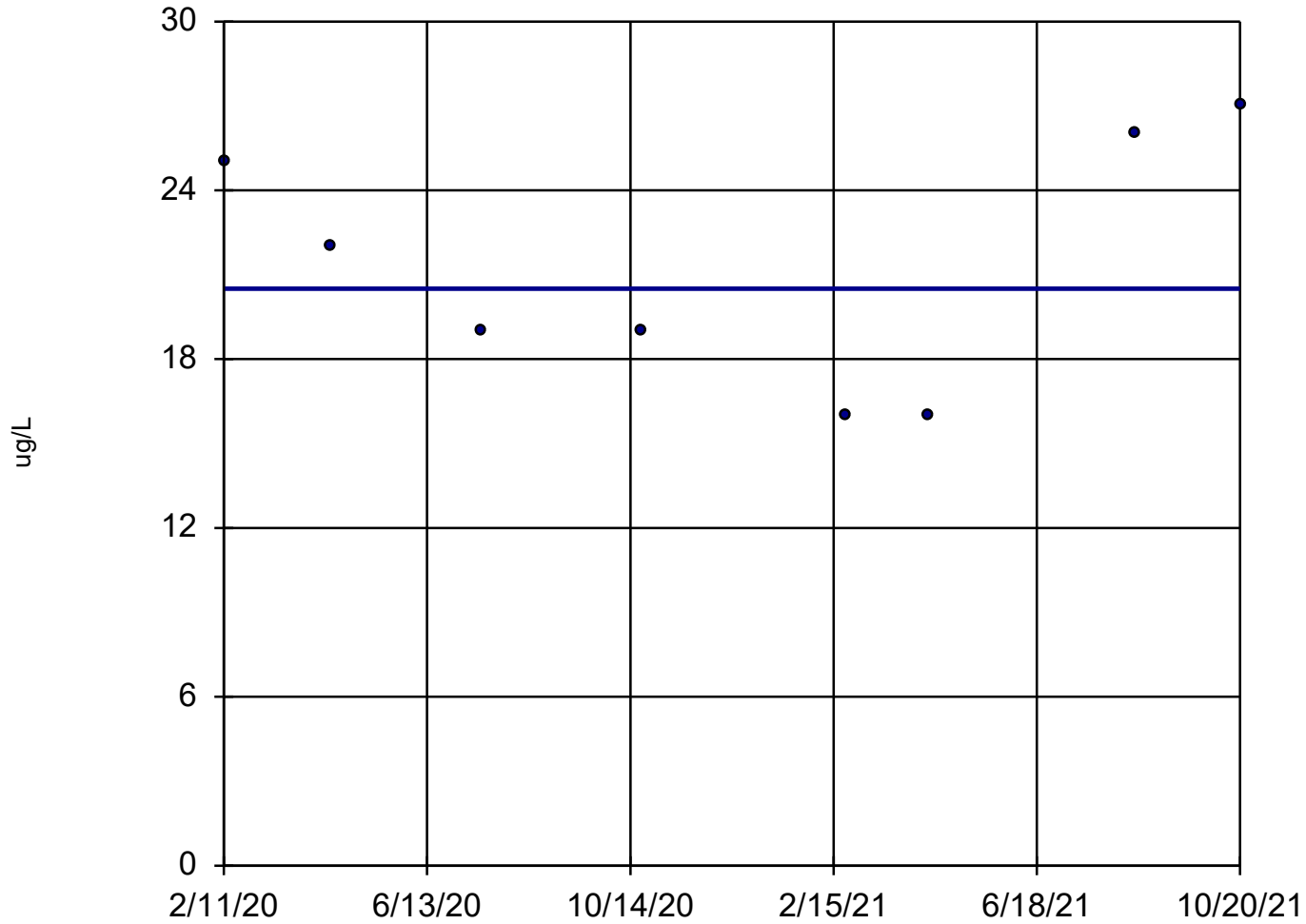
## PZ-24S



n = 8  
Slope = -1.356  
units per year.  
Mann-Kendall  
statistic = -3  
critical = -20  
Trend not sig-  
nificant at 98%  
confidence level  
( $\alpha = 0.01$  per  
tail).

Sen's Slope Estimator Analysis Run 12/6/2021 10:59 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

## Barium, Total PZ-40S

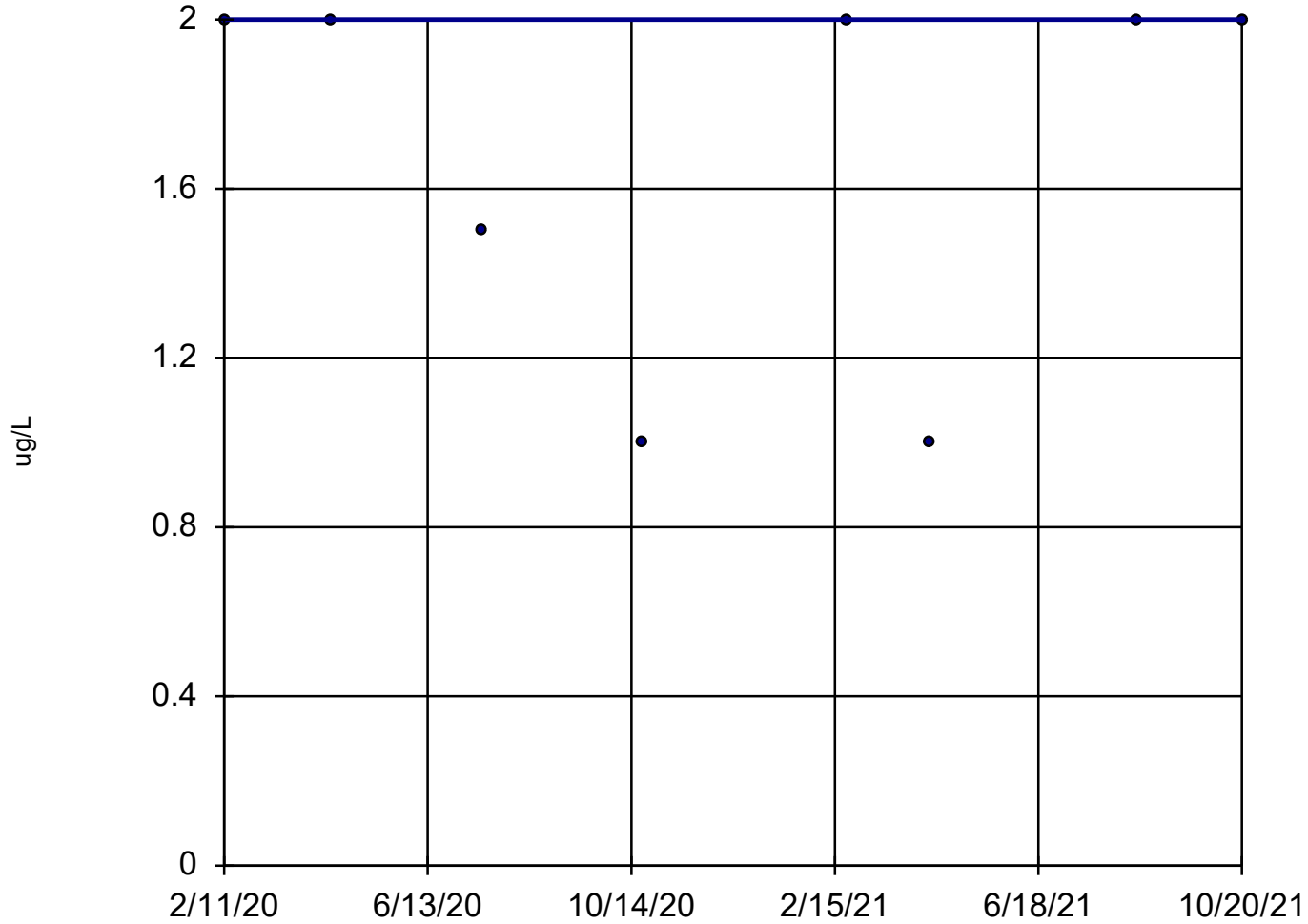


n = 8  
Slope = 0  
units per year.  
Mann-Kendall  
statistic = 0  
critical = 20  
Trend not sig-  
nificant at 98%  
confidence level  
( $\alpha = 0.01$  per  
tail).

Sen's Slope Estimator Analysis Run 12/6/2021 10:59 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

# Chromium, Total

PZ-24S

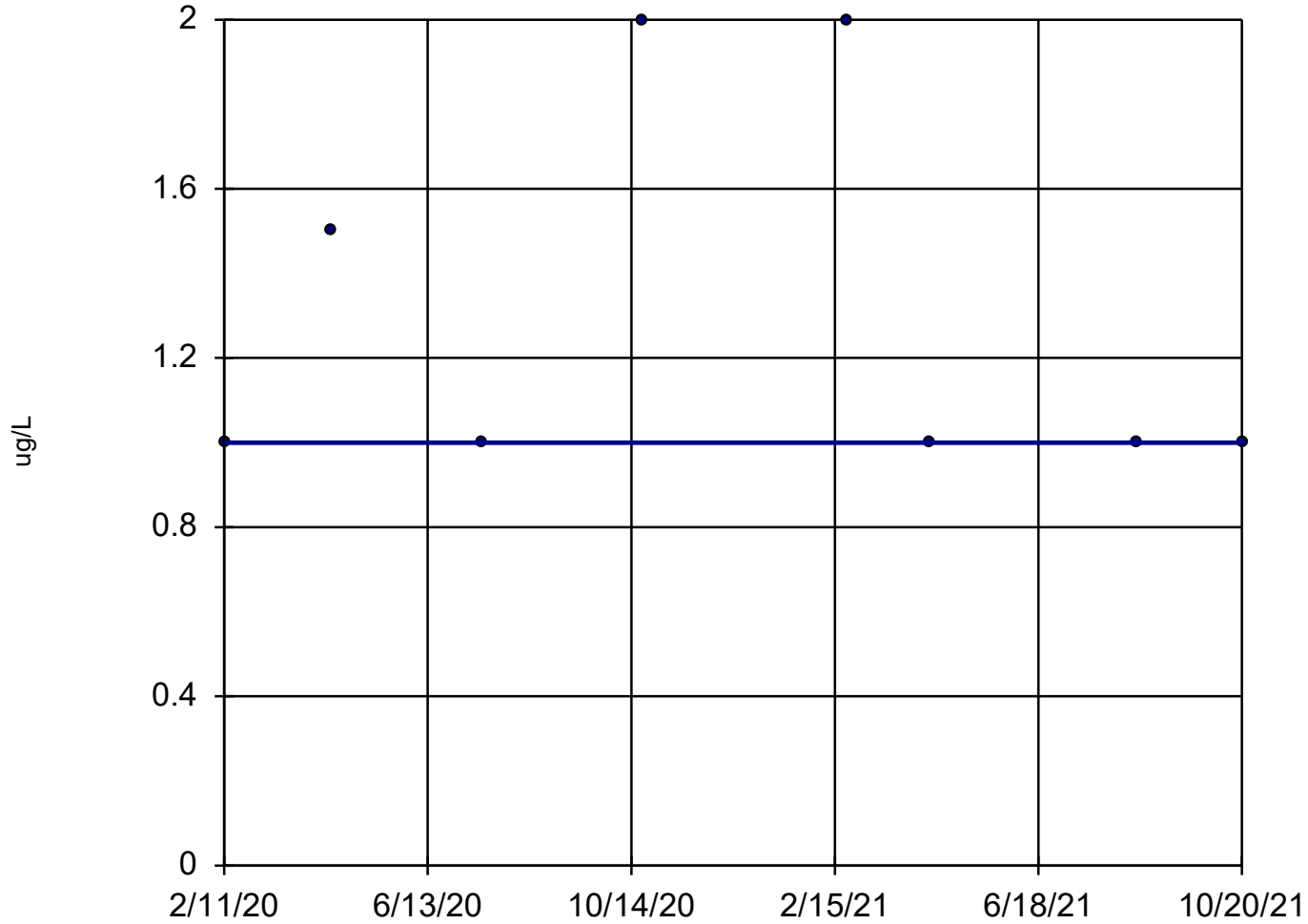


n = 8  
Slope = 0  
units per year.  
Mann-Kendall  
statistic = -1  
critical = -20  
Trend not sig-  
nificant at 98%  
confidence level  
( $\alpha = 0.01$  per  
tail).

Sen's Slope Estimator Analysis Run 12/6/2021 10:59 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

# Chromium, Total

PZ-40S



n = 8  
Slope = 0  
units per year.  
Mann-Kendall  
statistic = -3  
critical = -20  
Trend not sig-  
nificant at 98%  
confidence level  
( $\alpha = 0.01$  per  
tail).

Sen's Slope Estimator Analysis Run 12/6/2021 10:59 AM  
Client: Consumers Energy Data: JHC CCR\_Sanitas Data\_4Q21

## **Appendix D**

# **October 2021 Laboratory Reports**



To: CDBatts, JH Campbell Complex

From: EBlaj, T-258

Date: November 08, 2021

Subject: JH CAMPBELL SOLID WASTE DISPOSAL AREA – GROUNDWATER MONITORING  
4<sup>th</sup> Quarter, 2021 – Background Wells

CC: BLSwanberg, P22-119  
HDRegister, P22-521

Sarah Holmstrom, Project Manager  
TRC Companies, Inc.  
1540 Eisenhower Place  
Ann Arbor, MI 48108

---

**Chemistry Project: 21-1276**

CE Laboratory Services conducted groundwater monitoring on 10/19/2021 through 10/22/2021 at the JH Campbell Solid Waste Disposal Area, for the 4<sup>th</sup> Quarter monitoring requirements. The samples were received for analysis by the Chemistry department on 10/22/2021.

Samples for Radium analysis have been subcontracted to Eurofins/TestAmerica, Inc. and their results are being reported separately. Please note that the subcontracted work is not reported under the CE laboratory scope of accreditation.

With the exception noted above, the report that follows presents the results of the requested analytical testing; the results apply only to the samples, as received. All samples have been analyzed in accordance with the 2016 TNI Standard and the applicable A2LA accreditation scope for Laboratory Services. Any exceptions to applicable test method criteria and standard compliance are noted in the Case Narrative, or flagged with applicable qualifiers in the analytical results section.

Reviewed and approved by:

Emil Blaj  
Sr. Technical Analyst  
Project Lead



*Testing performed in accordance with the A2LA scope of accreditation specified in the listed certificate. The information contained in this report is the sole property of Consumers Energy. It cannot be reproduced except in full, and with consent from Consumers Energy, or the customer for which this report was issued.*

## CASE NARRATIVE

### I. Sample Receipt

All samples were received within hold time and in good conditions; no anomalies were noted on the Sample Log-In Shipment Inspection Form during sample check-in. Identification of all samples included in the work order/project is provided in the sample summary section. Sample preservation upon receipt was verified by the sample custodian and confirmed to meet method requirements.

### II. Methodology

Unless otherwise indicated, sample preparation and analysis was performed in accordance with the corresponding test methods from “Methods for the Determination of Inorganic Substances in Environmental Samples (EPA/600/R-93/100); SW-846, “Test Methods for Evaluating Solid Waste – Physical/Chemical Methods”, USEPA (latest revisions), and Standard Methods for the Examination of Water and Wastewater, APHA-AWWA-WPCF, 22<sup>nd</sup> Edition, 2012.

### III. Results/Quality Control

Analytical results for this report are presented by laboratory sample ID, container & aliquot number. Results for the field blanks, field duplicates, and percent recoveries of the field matrix spike & matrix spike duplicate samples are included in the results section. Unless specifically noted in the case narrative, all method quality control requirements have been met. If any results are qualified, the corresponding data flags/qualifiers are listed on the last page of the results section. Any additional information on method performance, when applicable, is presented in this section of the case narrative. When data flags are not needed, the qualifiers text box on the last page is left blank, and a statement confirms that no exceptions occurred.

## DEFINITIONS / QUALIFIERS

The following qualifiers and/or acronyms are used in the report where applicable:

<u>Acronym</u>	<u>Description</u>
RL	Reporting Limit
ND	Result not detected or below Reporting Limit
NT	Not a TNI Analyte
LCS	Laboratory Control Sample
LRB	Laboratory Reagent Blank (also referred to as Method Blank)
DUP	Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
TDL	Target Detection Limit
SM	Standard Methods Compendium

<u>Qualifier</u>	<u>Description</u>
*	Generic data flag, applicable description added in the corresponding notes section
B	The analyte was detected in the LRB at a level which is significant relative to sample result

D	Reporting limit elevated due to dilution
E	Estimated due to result exceeding the linear range of the analyzer
H	The maximum recommended hold time was exceeded
I	Dilution required due to matrix interference; reporting limit elevated
J	Estimated due to result found above MDL but below PQL (or RL)
K	Reporting limit raised due to matrix interference
M	The precision for duplicate analysis was not met; RPD outside acceptance criteria
N	Non-homogeneous sample made analysis questionable
PI	Possible interference may have affected the accuracy of the laboratory result
Q	Matrix Spike or Matrix Spike Duplicate recovery outside acceptance criteria
R	Result confirmed by new sample preparation and reanalysis
X	Other notation required; comment listed in sample notes and/or case narrative

## Work Order Sample Summary

---

**Customer Name:** JH Campbell Complex  
**Work Order ID:** Q4 2021 JHC Background Wells  
**Date Received:** 10/22/2021  
**Chemistry Project:** 21-1276

<u>Sample #</u>	<u>Field Sample ID</u>	<u>Matrix</u>	<u>Sample Date</u>	<u>Site</u>
21-1276-01	JHC-MW-15023	Groundwater	10/20/2021 10:57 AM	JHC RCRA GW Monitoring - Background Wells
21-1276-02	JHC-MW-15024	Groundwater	10/20/2021 09:28 AM	JHC RCRA GW Monitoring - Background Wells
21-1276-03	JHC-MW-15025	Groundwater	10/19/2021 05:58 PM	JHC RCRA GW Monitoring - Background Wells
21-1276-04	JHC-MW-15026	Groundwater	10/19/2021 04:51 PM	JHC RCRA GW Monitoring - Background Wells
21-1276-05	JHC-MW-15027	Groundwater	10/19/2021 03:56 PM	JHC RCRA GW Monitoring - Background Wells
21-1276-06	JHC-MW-15028	Groundwater	10/19/2021 02:36 PM	JHC RCRA GW Monitoring - Background Wells
21-1276-07	DUP-01	Groundwater	10/19/2021 12:00 AM	JHC RCRA GW Monitoring - Background Wells
21-1276-08	FB-01	Water	10/20/2021 09:49 AM	JHC RCRA GW Monitoring - Background Wells
21-1276-09	EB-01	Water	10/19/2021 06:23 PM	JHC RCRA GW Monitoring - Background Wells
21-1276-10	JHC-MW-15025 Field MS	Groundwater	10/19/2021 05:58 PM	JHC RCRA GW Monitoring - Background Wells
21-1276-11	JHC-MW-15025 Field MSD	Groundwater	10/19/2021 05:58 PM	JHC RCRA GW Monitoring - Background Wells

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
 Field Sample ID: **JHC-MW-15023**  
 Lab Sample ID: 21-1276-01  
 Matrix: Groundwater

Laboratory Project: **21-1276**  
 Collect Date: 10/20/2021  
 Collect Time: 10:57 AM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1276-01-C01-A01 Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/29/2021	AB21-1027-11

### Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 21-1276-01-C01-A02 Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Arsenic	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Barium	21		ug/L	5.0	11/04/2021	AB21-1103-10
Beryllium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Boron	41		ug/L	20.0	11/03/2021	AB21-1103-10
Cadmium	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Calcium	10700		ug/L	1000.0	11/03/2021	AB21-1103-10
Chromium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Cobalt	ND		ug/L	6.0	11/04/2021	AB21-1103-10
Copper	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Iron	86		ug/L	20.0	11/03/2021	AB21-1103-10
Lead	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Lithium	ND		ug/L	10.0	11/04/2021	AB21-1103-10
Magnesium	3350		ug/L	1000.0	11/03/2021	AB21-1103-10
Molybdenum	ND		ug/L	5.0	11/04/2021	AB21-1103-10
Nickel	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Potassium	767		ug/L	100.0	11/03/2021	AB21-1103-10
Selenium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Silver	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Sodium	3330		ug/L	1000.0	11/03/2021	AB21-1103-10
Thallium	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Vanadium	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Zinc	ND		ug/L	10.0	11/04/2021	AB21-1103-10

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot #: 21-1276-01-C02-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	3600		ug/L	1000.0	10/27/2021	AB21-1028-01
Fluoride	ND		ug/L	1000.0	10/27/2021	AB21-1028-01
Sulfate	11800		ug/L	1000.0	10/27/2021	AB21-1028-01

### Total Dissolved Solids by SM 2540C

Aliquot #: 21-1276-01-C03-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	77		mg/L	10.0	10/27/2021	AB21-1027-04



# Analytical Report

Report Date: 11/08/21

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
Field Sample ID: **JHC-MW-15023**  
Lab Sample ID: 21-1276-01  
Matrix: Groundwater

Laboratory Project: **21-1276**  
Collect Date: 10/20/2021  
Collect Time: 10:57 AM

### Alkalinity by SM 2320B

Aliquot #: 21-1276-01-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	23000		ug/L	10000.0	10/29/2021	AB21-1029-15
Alkalinity Bicarbonate	23000		ug/L	10000.0	10/29/2021	AB21-1029-15
Alkalinity Carbonate	ND		ug/L	10000.0	10/29/2021	AB21-1029-15

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
 Field Sample ID: **JHC-MW-15024**  
 Lab Sample ID: 21-1276-02  
 Matrix: Groundwater

Laboratory Project: **21-1276**  
 Collect Date: 10/20/2021  
 Collect Time: 09:28 AM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1276-02-C01-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/29/2021	AB21-1027-11

### Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 21-1276-02-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Arsenic	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Barium	25		ug/L	5.0	11/04/2021	AB21-1103-10
Beryllium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Boron	ND		ug/L	20.0	11/03/2021	AB21-1103-10
Cadmium	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Calcium	40200		ug/L	1000.0	11/03/2021	AB21-1103-10
Chromium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Cobalt	ND		ug/L	6.0	11/04/2021	AB21-1103-10
Copper	1		ug/L	1.0	11/04/2021	AB21-1103-10
Iron	119		ug/L	20.0	11/03/2021	AB21-1103-10
Lead	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Lithium	ND		ug/L	10.0	11/04/2021	AB21-1103-10
Magnesium	11600		ug/L	1000.0	11/03/2021	AB21-1103-10
Molybdenum	ND		ug/L	5.0	11/04/2021	AB21-1103-10
Nickel	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Potassium	1060		ug/L	100.0	11/03/2021	AB21-1103-10
Selenium	2		ug/L	1.0	11/04/2021	AB21-1103-10
Silver	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Sodium	15500		ug/L	1000.0	11/03/2021	AB21-1103-10
Thallium	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Vanadium	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Zinc	ND		ug/L	10.0	11/04/2021	AB21-1103-10

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot #: 21-1276-02-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	47100		ug/L	1000.0	10/27/2021	AB21-1028-01
Fluoride	ND		ug/L	1000.0	10/27/2021	AB21-1028-01
Sulfate	7530		ug/L	1000.0	10/27/2021	AB21-1028-01

### Total Dissolved Solids by SM 2540C

Aliquot #: 21-1276-02-C03-A01

Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	242		mg/L	10.0	10/27/2021	AB21-1027-04





# Analytical Report

Report Date: 11/08/21

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
Field Sample ID: **JHC-MW-15024**  
Lab Sample ID: 21-1276-02  
Matrix: Groundwater

Laboratory Project: **21-1276**  
Collect Date: 10/20/2021  
Collect Time: 09:28 AM

### Alkalinity by SM 2320B

Aliquot #: 21-1276-02-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	112000		ug/L	10000.0	10/29/2021	AB21-1029-15
Alkalinity Bicarbonate	112000		ug/L	10000.0	10/29/2021	AB21-1029-15
Alkalinity Carbonate	ND		ug/L	10000.0	10/29/2021	AB21-1029-15



# Analytical Report

Report Date: 11/08/21

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
 Field Sample ID: **JHC-MW-15025**  
 Lab Sample ID: 21-1276-03  
 Matrix: Groundwater

