July 21, 2023 ***TRANSMITTAL VIA EMAIL 07/21/2023***

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Materials Management Division
Bay City District Office
401 Ketchum St, Suite B
Bay City, Michigan 48708

SUBJECT: Semiannual Progress Report – Selection of Final Remedy pursuant to §257.97(a)
DE Karn Bottom Ash Pond Coal Combustion Residuals (CCR) Unit

Dear Ms. Babcock,

This Semiannual Progress Report, prepared as a requirement of §257.97(a) of the Federal Coal Combustion Residual (CCR) Rule, describes progress towards selecting and implementing the final remedy for the Karn Bottom Ash Pond after the completion of the *Assessment of Corrective Measures, DE Karn Bottom Ash Pond Coal Combustion Residual Unit*, dated September 11, 2019 (Karn Bottom Ash Pond ACM) (TRC, 2019). Groundwater management alternatives considered to be technically feasible following source removal activities that could potentially address the residual arsenic under *known* groundwater conditions were identified in the report as: 1) Source removal with post-remedy monitoring, 2) Source removal with groundwater capture/control, 3) Source removal with impermeable barrier, 4) Source removal with active geochemical sequestration, and 5) Source removal with passive geochemical sequestration.

Karn Bottom Ash Pond and Landfill Closure Activities

Consumers Energy prepared and submitted to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) a closure work plan for the Karn Bottom Ash Pond (Karn Bottom Ash Pond Work Plan) and a Response Action Plan developed in accordance with Part 115 dated November 30, 2018 and March 15, 2019, respectively. These plans were developed in anticipation of supporting the Assessment of Corrective Measures that would be necessary for evaluating and selecting a final remedy for the Karn Bottom Ash Pond after Consumers Energy provided notification of exceeding Groundwater Protection Standard (GWPS) per §257.95(g) that arsenic was present at statistically significant levels above the federal GWPS in five of six downgradient wells at the Karn Bottom Ash Pond.

EGLE approved the Karn Bottom Ash Pond Work Plan on December 20, 2019 based on expectation that a report documenting the removal activities and certifying solid waste has been removed in accordance with the work plan would be submitted at the completion of activities. Consumers Energy submitted for review and approval, *D.E. Karn Generating Facility Bottom Ash Pond CCR Removal Documentation Report* (Karn Bottom Ash Pond Closure Report) on October 30, 2019 to satisfy requirements for completing the removal of solid waste so that

obtaining a solid waste operating license was unnecessary. The certification of solid waste removal was approved by EGLE on December 1, 2020. Subsequently, EGLE approved the Response Action Plan on May 14, 2020 based on submittal of the Assessment of Corrective Measures.

Closure by removal has been achieved pursuant to 324.11519b(9)(b) by documenting the removal of sources of contamination under the response action plan. However, concentrations of arsenic in groundwater exceeding the GWPS pursuant to 40 CFR 257.95(h) have persisted within the compliance monitoring well network after the source removal activities were completed. EGLE has approved a remedy consistent with R 299.4444 and R 299.4445 of the Part 115 rules through the approval of the DE Karn Hydrogeological Monitoring Plan, Rev. 03 that includes the determination of Groundwater Not in an Aquifer 0and groundwater mixing zone authorization. Additional steps needed to address residual groundwater contamination are discussed in the observations and results sections below.

Karn Bottom Ash Pond Assessment Activities for this Period

Consumers Energy instrumented the six new monitoring wells constructed within the former Karn Bottom Ash Pond area during the first week of March 2022 and the existing, certified Groundwater Monitoring System with mini-Troll™ pressure transducers that started collecting high-resolution groundwater elevation data starting on April 7 2023. These data will be summarized in the 2023 Annual Groundwater Monitoring and Corrective Action Report to be submitted in January 2024. Based on the evaluation of data from the May 2023 sampling event, the following general observations were noted:

- Groundwater flow and direction was found to confirm the lack of radial flow within the former bottom ash pond area and helped to refine the extent of the new potentiometric high;
- The Karn 1&2 Electrical Generating Units that contribute process water discharges to the unlined ditch located immediately northeast of the former bottom ash pond ceased operation on May 30, 2023; and
- The distribution of arsenic was confirmed to be below the site-specific chronic concentration of 100 ug/L at all six locations; however, several monitoring wells had arsenic observed at concentrations above the site-specific GWPS of 21 ug/L.

Results of May 2023 Sampling Event

Statistical analysis from the May 2023 semiannual groundwater monitoring event verified that the only constituent of concern that is present at statistically significant levels above the established GWPS is arsenic. Results are presented in *May 2023 Assessment Monitoring Data Summary and Statistical Evaluation Consumers Energy, DE Karn Site, Bottom Ash Pond CCR Unit* (TRC, 2023a). Additionally, monitoring performed under the Karn Groundwater Surface-Water Interface (GSI) Compliance Plan

demonstrates protection of human health and the environment with criteria determined to be protective at the point of exposure. These results are presented in the *Second Semiannual 2023 Nature and Extent Data Summary, DE Karn Bottom Ash Pond, Consumers Energy* (N&E Summary) (TRC, 2023b).

Significant observations from the event summaries are as follows:

- Groundwater potentiometric surface within the area of the former Karn Bottom Ash Pond exhibits flow primarily moving west towards the intake channel, or south towards the Karn Generating Plant rather than radially from within the pond area;
- Regionally, radial flow is observed with a new "high" point shifted to the east of the former Karn Bottom Ash Pond geographically centered between monitoring wells DEK-MW-15003 and OW-12;
- Based on changes in the groundwater potentiometric surface, Monitoring Wells DEK-MW-15003 and DEK-MW-15004 are no longer downgradient from the CCR unit and indicative of determining attainment of GWPS for arsenic or detecting new releases from the former Karn Bottom Ash Pond;
- No additional Appendix IV constituents have been observed at statistically significant levels above GWPS for the Karn Bottom Ash Pond groundwater monitoring system;
- Redox conditions continue to demonstrate that groundwater redox chemistry equilibrium is continuing to shift back to pre-source removal conditions as reflected in the trends for dissolved oxygen reverting back to primarily anoxic concentrations (e.g. less than 0.5 mg/L) and electrical potential primarily returning to negative potential; and
- Arsenic concentrations at DEK-MW-15002 has a statistically significant decreasing trend based on the previous eight events and arsenic concentrations have been below the GWPS since April 2019.

Conclusions

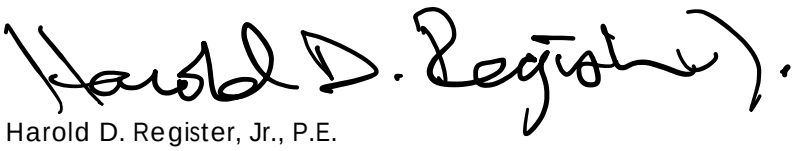
Source removal activities for the Karn Bottom Ash Pond have been completed and documented in the Karn Bottom Ash Pond Closure Report submitted to EGLE on October 30, 2019. Improvements in groundwater quality have been observed in the groundwater monitoring system, but observations of ongoing changes in groundwater potentiometric surface that may influence groundwater flow characteristics and/or alter groundwater redox conditions at monitoring locations that could influence constituent concentrations, still require further evaluation before a final remedy can be selected. To aid in the further evaluation, Consumers Energy installed six additional monitoring wells within the former Karn Bottom Ash Pond area that were integrated into the 2022 sampling schedule. Additionally, these groundwater monitoring wells have been instrumented with mini-Trolls™ that measure the groundwater elevation to a calibrated datum on frequent basis to better understand the relationships between groundwater elevation and potential flux. Subsequent sampling events to include the

additional monitoring wells will inform the on-going improvements and retention of monitoring-only, passive, or active remedial options following the source removal. As conditions continue to be evaluated post-source removal, the drinking water and groundwater-surface water interface (GSI) pathway are protected by quarterly monitoring performed under the Michigan-approved hydrogeological monitoring plan that includes a GSI Compliance Monitoring Program.

The final remedy for the Karn Bottom Ash Pond will be formally selected per §257.97 and Michigan Solid Waste requirements 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).

The next semiannual progress report will be submitted in six months by January 31, 2024. Please feel free to contact me with any questions or clarifications.

Sincerely,



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Enclosure: *May 2023 Assessment Monitoring Data Summary and Statistical Evaluation Consumers Energy, DE Karn Site, Bottom Ash Pond CCR Unit*. (TRC, July 29, 2023a).

First Semiannual 2023 Nature and Extent Data Summary, DE Karn Bottom Ash Pond, Consumers Energy. (TRC, July 29, 2023b).

Enclosures

May 2023 Assessment Monitoring Data Summary and Statistical Evaluation

DE Karn, Bottom Ash Pond CCR Unit

Essexville, Michigan

July 2023

Prepared For:

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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), as amended. Standards for groundwater monitoring and corrective action codified in the CCR Rule (40 CFR 257.90 – 257.98) apply to the DE Karn Bottom Ash Pond CCR Unit (Karn Bottom Ash Pond).

Consumers Energy is continuing semiannual assessment monitoring in accordance with §257.95 of the CCR Rule for the Karn Bottom Ash Pond located in Essexville, Michigan. This report has been prepared to provide the summary of the May 2023 assessment groundwater monitoring results, data quality review, and statistical data evaluation for the Karn Bottom Ash Pond groundwater monitoring system.

1.1 Program Summary

Groundwater monitoring for the Karn Bottom Ash Pond commenced after the installation of the monitoring well network in December 2015 to establish background conditions. Detection monitoring was initiated on October 17, 2017 in conformance with the self-implementing schedule in the CCR Rule.

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

- Boron at DEK-MW-15001, DEK-MW-15002, DEK-MW-15003, DEK-MW-15004, DEK-MW-15005, DEK-MW-15006;
- Fluoride at DEK-MW-15001;
- Field pH at DEK-MW-15001, DEK-MW-15002, DEK-MW-15003, DEK-MW-15005, DEK-MW-15006; and
- Sulfate at DEK-MW-15006.

On April 25, 2018, Consumers Energy entered assessment monitoring upon determining that an Alternate Source Demonstration for the Appendix III constituents was not successful. After subsequent sampling for Appendix IV constituents, Consumers Energy provided notification that arsenic was present at statistically significant levels above the Ground Water Protection Standards (GWPS) established at 21 ug/L (Consumers Energy, January 2019) in five of the six downgradient monitoring wells at the Karn Bottom Ash Pond as follows:

- Arsenic at DEK-MW-15001, DEK-MW-15002, DEK-MW-15003, DEK-MW-15004, and DEK-MW-15005.

The notification of the GWPS exceedance on January 14, 2019 was followed up with a Response Action Plan submitted to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) on March 15, 2019 laying out the preliminary understanding of water quality and

actions that were underway to mitigate or eliminate unacceptable risk associated with the identified release from the CCR unit. The *Assessment of Corrective Measures* (ACM) (TRC, September 2019) was initiated on April 14, 2019 and submitted on September 11, 2019 in accordance with the schedule in §257.96 and the requirements of the Response Action Plan.

The ACM documents that the groundwater nature and extent has been defined, as required in §257.95(g)(1). Although arsenic concentrations exceed the GWPS in on-site groundwater monitoring locations, arsenic is delineated within the limits of the property owned by Consumers Energy and there are **currently no adverse effects on human health or the environment** from either surface water or groundwater due to CCR management at the Karn Bottom Ash Pond. Per §257.96(b), Consumers Energy is continuing to monitor groundwater in accordance with the assessment monitoring program as specified in §257.95.

Evaluation of groundwater under the CCR Rule focused on the following constituents that were collected *unfiltered* in the field:

CCR Rule Monitoring Constituents

Appendix III	Appendix IV	
Boron	Antimony	Mercury
Calcium	Arsenic	Molybdenum
Chloride	Barium	Radium 226/228
Fluoride	Beryllium	Selenium
pH	Cadmium	Thallium
Sulfate	Chromium	
Total Dissolved Solids (TDS)	Cobalt	
	Fluoride	
	Lead	
	Lithium	

Prior to remedy selection, Consumers Energy will also collect a sufficient number of samples to evaluate Michigan state-specific constituents as follows:

Additional Monitoring Constituents (Michigan Part 115/PA 640)

Detection Monitoring	Assessment Monitoring
Iron	Copper
	Nickel
	Silver
	Vanadium
	Zinc

Consumers Energy will continue to evaluate corrective measures for the Karn Bottom Ash Pond per §257.96 and §257.97 and is continuing semiannual assessment monitoring in accordance with §257.95.

1.2 Site Overview

The Karn Bottom Ash Pond is located within the DE Karn Power Plant site, which is located north of the JC Weadock Power Plant, east of the Saginaw River, south and west of Saginaw Bay (Figure 1). Two coal-fired power generating units (Karn Units 1 & 2) began generating electricity in 1958 and 1959, respectively. Karn Units 3 & 4, co-located with the coal-fired generating units, are oil- and natural gas-fueled. Two other areas of coal ash management within the Karn site are the Karn Landfill and the Karn Lined Impoundment. The Karn Landfill has been certified closed and is now in post-closure care and is being monitored in accordance with the EGLE-approved *Hydrogeological Monitoring Plan, Rev. 3, DE Karn Solid Waste Disposal Area* (December 19, 2017). The Karn Lined Impoundment has been licensed to operate by the EGLE under Part 115 (License Number 9629) and is being monitored in accordance with the EGLE-approved *Karn Lined Impoundment Hydrogeological Monitoring Plan* (November 13, 2020). The locations of the Karn Landfill, the Karn Lined Impoundment, and the Karn Bottom Ash Pond are shown on Figure 2.

Previously, the Karn Bottom Ash Pond was used for wet ash dewatering and was the primary settling/detention structure for the National Pollutant Discharge Elimination System (NPDES) treatment system prior to discharge. Consumers Energy provided notification of initiation of closure on October 12, 2018 to implement the certified closure plan by removal of CCR under the self-implementing requirements and schedule of the CCR Rule. In preparation for removal of the Karn Bottom Ash Pond, a new lined impoundment (Karn Lined Impoundment) was constructed meeting the requirements of the CCR Rule and the operational needs at the Karn Power Plant. The Karn Lined Impoundment began receipt of CCR and non-CCR on June 7,

[1] 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). The December 2018 amendments to Part 115 were developed to provide the State of Michigan oversight of CCR impoundments and landfills and to better align existing state solid waste management rules and statutes with the CCR Rule.

2018 when it replaced the Karn Bottom Ash Pond operations.

Consumers Energy has completed the removal of CCR consistent with the timeline for closure of the Karn Bottom Ash Pond under the *DE Karn Bottom Ash Pond Closure Plan* (Golder, January 2018; Revised April 2018) and the CCR Rule's closure by removal provisions in §257.102(c). Consumers Energy ceased hydraulic loading to the Karn Bottom Ash Pond in June 2018 and allowed the area to dewater by gravity. Consumers Energy then operated a construction dewatering system to allow for excavation of the vertical and lateral extent of CCR that commenced on March 20, 2019 and has operated through the construction and restoration period. The excavation extended to six inches below known CCR elevations established from previous investigations. Excavated CCR has been placed in the neighboring Weadock Landfill that is constructed with of a fully encapsulation soil-bentonite slurry wall keyed into a competently confining clay unit. The Karn Bottom Ash Pond has been restored by backfilling and grading the surface with clean fill in accordance with the plan to promote stormwater drainage, minimize ponding of surface water, and to reduce the potential of infiltration and migration of residual arsenic and any future constituents of concern (COCs). With the CCR removal complete, Consumers Energy submitted the *DE Karn Generating Facility Bottom Ash Pond CCR Removal Documentation Report* (Golder, October 2019) on October 30, 2019. EGLE approved the documentation removal report on December 1, 2020. Groundwater conditions post-CCR removal continue to be monitored.

1.3 Geology/Hydrogeology

The majority of the Karn Bottom Ash Pond area is comprised of surficial CCR and sand fill. USGS topographic maps and aerial photographs dating back to 1938, in addition to field descriptions of subsurface soil at the site, indicate that the site was largely developed by reclaiming low-lands through construction of perimeter dikes and subsequent ash filling (AECOM, 2009).

The surficial fill consists of a mixture of varying percentages of ash, sand, and clay-rich fill ranging from 5 to 15 feet thick. Below the surficial fill, native alluvium and lacustrine soils are present at varying depths. Generally, there is a well graded sand unit present to depths of 10 to 30 feet below ground surface (ft bgs) overlying a clay till which is observed at depths ranging from 25 to 75 ft bgs. In general, the alluvium soils (sands) are deeper along the Saginaw River and there are shallower lacustrine deposits (clays, silts and sands deposited in or on the shores of glacial lakes) at other areas. The clay till acts as a hydraulic barrier that separates the shallow groundwater from the underlying sandstone. A sandstone unit, which is part of the Saginaw formation, was generally encountered at 80 to 90 ft bgs.

The DE Karn Power Plant site is bounded by several surface water features (Figure 1): the Saginaw River to the west, Saginaw Bay (Lake Huron) to the north and east, and a discharge channel to the south. In general, shallow groundwater is encountered at a similar or slightly higher elevation relative to the surrounding surface water features. Groundwater flow in the upper aquifer is largely controlled by the surface water elevations of Saginaw River and Saginaw Bay. In the vicinity of the Karn Bottom Ash Pond, the shallow groundwater flow is generally to the west, toward the intake channel.

2.0 Groundwater Monitoring

2.1 Monitoring Well Network

In accordance with 40 CFR 257.91, Consumers Energy established a groundwater monitoring system for the Karn Bottom Ash Pond, which consists of 10 monitoring wells (four background monitoring wells and six downgradient monitoring wells) that are screened in the uppermost aquifer. The monitoring well locations are shown on Figure 2.

Groundwater around the Karn Bottom Ash Pond was initially characterized as radial based on the eight initial background sampling events prior to commencing detection monitoring; therefore, the six downgradient wells (DEK-MW-15001 through DEK-MW-15006) that were installed and spaced along the circumference of the Karn Bottom Ash Pond continued to accurately represent the quality of groundwater passing the waste boundary that ensures detection of groundwater contamination such that all potential contaminant pathways are monitored. Monitoring well DEK-MW-15001 was decommissioned on April 18, 2018 due to the installation of the new Karn Lined Impoundment, which is a new double composite lined CCR unit constructed as a replacement to the Karn Bottom Ash Pond. Monitoring well DEK-MW-18001 was installed on May 21, 2018 approximately 80 feet southeast of DEK-MW-15001 to maintain the perimeter downgradient monitoring well network.

Groundwater flow direction near the former pond has changed as a result of the pond decommissioning and monitoring wells DEK-MW-15003 and DEK-MW-15004 are no longer located downgradient of the unit (Figure 3). These two wells were removed from the certified downgradient monitoring well network. The recertification was included in Appendix D of the *October 2021 Assessment Monitoring Data Summary and Statistical Evaluation* (TRC, January 2022).

Four monitoring wells located south of the Karn Bottom Ash Pond on the JC Weadock Power Plant site provide data on background groundwater quality that has not been affected by the CCR unit (MW-15002, MW-15008, MW-15016, and MW-15019). Analysis for the establishment of these wells as background is detailed in the *Groundwater Statistical Evaluation Plan* for the Karn Bottom Ash Pond, dated October 17, 2017.

2.2 May 2023 Assessment Monitoring

Per §257.95, all wells in the CCR unit groundwater monitoring program must be sampled semiannually. TRC conducted the first semiannual assessment monitoring event of 2023 for Appendix III and IV constituents at the Karn Bottom Ash Pond CCR Unit in accordance with the *DE Karn Monitoring Program Sample Analysis Plan* (ARCADIS, May 2016) (SAP). The semiannual assessment monitoring event was performed on May 1st 3 through 3, 2023.

The May 2023 sampling event included collection of static water level measurements from the Karn Bottom Ash Pond groundwater monitoring system and other site wells to support preparation of a groundwater contour map. Static water elevation data are summarized in Table 1 and groundwater elevation data are shown on Figure 3. The Karn Bottom Ash Pond monitoring wells (DEK-MW-15002, DEK-MW-15005, DEK-MW-15006 and DEK-MW-18001) and

background monitoring wells (MW-15002, MW-15008, MW-15016, and MW-15019) were purged with peristaltic pumps utilizing low-flow sampling methodology. Field parameters were stabilized at each monitoring well prior to collecting groundwater samples. Stabilized field parameters for each monitoring well are summarized in Table 2.

The groundwater samples were analyzed by the Consumers Energy Trail Street Laboratory for Appendix III and IV constituents in accordance with the SAP. Radium analyses were completed by Eurofins Environment Testing. The analytical results for the background wells are summarized in Table 3, and the analytical results for the downgradient monitoring wells are summarized in Table 4. Analytical results from the May 2023 monitoring event are included in the attached laboratory reports (Appendix C).

2.2.1 Groundwater Flow Rate and Direction

Groundwater elevation data collected during the May 2023 assessment monitoring event are provided in Table 1. These data were used to construct the groundwater contour map (Figure 3). Groundwater elevations measured at the site in May 2023 are generally within the range of 578 to 587 feet above mean sea level (ft NAVD88) and groundwater is typically encountered at equal elevation relative to the surrounding surface water features measured by the NOAA gauging station or within approximately 6 feet higher, flowing toward the bounding surface water features.

Although historically the point source discharge of sluiced bottom ash into the Karn Bottom Ash Pond created localized mounding of the potentiometric surface, the new Karn Lined Impoundment went into service on June 7, 2018 and has been continuously collecting the process water and bottom ash that went into the former bottom ash pond. Since the former bottom ash pond is no longer being hydraulically loaded with sluiced ash and has been dewatered by gravity, the characteristic groundwater mound centered within the former surface pool area is no longer present. The groundwater elevation data collected from the groundwater monitoring system of the former Karn Bottom Ash Pond in May 2023demonstrate a reduction in groundwater elevation measurements by several feet when compared to groundwater elevations measured prior to June 2018. Due to the operational changes of the bottom ash pond and the completion of the landfill capping activities, the gradient between the bottom ash pond area and the surrounding surface water bodies is flattening out as compared to previous quarters as the groundwater elevations are reaching a new equilibrium, as expected. Groundwater at the Site is locally influenced by incidental infiltration from precipitation over the uncovered acreage and the unlined low volume miscellaneous wastewater conveyance associated with the permitted NPDES discharge system, which is located just north of the Karn Lined Impoundment. Monitoring Wells OW-11, OW-12, and DEK-MW-15003 delineate the newly established groundwater elevation high point with porewater flow generally flowing radially towards the adjacent surface water features from this newly established potentiometric “high”, as illustrated in Figure 3. As such, the groundwater flow across the footprint of the former bottom ash pond is generally to the west.

The average hydraulic gradient observed on May 1, 2023 in the Karn Bottom Ash Pond area during these events is estimated at 0.0054 ft/ft. The gradient was calculated using the monitoring well pairs DEK-MW-15004/DEK-MW-15005 and DEK-MW-15003/DEK-MW-15006. Using the mean hydraulic conductivity of 15 ft/day (ARCADIS, 2016) and an assumed effective porosity of 0.3, the estimated average seepage velocity was 0.27 ft/day or 98 ft/year.

2.2.2 Data Quality

Analytical data were found to be usable for assessment monitoring and were generally consistent with previous sampling events. The Data Quality Reviews are included as Appendix A.

3.0 Assessment Monitoring Statistical Evaluation

Assessment monitoring is continuing at the Karn Bottom Ash Pond while Consumers Energy further evaluates corrective measures in accordance with §257.96 and §257.97 as outlined in the ACM. The following section summarizes the statistical approach applied to assess the May 2023 groundwater data in accordance with the assessment monitoring program.

3.1 Establishing Groundwater Protection Standards

The GWPSs are used to assess whether Appendix IV constituent concentrations are present in groundwater at unacceptable levels as a result of CCR Unit operations by statistically comparing concentrations in the downgradient wells to the GWPSs for each Appendix IV constituent. In accordance with §257.95(h) and the Stats Plan, GWPSs were established for the Appendix IV constituents following the preliminary assessment monitoring event as documented in the Groundwater Protection Standards technical memorandum (Appendix C of the *2018 Annual Groundwater Monitoring Report,* TRC, January 2019). The GWPS is established as the higher of the EPA Maximum Contaminant Level (MCL) or statistically derived background level for constituents with MCLs and the higher of the EPA Regional Screening Levels (RSLs) or background level for constituents without an established MCL.

3.2 Data Comparison to Groundwater Protection Standards

The compliance well groundwater concentrations for Appendix IV constituents were compared to the GWPSs to determine if a statistically significant exceedance had occurred in accordance with §257.95. 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 monitoring well data exceeds the GWPS of any Appendix IV constituent. 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 federal GWPS in five of the six downgradient wells at the Karn Bottom Ash Pond.

Confidence intervals were established per the statistical methods detailed in the *Statistical Evaluation of May 2023 Assessment Monitoring Sampling Event* technical memorandum provided in Appendix B. For each Appendix IV constituent, the concentrations were first compared directly to their respective GWPS. Constituent-well combinations that included a direct exceedance of the GWPSs were retained for further statistical analysis using confidence limits.

Due to changes in groundwater flow direction on site, monitoring wells DEK-MW-15003 and DEK-MW-15004 are no longer located downgradient of the unit and were determined to be no longer indicative of groundwater conditions influenced by the Karn Bottom Ash Pond. Therefore, monitoring wells DEK-MW-15003 and DEK-MW-15004 are no longer included for assessment monitoring statistical analysis. The monitoring well network for statistical evaluation consists of the four monitoring wells located downgradient of the bottom ash pond (DEK-MW-15002, DEK-MW-15005, DEK-MW-15006, and DEK-MW-18001). Overall, the assessment

monitoring statistical evaluations have confirmed that arsenic is the only Appendix IV constituent present at statistically significant levels above the GWPS. The statistical evaluation of the May 2023 semiannual assessment monitoring event data indicate that arsenic is present at statistically significant levels exceeding the GWPS in downgradient monitoring wells at the Karn Bottom Ash Pond:

Constituent	GWPS	#Downgradient Wells Observed
Arsenic	21 ug/L	2 of 4

Previously, arsenic was present in downgradient well DEK-MW-15002 and DEK-MW-15006 at a statistically significant level; however, arsenic concentrations have declined since sluicing to the Karn Bottom Ash Pond ceased in June 2018 and the bottom ash and transport water was diverted to the Karn Lined Impoundment (Appendix B: Attachment 1). The statistical evaluation of the April 2019 through May 2023 data show that the lower confidence limit for arsenic is below the GWPS at DEK-MW-15002 and DEK MW-15006.

Concentrations of arsenic at DEK-MW-18001 have decreased since loading to the Karn Bottom Ash Pond ceased; however, arsenic remains above the GWPS at a statistically significant level. Arsenic at DEK-MW-15005 also remain above the GWPS at a statistically significant level. A summary of the confidence intervals for May 2023 is provided in Table 5. Although arsenic is present above the GWPS, the drinking water pathway is not complete as there are no drinking water wells on-site. Redox conditions, which affect contaminant transport, are still stabilizing in the Bottom Ash Pond Area following removal activities and will continue to be evaluated further.

4.0 Conclusions and Recommendations

Corrective action has been triggered and assessment monitoring is ongoing at the Karn Bottom Ash Pond CCR unit. A summary of the May 2023assessment monitoring event is presented in this report.

Overall, the statistical assessments have confirmed that arsenic is the only Appendix IV constituent present at statistically significant levels above the GWPS. Consumers Energy has completed the removal of CCR consistent with the timeline for closure of the Karn Bottom Ash Pond under the *DE Karn Bottom Ash Pond Closure Plan* (Golder, January 2018; Revised April 2018) and the CCR Rule's closure by removal provisions in §257.102(c).

The ACM Report provided a high-level assessment of groundwater remediation technologies that could potentially address site-specific COCs (i.e., arsenic) under known groundwater conditions. Groundwater chemistry appears to be improving in some areas as a result of discontinuing the hydraulic loading to the Karn Bottom Ash Pond and the completed source removal of CCR, as shown by the decreasing concentration of arsenic at DEK-MW-15002 ; however, attainment of the GWPS at all of the Bottom Ash Pond compliance wells may not be feasible due to influences other than the former pond, such as the presence and former operation of the nearby Karn Landfill. Redox conditions, which affect contaminant transport, are still stabilizing following pond removal and will continue to be evaluated further.

Consumers Energy will continue assessment monitoring and evaluate corrective measures in accordance with §257.96 and §257.97 as outlined in the Karn Bottom Ash Pond ACM. The groundwater management remedy for the Karn Bottom Ash Pond will be selected as soon as feasible to meet the federal standards of §257.96(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 monitoring event is tentatively scheduled for the fourth calendar quarter of 2023.

5.0 References

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TRC. January 2022. October 2021 Assessment Monitoring Data Summary and Statistical Evaluation – DE Karn Power Plant, Bottom Ash Pond CCR Unit. Prepared for Consumers Energy Company.

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

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

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

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

Tables

Table 1
Summary of Groundwater Elevation Data
DE Karn – RCRA CCR Monitoring Program
Essexville, Michigan

Well Location	TOC Elevation (ft)	Geologic Unit of Screen Interval	Screen Interval Elevation (ft)	May 1, 2023	
				Depth to Water (ft BTOC)	Groundwater Elevation (ft)
DEK Bottom Ash Pond					
DEK-MW-15002	590.87	Sand	578.3 to 575.3	6.35	584.52
DEK-MW-15005	589.72	Sand	572.3 to 567.3	9.90	579.82
DEK-MW-15006	589.24	Sand	573.0 to 568.0	9.44	579.80
DEK Bottom Ash Pond & Karn Lined Impoundment					
DEK-MW-18001	593.47	Sand	579.2 to 574.2	8.89	584.58
Karn Lined Impoundment					
DEK-MW-15003	602.74	Sand	578.8 to 574.8	16.90	585.84
OW-10	591.58	Silty Sand and Silty Clay	576.0 to 571.0	7.08	584.50
OW-11	607.90	Silt/Fly Ash	587.5 to 582.5	22.30	585.60
OW-12	603.10	Silty Sand	584.2 to 579.2	17.14	585.96
DEK Nature and Extent					
DEK-MW-15004	611.04	Sand	576.6 to 571.6	28.25	582.79
MW-01	597.02	Sand	573.0 to 570.0	17.20	579.82
MW-03	597.30	Sand	569.8 to 566.8	17.58	579.72
MW-06	589.44	Sand and Silty Sand	578.5 to 563.5	9.44	580.00
MW-08	598.78	Sand and Silty Clay	580.9 to 570.9	17.68	581.10
MW-10	596.97	Sand	582.5 to 572.5	16.75	580.22
MW-12	598.60	Sand	583.9 to 573.9	18.63	579.97
MW-14	594.37	Sand and Silty Clay	584.7 to 574.7	14.55	579.82
MW-16	595.80	Sand and Sand/Bottom Ash	584.1 to 574.1	16.14	579.66
MW-22	598.99	Ash/Sand	571.4 to 568.4	16.81	582.18
MW-23	595.57	Ash/Sand	576.9 to 571.9	13.90	581.67
DEK Static Water Level					
MW-02	597.34	Sand and Silty Clay	572.5 to 567.5	17.50	579.84
MW-04	598.01	NR	569.5 to 564.5	18.30	579.71
MW-17	597.91	Sand	577.0 to 574.0	13.42	584.49
MW-18	609.22	Silty Sand and Silty Clay	575.8 to 573.8	25.90	583.32
MW-19	597.28	NR	572.1 to 567.1	19.15	578.13
MW-20	632.75	Sand	582.3 to 579.3	52.67	580.08
MW-21	632.91	Sand	587.1 to 584.1	51.10	581.81
OW-01	631.33	NR	572.5 to 567.5	51.14	580.19
OW-02	598.01	Fly Ash	579.4 to 576.4	15.70	582.31
OW-03	597.94	Fly Ash and Sand	573.6 to 568.6	17.18	580.76
OW-04	590.21	Sand and Bottom/Fly Ash	579.1 to 574.1	10.40	579.81
OW-05	593.53	Sand	576.9 to 571.9	15.00	578.53
OW-06	603.95	NR	580.9 to 575.9	17.20	586.75
OW-07	596.41	Ash	583.3 to 580.3	15.11	581.30
OW-08	593.93	NR	581.0 to 576.0	10.88	583.05
OW-09	593.45	NR	585.5 to 580.5	10.33	583.12
OW-13	588.52	NR	579.5 to 574.5	3.86	584.66
OW-15	587.75	NR	572.8 to 567.8	3.40	584.35

Notes:

Survey data from: Rowe Professional Services Company (Nov. 2015) and Consumers Energy Company drawings: SG-21733, Sheet 1, Rev. G (Karn, 11/27/18); and SG=21733, Sheet 2, Rev. C (Weadock, 11/27/18).

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.

NR: Not Recorded

Table 2
Summary of Field Parameters
DE Karn Bottom Ash Pond – RCRA CCR Monitoring Program
Essexville, Michigan

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (SU)	Specific Conductivity (umhos/cm)	Temperature (°C)	Turbidity (NTU)
Background							
MW-15002	5/1/2023	0.48	-80.3	7.2	413	9.0	3.1
MW-15008	5/1/2023	0.22	-106.3	6.6	1,032	9.0	8.9
MW-15016	5/2/2023	0.37	-43.9	6.9	914	8.1	3.0
MW-15019	5/1/2023	0.49	-99.3	6.6	1,457	8.1	3.5
Karn Bottom Ash Pond							
DEK-MW-15002	5/2/2023	0.39	-135.9	7.2	936	9.1	2.9
DEK-MW-15005	5/2/2023	0.31	-106.4	7.4	830	9.3	2.9
DEK-MW-15006	5/2/2023	0.33	-131.4	7.5	888	9.9	2.1
DEK-MW-18001	5/3/2023	0.19	-228.5	7.6	858	9.6	9.9

Notes:

mg/L - Milligrams per Liter.

mV - Millivolts.

SU - Standard units.

umhos/cm - Micromhos per centimeter.

°C - Degrees Celsius

NTU - Nephelometric Turbidity Unit.

Table 3
Summary of Groundwater Sampling Results (Analytical)
DE Karn & JC Weadock Background – RCRA CCR Monitoring Program
Essexville, Michigan

					Sample Location:	**MW-15002**	**MW-15008**	**MW-15016**	**MW-15019**
					Sample Date:	5/1/2023	5/1/2023	5/1/2023	5/1/2023
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	Background			
Appendix III[(1)]									
Boron	ug/L	NC	500	500	4,000	< 20	107	347	211
Calcium	mg/L	NC	NC	NC	500[EE]	48.4	108	175	159
Chloride	mg/L	**250****	**250[E]**	**250[E]**	**50**	**64.5**	**259**	**106**	**302**
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	**250****	**250[E]**	**250[E]**	500[EE]	14.9	10.5	**253**	94.2
Total Dissolved Solids	mg/L	**500****	**500[E]**	**500[E]**	**500**	351	**877**	**889**	**1,170**
pH, Field	SU	6.5 - 8.5**	6.5 - 8.5[E]	6.5 - 8.5[E]	6.5 - 9.0	7.2	6.6	6.9	6.6
Appendix IV[(1)]									
Antimony	ug/L	6	6.0	6.0	2.0	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	10	10	10	< 1.0	1	2	1
Barium	ug/L	2,000	2,000	2,000	1,200	63	71	58	317
Beryllium	ug/L	4	4.0	4.0	33	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	5.0	5.0	2.5	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	100	100	11	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	40	100	100	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	4.0	4.0	14	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	170	350	440	< 10	24	64	13
Mercury	ug/L	2	2.0	2.0	0.20#	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	73	210	120	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NC	NC	NC	NC	< 0.183	< 0.249	< 0.127	0.31
Radium-228	pCi/L	NC	NC	NC	NC	< 0.547	< 1.16	< 1.01	< 0.859
Radium-226/228	pCi/L	5	NC	NC	NC	< 0.547	< 1.16	< 1.01	< 0.859
Selenium	ug/L	50	50	50	**5.0**	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	2.0	2.0	2.0	< 2	< 2	< 2	< 2
Additional MI Part 115[(2)]									
Iron	ug/L	**300****	**300[E]**	**300[E]**	500,000[EE]	**729**	**17,900**	**1,970**	**21,500**
Copper	ug/L	1,000**	1,000[E]	1,000[E]	20	1	< 1.0	< 1.0	< 1.0
Nickel	ug/L	NC	100	100	120	< 2	2	6	3
Silver	ug/L	100**	34	98	0.2	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	ug/L	NC	**4.5**	62	27	< 2	**5**	< 2	< 2
Zinc	ug/L	5,000**	2,400	5,000[E]	260	< 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 hardness of 258 mg CaCO3/L (average of SW-01 [Lake Huron] and SW-02 [Saginaw River] collected in April 2018) per footnote {G} of Michigan Part 201 criteria tables. Chromium GSI criterion based on hexavalent chromium per footnote {H}. GSI criterion is protective for surface water used as a drinking water source as described in footnote {X}. GSI criterion for chloride is 50 mg/L when the discharge is to the Great Lakes or connecting waters per footnote {FF}
# - 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 Amendment - Public Act No. 640 of 2018 Section 11511a(3)(c) and 11519b(2) addtional detection monitoring constituent (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)
JC Weadock Bottom Ash Pond – RCRA CCR Monitoring Program
Essexville, Michigan

					Sample Location:	JCW-MW-15007	JCW-MW-15009	JCW-MW-15010	JCW-MW-15028
					Sample Date:	5/2/2023	5/2/2023	5/2/2023	5/2/2023
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^				
Appendix III[(1)]									
Boron	ug/L	NC	**500**	**500**	4,000	212	170	**1,100**	**508**
Calcium	mg/L	NC	NC	NC	**500[EE]**	207	**526**	199	198
Chloride	mg/L	**250****	**250[E]**	**250[E]**	**50**	**1,810**	36.2	25	**1,110**
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	**250****	**250[E]**	**250[E]**	**500[EE]**	175	**1,490**	**273**	122
Total Dissolved Solids	mg/L	**500****	**500[E]**	**500[E]**	**500**	**3,630**	**2,260**	**936**	**2,520**
pH, Field	SU	**6.5 - 8.5****	**6.5 - 8.5[E]**	**6.5 - 8.5[E]**	**6.5 - 9.0**	7.0	**5.8**	7.1	7.6
Appendix IV[(1)]									
Antimony	ug/L	6	6.0	6.0	2.0	< 1	< 1	< 1	< 1
Arsenic	ug/L	**10**	**10**	**10**	**10**	8	< 1	**14**	< 1
Barium	ug/L	2,000	2,000	2,000	1,200	189	19	285	381
Beryllium	ug/L	4	4.0	4.0	33	< 1	1	< 1	< 1
Cadmium	ug/L	5	5.0	5.0	2.5	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	100	100	11	< 1	< 1	< 1	< 1
Cobalt	ug/L	NC	40	100	100	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	4.0	4.0	14	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	170	350	440	55	79	78	56
Mercury	ug/L	2	2.0	2.0	0.20#	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	73	210	120	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NC	NC	NC	NC	0.216	< 0.134	0.304	0.448
Radium-228	pCi/L	NC	NC	NC	NC	< 0.579	< 0.944	< 0.740	0.968
Radium-226/228	pCi/L	5	NC	NC	NC	< 0.579	< 0.944	< 0.740	1.42
Selenium	ug/L	50	50	50	5.0	3	2	< 1	< 1
Thallium	ug/L	2	2.0	2.0	2.0	< 2	< 2	< 2	< 2
Additional MI Part 115[(2)]									
Iron	ug/L	**300****	**300[E]**	**300[E]**	500,000[EE]	**1,460**	**13,900**	**417**	**585**
Copper	ug/L	1,000**	1,000[E]	1,000[E]	20	< 1	1	< 1	< 1
Nickel	ug/L	NC	100	100	120	6	13	4	4
Silver	ug/L	100**	34	98	0.2	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	ug/L	NC	**4.5**	62	27	**17**	< 2	< 2	**8**
Zinc	ug/L	5,000**	2,400	5,000[E]	260	< 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 hardness of 258 mg CaCO3/L (average of SW-01 [Lake Huron] and SW-02 [Saginaw River] collected in April 2018) per footnote {G} of Michigan Part 201 criteria tables. Chromium GSI criterion based on hexavalent chromium per footnote {H}. GSI criterion is protective for surface water used as a drinking water source as described in footnote {X}. GSI criterion for chloride is 50 mg/L when the discharge is to the Great Lakes or connecting waters per footnote {FF}
# - 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 Amendment - Public Act No. 640 of 2018 Section 11511a(3)(c) and 11519b(2) addtional detection monitoring constituent (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 Assessment Monitoring Statistical Evaluation – May 2023
DE Karn Bottom Ash Pond – RCRA CCR Monitoring Program
Essexville, Michigan

Constituent	Units	GWPS	DEW-MW-15002		DEK-MW-15005		DEK-MW-15006		DEK-MW-18001	
			LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
Arsenic	ug/L	21	1.7	14	30	83	20	28	99	331

Notes:

Only compliance well/constituent pairs with one or more concentrations exceeding the GWPS within the 8 most recent semiannual sampling events are included on this table.

ug/L - micrograms per Liter.