Laboratory Project: **21-1276**  
 Collect Date: 10/19/2021  
 Collect Time: 05:58 PM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1276-03-C01-A01 Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/29/2021	AB21-1027-11

### Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 21-1276-03-C01-A02 Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Arsenic	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Barium	6		ug/L	5.0	11/04/2021	AB21-1103-10
Beryllium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Boron	ND		ug/L	20.0	11/03/2021	AB21-1103-10
Cadmium	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Calcium	24200		ug/L	1000.0	11/03/2021	AB21-1103-10
Chromium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Cobalt	ND		ug/L	6.0	11/04/2021	AB21-1103-10
Copper	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Iron	47		ug/L	20.0	11/03/2021	AB21-1103-10
Lead	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Lithium	ND		ug/L	10.0	11/04/2021	AB21-1103-10
Magnesium	7070		ug/L	1000.0	11/03/2021	AB21-1103-10
Molybdenum	ND		ug/L	5.0	11/04/2021	AB21-1103-10
Nickel	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Potassium	1050		ug/L	100.0	11/03/2021	AB21-1103-10
Selenium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Silver	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Sodium	23000		ug/L	1000.0	11/03/2021	AB21-1103-10
Thallium	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Vanadium	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Zinc	ND		ug/L	10.0	11/04/2021	AB21-1103-10

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot #: 21-1276-03-C02-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	23300		ug/L	1000.0	10/27/2021	AB21-1028-01
Fluoride	ND		ug/L	1000.0	10/27/2021	AB21-1028-01
Sulfate	8980		ug/L	1000.0	10/27/2021	AB21-1028-01

### Total Dissolved Solids by SM 2540C

Aliquot #: 21-1276-03-C03-A01 #Error

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	259		mg/L	10.0	10/26/2021	



# Analytical Report

Report Date: 11/08/21

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
Field Sample ID: **JHC-MW-15025**  
Lab Sample ID: 21-1276-03  
Matrix: Groundwater

Laboratory Project: **21-1276**  
Collect Date: 10/19/2021  
Collect Time: 05:58 PM

### Alkalinity by SM 2320B

Aliquot #: 21-1276-03-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	100000		ug/L	10000.0	10/29/2021	AB21-1029-15
Alkalinity Bicarbonate	100000		ug/L	10000.0	10/29/2021	AB21-1029-15
Alkalinity Carbonate	ND		ug/L	10000.0	10/29/2021	AB21-1029-15

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
 Field Sample ID: **JHC-MW-15026**  
 Lab Sample ID: 21-1276-04  
 Matrix: Groundwater

Laboratory Project: **21-1276**  
 Collect Date: 10/19/2021  
 Collect Time: 04:51 PM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1276-04-C01-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/29/2021	AB21-1027-11

### Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 21-1276-04-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Arsenic	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Barium	8		ug/L	5.0	11/04/2021	AB21-1103-10
Beryllium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Boron	ND		ug/L	20.0	11/03/2021	AB21-1103-10
Cadmium	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Calcium	4010		ug/L	1000.0	11/03/2021	AB21-1103-10
Chromium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Cobalt	ND		ug/L	6.0	11/04/2021	AB21-1103-10
Copper	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Iron	28		ug/L	20.0	11/03/2021	AB21-1103-10
Lead	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Lithium	ND		ug/L	10.0	11/04/2021	AB21-1103-10
Magnesium	ND		ug/L	1000.0	11/03/2021	AB21-1103-10
Molybdenum	ND		ug/L	5.0	11/04/2021	AB21-1103-10
Nickel	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Potassium	669		ug/L	100.0	11/03/2021	AB21-1103-10
Selenium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Silver	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Sodium	2310		ug/L	1000.0	11/03/2021	AB21-1103-10
Thallium	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Vanadium	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Zinc	ND		ug/L	10.0	11/04/2021	AB21-1103-10

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot #: 21-1276-04-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	1090		ug/L	1000.0	10/27/2021	AB21-1028-01
Fluoride	ND		ug/L	1000.0	10/27/2021	AB21-1028-01
Sulfate	5810		ug/L	1000.0	10/27/2021	AB21-1028-01

### Total Dissolved Solids by SM 2540C

Aliquot #: 21-1276-04-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	34		mg/L	10.0	10/26/2021	AB21-1026-12



# Analytical Report

Report Date: 11/08/21

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
Field Sample ID: **JHC-MW-15026**  
Lab Sample ID: 21-1276-04  
Matrix: Groundwater

Laboratory Project: **21-1276**  
Collect Date: 10/19/2021  
Collect Time: 04:51 PM

### Alkalinity by SM 2320B

Aliquot #: 21-1276-04-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	15300		ug/L	10000.0	10/29/2021	AB21-1029-15
Alkalinity Bicarbonate	15300		ug/L	10000.0	10/29/2021	AB21-1029-15
Alkalinity Carbonate	ND		ug/L	10000.0	10/29/2021	AB21-1029-15



# Analytical Report

Report Date: 11/08/21

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
 Field Sample ID: **JHC-MW-15027**  
 Lab Sample ID: 21-1276-05  
 Matrix: Groundwater

Laboratory Project: **21-1276**  
 Collect Date: 10/19/2021  
 Collect Time: 03:56 PM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1276-05-C01-A01 Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/29/2021	AB21-1027-11

### Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 21-1276-05-C01-A02 Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Arsenic	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Barium	15		ug/L	5.0	11/04/2021	AB21-1103-10
Beryllium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Boron	ND		ug/L	20.0	11/03/2021	AB21-1103-10
Cadmium	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Calcium	13400		ug/L	1000.0	11/03/2021	AB21-1103-10
Chromium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Cobalt	ND		ug/L	6.0	11/04/2021	AB21-1103-10
Copper	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Iron	1430		ug/L	20.0	11/03/2021	AB21-1103-10
Lead	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Lithium	ND		ug/L	10.0	11/04/2021	AB21-1103-10
Magnesium	2890		ug/L	1000.0	11/03/2021	AB21-1103-10
Molybdenum	ND		ug/L	5.0	11/04/2021	AB21-1103-10
Nickel	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Potassium	237		ug/L	100.0	11/03/2021	AB21-1103-10
Selenium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Silver	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Sodium	1900		ug/L	1000.0	11/03/2021	AB21-1103-10
Thallium	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Vanadium	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Zinc	ND		ug/L	10.0	11/04/2021	AB21-1103-10

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot #: 21-1276-05-C02-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	ND		ug/L	1000.0	10/27/2021	AB21-1028-01
Fluoride	ND		ug/L	1000.0	10/27/2021	AB21-1028-01
Sulfate	7890		ug/L	1000.0	10/27/2021	AB21-1028-01

### Total Dissolved Solids by SM 2540C

Aliquot #: 21-1276-05-C03-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	71		mg/L	10.0	10/26/2021	AB21-1026-12



# Analytical Report

Report Date: 11/08/21

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
Field Sample ID: **JHC-MW-15027**  
Lab Sample ID: 21-1276-05  
Matrix: Groundwater

Laboratory Project: **21-1276**  
Collect Date: 10/19/2021  
Collect Time: 03:56 PM

### Alkalinity by SM 2320B

Aliquot #: 21-1276-05-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	42900		ug/L	10000.0	10/29/2021	AB21-1029-15
Alkalinity Bicarbonate	42900		ug/L	10000.0	10/29/2021	AB21-1029-15
Alkalinity Carbonate	ND		ug/L	10000.0	10/29/2021	AB21-1029-15



## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
 Field Sample ID: **JHC-MW-15028**  
 Lab Sample ID: 21-1276-06  
 Matrix: Groundwater

Laboratory Project: **21-1276**  
 Collect Date: 10/19/2021  
 Collect Time: 02:36 PM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1276-06-C01-A01 Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/29/2021	AB21-1027-11

### Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 21-1276-06-C01-A02 Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Arsenic	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Barium	8		ug/L	5.0	11/04/2021	AB21-1103-10
Beryllium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Boron	ND		ug/L	20.0	11/03/2021	AB21-1103-10
Cadmium	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Calcium	20000		ug/L	1000.0	11/03/2021	AB21-1103-10
Chromium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Cobalt	ND		ug/L	6.0	11/04/2021	AB21-1103-10
Copper	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Iron	41		ug/L	20.0	11/03/2021	AB21-1103-10
Lead	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Lithium	ND		ug/L	10.0	11/04/2021	AB21-1103-10
Magnesium	4380		ug/L	1000.0	11/03/2021	AB21-1103-10
Molybdenum	ND		ug/L	5.0	11/04/2021	AB21-1103-10
Nickel	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Potassium	320		ug/L	100.0	11/03/2021	AB21-1103-10
Selenium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Silver	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Sodium	1350		ug/L	1000.0	11/03/2021	AB21-1103-10
Thallium	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Vanadium	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Zinc	ND		ug/L	10.0	11/04/2021	AB21-1103-10

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot #: 21-1276-06-C02-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	ND		ug/L	1000.0	10/27/2021	AB21-1028-01
Fluoride	ND		ug/L	1000.0	10/27/2021	AB21-1028-01
Sulfate	5900		ug/L	1000.0	10/27/2021	AB21-1028-01

### Total Dissolved Solids by SM 2540C

Aliquot #: 21-1276-06-C03-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	203		mg/L	10.0	10/26/2021	AB21-1026-12



# Analytical Report

Report Date: 11/08/21

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
Field Sample ID: **JHC-MW-15028**  
Lab Sample ID: 21-1276-06  
Matrix: Groundwater

Laboratory Project: **21-1276**  
Collect Date: 10/19/2021  
Collect Time: 02:36 PM

### Alkalinity by SM 2320B

Aliquot #: 21-1276-06-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	72000		ug/L	10000.0	10/29/2021	AB21-1029-15
Alkalinity Bicarbonate	72000		ug/L	10000.0	10/29/2021	AB21-1029-15
Alkalinity Carbonate	ND		ug/L	10000.0	10/29/2021	AB21-1029-15



# Analytical Report

Report Date: 11/08/21

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
 Field Sample ID: **DUP-01**  
 Lab Sample ID: 21-1276-07  
 Matrix: Groundwater

Laboratory Project: **21-1276**  
 Collect Date: 10/19/2021  
 Collect Time: 12:00 AM

**Mercury by EPA 7470A, Total, Aqueous** Aliquot #: 21-1276-07-C01-A01 Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/29/2021	AB21-1027-11

**Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp** Aliquot #: 21-1276-07-C01-A02 Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Arsenic	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Barium	8		ug/L	5.0	11/04/2021	AB21-1103-10
Beryllium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Boron	ND		ug/L	20.0	11/03/2021	AB21-1103-10
Cadmium	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Calcium	20600		ug/L	1000.0	11/03/2021	AB21-1103-10
Chromium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Cobalt	ND		ug/L	6.0	11/04/2021	AB21-1103-10
Copper	1		ug/L	1.0	11/04/2021	AB21-1103-10
Iron	35		ug/L	20.0	11/03/2021	AB21-1103-10
Lead	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Lithium	ND		ug/L	10.0	11/04/2021	AB21-1103-10
Magnesium	4580		ug/L	1000.0	11/03/2021	AB21-1103-10
Molybdenum	ND		ug/L	5.0	11/04/2021	AB21-1103-10
Nickel	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Potassium	362		ug/L	100.0	11/03/2021	AB21-1103-10
Selenium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Silver	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Sodium	1420		ug/L	1000.0	11/03/2021	AB21-1103-10
Thallium	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Vanadium	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Zinc	ND		ug/L	10.0	11/04/2021	AB21-1103-10

**Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous** Aliquot #: 21-1276-07-C02-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	ND		ug/L	1000.0	10/27/2021	AB21-1028-01
Fluoride	ND		ug/L	1000.0	10/27/2021	AB21-1028-01
Sulfate	5230		ug/L	1000.0	10/27/2021	AB21-1028-01

**Total Dissolved Solids by SM 2540C** Aliquot #: 21-1276-07-C03-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	108		mg/L	10.0	10/26/2021	AB21-1026-12



# Analytical Report

Report Date: 11/08/21

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
Field Sample ID: **DUP-01**  
Lab Sample ID: 21-1276-07  
Matrix: Groundwater

Laboratory Project: **21-1276**  
Collect Date: 10/19/2021  
Collect Time: 12:00 AM

### Alkalinity by SM 2320B

Aliquot #: 21-1276-07-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	73500		ug/L	10000.0	10/29/2021	AB21-1029-15
Alkalinity Bicarbonate	73500		ug/L	10000.0	10/29/2021	AB21-1029-15
Alkalinity Carbonate	ND		ug/L	10000.0	10/29/2021	AB21-1029-15

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
 Field Sample ID: **FB-01**  
 Lab Sample ID: 21-1276-08  
 Matrix: Water

Laboratory Project: **21-1276**  
 Collect Date: 10/20/2021  
 Collect Time: 09:49 AM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1276-08-C01-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/29/2021	AB21-1027-11

### Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 21-1276-08-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Arsenic	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Barium	ND		ug/L	5.0	11/04/2021	AB21-1103-10
Beryllium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Boron	ND		ug/L	20.0	11/03/2021	AB21-1103-10
Cadmium	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Calcium	ND		ug/L	1000.0	11/03/2021	AB21-1103-10
Chromium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Cobalt	ND		ug/L	6.0	11/04/2021	AB21-1103-10
Copper	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Iron	ND		ug/L	20.0	11/03/2021	AB21-1103-10
Lead	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Lithium	ND		ug/L	10.0	11/04/2021	AB21-1103-10
Magnesium	ND		ug/L	1000.0	11/03/2021	AB21-1103-10
Molybdenum	ND		ug/L	5.0	11/04/2021	AB21-1103-10
Nickel	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Potassium	ND		ug/L	100.0	11/03/2021	AB21-1103-10
Selenium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Silver	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Sodium	ND		ug/L	1000.0	11/03/2021	AB21-1103-10
Thallium	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Vanadium	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Zinc	ND		ug/L	10.0	11/04/2021	AB21-1103-10

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot #: 21-1276-08-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	ND		ug/L	1000.0	10/27/2021	AB21-1028-01
Fluoride	ND		ug/L	1000.0	10/27/2021	AB21-1028-01
Sulfate	ND		ug/L	1000.0	10/27/2021	AB21-1028-01

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
 Field Sample ID: **EB-01**  
 Lab Sample ID: 21-1276-09  
 Matrix: Water

Laboratory Project: **21-1276**  
 Collect Date: 10/19/2021  
 Collect Time: 06:23 PM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1276-09-C01-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/29/2021	AB21-1027-11

### Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 21-1276-09-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Arsenic	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Barium	ND		ug/L	5.0	11/04/2021	AB21-1103-10
Beryllium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Boron	ND		ug/L	20.0	11/03/2021	AB21-1103-10
Cadmium	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Calcium	ND		ug/L	1000.0	11/03/2021	AB21-1103-10
Chromium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Cobalt	ND		ug/L	6.0	11/04/2021	AB21-1103-10
Copper	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Iron	ND		ug/L	20.0	11/03/2021	AB21-1103-10
Lead	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Lithium	ND		ug/L	10.0	11/04/2021	AB21-1103-10
Magnesium	ND		ug/L	1000.0	11/03/2021	AB21-1103-10
Molybdenum	ND		ug/L	5.0	11/04/2021	AB21-1103-10
Nickel	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Potassium	ND		ug/L	100.0	11/03/2021	AB21-1103-10
Selenium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Silver	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Sodium	ND		ug/L	1000.0	11/03/2021	AB21-1103-10
Thallium	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Vanadium	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Zinc	ND		ug/L	10.0	11/04/2021	AB21-1103-10

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot #: 21-1276-09-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	ND		ug/L	1000.0	10/27/2021	AB21-1028-01
Fluoride	ND		ug/L	1000.0	10/27/2021	AB21-1028-01
Sulfate	ND		ug/L	1000.0	10/27/2021	AB21-1028-01

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
 Field Sample ID: **JHC-MW-15025 Field MS**  
 Lab Sample ID: 21-1276-10  
 Matrix: Groundwater

Laboratory Project: **21-1276**  
 Collect Date: 10/19/2021  
 Collect Time: 05:58 PM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1276-10-C01-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	84.8		%	0.2	10/29/2021	AB21-1027-11

### Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 21-1276-10-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	108		%	1.0	11/04/2021	AB21-1103-10
Arsenic	102		%	1.0	11/04/2021	AB21-1103-10
Barium	108		%	5.0	11/04/2021	AB21-1103-10
Beryllium	105		%	1.0	11/04/2021	AB21-1103-10
Boron	96		%	20.0	11/03/2021	AB21-1103-10
Cadmium	106		%	0.2	11/04/2021	AB21-1103-10
Calcium	99.7		%	1000.0	11/03/2021	AB21-1103-10
Chromium	103		%	1.0	11/04/2021	AB21-1103-10
Cobalt	103		%	6.0	11/04/2021	AB21-1103-10
Copper	102		%	1.0	11/04/2021	AB21-1103-10
Iron	98		%	20.0	11/03/2021	AB21-1103-10
Lead	96		%	1.0	11/04/2021	AB21-1103-10
Lithium	97		%	10.0	11/04/2021	AB21-1103-10
Magnesium	108		%	1000.0	11/03/2021	AB21-1103-10
Molybdenum	107		%	5.0	11/04/2021	AB21-1103-10
Nickel	101		%	2.0	11/04/2021	AB21-1103-10
Potassium	109		%	100.0	11/03/2021	AB21-1103-10
Selenium	104		%	1.0	11/04/2021	AB21-1103-10
Silver	102		%	0.2	11/04/2021	AB21-1103-10
Sodium	107		%	1000.0	11/03/2021	AB21-1103-10
Thallium	97		%	2.0	11/04/2021	AB21-1103-10
Vanadium	104		%	2.0	11/04/2021	AB21-1103-10
Zinc	99		%	10.0	11/04/2021	AB21-1103-10

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot #: 21-1276-10-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	94		%	1000.0	10/27/2021	AB21-1028-01
Fluoride	88		%	1000.0	10/27/2021	AB21-1028-01
Sulfate	94		%	1000.0	10/27/2021	AB21-1028-01



## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**  
 Field Sample ID: **JHC-MW-15025 Field MSD**  
 Lab Sample ID: 21-1276-11  
 Matrix: Groundwater

Laboratory Project: **21-1276**  
 Collect Date: 10/19/2021  
 Collect Time: 05:58 PM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1276-11-C01-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	110		%	0.2	10/29/2021	AB21-1027-11

### Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 21-1276-11-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	105		%	1.0	11/04/2021	AB21-1103-10
Arsenic	100		%	1.0	11/04/2021	AB21-1103-10
Barium	105		%	5.0	11/04/2021	AB21-1103-10
Beryllium	106		%	1.0	11/04/2021	AB21-1103-10
Boron	101		%	20.0	11/03/2021	AB21-1103-10
Cadmium	104		%	0.2	11/04/2021	AB21-1103-10
Calcium	101		%	1000.0	11/03/2021	AB21-1103-10
Chromium	103		%	1.0	11/04/2021	AB21-1103-10
Cobalt	102		%	6.0	11/04/2021	AB21-1103-10
Copper	98		%	1.0	11/04/2021	AB21-1103-10
Iron	106		%	20.0	11/03/2021	AB21-1103-10
Lead	96		%	1.0	11/04/2021	AB21-1103-10
Lithium	100		%	10.0	11/04/2021	AB21-1103-10
Magnesium	111		%	1000.0	11/03/2021	AB21-1103-10
Molybdenum	105		%	5.0	11/04/2021	AB21-1103-10
Nickel	100		%	2.0	11/04/2021	AB21-1103-10
Potassium	117		%	100.0	11/03/2021	AB21-1103-10
Selenium	102		%	1.0	11/04/2021	AB21-1103-10
Silver	100		%	0.2	11/04/2021	AB21-1103-10
Sodium	116		%	1000.0	11/03/2021	AB21-1103-10
Thallium	97		%	2.0	11/04/2021	AB21-1103-10
Vanadium	104		%	2.0	11/04/2021	AB21-1103-10
Zinc	97		%	10.0	11/04/2021	AB21-1103-10

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot #: 21-1276-11-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	93		%	1000.0	10/27/2021	AB21-1028-01
Fluoride	87		%	1000.0	10/27/2021	AB21-1028-01
Sulfate	93		%	1000.0	10/27/2021	AB21-1028-01



# Analytical Report

Report Date: 11/08/21

**Laboratory Services**  
A CENTURY OF EXCELLENCE

Data Qualifiers	Exception Summary
-----------------	-------------------

No exceptions occurred.

CONSUMERS  
ENERGY

Chemistry Department  
General Standard Operating Procedure

PROC CHEM-1 2.01  
PAGE 1 OF 2  
REVISION 3  
ATTACHMENT A

**TITLE: SAMPLE LOG-IN – SHIPMENT INSPECTION FORM**

Project Log-In Number: 21-1276

Inspection Date: 10/25/21 Inspection By: CH

Sample Origin/Project Name: JHC 04-2021 Background/PmdA

Shipment Delivered By: Enter the type of shipment carrier.

Pony \_\_\_\_\_ FedEx \_\_\_\_\_ UPS \_\_\_\_\_ USPS \_\_\_\_\_ Airborne \_\_\_\_\_  
Other/Hand Carry (whom) CP-CMS  
Tracking Number \_\_\_\_\_ Shipping Form Attached Yes \_\_\_\_\_ No \_\_\_\_\_

Shipping Containers: Enter the type and number of shipping containers received.

Cooler (2) Cardboard Box \_\_\_\_\_ Custom Case \_\_\_\_\_ Envelope/Mailer \_\_\_\_\_  
Loose/Unpackaged Containers \_\_\_\_\_ Other \_\_\_\_\_

Condition of Shipment: Enter the as-received condition of the shipment container

Damaged Shipment Observed. None  Dented \_\_\_\_\_ Leaking \_\_\_\_\_  
Other \_\_\_\_\_

Shipment Security: Enter if any of the shipping containers were opened before receipt

Shipping Containers Received. Opened \_\_\_\_\_ Sealed

Enclosed Documents: Enter the type of documents enclosed with the shipment

CoC  Work Request \_\_\_\_\_ Air Data Sheet \_\_\_\_\_ Other \_\_\_\_\_

Temperature of Containers: Measure the temperature of several sample containers

As-Received Temperature Range: 1.2 - 4.0°C Samples Received on Ice. Yes  No \_\_\_\_\_

M&TE # and Expiration: 015A02 / 015A02  
10.3.22

Number and Type of Containers: Enter the total number of sample containers received

Container Type	Water	Soil	Other	Broken	Leaking
VOA (40mL or <u>60mL</u> )	<u>14</u>	_____	_____	_____	_____
Quart/Liter ( <u>g/d</u> )	<u>18</u>	_____	_____	_____	_____
9-oz (amber glass jar)	_____	_____	_____	_____	_____
2-oz (amber glass)	_____	_____	_____	_____	_____
125 mL (plastic)	<u>22</u>	_____	_____	_____	_____
24 mL vial (glass)	_____	_____	_____	_____	_____
<u>250</u> <del>500</del> mL (plastic)	<u>9</u>	_____	_____	_____	_____
Other _____	_____	_____	_____	_____	_____

# CHAIN OF CUSTODY

## CONSUMERS ENERGY COMPANY – LABORATORY SERVICES



135 WEST TRAIL ST., JACKSON, MI 49201 • (517) 788-1251 • FAX (517) 788-2533

SAMPLING SITE				PROJECT NUMBER			ANALYSIS REQUESTED						PAGE <u>1</u> OF <u>1</u>	
JHC Q4-2021 RCRA GW Monitoring Background Wells				21-1276									SEND REPORT TO Caleb Batts	
SAMPLING TEAM				DATE SHIPPED		SITE SKETCHED ATTACHED? CIRCLE ONE		Metals, Total	Amions	TDS	Alkalinity	Radium	PHONE _____	
CET / <u>DMW</u> / CLH						Yes      No								
CE CONTROL #	SAMPLE DATE	SAMPLE TIME	SAMPLE MATRIX	SAMPLE DESCRIPTION / LOCATION	DEPTH	# OF CONTAINERS								REMARKS
21-1276-01	10.20.21	1057	GW	JHC-MW-15023	--	7	X	X	X	X	X			
-02	↓	0928	GW	JHC-MW-15024	--	7	X	X	X	X	X			
-03	10.19.21	1758	GW	JHC-MW-15025	--	7	X	X	X	X	X			
-04	↓	1651	GW	JHC-MW-15026	--	7	X	X	X	X	X			
-05	↓	1556	GW	JHC-MW-15027	--	7	X	X	X	X	X			
-06	↓	1436	GW	JHC-MW-15028	--	7	X	X	X	X	X			
-07	↓	—	GW	DUP-01	--	7	X	X	X	X	X			
-08	10.20.21	0949	W	FB-01	--	5	X	X	X		X			
-09	10.19.21	1823	W	EB-01	--	5	X	X	X		X			
-10	10.19.21	1758	GW	JHC-MW-15025 Field MS	--	2	X	X						
-11	↓	1758	GW	JHC-MW-15025 Field MSD	--	2	X	X						

RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)	COMMENTS
<i>C. SubHann</i>	10/22/2021 <sup>11736</sup> <del>1750</del>	<i>[Signature]</i>	1.2-4.0°C 015AD2
RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)	
	<sup>not</sup> 102221	<i>[Signature]</i>	

ORIGINAL TO LAB      COPY TO CUSTOMER

## ANALYTICAL REPORT

Eurofins TestAmerica, St. Louis  
13715 Rider Trail North  
Earth City, MO 63045  
Tel: (314)298-8566

Laboratory Job ID: 160-43807-1

Client Project/Site: JH Campbell CCR Groundwater Testing

**For:**

Consumers Energy  
135 W Trail Street  
Jackson, Michigan 49201

Attn: Emil Blaj



*Authorized for release by:  
11/30/2021 5:26:10 PM*

Jayna Awalt, Project Manager II  
(314)298-8566  
[Jayna.Awalt@Eurofinset.com](mailto:Jayna.Awalt@Eurofinset.com)

### LINKS

Review your project  
results through  
**Total Access**

Have a Question?



Visit us at:

[www.eurofinsus.com/Env](http://www.eurofinsus.com/Env)

*This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.*

*Results relate only to the items tested and the sample(s) as received by the laboratory.*



# Table of Contents

Cover Page . . . . .	1
Table of Contents . . . . .	2
Case Narrative . . . . .	3
Chain of Custody . . . . .	4
Receipt Checklists . . . . .	6
Definitions/Glossary . . . . .	7
Method Summary . . . . .	8
Sample Summary . . . . .	9
Client Sample Results . . . . .	10
QC Sample Results . . . . .	16
QC Association Summary . . . . .	18
Tracer Carrier Summary . . . . .	19

# Case Narrative

Client: Consumers Energy  
Project/Site: JH Campbell CCR Groundwater Testing

Job ID: 160-43807-1

---

**Job ID: 160-43807-1**

---

**Laboratory: Eurofins TestAmerica, St. Louis**

---

**Narrative**

**Job Narrative  
160-43807-1**

**Receipt**

The samples were received on 10/28/2021 8:45 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved. The temperature of the cooler at receipt was 17.6° C.

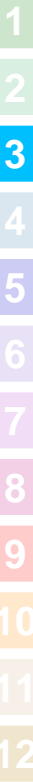
**RAD**

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

Radium-228 Prep Batch 160-535028/Radium-226 Prep Batch 160-535027

Insufficient sample volume was available to perform a sample duplicate for the following samples: JHC-MW-15023 (160-43807-1), JHC-MW-15024 (160-43807-2), JHC-MW-15025 (160-43807-3), JHC-MW-15026 (160-43807-4), JHC-MW-15027 (160-43807-5), JHC-MW-15028 (160-43807-6), DUP-01 (160-43807-7), FB-01 (160-43807-8) and EB-01 (160-43807-9). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.





Earth City, MO 63045-1205  
phone 314.298.8566 fax 314.298.8757

TestAmerica Laboratories, Inc. db/a Eurofins TestAmerica

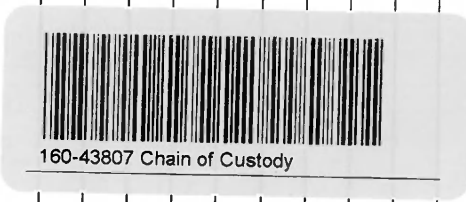
Regulatory Program:  DW  NPDES  RCRA  Other:

**Client Contact**  
Consumers Energy, Laboratory Services  
135 W. Trail Street  
Jackson, MI 49201  
517-788-5888  
(xxx) xxx-xxxx FAX  
Project Name: JH Campbell Background Wells  
Project #: 21-1276  
PO #

**Project Manager: Emil Blaj**  
Email: Emil.Blaj@cmsenergy.com  
Tel/Fax: 517-788-5888

**Analysis Turnaround Time**  
 CALENDAR DAYS  WORKING DAYS  
TAT if different from Below \_\_\_\_\_  
 2 weeks  
 1 week  
 2 days  
 1 day

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Preservative		Sample Specific Notes:
						Perform MS / MSD (Y / N)	Radium 226 (EPA 903.1)	
JHC-MW-15023	10/20/2021	1057	G	GW	2	N	X	
JHC-MW-15024	10/20/21	0928	G	GW	2	N	X	
JHC-MW-15025	10/19/21	1758	G	GW	2	N	X	
JHC-MW-15026	10/19/21	1651	G	GW	2	N	X	
JHC-MW-15027	10/19/21	1556	G	GW	2	N	X	
JHC-MW-15028	10/19/21	1436	G	GW	2	N	X	
DUP-01	--	--	G	GW	2	N	X	
FB-01	10/20/2021	0949	G	DI	2	N	X	
EB-01	10/19/2021	1823	G	DI	2	N	X	



Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other

**Possible Hazard Identification:**  
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

Special Instructions/QC Requirements & Comments:  
 Non-Hazard  Flammable  Skin Irritant  Poison B  Unknown

Return to Client  Disposal by Lab  Archive for \_\_\_\_\_ Months

Custody Seals Intact:  Yes  No

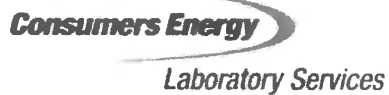
Relinquished by: *WPS*  
Relinquished by: *WPS*  
Relinquished by: *WPS*

Received by: *WPS*  
Received in Laboratory by: *WPS*

Company: *Consumers Energy*  
Company: *WPS*  
Company: *WPS*

Date/Time: 10/24/21  
Date/Time: 10/24/21  
Date/Time: 10/24/21

Therm ID No.: \_\_\_\_\_  
Date/Time: \_\_\_\_\_  
Date/Time: *OCT 20 2021 08:45*  
Date/Time: \_\_\_\_\_



135 W. Trail Street  
Jackson, MI 49201

TestAmerica Michigan  
10448 Citation Drive: Ste 200  
Brighton, MI 48116

**PROCUREMENT #: 21101165**

QA Code: NQ

(Item 1) - Part Number: N/A - Quantity : 1  
JHC CCR Rule GW Q4-2021 Samples

Groundwater Samples for Radium 226 (EPA 903.1) and Radium 228 (EPA 904.0)

Standard TAT Request.

Reference Quote #16009576-0

(Item 2) - Part Number: NA - Quantity : 1  
Please include Consumers Energy Project Number and Procurement Number on all submitted invoices

For technical questions, please contact Emil Blaj at 517-788-5888, or Emil.Blaj@cmsenergy.com.

To expedite payment please provide the Procurement number on all invoices.

Send Invoices To:

Consumers Energy Company  
Attn: Accounts Payable  
135 W Trail St.  
Jackson, MI 49201

# Login Sample Receipt Checklist

Client: Consumers Energy

Job Number: 160-43807-1

**Login Number: 43807**

**List Source: Eurofins TestAmerica, St. Louis**

**List Number: 1**

**Creator: Korrinhizer, Micha L**

Question	Answer	Comment
Radioactivity wasn't checked or is <math>\leq</math> background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <math><6\text{mm}</math> (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	



# Definitions/Glossary

Client: Consumers Energy  
Project/Site: JH Campbell CCR Groundwater Testing

Job ID: 160-43807-1

## Qualifiers

### Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

## Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

# Method Summary

Client: Consumers Energy  
Project/Site: JH Campbell CCR Groundwater Testing

Job ID: 160-43807-1

Method	Method Description	Protocol	Laboratory
903.0	Radium-226 (GFPC)	EPA	TAL SL
904.0	Radium-228 (GFPC)	EPA	TAL SL
Ra226_Ra228	Combined Radium-226 and Radium-228	TAL-STL	TAL SL
PrecSep_0	Preparation, Precipitate Separation	None	TAL SL
PrecSep-21	Preparation, Precipitate Separation (21-Day In-Growth)	None	TAL SL

#### Protocol References:

EPA = US Environmental Protection Agency

None = None

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

#### Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

# Sample Summary

Client: Consumers Energy  
Project/Site: JH Campbell CCR Groundwater Testing

Job ID: 160-43807-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-43807-1	JHC-MW-15023	Water	10/20/21 10:57	10/28/21 08:45
160-43807-2	JHC-MW-15024	Water	10/20/21 09:28	10/28/21 08:45
160-43807-3	JHC-MW-15025	Water	10/19/21 17:58	10/28/21 08:45
160-43807-4	JHC-MW-15026	Water	10/19/21 16:51	10/28/21 08:45
160-43807-5	JHC-MW-15027	Water	10/19/21 15:56	10/28/21 08:45
160-43807-6	JHC-MW-15028	Water	10/19/21 14:36	10/28/21 08:45
160-43807-7	DUP-01	Water	10/19/21 00:00	10/28/21 08:45
160-43807-8	FB-01	Water	10/20/21 09:49	10/28/21 08:45
160-43807-9	EB-01	Water	10/19/21 18:23	10/28/21 08:45



# Client Sample Results

Client: Consumers Energy  
 Project/Site: JH Campbell CCR Groundwater Testing

Job ID: 160-43807-1

**Client Sample ID: JHC-MW-15023**

**Lab Sample ID: 160-43807-1**

Date Collected: 10/20/21 10:57

Matrix: Water

Date Received: 10/28/21 08:45

**Method: 903.0 - Radium-226 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0915	U	0.0932	0.0935	1.00	0.148	pCi/L	11/04/21 08:46	11/29/21 13:31	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	97.0		40 - 110					11/04/21 08:46	11/29/21 13:31	1

**Method: 904.0 - Radium-228 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0693	U	0.233	0.233	1.00	0.407	pCi/L	11/04/21 09:20	11/23/21 12:52	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	97.0		40 - 110					11/04/21 09:20	11/23/21 12:52	1
Y Carrier	77.0		40 - 110					11/04/21 09:20	11/23/21 12:52	1

**Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.161	U	0.251	0.251	5.00	0.407	pCi/L		11/30/21 15:36	1

**Client Sample ID: JHC-MW-15024**

**Lab Sample ID: 160-43807-2**

Date Collected: 10/20/21 09:28

Matrix: Water

Date Received: 10/28/21 08:45

**Method: 903.0 - Radium-226 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0470	U	0.0826	0.0827	1.00	0.144	pCi/L	11/04/21 08:46	11/29/21 13:31	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	103		40 - 110					11/04/21 08:46	11/29/21 13:31	1

**Method: 904.0 - Radium-228 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.317	U	0.226	0.227	1.00	0.349	pCi/L	11/04/21 09:20	11/23/21 12:52	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	103		40 - 110					11/04/21 09:20	11/23/21 12:52	1
Y Carrier	79.6		40 - 110					11/04/21 09:20	11/23/21 12:52	1



# Client Sample Results

Client: Consumers Energy  
 Project/Site: JH Campbell CCR Groundwater Testing

Job ID: 160-43807-1

**Client Sample ID: JHC-MW-15024**

**Lab Sample ID: 160-43807-2**

Date Collected: 10/20/21 09:28

Matrix: Water

Date Received: 10/28/21 08:45

**Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.364		0.241	0.242	5.00	0.349	pCi/L		11/30/21 15:36	1

**Client Sample ID: JHC-MW-15025**

**Lab Sample ID: 160-43807-3**

Date Collected: 10/19/21 17:58

Matrix: Water

Date Received: 10/28/21 08:45

**Method: 903.0 - Radium-226 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.0104	U	0.0772	0.0772	1.00	0.155	pCi/L	11/04/21 08:46	11/29/21 13:32	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Ba Carrier	100		40 - 110					11/04/21 08:46	11/29/21 13:32	1

**Method: 904.0 - Radium-228 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.131	U	0.255	0.255	1.00	0.434	pCi/L	11/04/21 09:20	11/23/21 12:52	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Ba Carrier	100		40 - 110					11/04/21 09:20	11/23/21 12:52	1
Y Carrier	76.6		40 - 110					11/04/21 09:20	11/23/21 12:52	1

**Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.121	U	0.266	0.266	5.00	0.434	pCi/L		11/30/21 15:36	1

**Client Sample ID: JHC-MW-15026**

**Lab Sample ID: 160-43807-4**

Date Collected: 10/19/21 16:51

Matrix: Water

Date Received: 10/28/21 08:45

**Method: 903.0 - Radium-226 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.124	U	0.101	0.102	1.00	0.154	pCi/L	11/04/21 08:46	11/29/21 13:32	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Ba Carrier	102		40 - 110					11/04/21 08:46	11/29/21 13:32	1

# Client Sample Results

Client: Consumers Energy  
 Project/Site: JH Campbell CCR Groundwater Testing

Job ID: 160-43807-1

**Client Sample ID: JHC-MW-15026**

**Lab Sample ID: 160-43807-4**

Date Collected: 10/19/21 16:51

Matrix: Water

Date Received: 10/28/21 08:45

**Method: 904.0 - Radium-228 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.449		0.279	0.282	1.00	0.428	pCi/L	11/04/21 09:20	11/23/21 12:52	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Ba Carrier	102		40 - 110					11/04/21 09:20	11/23/21 12:52	1
Y Carrier	78.5		40 - 110					11/04/21 09:20	11/23/21 12:52	1

**Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.573		0.297	0.300	5.00	0.428	pCi/L		11/30/21 15:36	1

**Client Sample ID: JHC-MW-15027**

**Lab Sample ID: 160-43807-5**

Date Collected: 10/19/21 15:56

Matrix: Water

Date Received: 10/28/21 08:45

**Method: 903.0 - Radium-226 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0186	U	0.0695	0.0695	1.00	0.131	pCi/L	11/04/21 08:46	11/29/21 13:32	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Ba Carrier	98.5		40 - 110					11/04/21 08:46	11/29/21 13:32	1

**Method: 904.0 - Radium-228 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.344	U	0.245	0.247	1.00	0.380	pCi/L	11/04/21 09:20	11/23/21 12:53	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Ba Carrier	98.5		40 - 110					11/04/21 09:20	11/23/21 12:53	1
Y Carrier	78.9		40 - 110					11/04/21 09:20	11/23/21 12:53	1

**Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.363	U	0.255	0.257	5.00	0.380	pCi/L		11/30/21 15:36	1

# Client Sample Results

Client: Consumers Energy  
Project/Site: JH Campbell CCR Groundwater Testing

Job ID: 160-43807-1

**Client Sample ID: JHC-MW-15028**

**Lab Sample ID: 160-43807-6**

Date Collected: 10/19/21 14:36

Matrix: Water

Date Received: 10/28/21 08:45

**Method: 903.0 - Radium-226 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0894	U	0.0826	0.0829	1.00	0.127	pCi/L	11/04/21 08:46	11/29/21 13:32	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	98.0		40 - 110					11/04/21 08:46	11/29/21 13:32	1

**Method: 904.0 - Radium-228 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.188	U	0.237	0.237	1.00	0.393	pCi/L	11/04/21 09:20	11/23/21 12:53	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	98.0		40 - 110					11/04/21 09:20	11/23/21 12:53	1
Y Carrier	79.3		40 - 110					11/04/21 09:20	11/23/21 12:53	1

**Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.278	U	0.251	0.251	5.00	0.393	pCi/L		11/30/21 15:36	1

**Client Sample ID: DUP-01**

**Lab Sample ID: 160-43807-7**

Date Collected: 10/19/21 00:00

Matrix: Water

Date Received: 10/28/21 08:45

**Method: 903.0 - Radium-226 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.000	U	0.0666	0.0666	1.00	0.133	pCi/L	11/04/21 08:46	11/29/21 13:32	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	99.5		40 - 110					11/04/21 08:46	11/29/21 13:32	1

**Method: 904.0 - Radium-228 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0672	U	0.304	0.304	1.00	0.526	pCi/L	11/04/21 09:20	11/23/21 12:53	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	99.5		40 - 110					11/04/21 09:20	11/23/21 12:53	1
Y Carrier	78.1		40 - 110					11/04/21 09:20	11/23/21 12:53	1

# Client Sample Results

Client: Consumers Energy  
 Project/Site: JH Campbell CCR Groundwater Testing

Job ID: 160-43807-1

**Client Sample ID: DUP-01**  
**Date Collected: 10/19/21 00:00**  
**Date Received: 10/28/21 08:45**

**Lab Sample ID: 160-43807-7**  
**Matrix: Water**

**Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.0672	U	0.311	0.311	5.00	0.526	pCi/L		11/30/21 15:36	1

**Client Sample ID: FB-01**  
**Date Collected: 10/20/21 09:49**  
**Date Received: 10/28/21 08:45**

**Lab Sample ID: 160-43807-8**  
**Matrix: Water**

**Method: 903.0 - Radium-226 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.00317	U	0.0664	0.0664	1.00	0.132	pCi/L	11/04/21 08:46	11/29/21 13:32	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Ba Carrier	101		40 - 110					11/04/21 08:46	11/29/21 13:32	1

**Method: 904.0 - Radium-228 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.0774	U	0.277	0.277	1.00	0.502	pCi/L	11/04/21 09:20	11/23/21 12:56	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Ba Carrier	101		40 - 110					11/04/21 09:20	11/23/21 12:56	1
Y Carrier	72.9		40 - 110					11/04/21 09:20	11/23/21 12:56	1

**Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	-0.0742	U	0.285	0.285	5.00	0.502	pCi/L		11/30/21 15:36	1

**Client Sample ID: EB-01**  
**Date Collected: 10/19/21 18:23**  
**Date Received: 10/28/21 08:45**

**Lab Sample ID: 160-43807-9**  
**Matrix: Water**

**Method: 903.0 - Radium-226 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.0212	U	0.0642	0.0642	1.00	0.137	pCi/L	11/04/21 08:46	11/29/21 13:32	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Ba Carrier	98.0		40 - 110					11/04/21 08:46	11/29/21 13:32	1

# Client Sample Results

Client: Consumers Energy  
 Project/Site: JH Campbell CCR Groundwater Testing

Job ID: 160-43807-1

**Client Sample ID: EB-01**

**Lab Sample ID: 160-43807-9**

Date Collected: 10/19/21 18:23

Matrix: Water

Date Received: 10/28/21 08:45

**Method: 904.0 - Radium-228 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0947	U	0.256	0.256	1.00	0.441	pCi/L	11/04/21 09:20	11/23/21 12:57	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	98.0		40 - 110					11/04/21 09:20	11/23/21 12:57	1
Y Carrier	80.7		40 - 110					11/04/21 09:20	11/23/21 12:57	1

**Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.0735	U	0.264	0.264	5.00	0.441	pCi/L		11/30/21 15:36	1



# QC Sample Results

Client: Consumers Energy  
 Project/Site: JH Campbell CCR Groundwater Testing

Job ID: 160-43807-1

## Method: 903.0 - Radium-226 (GFPC)

**Lab Sample ID: MB 160-535027/23-A**  
**Matrix: Water**  
**Analysis Batch: 539049**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 535027**

Analyte	MB		Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-226	0.02492	U	0.0710	0.0710	1.00	0.131	pCi/L	11/04/21 08:46	11/29/21 13:39	1
Carrier	MB %Yield	MB Qualifier	Limits				Prepared	Analyzed	Dil Fac	
Ba Carrier	96.8		40 - 110				11/04/21 08:46	11/29/21 13:39	1	

**Lab Sample ID: LCS 160-535027/1-A**  
**Matrix: Water**  
**Analysis Batch: 539046**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 535027**

Analyte	Spike Added	LCS Result	LCS Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Radium-226	11.3	10.20		1.09	1.00	0.146	pCi/L	90	75 - 125
Carrier	LCS %Yield	LCS Qualifier	Limits						
Ba Carrier	95.0		40 - 110						

**Lab Sample ID: LCSD 160-535027/2-A**  
**Matrix: Water**  
**Analysis Batch: 539046**

**Client Sample ID: Lab Control Sample Dup**  
**Prep Type: Total/NA**  
**Prep Batch: 535027**

Analyte	Spike Added	LCSD Result	LCSD Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER
				Uncert. (2σ+/-)							Limit
Radium-226	11.3	9.657		1.04	1.00	0.160	pCi/L	85	75 - 125	0.25	1
Carrier	LCSD %Yield	LCSD Qualifier	Limits								
Ba Carrier	92.0		40 - 110								

## Method: 904.0 - Radium-228 (GFPC)

**Lab Sample ID: MB 160-535028/23-A**  
**Matrix: Water**  
**Analysis Batch: 538233**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 535028**

Analyte	MB		Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-228	0.09522	U	0.195	0.195	1.00	0.336	pCi/L	11/04/21 09:20	11/23/21 13:02	1
Carrier	MB %Yield	MB Qualifier	Limits				Prepared	Analyzed	Dil Fac	
Ba Carrier	96.8		40 - 110				11/04/21 09:20	11/23/21 13:02	1	
Y Carrier	84.5		40 - 110				11/04/21 09:20	11/23/21 13:02	1	

# QC Sample Results

Client: Consumers Energy  
 Project/Site: JH Campbell CCR Groundwater Testing

Job ID: 160-43807-1

## Method: 904.0 - Radium-228 (GFPC) (Continued)

**Lab Sample ID: LCS 160-535028/1-A**  
**Matrix: Water**  
**Analysis Batch: 538216**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 535028**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	
									75	125
Radium-228	9.12	9.646		1.14	1.00	0.428	pCi/L	106	75	125
<b>LCS LCS</b>										
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>							
Ba Carrier	95.0		40 - 110							
Y Carrier	79.3		40 - 110							

**Lab Sample ID: LCSD 160-535028/2-A**  
**Matrix: Water**  
**Analysis Batch: 538216**

**Client Sample ID: Lab Control Sample Dup**  
**Prep Type: Total/NA**  
**Prep Batch: 535028**

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		RER	Limit
									75	125	0.78	1
Radium-228	9.12	7.977		0.997	1.00	0.440	pCi/L	87	75	125	0.78	1
<b>LCSD LCSD</b>												
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>									
Ba Carrier	92.0		40 - 110									
Y Carrier	79.6		40 - 110									



# QC Association Summary

Client: Consumers Energy  
 Project/Site: JH Campbell CCR Groundwater Testing

Job ID: 160-43807-1

## Rad

### Prep Batch: 535027

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-43807-1	JHC-MW-15023	Total/NA	Water	PrecSep-21	
160-43807-2	JHC-MW-15024	Total/NA	Water	PrecSep-21	
160-43807-3	JHC-MW-15025	Total/NA	Water	PrecSep-21	
160-43807-4	JHC-MW-15026	Total/NA	Water	PrecSep-21	
160-43807-5	JHC-MW-15027	Total/NA	Water	PrecSep-21	
160-43807-6	JHC-MW-15028	Total/NA	Water	PrecSep-21	
160-43807-7	DUP-01	Total/NA	Water	PrecSep-21	
160-43807-8	FB-01	Total/NA	Water	PrecSep-21	
160-43807-9	EB-01	Total/NA	Water	PrecSep-21	
MB 160-535027/23-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-535027/1-A	Lab Control Sample	Total/NA	Water	PrecSep-21	
LCSD 160-535027/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep-21	

### Prep Batch: 535028

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-43807-1	JHC-MW-15023	Total/NA	Water	PrecSep_0	
160-43807-2	JHC-MW-15024	Total/NA	Water	PrecSep_0	
160-43807-3	JHC-MW-15025	Total/NA	Water	PrecSep_0	
160-43807-4	JHC-MW-15026	Total/NA	Water	PrecSep_0	
160-43807-5	JHC-MW-15027	Total/NA	Water	PrecSep_0	
160-43807-6	JHC-MW-15028	Total/NA	Water	PrecSep_0	
160-43807-7	DUP-01	Total/NA	Water	PrecSep_0	
160-43807-8	FB-01	Total/NA	Water	PrecSep_0	
160-43807-9	EB-01	Total/NA	Water	PrecSep_0	
MB 160-535028/23-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-535028/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-535028/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

# Tracer/Carrier Summary

Client: Consumers Energy  
 Project/Site: JH Campbell CCR Groundwater Testing

Job ID: 160-43807-1

## Method: 903.0 - Radium-226 (GFPC)

Matrix: Water

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Ba (40-110)	
160-43807-1	JHC-MW-15023	97.0	
160-43807-2	JHC-MW-15024	103	
160-43807-3	JHC-MW-15025	100	
160-43807-4	JHC-MW-15026	102	
160-43807-5	JHC-MW-15027	98.5	
160-43807-6	JHC-MW-15028	98.0	
160-43807-7	DUP-01	99.5	
160-43807-8	FB-01	101	
160-43807-9	EB-01	98.0	
LCS 160-535027/1-A	Lab Control Sample	95.0	
LCSD 160-535027/2-A	Lab Control Sample Dup	92.0	
MB 160-535027/23-A	Method Blank	96.8	
<b>Tracer/Carrier Legend</b>			
Ba = Ba Carrier			

## Method: 904.0 - Radium-228 (GFPC)

Matrix: Water

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Ba (40-110)	Y (40-110)
160-43807-1	JHC-MW-15023	97.0	77.0
160-43807-2	JHC-MW-15024	103	79.6
160-43807-3	JHC-MW-15025	100	76.6
160-43807-4	JHC-MW-15026	102	78.5
160-43807-5	JHC-MW-15027	98.5	78.9
160-43807-6	JHC-MW-15028	98.0	79.3
160-43807-7	DUP-01	99.5	78.1
160-43807-8	FB-01	101	72.9
160-43807-9	EB-01	98.0	80.7
LCS 160-535028/1-A	Lab Control Sample	95.0	79.3
LCSD 160-535028/2-A	Lab Control Sample Dup	92.0	79.6
MB 160-535028/23-A	Method Blank	96.8	84.5
<b>Tracer/Carrier Legend</b>			
Ba = Ba Carrier			
Y = Y Carrier			

To: CDBatts, JH Campbell Complex

From: EBlaj, T-258

Date: November 08, 2021

Subject: JH CAMPBELL SOLID WASTE DISPOSAL AREA – GROUNDWATER MONITORING  
4<sup>th</sup> Quarter, 2021 – Pond A Wells

CC: BLSwanberg, P22-119  
HDRegister, P22-521

Sarah Holmstrom, Project Manager  
TRC Companies, Inc.  
1540 Eisenhower Place  
Ann Arbor, MI 48108

---

**Chemistry Project: 21-1280R**

CE Laboratory Services conducted groundwater monitoring on 10/19/2021 through 10/22/2021 at the JH Campbell Solid Waste Disposal Area, for the 4<sup>th</sup> Quarter monitoring requirements. The samples were received for analysis by the Chemistry department on 10/22/2021.