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

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

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

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

Figures

BASE MAP: USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

PROJECT:
CONSUMERS ENERGY COMPANY
DE KARN AND JC WEADOCK POWER PLANTS
ESSEXVILLE, MICHIGAN

TITLE:
SITE LOCATION MAP

DRAWN BY:	A. ADAIR	PROJ. NO.:	514404.0001
CHECKED BY:	J. KRENZ		
APPROVED BY:	D. LITZ		**FIGURE 1**
DATE:	JULY 2023		

TRC
1540 EISENHOWER PLACE
ANN ARBOR, MI 48108-3284
PHONE: 734.971.7080

FILE: 464095_DEKARN

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

LEGEND

- DEK BOTTOM ASH POND & LINED IMPOUNDMENT MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- DEK LINED IMPOUNDMENT MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- NATURE AND EXTENT WELL
- SURFACE WATER GAUGING STATION
- BACKGROUND MONITORING WELL
- SLURRY WALL (APPROXIMATE)
- EXTENT OF GEOSYNTHETICS

NOTES

1. BASE MAP IMAGERY FROM NEARMAP, (5/4/2022).
2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).
4. A SINGLE WELL SYMBOL IS SHOWN FOR WELL PAIRS MW-01/MW-02 AND MW-03/MW-04 AS THE WELLS ARE LOCATED WITHIN 3-FT OF EACH OTHER.

N

0 800 1,600 Feet

1" = 800'
1:9,600

PROJECT:
CONSUMERS ENERGY COMPANY
DE KARN AND JC WEADOCK POWER PLANTS
ESSEXVILLE, MICHIGAN

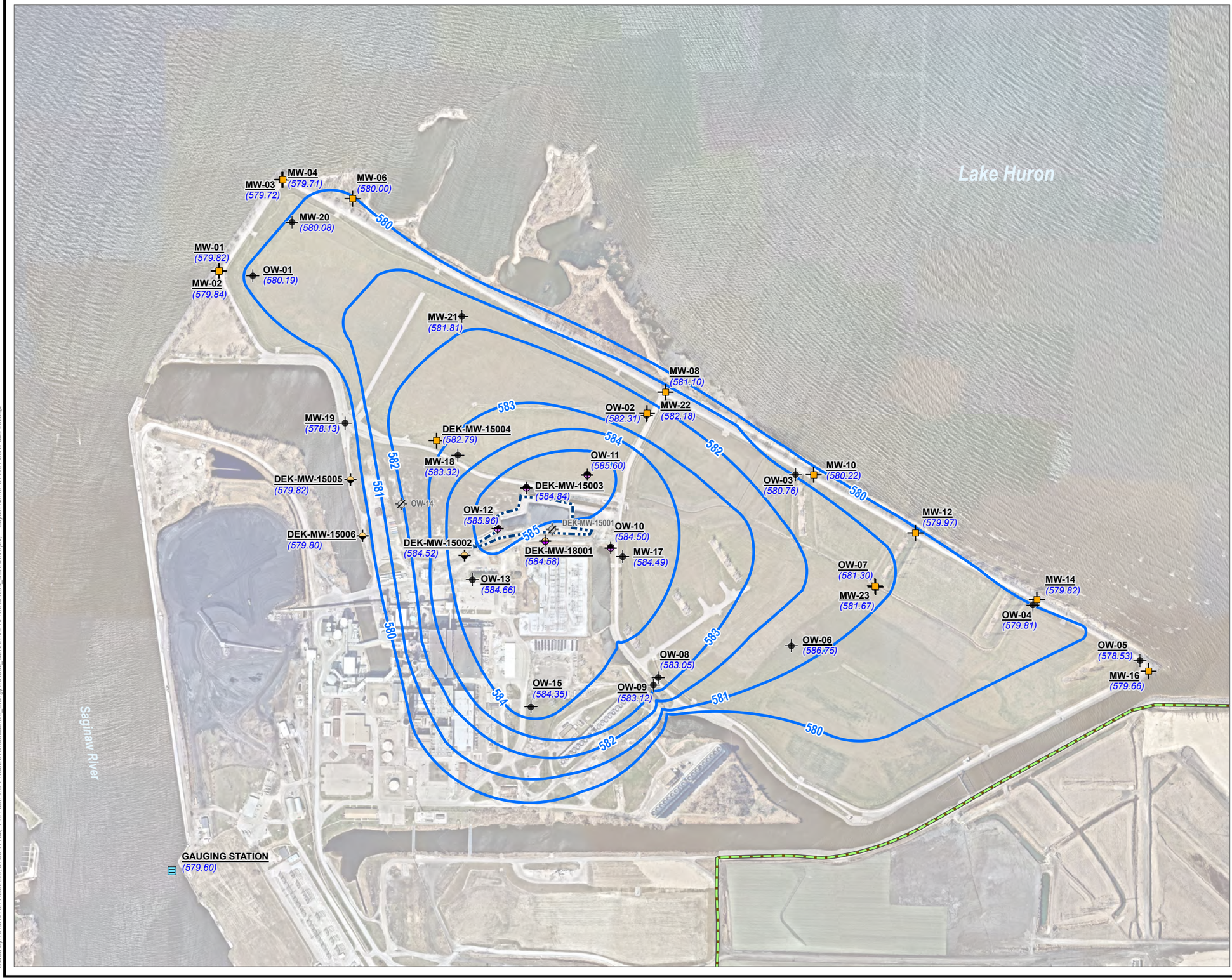
TITLE:
SITE LAYOUT MAP

DRAWN BY:	A. ADAIR	PROJ NO.:	514404.0001
CHECKED BY:	J. KRENZ		**FIGURE 2**
APPROVED BY:	D. LITZ		
DATE:	JULY 2023		

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

FILE NO.: 464095_DEKARN.mxd

Plot Date: 7/20/2023, 12:33:47 PM by AADAIR -- LAYOUT: ANSI B (11"x17")
Path: T:\1-PROJECTS\Consumers_Energy\464095_DEKARN\2-APRX\464095_DEKARN.aprx



LEGEND

- DEK BOTTOM ASH POND & LINED IMPOUNDMENT MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- DEK LINED IMPOUNDMENT MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- NATURE AND EXTENT WELL
- SURFACE WATER GAUGING STATION
- GROUNDWATER ELEVATION CONTOUR
- SLURRY WALL (APPROXIMATE)
- EXTENT OF GEOSYNTHETICS
- (580.21) GROUNDWATER ELEVATION

NOTES

1. BASE MAP IMAGERY FROM NEARMAP, (5/4/2022).
2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).
4. A SINGLE WELL SYMBOL IS SHOWN FOR WELL PAIRS MW-01/MW-02 AND MW-03/MW-04 AS THE WELLS ARE LOCATED WITHIN 3-FT OF EACH OTHER.
5. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.

N

1:7,200

1" = 600'

0 600 1,200 FEET

PROJECT:
CONSUMERS ENERGY COMPANY
DE KARN POWER PLANT
ESSEXVILLE, MICHIGAN

TITLE:
SHALLOW GROUNDWATER CONTOUR MAP
MAY 2023

DRAWN BY:	A. ADAIR	PROJ. NO.:	514404.0001
CHECKED BY:	J. KRENZ		
APPROVED BY:	D. LITZ		**FIGURE 3**
DATE:	JULY 2023		

TRC
1540 EISENHOWER PLACE
ANN ARBOR, MI 48108-3284
PHONE: 734.971.7080

FILE: 464095_DEKARN.aprx

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl; Map Rotation: 0
Saved By: AADAIR on 7/20/2023 at 10:35:47 AM; File Path: T:\1-PROJECTS\Consumers_Energy\464095_DEKARN\2-APRX\464095_DEKARN.aprx; Layout Name: 514404-SGW-003-2023Q2

Appendix A
Data Quality Reviews

Laboratory Data Quality Review
Groundwater Monitoring Event May 2023
JC Weadock/DE Karn Background

Groundwater samples were collected by TRC for the May 2023 sampling event. Samples were analyzed for total metals, anions, and total dissolved solids by Consumers Energy (CE) Laboratory Services in Jackson, Michigan. The laboratory analytical results were reported in laboratory sample delivery group (SDG) 23-0404.

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

- MW-15002
- MW-15008
- MW-15016
- MW-15019

Each sample was analyzed for the following constituents:

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

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

Data Usability Review Procedure

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

- Sample receipt, as noted in the cover page or case narrative;
- 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 CE Laboratory Services. Therefore, potential contamination arising from laboratory sample preparation and/or analytical procedures and the accuracy of the analytical method using a clean matrix could not be evaluated for the metals, anions, and TDS analyses.

This data usability report addresses the following items:

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

Review Summary

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

- The reviewed Appendix III, IV, and additional Part 115 constituents, as well as magnesium, potassium, and sodium 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 field blank (FB-Background) was collected. Total metals were not detected in this blank sample.
- The field duplicate pair samples were DUP-Background and MW-15019; all criteria between the parent and duplicate samples were within the QC limits.
- Laboratory duplicate and MS/MSD analyses were not performed on a sample from this data set.

Laboratory Data Quality Review
Groundwater Monitoring Event May 2023
DE Karn Bottom Ash Pond and Lined Impoundment

A groundwater sample was collected by TRC for the May 2023 sampling event. The sample was analyzed for total metals, anions, total dissolved solids, ammonia, and alkalinity by Consumers Energy (CE) Laboratory Services in Jackson, Michigan. The sulfide analysis was subcontracted to Merit Laboratories, Inc. (Merit) in East Lansing, Michigan. The laboratory analytical results were reported in laboratory sample delivery groups (SDGs) 23-0401R and S48227.01(01).

During the May 2023 sampling event, a groundwater sample was collected from the following well:

- DEK-MW-18001

The sample was analyzed for the following constituents:

Analyte Group	Method
Anions (Fluoride, Chloride, Sulfate, Nitrate, Nitrite)	EPA 300.0
Total Dissolved Solids (TDS)	SM 2540C
Total Metals	SW-846 6020B/7470A
Alkalinity (Bicarbonate, Carbonate, and Total)	SM 2320B
Ammonia	SM 4500 NH3(h)
Sulfide	SM 4500 S2D

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, where applicable. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Field and equipment blanks are used to assess potential contamination arising from field procedures;

- Data for laboratory control samples (LCSs) and laboratory control sample duplicates (LCSDs), when performed. The LCSs and/or LCSDs are used to assess the accuracy of the analytical method using a clean matrix;
- Percent recoveries for matrix spike (MS) and matrix spike duplicates (MSD), when performed on project samples. Percent recoveries are calculated for each analyte spiked and used to assess bias due to sample matrix effects;
- Data for laboratory duplicates, when performed on project samples. The laboratory duplicates are replicate analyses of one sample and are used to assess the precision of the analytical method;
- Data for blind field duplicates, when collected. 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 and Merit. 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, ammonia, TDS, alkalinity, and sulfide 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, IV, optional Piper Diagram analyses, additional Part 115 constituents, and additional geochemistry parameters will be utilized for the purposes of a detection or assessment monitoring program.
- Data are usable for the purposes of the detection or assessment monitoring program.
- When the data are evaluated through a detection or assessment monitoring statistical program, findings below may be used to support the removal of outliers.

QA/QC Sample Summary

- A field blank was not collected with this data set.
- An equipment blank was not collected with this data set.
- MS and MSD analyses were performed on sample DEK-MW-18001 for total metals, anions, ammonia, total alkalinity, and sulfide. The recoveries were within the acceptance limits. Relative percent differences (RPDs) were not provided by the laboratory for all parameters and therefore were not evaluated; further, with the exception of sulfide, 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.

- A field duplicate pair was not collected with this data set.
- Laboratory duplicate analyses were not performed on the sample in this data set.

Laboratory Data Quality Review
Groundwater Monitoring Event May 2023
DE Karn Bottom Ash Pond

Groundwater samples were collected by TRC for the May 2023 sampling event. Samples were analyzed for total metals, anions, total dissolved solids, ammonia, and alkalinity by Consumers Energy (CE) Laboratory Services in Jackson, Michigan. The sulfide analyses were subcontracted to Merit Laboratories, Inc. (Merit) in East Lansing, Michigan. The laboratory analytical results were reported in laboratory sample delivery groups (SDGs) 23-0400 and S48155.01(01).

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

- DEK-MW-15002
- DEK-MW-15005
- DEK-MW-15006

Each sample was analyzed for the following constituents:

Analyte Group	Method
Anions (Fluoride, Chloride, Sulfate, Nitrate, and Nitrite)	EPA 300.0
Total Dissolved Solids (TDS)	SM 2540C
Total Metals	SW-846 6020B/7470A
Alkalinity (Bicarbonate, Carbonate, and Total)	SM 2320B
Ammonia	SM 4500 NH3(h)
Sulfide	SM 4500 S2D

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, where applicable. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Field and equipment blanks are used to assess potential contamination arising from field procedures;
- Data for laboratory control samples (LCSs) and laboratory control sample duplicates (LCSDs), when performed. The LCSs and/or LCSDs are used to assess the accuracy of the analytical method using a clean matrix;

- Percent recoveries for matrix spike (MS) and matrix spike duplicates (MSD), when performed on project samples. Percent recoveries are calculated for each analyte spiked and used to assess bias due to sample matrix effects;
- Data for laboratory duplicates, when performed on project samples. The laboratory duplicates are replicate analyses of one sample and are used to assess the precision of the analytical method;
- 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 and Merit. 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, TDS, ammonia, and sulfide 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, IV, optional Piper diagram analyses, additional Part 115 constituents, and additional geochemistry parameters will be utilized for the purposes of the detection 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 field blank (FB-DEK-BAP) and one equipment blank (EB-DEK-BAP) were collected with this data set. Total metals, nitrate, nitrite, ammonia, and sulfide were not detected in these blanks.
- The field duplicate pair samples were DUP-DEK-BAP-01 with DEK-MW-15005; relative percent differences (RPDs) between the parent and duplicate sample were within the QC limits.
- Laboratory duplicate and MS/MSD analyses were not performed on a sample from this data set.

Laboratory Data Quality Review
Groundwater Monitoring Event May 2023
JC Weadock/Karn DEK Background

Groundwater samples were collected by TRC for the May 2023 sampling event. Samples were analyzed for radium by Eurofins in St. Louis, Missouri (Eurofins – St. Louis). The laboratory analytical results were reported in laboratory sample delivery group (SDG) 240-184759-1 Revision 1.

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

- MW-15002
- MW-15008
- MW-15016
- MW-15019

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

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

This data usability report addresses the following items:

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

Review Summary

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

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

QA/QC Sample Summary

- Target analytes were not detected in the method blanks (MBs) with the following exception.
  - Radium-226 was detected in MB 160-611074/1-A at 0.1185 +/- 0.0829 pCi/L. Potential false positive exists for radium-226 results with normalized absolute differences (NADs) <1.96, as summarized in attachment A.
- One field blank (FB-Background) was collected. Target analytes were not detected in the field blank sample.
- LCS/LCSD recoveries and relative percent differences for all target analytes were within laboratory control limits.
- MS/MSD and laboratory duplicate analyses were not performed on a sample from this SDG.
- The field duplicate pair samples were DUP-Background/MW-15019. All criteria were met.
- Carrier recoveries were within 40-110%.

Attachment A
Summary of Data Non-Conformances for Groundwater Analytical Data
DE Karn/JC Weadock Background– CCR Monitoring Program
Essexville, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
MW-15019 DUP-BACKGROUND	5/1/2023 5/1/2023	Radium 226	Detected result is potentially a false positive due to method blank contamination.

Laboratory Data Quality Review
Groundwater Monitoring Event May 2023
DE Karn Bottom Ash Pond and Lined Impoundment

A groundwater sample was collected by TRC for the May 2023 sampling event. The sample was analyzed for radium by Eurofins in St. Louis, Missouri (Eurofins – St. Louis). The laboratory analytical results were reported in laboratory sample delivery group (SDG) 240-184761-1 Revision 1.

During the May 2023 sampling event, a groundwater sample was collected from the following well:

- DEK-MW-18001

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

- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

This data usability report addresses the following items:

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

Review Summary

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

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

QA/QC Sample Summary

- Target analytes were not detected in the method blanks (MBs) with the following exception.
  - Radium-226 was detected in MB 160-611074/1-A at 0.1185 +/- 0.0829 pCi/L. Potential false positive exists for radium-226 results with normalized absolute differences (NADs) <1.96, as summarized in attachment A.
- No equipment or field blanks were collected.
- LCS/LCSD recoveries and relative percent differences for all target analytes were within laboratory control limits.
- MS/MSD and laboratory duplicate analyses were not performed on a sample from this SDG.
- A field duplicate pair was not collected.
- Carrier recoveries were within 40-110%.

Attachment A
Summary of Data Non-Conformances for Groundwater Analytical Data
DE Karn Bottom Ash Pond and Lined Impoundment – CCR Monitoring Program
Essexville, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
DEK-MW-18001	5/3/2023	Radium 226	Detected result is potentially a false positive due to method blank contamination.

Laboratory Data Quality Review
Groundwater Monitoring Event May 2023
DE Karn Bottom Ash Pond

Groundwater samples were collected by TRC for the May 2023 sampling event. Samples were analyzed for radium by Eurofins in St. Louis, Missouri (Eurofins – St. Louis). The laboratory analytical results were reported in laboratory sample delivery group (SDG) 240-184755-1.

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

- DEK-MW-15002
- DEK-MW-15005
- DEK-MW-15006

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

- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

This data usability report addresses the following items:

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

Review Summary

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

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

QA/QC Sample Summary

- Target analytes were not detected in the method blanks (MBs) with the following exception.
  - Radium-226 was detected in MB 160-611074/1-A at 0.1185 +/- 0.0829 pCi/L. Potential false positive exists for radium-226 results with normalized absolute differences (NADs) <1.96, as summarized in attachment A.
- One equipment blank (EB-DEK-BAP) was collected. Target analytes were not detected in the equipment blank sample.
- LCS/LCSD recoveries and relative percent differences (RPDs) for all target analytes were within laboratory control limits.
- MS/MSD and laboratory duplicate analyses were not performed on a sample from this SDG.
- The field duplicate pair samples were DUP-DEK-BAP-01/DEK-MW-15005. All criteria were met.
- Carrier recoveries were within 40-110%.

Attachment A
Summary of Data Non-Conformances for Groundwater Analytical Data
DE Karn Bottom Ash Pond – CCR Monitoring Program
Essexville, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
DEK-MW-15002	5/2/2023	Radium 226	Detected result is potentially a false positive due to method blank contamination (normalized absolute difference <1.96).
DEK-MW-15005	5/2/2023		
DEK-MW-15006	5/2/2023		
DUP-DEK-BAP-01	5/2/2023		

Appendix B
Statistical Evaluation of May 2023
Assessment Monitoring Sampling Event

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Technical Memorandum

Date:	June 20, 2023
To:	J.R. Register, Consumers Energy
From:	Darby Litz, TRC Alex Eklund, TRC
Project No.:	514404.0001.0000Phase 002, Task 002
Subject:	Statistical Evaluation of May 2023 Assessment Monitoring Sampling Event DE Karn Bottom Ash Pond, Consumers Energy Company, Essexville, Michigan

During the statistical evaluation of the initial assessment monitoring event (May 2018), arsenic was present in one or more downgradient monitoring wells at statistically significant levels exceeding the Groundwater Protection Standard (GWPS). Therefore, Consumers Energy Company (Consumers Energy) initiated an Assessment of Corrective Measures (ACM) within 90 days from when the Appendix IV exceedance was determined. The ACM was completed on September 11, 2019. Currently, Consumers Energy is continuing semiannual assessment monitoring in accordance with §257.95 of the CCR Rule [1] at the DE Karn Power Plant Bottom Ash Pond (Karn Bottom Ash Pond).

An assessment monitoring event was conducted between May 1st and 3rd, 2023. In accordance with §257.95, the assessment monitoring data must be compared to GWPSs to determine whether or not Appendix IV constituents are detected at statistically significant levels above the GWPSs. GWPSs were established in accordance with §257.95(h), as detailed in the October 15, 2018 Groundwater Protection Standards technical memorandum, which was also included in the 2018 Annual Groundwater Monitoring Report (TRC, January 2019).

The statistical evaluation of the assessment monitoring event data indicates the following constituent is present at statistically significant levels exceeding the GWPS in downgradient monitoring wells at the Karn Bottom Ash Pond:

Constituent	GWPS	#Downgradient Wells Observed
Arsenic	21 ug/L	2 of 4

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 that arsenic is the only constituent present at concentrations above the GWPS. Consumers Energy will continue to evaluate corrective measures per §257.96 and §257.97. Consumers Energy will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 -

[1] USEPA final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA) published April 17, 2015, as amended per Phase One, Part One of the CCR Rule (83 FR 36435).

§257.98.

Assessment Monitoring Statistical Evaluation

When the initial assessment monitoring event was completed in May 2018, the compliance well network at the Karn Bottom Ash Pond included six wells encircling the unit (DEK-MW-15002 through DEK-MW-15006 and DEK-MW-18001). Due to changes in groundwater flow direction on site, monitoring wells DEK-MW-15003 and DEK-MW-15004 are no longer located downgradient of the unit and were determined to be no longer indicative of groundwater conditions influenced by the Karn Bottom Ash Pond. Therefore, monitoring wells DEK-MW-15003 and DEK-MW-15004 are no longer included for statistical analysis. Starting with the May 2021 statistical evaluation, the compliance well network includes DEK-MW-15002, DEK-MW-15005, DEK-MW-15006, and DEK-MW-18001.

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

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

For each detected Appendix IV constituent, the concentrations from each well were first compared directly to the GWPS, as shown on Table 1. Parameter-well combinations that included a direct exceedance of the GWPS within the past eight sampling events (October 2019 through May 2023) were retained for further analysis. Arsenic in DEK-MW-15005, DEK-MW-15006, and DEK-MW-18001

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

at the Karn Bottom Ash Pond had individual results exceeding the GWPS.

Groundwater data were then evaluated utilizing Sanitas™ statistical software. Sanitas™ is a software tool that is commercially available for performing statistical evaluation 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 for each of the CCR Appendix IV constituents using a using a per test[3] 99 percent confidence level, i.e., a significance level (α) of 0.01. The following narrative describes the methods employed, the results obtained and the Sanitas™ output files are included as an attachment.

The statistical data evaluation included the following steps:

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

The results of these evaluations are presented and discussed below.

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. Initially, the assessment monitoring results were visually assessed for potential outliers or trends. No outliers were identified. Arsenic concentrations at DEK-MW-18001 appear to exhibit an upward trend on the time-series chart over the eight most recent sampling events (Attachment 1). This data set was tested further in Sanitas™ utilizing Sen's Slope to estimate the average rate of change in concentration over time and utilizing the Mann-Kendall trend test to test for significance of the trend at the 98% confidence level. The trend test showed that arsenic concentration at DEK-MW-18001 is generally increasing with time, as evidenced by the positive Sen's Slope. Additionally, the increase in concentration at DEK-MW-18001 was shown to be statistically significant (Attachment 1). Confidence bands are identified by the UG as the appropriate method for calculating confidence intervals on trending data. A confidence band calculates upper and lower confidence limits at each point along the trend to reduce variability and create a narrower confidence interval. At least 8 to 10 measurements should be available when computing a confidence band around a linear regression, and as of the May 2023 event, eight semiannual sampling events have been completed post-CCR removal.

The Sanitas™ software was used to test compliance at the downgradient monitoring wells using the confidence interval method for the most recent 8 sampling events. Eight independent sampling events

[3] Confidence level is assessed for each individual comparison (i.e. per well and per constituent).

provide the appropriate density of data as recommended per the UG yet are collected recently enough to provide an indication of current condition. The tests were run with a per-test 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 for well/constituent pairs with a direct GWPS exceedance are also included in Attachment 1. Non-detect data was 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 confidence bands and parametric or non-parametric confidence intervals for each well, along with notes on data transformations, as appropriate. Due to the increasing trend, a confidence band was calculated for the arsenic data set at DEK-MW-18001. The arsenic data set at DEK-MW-15006 was found to be normally distributed and the arsenic data set at DEK-MW-15005 was normalized using a square root transformation. The confidence bands and interval tests compare the lower confidence limit to the GWPS. The statistical evaluation of the Appendix IV parameters shows exceedances for arsenic at two of the four monitoring locations (DEK-MW-15005 and DEK-MW-18001). The results of the assessment monitoring statistical evaluation for the other downgradient wells are consistent with the results of the previous assessment monitoring data statistical evaluations, indicating that arsenic is the only constituent present at concentrations above the GWPS. Consumers Energy will continue to evaluate corrective measures per §257.96 and §257.97. Consumers Energy will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

Attachments

Table 1 Comparison of Groundwater Sampling Results to Groundwater Protection Standards

Attachment 1 Sanitas™ Output Files

Table

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards
DE Karn Bottom Ash Pond – RCRA CCR Monitoring Program
Essexville, Michigan

					Sample Location:	DEK-MW-15002										
					Sample Date:	10/15/2019	5/13/2020	10/6/2020	10/6/2020	5/3/2021	10/4/2021	5/3/2022	10/4/2022	10/4/2022	5/2/2023
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS	downgradient									
									Field Dup					Field Dup	
Appendix III															
Boron	ug/L	NC	NA	619	NA	1,600	1,390	1,580	1,600	1,420	1,530	1,100	1,340	1,370	1,270
Calcium	mg/L	NC	NA	302	NA	130	170	126	122	148	73.1	105	70.2	68	122
Chloride	mg/L	250*	NA	2,440	NA	410	130	106	102	148	102	99.3	105	103	81.7
Fluoride	ug/L	4,000	NA	1,000	NA	< 1,000	< 1,000	1,300	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	407	NA	150	367	142	139	216	58.3	172	33.7	33.2	225
Total Dissolved Solids	mg/L	500*	NA	4,600	NA	1,300	1,100	791	776	926	599	779	584	631	899
pH, Field	SU	6.5 - 8.5*	NA	6.5 - 7.3	NA	7.3	7.1	7.1	--	7.4	7.1	7.0	7.4	--	7.2
Appendix IV															
Antimony	ug/L	6	NA	1	6	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	NA	21	**21**	6.5	3	8	8	2	2	2	3	4	< 1
Barium	ug/L	2,000	NA	1,300	2,000	140	196	133	131	211	102	134	92	95	176
Beryllium	ug/L	4	NA	1	4	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	3	100	< 1.0	< 1	1	1	< 1	1	1	1	1	< 1
Cobalt	ug/L	NC	6	15	15	< 6.0	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	NA	1,000	4,000	<1,000	< 1,000	1,300	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	1	15	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	40	180	180	35	48	35	36	36	29	28	25	27	29
Mercury	ug/L	2	NA	0.2	2	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	6	100	< 5.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NC	NA	NA	NA	0.334	0.673	< 0.430	< 0.577	0.582	1.47	< 0.423	0.219	0.287	0.431
Radium-228	pCi/L	NC	NA	NA	NA	0.987	0.899	1.06	< 0.577	0.811	2.29	< 0.530	1.81	2.70	< 1.5
Radium-226/228	pCi/L	5	NA	3.32	5	0.654	< 0.763	0.642	< 0.460	< 0.537	0.827	0.636	2.03	2.99	< 1.5
Selenium	ug/L	50	NA	2	50	< 1.0	< 1	< 1	1	< 1	3	1	< 1	1	< 1
Thallium	ug/L	2	NA	2	2	< 2.0	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional Screening Level from 83 FR 36435.
UTL - Upper Tolerance Limit (95%) of the background data set.
GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards
DE Karn Bottom Ash Pond – RCRA CCR Monitoring Program
Essexville, Michigan

						Sample Location:	DEK-MW-15005										
						Sample Date:	10/15/2019	10/15/2019	5/13/2020	5/13/2020	10/7/2020	5/3/2021	5/3/2021	10/4/2021	5/3/2022	10/4/2022	5/2/2023	5/2/2023
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient											
Appendix III								Field Dup		Field Dup			Field Dup					Field Dup
Boron	ug/L	NC	NA	619	NA		700	650	863	858	847	926	948	991	787	911	856	864
Calcium	mg/L	NC	NA	302	NA		60	59	71.0	72.1	155	95.6	97.6	102	127	130	106	107
Chloride	mg/L	250*	NA	2,440	NA		64	64	48.0	47.5	52.7	65.2	65.1	82.3	141	138	86.7	87.4
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	407	NA		5.2	5.0	18.9	18.9	102	50.8	50.2	57.2	151	130	189	189
Total Dissolved Solids	mg/L	500*	NA	4,600	NA		390	400	419	425	687	534	561	546	909	894	767	764
pH, Field	SU	6.5 - 8.5*	NA	6.5 - 7.3	NA		7.6	--	8.1	--	7.7	7.6	--	7.1	7.1	7.5	7.4	--
Appendix IV																		
Antimony	ug/L	6	NA	1	6		< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	NA	21	**21**		**120**	**120**	**34**	**34**	**42**	**45**	**44**	**68**	**54**	**54**	**32**	**32**
Barium	ug/L	2,000	NA	1,300	2,000		110	100	127	127	248	173	170	192	305	312	228	224
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	3	100		< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	2	< 1	< 1
Cobalt	ug/L	NC	6	15	15		< 6.0	< 6.0	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	NA	1,000	4,000		<1,000	<1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	1	15		< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	40	180	180		16	15	20	20	45	38	39	41	36	36	27	28
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	6	100		< 5.0	< 5.0	< 5	< 5	< 5	8	8	7	12	8	8	8
Radium-226	pCi/L	NC	NA	NA	NA		0.165	0.185	< 0.469	< 0.335	0.621	0.291	< 0.187	1.12	0.620	0.544	0.355	0.417
Radium-228	pCi/L	NC	NA	NA	NA		0.524	0.682	1.34	0.662	0.875	0.722	0.650	2.06	1.08	3.11	< 0.755	< 0.785
Radium-226/228	pCi/L	5	NA	3.32	5		< 0.456	0.497	1.14	< 0.554	< 0.502	< 0.459	0.479	0.940	1.70	3.66	< 0.755	< 0.785
Selenium	ug/L	50	NA	2	50		< 1.0	< 1.0	< 1	< 1	< 1	1	1	2	1	1	1	< 1
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

pCi/L - picocuries per liter.

NA - not applicable.

NC - no criteria.

-- - not analyzed.

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

RSL - Regional Screening Level from 83 FR 36435.

UTL - Upper Tolerance Limit (95%) of the background data set.

GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.

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

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

All metals were analyzed as total unless otherwise specified.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards
DE Karn Bottom Ash Pond – RCRA CCR Monitoring Program
Essexville, Michigan

					Sample Location:	DEK-MW-15006										
					Sample Date:	10/14/2019	5/13/2020	10/7/2020	5/3/2021	10/4/2021	10/4/2021	5/3/2022	5/3/2022	10/4/2022	5/2/2023	
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS	downgradient										
Appendix III											Field Dup		Field Dup			
Boron	ug/L	NC	NA	619	NA	1,200	1,090	1,220	938	1,050	1,080	893	888	871	944	
Calcium	mg/L	NC	NA	302	NA	34	70.4	106	115	117	117	65.0	65.5	83.8	127	
Chloride	mg/L	250*	NA	2,440	NA	45	71.5	102	63.5	78.9	74.7	68.6	67.9	70.6	61.2	
Fluoride	ug/L	4,000	NA	1,000	NA	< 1,000	< 1,000	1,060	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	
Sulfate	mg/L	250*	NA	407	NA	74	316	296	324	209	196	173	168	254	385	
Total Dissolved Solids	mg/L	500*	NA	4,600	NA	450	833	1,010	790	712	708	597	609	720	847	
pH, Field	SU	6.5 - 8.5*	NA	6.5 - 7.3	NA	7.8	8.1	7.7	7.5	7.3	--	7.4	--	7.8	7.5	
Appendix IV																
Antimony	ug/L	6	NA	1	6	< 1.0	3	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	
Arsenic	ug/L	10	NA	21	**21**	**27**	21	**27**	**24**	**23**	**24**	**25**	**24**	**26**	16	
Barium	ug/L	2,000	NA	1,300	2,000	51	86	141	139	125	126	68	67	94	137	
Beryllium	ug/L	4	NA	1	4	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	
Cadmium	ug/L	5	NA	0.2	5	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	
Chromium	ug/L	100	NA	3	100	1.1	2	6	< 1	< 1	< 1	1	< 1	< 1	< 1	
Cobalt	ug/L	NC	6	15	15	< 6.0	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	
Fluoride	ug/L	4,000	NA	1,000	4,000	<1,000	< 1,000	1,060	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	
Lead	ug/L	NC	15	1	15	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	
Lithium	ug/L	NC	40	180	180	11	15	22	21	19	19	16	15	18	19	
Mercury	ug/L	2	NA	0.2	2	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	
Molybdenum	ug/L	NC	100	6	100	11	18	11	9	7	7	6	6	7	7	
Radium-226	pCi/L	NC	NA	NA	NA	< 0.159	< 0.370	0.629	0.353	0.797	0.832	< 0.449	0.395	0.242	0.324	
Radium-228	pCi/L	NC	NA	NA	NA	< 0.581	1.01	1.12	1.16	1.50	1.35	0.870	< 0.502	1.43	< 0.894	
Radium-226/228	pCi/L	5	NA	3.32	5	< 0.581	0.780	0.492	0.804	0.704	0.518	1.29	0.742	1.67	< 0.894	
Selenium	ug/L	50	NA	2	50	< 1.0	< 1	< 1	< 1	2	2	< 1	1	1	1	
Thallium	ug/L	2	NA	2	2	< 2.0	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

pCi/L - picocuries per liter.

NA - not applicable.

NC - no criteria.

-- - not analyzed.

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

RSL - Regional Screening Level from 83 FR 36435.

UTL - Upper Tolerance Limit (95%) of the background data set.

GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.

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

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

All metals were analyzed as total unless otherwise specified.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards
DE Karn Bottom Ash Pond – RCRA CCR Monitoring Program
Essexville, Michigan

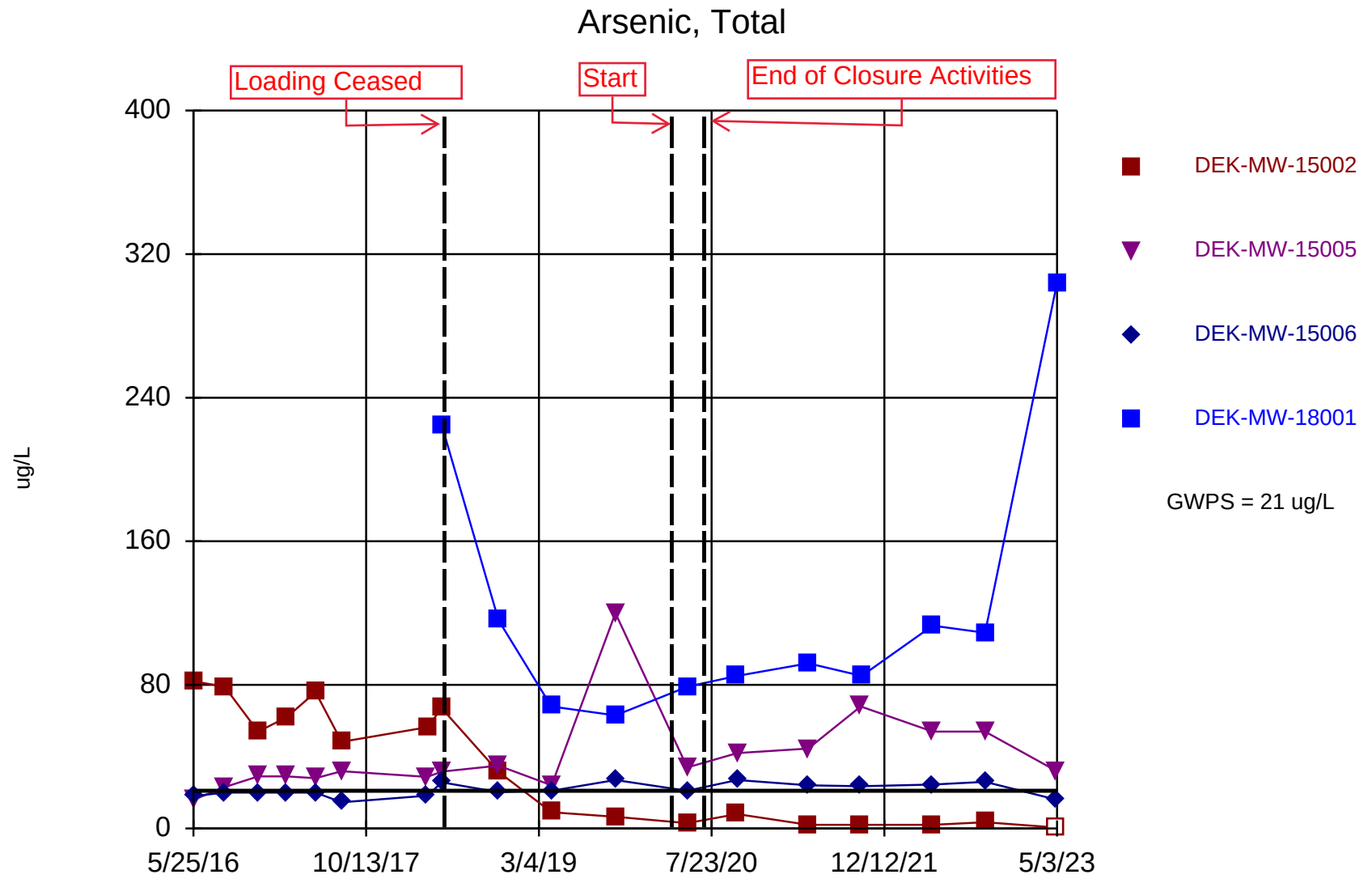
					Sample Location:	DEK-MW-18001							
					Sample Date:	10/15/2019	5/14/2020	10/6/2020	5/3/2021	10/7/2021	5/3/2022	10/4/2022	5/3/2023
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS	downgradient							
Appendix III													
Boron	ug/L	NC	NA	619	NA	2,200	1,670	1,740	1,180	1,370	869	1,060	931
Calcium	mg/L	NC	NA	302	NA	84	72.1	71.7	65.2	71.0	63.7	58.3	54.6
Chloride	mg/L	250*	NA	2,440	NA	81	64.7	60.7	51.6	55.2	65.9	62.5	62.2
Fluoride	ug/L	4,000	NA	1,000	NA	1,000	1,090	1,240	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	407	NA	31	51.1	91.9	121	118	187	140	148
Total Dissolved Solids	mg/L	500*	NA	4,600	NA	500	484	476	486	494	555	551	575
pH, Field	SU	6.5 - 8.5*	NA	6.5 - 7.3	NA	7.3	7.7	7.6	7.3	7.4	7.6	7.6	7.6
Appendix IV													
Antimony	ug/L	6	NA	1	6	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	NA	21	**21**	**63**	**79**	**85**	**92**	**85**	**113**	**109**	**304**
Barium	ug/L	2,000	NA	1,300	2,000	160	130	136	135	135	164	135	152
Beryllium	ug/L	4	NA	1	4	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	3	100	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	NC	6	15	15	< 6.0	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	NA	1,000	4,000	1,000	1,090	1,240	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	1	15	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	40	180	180	36	27	26	25	24	22	23	20
Mercury	ug/L	2	NA	0.2	2	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	6	100	< 5.0	< 5	< 5	< 5	< 5	< 5	< 5	11
Radium-226	pCi/L	NC	NA	NA	NA	0.206	< 0.608	< 0.473	0.189	0.873	0.294	0.264	0.268
Radium-228	pCi/L	NC	NA	NA	NA	0.952	< 0.676	0.591	0.828	1.85	0.592	1.67	0.599
Radium-226/228	pCi/L	5	NA	3.32	5	0.746	< 0.676	0.463	0.639	0.979	0.885	1.93	0.868
Selenium	ug/L	50	NA	2	50	< 1.0	< 1	1	< 1	2	2	< 1	1
Thallium	ug/L	2	NA	2	2	< 2.0	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional Screening Level from 83 FR 36435.
UTL - Upper Tolerance Limit (95%) of the background data set.
GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Attachment 1
Sanitas™ Output Files

Hollow symbols indicate censored values.