Samples for Radium analysis have been subcontracted to Eurofins/TestAmerica, Inc. and their results are being reported separately. Please note that the subcontracted work is not reported under the CE laboratory scope of accreditation.

With the exception noted above, the report that follows presents the results of the requested analytical testing; the results apply only to the samples, as received. All samples have been analyzed in accordance with the 2016 TNI Standard and the applicable A2LA accreditation scope for Laboratory Services. Any exceptions to applicable test method criteria and standard compliance are noted in the Case Narrative, or flagged with applicable qualifiers in the analytical results section.

Reviewed and approved by:

Emil Blaj  
Sr. Technical Analyst  
Project Lead



*Testing performed in accordance with the A2LA scope of accreditation specified in the listed certificate. The information contained in this report is the sole property of Consumers Energy. It cannot be reproduced except in full, and with consent from Consumers Energy, or the customer for which this report was issued.*

## CASE NARRATIVE

### I. Sample Receipt

All samples were received within hold time and in good conditions; no anomalies were noted on the Sample Log-In Shipment Inspection Form during sample check-in. Identification of all samples included in the work order/project is provided in the sample summary section. Sample preservation upon receipt was verified by the sample custodian and confirmed to meet method requirements.

### II. Methodology

Unless otherwise indicated, sample preparation and analysis was performed in accordance with the corresponding test methods from “Methods for the Determination of Inorganic Substances in Environmental Samples (EPA/600/R-93/100); SW-846, “Test Methods for Evaluating Solid Waste – Physical/Chemical Methods”, USEPA (latest revisions), and Standard Methods for the Examination of Water and Wastewater, APHA-AWWA-WPCF, 22<sup>nd</sup> Edition, 2012.

### III. Results/Quality Control

Analytical results for this report are presented by laboratory sample ID, container & aliquot number. Results for the field blanks, field duplicates, and percent recoveries of the field matrix spike & matrix spike duplicate samples are included in the results section. Unless specifically noted in the case narrative, all method quality control requirements have been met. If any results are qualified, the corresponding data flags/qualifiers are listed on the last page of the results section. Any additional information on method performance, when applicable, is presented in this section of the case narrative. When data flags are not needed, the qualifiers text box on the last page is left blank, and a statement confirms that no exceptions occurred.

## DEFINITIONS / QUALIFIERS

The following qualifiers and/or acronyms are used in the report where applicable:

<u>Acronym</u>	<u>Description</u>
RL	Reporting Limit
ND	Result not detected or below Reporting Limit
NT	Not a TNI Analyte
LCS	Laboratory Control Sample
LRB	Laboratory Reagent Blank (also referred to as Method Blank)
DUP	Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
TDL	Target Detection Limit
SM	Standard Methods Compendium

<u>Qualifier</u>	<u>Description</u>
*	Generic data flag, applicable description added in the corresponding notes section
B	The analyte was detected in the LRB at a level which is significant relative to sample result

D	Reporting limit elevated due to dilution
E	Estimated due to result exceeding the linear range of the analyzer
H	The maximum recommended hold time was exceeded
I	Dilution required due to matrix interference; reporting limit elevated
J	Estimated due to result found above MDL but below PQL (or RL)
K	Reporting limit raised due to matrix interference
M	The precision for duplicate analysis was not met; RPD outside acceptance criteria
N	Non-homogeneous sample made analysis questionable
PI	Possible interference may have affected the accuracy of the laboratory result
Q	Matrix Spike or Matrix Spike Duplicate recovery outside acceptance criteria
R	Result confirmed by new sample preparation and reanalysis
X	Other notation required; comment listed in sample notes and/or case narrative

**Customer Name:** JH Campbell Complex  
**Work Order ID:** Q4-2021 Pond A Wells  
**Date Received:** 10/22/2021  
**Chemistry Project:** 21-1280

<u>Sample #</u>	<u>Field Sample ID</u>	<u>Matrix</u>	<u>Sample Date</u>	<u>Site</u>
21-1280-01	JHC-MW-15006	Groundwater	10/21/2021 01:49 PM	JHC RCRA GW Monitoring - Pond A Unit
21-1280-02	JHC-MW-15007R	Groundwater	10/21/2021 11:38 AM	JHC RCRA GW Monitoring - Pond A Unit
21-1280-03	JHC-MW-15008R	Groundwater	10/21/2021 04:01 PM	JHC RCRA GW Monitoring - Pond A Unit
21-1280-04	JHC-MW-15009R	Groundwater	10/21/2021 05:11 PM	JHC RCRA GW Monitoring - Pond A Unit
21-1280-05	JHC-MW-15011R	Groundwater	10/21/2021 03:42 PM	JHC RCRA GW Monitoring - Pond A Unit
21-1280-06	DUP-05	Groundwater	10/21/2021 12:00 AM	JHC RCRA GW Monitoring - Pond A Unit
21-1280-07	JHC-MW-15008R Field MS	Groundwater	10/21/2021 04:01 PM	JHC RCRA GW Monitoring - Pond A Unit
21-1280-08	JHC-MW-15008R Field MSD	Groundwater	10/21/2021 04:01 PM	JHC RCRA GW Monitoring - Pond A Unit

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**  
 Field Sample ID: **JHC-MW-15006**  
 Lab Sample ID: 21-1280-01  
 Matrix: Groundwater

Laboratory Project: **21-1280**  
 Collect Date: 10/21/2021  
 Collect Time: 01:49 PM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1280-01-C01-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/28/2021	AB21-1028-03

### Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 21-1280-01-C01-A02 Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Arsenic	6		ug/L	1.0	11/04/2021	AB21-1103-10
Barium	211		ug/L	5.0	11/04/2021	AB21-1103-10
Beryllium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Boron	371		ug/L	20.0	11/03/2021	AB21-1103-10
Cadmium	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Calcium	84500		ug/L	1000.0	11/03/2021	AB21-1103-10
Chromium	2		ug/L	1.0	11/04/2021	AB21-1103-10
Cobalt	ND		ug/L	6.0	11/04/2021	AB21-1103-10
Copper	3		ug/L	1.0	11/04/2021	AB21-1103-10
Iron	185		ug/L	20.0	11/03/2021	AB21-1103-10
Lead	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Lithium	13		ug/L	10.0	11/04/2021	AB21-1103-10
Magnesium	21400		ug/L	1000.0	11/03/2021	AB21-1103-10
Molybdenum	48		ug/L	5.0	11/04/2021	AB21-1103-10
Nickel	5		ug/L	2.0	11/04/2021	AB21-1103-10
Potassium	5760		ug/L	100.0	11/03/2021	AB21-1103-10
Selenium	1		ug/L	1.0	11/04/2021	AB21-1103-10
Silver	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Sodium	29800		ug/L	1000.0	11/03/2021	AB21-1103-10
Thallium	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Vanadium	12		ug/L	2.0	11/04/2021	AB21-1103-10
Zinc	53		ug/L	10.0	11/04/2021	AB21-1103-10

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot #: 21-1280-01-C02-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	19600		ug/L	1000.0	10/28/2021	AB21-1029-01
Fluoride	ND		ug/L	1000.0	10/28/2021	AB21-1029-01
Sulfate	217000		ug/L	1000.0	11/01/2021	AB21-1029-01

### Total Dissolved Solids by SM 2540C

Aliquot #: 21-1280-01-C03-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	485		mg/L	10.0	10/27/2021	AB21-1027-07



# Analytical Report

Report Date: 11/08/21

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**  
Field Sample ID: **JHC-MW-15006**  
Lab Sample ID: 21-1280-01  
Matrix: Groundwater

Laboratory Project: **21-1280**  
Collect Date: 10/21/2021  
Collect Time: 01:49 PM

### Alkalinity by SM 2320B

Aliquot #: 21-1280-01-C04-A01

Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	131000		ug/L	10000.0	11/02/2021	AB21-1102-11
Alkalinity Bicarbonate	131000		ug/L	10000.0	11/02/2021	AB21-1102-11
Alkalinity Carbonate	ND		ug/L	10000.0	11/02/2021	AB21-1102-11



## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**  
 Field Sample ID: **JHC-MW-15007R**  
 Lab Sample ID: 21-1280-02  
 Matrix: Groundwater

Laboratory Project: **21-1280**  
 Collect Date: 10/21/2021  
 Collect Time: 11:38 AM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1280-02-C01-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/28/2021	AB21-1028-03

### Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 21-1280-02-C01-A02 Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Arsenic	7		ug/L	1.0	11/04/2021	AB21-1103-10
Barium	219		ug/L	5.0	11/04/2021	AB21-1103-10
Beryllium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Boron	956		ug/L	20.0	11/03/2021	AB21-1103-10
Cadmium	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Calcium	68500		ug/L	1000.0	11/03/2021	AB21-1103-10
Chromium	1		ug/L	1.0	11/04/2021	AB21-1103-10
Cobalt	ND		ug/L	6.0	11/04/2021	AB21-1103-10
Copper	4		ug/L	1.0	11/04/2021	AB21-1103-10
Iron	151		ug/L	20.0	11/03/2021	AB21-1103-10
Lead	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Lithium	13		ug/L	10.0	11/04/2021	AB21-1103-10
Magnesium	30400		ug/L	1000.0	11/03/2021	AB21-1103-10
Molybdenum	16		ug/L	5.0	11/04/2021	AB21-1103-10
Nickel	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Potassium	3640		ug/L	100.0	11/03/2021	AB21-1103-10
Selenium	4		ug/L	1.0	11/04/2021	AB21-1103-10
Silver	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Sodium	15500		ug/L	1000.0	11/03/2021	AB21-1103-10
Thallium	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Vanadium	8		ug/L	2.0	11/04/2021	AB21-1103-10
Zinc	21		ug/L	10.0	11/04/2021	AB21-1103-10

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot #: 21-1280-02-C02-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	13900		ug/L	1000.0	10/28/2021	AB21-1029-01
Fluoride	ND		ug/L	1000.0	10/28/2021	AB21-1029-01
Sulfate	101000		ug/L	1000.0	10/28/2021	AB21-1029-01

### Total Dissolved Solids by SM 2540C

Aliquot #: 21-1280-02-C03-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	418		mg/L	10.0	10/27/2021	AB21-1027-07



# Analytical Report

Report Date: 11/08/21

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**  
Field Sample ID: **JHC-MW-15007R**  
Lab Sample ID: 21-1280-02  
Matrix: Groundwater

Laboratory Project: **21-1280**  
Collect Date: 10/21/2021  
Collect Time: 11:38 AM

### Alkalinity by SM 2320B

Aliquot #: 21-1280-02-C04-A01

Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	228000		ug/L	10000.0	11/02/2021	AB21-1102-11
Alkalinity Bicarbonate	228000		ug/L	10000.0	11/02/2021	AB21-1102-11
Alkalinity Carbonate	ND		ug/L	10000.0	11/02/2021	AB21-1102-11

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**  
 Field Sample ID: **JHC-MW-15008R**  
 Lab Sample ID: 21-1280-03  
 Matrix: Groundwater

Laboratory Project: **21-1280**  
 Collect Date: 10/21/2021  
 Collect Time: 04:01 PM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1280-03-C01-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/28/2021	AB21-1028-03

### Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 21-1280-03-C01-A02 Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	1		ug/L	1.0	11/04/2021	AB21-1103-10
Arsenic	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Barium	167		ug/L	5.0	11/04/2021	AB21-1103-10
Beryllium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Boron	786		ug/L	20.0	11/03/2021	AB21-1103-10
Cadmium	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Calcium	77200		ug/L	1000.0	11/03/2021	AB21-1103-10
Chromium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Cobalt	ND		ug/L	6.0	11/04/2021	AB21-1103-10
Copper	1		ug/L	1.0	11/04/2021	AB21-1103-10
Iron	150		ug/L	20.0	11/03/2021	AB21-1103-10
Lead	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Lithium	19		ug/L	10.0	11/04/2021	AB21-1103-10
Magnesium	28700		ug/L	1000.0	11/03/2021	AB21-1103-10
Molybdenum	26		ug/L	5.0	11/04/2021	AB21-1103-10
Nickel	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Potassium	2320		ug/L	100.0	11/03/2021	AB21-1103-10
Selenium	20		ug/L	1.0	11/04/2021	AB21-1103-10
Silver	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Sodium	19000		ug/L	1000.0	11/03/2021	AB21-1103-10
Thallium	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Vanadium	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Zinc	ND		ug/L	10.0	11/04/2021	AB21-1103-10

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot #: 21-1280-03-C02-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	15700		ug/L	1000.0	10/28/2021	AB21-1029-01
Fluoride	ND		ug/L	1000.0	10/28/2021	AB21-1029-01
Sulfate	112000		ug/L	1000.0	10/28/2021	AB21-1029-01

### Total Dissolved Solids by SM 2540C

Aliquot #: 21-1280-03-C03-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	443		mg/L	10.0	10/27/2021	AB21-1027-07



# Analytical Report

Report Date: 11/08/21

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**  
Field Sample ID: **JHC-MW-15008R**  
Lab Sample ID: 21-1280-03  
Matrix: Groundwater

Laboratory Project: **21-1280**  
Collect Date: 10/21/2021  
Collect Time: 04:01 PM

### Alkalinity by SM 2320B

Aliquot #: 21-1280-03-C04-A01

Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	245000		ug/L	10000.0	11/02/2021	AB21-1102-11
Alkalinity Bicarbonate	245000		ug/L	10000.0	11/02/2021	AB21-1102-11
Alkalinity Carbonate	ND		ug/L	10000.0	11/02/2021	AB21-1102-11

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**  
 Field Sample ID: **JHC-MW-15009R**  
 Lab Sample ID: 21-1280-04  
 Matrix: Groundwater

Laboratory Project: **21-1280**  
 Collect Date: 10/21/2021  
 Collect Time: 05:11 PM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1280-04-C01-A01

Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/28/2021	AB21-1028-03

### Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 21-1280-04-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Arsenic	1		ug/L	1.0	11/04/2021	AB21-1103-10
Barium	286		ug/L	5.0	11/04/2021	AB21-1103-10
Beryllium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Boron	1680		ug/L	20.0	11/03/2021	AB21-1103-10
Cadmium	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Calcium	58700		ug/L	1000.0	11/03/2021	AB21-1103-10
Chromium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Cobalt	ND		ug/L	6.0	11/04/2021	AB21-1103-10
Copper	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Iron	1090		ug/L	20.0	11/03/2021	AB21-1103-10
Lead	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Lithium	15		ug/L	10.0	11/04/2021	AB21-1103-10
Magnesium	14700		ug/L	1000.0	11/03/2021	AB21-1103-10
Molybdenum	5		ug/L	5.0	11/04/2021	AB21-1103-10
Nickel	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Potassium	2940		ug/L	100.0	11/03/2021	AB21-1103-10
Selenium	62		ug/L	1.0	11/04/2021	AB21-1103-10
Silver	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Sodium	10900		ug/L	1000.0	11/03/2021	AB21-1103-10
Thallium	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Vanadium	3		ug/L	2.0	11/04/2021	AB21-1103-10
Zinc	ND		ug/L	10.0	11/04/2021	AB21-1103-10

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot #: 21-1280-04-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	12100		ug/L	1000.0	10/28/2021	AB21-1029-01
Fluoride	ND		ug/L	1000.0	10/28/2021	AB21-1029-01
Sulfate	25700		ug/L	1000.0	10/28/2021	AB21-1029-01

### Total Dissolved Solids by SM 2540C

Aliquot #: 21-1280-04-C03-A01

Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	301		mg/L	10.0	10/27/2021	AB21-1027-07



# Analytical Report

Report Date: 11/08/21

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**  
Field Sample ID: **JHC-MW-15009R**  
Lab Sample ID: 21-1280-04  
Matrix: Groundwater

Laboratory Project: **21-1280**  
Collect Date: 10/21/2021  
Collect Time: 05:11 PM

### Alkalinity by SM 2320B

Aliquot #: 21-1280-04-C04-A01

Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	214000		ug/L	10000.0	11/02/2021	AB21-1102-11
Alkalinity Bicarbonate	214000		ug/L	10000.0	11/02/2021	AB21-1102-11
Alkalinity Carbonate	ND		ug/L	10000.0	11/02/2021	AB21-1102-11

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**  
 Field Sample ID: **JHC-MW-15011R**  
 Lab Sample ID: 21-1280-05  
 Matrix: Groundwater

Laboratory Project: **21-1280**  
 Collect Date: 10/21/2021  
 Collect Time: 03:42 PM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1280-05-C01-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/28/2021	AB21-1028-03

### Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 21-1280-05-C01-A02 Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Arsenic	3		ug/L	1.0	11/04/2021	AB21-1103-10
Barium	131		ug/L	5.0	11/04/2021	AB21-1103-10
Beryllium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Boron	2150		ug/L	20.0	11/03/2021	AB21-1103-10
Cadmium	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Calcium	51000		ug/L	1000.0	11/03/2021	AB21-1103-10
Chromium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Cobalt	ND		ug/L	6.0	11/04/2021	AB21-1103-10
Copper	1		ug/L	1.0	11/04/2021	AB21-1103-10
Iron	264		ug/L	20.0	11/03/2021	AB21-1103-10
Lead	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Lithium	ND		ug/L	10.0	11/04/2021	AB21-1103-10
Magnesium	18000		ug/L	1000.0	11/03/2021	AB21-1103-10
Molybdenum	13		ug/L	5.0	11/04/2021	AB21-1103-10
Nickel	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Potassium	3420		ug/L	100.0	11/03/2021	AB21-1103-10
Selenium	4		ug/L	1.0	11/04/2021	AB21-1103-10
Silver	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Sodium	10600		ug/L	1000.0	11/03/2021	AB21-1103-10
Thallium	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Vanadium	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Zinc	ND		ug/L	10.0	11/04/2021	AB21-1103-10

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot #: 21-1280-05-C02-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	13500		ug/L	1000.0	10/28/2021	AB21-1029-01
Fluoride	ND		ug/L	1000.0	10/28/2021	AB21-1029-01
Sulfate	45000		ug/L	1000.0	10/28/2021	AB21-1029-01

### Total Dissolved Solids by SM 2540C

Aliquot #: 21-1280-05-C03-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	195		mg/L	10.0	10/27/2021	AB21-1027-07



# Analytical Report

Report Date: 11/08/21

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**  
Field Sample ID: **JHC-MW-15011R**  
Lab Sample ID: 21-1280-05  
Matrix: Groundwater

Laboratory Project: **21-1280**  
Collect Date: 10/21/2021  
Collect Time: 03:42 PM

### Alkalinity by SM 2320B

Aliquot #: 21-1280-05-C04-A01

Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	172000		ug/L	10000.0	11/02/2021	AB21-1102-11
Alkalinity Bicarbonate	172000		ug/L	10000.0	11/02/2021	AB21-1102-11
Alkalinity Carbonate	ND		ug/L	10000.0	11/02/2021	AB21-1102-11



## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**  
 Field Sample ID: **DUP-05**  
 Lab Sample ID: 21-1280-06  
 Matrix: Groundwater

Laboratory Project: **21-1280**  
 Collect Date: 10/21/2021  
 Collect Time: 12:00 AM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1280-06-C01-A01

Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/28/2021	AB21-1028-03

### Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 21-1280-06-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Arsenic	7		ug/L	1.0	11/04/2021	AB21-1103-10
Barium	224		ug/L	5.0	11/04/2021	AB21-1103-10
Beryllium	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Boron	1000		ug/L	20.0	11/03/2021	AB21-1103-10
Cadmium	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Calcium	72600		ug/L	1000.0	11/03/2021	AB21-1103-10
Chromium	2		ug/L	1.0	11/04/2021	AB21-1103-10
Cobalt	ND		ug/L	6.0	11/04/2021	AB21-1103-10
Copper	4		ug/L	1.0	11/04/2021	AB21-1103-10
Iron	165		ug/L	20.0	11/03/2021	AB21-1103-10
Lead	ND		ug/L	1.0	11/04/2021	AB21-1103-10
Lithium	13		ug/L	10.0	11/04/2021	AB21-1103-10
Magnesium	31700		ug/L	1000.0	11/03/2021	AB21-1103-10
Molybdenum	16		ug/L	5.0	11/04/2021	AB21-1103-10
Nickel	2		ug/L	2.0	11/04/2021	AB21-1103-10
Potassium	3580		ug/L	100.0	11/03/2021	AB21-1103-10
Selenium	4		ug/L	1.0	11/04/2021	AB21-1103-10
Silver	ND		ug/L	0.2	11/04/2021	AB21-1103-10
Sodium	16400		ug/L	1000.0	11/03/2021	AB21-1103-10
Thallium	ND		ug/L	2.0	11/04/2021	AB21-1103-10
Vanadium	8		ug/L	2.0	11/04/2021	AB21-1103-10
Zinc	20		ug/L	10.0	11/04/2021	AB21-1103-10

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot #: 21-1280-06-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	14200		ug/L	1000.0	10/28/2021	AB21-1029-01
Fluoride	ND		ug/L	1000.0	10/28/2021	AB21-1029-01
Sulfate	104000		ug/L	1000.0	10/28/2021	AB21-1029-01

### Total Dissolved Solids by SM 2540C

Aliquot #: 21-1280-06-C03-A01

Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	419		mg/L	10.0	10/27/2021	AB21-1027-07



# Analytical Report

Report Date: 11/08/21

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**  
Field Sample ID: **DUP-05**  
Lab Sample ID: 21-1280-06  
Matrix: Groundwater