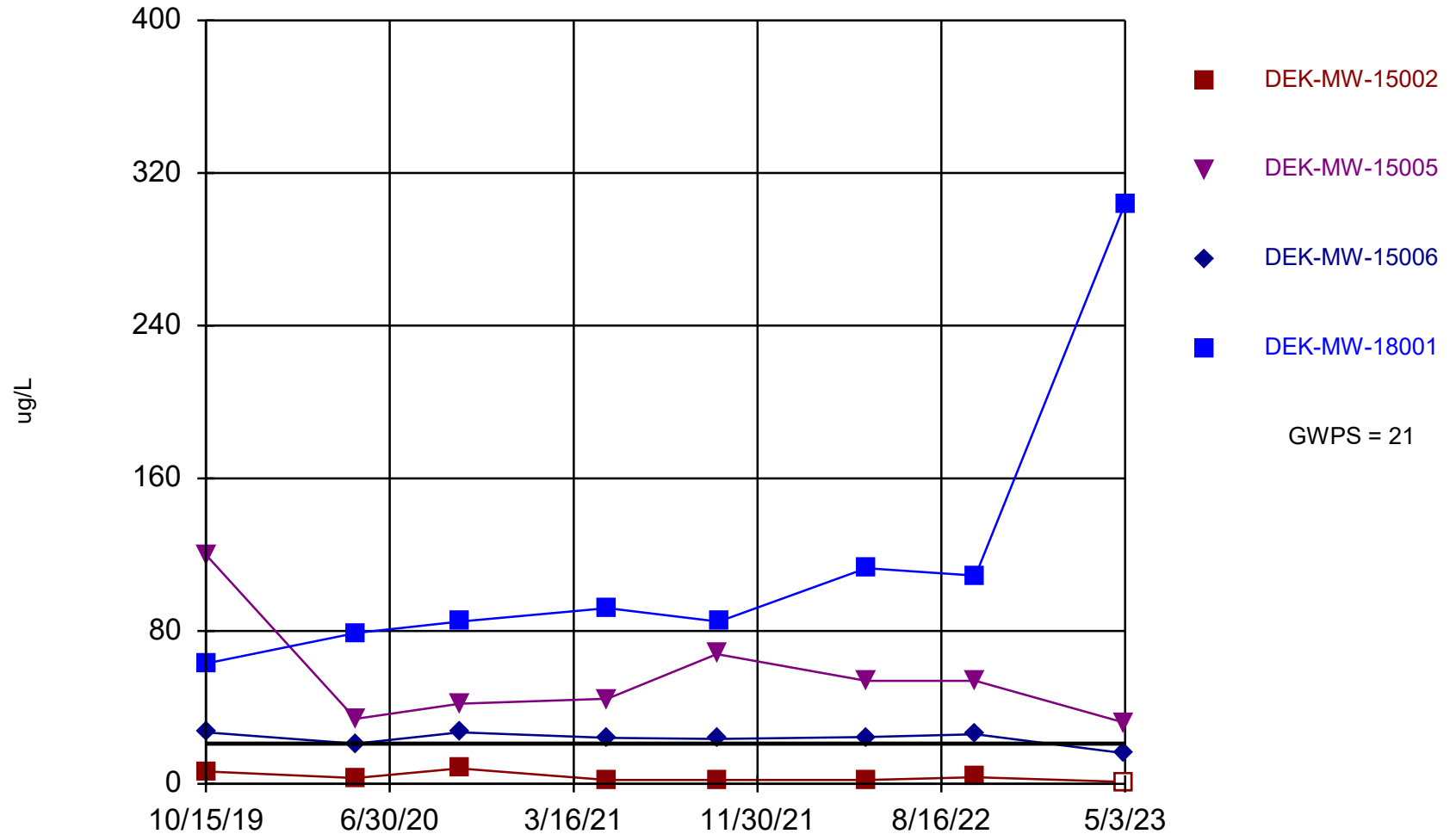
Time Series Analysis Run 6/29/2023 3:43 PM

Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_23Q2

Confidence interval evaluations include 8 most recent semiannual sampling events

Hollow symbols indicate censored values.

Arsenic Comparison to GWPS



Time Series Analysis Run 5/26/2023 12:15 PM

Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_23Q2

Summary Report

Constituent: Arsenic, Total Analysis Run 5/26/2023 12:28 PM
Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_23Q2

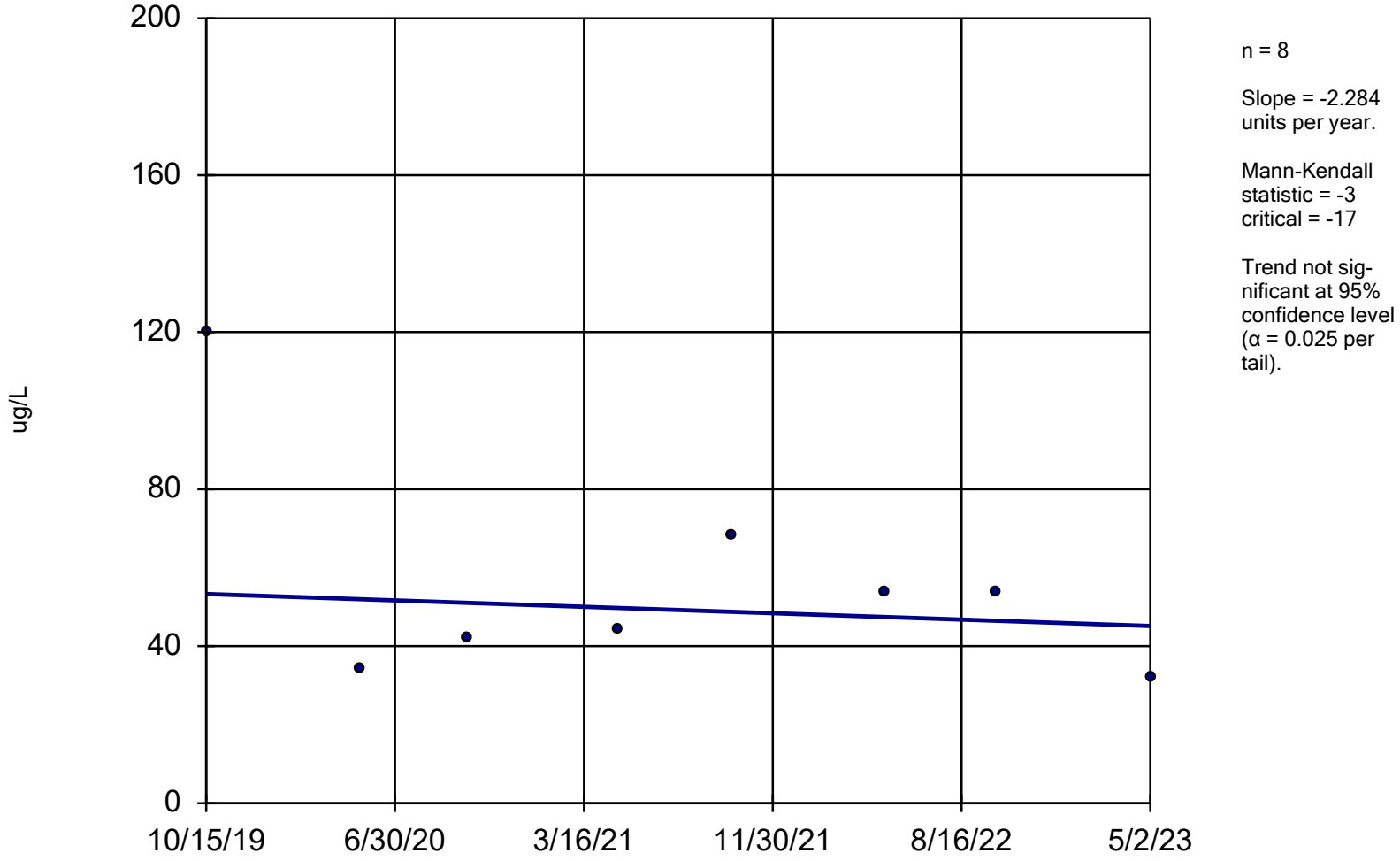
For observations made between 10/15/2019 and 5/3/2023, a summary of the selected data set:

Observations = 32
ND/Trace = 1
Wells = 4
Minimum Value = 1
Maximum Value = 304
Mean Value = 49.86
Median Value = 29.5
Standard Deviation = 58.51
Coefficient of Variation = 1.173
Skewness = 2.691

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
DEK-MW-15002	8	1	1	8	3.5	2.5	2.464	0.704	0.9417
DEK-MW-15005	8	0	32	120	56.06	49.25	28.38	0.5061	1.565
DEK-MW-15006	8	0	16	27	23.63	24.25	3.672	0.1554	-1.143
DEK-MW-18001	8	0	63	304	116.3	88.5	77.53	0.6669	2.078

Arsenic, Total

DEK-MW-15005



n = 8

Slope = -2.284 units per year.

Mann-Kendall statistic = -3
critical = -17

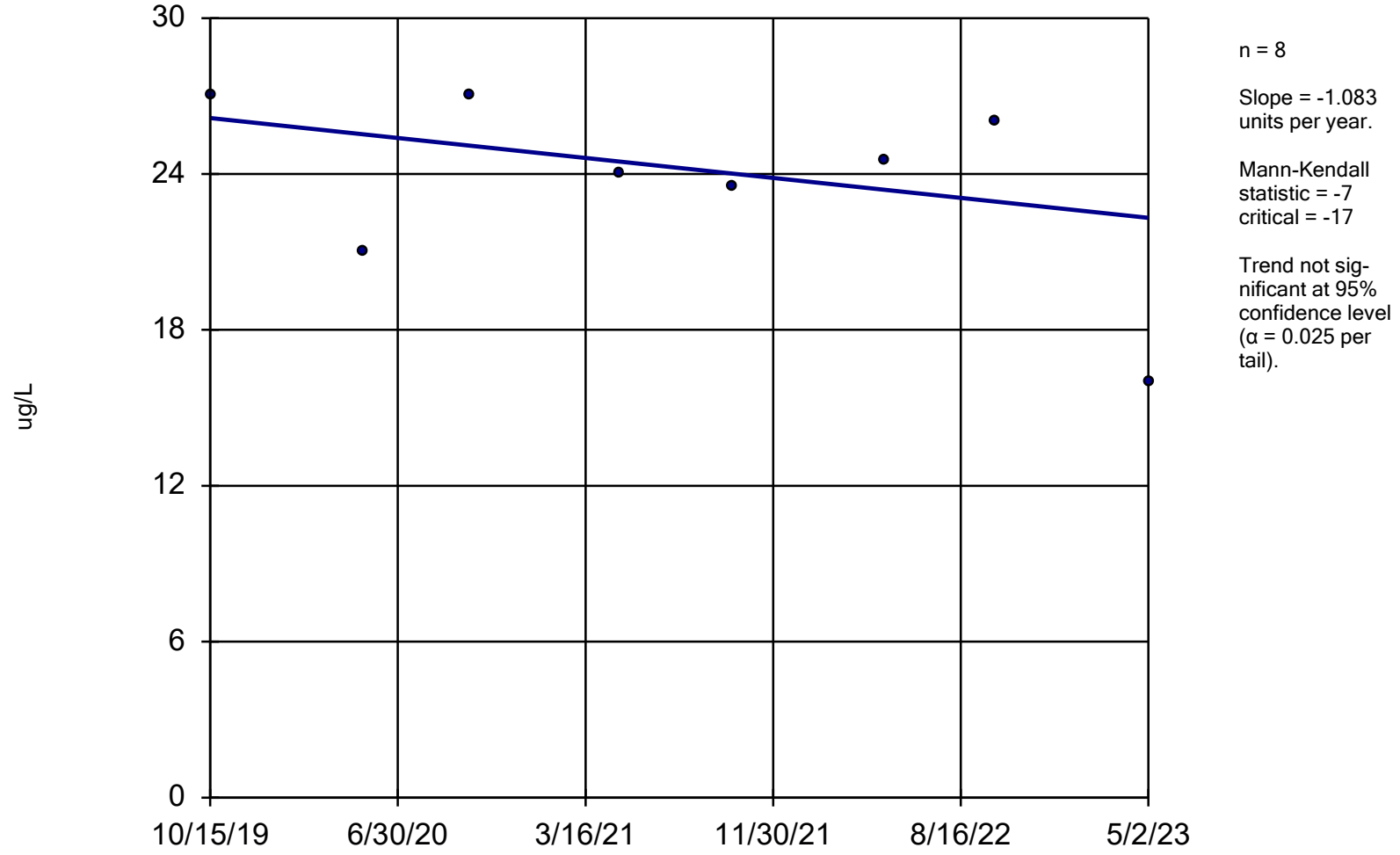
Trend not significant at 95% confidence level (α = 0.025 per tail).

Sen's Slope Estimator Analysis Run 5/26/2023 12:31 PM

Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_23Q2

Arsenic, Total

DEK-MW-15006



n = 8

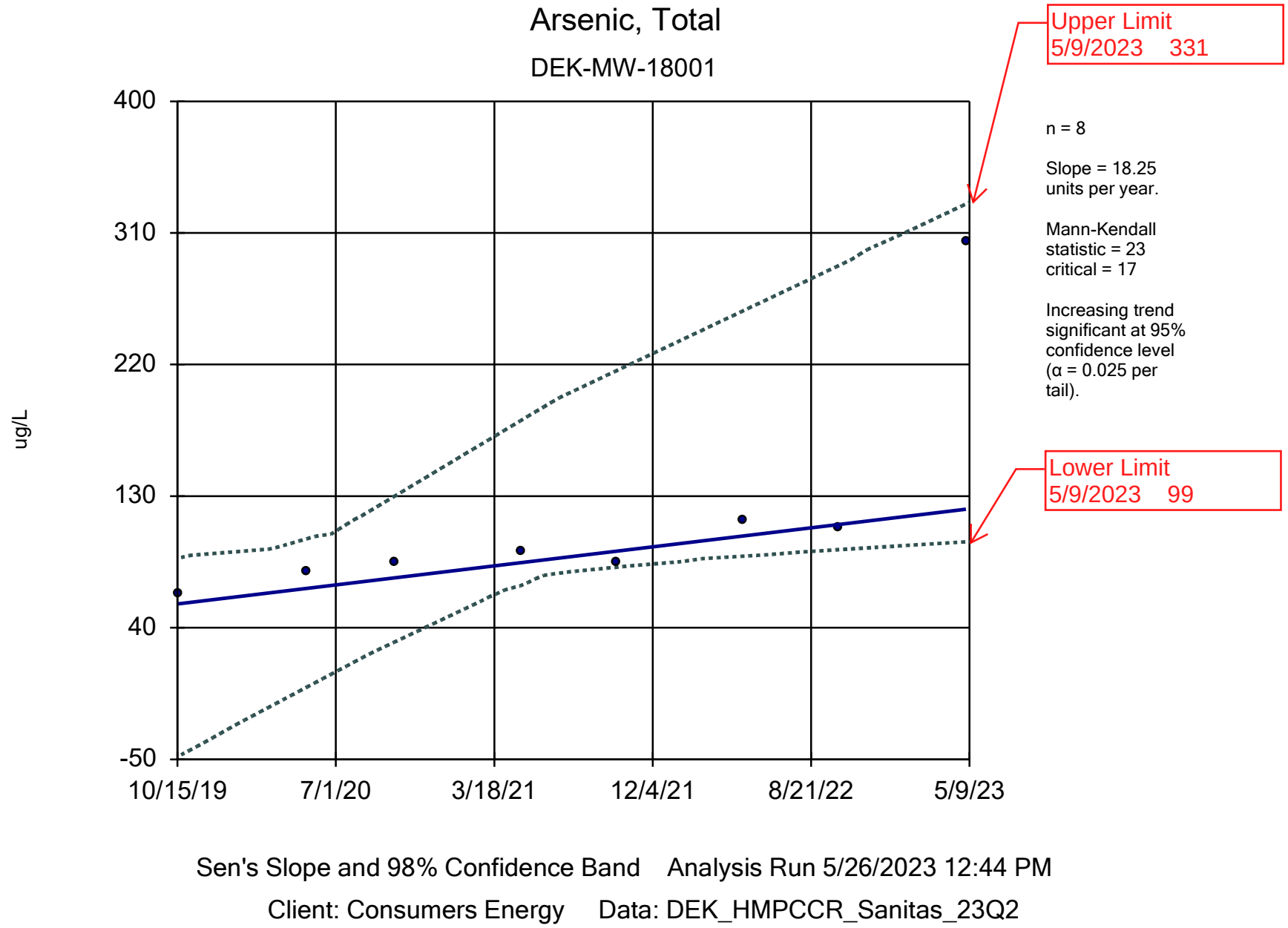
Slope = -1.083 units per year.

Mann-Kendall statistic = -7
critical = -17

Trend not significant at 95% confidence level (α = 0.025 per tail).

Sen's Slope Estimator Analysis Run 5/26/2023 12:31 PM

Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_23Q2

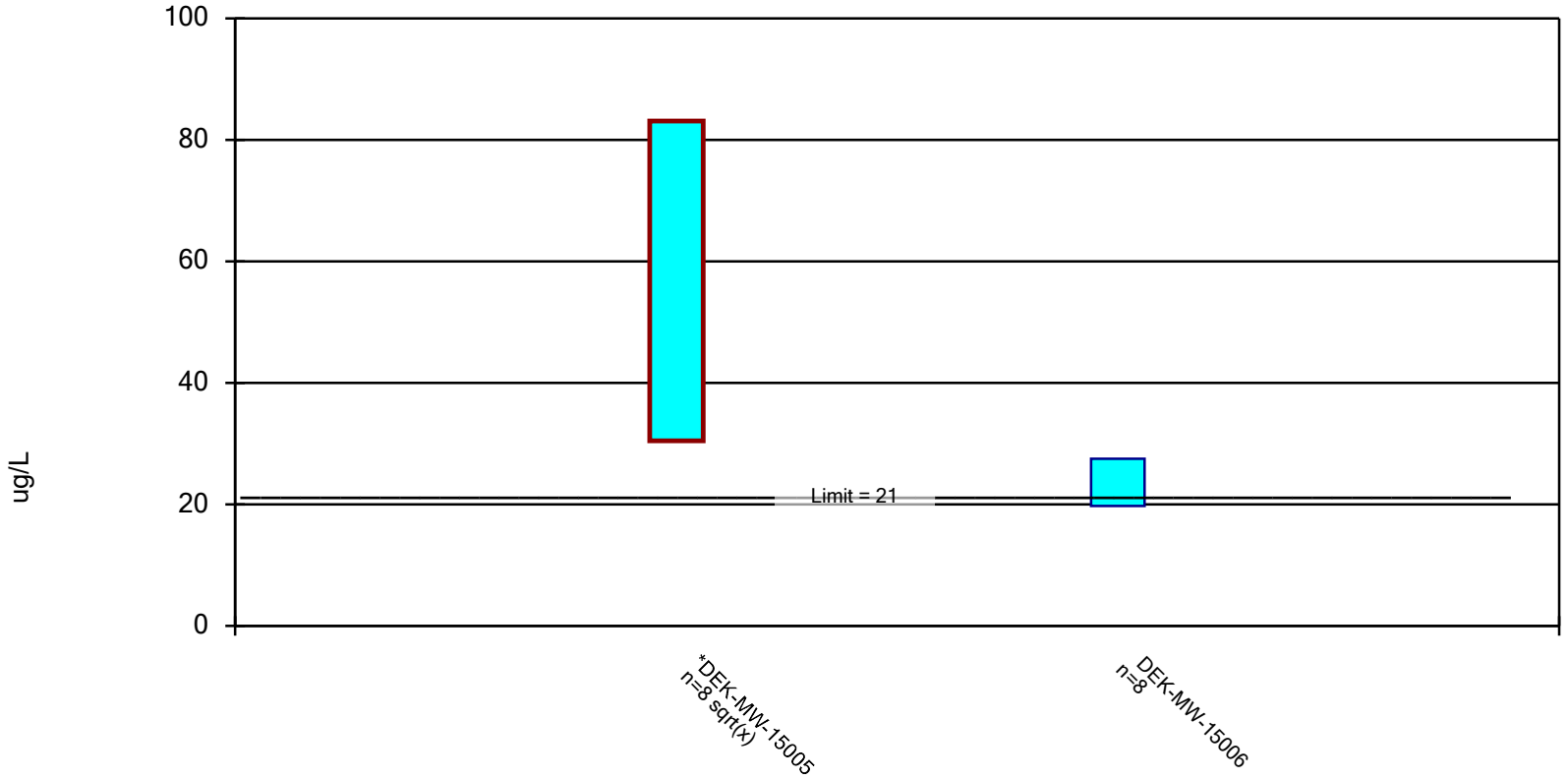


Sen's Slope and 98% Confidence Band Analysis Run 5/26/2023 12:44 PM

Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_23Q2

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 5/26/2023 12:35 PM

Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_23Q2

Confidence Interval

Constituent: Arsenic, Total (ug/L) Analysis Run 5/26/2023 12:35 PM

Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_23Q2

	DEK-MW-15005	DEK-MW-15006
10/15/2019	120 (D)	27
5/13/2020	34 (D)	21
10/7/2020	42	27
5/3/2021	44.5 (D)	24
10/4/2021	68	23.5 (D)
5/3/2022	54	24.5 (D)
10/4/2022	54	26
5/2/2023	32 (D)	16
Mean	56.06	23.63
Std. Dev.	28.38	3.672
Upper Lim.	83.11	27.52
Lower Lim.	30.44	19.73

Appendix C
Laboratory Analytical Reports

Consumers Energy
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135 W. Trail St.
Jackson, MI 49201
phone 517-788-1251
fax 517-788-2533

To: CDBatts, Karn/Weadock

From: EBlaj, T-258

Date: May 19, 2023

Subject: RCRA GROUNDWATER MONITORING – DEK BOTTOM ASH POND WELLS – 2023 Q2

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

Darby Litz, Project Manager
TRC Companies, Inc.
1540 Eisenhower Place
Ann Arbor, MI 48108

Chemistry Project: 23-0400

TRC Environmental, Inc. conducted groundwater monitoring at the DEKarn Bottom Ash Pond Wells area during the week of 05/01/2023 for the 2nd Quarter requirement, as specified in the Sampling and Analysis Plan for the site. The samples were received for analysis by the Chemistry department of Laboratory Services on 05/03/2023.

Samples for Total Sulfide have been subcontracted to Merit Laboratories, Inc. and the results are listed under the analyst initials "Merit". 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

ilac-MRA A2LA ACCREDITED Certificate #1097.04

CASE NARRATIVE

I. Sample Receipt

All samples were received within hold time and in good conditions; no anomalies were noted on the attached 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. All sample preservation and temperature 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, 22nd 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 recoveries of the field matrix spike & matrix spike duplicate samples are included in the results section; all other quality control data is listed in the Quality Control Summary associated with the particular test method, as appropriate. 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:

Acronym	Description
RL	Reporting Limit
ND	Result not detected or below Reporting Limit
NT	Non 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

Qualifier	Description
*	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

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Work Order Sample Summary

Customer Name: Karn/Weadock Complex
Work Order ID: Q2-2023 DEK Bottom Ash Pond Wells
Date Received: 5/3/2023
Chemistry Project: 23-0400

Sample #	Field Sample ID	Matrix	Sample Date	Site
23-0400-01	DEK-MW-15002	Groundwater	05/02/2023 12:07	DEK Bottom Ash Pond
23-0400-02	DEK-MW-15005	Groundwater	05/02/2023 09:53	DEK Bottom Ash Pond
23-0400-03	DEK-MW-15006	Groundwater	05/02/2023 11:13	DEK Bottom Ash Pond
23-0400-04	DUP-DEK-BAP-01	Groundwater	05/02/2023 00:00	DEK Bottom Ash Pond
23-0400-05	FB-DEK-BAP	Water	05/02/2023 12:07	DEK Bottom Ash Pond
23-0400-06	EB-DEK-BAP	Water	05/02/2023 12:21	DEK Bottom Ash Pond

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Analytical Report

Report Date: 05/19/23

Sample Site: **DEK Bottom Ash Pond**
Field Sample ID: **DEK-MW-15002**
Lab Sample ID: 23-0400-01
Matrix: Groundwater

Laboratory Project: **23-0400**
Collect Date: 05/02/2023
Collect Time: 12:07 PM

Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 23-0400-01-C01-A01 **Analyst: EB**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Arsenic	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Barium	176		ug/L	5.0	05/09/2023	AB23-0510-13
Beryllium	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Boron	1270		ug/L	20.0	05/09/2023	AB23-0510-13
Cadmium	ND		ug/L	0.2	05/09/2023	AB23-0510-13
Calcium	122000		ug/L	1000.0	05/09/2023	AB23-0510-13
Chromium	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Cobalt	ND		ug/L	6.0	05/09/2023	AB23-0510-13
Copper	1		ug/L	1.0	05/09/2023	AB23-0510-13
Iron	1680		ug/L	20.0	05/09/2023	AB23-0510-13
Lead	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Lithium	29		ug/L	10.0	05/09/2023	AB23-0510-13
Magnesium	39700		ug/L	1000.0	05/09/2023	AB23-0510-13
Manganese	354		ug/L	5.0	05/09/2023	AB23-0510-13
Molybdenum	ND		ug/L	5.0	05/09/2023	AB23-0510-13
Nickel	3		ug/L	2.0	05/09/2023	AB23-0510-13
Potassium	10800		ug/L	100.0	05/09/2023	AB23-0510-13
Selenium	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Silver	ND		ug/L	0.2	05/09/2023	AB23-0510-13
Sodium	99500		ug/L	1000.0	05/09/2023	AB23-0510-13
Thallium	ND		ug/L	2.0	05/09/2023	AB23-0510-13
Vanadium	ND		ug/L	2.0	05/09/2023	AB23-0510-13
Zinc	19		ug/L	10.0	05/09/2023	AB23-0510-13

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 23-0400-01-C01-A02 **Analyst: CLE**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	05/11/2023	AB23-0511-02

Anions by EPA 300.0 Aqueous, NO2, NO3

Aliquot #: 23-0400-01-C02-A01 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Nitrate	ND		ug/L	100.0	05/03/2023	AB23-0503-05
Nitrite	ND		ug/L	100.0	05/03/2023	AB23-0503-05

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

Aliquot #: 23-0400-01-C02-A02 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	81700		ug/L	1000.0	05/05/2023	AB23-0505-06

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Analytical Report

Report Date: 05/19/23

Sample Site: **DEK Bottom Ash Pond**
Field Sample ID: **DEK-MW-15002**
Lab Sample ID: 23-0400-01
Matrix: Groundwater

Laboratory Project: **23-0400**
Collect Date: 05/02/2023
Collect Time: 12:07 PM

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

Aliquot #: 23-0400-01-C02-A02 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Fluoride	ND		ug/L	1000.0	05/05/2023	AB23-0505-06
Sulfate	225000		ug/L	1000.0	05/05/2023	AB23-0505-06

Nitrogen-Ammonia by SM4500NH3(h), Groundwater HL

Aliquot #: 23-0400-01-C03-A01 **Analyst: CLE**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Ammonia	5500		ug/L	25.0	05/12/2023	AB23-0512-02

Total Dissolved Solids by SM 2540C

Aliquot #: 23-0400-01-C04-A01 **Analyst: LMO**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	899		mg/L	10.0	05/04/2023	AB23-0504-07

Alkalinity by SM 2320B

Aliquot #: 23-0400-01-C05-A01 **Analyst: DLS**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	385000		ug/L	10000.0	05/05/2023	AB23-0505-09
Alkalinity Bicarbonate	385000		ug/L	10000.0	05/05/2023	AB23-0505-09
Alkalinity Carbonate	ND		ug/L	10000.0	05/05/2023	AB23-0505-09

Sulfide, Total by SM 4500 S2D

Aliquot #: 23-0400-01-C07-A01 **Analyst: Merit**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Sulfide	100		ug/L	20.0	05/05/2023	AB23-0504-02

Sample Site: **DEK Bottom Ash Pond**
Field Sample ID: **DEK-MW-15005**
Lab Sample ID: 23-0400-02
Matrix: Groundwater

Laboratory Project: **23-0400**
Collect Date: 05/02/2023
Collect Time: 09:53 AM

Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 23-0400-02-C01-A01 **Analyst: EB**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Arsenic	32		ug/L	1.0	05/09/2023	AB23-0510-13
Barium	228		ug/L	5.0	05/09/2023	AB23-0510-13
Beryllium	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Boron	856		ug/L	20.0	05/09/2023	AB23-0510-13
Cadmium	ND		ug/L	0.2	05/09/2023	AB23-0510-13
Calcium	106000		ug/L	1000.0	05/09/2023	AB23-0510-13
Chromium	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Cobalt	ND		ug/L	6.0	05/09/2023	AB23-0510-13
Copper	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Iron	695		ug/L	20.0	05/09/2023	AB23-0510-13
Lead	ND		ug/L	1.0	05/18/2023	AB23-0510-13
Lithium	27		ug/L	10.0	05/09/2023	AB23-0510-13
Magnesium	21400		ug/L	1000.0	05/09/2023	AB23-0510-13
Manganese	294		ug/L	5.0	05/09/2023	AB23-0510-13
Molybdenum	8		ug/L	5.0	05/09/2023	AB23-0510-13
Nickel	3		ug/L	2.0	05/09/2023	AB23-0510-13
Potassium	8560		ug/L	100.0	05/09/2023	AB23-0510-13
Selenium	1		ug/L	1.0	05/09/2023	AB23-0510-13
Silver	ND		ug/L	0.2	05/09/2023	AB23-0510-13
Sodium	110000		ug/L	1000.0	05/09/2023	AB23-0510-13
Thallium	ND		ug/L	2.0	05/09/2023	AB23-0510-13
Vanadium	ND		ug/L	2.0	05/09/2023	AB23-0510-13
Zinc	ND		ug/L	10.0	05/09/2023	AB23-0510-13

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 23-0400-02-C01-A02 **Analyst: CLE**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	05/11/2023	AB23-0511-02

Anions by EPA 300.0 Aqueous, NO2, NO3

Aliquot #: 23-0400-02-C02-A01 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Nitrate	ND		ug/L	100.0	05/03/2023	AB23-0503-05
Nitrite	ND		ug/L	100.0	05/03/2023	AB23-0503-05

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

Aliquot #: 23-0400-02-C02-A02 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	86700		ug/L	1000.0	05/05/2023	AB23-0505-06

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Analytical Report

Report Date: 05/19/23

Sample Site: **DEK Bottom Ash Pond**
Field Sample ID: **DEK-MW-15005**
Lab Sample ID: 23-0400-02
Matrix: Groundwater

Laboratory Project: **23-0400**
Collect Date: 05/02/2023
Collect Time: 09:53 AM

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

Aliquot #: 23-0400-02-C02-A02 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Fluoride	ND		ug/L	1000.0	05/05/2023	AB23-0505-06
Sulfate	189000		ug/L	1000.0	05/05/2023	AB23-0505-06

Nitrogen-Ammonia by SM4500NH3(h), Groundwater HL

Aliquot #: 23-0400-02-C03-A01 **Analyst: CLE**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Ammonia	3290		ug/L	25.0	05/12/2023	AB23-0512-02

Total Dissolved Solids by SM 2540C

Aliquot #: 23-0400-02-C04-A01 **Analyst: LMO**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	767		mg/L	10.0	05/04/2023	AB23-0504-07

Alkalinity by SM 2320B

Aliquot #: 23-0400-02-C05-A01 **Analyst: DLS**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	329000		ug/L	10000.0	05/05/2023	AB23-0505-09
Alkalinity Bicarbonate	329000		ug/L	10000.0	05/05/2023	AB23-0505-09
Alkalinity Carbonate	ND		ug/L	10000.0	05/05/2023	AB23-0505-09

Sulfide, Total by SM 4500 S2D

Aliquot #: 23-0400-02-C07-A01 **Analyst: Merit**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Sulfide	60		ug/L	20.0	05/05/2023	AB23-0504-02

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Analytical Report

Report Date: 05/19/23

Sample Site: **DEK Bottom Ash Pond**
Field Sample ID: **DEK-MW-15006**
Lab Sample ID: 23-0400-03
Matrix: Groundwater

Laboratory Project: **23-0400**
Collect Date: 05/02/2023
Collect Time: 11:13 AM

Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 23-0400-03-C01-A01 **Analyst: EB**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Arsenic	16		ug/L	1.0	05/09/2023	AB23-0510-13
Barium	137		ug/L	5.0	05/09/2023	AB23-0510-13
Beryllium	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Boron	944		ug/L	20.0	05/09/2023	AB23-0510-13
Cadmium	ND		ug/L	0.2	05/09/2023	AB23-0510-13
Calcium	127000		ug/L	1000.0	05/09/2023	AB23-0510-13
Chromium	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Cobalt	ND		ug/L	6.0	05/09/2023	AB23-0510-13
Copper	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Iron	985		ug/L	20.0	05/09/2023	AB23-0510-13
Lead	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Lithium	19		ug/L	10.0	05/09/2023	AB23-0510-13
Magnesium	17900		ug/L	1000.0	05/09/2023	AB23-0510-13
Manganese	454		ug/L	5.0	05/09/2023	AB23-0510-13
Molybdenum	7		ug/L	5.0	05/09/2023	AB23-0510-13
Nickel	3		ug/L	2.0	05/09/2023	AB23-0510-13
Potassium	8840		ug/L	100.0	05/09/2023	AB23-0510-13
Selenium	1		ug/L	1.0	05/09/2023	AB23-0510-13
Silver	ND		ug/L	0.2	05/09/2023	AB23-0510-13
Sodium	103000		ug/L	1000.0	05/09/2023	AB23-0510-13
Thallium	ND		ug/L	2.0	05/09/2023	AB23-0510-13
Vanadium	ND		ug/L	2.0	05/09/2023	AB23-0510-13
Zinc	ND		ug/L	10.0	05/09/2023	AB23-0510-13

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 23-0400-03-C01-A02 **Analyst: CLE**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	05/11/2023	AB23-0511-02

Anions by EPA 300.0 Aqueous, NO2, NO3

Aliquot #: 23-0400-03-C02-A01 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Nitrate	ND		ug/L	100.0	05/03/2023	AB23-0503-05
Nitrite	ND		ug/L	100.0	05/03/2023	AB23-0503-05

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

Aliquot #: 23-0400-03-C02-A02 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	61200		ug/L	1000.0	05/05/2023	AB23-0505-06

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Analytical Report

Report Date: 05/19/23

Sample Site: **DEK Bottom Ash Pond**
Field Sample ID: **DEK-MW-15006**
Lab Sample ID: 23-0400-03
Matrix: Groundwater

Laboratory Project: **23-0400**
Collect Date: 05/02/2023
Collect Time: 11:13 AM

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

Aliquot #: 23-0400-03-C02-A02 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Fluoride	ND		ug/L	1000.0	05/05/2023	AB23-0505-06
Sulfate	385000		ug/L	1000.0	05/06/2023	AB23-0505-06

Nitrogen-Ammonia by SM4500NH3(h), Groundwater HL

Aliquot #: 23-0400-03-C03-A01 **Analyst: CLE**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Ammonia	3830		ug/L	25.0	05/12/2023	AB23-0512-02

Total Dissolved Solids by SM 2540C

Aliquot #: 23-0400-03-C04-A01 **Analyst: LMO**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	847		mg/L	10.0	05/04/2023	AB23-0504-07

Alkalinity by SM 2320B

Aliquot #: 23-0400-03-C05-A01 **Analyst: DLS**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	197000		ug/L	10000.0	05/05/2023	AB23-0505-09
Alkalinity Bicarbonate	197000		ug/L	10000.0	05/05/2023	AB23-0505-09
Alkalinity Carbonate	ND		ug/L	10000.0	05/05/2023	AB23-0505-09

Sulfide, Total by SM 4500 S2D

Aliquot #: 23-0400-03-C07-A01 **Analyst: Merit**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Sulfide	40		ug/L	20.0	05/05/2023	AB23-0504-02

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Analytical Report

Report Date: 05/19/23

Sample Site: **DEK Bottom Ash Pond**
Field Sample ID: **DUP-DEK-BAP-01**
Lab Sample ID: 23-0400-04
Matrix: Groundwater