Laboratory Project: **21-1280**  
Collect Date: 10/21/2021  
Collect Time: 12:00 AM

### Alkalinity by SM 2320B

Aliquot #: 21-1280-06-C04-A01

Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	228000		ug/L	10000.0	11/02/2021	AB21-1102-11
Alkalinity Bicarbonate	228000		ug/L	10000.0	11/02/2021	AB21-1102-11
Alkalinity Carbonate	ND		ug/L	10000.0	11/02/2021	AB21-1102-11

**Laboratory Services**  
A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**  
 Field Sample ID: **JHC-MW-15008R Field MS**  
 Lab Sample ID: 21-1280-07  
 Matrix: Groundwater

Laboratory Project: **21-1280**  
 Collect Date: 10/21/2021  
 Collect Time: 04:01 PM

**Mercury by EPA 7470A, Total, Aqueous**

Aliquot #: 21-1280-07-C01-A01

Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	93.8		%	0.2	10/28/2021	AB21-1028-03

**Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp**

Aliquot #: 21-1280-07-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	111		%	1.0	11/04/2021	AB21-1103-10
Arsenic	95		%	1.0	11/04/2021	AB21-1103-10
Barium	110		%	5.0	11/04/2021	AB21-1103-10
Beryllium	110		%	1.0	11/04/2021	AB21-1103-10
Boron	106		%	20.0	11/03/2021	AB21-1103-10
Cadmium	108		%	0.2	11/04/2021	AB21-1103-10
Calcium	107		%	1000.0	11/03/2021	AB21-1103-10
Chromium	94		%	1.0	11/04/2021	AB21-1103-10
Cobalt	94		%	6.0	11/04/2021	AB21-1103-10
Copper	89		%	1.0	11/04/2021	AB21-1103-10
Iron	99		%	20.0	11/03/2021	AB21-1103-10
Lead	96		%	1.0	11/04/2021	AB21-1103-10
Lithium	99		%	10.0	11/04/2021	AB21-1103-10
Magnesium	113		%	1000.0	11/03/2021	AB21-1103-10
Molybdenum	106		%	5.0	11/04/2021	AB21-1103-10
Nickel	90		%	2.0	11/04/2021	AB21-1103-10
Potassium	108		%	100.0	11/03/2021	AB21-1103-10
Selenium	98		%	1.0	11/04/2021	AB21-1103-10
Silver	101		%	0.2	11/04/2021	AB21-1103-10
Sodium	114		%	1000.0	11/03/2021	AB21-1103-10
Thallium	97		%	2.0	11/04/2021	AB21-1103-10
Vanadium	96		%	2.0	11/04/2021	AB21-1103-10
Zinc	91		%	10.0	11/04/2021	AB21-1103-10

**Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous**

Aliquot #: 21-1280-07-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	96		%	1000.0	10/28/2021	AB21-1029-01
Fluoride	87		%	1000.0	10/28/2021	AB21-1029-01
Sulfate	101		%	1000.0	10/28/2021	AB21-1029-01

## Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**  
 Field Sample ID: **JHC-MW-15008R Field MSD**  
 Lab Sample ID: 21-1280-08  
 Matrix: Groundwater

Laboratory Project: **21-1280**  
 Collect Date: 10/21/2021  
 Collect Time: 04:01 PM

### Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1280-08-C01-A01

Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	97.8		%	0.2	10/28/2021	AB21-1028-03

### Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 21-1280-08-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	113		%	1.0	11/04/2021	AB21-1103-10
Arsenic	95		%	1.0	11/04/2021	AB21-1103-10
Barium	113		%	5.0	11/04/2021	AB21-1103-10
Beryllium	108		%	1.0	11/04/2021	AB21-1103-10
Boron	101		%	20.0	11/03/2021	AB21-1103-10
Cadmium	109		%	0.2	11/04/2021	AB21-1103-10
Calcium	107		%	1000.0	11/03/2021	AB21-1103-10
Chromium	96		%	1.0	11/04/2021	AB21-1103-10
Cobalt	93		%	6.0	11/04/2021	AB21-1103-10
Copper	89		%	1.0	11/04/2021	AB21-1103-10
Iron	100		%	20.0	11/03/2021	AB21-1103-10
Lead	95		%	1.0	11/04/2021	AB21-1103-10
Lithium	97		%	10.0	11/04/2021	AB21-1103-10
Magnesium	112		%	1000.0	11/03/2021	AB21-1103-10
Molybdenum	107		%	5.0	11/04/2021	AB21-1103-10
Nickel	88		%	2.0	11/04/2021	AB21-1103-10
Potassium	106		%	100.0	11/03/2021	AB21-1103-10
Selenium	95		%	1.0	11/04/2021	AB21-1103-10
Silver	102		%	0.2	11/04/2021	AB21-1103-10
Sodium	112		%	1000.0	11/03/2021	AB21-1103-10
Thallium	98		%	2.0	11/04/2021	AB21-1103-10
Vanadium	97		%	2.0	11/04/2021	AB21-1103-10
Zinc	91		%	10.0	11/04/2021	AB21-1103-10

### Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot #: 21-1280-08-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	94		%	1000.0	10/28/2021	AB21-1029-01
Fluoride	86		%	1000.0	10/28/2021	AB21-1029-01
Sulfate	100		%	1000.0	10/28/2021	AB21-1029-01

Data Qualifiers	Exception Summary
-----------------	-------------------

No exceptions occurred.

CONSUMERS  
ENERGY

Chemistry Department  
General Standard Operating Procedure

PROC CHEM-1.2.01  
PAGE 1 OF 2  
REVISION 3  
ATTACHMENT A

**TITLE: SAMPLE LOG-IN - SHIPMENT INSPECTION FORM**

Project Log-In Number: 21-1280

Inspection Date: 10/29/21 Inspection By: UWH

Sample Origin/Project Name: POND A JHC 04-2021

Shipment Delivered By: Enter the type of shipment carrier

Pony \_\_\_\_\_ FedEx \_\_\_\_\_ UPS \_\_\_\_\_ USPS \_\_\_\_\_ Airborne \_\_\_\_\_

Other/Hand Carry (whom) UWH

Tracking Number: \_\_\_\_\_ Shipping Form Attached. Yes \_\_\_\_\_ No \_\_\_\_\_

Shipping Containers: Enter the type and number of shipping containers received

Cooler (2) Cardboard Box \_\_\_\_\_ Custom Case \_\_\_\_\_ Envelope/Mailer \_\_\_\_\_

Loose/Unpackaged Containers \_\_\_\_\_ Other \_\_\_\_\_

Condition of Shipment: Enter the as-received condition of the shipment container.

Damaged Shipment Observed: None  Dented \_\_\_\_\_ Leaking \_\_\_\_\_

Other \_\_\_\_\_

Shipment Security: Enter if any of the shipping containers were opened before receipt

Shipping Containers Received: Opened \_\_\_\_\_ Sealed

Enclosed Documents: Enter the type of documents enclosed with the shipment

CoC  Work Request \_\_\_\_\_ Air Data Sheet \_\_\_\_\_ Other \_\_\_\_\_

Temperature of Containers: Measure the temperature of several sample containers

As-Received Temperature Range 2.1 - 3.6°C Samples Received on Ice. Yes  No \_\_\_\_\_

M&TE # and Expiration 015402 | 6-3-22

Number and Type of Containers: Enter the total number of sample containers received

Container Type	Water	Soil	Other	Broken	Leaking
VOA (40mL or 60mL)	<u>12</u>	_____	_____	_____	_____
Quart/Liter (g/p)	<u>12</u>	_____	_____	_____	_____
9-oz (amber glass jar)	_____	_____	_____	_____	_____
2-oz (amber glass)	_____	_____	_____	_____	_____
125 mL (plastic)	<u>16</u>	_____	_____	_____	_____
24 mL vial (glass)	_____	_____	_____	_____	_____
<u>750</u> 500 mL (plastic)	<u>6</u>	_____	_____	_____	_____
Other	_____	_____	_____	_____	_____



## ANALYTICAL REPORT

Eurofins TestAmerica, St. Louis  
13715 Rider Trail North  
Earth City, MO 63045  
Tel: (314)298-8566

Laboratory Job ID: 160-43809-1

Client Project/Site: JH Campbell CCR Groundwater Testing

**For:**

Consumers Energy  
135 W Trail Street  
Jackson, Michigan 49201

Attn: Emil Blaj



*Authorized for release by:  
11/30/2021 5:27:57 PM*

Jayna Awalt, Project Manager II  
(314)298-8566  
[Jayna.Awalt@Eurofinset.com](mailto:Jayna.Awalt@Eurofinset.com)

### LINKS

Review your project  
results through  
**Total Access**

Have a Question?



Visit us at:

[www.eurofinsus.com/Env](http://www.eurofinsus.com/Env)

*This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.*

*Results relate only to the items tested and the sample(s) as received by the laboratory.*





# Table of Contents

Cover Page . . . . .	1
Table of Contents . . . . .	2
Case Narrative . . . . .	3
Chain of Custody . . . . .	4
Receipt Checklists . . . . .	6
Definitions/Glossary . . . . .	7
Method Summary . . . . .	8
Sample Summary . . . . .	9
Client Sample Results . . . . .	10
QC Sample Results . . . . .	14
QC Association Summary . . . . .	16
Tracer Carrier Summary . . . . .	17

# Case Narrative

Client: Consumers Energy  
Project/Site: JH Campbell CCR Groundwater Testing

Job ID: 160-43809-1

---

**Job ID: 160-43809-1**

---

**Laboratory: Eurofins TestAmerica, St. Louis**

## Narrative

---

**Job Narrative  
160-43809-1**

### Receipt

The samples were received on 10/28/2021 8:45 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved. The temperature of the cooler at receipt was 18.6° C.

### RAD

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

#### Radium-228 Prep Batch 160-535028/Radium-226 Prep Batch 160-535027

Insufficient sample volume was available to perform a sample duplicate for the following samples: JHC-MW-15006 (160-43809-1), JHC-MW-15007R (160-43809-2), JHC-MW-15008R (160-43809-3), JHC-15009R (160-43809-4), JHC-MW-15011R (160-43809-5) and DUP-05 (160-43809-6). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Earth City, MO 63045-1205  
phone 314.298.8566 fax 314.298.8757

TestAmerica Laboratories, Inc. d/b/a Eurofins TestAmerica

Regulatory Program:  DW  NPDES  RCRA  Other:

**Client Contact**  
Consumers Energy, Laboratory Services  
135 W. Trail Street  
Jackson, MI 49201  
517-788-5888  
(xxx) xxx-xxxx FAX  
Project Name: JH Campbell Pond A Wells  
Project #: 21-1280  
P O #

**Project Manager: Emil Blaj**  
Email: Emil.Blaj@cmsenergy.com  
Tel/Fax: 517-788-5888

**Analysis Turnaround Time**  
 CALENDAR DAYS  WORKING DAYS  
TAT if different from Below  
 2 weeks  
 1 week  
 2 days  
 1 day

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.
JHC-MW-15006	10/21/2021	1349	G	GW	2
JHC-MW-15007R	10/21/21	1138	G	GW	2
JHC-MW-15008R	10/21/21	1601	G	GW	2
JHC-15009R	10/21/21	1711	G	GW	2
JHC-MW-15011R	10/21/21	1542	G	DI	2
DUP-05	10/21/21	--	G	DI	2

**Preservation Used:** 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other

**Possible Hazard Identification:** Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

Special Instructions/QC Requirements & Comments:

Non-Hazard  Flammable  Skin Irritant  Poison B  Unknown

Return to Client  Disposal by Lab  Archive for \_\_\_\_\_ Months

Custody Seal No.: \_\_\_\_\_

Custody Seals Intact:  Yes  No

Relinquished by: CASEY HANSEN Date/Time: 10/20/21 0930  
Company: Consumers Energy

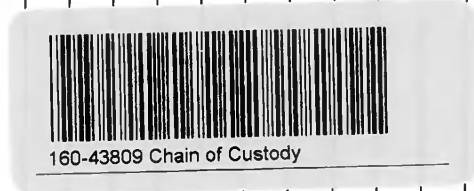
Relinquished by: WPS Date/Time: 10/20/21 0930  
Company: Consumers Energy

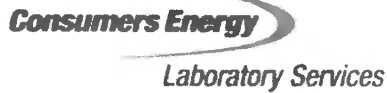
Relinquished by: MICHA KERVAININGA Date/Time: 10/20/21 0845  
Company: ERA SIZ

Received by: WPS Date/Time: \_\_\_\_\_  
Company: \_\_\_\_\_

Received in Laboratory by: \_\_\_\_\_ Date/Time: \_\_\_\_\_  
Company: \_\_\_\_\_

Therm ID No.: \_\_\_\_\_ Cooler Temp. (°C): Obs'd: \_\_\_\_\_





135 W. Trail Street  
Jackson, MI 49201

TestAmerica Michigan  
10448 Citation Drive, Ste 200  
Brighton, MI 48116

**PROCUREMENT #: 21101165**

QA Code: NQ

(Item 1) - Part Number: N/A - Quantity : 1  
JHC CCR Rule GW Q4-2021 Samples

Groundwater Samples for Radium 226 (EPA 903.1) and Radium 228 (EPA 904.0)

Standard TAT Request.

Reference Quote #16009576-0

(Item 2) - Part Number: NA - Quantity : 1  
Please include Consumers Energy Project Number and Procurement Number on all submitted invoices

For technical questions, please contact Emil Blaj at 517-788-5888, or Emil.Blj@cmsenergy.com.

To expedite payment please provide the Procurement number on all invoices.

Send Invoices To:

Consumers Energy Company  
Attn: Accounts Payable  
135 W Trail St.  
Jackson, MI 49201

# Login Sample Receipt Checklist

Client: Consumers Energy

Job Number: 160-43809-1

**Login Number: 43809**

**List Source: Eurofins TestAmerica, St. Louis**

**List Number: 1**

**Creator: Korrinhizer, Micha L**

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

# Definitions/Glossary

Client: Consumers Energy  
Project/Site: JH Campbell CCR Groundwater Testing

Job ID: 160-43809-1

## Qualifiers

### Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

## Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

# Method Summary

Client: Consumers Energy  
Project/Site: JH Campbell CCR Groundwater Testing

Job ID: 160-43809-1

Method	Method Description	Protocol	Laboratory
903.0	Radium-226 (GFPC)	EPA	TAL SL
904.0	Radium-228 (GFPC)	EPA	TAL SL
Ra226_Ra228	Combined Radium-226 and Radium-228	TAL-STL	TAL SL
PrecSep_0	Preparation, Precipitate Separation	None	TAL SL
PrecSep-21	Preparation, Precipitate Separation (21-Day In-Growth)	None	TAL SL

#### Protocol References:

EPA = US Environmental Protection Agency

None = None

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

#### Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

# Sample Summary

Client: Consumers Energy  
Project/Site: JH Campbell CCR Groundwater Testing

Job ID: 160-43809-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-43809-1	JHC-MW-15006	Water	10/21/21 13:49	10/28/21 08:45
160-43809-2	JHC-MW-15007R	Water	10/21/21 11:38	10/28/21 08:45
160-43809-3	JHC-MW-15008R	Water	10/21/21 16:01	10/28/21 08:45
160-43809-4	JHC-15009R	Water	10/21/21 17:11	10/28/21 08:45
160-43809-5	JHC-MW-15011R	Water	10/21/21 15:42	10/28/21 08:45
160-43809-6	DUP-05	Water	10/21/21 00:00	10/28/21 08:45

1

2

3

4

5

6

7

8

9

10

11

12



# Client Sample Results

Client: Consumers Energy  
 Project/Site: JH Campbell CCR Groundwater Testing

Job ID: 160-43809-1

**Client Sample ID: JHC-MW-15006**

**Lab Sample ID: 160-43809-1**

Date Collected: 10/21/21 13:49

Matrix: Water

Date Received: 10/28/21 08:45

**Method: 903.0 - Radium-226 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.277		0.127	0.129	1.00	0.159	pCi/L	11/04/21 08:46	11/29/21 13:32	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	102		40 - 110					11/04/21 08:46	11/29/21 13:32	1

**Method: 904.0 - Radium-228 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.357	U	0.249	0.251	1.00	0.387	pCi/L	11/04/21 09:20	11/23/21 12:57	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	102		40 - 110					11/04/21 09:20	11/23/21 12:57	1
Y Carrier	80.4		40 - 110					11/04/21 09:20	11/23/21 12:57	1

**Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.634		0.280	0.282	5.00	0.387	pCi/L		11/30/21 15:36	1

**Client Sample ID: JHC-MW-15007R**

**Lab Sample ID: 160-43809-2**

Date Collected: 10/21/21 11:38

Matrix: Water

Date Received: 10/28/21 08:45

**Method: 903.0 - Radium-226 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.309		0.118	0.122	1.00	0.129	pCi/L	11/04/21 08:46	11/29/21 13:33	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	98.8		40 - 110					11/04/21 08:46	11/29/21 13:33	1

**Method: 904.0 - Radium-228 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.273	U	0.245	0.247	1.00	0.394	pCi/L	11/04/21 09:20	11/23/21 12:57	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	98.8		40 - 110					11/04/21 09:20	11/23/21 12:57	1
Y Carrier	81.9		40 - 110					11/04/21 09:20	11/23/21 12:57	1

# Client Sample Results

Client: Consumers Energy  
 Project/Site: JH Campbell CCR Groundwater Testing

Job ID: 160-43809-1

## Client Sample ID: JHC-MW-15007R

## Lab Sample ID: 160-43809-2

Date Collected: 10/21/21 11:38

Matrix: Water

Date Received: 10/28/21 08:45

### Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.583		0.272	0.275	5.00	0.394	pCi/L		11/30/21 15:36	1

## Client Sample ID: JHC-MW-15008R

## Lab Sample ID: 160-43809-3

Date Collected: 10/21/21 16:01

Matrix: Water

Date Received: 10/28/21 08:45

### Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.281		0.115	0.118	1.00	0.132	pCi/L	11/04/21 08:46	11/29/21 13:33	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	102		40 - 110					11/04/21 08:46	11/29/21 13:33	1

### Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.380	U	0.256	0.258	1.00	0.397	pCi/L	11/04/21 09:20	11/23/21 12:57	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	102		40 - 110					11/04/21 09:20	11/23/21 12:57	1
Y Carrier	82.6		40 - 110					11/04/21 09:20	11/23/21 12:57	1

### Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.661		0.281	0.284	5.00	0.397	pCi/L		11/30/21 15:36	1

## Client Sample ID: JHC-15009R

## Lab Sample ID: 160-43809-4

Date Collected: 10/21/21 17:11

Matrix: Water

Date Received: 10/28/21 08:45

### Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.374		0.140	0.144	1.00	0.162	pCi/L	11/04/21 08:46	11/29/21 13:33	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	105		40 - 110					11/04/21 08:46	11/29/21 13:33	1

# Client Sample Results

Client: Consumers Energy  
 Project/Site: JH Campbell CCR Groundwater Testing

Job ID: 160-43809-1

## Client Sample ID: JHC-15009R

## Lab Sample ID: 160-43809-4

Date Collected: 10/21/21 17:11

Matrix: Water

Date Received: 10/28/21 08:45

### Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.354	U	0.242	0.245	1.00	0.376	pCi/L	11/04/21 09:20	11/23/21 12:57	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	105		40 - 110					11/04/21 09:20	11/23/21 12:57	1
Y Carrier	83.4		40 - 110					11/04/21 09:20	11/23/21 12:57	1

### Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.728		0.280	0.284	5.00	0.376	pCi/L		11/30/21 15:36	1

## Client Sample ID: JHC-MW-15011R

## Lab Sample ID: 160-43809-5

Date Collected: 10/21/21 15:42

Matrix: Water

Date Received: 10/28/21 08:45

### Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.157		0.102	0.103	1.00	0.145	pCi/L	11/04/21 08:46	11/29/21 13:33	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	107		40 - 110					11/04/21 08:46	11/29/21 13:33	1

### Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.428		0.257	0.260	1.00	0.393	pCi/L	11/04/21 09:20	11/23/21 12:57	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	107		40 - 110					11/04/21 09:20	11/23/21 12:57	1
Y Carrier	82.2		40 - 110					11/04/21 09:20	11/23/21 12:57	1

### Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.585		0.277	0.280	5.00	0.393	pCi/L		11/30/21 15:36	1

# Client Sample Results

Client: Consumers Energy  
 Project/Site: JH Campbell CCR Groundwater Testing

Job ID: 160-43809-1

**Client Sample ID: DUP-05**

**Lab Sample ID: 160-43809-6**

Date Collected: 10/21/21 00:00

Matrix: Water

Date Received: 10/28/21 08:45

**Method: 903.0 - Radium-226 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.302		0.132	0.134	1.00	0.165	pCi/L	11/04/21 08:46	11/29/21 13:33	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	103		40 - 110					11/04/21 08:46	11/29/21 13:33	1

**Method: 904.0 - Radium-228 (GFPC)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.181	U	0.230	0.230	1.00	0.381	pCi/L	11/04/21 09:20	11/23/21 12:57	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	103		40 - 110					11/04/21 09:20	11/23/21 12:57	1
Y Carrier	82.6		40 - 110					11/04/21 09:20	11/23/21 12:57	1

**Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.483		0.265	0.266	5.00	0.381	pCi/L		11/30/21 15:36	1

# QC Sample Results

Client: Consumers Energy  
 Project/Site: JH Campbell CCR Groundwater Testing

Job ID: 160-43809-1

## Method: 903.0 - Radium-226 (GFPC)

**Lab Sample ID: MB 160-535027/23-A**  
**Matrix: Water**  
**Analysis Batch: 539049**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 535027**

Analyte	MB		Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	MB Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-226	0.02492	U	0.0710	0.0710	1.00	0.131	pCi/L	11/04/21 08:46	11/29/21 13:39	1
Carrier	MB %Yield	MB Qualifier	Limits		Prepared	Analyzed	Dil Fac			
Ba Carrier	96.8		40 - 110		11/04/21 08:46	11/29/21 13:39	1			

**Lab Sample ID: LCS 160-535027/1-A**  
**Matrix: Water**  
**Analysis Batch: 539046**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 535027**

Analyte	Spike Added	LCS Result	LCS Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Radium-226	11.3	10.20		1.09	1.00	0.146	pCi/L	90	75 - 125
Carrier	LCS %Yield	LCS Qualifier	Limits						
Ba Carrier	95.0		40 - 110						

**Lab Sample ID: LCSD 160-535027/2-A**  
**Matrix: Water**  
**Analysis Batch: 539046**

**Client Sample ID: Lab Control Sample Dup**  
**Prep Type: Total/NA**  
**Prep Batch: 535027**

Analyte	Spike Added	LCSD Result	LCSD Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER
				Uncert. (2σ+/-)							Limit
Radium-226	11.3	9.657		1.04	1.00	0.160	pCi/L	85	75 - 125	0.25	1
Carrier	LCSD %Yield	LCSD Qualifier	Limits								
Ba Carrier	92.0		40 - 110								

## Method: 904.0 - Radium-228 (GFPC)

**Lab Sample ID: MB 160-535028/23-A**  
**Matrix: Water**  
**Analysis Batch: 538233**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 535028**

Analyte	MB		Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	MB Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-228	0.09522	U	0.195	0.195	1.00	0.336	pCi/L	11/04/21 09:20	11/23/21 13:02	1
Carrier	MB %Yield	MB Qualifier	Limits		Prepared	Analyzed	Dil Fac			
Ba Carrier	96.8		40 - 110		11/04/21 09:20	11/23/21 13:02	1			
Y Carrier	84.5		40 - 110		11/04/21 09:20	11/23/21 13:02	1			

# QC Sample Results

Client: Consumers Energy  
 Project/Site: JH Campbell CCR Groundwater Testing

Job ID: 160-43809-1

## Method: 904.0 - Radium-228 (GFPC) (Continued)

**Lab Sample ID: LCS 160-535028/1-A**  
**Matrix: Water**  
**Analysis Batch: 538216**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 535028**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	
									75	125
Radium-228	9.12	9.646		1.14	1.00	0.428	pCi/L	106	75	125
<b>LCS LCS</b>										
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>							
Ba Carrier	95.0		40 - 110							
Y Carrier	79.3		40 - 110							