Laboratory Project: **23-0400**
Collect Date: 05/02/2023
Collect Time: 12:00 AM

Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 23-0400-04-C01-A01 **Analyst: EB**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Arsenic	32		ug/L	1.0	05/09/2023	AB23-0510-13
Barium	224		ug/L	5.0	05/09/2023	AB23-0510-13
Beryllium	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Boron	864		ug/L	20.0	05/09/2023	AB23-0510-13
Cadmium	ND		ug/L	0.2	05/09/2023	AB23-0510-13
Calcium	107000		ug/L	1000.0	05/09/2023	AB23-0510-13
Chromium	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Cobalt	ND		ug/L	6.0	05/09/2023	AB23-0510-13
Copper	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Iron	684		ug/L	20.0	05/09/2023	AB23-0510-13
Lead	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Lithium	28		ug/L	10.0	05/09/2023	AB23-0510-13
Magnesium	21000		ug/L	1000.0	05/09/2023	AB23-0510-13
Manganese	299		ug/L	5.0	05/09/2023	AB23-0510-13
Molybdenum	8		ug/L	5.0	05/09/2023	AB23-0510-13
Nickel	3		ug/L	2.0	05/09/2023	AB23-0510-13
Potassium	8530		ug/L	100.0	05/09/2023	AB23-0510-13
Selenium	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Silver	ND		ug/L	0.2	05/09/2023	AB23-0510-13
Sodium	111000		ug/L	1000.0	05/09/2023	AB23-0510-13
Thallium	ND		ug/L	2.0	05/09/2023	AB23-0510-13
Vanadium	ND		ug/L	2.0	05/09/2023	AB23-0510-13
Zinc	ND		ug/L	10.0	05/09/2023	AB23-0510-13

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 23-0400-04-C01-A02 **Analyst: CLE**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	05/11/2023	AB23-0511-02

Anions by EPA 300.0 Aqueous, NO2, NO3

Aliquot #: 23-0400-04-C02-A01 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Nitrate	ND		ug/L	100.0	05/03/2023	AB23-0503-05
Nitrite	ND		ug/L	100.0	05/03/2023	AB23-0503-05

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

Aliquot #: 23-0400-04-C02-A02 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	87400		ug/L	1000.0	05/05/2023	AB23-0505-06

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Analytical Report

Report Date: 05/19/23

Sample Site: **DEK Bottom Ash Pond**
Field Sample ID: **DUP-DEK-BAP-01**
Lab Sample ID: 23-0400-04
Matrix: Groundwater

Laboratory Project: **23-0400**
Collect Date: 05/02/2023
Collect Time: 12:00 AM

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

Aliquot #: 23-0400-04-C02-A02 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Fluoride	ND		ug/L	1000.0	05/05/2023	AB23-0505-06
Sulfate	189000		ug/L	1000.0	05/05/2023	AB23-0505-06

Nitrogen-Ammonia by SM4500NH3(h), Groundwater HL

Aliquot #: 23-0400-04-C03-A01 **Analyst: CLE**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Ammonia	3310		ug/L	25.0	05/12/2023	AB23-0512-02

Total Dissolved Solids by SM 2540C

Aliquot #: 23-0400-04-C04-A01 **Analyst: LMO**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	764		mg/L	10.0	05/04/2023	AB23-0504-07

Alkalinity by SM 2320B

Aliquot #: 23-0400-04-C05-A01 **Analyst: DLS**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	324000		ug/L	10000.0	05/05/2023	AB23-0505-09
Alkalinity Bicarbonate	324000		ug/L	10000.0	05/05/2023	AB23-0505-09
Alkalinity Carbonate	ND		ug/L	10000.0	05/05/2023	AB23-0505-09

Sulfide, Total by SM 4500 S2D

Aliquot #: 23-0400-04-C07-A01 **Analyst: Merit**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Sulfide	60		ug/L	20.0	05/05/2023	AB23-0504-02

Sample Site: **DEK Bottom Ash Pond**
Field Sample ID: **FB-DEK-BAP**
Lab Sample ID: 23-0400-05
Matrix: Water

Laboratory Project: **23-0400**
Collect Date: 05/02/2023
Collect Time: 12:07 PM

Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 23-0400-05-C01-A01 **Analyst: EB**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Arsenic	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Barium	ND		ug/L	5.0	05/09/2023	AB23-0510-13
Beryllium	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Boron	ND		ug/L	20.0	05/09/2023	AB23-0510-13
Cadmium	ND		ug/L	0.2	05/09/2023	AB23-0510-13
Calcium	ND		ug/L	1000.0	05/09/2023	AB23-0510-13
Chromium	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Cobalt	ND		ug/L	6.0	05/09/2023	AB23-0510-13
Copper	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Iron	ND		ug/L	20.0	05/09/2023	AB23-0510-13
Lead	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Lithium	ND		ug/L	10.0	05/09/2023	AB23-0510-13
Magnesium	ND		ug/L	1000.0	05/09/2023	AB23-0510-13
Manganese	ND		ug/L	5.0	05/09/2023	AB23-0510-13
Molybdenum	ND		ug/L	5.0	05/09/2023	AB23-0510-13
Nickel	ND		ug/L	2.0	05/09/2023	AB23-0510-13
Potassium	ND		ug/L	100.0	05/09/2023	AB23-0510-13
Selenium	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Silver	ND		ug/L	0.2	05/09/2023	AB23-0510-13
Sodium	ND		ug/L	1000.0	05/09/2023	AB23-0510-13
Thallium	ND		ug/L	2.0	05/09/2023	AB23-0510-13
Vanadium	ND		ug/L	2.0	05/09/2023	AB23-0510-13
Zinc	ND		ug/L	10.0	05/09/2023	AB23-0510-13

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 23-0400-05-C01-A02 **Analyst: CLE**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	05/11/2023	AB23-0511-02

Anions by EPA 300.0 Aqueous, NO2, NO3

Aliquot #: 23-0400-05-C02-A01 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Nitrate	ND		ug/L	100.0	05/03/2023	AB23-0503-05
Nitrite	ND		ug/L	100.0	05/03/2023	AB23-0503-05

Nitrogen-Ammonia by SM4500NH3(h), Groundwater HL

Aliquot #: 23-0400-05-C03-A01 **Analyst: CLE**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Ammonia	ND		ug/L	25.0	05/12/2023	AB23-0512-02

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Analytical Report

Report Date: 05/19/23

Sample Site:	**DEK Bottom Ash Pond**	Laboratory Project:	**23-0400**
Field Sample ID:	**FB-DEK-BAP**	Collect Date:	05/02/2023
Lab Sample ID:	23-0400-05	Collect Time:	12:07 PM
Matrix:	Water		

Sulfide, Total by SM 4500 S2D

Aliquot #: 23-0400-05-C04-A01 **Analyst: Merit**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Sulfide	ND		ug/L	20.0	05/05/2023	AB23-0504-02

Sample Site: **DEK Bottom Ash Pond**
Field Sample ID: **EB-DEK-BAP**
Lab Sample ID: 23-0400-06
Matrix: Water

Laboratory Project: **23-0400**
Collect Date: 05/02/2023
Collect Time: 12:21 PM

Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 23-0400-06-C01-A01 **Analyst: EB**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Arsenic	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Barium	ND		ug/L	5.0	05/09/2023	AB23-0510-13
Beryllium	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Boron	ND		ug/L	20.0	05/09/2023	AB23-0510-13
Cadmium	ND		ug/L	0.2	05/09/2023	AB23-0510-13
Calcium	ND		ug/L	1000.0	05/09/2023	AB23-0510-13
Chromium	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Cobalt	ND		ug/L	6.0	05/09/2023	AB23-0510-13
Copper	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Iron	ND		ug/L	20.0	05/09/2023	AB23-0510-13
Lead	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Lithium	ND		ug/L	10.0	05/09/2023	AB23-0510-13
Magnesium	ND		ug/L	1000.0	05/09/2023	AB23-0510-13
Manganese	ND		ug/L	5.0	05/09/2023	AB23-0510-13
Molybdenum	ND		ug/L	5.0	05/09/2023	AB23-0510-13
Nickel	ND		ug/L	2.0	05/09/2023	AB23-0510-13
Potassium	ND		ug/L	100.0	05/09/2023	AB23-0510-13
Selenium	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Silver	ND		ug/L	0.2	05/09/2023	AB23-0510-13
Sodium	ND		ug/L	1000.0	05/09/2023	AB23-0510-13
Thallium	ND		ug/L	2.0	05/09/2023	AB23-0510-13
Vanadium	ND		ug/L	2.0	05/09/2023	AB23-0510-13
Zinc	ND		ug/L	10.0	05/09/2023	AB23-0510-13

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 23-0400-06-C01-A02 **Analyst: CLE**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	05/11/2023	AB23-0511-02

Anions by EPA 300.0 Aqueous, NO2, NO3

Aliquot #: 23-0400-06-C02-A01 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Nitrate	ND		ug/L	100.0	05/03/2023	AB23-0503-05
Nitrite	ND		ug/L	100.0	05/03/2023	AB23-0503-05

Nitrogen-Ammonia by SM4500NH3(h), Groundwater HL

Aliquot #: 23-0400-06-C03-A01 **Analyst: CLE**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Ammonia	ND		ug/L	25.0	05/12/2023	AB23-0512-02

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Analytical Report

Report Date: 05/19/23

Sample Site:	**DEK Bottom Ash Pond**	Laboratory Project:	**23-0400**
Field Sample ID:	**EB-DEK-BAP**	Collect Date:	05/02/2023
Lab Sample ID:	23-0400-06	Collect Time:	12:21 PM
Matrix:	Water		

Sulfide, Total by SM 4500 S2D

Aliquot #: 23-0400-06-C04-A01 **Analyst: Merit**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Sulfide	ND		ug/L	20.0	05/05/2023	AB23-0504-02

Data Qualifiers	Exception Summary
	No exceptions occurred.

General Standard Operating Procedure

TITLE: SAMPLE LOG-IN – SHIPMENT INSPECTION FORM

Project Log-In Number: 23-0400

Inspection Date: 5.03.23 **Inspection By:** LMO

Sample Origin/Project Name: Q2-2023 DEK Bottom Ash Pond Wells

Shipment Delivered By: Enter the type of shipment carrier.

Pony _____ FedEx X UPS _____ USPS _____ Airborne _____

Other/Hand Carry (whom) _____

Tracking Number: 3977 7543 4 7108 Shipping Form Attached: Yes X No _____

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

Cooler X 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 X Dented _____ Leaking _____

Other _____

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

Shipping Containers Received: Opened _____ Sealed X

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

CoC X Work Request _____ Air Data Sheet _____ Other _____

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

As-Received Temperature Range 2.1-5.4 Samples Received on Ice: Yes X No _____

M&TE # and Expiration 27723 5.25.23

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

Container Type	Water	Soil	Other	Broken	Leaking
VOA (40mL or 60mL)	8				
Quart/Liter (g/p)					
9-oz (amber glass jar)					
2-oz (amber glass)					
125 mL (plastic)	24				
24 mL vial (glass)					
250 ~~500~~ mL (plastic) LMO 5.3.23	4				
Other					

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

SAMPLING SITE / CUSTOMER: Q2-2023 DEK Bottom Ash Pond Wells

PROJECT NUMBER: **23-0400**

SAP CC or WO#:

REQUESTER: Harold Register

SAMPLING TEAM:

TURNAROUND TIME REQUIRED: ☐ 24 HR ☐ 48 HR ☐ 3 DAYS ☐ STANDARD ☒ OTHER _____

SEND REPORT TO: Caleb Batts — email: — phone:

COPY TO: Harold Register; TRC

MATRIX CODES: GW = Groundwater; WW = Wastewater; W = Water / Aqueous Liquid; S = Soil / General Solid; O = Oil; OX = Other _____; SL = Sludge; A = Air; WP = Wipe; WT = General Waste

ANALYSIS REQUESTED (Attach List if More Space is Needed)

QA REQUIREMENT: ☐ NPDES ☒ TNI ☐ ISO 17025 ☐ 10 CFR 50 APP. B ☐ INTERNAL INFO ☐ OTHER _____

LAB SAMPLE ID	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	MATRIX	FIELD SAMPLE ID / LOCATION	CONTAINERS TOTAL #	PRESERVATIVE None	HNO_3	H_2SO_4	NaOH	HCl	MeOH	Other	Total Metals	Anions	Ammonia	TDS	Alkalinity	Sulfide	REMARKS
23-0400-01	5-2-23	1207	GW	DEK-MW-15002	7	4	1	1	1				x	x	x	x	x	x	
-02	5-2-23	0953	GW	DEK-MW-15005	7	4	1	1	1				x	x	x	x	x	x	
-03	5-2-23	1113	GW	DEK-MW-15006	7	4	1	1	1				x	x	x	x	x	x	
-04	5-2-23	—	GW	DUP-DEK-BAP-01	7	4	1	1	1				x	x	x	x	x	x	
-05	5-2-23	1207	W	FB-DEK-BAP	4	1	1	1	1				x	x	x			x	
-06	5-2-23	1221	W	EB-DEK-BAP	4	1	1	1	1				x	x	x			x	

RELINQUISHED BY: [signature] — DATE/TIME: 5-2-23 / 1600 — RECEIVED BY: FedEx

RELINQUISHED BY: Fed Ex — DATE/TIME: 05-03-23 10:20 — RECEIVED BY: [signature]

COMMENTS:

Received on Ice? ☑ Yes ☐ No — M&TE #: 27723

Temperature: 2.1-5.4 °C — Cal. Due Date: 5-25-23

Analytical Laboratory Report

Report ID: S48155.01(01)
Generated on 05/05/2023

Report to

Attention: Emil Blaj
Consumers Energy Company
135 West Trail Street
Jackson, MI 49201

Phone: D:517-788-5888 C:517-684-9467 FAX:
Email: emil.blaj@cmsenergy.com

Report produced by

Merit Laboratories, Inc.
2680 East Lansing Drive
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:
John Laverty (johnlaverty@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

Report Summary

Lab Sample ID(s): S48155.01-S48155.06
Project: 23-0400 PR#23050668
Collected Date(s): 05/02/2023
Submitted Date/Time: 05/03/2023 16:41
Sampled by: Unknown
P.O. #: 4400114090

Table of Contents

Maya Murshak
Technical Director

General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.
Methods may be modified for improved performance.
Results reported on a dry weight basis where applicable.
'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).
When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.
40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.
QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.
Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.
Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.
Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.
Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)
PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."
Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.
Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

Report Narrative

There is no additional narrative for this analytical report

Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched

Method Summary

Method	Version
SM4500-S2 D	Standard Method 4450 S2 D 2011

Analytical Laboratory Report

Sample Summary (6 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S48155.01	23-0400-01 (DEK-MW-15002)	Groundwater	05/02/23 12:07
S48155.02	23-0400-02 (DEK-MW-15005)	Groundwater	05/02/23 09:53
S48155.03	23-0400-03 (DEK-MW-15006)	Groundwater	05/02/23 11:13
S48155.04	23-0400-04 (DUP-DEK-BAP-01)	Groundwater	05/02/23 00:01
S48155.05	23-0400-05 (FB-DEK-BAP)	Groundwater	05/02/23 12:07
S48155.06	23-0400-06 (EB-DEK-BAP)	Groundwater	05/02/23 12:21

Analytical Laboratory Report

Lab Sample ID: S48155.01
Sample Tag: 23-0400-01 (DEK-MW-15002)
Collected Date/Time: 05/02/2023 12:07
Matrix: Groundwater
COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	NaOH/Zn Acetate	Yes	4.1	IR

Inorganics

Method: SM4500-S2 D, Run Date: 05/05/23 15:06, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfide	0.10	0.02	0.005	mg/L	1	18496-25-8	

Analytical Laboratory Report

Lab Sample ID: S48155.02
Sample Tag: 23-0400-02 (DEK-MW-15005)
Collected Date/Time: 05/02/2023 09:53
Matrix: Groundwater
COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	NaOH/Zn Acetate	Yes	4.1	IR

Inorganics

Method: SM4500-S2 D, Run Date: 05/05/23 15:08, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfide	0.06	0.02	0.005	mg/L	1	18496-25-8	

Analytical Laboratory Report

Lab Sample ID: S48155.03
Sample Tag: 23-0400-03 (DEK-MW-15006)
Collected Date/Time: 05/02/2023 11:13
Matrix: Groundwater
COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	NaOH/Zn Acetate	Yes	4.1	IR

Inorganics

Method: SM4500-S2 D, Run Date: 05/05/23 15:16, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfide	0.04	0.02	0.005	mg/L	1	18496-25-8	

Analytical Laboratory Report

Lab Sample ID: S48155.04
Sample Tag: 23-0400-04 (DUP-DEK-BAP-01)
Collected Date/Time: 05/02/2023 00:01
Matrix: Groundwater
COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	NaOH/Zn Acetate	Yes	4.1	IR

Inorganics

Method: SM4500-S2 D, Run Date: 05/05/23 15:18, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfide	0.06	0.02	0.005	mg/L	1	18496-25-8	

Analytical Laboratory Report

Lab Sample ID: S48155.05
Sample Tag: 23-0400-05 (FB-DEK-BAP)
Collected Date/Time: 05/02/2023 12:07
Matrix: Groundwater
COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	NaOH/Zn Acetate	Yes	4.1	IR

Inorganics

Method: SM4500-S2 D, Run Date: 05/05/23 15:20, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfide	Not detected	0.02	0.005	mg/L	1	18496-25-8	

Analytical Laboratory Report

Lab Sample ID: S48155.06
Sample Tag: 23-0400-06 (EB-DEK-BAP)
Collected Date/Time: 05/02/2023 12:21
Matrix: Groundwater
COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	NaOH/Zn Acetate	Yes	4.1	IR

Inorganics

Method: SM4500-S2 D, Run Date: 05/05/23 15:22, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfide	Not detected	0.02	0.005	mg/L	1	18496-25-8	

Merit Laboratories Login Checklist

Lab Set ID: S48155
Client: CONSUMERS (Consumers Energy Company)
Project: 23-0400 PR#23050668
Submitted: 05/03/2023 16:41 Login User: MMC

Attention: Emil Blaj
Address: Consumers Energy Company
135 West Trail Street
Jackson, MI 49201

Phone: D:517-788-5888 FAX:
Email: emil.blaj@cmsenergy.com

Selection				Description	Note
Sample Receiving					
01.	[X] Yes	[ ] No	[ ] N/A	Samples are received at 4C +/- 2C Thermometer #	IR 4.1
02.	[X] Yes	[ ] No	[ ] N/A	Received on ice/ cooling process begun	
03.	[ ] Yes	[X] No	[ ] N/A	Samples shipped	
04.	[ ] Yes	[X] No	[ ] N/A	Samples left in 24 hr. drop box	
05.	[ ] Yes	[ ] No	[X] N/A	Are there custody seals/tape or is the drop box locked	
Chain of Custody					
06.	[X] Yes	[ ] No	[ ] N/A	COC adequately filled out	
07.	[X] Yes	[ ] No	[ ] N/A	COC signed and relinquished to the lab	
08.	[X] Yes	[ ] No	[ ] N/A	Sample tag on bottles match COC	
09.	[ ] Yes	[X] No	[ ] N/A	Subcontracting needed? Subcontacted to:	
Preservation					
10.	[X] Yes	[ ] No	[ ] N/A	Do sample have correct chemical preservation	
11.	[X] Yes	[ ] No	[ ] N/A	Completed pH checks on preserved samples? (no VOAs)	
12.	[ ] Yes	[X] No	[ ] N/A	Did any samples need to be preserved in the lab?	
Bottle Conditions					
13.	[X] Yes	[ ] No	[ ] N/A	All bottles intact	
14.	[X] Yes	[ ] No	[ ] N/A	Appropriate analytical bottles are used	
15.	[X] Yes	[ ] No	[ ] N/A	Merit bottles used	
16.	[X] Yes	[ ] No	[ ] N/A	Sufficient sample volume received	
17.	[ ] Yes	[X] No	[ ] N/A	Samples require laboratory filtration	
18.	[X] Yes	[ ] No	[ ] N/A	Samples submitted within holding time	
19.	[ ] Yes	[ ] No	[X] N/A	Do water VOC or TOX bottles contain headspace	

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S48155 Submitted: 05/03/2023 16:41

Client: CONSUMERS (Consumers Energy Company)

Project: 23-0400 PR#23050668

Initial Preservation Check: 05/04/2023 08:44 MMC

Preservation Recheck (E200.8): N/A

Attention: Emil Blaj
Address: Consumers Energy Company
135 West Trail Street
Jackson, MI 49201

Phone: D:517-788-5888 FAX:
Email: emil.blaj@cmsenergy.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S48155.01	125ml Plastic NaOH/Zn Acetate	>12			
S48155.02	125ml Plastic NaOH/Zn Acetate	>12			
S48155.03	125ml Plastic NaOH/Zn Acetate	>12			
S48155.04	125ml Plastic NaOH/Zn Acetate	>12			
S48155.05	125ml Plastic NaOH/Zn Acetate	>12			
S48155.06	125ml Plastic NaOH/Zn Acetate	>12			

Merit Laboratories, Inc.

2680 East Lansing Dr., East Lansing, MI 48823
Phone (517) 332-0167 Fax (517) 332-4034
www.meritlabs.com

C.O.C. PAGE # 1 OF 1

CHAIN OF CUSTODY RECORD

REPORT TO

CONTACT NAME: Emil Blaj
COMPANY: Consumers Energy
ADDRESS: 135 W. Trail Street
CITY: Jackson | STATE: MI | ZIP CODE: 49201
PHONE NO.: 517-788-5888 | FAX NO.: 517-788-2533 | P.O. NO.: 4400114090
E-MAIL ADDRESS: emil.blaj@cmsenergy.com | QUOTE NO.:

INVOICE TO

CONTACT NAME | ☒ SAME
COMPANY
ADDRESS
CITY | STATE | ZIP CODE
PHONE NO. | E-MAIL ADDRESS

PROJECT NO./NAME: 23-0400 PR#23050668
SAMPLER(S) - PLEASE PRINT/SIGN NAME: N/A

TURNAROUND TIME REQUIRED ☐ 1 DAY ☐ 2 DAYS ☐ 3 DAYS ☒ STANDARD ☐ OTHER _____

DELIVERABLES REQUIRED ☐ STD ☒ LEVEL II ☐ LEVEL III ☐ LEVEL IV ☐ EDD ☐ OTHER _____

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ Other _____

MERIT LAB NO. (FOR LAB USE ONLY)	YEAR DATE	YEAR TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives: NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Total Sulfide	Special Instructions
48155.01	05/02/23	1207	23-0400-01 (DEK-MW-15002)	GW	1					1			✓	preserved with NaOH/ZnAcetate
.02	05/02/23	0953	23-0400-02 (DEK-MW-15005)	GW	1					1			✓	"
.03	05/02/23	1113	23-0400-03 (DEK-MW-15006)	GW	1					1			✓	"
.04	05/02/23	-	23-0400-04 (DUP-DEK-BAP-01)	GW	1					1			✓	"
.05	05/02/23	1207	23-0400-05 (FB-DEK-BAP)	GW	1					1			✓	"
.06	05/02/23	1221	23-0400-06 (EB-DEK-BAP)	GW	1					1			✓	"

RELINQUISHED BY: SIGNATURE/ORGANIZATION: CONSUMERS ENERGY ☐ Sampler | DATE: 05-05-23 | TIME: 1641
RECEIVED BY: SIGNATURE/ORGANIZATION: M Chilcote | DATE: 5/3/23 | TIME: 1641

RELINQUISHED BY: SIGNATURE/ORGANIZATION | DATE | TIME
RECEIVED BY: SIGNATURE/ORGANIZATION | DATE | TIME

RELINQUISHED BY: SIGNATURE/ORGANIZATION | DATE | TIME
RECEIVED BY: SIGNATURE/ORGANIZATION | DATE | TIME

RELINQUISHED BY: SIGNATURE/ORGANIZATION | DATE | TIME
RECEIVED BY: SIGNATURE/ORGANIZATION | DATE | TIME

SEAL NO. | SEAL INTACT YES ☐ NO ☐ | INITIALS
SEAL NO. | SEAL INTACT YES ☐ NO ☐ | INITIALS

NOTES: TEMP. ON ARRIVAL 4.1

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

Rev. 5.18.12

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135 W. Trail St.
Jackson, MI 49201
phone 517-788-1251
fax 517-788-2533

To: CDBatts, Karn/Weadock

From: EBlaj, T-258

Date: May 19, 2023

Subject: RCRA GROUNDWATER MONITORING – KARN BAP & LINED IMP. WELLS – 2023 Q2

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

Darby Litz, Project Manager
TRC Companies, Inc.
1540 Eisenhower Place
Ann Arbor, MI 48108

Chemistry Project: 23-0401R

TRC Environmental, Inc. conducted groundwater monitoring at the DEKarn Bottom Ash Pond and Lined Impoundment Wells area during the week of 05/01/2023, for the 2nd Quarter requirement, as specified in the Sampling and Analysis Plan for the site. The samples were received for analysis by the Chemistry department of Laboratory Services on 05/04/2023.

Samples for Total Sulfide have been subcontracted to Merit Laboratories, Inc. and the results are listed under the analyst initials "Merit". 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

ilac-MRA A2LA ACCREDITED Certificate #1097.04

CASE NARRATIVE

I. Sample Receipt

All samples were received within hold time and in good conditions; no anomalies were noted on the attached 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. All sample preservation and temperature 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, 22nd 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 recoveries of the field matrix spike & matrix spike duplicate samples are included in the results section; all other quality control data is listed in the Quality Control Summary associated with the particular test method, as appropriate. 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:

Acronym	Description
RL	Reporting Limit
ND	Result not detected or below Reporting Limit
NT	Non 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

Qualifier	Description
*	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

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Work Order Sample Summary

Customer Name: Karn/Weadock Complex
Work Order ID: Q2-2023 DEK Bottom Ash Pond & Lined Impoundment
Date Received: 5/4/2023
Chemistry Project: 23-0401

Sample #	Field Sample ID	Matrix	Sample Date	Site
23-0401-01	DEK-MW-18001	Groundwater	05/03/2023 06:40	DEK Bottom Ash Pond & Lined Impoundment
23-0401-02	DEK-MW-18001 MS	Groundwater	05/03/2023 06:40	DEK Bottom Ash Pond & Lined Impoundment
23-0401-03	DEK-MW-18001 MSD	Groundwater	05/03/2023 06:40	DEK Bottom Ash Pond & Lined Impoundment

Sample Site: **DEK Bottom Ash Pond & Lined Impoundment**
Field Sample ID: **DEK-MW-18001**
Lab Sample ID: 23-0401-01
Matrix: Groundwater

Laboratory Project: **23-0401**
Collect Date: 05/03/2023
Collect Time: 06:40 AM

Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 23-0401-01-C01-A01 **Analyst: EB**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Arsenic	304		ug/L	1.0	05/09/2023	AB23-0510-13
Barium	152		ug/L	5.0	05/09/2023	AB23-0510-13
Beryllium	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Boron	931		ug/L	20.0	05/09/2023	AB23-0510-13
Cadmium	ND		ug/L	0.2	05/09/2023	AB23-0510-13
Calcium	54600		ug/L	1000.0	05/09/2023	AB23-0510-13
Chromium	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Cobalt	ND		ug/L	6.0	05/09/2023	AB23-0510-13
Copper	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Iron	875		ug/L	20.0	05/09/2023	AB23-0510-13
Lead	ND		ug/L	1.0	05/09/2023	AB23-0510-13
Lithium	20		ug/L	10.0	05/09/2023	AB23-0510-13
Magnesium	10600		ug/L	1000.0	05/09/2023	AB23-0510-13
Manganese	144		ug/L	5.0	05/09/2023	AB23-0510-13
Molybdenum	11		ug/L	5.0	05/09/2023	AB23-0510-13
Nickel	ND		ug/L	2.0	05/09/2023	AB23-0510-13
Potassium	5960		ug/L	100.0	05/09/2023	AB23-0510-13
Selenium	1		ug/L	1.0	05/09/2023	AB23-0510-13
Silver	ND		ug/L	0.2	05/09/2023	AB23-0510-13
Sodium	112000		ug/L	1000.0	05/09/2023	AB23-0510-13
Thallium	ND		ug/L	2.0	05/09/2023	AB23-0510-13
Vanadium	ND		ug/L	2.0	05/09/2023	AB23-0510-13
Zinc	12		ug/L	10.0	05/09/2023	AB23-0510-13

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 23-0401-01-C01-A02 **Analyst: CLE**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	05/11/2023	AB23-0511-02

Anions by EPA 300.0 Aqueous, NO2, NO3

Aliquot #: 23-0401-01-C02-A01 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Nitrate	ND		ug/L	100.0	05/04/2023	AB23-0504-05
Nitrite	ND		ug/L	100.0	05/04/2023	AB23-0504-05

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

Aliquot #: 23-0401-01-C02-A02 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	62200		ug/L	1000.0	05/05/2023	AB23-0505-06

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Analytical Report

Report Date: 05/19/23

Sample Site: **DEK Bottom Ash Pond & Lined Impoundment**
Field Sample ID: **DEK-MW-18001**
Lab Sample ID: 23-0401-01
Matrix: Groundwater

Laboratory Project: **23-0401**
Collect Date: 05/03/2023
Collect Time: 06:40 AM

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

Aliquot #: 23-0401-01-C02-A02 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Fluoride	ND		ug/L	1000.0	05/05/2023	AB23-0505-06
Sulfate	148000		ug/L	1000.0	05/05/2023	AB23-0505-06

Nitrogen-Ammonia by SM4500NH3(h), Groundwater HL

Aliquot #: 23-0401-01-C03-A01 **Analyst: CLE**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Ammonia	1740		ug/L	25.0	05/12/2023	AB23-0512-02

Total Dissolved Solids by SM 2540C

Aliquot #: 23-0401-01-C04-A01 **Analyst: LMO**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	575		mg/L	10.0	05/05/2023	AB23-0505-05

Alkalinity by SM 2320B

Aliquot #: 23-0401-01-C05-A01 **Analyst: DLS**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	192000		ug/L	10000.0	05/10/2023	AB23-0510-02
Alkalinity Bicarbonate	192000		ug/L	10000.0	05/10/2023	AB23-0510-02
Alkalinity Carbonate	ND		ug/L	10000.0	05/10/2023	AB23-0510-02

Sulfide, Total by SM 4500 S2D

Aliquot #: 23-0401-01-C07-A01 **Analyst: Merit**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Sulfide	ND		ug/L	20.0	05/05/2023	AB23-0505-10

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Analytical Report

Report Date: 05/19/23

Sample Site: **DEK Bottom Ash Pond & Lined Impoundment**
Field Sample ID: **DEK-MW-18001 MS**
Lab Sample ID: 23-0401-02
Matrix: Groundwater

Laboratory Project: **23-0401**
Collect Date: 05/03/2023
Collect Time: 06:40 AM

Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 23-0401-02-C01-A01 **Analyst: EB**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	109		%	1.0	05/09/2023	AB23-0510-13
Arsenic	92		%	1.0	05/09/2023	AB23-0510-13
Barium	111		%	5.0	05/09/2023	AB23-0510-13
Beryllium	104		%	1.0	05/09/2023	AB23-0510-13
Boron	99		%	20.0	05/09/2023	AB23-0510-13
Cadmium	105		%	0.2	05/09/2023	AB23-0510-13
Calcium	101		%	1000.0	05/09/2023	AB23-0510-13
Chromium	91		%	1.0	05/09/2023	AB23-0510-13
Cobalt	96		%	6.0	05/09/2023	AB23-0510-13
Copper	94		%	1.0	05/09/2023	AB23-0510-13
Iron	110		%	20.0	05/09/2023	AB23-0510-13
Lead	99		%	1.0	05/09/2023	AB23-0510-13
Lithium	99		%	10.0	05/09/2023	AB23-0510-13
Magnesium	103		%	1000.0	05/09/2023	AB23-0510-13
Manganese	96		%	5.0	05/09/2023	AB23-0510-13
Molybdenum	114		%	5.0	05/09/2023	AB23-0510-13
Nickel	94		%	2.0	05/09/2023	AB23-0510-13
Potassium	100		%	100.0	05/09/2023	AB23-0510-13
Selenium	98		%	1.0	05/09/2023	AB23-0510-13
Silver	93.9		%	0.2	05/09/2023	AB23-0510-13
Sodium	105		%	1000.0	05/09/2023	AB23-0510-13
Thallium	99		%	2.0	05/09/2023	AB23-0510-13
Vanadium	99		%	2.0	05/09/2023	AB23-0510-13
Zinc	93		%	10.0	05/09/2023	AB23-0510-13

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 23-0401-02-C01-A02 **Analyst: CLE**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	104		%	0.2	05/11/2023	AB23-0511-02

Anions by EPA 300.0 Aqueous, NO2, NO3

Aliquot #: 23-0401-02-C02-A01 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Nitrate	85		%	100.0	05/04/2023	AB23-0504-05
Nitrite	92		%	100.0	05/04/2023	AB23-0504-05

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

Aliquot #: 23-0401-02-C02-A02 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	99		%	1000.0	05/05/2023	AB23-0505-06

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Analytical Report

Report Date: 05/19/23

Sample Site: **DEK Bottom Ash Pond & Lined Impoundment**
Field Sample ID: **DEK-MW-18001 MS**
Lab Sample ID: 23-0401-02
Matrix: Groundwater

Laboratory Project: **23-0401**
Collect Date: 05/03/2023
Collect Time: 06:40 AM

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

Aliquot #: 23-0401-02-C02-A02 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Fluoride	94		%	1000.0	05/05/2023	AB23-0505-06
Sulfate	102		%	1000.0	05/05/2023	AB23-0505-06

Nitrogen-Ammonia by SM4500NH3(h), Groundwater HL

Aliquot #: 23-0401-02-C03-A01 **Analyst: CLE**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Ammonia	102		%	25.0	05/12/2023	AB23-0512-02

Alkalinity by SM 2320B

Aliquot #: 23-0401-02-C04-A01 **Analyst: DLS**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	97.9		%	10000.0	05/10/2023	AB23-0510-02

Sulfide, Total by SM 4500 S2D

Aliquot #: 23-0401-02-C06-A01 **Analyst: Merit**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Sulfide	92		%	20.0	05/05/2023	AB23-0505-10

Sample Site: **DEK Bottom Ash Pond & Lined Impoundment**
Field Sample ID: **DEK-MW-18001 MSD**
Lab Sample ID: 23-0401-03
Matrix: Groundwater

Laboratory Project: **23-0401**
Collect Date: 05/03/2023
Collect Time: 06:40 AM

Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 23-0401-03-C01-A01 **Analyst: EB**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	110		%	1.0	05/09/2023	AB23-0510-13
Arsenic	104		%	1.0	05/09/2023	AB23-0510-13
Barium	112		%	5.0	05/09/2023	AB23-0510-13
Beryllium	106		%	1.0	05/09/2023	AB23-0510-13
Boron	98		%	20.0	05/09/2023	AB23-0510-13
Cadmium	106		%	0.2	05/09/2023	AB23-0510-13
Calcium	97.8		%	1000.0	05/09/2023	AB23-0510-13
Chromium	93		%	1.0	05/09/2023	AB23-0510-13
Cobalt	97		%	6.0	05/09/2023	AB23-0510-13
Copper	92		%	1.0	05/09/2023	AB23-0510-13
Iron	104		%	20.0	05/09/2023	AB23-0510-13
Lead	97		%	1.0	05/09/2023	AB23-0510-13
Lithium	98		%	10.0	05/09/2023	AB23-0510-13
Magnesium	101		%	1000.0	05/09/2023	AB23-0510-13
Manganese	97		%	5.0	05/09/2023	AB23-0510-13
Molybdenum	113		%	5.0	05/09/2023	AB23-0510-13
Nickel	94		%	2.0	05/09/2023	AB23-0510-13
Potassium	102		%	100.0	05/09/2023	AB23-0510-13
Selenium	97		%	1.0	05/09/2023	AB23-0510-13
Silver	96.3		%	0.2	05/09/2023	AB23-0510-13
Sodium	103		%	1000.0	05/09/2023	AB23-0510-13
Thallium	98		%	2.0	05/09/2023	AB23-0510-13
Vanadium	100		%	2.0	05/09/2023	AB23-0510-13
Zinc	94		%	10.0	05/09/2023	AB23-0510-13

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 23-0401-03-C01-A02 **Analyst: CLE**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	108		%	0.2	05/11/2023	AB23-0511-02

Anions by EPA 300.0 Aqueous, NO2, NO3

Aliquot #: 23-0401-03-C02-A01 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Nitrate	86		%	100.0	05/04/2023	AB23-0504-05
Nitrite	93		%	100.0	05/04/2023	AB23-0504-05

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

Aliquot #: 23-0401-03-C02-A02 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	98		%	1000.0	05/05/2023	AB23-0505-06

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Analytical Report

Report Date: 05/19/23

Sample Site: **DEK Bottom Ash Pond & Lined Impoundment**
Field Sample ID: **DEK-MW-18001 MSD**
Lab Sample ID: 23-0401-03
Matrix: Groundwater

Laboratory Project: **23-0401**
Collect Date: 05/03/2023
Collect Time: 06:40 AM

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

Aliquot #: 23-0401-03-C02-A02 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Fluoride	93		%	1000.0	05/05/2023	AB23-0505-06
Sulfate	102		%	1000.0	05/05/2023	AB23-0505-06

Nitrogen-Ammonia by SM4500NH3(h), Groundwater HL

Aliquot #: 23-0401-03-C03-A01 **Analyst: CLE**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Ammonia	101		%	25.0	05/12/2023	AB23-0512-02

Alkalinity by SM 2320B

Aliquot #: 23-0401-03-C04-A01 **Analyst: DLS**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	101		%	10000.0	05/10/2023	AB23-0510-02

Sulfide, Total by SM 4500 S2D

Aliquot #: 23-0401-03-C06-A01 **Analyst: Merit**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Sulfide	91		%	20.0	05/05/2023	AB23-0505-10

Data Qualifiers	Exception Summary
	No exceptions occurred.

General Standard Operating Procedure

TITLE: SAMPLE LOG-IN – SHIPMENT INSPECTION FORM

Project Log-In Number: 23-0401

Inspection Date: 5.04.23 **Inspection By:** UMO

Sample Origin/Project Name: Q2-2023 Bottom Ash Pond + Lined Impound

Shipment Delivered By: Enter the type of shipment carrier.

Pony _____ FedEx _____ UPS _____ USPS _____ Airborne _____

Other/Hand Carry (whom) _____

Tracking Number: _____ Shipping Form Attached: Yes _____ No _____

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

Cooler X 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 X Dented _____ Leaking _____

Other _____

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

Shipping Containers Received: Opened _____ Sealed X

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

CoC X Work Request _____ Air Data Sheet _____ Other _____

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

As-Received Temperature Range 1.6-2.1 Samples Received on Ice: Yes X No _____

M&TE # and Expiration L5027723 5.25.23

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

Container Type	Water	Soil	Other	Broken	Leaking
VOA (40mL or 60mL)	6				
Quart/Liter (g/p)					
9-oz (amber glass jar)					
2-oz (amber glass)					
125 mL (plastic)	12				
24 mL vial (glass)					
250 ~~500~~ mL (plastic) UMO 5.4.23	1				
Other					

plt strip
lot # 205522
exp. 2.15.25

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Page _____ of _____

SAMPLING SITE / CUSTOMER: Q2-2023 DEK Bottom Ash Pond & Lined Impound.	PROJECT NUMBER: **23-0401**	SAP CC or WO#:	
SAMPLING TEAM:	TURNAROUND TIME REQUIRED: ☐ 24 HR ☐ 48 HR ☐ 3 DAYS ☐ STANDARD ☒ OTHER _____	REQUESTER: Harold Register	
SEND REPORT TO: Caleb Batts	email:	phone:	
COPY TO: Harold Register / TRC	MATRIX CODES: GW = Groundwater, WW = Wastewater, W = Water / Aqueous Liquid, S = Soil / General Solid, O = Oil, OX = Other _____, SL = Sludge, A = Air, WP = Wipe, WT = General Waste		

LAB SAMPLE ID	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	MATRIX	FIELD SAMPLE ID / LOCATION	CONTAINERS TOTAL #	PRESERVATIVE None	HNO_3	H_2SO_4	NaOH	HCl	MeOH	Other	Total Metals	Anions	Ammonia	TDS	Alkalinity	Sulfide				REMARKS
23-0401-01	5/3/23	0640	GW	DEK-MW-18001	7	4	1	1	1				x	x	x	x	x	x				
-02	"	0640	GW	DEK-MW-18001 MS	6	3	1	1	1				x	x	x		x	x				
-03	"	0640	GW	DEK-MW-18001 MSD	6	3	1	1	1				x	x	x		x	x				

ANALYSIS REQUESTED (Attach List if More Space is Needed)

QA REQUIREMENT:
- ☐ NPDES
- ☒ TNI
- ☐ ISO 17025
- ☐ 10 CFR 50 APP. B
- ☐ INTERNAL INFO
- ☐ OTHER _____

RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:
	5/4/23 0900	
RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:

COMMENTS:

Received on Ice? ☑ Yes ☐ No M&TE #: LS627723

Temperature: 1.6-2.1 °C Cal. Due Date: 5-25-23

General Standard Operating Procedure

TITLE: SAMPLE LOG-IN – SHIPMENT INSPECTION FORM

Project Log-In Number: 23-0401

Inspection Date: 5.04.23 **Inspection By:** UMO

Sample Origin/Project Name: Q2-2023 Bottom Ash Pond + Lined Impound

Shipment Delivered By: Enter the type of shipment carrier.

Pony _____ FedEx _____ UPS _____ USPS _____ Airborne _____

Other/Hand Carry (whom) _____

Tracking Number: _____ Shipping Form Attached: Yes _____ No _____

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

Cooler X 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 X Dented _____ Leaking _____

Other _____

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

Shipping Containers Received: Opened _____ Sealed X

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

CoC X Work Request _____ Air Data Sheet _____ Other _____

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

As-Received Temperature Range 1.6-2.1 Samples Received on Ice: Yes X No _____

M&TE # and Expiration L5027723 5.25.23

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

Container Type	Water	Soil	Other	Broken	Leaking
VOA (40mL or 60mL)	6				
Quart/Liter (g/p)					
9-oz (amber glass jar)					
2-oz (amber glass)					
125 mL (plastic)	12				
24 mL vial (glass)					
250 ~~500~~ mL (plastic) UMO 5.4.23	1				
Other					

pH strip
Lot # 205522
exp. 2.15.25

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Page _____ of _____

SAMPLING SITE / CUSTOMER: Q2-2023 DEK Bottom Ash Pond & Lined Impound.	PROJECT NUMBER: **23-0401**	SAP CC or WO#:	
SAMPLING TEAM:	TURNAROUND TIME REQUIRED: ☐ 24 HR ☐ 48 HR ☐ 3 DAYS ☐ STANDARD ☒ OTHER _____	REQUESTER: Harold Register	
SEND REPORT TO: Caleb Batts	email:	phone:	
COPY TO: Harold Register; TRC	MATRIX CODES: GW = Groundwater; WW = Wastewater; W = Water / Aqueous Liquid; S = Soil / General Solid; O = Oil; OX = Other _____; SL = Sludge; A = Air; WP = Wipe; WT = General Waste		

ANALYSIS REQUESTED (Attach List if More Space is Needed)

QA REQUIREMENT:
☐ NPDES
☒ TNI
☐ ISO 17025
☐ 10 CFR 50 APP. B
☐ INTERNAL INFO
☐ OTHER _____

LAB SAMPLE ID	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	MATRIX	FIELD SAMPLE ID / LOCATION	CONTAINERS TOTAL #	PRESERVATIVE None	HNO_3	H_2SO_4	NaOH	HCl	MeOH	Other	Total Metals	Anions	Ammonia	TDS	Alkalinity	Sulfide	REMARKS
23-0401-01	5/3/23	0640	GW	DEK-MW-18001	7	4	1	1	1				x	x	x	x	x	x	
-02	〃	0640	GW	DEK-MW-18001 MS	6	3	1	1	1				x	x	x		x	x	
-03	〃	0640	GW	DEK-MW-18001 MSD	6	3	1	1	1				x	x	x		x	x	

RELINQUISHED BY:	DATE/TIME: 5/4/23 0900	RECEIVED BY:
RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:

COMMENTS:

Received on Ice? ☑ Yes ☐ No M&TE #: LS627723

Temperature: 1.6-2.1 °C Cal. Due Date: 5-25-23

Analytical Laboratory Report

Report ID: S48227.01(01)
Generated on 05/08/2023

Report to

Attention: Emil Blaj
Consumers Energy Company
135 West Trail Street
Jackson, MI 49201

Phone: D:517-788-5888 C:517-684-9467 FAX:
Email: emil.blaj@cmsenergy.com

Report produced by

Merit Laboratories, Inc.
2680 East Lansing Drive
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:
John Laverty (johnlaverty@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

Report Summary

Lab Sample ID(s): S48227.01-S48227.03
Project: 23-0401 PR#23050668
Collected Date(s): 05/03/2023
Submitted Date/Time: 05/04/2023 16:41
Sampled by: Unknown
P.O. #: 4400114090

Table of Contents

Maya Murshak
Technical Director

Analytical Laboratory Report

General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.
Methods may be modified for improved performance.
Results reported on a dry weight basis where applicable.
'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).
When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.
40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.
QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.
Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.
Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)
PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."
Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.
Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

Report Narrative

There is no additional narrative for this analytical report

Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched

Method Summary

Method	Version
SM4500-S2 D	Standard Method 4450 S2 D 2011

Analytical Laboratory Report

Sample Summary (3 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S48227.01	23-0401-01 (DEK-MW-18001)	Groundwater	05/03/23 06:40
S48227.02	23-0401-02 (DEK-MW-18001 Field MS)	Groundwater	05/03/23 06:40
S48227.03	23-0401-03 (DEK-MW-18001 Field MSD)	Groundwater	05/03/23 06:40

Analytical Laboratory Report

Lab Sample ID: S48227.01
Sample Tag: 23-0401-01 (DEK-MW-18001)
Collected Date/Time: 05/03/2023 06:40
Matrix: Groundwater
COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	NaOH/Zn Acetate	Yes	3.7	IR

Inorganics

Method: SM4500-S2 D, Run Date: 05/05/23 16:26, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfide	Not detected	0.02	0.005	mg/L	1	18496-25-8	

Analytical Laboratory Report

Lab Sample ID: S48227.02
Sample Tag: 23-0401-02 (DEK-MW-18001 Field MS)
Collected Date/Time: 05/03/2023 06:40
Matrix: Groundwater
COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	NaOH/Zn Acetate	Yes	3.7	IR

Inorganics

Method: SM4500-S2 D, Run Date: 05/05/23 16:30, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfide	0.183	0.02	0.005	mg/L	1	18496-25-8	1

1-* Sample spike @ 0.20 mg/L

Analytical Laboratory Report

Lab Sample ID: S48227.03
Sample Tag: 23-0401-03 (DEK-MW-18001 Field MSD)
Collected Date/Time: 05/03/2023 06:40
Matrix: Groundwater
COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	NaOH/Zn Acetate	Yes	3.7	IR

Inorganics

Method: SM4500-S2 D, Run Date: 05/05/23 16:32, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfide	0.182	0.02	0.005	mg/L	1	18496-25-8	1

1-* Sample spike @ 0.20 mg/L

Merit Laboratories Login Checklist

Lab Set ID: S48227
Client: CONSUMERS (Consumers Energy Company)
Project: 23-0401 PR#23050668
Submitted: 05/04/2023 16:41 Login User: MMC

Attention: Emil Blaj
Address: Consumers Energy Company
135 West Trail Street
Jackson, MI 49201

Phone: D:517-788-5888 FAX:
Email: emil.blaj@cmsenergy.com

Selection				Description	Note
Sample Receiving					
01.	[X] Yes	[ ] No	[ ] N/A	Samples are received at 4C +/- 2C Thermometer #	IR 3.7
02.	[X] Yes	[ ] No	[ ] N/A	Received on ice/ cooling process begun	
03.	[ ] Yes	[X] No	[ ] N/A	Samples shipped	
04.	[ ] Yes	[X] No	[ ] N/A	Samples left in 24 hr. drop box	
05.	[ ] Yes	[ ] No	[X] N/A	Are there custody seals/tape or is the drop box locked	
Chain of Custody					
06.	[X] Yes	[ ] No	[ ] N/A	COC adequately filled out	
07.	[X] Yes	[ ] No	[ ] N/A	COC signed and relinquished to the lab	
08.	[X] Yes	[ ] No	[ ] N/A	Sample tag on bottles match COC	
09.	[ ] Yes	[X] No	[ ] N/A	Subcontracting needed? Subcontacted to:	
Preservation					
10.	[X] Yes	[ ] No	[ ] N/A	Do sample have correct chemical preservation	
11.	[X] Yes	[ ] No	[ ] N/A	Completed pH checks on preserved samples? (no VOAs)	
12.	[ ] Yes	[X] No	[ ] N/A	Did any samples need to be preserved in the lab?	
Bottle Conditions					
13.	[X] Yes	[ ] No	[ ] N/A	All bottles intact	
14.	[X] Yes	[ ] No	[ ] N/A	Appropriate analytical bottles are used	
15.	[ ] Yes	[X] No	[ ] N/A	Merit bottles used	
16.	[X] Yes	[ ] No	[ ] N/A	Sufficient sample volume received	
17.	[ ] Yes	[X] No	[ ] N/A	Samples require laboratory filtration	
18.	[X] Yes	[ ] No	[ ] N/A	Samples submitted within holding time	
19.	[ ] Yes	[ ] No	[X] N/A	Do water VOC or TOX bottles contain headspace	

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S48227 Submitted: 05/04/2023 16:41

Client: CONSUMERS (Consumers Energy Company)

Project: 23-0401 PR#23050668

Initial Preservation Check: 05/05/2023 08:42 MMC

Preservation Recheck (E200.8): N/A

Attention: Emil Blaj
Address: Consumers Energy Company
135 West Trail Street
Jackson, MI 49201

Phone: D:517-788-5888 FAX:
Email: emil.blaj@cmsenergy.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S48227.01	125ml Plastic NaOH/Zn Acetate	>12			
S48227.02	125ml Plastic NaOH/Zn Acetate	>12			
S48227.03	125ml Plastic NaOH/Zn Acetate	>12			

Merit Laboratories, Inc.
2680 East Lansing Dr., East Lansing, MI 48823
Phone (517) 332-0167 Fax (517) 332-4034
www.meritlabs.com

CHAIN OF CUSTODY RECORD

REPORT TO

CONTACT NAME: Emil Blaj
COMPANY: Consumers Energy
ADDRESS: 135 W. Trail Street
CITY: Jackson | STATE: MI | ZIP CODE: 49201
PHONE NO.: 517-788-5888 | FAX NO.: 517-788-2533 | P.O. NO.: 4400114090
E-MAIL ADDRESS: emil.blaj@cmsenergy.com | QUOTE NO.:

INVOICE TO

CONTACT NAME | ☒ SAME
COMPANY
ADDRESS
CITY | STATE | ZIP CODE
PHONE NO. | E-MAIL ADDRESS

PROJECT NO./NAME: 23-0401 PR#23050668
SAMPLER(S) - PLEASE PRINT/SIGN NAME: N/A

TURNAROUND TIME REQUIRED ☐ 1 DAY ☐ 2 DAYS ☐ 3 DAYS ☒ STANDARD ☐ OTHER _____

DELIVERABLES REQUIRED ☐ STD ☒ LEVEL II ☐ LEVEL III ☐ LEVEL IV ☐ EDD ☐ OTHER _____

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

Certifications: ☐ OHIO VAP ☐ Drinking Water ☐ DoD ☐ NPDES
Project Locations: ☐ Detroit ☐ New York ☐ Other _____

MERIT LAB NO. (FOR LAB USE ONLY)	YEAR: DATE	YEAR: TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives: NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Total Sulfide	Special Instructions
48227.01	05/03/23	0640	23-0401-01 (DEK-MW-18001)	GW	1					1			✓	preserved with NaOH/ZnAcetate
.02	05/03/23	0640	23-0401-02 (DEK-MW-18001 Field MS)	GW	1					1			✓	"
.03	05/03/23	0640	23-0401-03 (DEK-MW-18001 Field MSD)	GW	1					1			✓	"
														Please spike MS/MSD and report
														spike concentration and/or rec.

RELINQUISHED BY: SIGNATURE/ORGANIZATION: ☐ Sampler CONSUMERS ENERGY — DATE: 05-04-23 — TIME: 1641
RECEIVED BY: SIGNATURE/ORGANIZATION: M Oilcato — DATE: 5/4/23 — TIME: 1641
RELINQUISHED BY: SIGNATURE/ORGANIZATION — DATE — TIME
RECEIVED BY: SIGNATURE/ORGANIZATION — DATE — TIME

RELINQUISHED BY: SIGNATURE/ORGANIZATION — DATE — TIME
RECEIVED BY: SIGNATURE/ORGANIZATION — DATE — TIME

SEAL NO. | SEAL INTACT YES ☐ NO ☐ | INITIALS
SEAL NO. | SEAL INTACT YES ☐ NO ☐ | INITIALS

NOTES: TEMP. ON ARRIVAL 3.7

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

Rev. 5.18.12

Consumers Energy
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Laboratory Services
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135 W. Trail St.
Jackson, MI 49201

phone 517-788-1251
fax 517-788-2533

To: CDBatts, Karn/Weadock

From: EBlaj, T-258

Date: May 19, 2023

Subject: RCRA GROUNDWATER MONITORING – DEK-JCW BACKGROUND WELLS – 2023 Q2

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

Darby Litz, Project Manager
TRC Companies, Inc.
1540 Eisenhower Place
Ann Arbor, MI 48108

Chemistry Project: 23-0404

TRC Environmental, Inc. conducted groundwater monitoring at the Karn/Weadock Background Wells area during the week of 05/01/2023 for the 2nd Quarter requirement, as specified in the Sampling and Analysis Plan for the site. The samples were received for analysis by the Chemistry department of Laboratory Services on 05/03/2023.

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

ilac-MRA A2LA ACCREDITED Certificate #1097.04

CASE NARRATIVE

I. Sample Receipt

All samples were received within hold time and in good conditions; no anomalies were noted on the attached 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. All sample preservation and temperature 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, 22nd 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 recoveries of the field matrix spike & matrix spike duplicate samples are included in the results section, when applicable; all other quality control data is listed in the Quality Control Summary associated with the particular test method, as appropriate. 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:

Acronym	Description
RL	Reporting Limit
ND	Result not detected or below Reporting Limit
NT	Non 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

Qualifier	Description
*	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

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Work Order Sample Summary

Customer Name: Karn/Weadock Complex
Work Order ID: Q2-2023 DEK-JCW Background Wells
Date Received: 5/3/2023
Chemistry Project: 23-0404

Sample #	Field Sample ID	Matrix	Sample Date	Site
23-0404-01	MW-15002	Groundwater	05/01/2023 15:01	DEK JCW Background
23-0404-02	MW-15008	Groundwater	05/01/2023 12:40	DEK JCW Background
23-0404-03	MW-15016	Groundwater	05/01/2023 08:40	DEK JCW Background
23-0404-04	MW-15019	Groundwater	05/01/2023 13:43	DEK JCW Background
23-0404-05	DUP-Background	Groundwater	05/01/2023 00:00	DEK JCW Background
23-0404-06	FB- Background	Water	05/01/2023 12:40	DEK JCW Background

Sample Site: **DEK JCW Background**
Field Sample ID: **MW-15002**
Lab Sample ID: 23-0404-01
Matrix: Groundwater

Laboratory Project: **23-0404**
Collect Date: 05/01/2023
Collect Time: 03:01 PM

Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 23-0404-01-C01-A01 **Analyst: EB**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Arsenic	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Barium	63		ug/L	5.0	05/10/2023	AB23-0510-14
Beryllium	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Boron	ND		ug/L	20.0	05/10/2023	AB23-0510-14
Cadmium	ND		ug/L	0.2	05/10/2023	AB23-0510-14
Calcium	48400		ug/L	1000.0	05/10/2023	AB23-0510-14
Chromium	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Cobalt	ND		ug/L	6.0	05/10/2023	AB23-0510-14
Copper	1		ug/L	1.0	05/10/2023	AB23-0510-14
Iron	729		ug/L	20.0	05/10/2023	AB23-0510-14
Lead	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Lithium	ND		ug/L	10.0	05/10/2023	AB23-0510-14
Magnesium	5950		ug/L	1000.0	05/10/2023	AB23-0510-14
Molybdenum	ND		ug/L	5.0	05/10/2023	AB23-0510-14
Nickel	ND		ug/L	2.0	05/10/2023	AB23-0510-14
Potassium	834		ug/L	100.0	05/10/2023	AB23-0510-14
Selenium	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Silver	ND		ug/L	0.2	05/10/2023	AB23-0510-14
Sodium	72000		ug/L	1000.0	05/10/2023	AB23-0510-14
Thallium	ND		ug/L	2.0	05/10/2023	AB23-0510-14
Vanadium	ND		ug/L	2.0	05/10/2023	AB23-0510-14
Zinc	ND		ug/L	10.0	05/10/2023	AB23-0510-14

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 23-0404-01-C01-A02 **Analyst: CLE**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	05/12/2023	AB23-0512-06

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

Aliquot #: 23-0404-01-C02-A01 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	64500		ug/L	1000.0	05/11/2023	AB23-0511-03
Fluoride	ND		ug/L	1000.0	05/11/2023	AB23-0511-03
Sulfate	14900		ug/L	1000.0	05/11/2023	AB23-0511-03

Total Dissolved Solids by SM 2540C

Aliquot #: 23-0404-01-C03-A01 **Analyst: LMO**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	351		mg/L	10.0	05/04/2023	AB23-0504-07

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Analytical Report

Report Date: 05/19/23

Sample Site: **DEK JCW Background**
Field Sample ID: **MW-15008**
Lab Sample ID: 23-0404-02
Matrix: Groundwater

Laboratory Project: **23-0404**
Collect Date: 05/01/2023
Collect Time: 12:40 PM

Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 23-0404-02-C01-A01 **Analyst: EB**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Arsenic	1		ug/L	1.0	05/10/2023	AB23-0510-14
Barium	71		ug/L	5.0	05/10/2023	AB23-0510-14
Beryllium	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Boron	107		ug/L	20.0	05/10/2023	AB23-0510-14
Cadmium	ND		ug/L	0.2	05/10/2023	AB23-0510-14
Calcium	108000		ug/L	1000.0	05/10/2023	AB23-0510-14
Chromium	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Cobalt	ND		ug/L	6.0	05/10/2023	AB23-0510-14
Copper	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Iron	17900		ug/L	20.0	05/10/2023	AB23-0510-14
Lead	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Lithium	24		ug/L	10.0	05/10/2023	AB23-0510-14
Magnesium	15400		ug/L	1000.0	05/10/2023	AB23-0510-14
Molybdenum	ND		ug/L	5.0	05/10/2023	AB23-0510-14
Nickel	2		ug/L	2.0	05/10/2023	AB23-0510-14
Potassium	3180		ug/L	100.0	05/10/2023	AB23-0510-14
Selenium	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Silver	ND		ug/L	0.2	05/10/2023	AB23-0510-14
Sodium	163000		ug/L	1000.0	05/10/2023	AB23-0510-14
Thallium	ND		ug/L	2.0	05/10/2023	AB23-0510-14
Vanadium	5		ug/L	2.0	05/10/2023	AB23-0510-14
Zinc	ND		ug/L	10.0	05/10/2023	AB23-0510-14

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 23-0404-02-C01-A02 **Analyst: CLE**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	05/12/2023	AB23-0512-06

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

Aliquot #: 23-0404-02-C02-A01 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	259000		ug/L	1000.0	05/11/2023	AB23-0511-03
Fluoride	ND		ug/L	1000.0	05/11/2023	AB23-0511-03
Sulfate	10500		ug/L	1000.0	05/11/2023	AB23-0511-03

Total Dissolved Solids by SM 2540C

Aliquot #: 23-0404-02-C03-A01 **Analyst: LMO**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	877		mg/L	10.0	05/04/2023	AB23-0504-07

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Analytical Report

Report Date: 05/19/23

Sample Site: **DEK JCW Background**
Field Sample ID: **MW-15016**
Lab Sample ID: 23-0404-03
Matrix: Groundwater

Laboratory Project: **23-0404**
Collect Date: 05/01/2023
Collect Time: 08:40 AM

Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 23-0404-03-C01-A01 **Analyst: EB**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Arsenic	2		ug/L	1.0	05/10/2023	AB23-0510-14
Barium	58		ug/L	5.0	05/10/2023	AB23-0510-14
Beryllium	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Boron	347		ug/L	20.0	05/10/2023	AB23-0510-14
Cadmium	ND		ug/L	0.2	05/10/2023	AB23-0510-14
Calcium	175000		ug/L	1000.0	05/10/2023	AB23-0510-14
Chromium	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Cobalt	ND		ug/L	6.0	05/10/2023	AB23-0510-14
Copper	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Iron	1970		ug/L	20.0	05/10/2023	AB23-0510-14
Lead	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Lithium	64		ug/L	10.0	05/10/2023	AB23-0510-14
Magnesium	23900		ug/L	1000.0	05/10/2023	AB23-0510-14
Molybdenum	ND		ug/L	5.0	05/10/2023	AB23-0510-14
Nickel	6		ug/L	2.0	05/10/2023	AB23-0510-14
Potassium	10300		ug/L	100.0	05/10/2023	AB23-0510-14
Selenium	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Silver	ND		ug/L	0.2	05/10/2023	AB23-0510-14
Sodium	84800		ug/L	1000.0	05/10/2023	AB23-0510-14
Thallium	ND		ug/L	2.0	05/10/2023	AB23-0510-14
Vanadium	ND		ug/L	2.0	05/10/2023	AB23-0510-14
Zinc	ND		ug/L	10.0	05/10/2023	AB23-0510-14

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 23-0404-03-C01-A02 **Analyst: CLE**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	05/16/2023	AB23-0516-03

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

Aliquot #: 23-0404-03-C02-A01 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	106000		ug/L	1000.0	05/11/2023	AB23-0511-03
Fluoride	ND		ug/L	1000.0	05/11/2023	AB23-0511-03
Sulfate	253000		ug/L	1000.0	05/11/2023	AB23-0511-03

Total Dissolved Solids by SM 2540C

Aliquot #: 23-0404-03-C03-A01 **Analyst: LMO**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	889		mg/L	10.0	05/04/2023	AB23-0504-07

Sample Site: **DEK JCW Background**
Field Sample ID: **MW-15019**
Lab Sample ID: 23-0404-04
Matrix: Groundwater

Laboratory Project: **23-0404**
Collect Date: 05/01/2023
Collect Time: 01:43 PM

Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 23-0404-04-C01-A01 **Analyst: EB**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Arsenic	1		ug/L	1.0	05/10/2023	AB23-0510-14
Barium	317		ug/L	5.0	05/10/2023	AB23-0510-14
Beryllium	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Boron	211		ug/L	20.0	05/10/2023	AB23-0510-14
Cadmium	ND		ug/L	0.2	05/10/2023	AB23-0510-14
Calcium	159000		ug/L	1000.0	05/10/2023	AB23-0510-14
Chromium	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Cobalt	ND		ug/L	6.0	05/10/2023	AB23-0510-14
Copper	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Iron	21500		ug/L	20.0	05/10/2023	AB23-0510-14
Lead	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Lithium	13		ug/L	10.0	05/10/2023	AB23-0510-14
Magnesium	35900		ug/L	1000.0	05/10/2023	AB23-0510-14
Molybdenum	ND		ug/L	5.0	05/10/2023	AB23-0510-14
Nickel	3		ug/L	2.0	05/10/2023	AB23-0510-14
Potassium	1770		ug/L	100.0	05/10/2023	AB23-0510-14
Selenium	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Silver	ND		ug/L	0.2	05/10/2023	AB23-0510-14
Sodium	200000		ug/L	1000.0	05/10/2023	AB23-0510-14
Thallium	ND		ug/L	2.0	05/10/2023	AB23-0510-14
Vanadium	ND		ug/L	2.0	05/10/2023	AB23-0510-14
Zinc	ND		ug/L	10.0	05/10/2023	AB23-0510-14

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 23-0404-04-C01-A02 **Analyst: CLE**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	05/16/2023	AB23-0516-03

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

Aliquot #: 23-0404-04-C02-A01 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	302000		ug/L	1000.0	05/11/2023	AB23-0511-03
Fluoride	ND		ug/L	1000.0	05/11/2023	AB23-0511-03
Sulfate	94200		ug/L	1000.0	05/11/2023	AB23-0511-03

Total Dissolved Solids by SM 2540C

Aliquot #: 23-0404-04-C03-A01 **Analyst: LMO**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	1170		mg/L	10.0	05/04/2023	AB23-0504-07

Sample Site: **DEK JCW Background**
Field Sample ID: **DUP-Background**
Lab Sample ID: 23-0404-05
Matrix: Groundwater

Laboratory Project: **23-0404**
Collect Date: 05/01/2023
Collect Time: 12:00 AM

Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 23-0404-05-C01-A01 **Analyst: EB**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Arsenic	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Barium	326		ug/L	5.0	05/10/2023	AB23-0510-14
Beryllium	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Boron	207		ug/L	20.0	05/10/2023	AB23-0510-14
Cadmium	ND		ug/L	0.2	05/10/2023	AB23-0510-14
Calcium	157000		ug/L	1000.0	05/10/2023	AB23-0510-14
Chromium	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Cobalt	ND		ug/L	6.0	05/10/2023	AB23-0510-14
Copper	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Iron	21700		ug/L	20.0	05/10/2023	AB23-0510-14
Lead	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Lithium	12		ug/L	10.0	05/10/2023	AB23-0510-14
Magnesium	36400		ug/L	1000.0	05/10/2023	AB23-0510-14
Molybdenum	ND		ug/L	5.0	05/10/2023	AB23-0510-14
Nickel	3		ug/L	2.0	05/10/2023	AB23-0510-14
Potassium	1800		ug/L	100.0	05/10/2023	AB23-0510-14
Selenium	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Silver	ND		ug/L	0.2	05/10/2023	AB23-0510-14
Sodium	203000		ug/L	1000.0	05/10/2023	AB23-0510-14
Thallium	ND		ug/L	2.0	05/10/2023	AB23-0510-14
Vanadium	ND		ug/L	2.0	05/10/2023	AB23-0510-14
Zinc	ND		ug/L	10.0	05/10/2023	AB23-0510-14

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 23-0404-05-C01-A02 **Analyst: CLE**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	05/16/2023	AB23-0516-03

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

Aliquot #: 23-0404-05-C02-A01 **Analyst: KDR**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	304000		ug/L	1000.0	05/11/2023	AB23-0511-03
Fluoride	ND		ug/L	1000.0	05/11/2023	AB23-0511-03
Sulfate	93300		ug/L	1000.0	05/11/2023	AB23-0511-03

Total Dissolved Solids by SM 2540C

Aliquot #: 23-0404-05-C03-A01 **Analyst: LMO**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	1170		mg/L	10.0	05/04/2023	AB23-0504-07

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Analytical Report

Report Date: 05/19/23

Sample Site: **DEK JCW Background**
Field Sample ID: **FB- Background**
Lab Sample ID: 23-0404-06
Matrix: Water

Laboratory Project: **23-0404**
Collect Date: 05/01/2023
Collect Time: 12:40 PM

Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp

Aliquot #: 23-0404-06-C01-A01 **Analyst: EB**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Arsenic	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Barium	ND		ug/L	5.0	05/10/2023	AB23-0510-14
Beryllium	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Boron	ND		ug/L	20.0	05/10/2023	AB23-0510-14
Cadmium	ND		ug/L	0.2	05/10/2023	AB23-0510-14
Calcium	ND		ug/L	1000.0	05/10/2023	AB23-0510-14
Chromium	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Cobalt	ND		ug/L	6.0	05/10/2023	AB23-0510-14
Copper	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Iron	ND		ug/L	20.0	05/10/2023	AB23-0510-14
Lead	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Lithium	ND		ug/L	10.0	05/10/2023	AB23-0510-14
Magnesium	ND		ug/L	1000.0	05/10/2023	AB23-0510-14
Molybdenum	ND		ug/L	5.0	05/10/2023	AB23-0510-14
Nickel	ND		ug/L	2.0	05/10/2023	AB23-0510-14
Potassium	ND		ug/L	100.0	05/10/2023	AB23-0510-14
Selenium	ND		ug/L	1.0	05/10/2023	AB23-0510-14
Silver	ND		ug/L	0.2	05/10/2023	AB23-0510-14
Sodium	ND		ug/L	1000.0	05/10/2023	AB23-0510-14
Thallium	ND		ug/L	2.0	05/10/2023	AB23-0510-14
Vanadium	ND		ug/L	2.0	05/10/2023	AB23-0510-14
Zinc	ND		ug/L	10.0	05/10/2023	AB23-0510-14

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 23-0404-06-C01-A02 **Analyst: CLE**

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	05/16/2023	AB23-0516-03

Data Qualifiers	Exception Summary
	No exceptions occurred.

General Standard Operating Procedure

TITLE: SAMPLE LOG-IN – SHIPMENT INSPECTION FORM

Project Log-In Number: 23-0404

Inspection Date: 5.04.23 **Inspection By:** LMO

Sample Origin/Project Name: Q2-2023 JCW-DEK Background Wells

Shipment Delivered By: Enter the type of shipment carrier.

Pony _____ FedEx _____ UPS _____ USPS _____ Airborne _____

Other/Hand Carry (whom) _____

Tracking Number: ~~3977 8026 0844~~ LMO 5.4.23 3977 7534 7119 Shipping Form Attached: Yes X No ____

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

Cooler ____ 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 - 2.3 Samples Received on Ice: Yes X No ____

M&TE # and Expiration 27723 5.25.23

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)					
9-oz (amber glass jar)					
2-oz (amber glass)					
125 mL (plastic)	11				
24 mL vial (glass)					
250 500 mL (plastic)	5				
Other LMO 5.4.23					

pH strip
Lot # 205522
exp. 2.16.25

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CONSUMERS ENERGY COMPANY – LABORATORY SERVICES

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

SAMPLING SITE / CUSTOMER: Q2-2023 JCW-DEK Background Wells

PROJECT NUMBER: **23-0404**

SAP CC or WO#:

REQUESTER: Harold Register

SAMPLING TEAM:

TURNAROUND TIME REQUIRED: ☐ 24 HR ☐ 48 HR ☐ 3 DAYS ☐ STANDARD ☒ OTHER _____

SEND REPORT TO: Caleb Batts — email: — phone:

COPY TO: Harold Register; TRC

MATRIX CODES: GW = Groundwater; WW = Wastewater; W = Water / Aqueous Liquid; S = Soil / General Solid; O = Oil; OX = Other _____; SL = Sludge; A = Air; WP = Wipe; WT = General Waste

ANALYSIS REQUESTED (Attach List if More Space is Needed): Total Metals; Anions; TDS

QA REQUIREMENT: ☐ NPDES ☒ TNI ☐ ISO 17025 ☐ 10 CFR 50 APP. B ☐ INTERNAL INFO ☐ OTHER _____

LAB SAMPLE ID	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	MATRIX	FIELD SAMPLE ID / LOCATION	CONTAINERS TOTAL #	PRESERVATIVE None	HNO_3	H_2SO_4	NaOH	HCl	MeOH	Other	Total Metals	Anions	TDS	REMARKS
23-0404-01	5-1-23	1501	GW	MW-15002	3	2	1						x	x	x	
-02	5-1-23	1240	GW	MW-15008	3	2	1						x	x	x	
-03	5-2-23	0840	GW	MW-15016	3	2	1						x	x	x	
-04	5-1-23	1343	GW	MW-15019	3	2	1						x	x	x	
-05	5-1-23	—	GW	DUP-Background	3	2	1						x	x	x	
-06	5-1-23	1240	W	FB- Background	1								x			

RELINQUISHED BY: [signature] — DATE/TIME: 5-2-23 1600 — RECEIVED BY: Fed Ex

RELINQUISHED BY: Fed Ex — DATE/TIME: 05-03-23 10:20 — RECEIVED BY: [signature]

COMMENTS:

Received on Ice? ☑ Yes ☐ No — M&TE #: 27723

Temperature: 0.4 - 2.3 °C — Cal. Due Date: 5-25-23

eurofins | Environment Testing

1 2 3 4 5 6 7 8 9 10 11 12 13 14

ANALYTICAL REPORT

PREPARED FOR

Attn: Darby Litz
TRC Environmental Corporation.
1540 Eisenhower Place
Ann Arbor, Michigan 48108-7080

Generated 6/8/2023 4:39:25 PM

JOB DESCRIPTION

Karn/Weadock CCR DEK Bottom Ash Pond

JOB NUMBER

240-184755-1

Eurofins Cleveland
180 S. Van Buren Avenue
Barberton OH 44203

See page two for job notes and contact information.

myEOL

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins Environment Testing North Central, LLC Project Manager.

Authorization

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Authorized for release by
Kris Brooks, Project Manager II
Kris.Brooks@et.eurofinsus.com
(330)966-9790

Table of Contents

Definitions/Glossary

Client: TRC Environmental Corporation. Job ID: 240-184755-1
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Qualifiers

Rad

Qualifier	Qualifier Description
G	The Sample MDC is greater than the requested RL.
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	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

Job ID: 240-184755-1

Laboratory: Eurofins Cleveland

Narrative

Job Narrative
240-184755-1

Receipt
The samples were received on 5/5/2023 8:00 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 0.5°C

Gas Flow Proportional Counter
Method 903.0: Radium-226 Prep Batch 160-611074Insufficient sample volume was available to perform a sample duplicate for the following samples: DEK-MW-15002 (240-184755-1), DEK-MW-15005 (240-184755-2), DEK-MW-15006 (240-184755-3), DUP-DEK-BAP-01 (240-184755-4) and EB-DEK-BAP (240-184755-5). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

Method 903.0: Radium-226 batch 611074Any 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.DEK-MW-15002 (240-184755-1), DEK-MW-15005 (240-184755-2), DEK-MW-15006 (240-184755-3), DUP-DEK-BAP-01 (240-184755-4), EB-DEK-BAP (240-184755-5), (LCS 160-611074/2-A), (LCSD 160-611074/3-A) and (MB 160-611074/1-A)

Method 904.0: Radium-228 Prep Batch 160-611088Insufficient sample volume was available to perform a sample duplicate for the following samples: DEK-MW-15002 (240-184755-1), DEK-MW-15005 (240-184755-2), DEK-MW-15006 (240-184755-3), DUP-DEK-BAP-01 (240-184755-4) and EB-DEK-BAP (240-184755-5). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

Method 904.0: Radium-228 batch 611088The detection goal was not met for the following sample(s). The samples and batch QC were prepped at full volume. Matrix interferences are suspected because the method blank achieved the detection goal demonstrating acceptable sample preparation and instrument performance: DEK-MW-15002 (240-184755-1). Analytical results are reported with the detection limit achieved

Method 904.0: Radium-228 batch 611088Any 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.DEK-MW-15002 (240-184755-1), DEK-MW-15005 (240-184755-2), DEK-MW-15006 (240-184755-3), DUP-DEK-BAP-01 (240-184755-4), EB-DEK-BAP (240-184755-5), (LCS 160-611088/2-A), (LCSD 160-611088/3-A) and (MB 160-611088/1-A)

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

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

Method Summary

Client: TRC Environmental Corporation.
Job ID: 240-184755-1
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

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

Protocol References:

EPA = US Environmental Protection Agency

None = None

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

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

Sample Summary

Client: TRC Environmental Corporation. Job ID: 240-184755-1
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
240-184755-1	DEK-MW-15002	Water	05/02/23 12:07	05/05/23 08:00
240-184755-2	DEK-MW-15005	Water	05/02/23 09:53	05/05/23 08:00
240-184755-3	DEK-MW-15006	Water	05/02/23 11:13	05/05/23 08:00
240-184755-4	DUP-DEK-BAP-01	Water	05/02/23 00:00	05/05/23 08:00
240-184755-5	EB-DEK-BAP	Water	05/02/23 12:21	05/05/23 08:00

Client Sample ID: DEK-MW-15002 Lab Sample ID: 240-184755-1

Date Collected: 05/02/23 12:07 **Matrix: Water**
Date Received: 05/05/23 08:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.431		0.183	0.187	1.00	0.216	pCi/L	05/11/23 12:08	06/08/23 06:46	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*58.9*		*30 - 110*	*05/11/23 12:08*	*06/08/23 06:46*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.548	U G	0.879	0.881	1.00	1.50	pCi/L	05/11/23 12:51	06/01/23 12:32	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*58.9*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:32*	*1*
Y Carrier	*50.0*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:32*	*1*

Method: TAL-STL 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	0.979	U	0.898	0.901	5.00	1.50	pCi/L		06/08/23 14:39	1

Client Sample ID: DEK-MW-15005 — Lab Sample ID: 240-184755-2

Date Collected: 05/02/23 09:53 — **Matrix: Water**
Date Received: 05/05/23 08:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.355		0.125	0.129	1.00	0.122	pCi/L	05/11/23 12:08	06/08/23 06:46	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*83.2*		*30 - 110*	*05/11/23 12:08*	*06/08/23 06:46*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.271	U	0.439	0.439	1.00	0.755	pCi/L	05/11/23 12:51	06/01/23 12:32	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*83.2*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:32*	*1*
Y Carrier	*52.0*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:32*	*1*

Method: TAL-STL 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	0.626	U	0.456	0.458	5.00	0.755	pCi/L		06/08/23 14:39	1

Client Sample ID: DEK-MW-15006 — Lab Sample ID: 240-184755-3

Date Collected: 05/02/23 11:13 — **Matrix: Water**
Date Received: 05/05/23 08:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.324		0.131	0.134	1.00	0.146	pCi/L	05/11/23 12:08	06/08/23 06:46	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.8*		*30 - 110*	*05/11/23 12:08*	*06/08/23 06:46*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.111	U	0.491	0.492	1.00	0.894	pCi/L	05/11/23 12:51	06/01/23 12:32	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.8*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:32*	*1*
Y Carrier	*52.5*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:32*	*1*

Method: TAL-STL 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	0.434	U	0.508	0.510	5.00	0.894	pCi/L		06/08/23 14:39	1

Client Sample ID: DUP-DEK-BAP-01 — Lab Sample ID: 240-184755-4

Date Collected: 05/02/23 00:00 — **Matrix: Water**
Date Received: 05/05/23 08:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.417		0.149	0.153	1.00	0.143	pCi/L	05/11/23 12:08	06/08/23 06:47	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*68.1*		*30 - 110*	*05/11/23 12:08*	*06/08/23 06:47*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.206	U	0.449	0.449	1.00	0.785	pCi/L	05/11/23 12:51	06/01/23 12:38	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*68.1*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:38*	*1*
Y Carrier	*79.2*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:38*	*1*

Method: TAL-STL 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	0.622	U	0.473	0.474	5.00	0.785	pCi/L		06/08/23 14:39	1