**Lab Sample ID: LCSD 160-535028/2-A**  
**Matrix: Water**  
**Analysis Batch: 538216**

**Client Sample ID: Lab Control Sample Dup**  
**Prep Type: Total/NA**  
**Prep Batch: 535028**

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		RER	Limit
									75	125	0.78	1
Radium-228	9.12	7.977		0.997	1.00	0.440	pCi/L	87	75	125	0.78	1
<b>LCSD LCSD</b>												
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>									
Ba Carrier	92.0		40 - 110									
Y Carrier	79.6		40 - 110									

# QC Association Summary

Client: Consumers Energy  
Project/Site: JH Campbell CCR Groundwater Testing

Job ID: 160-43809-1

## Rad

### Prep Batch: 535027

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-43809-1	JHC-MW-15006	Total/NA	Water	PrecSep-21	
160-43809-2	JHC-MW-15007R	Total/NA	Water	PrecSep-21	
160-43809-3	JHC-MW-15008R	Total/NA	Water	PrecSep-21	
160-43809-4	JHC-15009R	Total/NA	Water	PrecSep-21	
160-43809-5	JHC-MW-15011R	Total/NA	Water	PrecSep-21	
160-43809-6	DUP-05	Total/NA	Water	PrecSep-21	
MB 160-535027/23-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-535027/1-A	Lab Control Sample	Total/NA	Water	PrecSep-21	
LCSD 160-535027/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep-21	

### Prep Batch: 535028

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-43809-1	JHC-MW-15006	Total/NA	Water	PrecSep_0	
160-43809-2	JHC-MW-15007R	Total/NA	Water	PrecSep_0	
160-43809-3	JHC-MW-15008R	Total/NA	Water	PrecSep_0	
160-43809-4	JHC-15009R	Total/NA	Water	PrecSep_0	
160-43809-5	JHC-MW-15011R	Total/NA	Water	PrecSep_0	
160-43809-6	DUP-05	Total/NA	Water	PrecSep_0	
MB 160-535028/23-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-535028/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-535028/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

# Tracer/Carrier Summary

Client: Consumers Energy  
 Project/Site: JH Campbell CCR Groundwater Testing

Job ID: 160-43809-1

## Method: 903.0 - Radium-226 (GFPC)

Matrix: Water

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Ba (40-110)	
160-43809-1	JHC-MW-15006	102	
160-43809-2	JHC-MW-15007R	98.8	
160-43809-3	JHC-MW-15008R	102	
160-43809-4	JHC-15009R	105	
160-43809-5	JHC-MW-15011R	107	
160-43809-6	DUP-05	103	
LCS 160-535027/1-A	Lab Control Sample	95.0	
LCSD 160-535027/2-A	Lab Control Sample Dup	92.0	
MB 160-535027/23-A	Method Blank	96.8	
<b>Tracer/Carrier Legend</b>			
Ba = Ba Carrier			

## Method: 904.0 - Radium-228 (GFPC)

Matrix: Water

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Ba (40-110)	Y (40-110)
160-43809-1	JHC-MW-15006	102	80.4
160-43809-2	JHC-MW-15007R	98.8	81.9
160-43809-3	JHC-MW-15008R	102	82.6
160-43809-4	JHC-15009R	105	83.4
160-43809-5	JHC-MW-15011R	107	82.2
160-43809-6	DUP-05	103	82.6
LCS 160-535028/1-A	Lab Control Sample	95.0	79.3
LCSD 160-535028/2-A	Lab Control Sample Dup	92.0	79.6
MB 160-535028/23-A	Method Blank	96.8	84.5
<b>Tracer/Carrier Legend</b>			
Ba = Ba Carrier			
Y = Y Carrier			



## **Appendix E**

# **October 2021 Field Notes**

## WATER LEVEL DATA

Site: JH Campbell

Project No: 21-1274, 1276, 1277, 1278, 1279, 1280, 1281, 1287

Analyst: LWH, LMD, DMW, CET

Reviewed by:

Date: 10-19-21

Review Date:

11-05-21

Method: Electronic Tape

Tape ID: Solinst Geotech

 S/N: 319851  
501491

Geotek = 1005

Well ID	Time	DTW (ft)	DTB (ft)	Locked Y or N	Well Condition Good (G) / Poor (P) / Remarks			
JHC-MW-15023	0907	19.00	27.75	Y	GOOD	DMW		
JHC-MW-15024	0914	14.15	19.95	↓	↓	↓		
JHC-MW-15025	0917	13.36	20.00					
JHC-MW-15026	0927	15.11	21.01					
JHC-MW-15027	0930	15.47	23.00					
JHC-MW-15028	0936	15.04	20.79					
JHC-MW-15029	0938	12.11	20.91					
JHC-MW-15030	0940	10.32	16.84					
JHC-MW-15002	1205	25.35	33.25	Y	GOOD	LWH/LMD		
JHC-MW-15003	1208	33.47	36.48	↓	↓	↓		
JHC-MW-15005	1210	18.58	22.60					
JHC-MW-18004	1212	12.69	18.83					
JHC-MW-18005	1214	11.90	17.71					
JHC-MW-15013	1150	35.91	40.92					
JHC-MW-15015	1145	35.30	40.80					
JHC-MW-15016	10/20/21 1208	33.71	38.66				N/A	Truck loading all Day on 10/19.
JHC-MW-18001	1226	12.85	19.10					
JHC-MW-18002	1157	9.67	16.98					
JHC-MW-18003	1155	9.61	16.90					
JHC-MW-15006	1050	35.91	37.80					
JHC-MW-15007R	1100	37.00	42.85					
JHC-MW-15008R	1104	44.04	47.38					
JHC-MW-15009R	1111	43.87	50.65					
JHC-MW-15011R	1030	38.29	45.02					
JHC-MW-15017	1302	16.40	23.75					

NOTES: TOC reference point (top of steel plate for RWs)

DTW = Depth to Water

DTB = Depth to Bottom

Form Rev.04-12-20EB



### WATER LEVEL DATA

Site: JH Campbell

Project No: 21-1274, 1276, 1277, 1278, 1279, 1280, 1281, 1287

Analyst: CVH, LMO, DMW, CET

Reviewed by: *[Signature]*

Date: 10.19.2021

Review Date: 11-05-21

Method: Electronic Tape

Tape ID: *Solinist Geotech* S/N: *319851* *501491* *Geotek 27 x 1005*

Well ID	Time	DTW (ft)	DTB (ft)	Locked Y or N	Well Condition Good (G) / Poor (P) / Remarks
JHC-MW-15018	1306	17.05	22.73	Y	GOOD <i>CVH/LMO</i>
JHC-MW-15022	1009	29.53	36.22		<i>DMW</i>
JHC-MW-15031	1017	43.65	46.69		
JHC-MW-15032	0859	17.99	25.83		
JHC-MW-15033	0902	23.03	28.55		
JHC-MW-15034	0905	16.97	23.95		
JHC-MW-15035 (MW-B5)	1020	41.11	45.32		
JHC-MW-15036 (MW-B6)	1013	27.13	32.61		
JHC-MW-15037 (MW-B7)	1007	25.55	29.94		
MWA1	0951	12.37	18.11		Replaced w/new corbin lock
MWA2	0953	12.58	16.68		GOOD
MWB1	1032	Dry	35.01		Dry
MWB2	1030	37.06	37.51		GOOD
MWB2D	1028	37.33	51.00		
MWB3	1026	38.45	40.30		
MWB4	1024	41.41	47.70		
MWB5 (JHC-MW-15035)	1020	41.11	45.32		replaced w/new corbin lock
MWB6 (JHC-MW-15036)	1013	27.13	32.61		GOOD
MWB7 (JHC-MW-15037)	1007	25.55	29.94		
MW1	0933	12.63	16.11		
MW3	0921	12.55	16.56		
MW4	0911	32.20	32.71		
MW5	1001	12.25	15.78		
MW-8	0849	29.23	33.45		
MW-8C	0848	29.81	63.78		

NOTES: TOC reference point (top of steel plate for RWs)  
 DTW = Depth to Water  
 DTB = Depth to Bottom





**WATER LEVEL DATA**

Site: JH Campbell

Project No: 21-1214, 1214, 1277, 1278, 1279, 1280, 1281, 1287

Analyst: WH, LMD, DMW, CET

Reviewed by: *[Signature]*

Date: 10-19-2021

Review Date: 11-25-21

Method: Electronic Tape

Tape ID: 501mist Geotech S/N: 319051 501491 Geotech # 1005

Well ID	Time	DTW (ft)	DTB (ft)	Locked Y or N	Well Condition Good (G) / Poor (P) / Remarks
MW-9AR	1430	22.03	23.59	Y	GOOD CET
MW-9B	1432	21.99	29.55	↓	↓
MW-9C	1434	21.22	41.33	↓	↓
MW-9D	1436	21.06	54.68	↓	↓
MW-11A	1519	9.75	16.40	Y	GOOD WH LMD
MW-15	1501	12.80	16.24	↓	↓
MW-16A	1515	11.22	20.45	↓	↓
MW-16B	1514	10.55	50.15	↓	↓
MW-16C	1513	11.10	84.34	↓	↓
MW-17	1522	14.99	23.20	↓	↓
MW-18A	1408	28.97	36.80	↓	↓
MW-18B	1409	31.80	73.05	↓	↓
MW-18C	1410	32.20	86.95	↓	↓
MW-10AR	1325	Dry	14.28	Y	Dry re-checked 10/20/21 @ 0920 CET
MW-10B	1326	14.65	23.52	↓	↓
MW-12	1356	9.01	9.77	↓	↓
MW-13	1321	Dry	10.20	↓	Dry: rechecked 10/20/21 0926
MW-14	1318	9.27	17.46	↓	↓
MW-14S	1314	10.02	13.21	↓	↓
MW-14D	1315	9.39	37.46	↓	↓
PZ-23	0930	14.01	15.47	↓	↓
PZ-23S	0931	15.61	18.25	↓	↓
PZ-23D	0933	16.90	37.41	↓	↓
PZ-24	1010	5.98	13.78	↓	replaced w/new corbin lock
PZ-24S	1013	8.59	11.01	↓	↓

NOTES: TOC reference point (top of steel plate for RWs)  
 DTW = Depth to Water  
 DTB = Depth to Bottom



### WATER LEVEL DATA

Site: JH Campbell

Project No: 21-1274, 1276, 1277, 1280, 1278, 1279, 1281, 1287

Analyst: CVH, LMD, DMW, CET

Reviewed by: *f.*

Date: 10/19/21

Review Date: 11-05-21

Method: Electronic Tape

Tape ID: 501491  
SOLINST  
SOLINST GeoTech S/N: 379851  
Gated at 105

Well ID	Time	DTW (ft)	DTB (ft)	Locked Y or N	Well Condition Good (G) / Poor (P) / Remarks	
PZ-24D	1015	8.50	38.52	Y	CET	
PZ-37 (Gated Plant Area)	1519	5.19	20.04	↓	Replaced w/ new corbin	
PZ-40	0950	9.15	22.44			
PZ-40S	0947	11.99	17.65	lock plugs cap ↓	1" well GOOD CET	
P1S	1431	16.05	22.37			
P2S	1433	14.50	22.50			
P3S	1525	14.21	22.55			
P5S	1457	13.50	22.30			
P6S	1452	13.04	22.40			
P7S	1450	12.69	22.70			
P9S	1447	8.60	19.75			
P10	1505	8.50	10.52			NO CAP
P11	1520	6.90	9.54			
PZ-1203	1120	Dry	37.65			YES
PZ-1204	1120	Dry	30.90			
PZ-1205	0912	Dry	35.85			
PZ-1207	0930	Dry	32.73			
PZ-1208	1000	Dry	37.14			
PZ-1212	1000	Dry	24.50			
PZ-21-01	1012	34.80	38.05			
PZ-21-02	1010	37.20	43.40			
PZ-21-03	0936	38.04	43.52			
PZ-21-04	1130	38.60	44.10			
PZ-21-05	1124	33.50	42.85			
PZ-21-06	0925	38.54	45.80			

NOTES: TOC reference point (top of steel plate for RWs)  
DTW = Depth to Water  
DTB = Depth to Bottom





### WATER LEVEL DATA

Site: JH Campbell

Project No: 21-1274, 1274, 1277, 1278, 1279, 1280, 1281, 1287

Analyst: CVH, LMO, DMW, CET

Reviewed by: *J.*

Date: 10-19-21

Review Date: 11-05-21

Method: Electronic Tape

Tape ID: ~~SONST~~ ~~SONST~~ Geotech S/N: 319851 501491 Geotech # 1005

Well ID	Time	DTW (ft)	DTB (ft)	Locked Y or N	Well Condition Good (G) / Poor (P) / Remarks	
RW-1	1100	30.51	39.04	N/A	ELOOP	pmw/cet
RW-2	1123	35.25	53.00	↓	↓	↓
RW-3	1154	15.40	23.22			
RW-4	1221	9.29	22.03			
RW-5	1252	9.50	21.42			
RW-6	1205	10.87	21.95			
RW-7	1287	9.82	20.52			
SG-21-1	1127	0.60	N/A			
SG-21-2	1226	2.00	N/A	N/A	-	
SG-21-3	1310	2.08	N/A	N/A	-	
TW-17-01	1353	29.91	36.09	N	1" cap	cut/LMO
TW-17-07	1445	26.93	31.70	N	↓	CET
TW-17-08	1342	34.80	39.45	N		top of casing broke @ ground level
TW-17-10	1421	DMW/plugged	—		1" cap	
TW-17-12	1438	12.95	16.20		NO CAP	
TW-17-14	1443	7.17	10.95	1" cap		
TW-17-16	1444	6.96	9.16	↓	↓	
TW-18-01	1323	31.26	33.80			
TW-18-02	1351	29.35	29.55			
TW-18-03	1340	30.79	34.05			
TW-18-04	1327	31.80	34.70			
TW-18-05	1324	30.45	33.71			
TW-18-06	1331	31.92	36.96			
TW-18-07	1330	32.37	35.40			
TW-18-08	1232	33.00		↓	↓	

NOTES: TOC reference point (top of steel plate for RWs)  
 DTW = Depth to Water  
 DTB = Depth to Bottom





Consumers Energy Company  
Monitoring Well Sampling Worksheet

Well ID J4C MW-15023 Date 10-20-21 Control Number 21-1276-01  
 Location J4 Campbell Well Material:  PVC  SS  Iron  Galv. Steel  
 Purge Method:  Peristaltic  Submersible  Fultz  Bailer  
 Depth to Water Tape: Solinst S/N: 379851

QC SAMPLE:  MS/MSD  DUP-  Sonde ID:  11M  15H  19M  20G  21G

Depth-to-water T/PVC (ft) 19.00 Depth-To-Bottom T/PVC (ft) \_\_\_\_\_ Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity	Notes
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	ft	NTU	
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	< 0.33	+/- 10%	

Stabilization parameters for the last three readings

1015								19.00		
1016	6.93	13.9	77.1	22.6	2.26	+135.8	200	19.00	2.84	
1021	5.71	13.5	67.1	9.3	0.95	+191.2	200	19.00	2.39	
1026	5.65	13.7	74.7	9.2	0.94	+205.6	200	19.00	1.91	
1031	5.65	13.8	76.3	9.0	0.92	+206.6	200	19.00	1.92	
1036	5.68	13.8	80.5	8.9	0.90	+209.7	200	19.00	1.98	
1041	5.70	13.8	85.3	9.0	0.91	+210.5	200	19.00	2.01	
1046	5.75	13.8	88.0	9.0	0.92	+210.1	200	19.00	2.14	
1051	5.76	13.8	89.4	9.1	0.92	+209.4	200	19.00	2.17	
1056	5.77	13.8	90.5	9.1	0.93	+208.3	200	19.00	2.08	
1057										

Total Pump Time (min): 42 Total Purge Volume (gal): 2.2 Reviewed by: [Signature]

Weather: Sunny, 57°F

Comments: \_\_\_\_\_

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125 ml	HDPE	A	N	2	1L	HDPE	B	N
1	↓	↓	B	↓					
1	250 ml	↓	A	↓					
2	60 ml	VOA	A	↓					

\* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.



Consumers Energy Company  
 Monitoring Well Sampling Worksheet

Well ID JHC MW-15024 Date 10.20.21 Control Number 21-1276-02  
 Location JH Campbell Well Material:  PVC  SS  Iron  Galv. Steel  
 Purge Method:  Peristaltic  Submersible  Fultz  Bailer  
 Depth to Water Tape: Solinst S/N: 379851

QC SAMPLE:  MS/MSD  DUP- Sonde ID:  11M  15H  19M  20G  21G

Depth-to-water T/PVC (ft) 14.15 Depth-To-Bottom T/PVC (ft) \_\_\_\_\_ Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity	Notes
min	units	°C	uS/cm	% sat.	ppm	mV	ml/min	Drawdown ft	NTU	
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	< 0.33	+/- 10%	

Stabilization parameters for the last three readings

0846								14.15		
0847	7.71	12.4	575	16.3	1.68	+134.5	180	14.15	9.40	
0852	7.59	12.3	562	6.6	0.70	+126.8	180	14.15	4.85	
0857	7.47	12.4	513	5.7	0.58	+123.7	180	14.15	4.87	
0902	7.44	12.4	497.6	5.0	0.52	+122.1	180	14.15	4.88	
0907	7.31	12.3	476.4	5.0	0.53	+121.7	180	14.15	4.17	
0912	7.08	12.3	441.0	6.5	0.68	+122.4	180	14.15	4.23	
0917	7.01	12.4	429.5	7.2	0.75	+123.3	180	14.15	4.34	
0922	6.98	12.4	425.5	7.4	0.78	+124.3	180	14.15	4.41	
0927	6.97	12.4	422.2	7.5	0.79	+124.8	180	14.15	4.50	
0928										

Total Pump Time (min): 42 Total Purge Volume (gal): 2.0 Reviewed by: [Signature]

Weather: partly sunny; 54°F 11-05-21

Comments: \_\_\_\_\_

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____								
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N	
1	125 ml	HDPE	A	N	2	1L	HDPE	B	N	
1	↓	↓	B	↓						
1	250 ml	↓	A	↓						
2	60 ml	VDA	A	↓						

\* Pump rate should be <500 ml/min for low-flow and <1 gal/min for high Volume.



Consumers Energy Company  
Monitoring Well Sampling Worksheet

Well ID JHC MW-15025 Date 10-19-21 Control Number 21-1276-03/-10/-11  
 Location JH Campbell Well Material:  PVC  SS  Iron  Galv. Steel  
 Purge Method:  Peristaltic  Submersible  Fultz  Bailer  
 Depth to Water Tape: Solinst S/N: 379851

QC SAMPLE:  MS/MSD  DUP- Sonde ID:  11M  15H  19M  20G  21G

Depth-to-water T/PVC (ft) 13.36 Depth-To-Bottom T/PVC (ft) \_\_\_\_\_ Completed by JMW

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity	Notes
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU	
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	< 0.33	+/- 10%	

Stabilization parameters for the last three readings

1716								13.36		
1717	7.26	13.7	363.1	12.6	1.26	+198.7	200	13.36	2.01	
1722	7.61	13.3	369.7	6.0	0.62	+182.0	200	13.36	3.39	
1727	7.71	13.2	371.4	5.3	0.54	+173.6	200	13.36	4.01	
1732	7.78	13.1	360.4	5.7	0.59	+164.6	200	13.36	4.24	
1737	7.80	13.1	355.9	6.2	0.64	+159.2	200	13.36	4.15	
1742	7.81	13.1	352.7	6.9	0.71	+153.7	200	13.36	4.33	
1747	7.80	13.1	348.4	7.0	0.72	+149.6	200	13.36	4.56	
1752	7.79	13.1	342.9	7.1	0.73	+146.5	200	13.36	4.61	
1757	7.78	13.1	340.1	7.3	0.74	+144.5	200	13.36	4.53	
1758										

Total Pump Time (min): 42 Total Purge Volume (gal): 2.2 Reviewed by: J

Weather: cloudy; 64°F 11-05-21

Comments:

Bottles Filled Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - \_\_\_\_\_

Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
3	125 ml	HDPK	B	N	2	1L	HDPK	B	N
3	↓	↓	A	↓					
1	250 ml	↓	A	↓					
2	60 ml	VOA	A	↓					

\* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.



Consumers Energy Company  
 Monitoring Well Sampling Worksheet

Well ID JHC MW-15026 Date 10-19-21 Control Number 21-1276-04  
 Location JH Campbell Well Material:  PVC  SS  Iron  Galv. Steel  
 Purge Method:  Peristaltic  Submersible  Fultz  Bailer  
 Depth to Water Tape: Solinst S/N: 379851  
 QC SAMPLE:  MS/MSD  DUP- Sonde ID:  11M  15H  19M  20G  21G

Depth-to-water T/PVC (ft) 15.08 Depth-To-Bottom T/PVC (ft) \_\_\_\_\_ Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity	Notes
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU	
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	< 0.33	+/- 10%	

Stablization parameters for the last three readings

1624								15.08		
1625	6.79	15.1	49.2	19.1	1.90	+145.0	200	15.08	2.18	
1630	5.86	14.5	47.3	6.8	0.68	+162.2	200	15.08	1.89	
1635	5.79	14.6	46.1	5.9	0.60	+167.1	200	15.08	2.37	
1640	5.75	14.6	45.5	5.4	0.55	+173.3	200	15.08	2.25	
1645	5.73	14.6	45.3	5.3	0.53	+176.6	200	15.08	2.41	
1650	5.73	14.5	45.0	5.0	0.50	+181.6	200	15.08	2.33	
1651										

Total Pump Time (min): 27 Total Purge Volume (gal): 1.4 Reviewed by: [Signature]

Weather: cloudy, 65°F 11-05-21

Comments:

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125ml	HDPE	A	N	2	1L	HDPE	B	N
1	↓	↓	B	N					
1	250ml	↓	A	N					
2	60ml	VOA	A	N					

\* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company  
Monitoring Well Sampling Worksheet

Well ID JHC MW-15027 Date 10.19.21 Control Number 21-1276-05  
 Location JH Campbell Well Material:  PVC  SS  Iron  Galv. Steel  
 Purge Method:  Peristaltic  Submersible  Fultz  Bailor  
 Depth to Water Tape: Solinst S/N: 379851

QC SAMPLE:  MS/MSD  DUP-  Sonde ID:  11M  15H  19M  20G  21G

Depth-to-water T/PVC (ft) 15.47 Depth-To-Bottom T/PVC (ft) \_\_\_\_\_ Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity	Notes
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU	
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	< 0.33	+/- 10%	

Stablization parameters for the last three readings

1514								15.47		
1515	6.77	16.1	48.2	21.8	2.11	+133.5	200	15.47	31.06	
1520	5.40	15.8	52.9	7.7	0.76	+137.2	200	15.47	24.15	
1525	5.65	16.0	77.5	7.1	6.69	+103.2	200	15.47	13.64	
1530	5.73	16.0	84.7	7.0	0.68	+97.0	200	15.47	8.94	
1535	5.82	15.9	95.6	7.2	0.70	+89.4	200	15.47	7.33	
1540	5.85	16.0	97.5	7.6	6.74	+85.5	200	15.47	8.01	
1545	5.88	15.9	105.1	6.5	6.63	+77.8	200	15.47	8.74	
1550	5.88	16.0	105.2	6.4	6.63	+75.8	200	15.47	8.39	
1555	5.91	16.0	106.5	6.4	0.63	+69.4	200	15.47	8.34	
1556										

Total Pump Time (min): 42 Total Purge Volume (gal): 2.2 Reviewed by: J

Weather: Sunny; 66°F 11-05-21

Comments:

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125 ml	HDPG	A	N	2	1L	HDP HDPG	B	N
1	↓	↓	B	↓			dmw 10.19.21		
1	250 ml		A						
2	60 ml	VOP	A	↓					

\* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.