Client Sample ID: EB-DEK-BAP

Lab Sample ID: 240-184755-5
Date Collected: 05/02/23 12:21
Matrix: Water
Date Received: 05/05/23 08:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.0170	U	0.0594	0.0594	1.00	0.129	pCi/L	05/11/23 12:08	06/08/23 06:47	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.9*		*30 - 110*	*05/11/23 12:08*	*06/08/23 06:47*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.110	U	0.278	0.279	1.00	0.496	pCi/L	05/11/23 12:51	06/01/23 12:39	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.9*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:39*	*1*
Y Carrier	*82.6*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:39*	*1*

Method: TAL-STL 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	0.0929	U	0.284	0.285	5.00	0.496	pCi/L		06/08/23 14:39	1

Tracer/Carrier Summary

Client: TRC Environmental Corporation.
Job ID: 240-184755-1
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water
Prep Type: Total/NA

		Percent Yield (Acceptance Limits)
		Ba
Lab Sample ID	Client Sample ID	(30-110)
240-184755-1	DEK-MW-15002	58.9
240-184755-2	DEK-MW-15005	83.2
240-184755-3	DEK-MW-15006	87.8
240-184755-4	DUP-DEK-BAP-01	68.1
240-184755-5	EB-DEK-BAP	93.9
LCS 160-611074/2-A	Lab Control Sample	96.1
LCSD 160-611074/3-A	Lab Control Sample Dup	81.0
MB 160-611074/1-A	Method Blank	93.4

Tracer/Carrier Legend

Ba = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water
Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
		Ba	Y
Lab Sample ID	Client Sample ID	(30-110)	(30-110)
240-184755-1	DEK-MW-15002	58.9	50.0
240-184755-2	DEK-MW-15005	83.2	52.0
240-184755-3	DEK-MW-15006	87.8	52.5
240-184755-4	DUP-DEK-BAP-01	68.1	79.2
240-184755-5	EB-DEK-BAP	93.9	82.6
LCS 160-611088/2-A	Lab Control Sample	96.1	78.7
LCSD 160-611088/3-A	Lab Control Sample Dup	81.0	62.1
MB 160-611088/1-A	Method Blank	93.4	79.2

Tracer/Carrier Legend

Ba = Ba Carrier
Y = Y Carrier

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-611074/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 615046 — **Prep Batch: 611074**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.1185		0.0822	0.0829	1.00	0.113	pCi/L	05/11/23 12:08	06/08/23 06:45	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.4*		*30 - 110*	*05/11/23 12:08*	*06/08/23 06:45*	*1*

Lab Sample ID: LCS 160-611074/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 615046 — **Prep Batch: 611074**

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-226			11.3	9.514		1.02	1.00	0.110	pCi/L	84	75 - 113		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*96.1*		*30 - 110*

Lab Sample ID: LCSD 160-611074/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 615046 — **Prep Batch: 611074**

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits	RER	RER Limit
Radium-226			11.3	10.42		1.12	1.00	0.131	pCi/L	92	75 - 113	0.42	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*81.0*		*30 - 110*

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-611088/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 614160 — **Prep Batch: 611088**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.4069	U	0.333	0.335	1.00	0.512	pCi/L	05/11/23 12:51	06/01/23 12:31	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.4*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:31*	*1*
Y Carrier	*79.2*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:31*	*1*

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

Lab Sample ID: LCS 160-611088/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 614160 — **Prep Batch: 611088**

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-228			8.15	9.437		1.30	1.00	0.530	pCi/L	116	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*96.1*		*30 - 110*
Y Carrier	*78.7*		*30 - 110*

Lab Sample ID: LCSD 160-611088/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 614159 — **Prep Batch: 611088**

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits	RER	RER Limit
Radium-228			8.15	8.686		1.67	1.00	1.09	pCi/L	107	75 - 125	0.25	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*81.0*		*30 - 110*
Y Carrier	*62.1*		*30 - 110*

QC Association Summary

Client: TRC Environmental Corporation. Job ID: 240-184755-1
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Rad

Prep Batch: 611074

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-184755-1	DEK-MW-15002	Total/NA	Water	PrecSep STD	
240-184755-2	DEK-MW-15005	Total/NA	Water	PrecSep STD	
240-184755-3	DEK-MW-15006	Total/NA	Water	PrecSep STD	
240-184755-4	DUP-DEK-BAP-01	Total/NA	Water	PrecSep STD	
240-184755-5	EB-DEK-BAP	Total/NA	Water	PrecSep STD	
MB 160-611074/1-A	Method Blank	Total/NA	Water	PrecSep STD	
LCS 160-611074/2-A	Lab Control Sample	Total/NA	Water	PrecSep STD	
LCSD 160-611074/3-A	Lab Control Sample Dup	Total/NA	Water	PrecSep STD	

Prep Batch: 611088

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-184755-1	DEK-MW-15002	Total/NA	Water	PrecSep_0	
240-184755-2	DEK-MW-15005	Total/NA	Water	PrecSep_0	
240-184755-3	DEK-MW-15006	Total/NA	Water	PrecSep_0	
240-184755-4	DUP-DEK-BAP-01	Total/NA	Water	PrecSep_0	
240-184755-5	EB-DEK-BAP	Total/NA	Water	PrecSep_0	
MB 160-611088/1-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-611088/2-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-611088/3-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

Lab Chronicle

Client: TRC Environmental Corporation. Job ID: 240-184755-1
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Client Sample ID: DEK-MW-15002 — Lab Sample ID: 240-184755-1

Date Collected: 05/02/23 12:07 — **Matrix: Water**
Date Received: 05/05/23 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep STD			611074	KAC	EET SL	05/11/23 12:08
Total/NA	Analysis	903.0		1	615046	FLC	EET SL	06/08/23 06:46
Total/NA	Prep	PrecSep_0			611088	KAC	EET SL	05/11/23 12:51
Total/NA	Analysis	904.0		1	614160	FLC	EET SL	06/01/23 12:32
Total/NA	Analysis	Ra226_Ra228		1	615062	EMH	EET SL	06/08/23 14:39

Client Sample ID: DEK-MW-15005 — Lab Sample ID: 240-184755-2

Date Collected: 05/02/23 09:53 — **Matrix: Water**
Date Received: 05/05/23 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep STD			611074	KAC	EET SL	05/11/23 12:08
Total/NA	Analysis	903.0		1	615046	FLC	EET SL	06/08/23 06:46
Total/NA	Prep	PrecSep_0			611088	KAC	EET SL	05/11/23 12:51
Total/NA	Analysis	904.0		1	614160	FLC	EET SL	06/01/23 12:32
Total/NA	Analysis	Ra226_Ra228		1	615062	EMH	EET SL	06/08/23 14:39

Client Sample ID: DEK-MW-15006 — Lab Sample ID: 240-184755-3

Date Collected: 05/02/23 11:13 — **Matrix: Water**
Date Received: 05/05/23 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep STD			611074	KAC	EET SL	05/11/23 12:08
Total/NA	Analysis	903.0		1	615046	FLC	EET SL	06/08/23 06:46
Total/NA	Prep	PrecSep_0			611088	KAC	EET SL	05/11/23 12:51
Total/NA	Analysis	904.0		1	614160	FLC	EET SL	06/01/23 12:32
Total/NA	Analysis	Ra226_Ra228		1	615062	EMH	EET SL	06/08/23 14:39

Client Sample ID: DUP-DEK-BAP-01 — Lab Sample ID: 240-184755-4

Date Collected: 05/02/23 00:00 — **Matrix: Water**
Date Received: 05/05/23 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep STD			611074	KAC	EET SL	05/11/23 12:08
Total/NA	Analysis	903.0		1	615046	FLC	EET SL	06/08/23 06:47
Total/NA	Prep	PrecSep_0			611088	KAC	EET SL	05/11/23 12:51
Total/NA	Analysis	904.0		1	614159	FLC	EET SL	06/01/23 12:38
Total/NA	Analysis	Ra226_Ra228		1	615062	EMH	EET SL	06/08/23 14:39

Lab Chronicle

Client: TRC Environmental Corporation. Job ID: 240-184755-1
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Client Sample ID: EB-DEK-BAP
Lab Sample ID: 240-184755-5
Date Collected: 05/02/23 12:21
Matrix: Water
Date Received: 05/05/23 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep STD			611074	KAC	EET SL	05/11/23 12:08
Total/NA	Analysis	903.0		1	615046	FLC	EET SL	06/08/23 06:47
Total/NA	Prep	PrecSep_0			611088	KAC	EET SL	05/11/23 12:51
Total/NA	Analysis	904.0		1	614159	FLC	EET SL	06/01/23 12:39
Total/NA	Analysis	Ra226_Ra228		1	615062	EMH	EET SL	06/08/23 14:39

Laboratory References:
EET SL = Eurofins St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Accreditation/Certification Summary

Client: TRC Environmental Corporation. Job ID: 240-184755-1
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Laboratory: Eurofins St. Louis

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	20-001	05-06-25
ANAB	Dept. of Defense ELAP	L2305	04-06-25
ANAB	Dept. of Energy	L2305.01	04-06-25
ANAB	ISO/IEC 17025	L2305	04-06-25
Arizona	State	AZ0813	12-08-23
California	Los Angeles County Sanitation Districts	10259	06-30-22 *
California	State	2886	06-30-23
Florida	NELAP	E87689	06-30-23
HI - RadChem Recognition	State	n/a	06-30-23
Illinois	NELAP	200023	11-30-23
Iowa	State	373	12-01-24
Kansas	NELAP	E-10236	10-31-23
Kentucky (DW)	State	KY90125	12-31-23
Kentucky (WW)	State	KY90125 (Permit KY0004049)	12-31-23
Louisiana (All)	NELAP	04080	06-30-23
Louisiana (DW)	State	LA011	12-31-23
Maryland	State	310	09-30-23
MI - RadChem Recognition	State	9005	06-30-23
Missouri	State	780	06-30-25
Nevada	State	MO000542020-1	07-31-23
New Jersey	NELAP	MO002	06-30-23
New York	NELAP	11616	03-31-24
North Carolina (DW)	State	29700	07-31-23
North Dakota	State	R-207	06-30-23
Oklahoma	NELAP	9997	08-31-23
Oregon	NELAP	4157	09-01-23
Pennsylvania	NELAP	68-00540	02-28-24
South Carolina	State	85002001	06-30-23
Texas	NELAP	T104704193	07-31-23
US Fish & Wildlife	US Federal Programs	058448	07-31-23
USDA	US Federal Programs	P330-17-00028	05-18-26
Utah	NELAP	MO000542021-14	07-31-23
Virginia	NELAP	10310	06-14-23
Washington	State	C592	08-30-23
West Virginia DEP	State	381	10-31-23

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

MICHIGAN 190

Eurofins Cleveland
180 S. Van Buren Avenue
Barberton, OH 44203
Phone: 330-497-9396 Fax: 330-497-0772

Chain of Custody Record

05/05

MICHIGAN 190

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Client Information	Sampler: Jake Krenz	Lab PM: Brooks, Kris M	Carrier Tracking No(s):	COC No: 240-107206-29052.1
Client Contact: Jacob Krenz	Phone: 734-395-9804	E-Mail: Kris.Brooks@et.eurofinsus.com	State of Origin:	Page: Page 1 of 1
Company: TRC Environmental Corporation	PWSID:			Job #:
Address: 1540 Eisenhower Place	Due Date Requested:			
City: Ann Arbor	TAT Requested (days):			
State, Zip: MI, 48108-7080	Compliance Project: Δ Yes Δ No			
Phone: 734-971-7080(Tel) 734-971-9022(Fax)	PO #: 178827			
Email: JKrenz@trccompanies.com	WO #:			
Project Name: Karn/Weadock CCR DEK Bottom Ash Pond	Project #: 24024154			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0, Ra226Ra228_GFPC	904.0 - Standard Target List	Total Number of containers	Special Instructions/Note:
			Preservation Code:				D	D		
DEK-MW-15002	5-2-23	1207	G	Water	N	N	X	X		
DEK-MW-15005	5-2-23	0953	G	Water	N	N	X	X		
DEK-MW-15006	5-2-23	1113	G	Water	N	N	X	X		
DUP-DEK-BAP-01	5-2-23	—	G	Water	N	N	X	X		
EB-DEK-BAP	5-2-23	1221	G	Water	N	N	X	X		
				Water						

240-184755 Chain of Custody

Possible Hazard Identification
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

	Relinquished by	Date/Time	Company	Received by	Date/Time	Company
1		5-4-23 / 1417	TRC		5/4/23 1417	EEA
2		5/4/23 1419			5-5-23 800	ETNC
3						

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

Eurofins - Canton Sample Receipt Form/Narrative Login # : 184755
Barberton Facility

Client TRC Site Name

Cooler Received on 5-5-23 Opened on 5-5-23

Cooler unpacked by: Jenny Boyle

FedEx: 1st Grd Exp UPS FAS Clipper Client Drop Off Eurofins Courier Other

Receipt After-hours: Drop-off Date/Time Storage Location

Eurofins Cooler # EC Foam Box Client Cooler Box Other

Packing material used: Bubble Wrap Foam Plastic Bag None Other

COOLANT: Wet Ice Blue Ice Dry Ice Water None

1. Cooler temperature upon receipt ☐ See Multiple Cooler Form
   IR GUN # 22 (CF +0.0 °C) Observed Cooler Temp. 0.5 °C Corrected Cooler Temp. 0.5 °C

2. Were tamper/custody seals on the outside of the cooler(s)? If Yes Quantity 1	Yes	No
-Were the seals on the outside of the cooler(s) signed & dated?	Yes	No NA
-Were tamper/custody seals on the bottle(s) or bottle kits (LLHg/MeHg)?	Yes	No
-Were tamper/custody seals intact and uncompromised?	Yes	No NA
3. Shippers' packing slip attached to the cooler(s)?	Yes	No
4. Did custody papers accompany the sample(s)?	Yes	No
5. Were the custody papers relinquished & signed in the appropriate place?	Yes	No
6. Was/were the person(s) who collected the samples clearly identified on the COC?	Yes	No
7. Did all bottles arrive in good condition (Unbroken)?	Yes	No
8. Could all bottle labels (ID/Date/Time) be reconciled with the COC?	Yes	No
9. For each sample, does the COC specify preservatives (Y/N), # of containers (Y/N), and sample type of grab/comp (Y/N)?		
10. Were correct bottle(s) used for the test(s) indicated?	Yes	No
11. Sufficient quantity received to perform indicated analyses?	Yes	No
12. Are these work share samples and all listed on the COC?	Yes	No
If yes, Questions 13-17 have been checked at the originating laboratory.		
13. Were all preserved sample(s) at the correct pH upon receipt?	Yes	No NA pH Strip Lot# HC208070
14. Were VOAs on the COC?	Yes	No
15. Were air bubbles >6 mm in any VOA vials? ● ⬅ Larger than this.	Yes	No NA
16. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot #	Yes	No
17. Was a LL Hg or Me Hg trip blank present?	Yes	No

Tests that are not checked for pH by Receiving:
VOAs
Oil and Grease
TOC

Contacted PM Date by via Verbal Voice Mail Other

Concerning

18. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES ☐ additional next page

Samples processed by:

19. SAMPLE CONDITION

Sample(s) were received after the recommended holding time had expired.
Sample(s) were received in a broken container.
Sample(s) were received with bubble >6 mm in diameter. (Notify PM)

20. SAMPLE PRESERVATION

Sample(s) were further preserved in the laboratory.
Time preserved: Preservative(s) added/Lot number(s):

VOA Sample Preservation - Date/Time VOAs Frozen:

Login Container Summary Report

Temperature readings: _____

Client Sample ID	Lab ID	Container Type	Container pH	Container Temp	Preservative Added (mls)	Lot #
DEK-MW-15002	240-184755-A-1	Plastic 1 liter - Nitric Acid	<2			
DEK-MW-15002	240-184755-B-1	Plastic 1 liter - Nitric Acid	<2			
DEK-MW-15005	240-184755-A-2	Plastic 1 liter - Nitric Acid	<2			
DEK-MW-15005	240-184755-B-2	Plastic 1 liter - Nitric Acid	<2			
DEK-MW-15006	240-184755-A-3	Plastic 1 liter - Nitric Acid	<2			
DEK-MW-15006	240-184755-B-3	Plastic 1 liter - Nitric Acid	<2			
DUP-DEK-BAP-01	240-184755-A-4	Plastic 1 liter - Nitric Acid	<2			
DUP-DEK-BAP-01	240-184755-B-4	Plastic 1 liter - Nitric Acid	<2			
EB-DEK-BAP	240-184755-A-5	Plastic 1 liter - Nitric Acid	<2			
EB-DEK-BAP	240-184755-B-5	Plastic 1 liter - Nitric Acid	<2			

Eurofins Cleveland
180 S. Van Buren Avenue
Barberton, OH 44203
Phone: 330-497-9396 Fax: 330-497-0772

Chain of Custody Record

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Client Information (Sub Contract Lab)	Sampler:	Lab PM: Brooks, Kris M	Carrier Tracking No(s):	COC No: 240-167649.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Kris.Brooks@et.eurofinsus.com	State of Origin: Michigan	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note):		Job #: 240-184755-1
Address: 13715 Rider Trail North, ,	Due Date Requested: 6/6/2023			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: Kam/Weadock CCR Groundwater Monitoring	Project #: 24024154			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_STD Standard Target List	904.0/PrecSep_0 Standard Target List	Ra226Ra228_GFPC	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
DEK-MW-15002 (240-184755-1)	5/2/23	12:07 Eastern		Water			X	X	X	2	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L.
DEK-MW-15005 (240-184755-2)	5/2/23	09:53 Eastern		Water			X	X	X	2	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L.
DEK-MW-15006 (240-184755-3)	5/2/23	11:13 Eastern		Water			X	X	X	2	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L.
DUP-DEK-BAP-01 (240-184755-4)	5/2/23	Eastern		Water			X	X	X	2	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L.
EB-DEK-BAP (240-184755-5)	5/2/23	12:21 Eastern		Water			X	X	X	2	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L.
										(10)	

Note: Since laboratory accreditations are subject to change, Eurofins Environment Testing North Central, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Environment Testing North Central, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Environment Testing North Central, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Environment Testing North Central, LLC.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:
Relinquished by:	Date/Time: 5/5/23 1611	Company: EETNC	Received by: fedex
Relinquished by: fedex	Date/Time:	Company	Received by:
Relinquished by:	Date/Time:	Company	Received by: Date/Time: 5/8/23 0910 Company: ETASTL

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Login Sample Receipt Checklist

Client: TRC Environmental Corporation.

Job Number: 240-184755-1

Login Number: 184755
List Number: 2
Creator: Sharkey-Gonzalez, Briana L

List Source: Eurofins St. Louis
List Creation: 05/08/23 02:13 PM

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	

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ANALYTICAL REPORT

PREPARED FOR

Attn: Darby Litz
TRC Environmental Corporation.
1540 Eisenhower Place
Ann Arbor, Michigan 48108-7080

Generated 7/5/2023 11:17:35 AM Revision 1

JOB DESCRIPTION

Karn/Weadock CCR DEK Bottom Ash Pond

JOB NUMBER

240-184761-1

Eurofins Cleveland
180 S. Van Buren Avenue
Barberton OH 44203

See page two for job notes and contact information.

myEOL

Eurofins Cleveland

Job Notes

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The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins Environment Testing North Central, LLC Project Manager.

Authorization

Generated
7/5/2023 11:17:35 AM
Revision 1

Authorized for release by
Denise Heckler, Project Manager II
Denise.Heckler@et.eurofinsus.com
Designee for
Kris Brooks, Project Manager II
Kris.Brooks@et.eurofinsus.com
(330)966-9790

Table of Contents

Definitions/Glossary

Client: TRC Environmental Corporation. Job ID: 240-184761-1
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

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.
¤	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

Job ID: 240-184761-1

Laboratory: Eurofins Cleveland

Narrative

Job Narrative
240-184761-1

Comments
A revised report was provided on July 5, 2023. The sample ID was corrected to: DEK-MW-18001.

Receipt
The sample was received on 5/5/2023 8:00 AM. Unless otherwise noted below, the sample arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 2.4º C.

RAD
Method 903.0: Radium-226 batch 611074: 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.

Method 904.0: Radium-228 batch 611088: 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.

Method PrecSep_0: Radium-228 Prep Batch 160-611088: Insufficient sample volume was available to perform a sample duplicate for the following samples: DEK-MW-18001 (240-184761-1). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

Method PrecSep STD: Radium-226 Prep Batch 160-611074: Insufficient sample volume was available to perform a sample duplicate for the following samples: DEK-MW-18001 (240-184761-1). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

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

Method Summary

Client: TRC Environmental Corporation. Job ID: 240-184761-1
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

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

Protocol References:

EPA = US Environmental Protection Agency

None = None

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

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

Sample Summary

Client: TRC Environmental Corporation.
Job ID: 240-184761-1
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
240-184761-1	DEK-MW-18001	Water	05/03/23 06:40	05/05/23 08:00

Client Sample Results

Client: TRC Environmental Corporation. Job ID: 240-184761-1
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Client Sample ID: DEK-MW-18001 Lab Sample ID: 240-184761-1

Date Collected: 05/03/23 06:40 **Matrix: Water**
Date Received: 05/05/23 08:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.268		0.109	0.112	1.00	0.120	pCi/L	05/11/23 12:08	06/08/23 08:26	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.4*		*30 - 110*	*05/11/23 12:08*	*06/08/23 08:26*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.599		0.327	0.331	1.00	0.455	pCi/L	05/11/23 12:51	06/01/23 12:43	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.4*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:43*	*1*
Y Carrier	*90.4*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:43*	*1*

Method: TAL-STL 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	0.868		0.345	0.349	5.00	0.455	pCi/L		06/08/23 14:39	1

Tracer/Carrier Summary

Client: TRC Environmental Corporation. Job ID: 240-184761-1
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
		Ba
Lab Sample ID	Client Sample ID	(30-110)
240-184761-1	DEK-MW-18001	95.4
LCS 160-611074/2-A	Lab Control Sample	96.1
LCSD 160-611074/3-A	Lab Control Sample Dup	81.0
MB 160-611074/1-A	Method Blank	93.4

Tracer/Carrier Legend

Ba = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
		Ba	Y
Lab Sample ID	Client Sample ID	(30-110)	(30-110)
240-184761-1	DEK-MW-18001	95.4	90.4
LCS 160-611088/2-A	Lab Control Sample	96.1	78.7
LCSD 160-611088/3-A	Lab Control Sample Dup	81.0	62.1
MB 160-611088/1-A	Method Blank	93.4	79.2

Tracer/Carrier Legend

Ba = Ba Carrier
Y = Y Carrier

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-611074/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 615046 — **Prep Batch: 611074**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.1185		0.0822	0.0829	1.00	0.113	pCi/L	05/11/23 12:08	06/08/23 06:45	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.4*		*30 - 110*	*05/11/23 12:08*	*06/08/23 06:45*	*1*

Lab Sample ID: LCS 160-611074/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 615046 — **Prep Batch: 611074**

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-226			11.3	9.514		1.02	1.00	0.110	pCi/L	84	75 - 113		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*96.1*		*30 - 110*

Lab Sample ID: LCSD 160-611074/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 615046 — **Prep Batch: 611074**

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits	RER	RER Limit
Radium-226			11.3	10.42		1.12	1.00	0.131	pCi/L	92	75 - 113	0.42	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*81.0*		*30 - 110*

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-611088/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 614160 — **Prep Batch: 611088**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.4069	U	0.333	0.335	1.00	0.512	pCi/L	05/11/23 12:51	06/01/23 12:31	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.4*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:31*	*1*
Y Carrier	*79.2*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:31*	*1*

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

Lab Sample ID: LCS 160-611088/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 614160 — **Prep Batch: 611088**

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-228			8.15	9.437		1.30	1.00	0.530	pCi/L	116	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*96.1*		*30 - 110*
Y Carrier	*78.7*		*30 - 110*

Lab Sample ID: LCSD 160-611088/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 614159 — **Prep Batch: 611088**

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits	RER	RER Limit
Radium-228			8.15	8.686		1.67	1.00	1.09	pCi/L	107	75 - 125	0.25	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*81.0*		*30 - 110*
Y Carrier	*62.1*		*30 - 110*

Rad

Prep Batch: 611074

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-184761-1	DEK-MW-18001	Total/NA	Water	PrecSep STD	
MB 160-611074/1-A	Method Blank	Total/NA	Water	PrecSep STD	
LCS 160-611074/2-A	Lab Control Sample	Total/NA	Water	PrecSep STD	
LCSD 160-611074/3-A	Lab Control Sample Dup	Total/NA	Water	PrecSep STD	

Prep Batch: 611088

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-184761-1	DEK-MW-18001	Total/NA	Water	PrecSep_0	
MB 160-611088/1-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-611088/2-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-611088/3-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

Lab Chronicle

Client: TRC Environmental Corporation. Job ID: 240-184761-1
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Client Sample ID: DEK-MW-18001 Lab Sample ID: 240-184761-1

Date Collected: 05/03/23 06:40 **Matrix: Water**
Date Received: 05/05/23 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep STD			611074	KAC	EET SL	05/11/23 12:08
Total/NA	Analysis	903.0		1	615045	FLC	EET SL	06/08/23 08:26
Total/NA	Prep	PrecSep_0			611088	KAC	EET SL	05/11/23 12:51
Total/NA	Analysis	904.0		1	614159	FLC	EET SL	06/01/23 12:43
Total/NA	Analysis	Ra226_Ra228		1	615062	EMH	EET SL	06/08/23 14:39

Laboratory References:

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

Accreditation/Certification Summary

Client: TRC Environmental Corporation. Job ID: 240-184761-1
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Laboratory: Eurofins St. Louis

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	20-001	05-06-25
ANAB	Dept. of Defense ELAP	L2305	04-06-25
ANAB	Dept. of Energy	L2305.01	04-06-25
ANAB	ISO/IEC 17025	L2305	04-06-25
Arizona	State	AZ0813	12-08-23
California	Los Angeles County Sanitation Districts	10259	06-30-22 *
California	State	2886	06-30-23
Connecticut	State	PH-0241	03-31-25
Florida	NELAP	E87689	06-11-23
HI - RadChem Recognition	State	n/a	06-30-23
Illinois	NELAP	200023	11-30-23
Iowa	State	373	12-01-24
Kansas	NELAP	E-10236	10-31-23
Kentucky (DW)	State	KY90125	12-31-23
Kentucky (WW)	State	KY90125 (Permit KY0004049)	12-31-23
Louisiana	NELAP	04080	06-30-22 *
Louisiana (All)	NELAP	04080	06-30-23
Louisiana (DW)	State	LA011	12-31-23
Maryland	State	310	09-30-23
MI - RadChem Recognition	State	9005	06-30-23
Missouri	State	780	06-30-25
Nevada	State	MO000542020-1	07-31-23
New Jersey	NELAP	MO002	06-30-23
New Mexico	State	MO00054	06-30-23
New York	NELAP	11616	03-31-24
North Carolina (DW)	State	29700	07-31-23
North Dakota	State	R-207	06-30-23
Oklahoma	NELAP	9997	08-31-23
Oregon	NELAP	4157	09-01-23
Pennsylvania	NELAP	68-00540	02-28-24
South Carolina	State	85002001	06-30-23
Texas	NELAP	T104704193	07-31-23
US Fish & Wildlife	US Federal Programs	058448	07-31-23
USDA	US Federal Programs	P330-17-00028	05-18-26
Utah	NELAP	MO000542021-14	07-31-23
Virginia	NELAP	10310	06-14-23
Washington	State	C592	08-30-23
West Virginia DEP	State	381	10-31-23

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Eurofins Cleveland
180 S. Van Buren Avenue
Barberton, OH 44203
Phone: 330-497-9396 Fax: 330-497-0772

MICHIGAN 190

Chain of Custody Record

MICHIGAN 190

2.4 | 2.4

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Client Information	Sampler:	Lab PM: Brooks, Kris M	Carrier Tracking No(s):	COC No: 240-107206-29052.1
Client Contact: Jacob Krenz	Phone:	E-Mail: Kris.Brooks@et.eurofinsus.com	State of Origin:	Page: Page 1 of 1
Company: TRC Environmental Corporation.	PWSID:			Job #:
Address: 1540 Eisenhower Place	Due Date Requested:			
City: Ann Arbor	TAT Requested (days):			
State, Zip: MI, 48108-7080	Compliance Project: Δ Yes Δ No			
Phone: 734-971-7080(Tel) 734-971-9022(Fax)	PO #: 178827			
Email: JKrenz@trccompanies.com	WO #:			
Project Name: Karn/Weadock CCR DEK Bottom Ash Pond	Project #: 24024154			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0, Ra226Ra228_GFPC	904.0 - Standard Target List	Total Number of containers	Special Instructions/Note:
			Preservation Code:				D	D		
DEK-MW-15002				Water						
DEK-MW-15005				Water						
DEK-MW-15006				Water						
DUP-DEK-BAP-01				Water						
EB-DEK-BAP				Water						
DEK-MW-15001	5/3/23	0640	C	Water	N	N	F	F	2	

240-184761 Chain of Custody

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☑ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☑ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

	Relinquished by	Date/Time	Company	Received by	Date/Time	Company
1		5/4/23 0800	TRC		5/4/23 800am	GEL
2		5/4/23 800am			5-5-23 800	BETNE
3						

Custody Seals Intact: Δ Yes Δ No | Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

Eurofins - Canton Sample Receipt Form/Narrative **Login # :** 184761
Barberton Facility

Client TRC Site Name

Cooler Received on 5-5-23 Opened on 5-5-23

Cooler unpacked by:

FedEx: 1st Grd Exp UPS FAS Clipper Client Drop Off Eurofins Courier Other

Receipt After-hours: Drop-off Date/Time Storage Location

Eurofins Cooler # ES ~~Foam Box~~ Client Cooler Box Other

Packing material used: ~~Bubble Wrap~~ Foam Plastic Bag None Other

COOLANT: Wet Ice Blue Ice Dry Ice Water None

1. Cooler temperature upon receipt ☐ See Multiple Cooler Form

IR GUN # 22 (CF +0.0 °C) Observed Cooler Temp. °C Corrected Cooler Temp. °C

2. Were tamper/custody seals on the outside of the cooler(s)? If Yes Quantity 1	Yes	No
-Were the seals on the outside of the cooler(s) signed & dated?	Yes	No NA
-Were tamper/custody seals on the bottle(s) or bottle kits (LLHg/MeHg)?	Yes	No
-Were tamper/custody seals intact and uncompromised?	Yes	No NA
3. Shippers' packing slip attached to the cooler(s)?	Yes	No
4. Did custody papers accompany the sample(s)?	Yes	No
5. Were the custody papers relinquished & signed in the appropriate place?	Yes	No
6. Was/were the person(s) who collected the samples clearly identified on the COC?	Yes	No
7. Did all bottles arrive in good condition (Unbroken)?	Yes	No
8. Could all bottle labels (ID/Date/Time) be reconciled with the COC?	Yes	No
9. For each sample, does the COC specify preservatives (Y/N), # of containers (Y/N), and sample type of grab/comp (Y/N)?		
10. Were correct bottle(s) used for the test(s) indicated?	Yes	No
11. Sufficient quantity received to perform indicated analyses?	Yes	No
12. Are these work share samples and all listed on the COC?	Yes	No
If yes, Questions 13-17 have been checked at the originating laboratory.		
13. Were all preserved sample(s) at the correct pH upon receipt?	Yes	No NA pH Strip Lot# **HC208070**
14. Were VOAs on the COC?	Yes	No
15. Were air bubbles >6 mm in any VOA vials? ● ← Larger than this.	Yes	No NA
16. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot #	Yes	No
17. Was a LL Hg or Me Hg trip blank present?	Yes	No

Tests that are not checked for pH by Receiving:

VOAs
Oil and Grease
TOC

Contacted PM Date by via Verbal Voice Mail Other

Concerning

18. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES ☐ additional next page

Samples processed by:

19. SAMPLE CONDITION

Sample(s) were received after the recommended holding time had expired.

Sample(s) were received in a broken container.

Sample(s) were received with bubble >6 mm in diameter. (Notify PM)

20. SAMPLE PRESERVATION

Sample(s) were further preserved in the laboratory.

Time preserved: Preservative(s) added/Lot number(s):

VOA Sample Preservation - Date/Time VOAs Frozen:

Login Container Summary Report

Temperature readings: _____

Client Sample ID	Lab ID	Container Type	Container pH	Container Temp	Preservative Added (mls)	Lot #
DEK-MW-08001	240-184761-A-1	Plastic 1 liter - Nitric Acid	<2			
DEK-MW-08001	240-184761-B-1	Plastic 1 liter - Nitric Acid	<2			

Eurofins Cleveland
180 S. Van Buren Avenue
Barberton, OH 44203
Phone: 330-497-9396 Fax: 330-497-0772

Chain of Custody Record

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Client Information (Sub Contract Lab)	Sampler:	Lab PM: Brooks, Kris M	Carrier Tracking No(s):	COC No: 240-167649.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Kris.Brooks@et.eurofinsus.com	State of Origin: Michigan	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note):		Job #: 240-184761-1
Address: 13715 Rider Trail North, ,	Due Date Requested: 6/6/2023			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: Karn/Weadock CCR Groundwater Monitoring	Project #: 24024154			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_STD Standard Target List	904.0/PrecSep_0 Standard Target List	Ra226Ra228_GFPC	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
DEK-MW-08001 (240-184761-1)	5/3/23	06:40 Eastern		Water			X	X	X	2	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L.

Note: Since laboratory accreditations are subject to change, Eurofins Environment Testing North Central, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Environment Testing North Central, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Environment Testing North Central, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Environment Testing North Central, LLC.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:
Relinquished by: RAF	Date/Time: 5/3/23 1641	Company: ETNC	Received by: fedex
Relinquished by: fedex	Date/Time:	Company	Received by: Amanda Sharkey - Hanna
Relinquished by:	Date/Time:	Company	Received by:

Date/Time:	Company
5/3/23 0910	ETASTL

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Login Sample Receipt Checklist

Client: TRC Environmental Corporation.

Job Number: 240-184761-1

Login Number: 184761
List Number: 2
Creator: Sharkey-Gonzalez, Briana L

List Source: Eurofins St. Louis
List Creation: 05/08/23 01:17 PM

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	

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ANALYTICAL REPORT

PREPARED FOR

Attn: Darby Litz
TRC Environmental Corporation.
1540 Eisenhower Place
Ann Arbor, Michigan 48108-7080

Generated 7/5/2023 11:48:36 AM Revision 2

JOB DESCRIPTION

Karn/Weadock CCR DEK JCW Background Wells

JOB NUMBER

240-184759-1

Eurofins Cleveland
180 S. Van Buren Avenue
Barberton OH 44203

See page two for job notes and contact information.

Job Notes

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The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins Environment Testing North Central, LLC Project Manager.

Authorization

Generated
7/5/2023 11:48:36 AM
Revision 2

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Table of Contents

Definitions/Glossary

Client: TRC Environmental Corporation. Job ID: 240-184759-1
Project/Site: Karn/Weadock CCR DEK JCW Background Wells

Qualifiers

Rad

Qualifier	Qualifier Description
G	The Sample MDC is greater than the requested RL.
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	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

Job ID: 240-184759-1

Laboratory: Eurofins Cleveland

Narrative

Job Narrative
240-184759-1

Comments
A revised report was provided on July 5, 2023. The sample ID was corrected: DUP-BACKGROUND. The sampling date was corrected: MW-15016.

Receipt
The samples were received on 5/5/2023 8:00 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 0.3º C.

RAD
Method 903.0: Radium-226 batch 611074: 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.

Method 904.0: Radium-228 batch 611088: The detection goal was not met for the following sample. Sample was prepped at a reduced volume due to the presence of matrix interferences: MW-15008 (240-184759-2). Analytical results are reported with the detection limit achieved.

Method 904.0: Radium-228 batch 611088: The detection goal was not met for the following sample. The samples and batch QC were prepped at full volume. Matrix interferences are suspected because the method blank achieved the detection goal demonstrating acceptable sample preparation and instrument performance: MW-15016 (240-184759-3). Analytical results are reported with the detection limit achieved

Method 904.0: Radium-228 batch 611088: 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.