Consumers Energy Company  
 Monitoring Well Sampling Worksheet

Well ID JHC MW-15028 Date 10.19.21 Control Number 21-1276-061-07  
 Location JH Campbell Well Material:  PVC  SS  Iron  Galv. Steel  
 Purge Method:  Peristaltic  Submersible  Fultz  Bailer  
 Depth to Water Tape: Solinst S/N: 379851

QC SAMPLE:  MS/MSD  DUP- 01 Sonde ID:  11M  15H  19M  20G  21G

Depth-to-water T/PVC (ft) 15.05 Depth-To-Bottom T/PVC (ft) \_\_\_\_\_ Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity	Notes
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU	
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	< 0.33	+/- 10%	

Stabilization parameters for the last three readings

1354								15.08		
1355	8.29	15.0	161.9	31.3	3.06	+165.4	200	15.08	5.64	
1400	8.21	15.2	161.1	24.0	2.38	+112.1	200	15.08	5.13	
1405	8.25	14.9	160.8	23.5	2.33	+94.8	200	15.08	5.00	
1410	8.23	15.1	160.9	23.2	2.29	+82.2	200	15.08	5.27	
1415	8.27	14.9	160.5	23.1	2.29	+73.4	200	15.08	4.99	
1420	8.29	14.9	161.0	23.1	2.30	+60.2	200	15.08	4.79	
1425	8.26	15.4	166.8	23.2	2.31	+50.9	200	15.08	5.09	
1430	8.26	14.9	159.2	23.2	2.31	+52.0	200	15.08	4.88	
1435	8.25	14.8	158.9	23.2	2.32	+52.6	200	15.08	4.91	
1436										

Total Pump Time (min): 42 Total Purge Volume (gal): 2.2 Reviewed by: JH

Weather: Sunny, 68°F 11-05-21

Comments:

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F -							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
2	125 ml	HDPE	A	N	24	1L	HDPE	B	N
2	↓	↓	B	↓	dmw 10.19.21				
2	250 ml	↓	A	↓					
24	60 ml	VOA	A	↓					

\* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

dmw 10.19.21









Consumers Energy Company  
Monitoring Well Sampling Worksheet

Well ID MW-15006 Date 10-21-21 Control Number 21-1280-01  
 Location JAC Well Material:  PVC  SS  Iron  Galv. Steel  
 Purge Method:  Peristaltic  Submersible  Fultz  Bailer  
 Depth to Water Tape: Geotech S/N: 1005

QC SAMPLE:  MS/MSD  DUP- Sonde ID:  11M  15H  19M  20G  21G

Depth-to-water T/PVC (ft) 35.91 Depth-To-Bottom T/PVC (ft) 37.86 Completed by CE9

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity	Notes
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU	
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	< 0.33	+/- 10%	

Stabilization parameters for the last three readings

1302							100	35.91		
1308	7.89	14.6	857	23.6	2.38	67.6	100	35.91	12.10	
1313	7.75	14.6	853	13.6	1.37	60.6	100	35.91	8.98	
1318	7.71	15.7	834	9.6	0.95	41.2	100	35.91	7.04	
1323	7.72	17.9	806	8.9	0.84	28.3	100	35.91	6.89	
1328	7.75	19.8	792	7.8	0.71	15.7	100	35.91	7.79	
1333	7.75	21.4	780	7.0	0.62	6.3	100	35.91	6.41	
1334	7.76	22.5	740	6.7	0.58	-2.5	100	35.91	5.99	
1337	7.76	22.5	782	6.6	0.57	-3.8	100	35.91	5.83	
1346	7.76	22.8	783	6.6	0.51	-4.7	100	35.91	5.72	
1349										
1417										

Total Pump Time (min) 75 Total Purge Volume (gal) : 72.0 Reviewed by: [Signature]

Weather: \_\_\_\_\_  
 Comments: \_\_\_\_\_

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____								
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N	
1	125 mL	PLASTIC	B	N	2	2-L	PLASTIC	B	N	
1	250 mL	↓	A	↓						
2	100 mL	VQA	A	↓						

\* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company  
Monitoring Well Sampling Worksheet

Well ID: MU-15007R Date: 10-21-21 Control Number: 21-1280-07  
 Location: JHC Well Material:  PVC  SS  Iron  Galv. Steel  
 Purge Method:  Peristaltic  Submersible  Fultz  Bailor  
 Depth to Water Tape: Geotech S/N: 1005

QC SAMPLE:  MS/MSD  DUP-05 Sonde ID:  11M  15H  19M  20G  21G

Depth-to-water T/PVC (ft) 37.0 Depth-To-Bottom T/PVC (ft) 42.85 Completed by CEJ

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity	Notes
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU	
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	< 0.33	+/- 10%	

Stabilization parameters for the last three readings

1050							180			
1052	7.34	17.2	715	9.4	0.90	31.0	180	37.16	34.83	
1057	7.52	17.9	<del>809</del> 709	<del>0.77</del> 0.77	0.77	-50.6	180	37.16	31.42	
1102	7.72	19.4	700	7.4	0.68	-66.8	180	37.16	20.95	
1107	7.82	19.6	693	6.7	0.62	-74.3	180	37.16	17.16	
1112	7.85	20.4	690	6.2	0.56	-79.2	180	37.16	12.59	
1117	7.88	20.3	691	5.9	0.54	-84.2	180	37.16	9.29	
1122	7.91	21.3	689	5.4	0.48	-93.0	180	37.16	6.17	
1127	7.96	20.9	685	5.0	0.45	-100.7	180	37.16	4.88	
1132	7.97	20.7	685	4.9	0.48	-104.7	180	37.16	4.25	
1137	7.97	20.7	684	4.8	0.47	-107.4	180	37.16	4.01	
1138										
1211										

Total Pump Time (min): 81 Total Purge Volume (gal): 13.8 Reviewed by: J

Weather: \_\_\_\_\_  
 Comments: \_\_\_\_\_

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125mL	PLASTIC	B	N	2	1-L	PLASTIC	B	N
1	250mL	↓	A	↓					
2	100mL	VDA	A	↓					

\* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.



Consumers Energy Company  
Monitoring Well Sampling Worksheet

Well ID JHC-mw-1500BR Date 10-21-21 Control Number 21-1280-03,-07,-08  
 Location POND A Well Material:  PVC  SS  Iron  Galv. Steel

Purge Method:  Peristaltic  Bladder Submersible  Fultz  Bailer

Depth to Water Tape: Solonist S/N: 501491

QC SAMPLE:  MS/MSD  DUP- Sonde ID:  11M  15H  19M  20G  21G

Depth-to-water T/PVC (ft) 44.04 Depth-To-Bottom T/PVC (ft) 47.38 Completed by CVT

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity	Notes
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU	
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	< 0.33	+/- 10%	

Stabilization parameters for the last three readings

1520							250	44.04		
1525	7.19	14.6	718	8.7	0.88	+82.7	250	44.04	7.40	
1530	7.19	14.6	719	9.1	0.92	+67.7	250	44.04	1.34	
1535	7.19	14.6	718	9.9	1.00	+70.1	250	44.04	0.68	
1540	7.18	14.7	717	11.1	1.13	+73.1	250	44.04	-0.29	
1545	7.18	14.7	719	9.0	0.91	+73.0	250	44.04	-0.34	
1550	7.18	14.6	719	9.7	0.98	+73.4	250	44.04	-0.27	
<del>1600</del>	7.18	14.4	719	10.0	1.01	+73.8	250	44.04	-0.20	
1600	7.18	14.4	719	9.7	0.98	+74.0	250	44.04	-0.23	
1601	collected samples									
1613	end									

Total Pump Time (min): 41 Total Purge Volume (gal): 3.0 Reviewed by: [Signature]

Weather: 55°F, rain, wind, cloudy 11-05-21

Comments: collected MS/MSD

Bottles Filled Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - \_\_\_\_\_

Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
3	125ml	plastic	B	N	1	250ml	HDPE	A	N
3	125ml	plastic	A	N					
2	60ml	VDA	A	N					
2	1L	HDPE	B	N					

\* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company  
 Monitoring Well Sampling Worksheet

Well ID JAC-MW-15009R Date 10-21-21 Control Number 21-1280-04  
 Location JAC POND A Well Material:  PVC  SS  Iron  Galv. Steel

Purge Method:  Peristaltic  Bladder Submersible  Fultz  Bailor

Depth to Water Tape: Solonist S/N: 501491

QC SAMPLE:  MS/MSD  DUP- Sonde ID:  11M  15H  19M  20G  21G

Depth-to-water T/PVC (ft) 43.80 Depth-To-Bottom T/PVC (ft) 50.67 Completed by CVT

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity	Notes
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	ft	NTU	
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	< 0.33	+/- 10%	

Stablization parameters for the last three readings

1635							300	43.92		
1645	7.15	13.6	511	25.4	2.65	-70.2	300	43.92	10.41	
1650	7.12	13.4	504	30.4	3.16	-55.8	300	43.92	6.49	
1655	7.12	13.5	502	32.3	3.36	-50.8	300	43.92	4.99	
1700	7.11	13.5	499.9	34.1	3.54	-46.7	300	43.92	0.82	
1705	7.11	13.6	499.2	35.4	3.67	-44.9	300	43.92	0.76	
1710	7.11	13.5	497.9	35.4	3.79	-42.5	300	43.92	0.51	
1711	collected samples									
1723	end									

Total Pump Time (min): 41 Total Purge Volume (gal): 3.0 Reviewed by: [Signature]

Weather: 50°F, CLOUDY, WINDY 11-05-21

Comments:

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F -								
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N	
1	125mL	Plastic	B	N	2	1-L	Plastic	B	N	
1	125mL	↓	A	↓						
1	250mL	↓	A	↓						
2	60mL	VDA	A	↓						

\* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.



Consumers Energy Company  
 Monitoring Well Sampling Worksheet

Well ID MW 150118 Date 10-21-21 Control Number 21-1280-05  
 Location JMC Well Material:  PVC  SS  Iron  Galv. Steel  
 Purge Method:  Peristaltic  Submersible  Fultz  Bailor  
 Depth to Water Tape: Geotech S/N: 1605

QC SAMPLE:  MS/MSD  DUP-  Sonde ID:  11M  15H  19M  20G  21G

Depth-to-water T/PVC (ft) 38.29 Depth-To-Bottom T/PVC (ft) 45.02 Completed by CG

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity	Notes
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU	
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	< 0.33	+/- 10%	

Stabilization parameters for the last three readings

1440							100	38.29		
1446	8.04	16.1	534	19.5	1.90	-29.2	100	38.29	31.60	
1451	8.04	16.3	518	10.5	1.02	-79.3	100	38.29	31.40	
1456	8.00	17.3	507	7.7	0.74	-108.5	100	38.29	28.32	
1501	7.97	20.1	505	7.2	0.65	-130.4	100	38.29	25.07	
1506	7.99	20.6	508	6.9	0.61	-135.8	100	38.29	22.90	
1511	8.00	20.2	510	7.4	0.67	-138.6	100	38.29	21.55	
1516	7.99	20.2	507	7.3	0.66	-137.4	100	38.29	20.46	
1521	7.99	20.5	505	7.3	0.66	-131.4	100	38.29	19.79	
1526	7.97	20.1	508	7.3	0.71	-134.8	100	38.29	14.13	
1531	7.97	19.7	508	7.3	0.69	-136.6	100	38.29	9.17	
1536	7.96	20.0	504	7.1	0.69	-134.4	100	38.29	8.20	
1541	7.97	20.1	503	7.0	0.70	-134.9	100	38.29	8.13	
1542										
1710										

Total Pump Time (min): 150 Total Purge Volume (gal): ~4.0 Reviewed by: J

Weather: \_\_\_\_\_ Date: 11-05-21

Comments: \_\_\_\_\_

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125mL	PLASTIC	B	N	2	1-L	PLASTIC	B	N
1	125mL	↓	A	↓					
1	250mL	↓	A	↓					
2	400mL	VDA	A	↓					

\* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company  
 Monitoring Well Sampling Worksheet

Well ID MW 145 Date 10-21-21 Control Number 21-1287-06  
 Location JAC Well Material:  PVC  SS  Iron  Galv. Steel

Purge Method:  Peristaltic  Submersible  Fultz  Bailor

Depth to Water Tape: protected S/N: 1005

QC SAMPLE:  MS/MSD  DUP- Sonde ID:  11M  15H  19M  20G  21G

Depth-to-water T/PVC (ft) 10.02 Depth-To-Bottom T/PVC (ft) 13.21 Completed by CEY

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity	Notes
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU	
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	< 0.33	+/- 10%	

Stabilization parameters for the last three readings

0802							200	29016.01		
0804	6.72	14.9	40.7	8.9	0.88	80.4	200	29010.09	3.20	
0809	5.63	14.8	27.6	4.5	0.46	133.1	200	29010.09	2.47	
0814	5.55	14.8	26.8	4.4	0.44	137.9	200	10.09	2.52	
0819	5.48	14.8	26.9	4.2	0.42	141.6	200	10.09	2.71	
0824	5.47	14.7	26.4	4.4	0.44	143.5	200	10.09	2.99	
0829	5.47	14.8	26.2	4.4	0.44	144.6	200	10.09	2.84	
0834	5.47	14.8	26.2	5.0	0.50	145.2	200	10.09	2.57	
0839	5.47	14.7	25.9	4.7	0.47	145.7	200	10.09	2.66	
0844	5.47	14.7	26.4	4.6	0.47	145.5	200	10.09	2.66	
0845										
0858										

Total Pump Time (min): 56 Total Purge Volume (gal): ~ 2.9 Reviewed by: [Signature]

Weather: \_\_\_\_\_ Date: 11-05-21

Comments: \_\_\_\_\_

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____								
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N	
1	125ml	HDPE	B	Y	2	1000ml	HDPE	B	N	
1		I	I	N						
1		I	A	I						
1	250ml	I	I	I						

\* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.



Consumers Energy Company  
 Monitoring Well Sampling Worksheet

Well ID 92 245 Date 10-20-21 Control Number 21-1287-07  
 Location JAC Well Material:  PVC  SS  Iron  Galv. Steel  
 Purge Method:  Peristaltic  Submersible  Fultz  Bailor  
 Depth to Water Tape: Coated S/N: 1005

QC SAMPLE:  MS/MSD  DUP- Sonde ID:  11M  15H  19M  20G  21G

Depth-to-water T/PVC (ft) 8.59 Depth-To-Bottom T/PVC (ft) 11.01 Completed by CS

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity	Notes
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU	
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	< 0.33	+/- 10%	

Stablization parameters for the last three readings

1749							200	8.79		
1851	5.98	14.9	28.5	24.6	2.47	160.9	200	8.81	3.01	
1858	5.51	14.9	31.6	12.5	1.25	128.5	200	8.81	2.81	
1801	5.50	14.9	32.5	9.8	0.99	115.0	200	8.81	2.84	
1806	5.51	14.9	33.3	8.8	0.89	103.7	200	8.81	2.96	
1811	5.54	14.9	33.7	9.4	0.99	92.0	200	8.81	3.13	
1816	5.55	14.9	33.7	10.6	1.08	89.6	200	8.81	2.97	
1821	5.57	14.9	34.7	10.7	1.09	84.5	200	8.81	2.93	
1826	5.58	15.0	34.4	11.4	1.14	81.6	200	8.81	2.92	
1827										
1840										

Total Pump Time (min): 51 Total Purge Volume (gal): ~ 2.7 Reviewed by: J 11-05-21

Weather: \_\_\_\_\_  
 Comments: \_\_\_\_\_

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125ml	ADPE	B	Y	2	1000ml	ADPE	B	Y
1	1	1	1	Y					
1	1	1	A	Y					
1	250ml	1	1	Y					

\* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.



Consumers Energy Company  
 Monitoring Well Sampling Worksheet

Well ID P2405 Date 10-20-21 Control Number 21-1287-08  
 Location JHC Well Material:  PVC  SS  Iron  Galv. Steel  
 Purge Method:  Peristaltic  Submersible  Fultz  Bailor  
 Depth to Water Tape: Good S/N: 1005  
 QC SAMPLE:  MS/MSD  DUP- Sonde ID:  11M  15H  19M  20G  21G

Depth-to-water T/PVC (ft) 11.99 Depth-To-Bottom T/PVC (ft) 17.65 Completed by CGT

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity	Notes
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU	
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	< 0.33	+/- 10%	

Stablization parameters for the last three readings

1401							200	12.06		
1403	6.36	12.9	32.3	7.6	0.80	76.4	200	12.06	3.27	
1408	5.36	12.8	<del>4.6</del> 26.4	<del>0.44</del> 4.6	0.49	136.9	200	12.06	3.12	
1413	5.24	12.8	25.4	3.6	0.38	149.3	200	12.06	3.22	
1418	5.16	12.8	24.9	3.8	0.30	166.0	200	12.06	4.21	
1423	5.14	12.7	24.5	2.6	0.28	174.0	200	12.06	4.37	
1428	5.12	12.8	24.4	2.5	0.27	178.9	200	12.06	3.95	
1433	5.11	12.8	24.3	2.5	0.27	185.5	200	12.06	3.91	
1438	5.10	12.8	24.4	2.5	0.27	188.1	200	12.06	3.61	
1451										
1504										

Total Pump Time (min): 5063 Total Purge Volume (gal): 22.5 gal Reviewed by: J 10-05-21

Weather: \_\_\_\_\_  
 Comments: \_\_\_\_\_

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125ml	ADPE	A	N	2	100ml	ADPE	B	N
1	1	1	B	N					
1	250ml	1	A	N					

\* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

# **Appendix E**

## **Nature and Extent Data Summary**

## Technical Memorandum

---

**Date:** January 28, 2022

**To:** Bethany Swanberg, Consumers Energy

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

**Project No.:** 418422.0000.0000

**Subject:** 2021 Nature and Extent Data Summary, JH Campbell Pond A, Consumers Energy, West Olive, Michigan

---

In response to the United States Environmental Protection Agency's (U.S. EPA's) Resource Conservation and Recovery Act (RCRA) Coal Combustion Residual rule ("CCR Rule") promulgated on April 17, 2015, as amended, Consumers Energy Company (Consumers Energy) has conducted groundwater monitoring at the JH Campbell (JHC) Pond A CCR Unit. During the statistical evaluation of the initial assessment monitoring event (June 2018) for Pond A, arsenic was present in one or more downgradient monitoring well(s) at statistically significant levels exceeding the Groundwater Protection Standards (GWPSs)<sup>1</sup>.

The CCR Rule 40 CFR §257.96(a) requires that an owner or operator initiate an assessment of corrective measures (ACM) to prevent further release, to remediate any releases, and to restore impacted areas to original conditions if any Appendix IV constituent has been detected at a statistically significant level exceeding a GWPS. The *Assessment of Corrective Measures (ACM)* (TRC, September 2019) was initiated on April 15, 2019 and was certified and submitted to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) on September 11, 2019 in accordance with the schedule in §257.96.

Per §257.95(g)(1), in the event that the facility determines, pursuant to §257.93(h), that there is a statistical exceedance of the GWPSs for one or more of the Appendix IV constituents, the facility must characterize the nature and extent of the release of CCR as well as any site conditions that may affect the remedy selected. The nature and extent data consist of Appendix III and IV constituents collected from the background and downgradient CCR monitoring well networks and from supplemental downgradient wells in the EGLE-approved JHC Dry Ash Landfill Hydrogeological Monitoring Plan (HMP)<sup>2</sup> monitoring network.

---

<sup>1</sup> TRC. 2019. *Statistical Evaluation of Initial Assessment Monitoring Sampling Event, JH Campbell Pond A CCR Unit, Consumers Energy Company, West Olive, Michigan*. January 14.

<sup>2</sup> Consumers Power Company. 1996. *Hydrogeological Monitoring Plan for JH Campbell Ash Storage Facility, Consumers Power Company, Solid Waste Disposal Area, Coal Ash, Type III*. September.

## Technical Memorandum

In addition to the existing HMP wells, TRC, on behalf of Consumers Energy, installed shallow and deep step out wells (MW-14S, MW-14D, PZ-23S, PZ-23D, PZ-24S, PZ-24D, PZ-40S) nested with existing downgradient wells MW-14, PZ-23, PZ-24, and PZ-40 (shallow well only) in April 2018 to further characterize the horizontal and vertical distribution of Appendix III and IV constituents in groundwater downgradient from the CCR units. Several of these monitoring wells (MW-14S, PZ-24S, PZ-40S), in addition to existing HMP monitoring well MW-13, were also incorporated into the EGLE-approved *Pond A Assessment Monitoring Plan* (Pond A AMP) (TRC, July 2019), which was developed to comply with the Michigan Part 115 program. Five shallow and deep step-out temporary monitoring wells were installed downgradient of Pond A (TW-19-04A, TW-19-04B, TW-19-05, TW-19-06A, and TW-19-06B) in June 2019. The locations of the additional downgradient step out wells are shown on Figure 1. Nature and extent sampling in 2021 included shallow step-out wells in addition to wells and parameters monitored quarterly as part of the Pond A HMP. A summary of the nature and extent groundwater data collected in 2021 are provided on Table 1. The soil boring logs and well construction diagrams for the step out monitoring wells utilized for the nature and extent groundwater sampling are included in Appendix A of the *2019 Annual Groundwater Monitoring and Corrective Action Report and Fourth Quarter 2019 Hydrogeological Monitoring Report* (TRC, January 2020).

To further delineate the extent of arsenic, Barr Engineering, on behalf of Consumers Energy, completed five soil borings (SB-21-01 to SB-21-05) to the south of Pond A from March 25 to March 26, 2021. A temporary stainless steel well screen (3 feet in length) was set two feet below the observed water table in each soil boring and grab groundwater samples were collected using a peristaltic pump. The results are consistent with other nature and extent data and show that arsenic concentrations are below the GWPS downgradient from Pond A – below the laboratory reporting limit of 1 ug/L at three of the five locations and equal to the reporting limit at the other two locations. The locations of the soil borings are shown in Figure 1. The soil boring logs and well construction diagrams are included in Attachment 1. The groundwater sample results are provided in Table 2.

As discussed in the ACM, the nature and extent of contamination (e.g. arsenic in groundwater) relative to GWPSs has been defined per the RCRA CCR Rule requirements based on the site-specific hydrogeology. The presence of nearby surface water bodies (Recirculation Pond and the Pigeon River) as well as the unimpacted background monitoring wells to the north provide the boundaries for the extent of the GWPS exceedances. This was further confirmed by the additional 2021 grab groundwater sampling data that shows arsenic is well below the GWPS at all five of the soil boring locations immediately downgradient from Pond A. In addition, the underlying clay unit prevents the downward vertical migration of groundwater. Although Michigan Part 201 residential drinking water criteria are exceeded, there are no onsite drinking water wells downgradient from Pond A and the closest downgradient drinking water wells are located south and east of the Pigeon River, separated hydraulically by the river. Shallow groundwater has the potential to vent to nearby surface water boundaries that are not used for drinking water. Several Appendix III and IV constituents exceed the Michigan Part 201 generic groundwater-surface water interface (GSI) criteria in on-site wells; however, compliance for the GSI pathway is currently met for the Appendix III and IV constituents, including arsenic, based on data collected from the step out wells/GSI monitoring wells and the National pollutant Discharge Elimination System (NPDES) outfall at the Recirculation Pond. Compliance for the GSI pathway will continue to be monitored in accordance with the EGLE-approved Pond A AMP.