Method PrecSep_0: Radium-228 Prep Batch 160-611088: The following samples were prepared at a reduced aliquot due to Matrix: MW-15008 (240-184759-2), MW-15019 (240-184759-4) and DUP-BACKGROUND (240-184759-5). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

Method PrecSep_0: Radium-228 Prep Batch 160-611088: Insufficient sample volume was available to perform a sample duplicate for the following samples: MW-15002 (240-184759-1), MW-15016 (240-184759-3) and FB-BACKGROUND (240-184759-6). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

Method PrecSep STD: Radium-226 Prep Batch 160-611074: The following samples were prepared at a reduced aliquot due to Matrix: MW-15008 (240-184759-2), MW-15019 (240-184759-4) and DUP-BACKGROUND (240-184759-5). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

Method PrecSep STD: Radium-226 Prep Batch 160-611074: Insufficient sample volume was available to perform a sample duplicate for the following samples: MW-15002 (240-184759-1), MW-15016 (240-184759-3) and FB-BACKGROUND (240-184759-6). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

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

Method Summary

Client: TRC Environmental Corporation. Job ID: 240-184759-1
Project/Site: Karn/Weadock CCR DEK JCW Background Wells

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

Protocol References:

EPA = US Environmental Protection Agency

None = None

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

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

Sample Summary

Client: TRC Environmental Corporation. Job ID: 240-184759-1
Project/Site: Karn/Weadock CCR DEK JCW Background Wells

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
240-184759-1	MW-15002	Water	05/01/23 15:01	05/05/23 08:00
240-184759-2	MW-15008	Water	05/01/23 12:40	05/05/23 08:00
240-184759-3	MW-15016	Water	05/02/23 08:40	05/05/23 08:00
240-184759-4	MW-15019	Water	05/01/23 13:43	05/05/23 08:00
240-184759-5	DUP-BACKGROUND	Water	05/01/23 00:00	05/05/23 08:00
240-184759-6	FB-BACKGROUND	Water	05/01/23 12:40	05/05/23 08:00

Client Sample ID: MW-15002 Lab Sample ID: 240-184759-1

Date Collected: 05/01/23 15:01 **Matrix: Water**
Date Received: 05/05/23 08:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.115	U	0.115	0.115	1.00	0.183	pCi/L	05/11/23 12:08	06/08/23 06:47	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*80.0*		*30 - 110*	*05/11/23 12:08*	*06/08/23 06:47*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0854	U	0.301	0.301	1.00	0.547	pCi/L	05/11/23 12:51	06/01/23 12:40	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*80.0*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:40*	*1*
Y Carrier	*87.4*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:40*	*1*

Method: TAL-STL 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	0.200	U	0.322	0.322	5.00	0.547	pCi/L		06/08/23 14:39	1

Client Sample ID: MW-15008 — Lab Sample ID: 240-184759-2

Date Collected: 05/01/23 12:40 — **Matrix: Water**
Date Received: 05/05/23 08:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.102	U	0.147	0.147	1.00	0.249	pCi/L	05/11/23 12:08	06/08/23 06:47	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*76.4*		*30 - 110*	*05/11/23 12:08*	*06/08/23 06:47*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.286	U G	0.658	0.658	1.00	1.16	pCi/L	05/11/23 12:51	06/01/23 12:40	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*76.4*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:40*	*1*
Y Carrier	*61.5*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:40*	*1*

Method: TAL-STL 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	0.388	U	0.674	0.674	5.00	1.16	pCi/L		06/08/23 14:39	1

Client Sample ID: MW-15016 — Lab Sample ID: 240-184759-3

Date Collected: 05/02/23 08:40 — **Matrix: Water**
Date Received: 05/05/23 08:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0671	U	0.0783	0.0785	1.00	0.127	pCi/L	05/11/23 12:08	06/08/23 06:49	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*85.2*		*30 - 110*	*05/11/23 12:08*	*06/08/23 06:49*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.201	U G	0.523	0.523	1.00	1.01	pCi/L	05/11/23 12:51	06/01/23 12:40	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*85.2*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:40*	*1*
Y Carrier	*59.3*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:40*	*1*

Method: TAL-STL 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	-0.134	U	0.529	0.529	5.00	1.01	pCi/L		06/08/23 14:39	1

Client Sample ID: MW-15019 — Lab Sample ID: 240-184759-4

Date Collected: 05/01/23 13:43 — **Matrix: Water**
Date Received: 05/05/23 08:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.310		0.134	0.137	1.00	0.137	pCi/L	05/11/23 12:08	06/08/23 08:21	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*86.1*		*30 - 110*	*05/11/23 12:08*	*06/08/23 08:21*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.483	U	0.529	0.530	1.00	0.859	pCi/L	05/11/23 12:51	06/01/23 12:40	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*86.1*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:40*	*1*
Y Carrier	*65.7*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:40*	*1*

Method: TAL-STL 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	0.792	U	0.546	0.547	5.00	0.859	pCi/L		06/08/23 14:39	1

Client Sample ID: DUP-BACKGROUND
Lab Sample ID: 240-184759-5
Date Collected: 05/01/23 00:00
Matrix: Water
Date Received: 05/05/23 08:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.393**		0.140	0.144	1.00	0.123	pCi/L	05/11/23 12:08	06/08/23 08:22	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.4*		*30 - 110*	*05/11/23 12:08*	*06/08/23 08:22*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.588	U	0.553	0.556	1.00	0.883	pCi/L	05/11/23 12:51	06/01/23 12:41	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.4*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:41*	*1*
Y Carrier	*71.1*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:41*	*1*

Method: TAL-STL 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	**0.981**		0.570	0.574	5.00	0.883	pCi/L		06/08/23 14:39	1

Client Sample ID: FB-BACKGROUND
Lab Sample ID: 240-184759-6

Date Collected: 05/01/23 12:40
Matrix: Water
Date Received: 05/05/23 08:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.0163	U	0.0448	0.0449	1.00	0.109	pCi/L	05/11/23 12:08	06/08/23 08:22	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*85.4*		*30 - 110*	*05/11/23 12:08*	*06/08/23 08:22*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.242	U	0.351	0.352	1.00	0.593	pCi/L	05/11/23 12:51	06/01/23 12:41	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*85.4*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:41*	*1*
Y Carrier	*81.2*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:41*	*1*

Method: TAL-STL 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	0.226	U	0.354	0.355	5.00	0.593	pCi/L		06/08/23 14:39	1

Tracer/Carrier Summary

Client: TRC Environmental Corporation. Job ID: 240-184759-1
Project/Site: Karn/Weadock CCR DEK JCW Background Wells

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
		Ba
Lab Sample ID	Client Sample ID	(30-110)
240-184759-1	MW-15002	80.0
240-184759-2	MW-15008	76.4
240-184759-3	MW-15016	85.2
240-184759-4	MW-15019	86.1
240-184759-5	DUP-BACKGROUND	95.4
240-184759-6	FB-BACKGROUND	85.4
LCS 160-611074/2-A	Lab Control Sample	96.1
LCSD 160-611074/3-A	Lab Control Sample Dup	81.0
MB 160-611074/1-A	Method Blank	93.4

Tracer/Carrier Legend

Ba = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
		Ba	Y
Lab Sample ID	Client Sample ID	(30-110)	(30-110)
240-184759-1	MW-15002	80.0	87.4
240-184759-2	MW-15008	76.4	61.5
240-184759-3	MW-15016	85.2	59.3
240-184759-4	MW-15019	86.1	65.7
240-184759-5	DUP-BACKGROUND	95.4	71.1
240-184759-6	FB-BACKGROUND	85.4	81.2
LCS 160-611088/2-A	Lab Control Sample	96.1	78.7
LCSD 160-611088/3-A	Lab Control Sample Dup	81.0	62.1
MB 160-611088/1-A	Method Blank	93.4	79.2

Tracer/Carrier Legend

Ba = Ba Carrier
Y = Y Carrier

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-611074/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 615046 — **Prep Batch: 611074**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.1185		0.0822	0.0829	1.00	0.113	pCi/L	05/11/23 12:08	06/08/23 06:45	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.4*		*30 - 110*	*05/11/23 12:08*	*06/08/23 06:45*	*1*

Lab Sample ID: LCS 160-611074/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 615046 — **Prep Batch: 611074**

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-226			11.3	9.514		1.02	1.00	0.110	pCi/L	84	75 - 113		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*96.1*		*30 - 110*

Lab Sample ID: LCSD 160-611074/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 615046 — **Prep Batch: 611074**

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits	RER	RER Limit
Radium-226			11.3	10.42		1.12	1.00	0.131	pCi/L	92	75 - 113	0.42	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*81.0*		*30 - 110*

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-611088/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 614160 — **Prep Batch: 611088**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.4069	U	0.333	0.335	1.00	0.512	pCi/L	05/11/23 12:51	06/01/23 12:31	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.4*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:31*	*1*
Y Carrier	*79.2*		*30 - 110*	*05/11/23 12:51*	*06/01/23 12:31*	*1*

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

Lab Sample ID: LCS 160-611088/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 614160 — **Prep Batch: 611088**

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-228			8.15	9.437		1.30	1.00	0.530	pCi/L	116	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*96.1*		*30 - 110*
Y Carrier	*78.7*		*30 - 110*

Lab Sample ID: LCSD 160-611088/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 614159 — **Prep Batch: 611088**

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits	RER	RER Limit
Radium-228			8.15	8.686		1.67	1.00	1.09	pCi/L	107	75 - 125	0.25	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*81.0*		*30 - 110*
Y Carrier	*62.1*		*30 - 110*

QC Association Summary

Client: TRC Environmental Corporation. Job ID: 240-184759-1
Project/Site: Karn/Weadock CCR DEK JCW Background Wells

Rad

Prep Batch: 611074

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-184759-1	MW-15002	Total/NA	Water	PrecSep STD	
240-184759-2	MW-15008	Total/NA	Water	PrecSep STD	
240-184759-3	MW-15016	Total/NA	Water	PrecSep STD	
240-184759-4	MW-15019	Total/NA	Water	PrecSep STD	
240-184759-5	DUP-BACKGROUND	Total/NA	Water	PrecSep STD	
240-184759-6	FB-BACKGROUND	Total/NA	Water	PrecSep STD	
MB 160-611074/1-A	Method Blank	Total/NA	Water	PrecSep STD	
LCS 160-611074/2-A	Lab Control Sample	Total/NA	Water	PrecSep STD	
LCSD 160-611074/3-A	Lab Control Sample Dup	Total/NA	Water	PrecSep STD	

Prep Batch: 611088

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-184759-1	MW-15002	Total/NA	Water	PrecSep_0	
240-184759-2	MW-15008	Total/NA	Water	PrecSep_0	
240-184759-3	MW-15016	Total/NA	Water	PrecSep_0	
240-184759-4	MW-15019	Total/NA	Water	PrecSep_0	
240-184759-5	DUP-BACKGROUND	Total/NA	Water	PrecSep_0	
240-184759-6	FB-BACKGROUND	Total/NA	Water	PrecSep_0	
MB 160-611088/1-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-611088/2-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-611088/3-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

Lab Chronicle

Client: TRC Environmental Corporation. Job ID: 240-184759-1
Project/Site: Karn/Weadock CCR DEK JCW Background Wells

Client Sample ID: MW-15002 — Lab Sample ID: 240-184759-1

Date Collected: 05/01/23 15:01 — **Matrix: Water**
Date Received: 05/05/23 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep STD			611074	KAC	EET SL	05/11/23 12:08
Total/NA	Analysis	903.0		1	615046	FLC	EET SL	06/08/23 06:47
Total/NA	Prep	PrecSep_0			611088	KAC	EET SL	05/11/23 12:51
Total/NA	Analysis	904.0		1	614159	FLC	EET SL	06/01/23 12:40
Total/NA	Analysis	Ra226_Ra228		1	615062	EMH	EET SL	06/08/23 14:39

Client Sample ID: MW-15008 — Lab Sample ID: 240-184759-2

Date Collected: 05/01/23 12:40 — **Matrix: Water**
Date Received: 05/05/23 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep STD			611074	KAC	EET SL	05/11/23 12:08
Total/NA	Analysis	903.0		1	615046	FLC	EET SL	06/08/23 06:47
Total/NA	Prep	PrecSep_0			611088	KAC	EET SL	05/11/23 12:51
Total/NA	Analysis	904.0		1	614159	FLC	EET SL	06/01/23 12:40
Total/NA	Analysis	Ra226_Ra228		1	615062	EMH	EET SL	06/08/23 14:39

Client Sample ID: MW-15016 — Lab Sample ID: 240-184759-3

Date Collected: 05/02/23 08:40 — **Matrix: Water**
Date Received: 05/05/23 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep STD			611074	KAC	EET SL	05/11/23 12:08
Total/NA	Analysis	903.0		1	615045	FLC	EET SL	06/08/23 06:49
Total/NA	Prep	PrecSep_0			611088	KAC	EET SL	05/11/23 12:51
Total/NA	Analysis	904.0		1	614159	FLC	EET SL	06/01/23 12:40
Total/NA	Analysis	Ra226_Ra228		1	615062	EMH	EET SL	06/08/23 14:39

Client Sample ID: MW-15019 — Lab Sample ID: 240-184759-4

Date Collected: 05/01/23 13:43 — **Matrix: Water**
Date Received: 05/05/23 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep STD			611074	KAC	EET SL	05/11/23 12:08
Total/NA	Analysis	903.0		1	614897	FLC	EET SL	06/08/23 08:21
Total/NA	Prep	PrecSep_0			611088	KAC	EET SL	05/11/23 12:51
Total/NA	Analysis	904.0		1	614159	FLC	EET SL	06/01/23 12:40
Total/NA	Analysis	Ra226_Ra228		1	615062	EMH	EET SL	06/08/23 14:39

Lab Chronicle

Client: TRC Environmental Corporation. Job ID: 240-184759-1
Project/Site: Karn/Weadock CCR DEK JCW Background Wells

Client Sample ID: DUP-BACKGROUND — Lab Sample ID: 240-184759-5

Date Collected: 05/01/23 00:00 — **Matrix: Water**
Date Received: 05/05/23 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep STD			611074	KAC	EET SL	05/11/23 12:08
Total/NA	Analysis	903.0		1	614897	FLC	EET SL	06/08/23 08:22
Total/NA	Prep	PrecSep_0			611088	KAC	EET SL	05/11/23 12:51
Total/NA	Analysis	904.0		1	614159	FLC	EET SL	06/01/23 12:41
Total/NA	Analysis	Ra226_Ra228		1	615062	EMH	EET SL	06/08/23 14:39

Client Sample ID: FB-BACKGROUND — Lab Sample ID: 240-184759-6

Date Collected: 05/01/23 12:40 — **Matrix: Water**
Date Received: 05/05/23 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep STD			611074	KAC	EET SL	05/11/23 12:08
Total/NA	Analysis	903.0		1	614897	FLC	EET SL	06/08/23 08:22
Total/NA	Prep	PrecSep_0			611088	KAC	EET SL	05/11/23 12:51
Total/NA	Analysis	904.0		1	614159	FLC	EET SL	06/01/23 12:41
Total/NA	Analysis	Ra226_Ra228		1	615062	EMH	EET SL	06/08/23 14:39

Laboratory References:

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

Accreditation/Certification Summary

Client: TRC Environmental Corporation. Job ID: 240-184759-1
Project/Site: Karn/Weadock CCR DEK JCW Background Wells

Laboratory: Eurofins St. Louis

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	20-001	05-06-25
ANAB	Dept. of Defense ELAP	L2305	04-06-25
ANAB	Dept. of Energy	L2305.01	04-06-25
ANAB	ISO/IEC 17025	L2305	04-06-25
Arizona	State	AZ0813	12-08-23
California	Los Angeles County Sanitation Districts	10259	06-30-22 *
California	State	2886	06-30-23
Connecticut	State	PH-0241	03-31-25
Florida	NELAP	E87689	06-11-23
HI - RadChem Recognition	State	n/a	06-30-23
Illinois	NELAP	200023	11-30-23
Iowa	State	373	12-01-24
Kansas	NELAP	E-10236	10-31-23
Kentucky (DW)	State	KY90125	12-31-23
Kentucky (WW)	State	KY90125 (Permit KY0004049)	12-31-23
Louisiana	NELAP	04080	06-30-22 *
Louisiana (All)	NELAP	04080	06-30-23
Louisiana (DW)	State	LA011	12-31-23
Maryland	State	310	09-30-23
MI - RadChem Recognition	State	9005	06-30-23
Missouri	State	780	06-30-25
Nevada	State	MO000542020-1	07-31-23
New Jersey	NELAP	MO002	06-30-23
New Mexico	State	MO00054	06-30-23
New York	NELAP	11616	03-31-24
North Carolina (DW)	State	29700	07-31-23
North Dakota	State	R-207	06-30-23
Oklahoma	NELAP	9997	08-31-23
Oregon	NELAP	4157	09-01-23
Pennsylvania	NELAP	68-00540	02-28-24
South Carolina	State	85002001	06-30-23
Texas	NELAP	T104704193	07-31-23
US Fish & Wildlife	US Federal Programs	058448	07-31-23
USDA	US Federal Programs	P330-17-00028	05-18-26
Utah	NELAP	MO000542021-14	07-31-23
Virginia	NELAP	10310	06-14-23
Washington	State	C592	08-30-23
West Virginia DEP	State	381	10-31-23

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Eurofins Cleveland
180 S. Van Buren Avenue
Barberton, OH 44203
Phone: 330-497-9396 Fax: 330-497-0772

MICHIGAN 190

0-3 / 0-3

Chain of Custody Record

MICHIGAN 190

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Client Information	Sampler:	Lab PM: Brooks, Kris M	Carrier Tracking No(s):	COC No: 240-107203-33282.1
Client Contact: Jacob Krenz	Phone:	E-Mail: Kris.Brooks@et.eurofinsus.com	State of Origin:	Page: Page 1 of 1
Company: TRC Environmental Corporation.	PWSID:			Job #:
Address: 1540 Eisenhower Place	Due Date Requested:			
City: Ann Arbor	TAT Requested (days):			
State, Zip: MI, 48108-7080	Compliance Project: Δ Yes Δ No			
Phone: 734-971-7080(Tel) 734-971-9022(Fax)	PO #: TBD			
Email: JKrenz@trccompanies.com	WO #:			
Project Name: Karn/Weadock CCR Background Well	Project #: 24024154			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0, Ra226Ra228_GFPC	904.0 - Standard Target List	Total Number of containers	Special Instructions/Note:
			Preservation Code:				D	D		
MW-15002	5-1-23	1501	G	Water	N	N	X	X		
MW-15008	5-1-23	1240	G	Water	N	N	X	X		
MW-15016	5-2-23	0840	G	Water	N	N	X	X		
MW-15019	5-1-23	1343	G	Water	N	N	X	X		
DUP-Background	5-1-23	—	G	Water	N	N	X	X		
~~EQ-Background~~				~~Water~~						
FB-Background	5-1-23	1240	G	Water	N	N	X	X		

240-184759 Chain of Custody

Possible Hazard Identification
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

	Relinquished by	Date/Time	Company	Received by	Date/Time	Company
1	[signature]	5-4-23 1417	TRC	[signature]	5/4/23 1417	EETA
2	[signature]	5/4/23 1418	EETA	[signature]	5-5-23 800	EETNC
3	Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No | Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

Eurofins - Canton Sample Receipt Form/Narrative Login # : 184759
Barberton Facility

Client TRC Site Name

Cooler Received on 5-5-23 Opened on 5-5-23

Cooler unpacked by:

FedEx: 1st Grd Exp UPS FAS Clipper Client Drop Off Eurofins Courier Other

Receipt After-hours: Drop-off Date/Time Storage Location

Eurofins Cooler # EC ~~Foam Box~~ Client Cooler Box Other

Packing material used: ~~Bubble Wrap~~ Foam Plastic Bag None Other

COOLANT: Wet Ice Blue Ice Dry Ice Water None

1. Cooler temperature upon receipt ☐ See Multiple Cooler Form

IR GUN # 22 (CF +0.0 °C) Observed Cooler Temp. °C Corrected Cooler Temp. °C

2. Were tamper/custody seals on the outside of the cooler(s)? If Yes Quantity 1	Yes	No
-Were the seals on the outside of the cooler(s) signed & dated?	Yes	No NA
-Were tamper/custody seals on the bottle(s) or bottle kits (LLHg/MeHg)?	Yes	No
-Were tamper/custody seals intact and uncompromised?	Yes	No NA
3. Shippers' packing slip attached to the cooler(s)?	Yes	No
4. Did custody papers accompany the sample(s)?	Yes	No
5. Were the custody papers relinquished & signed in the appropriate place?	Yes	No
6. Was/were the person(s) who collected the samples clearly identified on the COC?	Yes	No
7. Did all bottles arrive in good condition (Unbroken)?	Yes	No
8. Could all bottle labels (ID/Date/Time) be reconciled with the COC?	Yes	No
9. For each sample, does the COC specify preservatives (Y/N), # of containers (Y/N), and sample type of grab/comp (Y/N)?		
10. Were correct bottle(s) used for the test(s) indicated?	Yes	No
11. Sufficient quantity received to perform indicated analyses?	Yes	No
12. Are these work share samples and all listed on the COC?	Yes	No
If yes, Questions 13-17 have been checked at the originating laboratory.		
13. Were all preserved sample(s) at the correct pH upon receipt?	Yes	No NA pH Strip Lot# HC208070
14. Were VOAs on the COC?	Yes	No
15. Were air bubbles >6 mm in any VOA vials? ● ⬅ Larger than this.	Yes	No NA
16. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot #	Yes	No
17. Was a LL Hg or Me Hg trip blank present?	Yes	No

Tests that are not checked for pH by Receiving:

VOAs
Oil and Grease
TOC

Contacted PM Date by via Verbal Voice Mail Other

Concerning

18. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES ☐ additional next page

Samples processed by:

19. SAMPLE CONDITION

Sample(s) were received after the recommended holding time had expired.

Sample(s) were received in a broken container.

Sample(s) were received with bubble >6 mm in diameter. (Notify PM)

20. SAMPLE PRESERVATION

Sample(s) were further preserved in the laboratory.

Time preserved: Preservative(s) added/Lot number(s):

VOA Sample Preservation - Date/Time VOAs Frozen:

Login Container Summary Report

Temperature readings: _____

Client Sample ID	Lab ID	Container Type	Container pH	Container Temp	Preservative Added (mls)	Lot #
MW-15002	240-184759-A-1	Plastic 1 liter - Nitric Acid	<2			
MW-15002	240-184759-B-1	Plastic 1 liter - Nitric Acid	<2			
MW-15008	240-184759-A-2	Plastic 1 liter - Nitric Acid	<2			
MW-15008	240-184759-B-2	Plastic 1 liter - Nitric Acid	<2			
MW-15016	240-184759-A-3	Plastic 1 liter - Nitric Acid	<2			
MW-15016	240-184759-B-3	Plastic 1 liter - Nitric Acid	<2			
MW-15019	240-184759-A-4	Plastic 1 liter - Nitric Acid	<2			
MW-15019	240-184759-B-4	Plastic 1 liter - Nitric Acid	<2			
DUP-BACKGROUD	240-184759-A-5	Plastic 1 liter - Nitric Acid	<2			
DUP-BACKGROUD	240-184759-B-5	Plastic 1 liter - Nitric Acid	<2			
FB-BACKGROUND	240-184759-A-6	Plastic 1 liter - Nitric Acid	<2			
FB-BACKGROUND	240-184759-B-6	Plastic 1 liter - Nitric Acid	<2			

Eurofins Cleveland
180 S. Van Buren Avenue
Barberton, OH 44203
Phone: 330-497-9396 Fax: 330-497-0772

Chain of Custody Record

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Client Information (Sub Contract Lab)	Sampler:	Lab PM: Brooks, Kris M	Carrier Tracking No(s):	COC No: 240-167649.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Kris.Brooks@et.eurofinsus.com	State of Origin: Michigan	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note):		Job #: 240-184759-1
Address: 13715 Rider Trail North, ,	Due Date Requested: 6/6/2023			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: Karn/Weadock CCR Groundwater Monitoring	Project #: 24024154			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_STD Standard Target List	904.0/PrecSep_0 Standard Target List	Ra226Ra228_GFPC	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
MW-15002 (240-184759-1)	5/1/23	15:01 Eastern		Water			X	X	X	2	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L.
MW-15008 (240-184759-2)	5/1/23	12:40 Eastern		Water			X	X	X	2	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L.
MW-15016 (240-184759-3)	5/1/23	08:40 Eastern		Water			X	X	X	2	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L.
MW-15019 (240-184759-4)	5/1/23	13:43 Eastern		Water			X	X	X	2	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L.
DUP-BACKGROUD (240-184759-5)	5/1/23	Eastern		Water			X	X	X	2	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L.
FB-BACKGROUND (240-184759-6)	5/1/23	12:40 Eastern		Water			X	X	X	2	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L.
										12	

Note: Since laboratory accreditations are subject to change, Eurofins Environment Testing North Central, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Environment Testing North Central, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Environment Testing North Central, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Environment Testing North Central, LLC.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:
Relinquished by:	Date/Time: 5523 1101	Company EETNC	Received by: fedex
Relinquished by: fedex	Date/Time:	Company	Received by:
Relinquished by:	Date/Time:	Company	Received by:

Received by:	Date/Time:	Company
	Date/Time: 5/8/23 0910	Company ETASTL
	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Login Sample Receipt Checklist

Client: TRC Environmental Corporation.

Job Number: 240-184759-1

Login Number: 184759
List Number: 2
Creator: Sharkey-Gonzalez, Briana L

List Source: Eurofins St. Louis
List Creation: 05/08/23 01:28 PM

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	

1540 Eisenhower Pl.
Ann Arbor, MI 48108

T 734.971.7080
TRCcompanies.com

Technical Memorandum

Date:	July 21, 2023
To:	J.R. Register, Consumers Energy
From:	Darby Litz, TRC Kristin Lowery, TRC
Project No.:	514404.0001.0000 Phase 2 Task 2
Subject:	First Semiannual 2023 Nature and Extent Data Summary, DE Karn Bottom Ash Pond, Consumers Energy, Essexville, Michigan

Introduction

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 DE Karn Bottom Ash Pond CCR Unit. During the statistical evaluation of the initial assessment monitoring event (May 2018) for the Karn Bottom Ash Pond, arsenic was present in one or more downgradient monitoring well(s) at statistically significant levels exceeding the Groundwater Protection Standards (GWPSs)[1].

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 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. Installation of additional monitoring wells at locations downgradient of the Karn Bottom Ash Pond groundwater monitoring system was not necessary or feasible due to the presence of existing monitoring wells sampled under the groundwater surface water interface (GSI) Compliance Monitoring Program administered under a Michigan-approved Hydrogeological Monitoring Plan (HMP) (Consumers Energy, 2019), and the proximity of the surface water bodies. Monitoring wells designated for nature and extent characterization are shown on Figures 1 and 2 and data collected over the past year (July 2022 through May 2023) from these nature and extent groundwater monitoring wells are included in Tables 1 and 2.

[1] TRC. 2019. *Statistical Evaluation of Initial Assessment Monitoring Sampling Event, DE Karn Bottom Ash Pond, Consumers Energy Company, Essexville, Michigan*. January 14.

Approach

Given the proximity of the Karn Bottom Ash Pond to the Karn Landfill at the Karn property, the nature and extent of contamination was assessed from a site-wide perspective rather than on a per CCR unit basis. The nature and extent of groundwater impacted by a release from the Karn Bottom Ash Pond overlaps with groundwater impacted by operation of the Karn Landfill. Additionally, looking at impacted groundwater on a site-wide basis was more practical from a risk mitigation standpoint, given:

- The likely age of the release(s);
- A long operational history of ash management;
- The historical use of CCR as fill; and
- The influence of geochemistry on several of the Appendix IV constituent concentrations in groundwater.

Groundwater Nature and Extent Relative to Groundwater Protection Standards

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. Although arsenic concentrations exceed the GWPS in on-site groundwater monitoring locations, arsenic is delineated within the limits of the property owned by Consumers Energy and there are currently no adverse effects on human health or the environment from either surface water or groundwater due to CCR management at the Karn Bottom Ash Pond. The property is owned and operated by Consumers Energy and groundwater is not used for drinking water. There are no on-site drinking water wells and there are no surface water potable water intakes within 3 miles of the site, so the drinking water pathway is not complete.

The distribution of arsenic relative to the Karn Bottom Ash Pond groundwater monitoring system in the shallow water-bearing unit as compared to the GWPS is presented in Figure 1. Three categories were assigned to groundwater data collected from July 2022 to May 2023, as follows:

- White – No Exceedances: all concentrations were below the GWPS
- Yellow – Two or More Exceedances: individual observations above the GWPS[2]
- Orange – Statistically Significant GWPS Exceedances[3]

The highest concentrations of arsenic observed in the vicinity of the Karn Bottom Ash Pond have been observed at DEK-MW-15003, a monitoring well located to the north of the bottom ash pond and associated with the shifted “highest” elevation of mounded groundwater relative to the Karn Bottom Ash Pond. Although historically the point source discharge of sluiced bottom ash into the Karn Bottom Ash Pond created localized mounding of the potentiometric surface, the new Karn Lined Impoundment went into service on June 7, 2018 and has been continuously collecting the process water and bottom ash that went into the former bottom ash pond. Since the former bottom ash pond is no longer being

[2] Although an exceedance is defined as a single detection above the GWPS, confidence intervals will be used to determine compliance per the CCR Rule using the Karn Bottom Ash Pond monitoring well network. Compliance with the GWPSs established under § 257.95(h) will be achieved by demonstrating that concentrations of constituents listed in Appendix IV to this part have not exceeded the GWPSs for a period of three consecutive years using the statistical procedures and performance standards in § 257.93(f) and (g).

[3] Lower confidence limit is above the GWPS based upon most recent assessment monitoring statistical evaluation using the eight most recent sampling events (October 2019 through May 2023).

hydraulically loaded with sluiced ash and has been dewatered by gravity, the characteristic groundwater mound centered within the pooled area is no longer present. The groundwater elevation data collected from the groundwater monitoring system of the former bottom ash pond this event demonstrate a reduction in groundwater elevation measurements by several feet when compared to groundwater elevations measured prior to June 2018. Given this shift in groundwater flow direction, DEK-MW-15003 and DEK-MW-15004 are now located upgradient to side gradient of the CCR unit and are no longer representative of groundwater chemistry downgradient of the Karn Bottom Ash Pond. DEK-MW-15003 and DEK-MW-15004 cannot reliably be used to assess the effectiveness of the CCR removal activities and are influenced by the long operational history of ash management in this area of the site. As such, these two wells were removed from the certified downgradient monitoring well network. DEK-MW-15003 and DEK-MW-15004 are instead used as part of the nature and extent monitoring well network for the purposes of informing the ongoing remedy selection and risk mitigation evaluations. The recertification was included in Appendix D of the *October 2021 Assessment Monitoring Data Summary and Statistical Evaluation*[4].

Recent data show that groundwater quality is changing since sluicing to the Karn Bottom Ash Pond ceased in June 2018 when the bottom ash and transport water was diverted to the Karn Lined Impoundment. Arsenic has been the only constituent to have triggered corrective action. TRC used Sanitas™ to compare groundwater data collected while the pond was still in operation ("background" for the purposes of the statistical comparison, December 2015 to June 2018) to data collected once hydraulic loading ceased ("compliance" for the purposes of the statistical comparison, June 2018 to present), as shown by the time-series charts and student t-test results (Attachment A). Mean arsenic concentrations in groundwater at DEK-MW-15002, DEK-MW-15003, and DEK-MW-18001[5] from June 2018 to present are lower than concentrations observed while the pond was in operation (prior to June 2018), whereas arsenic concentrations in groundwater at DEK-MW-15004, DEK-MW-15005, and DEK-MW-15006 are higher than concentrations observed while the pond was in operation. The decrease in concentrations of arsenic at DEK-MW-15002, DEK-MW-15003, and DEK-MW-18001 indicate that discontinuing the hydraulic loading to the Karn Bottom Ash Pond and the completed source removal of CCR was successful in removing a source of arsenic; however, attainment of the GWPS at all of the Bottom Ash Pond downgradient monitoring wells may not be feasible due to influences other than the former pond, such as the presence and former operation of the nearby Karn Landfill. Arsenic in the nature and extent monitoring wells located along the landfill perimeter bordering Saginaw Bay also exhibit concentrations above the GWPS. Although arsenic is present above the GWPS, the drinking water pathway is not complete as there are no drinking water wells on-site. Redox conditions, which affect contaminant transport, are still stabilizing in the Bottom Ash Pond Area following removal activities and will continue to be evaluated further.

As shown on the charts below, the dissolved oxygen concentration and oxidation-reduction potential (ORP) showed highly variable results following CCR removal activities.

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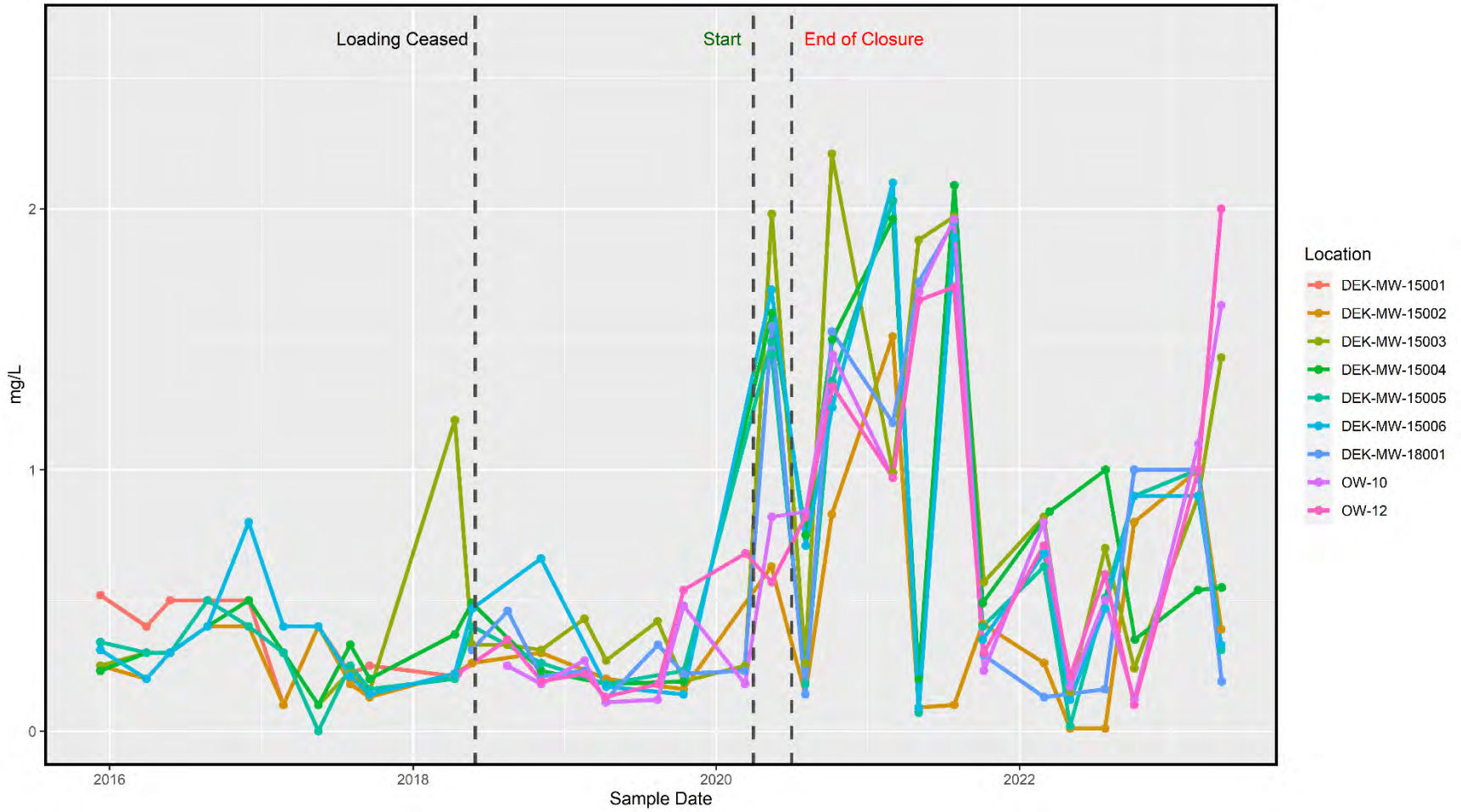
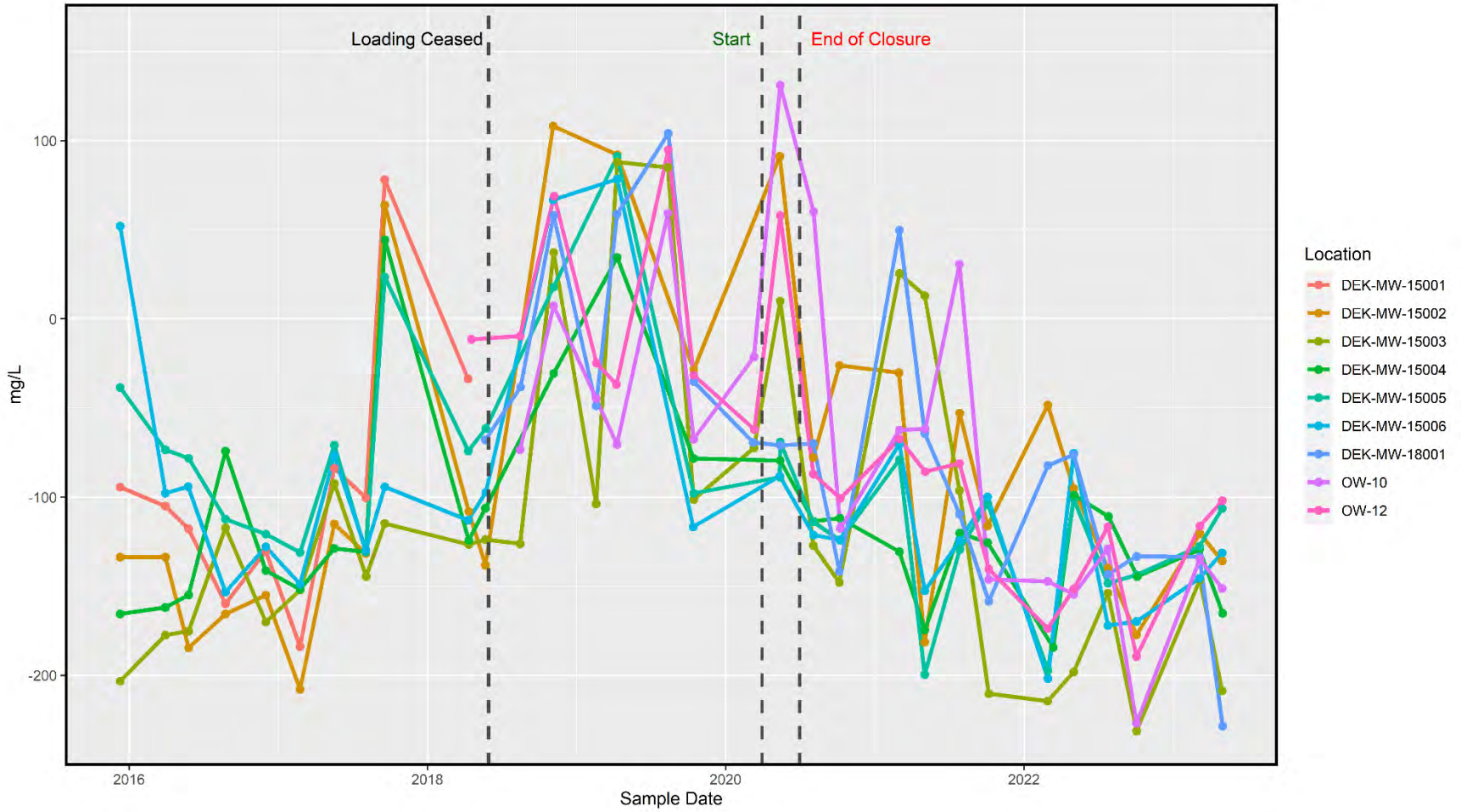
[4] TRC. January 2022. *October 2021 Assessment Monitoring Data Summary and Statistical Evaluation – DE Karn Power Plant, Bottom Ash Pond CCR Unit.* Prepared for Consumers Energy Company.

[5] Monitoring well DEK-MW-18001 was installed in May 2018, following decommissioning of monitoring well DEK-MW-15001. DEK-MW-15001 is located approximately 80 feet northwest of DEK-MW-18001 and was decommissioned due to the installation of the Karn Lined Impoundment. Due to the close proximity of the wells, data collected at DEK-MW-15001 from 2015 to April 2018 is used as the "background" for DEK-MW-18001.

Groundwater Chemistry Changes Post-Dewatering - Dissolved Oxygen



Groundwater Chemistry Changes Post-Dewatering - Oxidation-Reduction Potential



Specifically, dissolved oxygen transitioned from the suboxic/anoxic state of 0.5 mg/L or less to an oxic state of greater than 1.5 mg/L immediately following CCR removal. In the same time period, the electric potential transitioned from a moderately negative electric potential near -100 mV to a moderately positive electric potential of +100 mV. The observed trends for these two key field-measured parameters demonstrate that the preferred equilibrium redox state (e.g. preferred redox couple chemistry) also shifted during the time period immediately following CCR removal. Recent data indicate that trends in the redox conditions may be stabilizing at values similar to pre-dewatering conditions based on measurements of dissolved oxygen in the anoxic range of 0.5 – 1.0 mg/L and negative electric potential; however, measured dissolved oxygen at DEK-MW-15003, OW-10, and OW-12 has increased over the past two quarterly events. These trends will continue to be evaluated**.**

Groundwater Nature and Extent Relative to GSI

The drinking water pathway is not complete. Due to the presence of the surrounding surface water bodies, another relevant pathway is the groundwater surface water interface pathway. Monitoring performed under the Michigan-approved GSI Compliance Monitoring Program demonstrates protection of human health and the environment with criteria determined to be protective at the potential point of exposure. Transect/porewater GSI compliance sampling data collected quarterly show that biogeochemical conditions are contributing to the reduction of arsenic in groundwater as observed in transect push-point samples located along the water's edge of Saginaw Bay, where arsenic concentrations are generally much lower than the arsenic concentrations observed in the perimeter dike wells. Compliance with water quality criteria is demonstrated on a quarterly basis by evaluating the total chronic loading based on contribution from each GSI compliance sample location with respect to the total flux observed in the state-authorized site-specific mixing zone, per the HMP.