# Tables

**Table 1**  
 Summary of Groundwater Sampling Results (Analytical): February 2021 - October 2021  
 JH Campbell Nature and Extent Wells – RCRA CCR Monitoring Program  
 West Olive, Michigan

		Sample Location:				MW-14S				PZ-23S				PZ-24	
		Sample Date:				2/23/2021	4/14/2021	8/17/2021	10/21/2021	2/23/2021	4/14/2021	8/17/2021	10/21/2021	4/14/2021	10/20/2021
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI <sup>^</sup>										
<b>Appendix III<sup>(1)</sup></b>															
Boron	ug/L	NC	<b>500</b>	<b>500</b>	7,200	< 20	< 20	24	< 20	34	23	44	25	177	181
Calcium	mg/L	NC	NC	NC	500 <sup>EE</sup>	2.39	2.15	2.01	2.16	--	7.64	--	6.19	26.8	16.9
Chloride	mg/L	250 <sup>**</sup>	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	< 1.00	< 1.00	1.08	1.03	--	< 1.00	--	< 1.00	1.99	1.89
Fluoride	ug/L	4,000	NC	NC	NC	< 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>	1.63	1.26	1.47	2.38	--	2.72	--	2.61	28.2	11.2
Total Dissolved Solids	mg/L	500 <sup>**</sup>	500 <sup>E</sup>	500 <sup>E</sup>	500	35	35	37	57	--	43	--	42	282	126
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>5.4</b>	<b>5.5</b>	<b>5.58</b>	<b>5.47</b>	6.8	<b>6.4</b>	6.86	6.67	6.9	7.23
<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
Arsenic	ug/L	10	10	10	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	2,000	2,000	820	11	10	11	11	--	< 5	--	< 5	20	12
Beryllium	ug/L	4	4.0	4.0	18	< 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
Chromium	ug/L	100	100	100	11	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1	1
Cobalt	ug/L	NC	40	100	100	< 6	< 6	< 6	< 6	--	< 15	--	< 6	< 15	< 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
Lead	ug/L	NC	4.0	4.0	39	< 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
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
Molybdenum	ug/L	NC	<b>73</b>	210	3,200	< 5	< 5	< 5	< 5	6	5	7	6	7	14
Radium-226	pCi/L	NC	NC	NC	NC	--	--	--	< 0.158	--	--	--	< 0.186	--	< 0.254
Radium-228	pCi/L	NC	NC	NC	NC	--	--	--	< 0.402	--	--	--	0.521	--	0.628
Radium-226/228	pCi/L	5	NC	NC	NC	--	--	--	< 0.402	--	--	--	0.538	--	0.820
Selenium	ug/L	<b>50</b>	<b>50</b>	<b>50</b>	<b>5.0</b>	< 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
<b>Additional MI Part 115<sup>(2)</sup></b>															
Iron	ug/L	<b>300<sup>**</sup></b>	<b>300<sup>E</sup></b>	<b>300<sup>E</sup></b>	500,000 <sup>EE</sup>	124	245	<b>582</b>	<b>478</b>	--	--	--	--	--	--
Copper	ug/L	1,000 <sup>**</sup>	1,000 <sup>E</sup>	1,000 <sup>E</sup>	15	< 1	< 1	< 1	< 1	--	--	--	--	--	--
Nickel	ug/L	NC	100	100	86	< 2	< 2	< 2	< 2	< 2	--	< 2	--	--	--
Silver	ug/L	100 <sup>**</sup>	34	98	0.2	< 0.2	< 0.2	< 0.2	< 0.2	--	--	--	--	--	--
Vanadium	ug/L	NC	<b>4.5</b>	62	27	< 2	< 2	< 2	< 2	< 2	--	< 2	--	--	--
Zinc	ug/L	5,000 <sup>**</sup>	2,400	5,000 <sup>E</sup>	190	< 10	< 10	< 10	< 10	--	--	--	--	--	--

**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; -- not analyzed.  
 \* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 21, 2020.  
 \*\* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.  
<sup>^</sup> - 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).  
<sup>#</sup> - 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.  
<sup>E</sup> - Criterion is the aesthetic drinking water value per footnote (E).  
 (1) 40 CFR Part 257 Appendix III Detection Monitoring Constituents and Appendix IV Assessment Monitoring Constituents.  
 (2) Per Michigan Part 115 Amendments - Public Act No. 640 of 2018 Section 11511a(3)(c) and 11519b(2) additional detection monitoring constituents (iron) and assessment monitoring constituents (copper, nickel, silver, vanadium, and zinc) are reported.  
**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 1**  
 Summary of Groundwater Sampling Results (Analytical): February 2021 - October 2021  
 JH Campbell Nature and Extent Wells – RCRA CCR Monitoring Program  
 West Olive, Michigan

		Sample Location:				PZ-24S				PZ-40		PZ-40S			
		Sample Date:				2/23/2021	4/14/2021	8/17/2021	10/20/2021	4/14/2021	10/20/2021	2/23/2021	4/14/2021	8/17/2021	10/20/2021
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI <sup>^</sup>										
<b>Appendix III<sup>(1)</sup></b>															
Boron	ug/L	NC	<b>500</b>	<b>500</b>	7,200	< 20	< 20	25	< 20	211	245	< 20	< 20	< 20	< 20
Calcium	mg/L	NC	NC	NC	500 <sup>EE</sup>	2.65	2.11	2.70	3.61	10.6	7.58	1.67	1.35	1.73	1.75
Chloride	mg/L	250 <sup>**</sup>	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	< 1.00	< 1.00	1.05	< 1.00	7.33	4.37	< 1.00	< 1.00	1.11	1.64
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
Sulfate	mg/L	250 <sup>**</sup>	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	2.22	2.14	3.09	3.85	13.5	9.63	1.70	2.17	1.92	2.05
Total Dissolved Solids	mg/L	500 <sup>**</sup>	500 <sup>E</sup>	500 <sup>E</sup>	500	51	40	37	46	90	60	45	45	46	37
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>5.4</b>	<b>5.6</b>	<b>5.27</b>	<b>5.58</b>	<b>6.3</b>	<b>6.23</b>	<b>4.9</b>	<b>5.2</b>	<b>4.97</b>	<b>5.1</b>
<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
Arsenic	ug/L	10	10	10	10	< 1	< 1	1	2	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	2,000	2,000	820	27	23	32	20	16	12	16	16	26	27
Beryllium	ug/L	4	4.0	4.0	18	< 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
Chromium	ug/L	100	100	100	11	2	1	2	2	< 1	< 1	2	1	1	1
Cobalt	ug/L	NC	40	100	100	< 6	< 6	< 6	< 6	< 15	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 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
Lithium	ug/L	NC	170	350	440	< 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
Molybdenum	ug/L	NC	<b>73</b>	210	3,200	< 5	< 5	< 5	< 5	< 5	6	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NC	NC	NC	NC	--	--	--	0.340	--	< 0.159	--	--	--	< 0.219
Radium-228	pCi/L	NC	NC	NC	NC	--	--	--	< 0.653	--	< 0.441	--	--	--	< 0.495
Radium-226/228	pCi/L	5	NC	NC	NC	--	--	--	< 0.653	--	0.541	--	--	--	< 0.495
Selenium	ug/L	<b>50</b>	<b>50</b>	<b>50</b>	<b>5.0</b>	< 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
<b>Additional MI Part 115<sup>(2)</sup></b>															
Iron	ug/L	<b>300<sup>**</sup></b>	<b>300<sup>E</sup></b>	<b>300<sup>E</sup></b>	500,000 <sup>EE</sup>	<b>451</b>	<b>359</b>	<b>768</b>	<b>1,170</b>	--	--	<b>710</b>	<b>959</b>	<b>1,390</b>	<b>476</b>
Copper	ug/L	1,000 <sup>**</sup>	1,000 <sup>E</sup>	1,000 <sup>E</sup>	15	1	< 1	1	< 1	--	--	3	4	1	< 1
Nickel	ug/L	NC	100	100	86	< 2	< 2	< 2	< 2	--	--	< 2	< 2	< 2	< 2
Silver	ug/L	100 <sup>**</sup>	34	98	0.2	< 0.2	< 0.2	< 0.2	< 0.2	--	--	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	ug/L	NC	<b>4.5</b>	62	27	2	2	3	<b>5</b>	--	--	< 2	< 2	< 2	< 2
Zinc	ug/L	5,000 <sup>**</sup>	2,400	5,000 <sup>E</sup>	190	< 10	< 10	< 10	< 10	--	--	< 10	< 10	< 10	< 10

**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; -- not analyzed.  
 \* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 21, 2020.  
 \*\* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.  
<sup>^</sup> - 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).  
<sup>#</sup> - 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.  
<sup>E</sup> - Criterion is the aesthetic drinking water value per footnote (E).  
 (1) 40 CFR Part 257 Appendix III Detection Monitoring Constituents and Appendix IV Assessment Monitoring Constituents.  
 (2) Per Michigan Part 115 Amendments - Public Act No. 640 of 2018 Section 11511a(3)(c) and 11519b(2) additional detection monitoring constituents (iron) and assessment monitoring constituents (copper, nickel, silver, vanadium, and zinc) are reported.  
**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 1**  
 Summary of Groundwater Sampling Results (Analytical): February 2021 - October 2021  
 JH Campbell Nature and Extent Wells – RCRA CCR Monitoring Program  
 West Olive, Michigan

Sample Location:						TW-19-04A			TW-19-05			TW-19-06A		
Sample Date:						4/14/2021	8/17/2021	10/20/2021	4/14/2021	8/17/2021	10/20/2021	4/14/2021	8/18/2021	10/20/2021
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^									
<b>Appendix III<sup>(1)</sup></b>														
Boron	ug/L	NC	<b>500</b>	<b>500</b>	7,200	<b>1,780</b>	<b>2,000</b>	<b>1,830</b>	107	122	186	138	185	174
Calcium	mg/L	NC	NC	NC	500 <sup>EE</sup>	63.8	67.7	74.3	57.9	54.8	66.8	22.1	25.6	27.6
Chloride	mg/L	250**	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	2.42	8.49	2.93	4.77	2.21	8.39	< 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
Sulfate	mg/L	250**	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	27.6	26.5	50.3	25.8	19.9	42.9	13.8	11.7	11.5
Total Dissolved Solids	mg/L	500**	500 <sup>E</sup>	500 <sup>E</sup>	500	276	322	352	264	219	320	106	128	125
pH, Field	SU	<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>	6.7	7.27	6.96	6.9	7.19	7.32	6.9	7.64	7.3
<b>Appendix IV<sup>(1)</sup></b>														
Antimony	ug/L	6	6.0	6.0	130	2	3	3	2	2	2	< 1	< 1	< 1
Arsenic	ug/L	10	10	10	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	2,000	2,000	820	91	110	136	18	19	28	6	7	7
Beryllium	ug/L	4	4.0	4.0	18	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	5.0	5.0	3.5	0.3	< 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
Cobalt	ug/L	NC	40	100	100	< 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
Lead	ug/L	NC	4.0	4.0	39	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	170	350	440	15	20	20	20	24	23	< 10	< 10	< 10
Mercury	ug/L	2	2.0	2.0	0.20#	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	<b>73</b>	210	3,200	<b>96</b>	<b>86</b>	72	< 5	< 5	6	30	24	16
Radium-226	pCi/L	NC	NC	NC	NC	--	--	0.338	--	--	< 0.177	--	--	< 0.188
Radium-228	pCi/L	NC	NC	NC	NC	--	--	< 0.435	--	--	< 0.399	--	--	< 0.456
Radium-226/228	pCi/L	5	NC	NC	NC	--	--	0.684	--	--	< 0.399	--	--	0.477
Selenium	ug/L	<b>50</b>	<b>50</b>	<b>50</b>	<b>5.0</b>	<b>210</b>	<b>146</b>	<b>293</b>	<b>18</b>	<b>16</b>	<b>26</b>	<b>16</b>	<b>12</b>	< 1
Thallium	ug/L	2	2.0	2.0	3.7	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
<b>Additional MI Part 115<sup>(2)</sup></b>														
Iron	ug/L	<b>300**</b>	<b>300<sup>E</sup></b>	<b>300<sup>E</sup></b>	500,000 <sup>EE</sup>	< 20	< 20	130	< 20	29	123	125	<b>332</b>	245
Copper	ug/L	1,000**	1,000 <sup>E</sup>	1,000 <sup>E</sup>	15	< 1	< 1	< 1	2	2	2	< 1	< 1	< 1
Nickel	ug/L	NC	100	100	86	< 2	< 2	< 2	< 2	3	< 2	< 2	< 2	< 2
Silver	ug/L	100**	34	98	0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	ug/L	NC	<b>4.5</b>	62	27	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Zinc	ug/L	5,000**	2,400	5,000 <sup>E</sup>	190	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10

**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; -- - not analyzed.  
 \* - 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).  
 (1) 40 CFR Part 257 Appendix III Detection Monitoring Constituents and Appendix IV Assessment Monitoring Constituents.  
 (2) Per Michigan Part 115 Amendments - Public Act No. 640 of 2018 Section 11511a(3)(c) and 11519b(2) additional detection monitoring constituents (iron) and assessment monitoring constituents (copper, nickel, silver, vanadium, and zinc) are reported.  
**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 2**  
 Summary of Groundwater Sampling Results (Analytical): March 2021  
 JH Campbell Nature and Extent Grab Groundwater Samples – RCRA CCR Monitoring Program  
 West Olive, Michigan

						Sample Location:	SB-21-01	SB-21-02	SB-21-03	SB-21-04	SB-21-05
						Sample Date:	3/26/2021	3/25/2021	3/25/2021	3/25/2021	3/25/2021
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI <sup>^</sup>						
Arsenic	ug/L	10	10	10	10	1	< 1	< 1	< 1	< 1	1
Boron	ug/L	NC	<b>500</b>	<b>500</b>	7,200	103	<b>513</b>	<b>590</b>	294	313	
Calcium	ug/L	NC	NC	NC	5.0E+05 <sup>EE</sup>	134,000	41,200	33,300	44,100	73,800	
Chloride	ug/L	2.50E+05 <sup>**</sup>	2.50E+05	2.50E+05	5.0E+05 <sup>EE</sup>	5,980	8,540	13,500	16,200	17,600	
Chromium	ug/L	100	100	100	11	1	< 1	1	1	1	
Iron	ug/L	<b>300<sup>**</sup></b>	<b>300<sup>E</sup></b>	<b>300<sup>E</sup></b>	5.0E+05 <sup>EE</sup>	<b>765</b>	292	210	241	<b>418</b>	
Lithium	ug/L	NC	170	350	440	19	< 10	< 10	< 10	11	
Molybdenum	ug/L	NC	73	210	3,200	20	16	19	12	9	
Selenium	ug/L	<b>50</b>	<b>50</b>	<b>50</b>	<b>5.0</b>	<b>24</b>	<b>21</b>	<b>2</b>	<b>8</b>	<b>76</b>	
Sulfate	ug/L	<b>2.50E+05<sup>**</sup></b>	<b>2.50E+05</b>	<b>2.50E+05</b>	5.0E+05 <sup>EE</sup>	<b>295,000</b>	105,000	69,900	96,300	129,000	
Total Dissolved Solids	mg/L	<b>500<sup>**</sup></b>	<b>500</b>	<b>500</b>	<b>500</b>	<b>776</b>	241	224	271	421	
Vanadium	ug/L	NC	<b>4.5</b>	62	27	< 2	< 2	< 2	< 2	<b>12</b>	

**Notes:**

ug/L - micrograms per liter.

mg/L - milligrams per liter.

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

NC - no criteria.

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

\*\* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR), April 2012.

<sup>^</sup> - 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}.

<sup>E</sup> - Criterion is the aesthetic drinking water value per footnote {E}.

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

**BOLD** value indicates an exceedance of one or more of the listed criteria.

**RED** value indicates an exceedance of the MCL.

All metals were analyzed as total unless otherwise specified.

# Figure







# Appendix F

## Semiannual Progress Report

January 30, 2022

Subject:

Semiannual Progress Report - Selection of Remedy  
 JH Campbell Ponds 1-2 North and 1-2 South CCR Unit  
 JH Campbell Pond A CCR Unit

This Semiannual Progress Report, prepared as a requirement of §257.97(a) of 40 CFR Parts 257 and 261, Disposal of Coal Combustion Residuals from Electric Utilities, under subtitle D of the Resource Conservation and Recovery Act (RCRA), also known as the Coal Combustion Residuals (CCR) Rule, describes progress toward selecting and designing remedies for two CCR units that triggered Assessment of Corrective Measures (ACM) under the CCR Rule at the JH Campbell Solid Waste Disposal Area: Ponds 1-2 and Pond A. Based on the schedule of self-implementation prescribed in the CCR Rule, a progress report is required to be prepared semiannually upon completion of the Assessment of Corrective Measures Report until the remedy is selected. It is noteworthy that remedy selection for the Ponds 1-2 and Pond A, prescribed by the CCR Rule, is being undertaken in coordination with a Michigan Department of Environment, Great Lakes, and Energy (EGLE) Consent Agreement 115-01-2018, which was executed on December 28, 2018.

Consumers Energy (CE) reported statistically significant exceedances above the groundwater protection standard (GWPS) for a single Appendix IV constituent, arsenic, in the *“Notification of Appendix IV Constituent Exceeding Groundwater Protection Standard per §257.95(g)”* (Consumers Energy Company, January 2019).

Unit with GWPS Exceedance	Constituent	# of Downgradient Wells Observed
Pond A	Arsenic	1 of 6
Ponds 1-2	Arsenic	2 of 5

Subsequently, the Assessment of Corrective Measures Report (TRC, September 2019) was completed on September 11, 2019 for Ponds 1-2 and Pond A.

Semi-annual progress reports have been made available on the CE public-facing website. This is the fifth semi-annual update.

## Assessment Activities

### **Ponds 1-2**

Consumers Energy has performed CCR removal at Ponds 1-2 as documented in the "*JH Campbell Generating Facility Bottom Ash Ponds 1-2 Closure Plan*," (Golder, January 2018). Following the permanent cessation of hydraulic loading, CCR removal activities were completed in October 2018. On October 22, 2019 EGLE provided written concurrence that all bottom ash had been removed from Ponds 1-2 based on multiple lines of evidence described in the approved closure work plan.

Consumers Energy continues to monitor Ponds 1-2 semiannually for Appendix III and IV constituents. Since the cessation of hydraulic loading and removal of CCR at the unit, groundwater flow direction has changed significantly and JHC-MW-15002 and JHC-MW-15003 are no longer downgradient of the former CCR unit. They will continue to be sampled as part of the assessment monitoring program to evaluate groundwater quality post-CCR removal while the use of these wells in the groundwater monitoring system is re-evaluated.

Consumers Energy conducted the first semiannual assessment monitoring event of 2021 at Ponds 1-2 on April 12 through 14, 2021 in accordance with the Sample Analysis Plan for JH Campbell Bottom Ash Ponds 1-2 and Pond 3 (SAP) (TRC, January 2021). As discussed in the Statistical Evaluation of April 2021 Assessment Monitoring Sampling Event technical memorandum (TRC, July 30, 2021) the results indicated a new statistically significant level (SSL) above the GWPS for selenium at JHC-MW-15005. The new SSL above the GWPS for selenium at JHC-MW-15005 resulted from increases in concentrations observed after the cessation of hydraulic loading at Ponds 1-2 in 2018 and an associated change in local groundwater flow. TRC developed an Alternate Source Demonstration (ASD) for the new SSL in accordance with §257.95(g)(3)(ii). The multiple lines of evidence presented in the ASD show that the SSL is from a source other than Ponds 1-2. The alternate source was determined to be a system of closed, pre-existing units licensed under Michigan solid waste rules which are adjacent to Ponds 1-2. The closed, pre-existing units are not regulated under the CCR Rule, but remedial action is being taken under Consent Agreement WMRPD No. 115-01-2018. A remedial action plan (RAP) was submitted to EGLE on September 30, 2021.

### **Pond A**

Consumers Energy closed Pond A according to the "*JH Campbell Generating Facility Pond A Closure Plan, West Olive, Michigan*" (Golder, October 2016) and an updated closure plan detailing the final cover system submitted to EGLE in February 2019. The state closure



certification as required by Paragraph 4.2 of Consent Agreement WMRPD No. 115-01-2018 was approved by EGLE on November 25, 2019.

Since the installation of the final cover, six rounds of semiannual sampling have been conducted at Pond A. In accordance with Consent Agreement 115-01-2018, a revised Hydrogeological Monitoring Plan, *Pond A Hydrogeological Monitoring Plan, JH Campbell Power Plant, West Olive, Michigan* (HMP) (TRC, March 2019; Revised July 2019) was submitted to EGLE and approved in August 2019. The Pond A well network is being sampled quarterly under the EGLE-approved HMP.

The arsenic exceedance at JHC-MW-15011 which initially triggered corrective action continues to attenuate after reaching an apparent local maximum in late 2019, immediately following the completion of the final cover for Pond A. The arsenic concentration at JHC-MW-15011R decreased to below the GWPS in third and fourth quarter 2021 and the lower confidence limit for JHC-MW-15011/R was below the GWPS in third and fourth quarter 2021.

Nature and extent near Pond A was further characterized in March 2021 by collecting soil borings and grab groundwater samples immediately downgradient of Pond A. Details of the data collected are included in Appendix E of the *2021 Annual Groundwater Monitoring and Corrective Action Report* (TRC, January 2022) to which this progress report is also appended. Arsenic was below the GWPS (10 ug/L) at all five locations and was not detectable at a reporting limit of 1 ug/L at three of the five locations.

Increases in Appendix III constituents (e.g. boron) and direct exceedances of the selenium GWPS in JHC-MW-15011, JHC-MW-15010, JHC-MW-15009, and JHC-MW-15008R that have not yet resulted in a statistically significant exceedance suggest a detectable influence from the immediately adjacent, upgradient, closed, pre-existing CCR units on-site. The closed, pre-existing units are not regulated under the RCRA CCR Rule, but remedial action is being taken under Consent Agreement WMRPD No. 115-01-2018. A RAP for these units was submitted to EGLE on September 30, 2021.

## Conclusions

### ***Ponds 1-2***

Changing constituent concentrations indicate that the system is establishing a new equilibrium following source removal. Nature and extent sampling results suggest that the GWPS exceedances do not pose an immediate threat to human health or the environment.

The ASD performed for JHC-MW-15005 demonstrates the influence of immediately adjacent, closed, pre-existing units not regulated by the CCR Rule on at least one well in the downgradient groundwater monitoring network developed for Ponds 1-2. Consumers Energy is re-evaluating the well network for Ponds 1-2 to account for the influence from the closed, pre-existing units. Continued monitoring at Ponds 1-2 is appropriate to understand the new geochemical equilibrium being established at the former unit and the influence from the adjacent alternate source.

### **Pond A**

Arsenic at JHC-MW-15011/R continues to attenuate. The last two quarters of sampling at JHC-MW-15011R were below the GWPS. Nature and extent sampling data indicate that arsenic is not detected above the GWPS immediately downgradient from Pond A.

Groundwater monitoring data since the installation of the final cover indicate an observable influence from immediately adjacent, upgradient, closed, pre-existing units. Remedial action for the upgradient units is being taken under Consent Agreement WMRPD No. 115-01-2018.

## **Remedy Selection Process**

The ACM Report identified source removal and final cover as primary corrective actions for Ponds 1-2 and Pond A, respectively, but also considered five technically feasible groundwater management alternatives to address the potential for residual arsenic.

At Ponds 1-2, continued monitoring and a re-evaluation of the well network is appropriate to account for the changed groundwater flow and equilibrium established following the primary corrective action and to evaluate the influence of the alternate source on constituent concentrations in the Ponds 1-2 well network.

Arsenic continues to attenuate at Pond A following dewatering and the installation of the final cover. Groundwater monitoring data since the implementation of the primary corrective actions indicate an observable influence from immediately adjacent, upgradient, closed, pre-existing units. A formal demonstration of this influence is being developed in 2022.

If necessary, following the source control activities, the remedy for Ponds 1-2 and Pond A will be formally selected per §257.97 once the selected option is reviewed and commented on by EGLE and a public meeting is conducted at least 30-days prior to the final selection as required under §257.96(e).

## References

Consumers Energy Company. January 14, 2019. Notification of Appendix IV Constituent Exceeding Groundwater Protection Standard per §257.95(g), JH Campbell Pond A CCR Unit.

Consumers Energy Company. January 14, 2019. Notification of Appendix IV Constituent Exceeding Groundwater Protection Standard per §257.95(g), JH Campbell Ponds 1-2 CCR Unit.

Golder Associates. October 2016. JH Campbell Generating Facility Pond A Closure Plan, West Olive, Michigan. Prepared for Consumers Energy Company.

Golder Associates. January 2018. JH Campbell Generating Facility Bottom Ash Ponds 1-2 Closure Plan, West Olive, Michigan. Prepared for Consumers Energy Company.

TRC Environmental Corporation. January 2022. 2021 Annual Groundwater Monitoring and Corrective Action Report, JH Campbell Power Plant, Pond A CCR Unit. Prepared for Consumers Energy Company.

TRC Environmental Corporation. January 2021. Sample Analysis Plan for JH Campbell Bottom Ash Ponds 1-2 and Pond 3. Prepared for Consumers Energy Company.

TRC Environmental Corporation. September 2019. Assessment of Corrective Measures, Consumers Energy Company JH Campbell Ponds 1-2 North and 1-2 South and Pond A Coal Combustion Residual Units. Prepared for Consumers Energy Company.

TRC Environmental Corporation. March 2019; Revised July 2019. Pond A Hydrogeological Monitoring Plan, JH Campbell Power Plant, West Olive, Michigan. Prepared for Consumers Energy Company