The distribution of arsenic in the shallow water-bearing unit as compared to the mixing zone GSI criteria is presented in Figure 2. Three categories were assigned to the data from July 2022 to May 2023[6], as follows:

- White – No Exceedances: all concentrations were below the mixing zone GSI criteria
- Light Blue – Two consecutive exceedances of the chronic mixing zone GSI criterion
- Dark Blue – Two consecutive exceedances of the acute mixing zone GSI criterion

Groundwater monitoring locations along the DE Karn Intake Channel and boundary between the coal ash management areas and the power plant complex (DEK-MW-15002, DEK-MW-15005, DEK-MW-15006,) document contaminant concentrations of arsenic are less than the authorized mixing zone-based chronic concentration of 100 ug/L. Total chronic loading (i.e., mass flux), calculated from concentrations observed in transect groundwater samples collected from push-point samplers advanced at locations T1-3GSI through T6-3GSI, remains below the chronic mixing zone GSI criterion, indicating current conditions are protective of the GSI pathway.

[6] Given the dynamic nature of the groundwater surface water interactions, it is appropriate to look at a shorter timeframe for data analysis (one year).

Summary

The nature and extent of arsenic in the shallow water-bearing unit is defined in accordance with the Federal CCR rule. Risk from potential exposure to groundwater is managed. The drinking water pathway is not complete. Monitoring performed under the Michigan-approved GSI Compliance Monitoring Program demonstrates protection of human health and the environment with criteria determined to be protective at the potential point of exposure (i.e., state-authorized site-specific mixing zone criteria).

Attachments

Table 1 Summary of Groundwater Sampling Results (Analytical): DE Karn Nature and Extent Monitoring Wells
Table 2 Summary of Groundwater Sampling Results (Analytical): DE Karn Nature and Extent GSI Monitoring Locations

Figure 1 Nature and Extent Summary: GWPS Exceedances
Figure 2 Nature and Extent Summary: GSI Pathway Compliance

Attachment A Statistical Evaluation

Tables

Table 1
Summary of Groundwater Sampling Results (Analytical)
DE Karn Nature and Extent Monitoring Wells
Essexville, Michigan

									Sample Location:	DEK-MW-15003				DEK-MW-15004				MW-01			
									Sample Date:	7/26/2022	10/4/2022	3/8/2023	5/2/2023	7/27/2022	10/6/2022	3/7/2023	5/3/2023	7/26/2022	10/4/2022	3/6/2023	5/1/2023
Constituent	Unit	GWPS*	MI Residential**	MI Non-Residential**	MI GSI^	MI AMV***	MI FAV***	Chronic MZ^^	Acute MZ^^												
Appendix III																					
Boron	ug/L	NA	500	500	4,000	34,000	69,000	44,000	69,000	**773**	**891**	**816**	**701**	**965**	**1,340**	**972**	**931**	**5,620**	**5,440**	**5,270**	**5,650**
Calcium	mg/L	NA	NC	NC	500[EE]	NC	NC	NC	NC	**27.1**	**26.1**	**29.2**	**24.4**	**73.7**	**62.2**	**72.8**	**81.8**	**126**	**111**	**83.3**	**82.4**
Chloride	mg/L	NA	250[E]	250[E]	50	320,000	640,000	NC	NC	**58.6**	**60.8**	**58.7**	**58.9**	**69.2**	**70.6**	**68.4**	**66.7**	**81.8**	**78.9**	**93.3**	**84.8**
Fluoride	ug/L	4,000	NC	NC	NC	9,800	20,000	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	--	--	--	--
Sulfate	mg/L	NA	250[E]	250[E]	500[EE]	600,000	1,200,000	NC	NC	**39.3**	**39**	**41.8**	**50.2**	**245**	**98.9**	**267**	**273**	**117**	**84.8**	**3.26**	< 1
Total Dissolved Solids	mg/L	NA	500[E]	500[E]	500	NC	NC	NC	NC	**272**	**317**	**282**	**285**	**660**	**567**	**684**	**701**	--	--	--	--
pH, Field	su	NA	6.5 - 8.5[E]	6.5 - 8.5[E]	6.5 - 9.0	NC	NC	NC	NC	**8.1**	**8.3**	**8.0**	**8.0**	**7.1**	**7.4**	**7.4**	**7.3**	**8.0**	**8.4**	**8.1**	**8.4**
Appendix IV																					
Antimony	ug/L	6	6.0	6.0	2.0	1,100	2,300	NC	NC	< 1	< 1	**1**	< 1	< 1	< 1	< 1	< 1	--	--	--	--
Arsenic	ug/L	21[1]	10	10	10	340	680	100	680	**475**	**401**	**401**	**418**	**157**	**56**	**168**	**134**	**7**	**7**	**6**	**6**
Barium	ug/L	2,000	2,000	2,000	1,200	3,400	6,800	NC	NC	**40**	**44**	**44**	**36**	**142**	**90**	**151**	**162**	--	--	--	--
Beryllium	ug/L	4	4.0	4.0	33	300	600	NC	NC	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	--	--	--	--
Cadmium	ug/L	5	5.0	5.0	2.5	12	24	NC	NC	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	--	--	--	--
Chromium	ug/L	100	100	100	11	16	32	NC	NC	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	**2**	**1**	**1**	**1**
Cobalt	ug/L	15	40	100	100	370	740	NC	NC	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	--	--	--	--
Fluoride	ug/L	4,000	NC	NC	NC	9,800	20,000	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	--	--	--	--
Lead	ug/L	15	4.0	4.0	14	250	500	NC	NC	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	--	--	--	--
Lithium	ug/L	180	170	350	440	910	1,800	NC	NC	**20**	**23**	**21**	**20**	**37**	**16**	**36**	**40**	**108**	**106**	**78**	**91**
Mercury	ug/L	2	2.0	2.0	0.20#	1.4	2.8	NC	NC	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	--	--	--	--
Molybdenum	ug/L	100	73	210	120	29,000	58,000	NC	NC	**23**	**25**	**23**	**28**	**10**	**13**	**12**	**10**	< 5	< 5	< 5	< 5
Radium-226/228	pci/L	5	NC	NC	NC	NC	NC	NC	NC	--	**2.15**	--	--	--	--	--	--	--	--	--	--
Selenium	ug/L	50	50	50	5.0	62	120	55	120	**1**	< 1	**1**	**1**	**2**	< 1	< 1	< 1	**3**	**3**	**3**	**3**
Thallium	ug/L	2	2.0	2.0	2.0	47	94	NC	NC	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	--	--	--	--
MI Part 115 Parameters																					
Iron	ug/L	NA	300[E]	300[E]	500,000[EE]	NC	NC	NC	NC	**169**	**84**	**178**	**89**	**3,900**	**1,950**	**3,780**	**4,250**	**402**	**254**	**208**	**142**
Copper	ug/L	NA	1,000[E]	1,000[E]	20	33	66	NC	NC	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	--	--	--	--
Nickel	ug/L	NA	100	100	120	1,000	2,100	NC	NC	< 2	< 2	**3**	< 2	**2**	**3**	**3**	**2**	--	--	--	--
Silver	ug/L	NA	34	98	0.2	0.54	1.1	NC	NC	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	--	--	--	--
Vanadium	ug/L	NA	4.5	62	27	79	160	NC	NC	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	**2**
Zinc	ug/L	NA	2,400	5,000[E]	260	260	520	NC	NC	< 10	< 10	< 10	< 10	< 10	< 10	**15**	< 10	--	--	--	--

Notes:
ug/L - micrograms per liter; mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
* - GWPS (Groundwater Protection Standard) is the higher of the Maximum Contaminant Level (MCL)/Regional Screening Level from 83 FR 36435 (RSL) and Upper Tolerance Limit (UTL) as established in TRC's Technical Memorandum dated October 15, 2018.
** - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 21, 2020.
^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using hardness of 258 mg CaCO3/L (average of SW-01 [Lake Huron] and SW-02 [Saginaw River] collected in April 2018) per footnote {G} of Michigan Part 201 criteria tables. Chromium GSI criterion based on hexavalent chromium per footnote {H}. GSI criterion is protective for surface water used as a drinking water source as described in footnote {X}. GSI criterion for chloride is 50 mg/L when the discharge is to the Great Lakes or connecting waters per footnote {FF}.
*** - Aquatic Maximum (AMV) and Final Acute Values (FAV) are taken from EGLE Rule 323.1057 Part 4 - Water Quality Standards (Rule 57), March 15, 2018. Hardness-dependent criteria calculated using site-specific hardness of 258 mg CaCO3/L (average of SW-01 [Lake Huron] and SW-02 [Saginaw River] collected in April 2018). Chromium AMV & FAV criteria are based on hexavalent chromium.
^^ - Mixing Zone (MZ) GSI Criteria from Michigan Department of Environmental Quality (MDEQ) approval letter dated December 23, 2015.
# - 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 font denotes concentrations detected above laboratory reporting limits.
Result Indicates an exceedance of one or more applicable health-based drinking water and GSI criteria.
Result Indicates an exceedance of acute-based GSI criteria.
All metals were analyzed as total unless otherwise specified.
[1] - Constituent triggered an Assessment of Corrective Measures for the Karn Bottom Ash Pond as described in TRC's letter report dated Janurary 14, 2019.

Table 1
Summary of Groundwater Sampling Results (Analytical)
DE Karn Nature and Extent Monitoring Wells
Essexville, Michigan

										MW-03				MW-06				MW-08			
									Sample Date:	7/26/2022	10/4/2022	3/6/2023	5/1/2023	7/26/2022	10/4/2022	3/6/2023	5/1/2023	7/26/2022	10/4/2022	3/6/2023	5/1/2023
Constituent	Unit	GWPS*	MI Residential**	MI Non-Residential**	MI GSI^	MI AMV***	MI FAV***	Chronic MZ^^	Acute MZ^^												
Appendix III																					
Boron	ug/L	NA	500	500	4,000	34,000	69,000	44,000	69,000	**8,360**	**8,710**	**8,570**	**9,000**	**618**	**530**	**458**	**621**	**4,900**	**4,800**	**4,520**	**4,230**
Calcium	mg/L	NA	NC	NC	500[EE]	NC	NC	NC	NC	**119**	**118**	**129**	**133**	**102**	**91.2**	**104**	**174**	**169**	**155**	**154**	**165**
Chloride	mg/L	NA	250[E]	250[E]	50	320,000	640,000	NC	NC	**77.7**	**85.8**	**86.6**	**75**	**24.9**	**25.4**	**14.1**	**18.9**	**51.9**	**52.1**	**59.2**	**52.5**
Fluoride	ug/L	4,000	NC	NC	NC	9,800	20,000	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Sulfate	mg/L	NA	250[E]	250[E]	500[EE]	600,000	1,200,000	NC	NC	< 1	< 1	< 1	< 1	**90.1**	**92.8**	**78.2**	**255**	**291**	**268**	**275**	**317**
Total Dissolved Solids	mg/L	NA	500[E]	500[E]	500	NC	NC	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
pH, Field	su	NA	6.5 - 8.5[E]	6.5 - 8.5[E]	6.5 - 9.0	NC	NC	NC	NC	**7.9**	**8.4**	**7.5**	**8.0**	**7.2**	**7.4**	**7.3**	**7.3**	**7.0**	**7.1**	**7.2**	**7.4**
Appendix IV																					
Antimony	ug/L	6	6.0	6.0	2.0	1,100	2,300	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	ug/L	21[1]	10	10	10	340	680	100	680	**3**	**4**	**3**	**3**	**164**	**183**	**112**	**95**	**94**	**97**	**113**	**94**
Barium	ug/L	2,000	2,000	2,000	1,200	3,400	6,800	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	ug/L	4	4.0	4.0	33	300	600	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	ug/L	5	5.0	5.0	2.5	12	24	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	ug/L	100	100	100	11	16	32	NC	NC	**2**	**2**	**2**	**2**	**1**	< 1	**2**	**2**	< 1	< 1	< 1	< 1
Cobalt	ug/L	15	40	100	100	370	740	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Fluoride	ug/L	4,000	NC	NC	NC	9,800	20,000	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Lead	ug/L	15	4.0	4.0	14	250	500	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Lithium	ug/L	180	170	350	440	910	1,800	NC	NC	**92**	**89**	**87**	**102**	**38**	**35**	**33**	**52**	**110**	**105**	**102**	**117**
Mercury	ug/L	2	2.0	2.0	0.20#	1.4	2.8	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Molybdenum	ug/L	100	73	210	120	29,000	58,000	NC	NC	< 5	< 5	**6**	< 5	**8**	**8**	< 5	< 5	**20**	**22**	**19**	**17**
Radium-226/228	pci/L	5	NC	NC	NC	NC	NC	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	ug/L	50	50	50	5.0	62	120	55	120	**4**	**3**	**2**	**2**	**1**	**1**	< 1	**1**	**3**	**2**	< 1	**2**
Thallium	ug/L	2	2.0	2.0	2.0	47	94	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
MI Part 115 Parameters																					
Iron	ug/L	NA	300[E]	300[E]	500,000[EE]	NC	NC	NC	NC	**295**	**181**	**630**	**522**	**1,510**	**1,120**	**1,570**	**2,800**	**9,960**	**9,190**	**9,800**	**9,640**
Copper	ug/L	NA	1,000[E]	1,000[E]	20	33	66	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	ug/L	NA	100	100	120	1,000	2,100	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Silver	ug/L	NA	34	98	0.2	0.54	1.1	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	ug/L	NA	4.5	62	27	79	160	NC	NC	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Zinc	ug/L	NA	2,400	5,000[E]	260	260	520	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
ug/L - micrograms per liter; mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
* - GWPS (Groundwater Protection Standard) is the higher of the Maximum Contaminant Level (MCL)/Regional Screening Level from 83 FR 36435 (RSL) and Upper Tolerance Limit (UTL) as established in TRC's Technical Memorandum dated October 15, 2018.
** - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 21, 2020.
^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using hardness of 258 mg CaCO3/L (average of SW-01 [Lake Huron] and SW-02 [Saginaw River] collected in April 2018) per footnote {G} of Michigan Part 201 criteria tables. Chromium GSI criterion based on hexavalent chromium per footnote {H}. GSI criterion is protective for surface water used as a drinking water source as described in footnote {X}. GSI criterion for chloride is 50 mg/L when the discharge is to the Great Lakes or connecting waters per footnote {FF}.
*** - Aquatic Maximum (AMV) and Final Acute Values (FAV) are taken from EGLE Rule 323.1057 Part 4 - Water Quality Standards (Rule 57), March 15, 2018. Hardness-dependent criteria calculated using site-specific hardness of 258 mg CaCO3/L (average of SW-01 [Lake Huron] and SW-02 [Saginaw River] collected in April 2018). Chromium AMV & FAV criteria are based on hexavalent chromium.
^^ - Mixing Zone (MZ) GSI Criteria from Michigan Department of Environmental Quality (MDEQ) approval letter dated December 23, 2015.
# - 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 font denotes concentrations detected above laboratory reporting limits.

Result	Indicates an exceedance of one or more applicable health-based drinking water and GSI criteria.
Result	Indicates an exceedance of acute-based GSI criteria.

All metals were analyzed as total unless otherwise specified.
[1] - Constituent triggered an Assessment of Corrective Measures for the Karn Bottom Ash Pond as described in TRC's letter report dated Janurary 14, 2019.

Table 1
Summary of Groundwater Sampling Results (Analytical)
DE Karn Nature and Extent Monitoring Wells
Essexville, Michigan

										MW-10				MW-12				MW-14			
									Sample Date:	7/26/2022	10/4/2022	3/7/2023	5/1/2023	7/26/2022	10/4/2022	3/7/2023	5/1/2023	7/26/2022	10/4/2022	3/7/2023	5/1/2023
Constituent	Unit	GWPS*	MI Residential**	MI Non-Residential**	MI GSI^	MI AMV***	MI FAV***	Chronic MZ^^	Acute MZ^^												
Appendix III																					
Boron	ug/L	NA	500	500	4,000	34,000	69,000	44,000	69,000	**5,100**	**4,550**	**3,920**	**3,390**	**4,040**	**4,140**	**4,000**	**3,970**	**2,900**	**2,740**	**2,760**	**2,740**
Calcium	mg/L	NA	NC	NC	500[EE]	NC	NC	NC	NC	**186**	**172**	**214**	**243**	**190**	**186**	**196**	**192**	**204**	**241**	**159**	**176**
Chloride	mg/L	NA	250[E]	250[E]	50	320,000	640,000	NC	NC	**56.7**	**56.5**	**44.2**	**31.4**	**68.3**	**67.2**	**66.8**	**55.1**	**69**	**57.8**	**67**	**68.4**
Fluoride	ug/L	4,000	NC	NC	NC	9,800	20,000	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Sulfate	mg/L	NA	250[E]	250[E]	500[EE]	600,000	1,200,000	NC	NC	**108**	**156**	**353**	**528**	**265**	**250**	**285**	**249**	**282**	**573**	**121**	**223**
Total Dissolved Solids	mg/L	NA	500[E]	500[E]	500	NC	NC	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
pH, Field	su	NA	6.5 - 8.5[E]	6.5 - 8.5[E]	6.5 - 9.0	NC	NC	NC	NC	**7.1**	**7.1**	**7.1**	**7.3**	**7.2**	**7.2**	**7.3**	**7.5**	**7.1**	**7.0**	**7.2**	**7.4**
Appendix IV																					
Antimony	ug/L	6	6.0	6.0	2.0	1,100	2,300	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	ug/L	21[1]	10	10	10	340	680	100	680	**616**	**326**	**504**	**350**	**312**	**386**	**489**	**353**	**421**	**118**	**503**	**123**
Barium	ug/L	2,000	2,000	2,000	1,200	3,400	6,800	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	ug/L	4	4.0	4.0	33	300	600	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	ug/L	5	5.0	5.0	2.5	12	24	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	ug/L	100	100	100	11	16	32	NC	NC	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	15	40	100	100	370	740	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Fluoride	ug/L	4,000	NC	NC	NC	9,800	20,000	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Lead	ug/L	15	4.0	4.0	14	250	500	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Lithium	ug/L	180	170	350	440	910	1,800	NC	NC	**131**	**131**	**137**	**130**	**119**	**114**	**120**	**118**	**81**	**99**	**73**	**84**
Mercury	ug/L	2	2.0	2.0	0.20#	1.4	2.8	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Molybdenum	ug/L	100	73	210	120	29,000	58,000	NC	NC	< 5	**7**	< 5	**10**	**7**	**9**	< 5	**6**	**8**	**13**	< 5	**9**
Radium-226/228	pci/L	5	NC	NC	NC	NC	NC	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	ug/L	50	50	50	5.0	62	120	55	120	**2**	**2**	< 1	**2**	**6**	**4**	**2**	**7**	**5**	**27**	**3**	**17**
Thallium	ug/L	2	2.0	2.0	2.0	47	94	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
MI Part 115 Parameters																					
Iron	ug/L	NA	300[E]	300[E]	500,000[EE]	NC	NC	NC	NC	**5,760**	**3,520**	**6,920**	**7,940**	**1,800**	**3,070**	**3,410**	**2,010**	**3,400**	**164**	**3,250**	**633**
Copper	ug/L	NA	1,000[E]	1,000[E]	20	33	66	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	ug/L	NA	100	100	120	1,000	2,100	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Silver	ug/L	NA	34	98	0.2	0.54	1.1	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	ug/L	NA	4.5	62	27	79	160	NC	NC	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Zinc	ug/L	NA	2,400	5,000[E]	260	260	520	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
ug/L - micrograms per liter; mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
* - GWPS (Groundwater Protection Standard) is the higher of the Maximum Contaminant Level (MCL)/Regional Screening Level from 83 FR 36435 (RSL) and Upper Tolerance Limit (UTL) as established in TRC's Technical Memorandum dated October 15, 2018.
** - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 21, 2020.
^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using hardness of 258 mg CaCO3/L (average of SW-01 [Lake Huron] and SW-02 [Saginaw River] collected in April 2018) per footnote {G} of Michigan Part 201 criteria tables. Chromium GSI criterion based on hexavalent chromium per footnote {H}. GSI criterion is protective for surface water used as a drinking water source as described in footnote {X}. GSI criterion for chloride is 50 mg/L when the discharge is to the Great Lakes or connecting waters per footnote {FF}.
*** - Aquatic Maximum (AMV) and Final Acute Values (FAV) are taken from EGLE Rule 323.1057 Part 4 - Water Quality Standards (Rule 57), March 15, 2018. Hardness-dependent criteria calculated using site-specific hardness of 258 mg CaCO3/L (average of SW-01 [Lake Huron] and SW-02 [Saginaw River] collected in April 2018). Chromium AMV & FAV criteria are based on hexavalent chromium.
^^ - Mixing Zone (MZ) GSI Criteria from Michigan Department of Environmental Quality (MDEQ) approval letter dated December 23, 2015.
# - 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 font denotes concentrations detected above laboratory reporting limits.

Result	Indicates an exceedance of one or more applicable health-based drinking water and GSI criteria.
Result	Indicates an exceedance of acute-based GSI criteria.

All metals were analyzed as total unless otherwise specified.
[1] - Constituent triggered an Assessment of Corrective Measures for the Karn Bottom Ash Pond as described in TRC's letter report dated Janurary 14, 2019.

Table 1
Summary of Groundwater Sampling Results (Analytical)
DE Karn Nature and Extent Monitoring Wells
Essexville, Michigan

										MW-16				MW-22				MW-23			
									Sample Date:	7/26/2022	10/4/2022	3/7/2023	5/1/2023	7/27/2022	10/6/2022	3/7/2023	5/1/2023	7/27/2022	10/6/2022	3/7/2023	5/1/2023
Constituent	Unit	GWPS*	MI Residential**	MI Non-Residential**	MI GSI^	MI AMV***	MI FAV***	Chronic MZ^^	Acute MZ^^												
Appendix III																					
Boron	ug/L	NA	500	500	4,000	34,000	69,000	44,000	69,000	**1,360**	**1,510**	**1,520**	**1,710**	**6,870**	**6,930**	**--**	**--**	**6,760**	**6,830**	**--**	**--**
Calcium	mg/L	NA	NC	NC	500[EE]	NC	NC	NC	NC	**381**	**338**	**356**	**371**	**75.4**	**75.3**	--	--	**157**	**181**	--	--
Chloride	mg/L	NA	250[E]	250[E]	50	320,000	640,000	NC	NC	**113**	**104**	**159**	**123**	**95.4**	**104**	--	--	**56.9**	**55.4**	--	--
Fluoride	ug/L	4,000	NC	NC	NC	9,800	20,000	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Sulfate	mg/L	NA	250[E]	250[E]	500[EE]	600,000	1,200,000	NC	NC	**1,210**	**1,210**	**1,130**	**1,180**	**168**	**176**	--	--	**273**	**438**	**--**	**--**
Total Dissolved Solids	mg/L	NA	500[E]	500[E]	500	NC	NC	NC	NC	--	--	--	--	**550**	**593**	**--**	**--**	**886**	**871**	**--**	**--**
pH, Field	su	NA	6.5 - 8.5[E]	6.5 - 8.5[E]	6.5 - 9.0	NC	NC	NC	NC	**7.2**	**7.3**	**7.4**	**7.6**	**7.0**	**6.9**	--	--	**6.7**	**6.8**	--	--
Appendix IV																					
Antimony	ug/L	6	6.0	6.0	2.0	1,100	2,300	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	ug/L	21[1]	10	10	10	340	680	100	680	**2**	**1**	**2**	**2**	**516**	**559**	**--**	**--**	**47**	**53**	**--**	**--**
Barium	ug/L	2,000	2,000	2,000	1,200	3,400	6,800	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	ug/L	4	4.0	4.0	33	300	600	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	ug/L	5	5.0	5.0	2.5	12	24	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	ug/L	100	100	100	11	16	32	NC	NC	< 1	< 1	< 1	**1**	< 1	< 1	--	--	**2**	**1**	--	--
Cobalt	ug/L	15	40	100	100	370	740	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Fluoride	ug/L	4,000	NC	NC	NC	9,800	20,000	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Lead	ug/L	15	4.0	4.0	14	250	500	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Lithium	ug/L	180	170	350	440	910	1,800	NC	NC	**123**	**114**	**149**	**144**	**131**	**129**	--	--	**115**	**122**	--	--
Mercury	ug/L	2	2.0	2.0	0.20#	1.4	2.8	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Molybdenum	ug/L	100	73	210	120	29,000	58,000	NC	NC	**23**	**30**	**19**	**23**	**1,110**	**1,190**	**--**	**--**	**44**	**46**	--	--
Radium-226/228	pci/L	5	NC	NC	NC	NC	NC	NC	NC	--	--	--	--	**--**	**--**	**--**	**--**	--	--	--	--
Selenium	ug/L	50	50	50	5.0	62	120	55	120	**6**	**12**	**5**	**10**	**4**	**3**	--	--	**3**	**2**	--	--
Thallium	ug/L	2	2.0	2.0	2.0	47	94	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
MI Part 115 Parameters																					
Iron	ug/L	NA	300[E]	300[E]	500,000[EE]	NC	NC	NC	NC	**100**	**25**	**233**	**154**	**89**	**256**	--	--	**37,000**	**44,000**	**--**	**--**
Copper	ug/L	NA	1,000[E]	1,000[E]	20	33	66	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	ug/L	NA	100	100	120	1,000	2,100	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Silver	ug/L	NA	34	98	0.2	0.54	1.1	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	ug/L	NA	4.5	62	27	79	160	NC	NC	< 2	< 2	< 2	< 2	**3**	**3**	--	--	**5**	< 2	--	--
Zinc	ug/L	NA	2,400	5,000[E]	260	260	520	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
ug/L - micrograms per liter; mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
* - GWPS (Groundwater Protection Standard) is the higher of the Maximum Contaminant Level (MCL)/Regional Screening Level from 83 FR 36435 (RSL) and Upper Tolerance Limit (UTL) as established in TRC's Technical Memorandum dated October 15, 2018.
** - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 21, 2020.
^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using hardness of 258 mg CaCO3/L (average of SW-01 [Lake Huron] and SW-02 [Saginaw River] collected in April 2018) per footnote {G} of Michigan Part 201 criteria tables. Chromium GSI criterion based on hexavalent chromium per footnote {H}. GSI criterion is protective for surface water used as a drinking water source as described in footnote {X}. GSI criterion for chloride is 50 mg/L when the discharge is to the Great Lakes or connecting waters per footnote {FF}.
*** - Aquatic Maximum (AMV) and Final Acute Values (FAV) are taken from EGLE Rule 323.1057 Part 4 - Water Quality Standards (Rule 57), March 15, 2018. Hardness-dependent criteria calculated using site-specific hardness of 258 mg CaCO3/L (average of SW-01 [Lake Huron] and SW-02 [Saginaw River] collected in April 2018). Chromium AMV & FAV criteria are based on hexavalent chromium.
^^ - Mixing Zone (MZ) GSI Criteria from Michigan Department of Environmental Quality (MDEQ) approval letter dated December 23, 2015.
# - 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 font denotes concentrations detected above laboratory reporting limits.

Result	Indicates an exceedance of one or more applicable health-based drinking water and GSI criteria.
Result	Indicates an exceedance of acute-based GSI criteria.

All metals were analyzed as total unless otherwise specified.
[1] - Constituent triggered an Assessment of Corrective Measures for the Karn Bottom Ash Pond as described in TRC's letter report dated Janurary 14, 2019.

Table 1
Summary of Groundwater Sampling Results (Analytical)
DE Karn Nature and Extent Monitoring Wells
Essexville, Michigan

									Sample Location:	OW-10				OW-11				OW-12			
									Sample Date:	7/26/2022	10/4/2022	3/8/2023	5/2/2023	7/26/2022	10/4/2022	3/8/2023	5/2/2023	7/26/2022	10/4/2022	3/8/2023	5/2/2023
Constituent	Unit	GWPS*	MI Residential**	MI Non-Residential**	MI GSI^	MI AMV***	MI FAV***	Chronic MZ^^	Acute MZ^^												
Appendix III																					
Boron	ug/L	NA	500	500	4,000	34,000	69,000	44,000	69,000	**1,090**	**1,100**	**1,430**	**998**	**3,330**	**3,470**	**3,690**	**3,400**	**1,230**	**1,090**	**1,060**	**1,340**
Calcium	mg/L	NA	NC	NC	500[EE]	NC	NC	NC	NC	**101**	**118**	**123**	**98.8**	**5.33**	**7.13**	**5.77**	**6.42**	**84.8**	**70.7**	**64.8**	**124**
Chloride	mg/L	NA	250[E]	250[E]	50	320,000	640,000	NC	NC	**58**	**66**	**74.4**	**56.9**	**61.6**	**62.5**	**59.5**	**56.1**	**55.5**	**61.8**	**59.7**	**59.4**
Fluoride	ug/L	4,000	NC	NC	NC	9,800	20,000	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	**2,710**	**3,460**	**2,900**	**2,960**	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	NA	250[E]	250[E]	500[EE]	600,000	1,200,000	NC	NC	**2.67**	**46.4**	**11.3**	**8.28**	**19.9**	**19.3**	**17.4**	**17.6**	**169**	**150**	**142**	**265**
Total Dissolved Solids	mg/L	NA	500[E]	500[E]	500	NC	NC	NC	NC	**568**	**612**	**673**	**517**	**235**	**260**	**233**	**224**	**601**	**531**	**522**	**820**
pH, Field	su	NA	6.5 - 8.5[E]	6.5 - 8.5[E]	6.5 - 9.0	NC	NC	NC	NC	**7.2**	**7.1**	**7.3**	**7.3**	**9.8**	**9.6**	**9.8**	**9.7**	**7.1**	**7.2**	**7.2**	**7.1**
Appendix IV																					
Antimony	ug/L	6	6.0	6.0	2.0	1,100	2,300	NC	NC	< 1	< 1	< 1	< 1	**4**	**2**	**3**	**3**	< 1	< 1	< 1	< 1
Arsenic	ug/L	21[1]	10	10	10	340	680	100	680	**2**	**3**	**2**	**3**	**682**	**667**	**769**	**837**	**111**	**104**	**79**	**62**
Barium	ug/L	2,000	2,000	2,000	1,200	3,400	6,800	NC	NC	**163**	**157**	**166**	**146**	**17**	**28**	**21**	**24**	**90**	**80**	**100**	**168**
Beryllium	ug/L	4	4.0	4.0	33	300	600	NC	NC	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	5.0	5.0	2.5	12	24	NC	NC	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	100	100	11	16	32	NC	NC	**2**	**1**	< 1	**1**	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	15	40	100	100	370	740	NC	NC	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	NC	NC	NC	9,800	20,000	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	**2,710**	**3,460**	**2,900**	**2,960**	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	15	4.0	4.0	14	250	500	NC	NC	**1**	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	180	170	350	440	910	1,800	NC	NC	**27**	**31**	**31**	**26**	< 10	< 10	< 10	< 10	**36**	**34**	**33**	**44**
Mercury	ug/L	2	2.0	2.0	0.20#	1.4	2.8	NC	NC	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	100	73	210	120	29,000	58,000	NC	NC	< 5	< 5	< 5	< 5	**173**	**178**	**158**	**157**	**17**	**21**	**13**	**7**
Radium-226/228	pci/L	5	NC	NC	NC	NC	NC	NC	NC	--	**1.96**	--	--	--	**1.35**	--	--	**--**	**1.91**	**--**	**--**
Selenium	ug/L	50	50	50	5.0	62	120	55	120	**2**	**10**	**1**	**2**	**5**	**4**	**3**	**5**	**1**	**2**	< 1	**1**
Thallium	ug/L	2	2.0	2.0	2.0	47	94	NC	NC	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
MI Part 115 Parameters																					
Iron	ug/L	NA	300[E]	300[E]	500,000[EE]	NC	NC	NC	NC	**3,350**	**1,350**	**3,590**	**3,660**	**31**	**128**	**86**	**90**	**6,080**	**5,800**	**4,950**	**8,580**
Copper	ug/L	NA	1,000[E]	1,000[E]	20	33	66	NC	NC	**3**	**1**	**2**	**2**	< 1	**1**	< 1	**1**	< 1	< 1	< 1	< 1
Nickel	ug/L	NA	100	100	120	1,000	2,100	NC	NC	**3**	**3**	< 2	**3**	**2**	**2**	**2**	**2**	< 2	**3**	**2**	**3**
Silver	ug/L	NA	34	98	0.2	0.54	1.1	NC	NC	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	ug/L	NA	4.5	62	27	79	160	NC	NC	**5**	**5**	**3**	**3**	**1,500**	**693**	**1,020**	**743**	< 2	< 2	< 2	< 2
Zinc	ug/L	NA	2,400	5,000[E]	260	260	520	NC	NC	< 10	< 10	< 10	< 10	< 10	**181**	**13**	< 10	< 10	< 10	< 10	< 10

Notes:
ug/L - micrograms per liter; mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
* - GWPS (Groundwater Protection Standard) is the higher of the Maximum Contaminant Level (MCL)/Regional Screening Level from 83 FR 36435 (RSL) and Upper Tolerance Limit (UTL) as established in TRC's Technical Memorandum dated October 15, 2018.
** - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 21, 2020.
^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using hardness of 258 mg CaCO3/L (average of SW-01 [Lake Huron] and SW-02 [Saginaw River] collected in April 2018) per footnote {G} of Michigan Part 201 criteria tables. Chromium GSI criterion based on hexavalent chromium per footnote {H}. GSI criterion is protective for surface water used as a drinking water source as described in footnote {X}. GSI criterion for chloride is 50 mg/L when the discharge is to the Great Lakes or connecting waters per footnote {FF}.
*** - Aquatic Maximum (AMV) and Final Acute Values (FAV) are taken from EGLE Rule 323.1057 Part 4 - Water Quality Standards (Rule 57), March 15, 2018. Hardness-dependent criteria calculated using site-specific hardness of 258 mg CaCO3/L (average of SW-01 [Lake Huron] and SW-02 [Saginaw River] collected in April 2018). Chromium AMV & FAV criteria are based on hexavalent chromium.
^^ - Mixing Zone (MZ) GSI Criteria from Michigan Department of Environmental Quality (MDEQ) approval letter dated December 23, 2015.
# - 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 font denotes concentrations detected above laboratory reporting limits.

Result	Indicates an exceedance of one or more applicable health-based drinking water and GSI criteria.
Result	Indicates an exceedance of acute-based GSI criteria.

All metals were analyzed as total unless otherwise specified.
[1] - Constituent triggered an Assessment of Corrective Measures for the Karn Bottom Ash Pond as described in TRC's letter report dated Janurary 14, 2019.

Table 2
Summary of Groundwater Sampling Results (Analytical)
DE Karn Nature and Extent GSI Monitoring Locations
Essexville, Michigan

										T1-3GSI				T2-3GSI				T3-3GSI			
									Sample Location:												
									Sample Date:	7/25/2022	10/3/2022	3/6/2023	5/3/2023	7/25/2022	10/3/2022	3/6/2023	5/3/2023	7/25/2022	10/3/2022	3/6/2023	5/3/2023
Constituent	Unit	GWPS*	MI Residential**	MI Non-Residential**	MI GSI^	MI AMV***	MI FAV***	Chronic MZ^^	Acute MZ^^												
Appendix III																					
Boron	ug/L	NA	500	500	4,000	34,000	69,000	44,000	69,000	**48**	**321**	--	**22**	**5,240**	**5,030**	--	**2,280**	**705**	**404**	--	**46**
Calcium	mg/L	NA	NC	NC	500[EE]	NC	NC	NC	NC	**37.8**	**82.5**	--	**58.9**	**152**	**178**	--	**142**	**144**	**141**	--	**123**
Chloride	mg/L	NA	250[E]	250[E]	50	320,000	640,000	NC	NC	**51.5**	**48.7**	--	**44.5**	**68.2**	**61.6**	--	**28.3**	**45.9**	**66.6**	--	**23.8**
Sulfate	mg/L	NA	250[E]	250[E]	500[EE]	600,000	1,200,000	NC	NC	**23.9**	< 1	--	**34.7**	**16.5**	**79**	--	**118**	< 1	< 1	--	**119**
pH, Field	su	NA	6.5 - 8.5[E]	6.5 - 8.5[E]	6.5 - 9.0	NC	NC	NC	NC	**7.3**	**7.0**	--	**7.8**	**6.5**	**6.8**	--	**7.2**	**6.7**	**6.8**	--	**7.2**
Appendix IV																					
Arsenic	ug/L	21[1]	10	10	10	340	680	100[2]	680	**5**	**3**	--	**1**	< 1	< 1	--	**1**	< 1	**1**	--	< 1
Chromium	ug/L	100	100	100	11	16	32	NC	NC	**1**	**2**	--	< 1	**2**	**1**	--	**2**	**1**	**2**	--	**1**
Lithium	ug/L	180	170	350	440	910	1,800	NC	NC	< 10	**14**	--	< 10	**115**	**116**	--	**46**	**116**	**52**	--	**12**
Molybdenum	ug/L	100	73	210	120	29,000	58,000	NC	NC	**6**	< 5	--	< 5	< 5	< 5	--	< 5	< 5	< 5	--	< 5
Selenium	ug/L	50	50	50	5.0	62	120	NC	NC	**1**	< 1	--	**1**	**2**	**2**	--	**2**	**2**	**1**	--	**1**
MI Part 115 Parameters																					
Iron	ug/L	NA	300[E]	300[E]	500,000[EE]	NC	NC	NC	NC	**568**	**2,190**	--	**119**	**164**	**106**	--	< 20	**1,700**	**2,750**	--	**1,870**
Vanadium	ug/L	NA	4.5	62	27	260	520	NC	NC	< 2	< 2	--	< 2	**2**	< 2	--	**2**	< 2	< 2	--	< 2

Notes:
ug/L - micrograms per liter; mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
* - GWPS (Groundwater Protection Standard) is the higher of the Maximum Contaminant Level (MCL)/Regional Screening Level from 83 FR 36435 (RSL) and Upper Tolerance Limit (UTL) as established in TRC's Technical Memorandum dated October 15, 2018.
** - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 21, 2020.
^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using hardness of 258 mg CaCO3/L (average of SW-01 [Lake Huron] and SW-02 [Saginaw River] collected in April 2018) per footnote {G} of Michigan Part 201 criteria tables. Chromium GSI criterion based on hexavalent chromium per footnote {H}. GSI criterion is protective for surface water used as a drinking water source as described in footnote {X}. GSI criterion for chloride is 50 mg/L when the discharge is to the Great Lakes or connecting waters per footnote {FF}.
*** - Aquatic Maximum (AMV) and Final Acute Values (FAV) are taken from EGLE Rule 323.1057 Part 4 - Water Quality Standards (Rule 57), March 15, 2018. Hardness-dependent criteria calculated using site-specific hardness of 258 mg CaCO3/L (average of SW-01 [Lake Huron] and SW-02 [Saginaw River] collected in April 2018). Chromium AMV & FAV criteria are based on hexavalent chromium.
^^ - Mixing Zone (MZ) GSI Criteria from Michigan Department of Environmental Quality (MDEQ) approval letter dated December 23, 2015.
[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 font denotes concentrations detected above laboratory reporting limits.
Result Indicates an exceedance of one or more applicable health-based drinking water and GSI criteria.
Result Indicates an exceedance of acute-based GSI criteria.
All metals were analyzed as total unless otherwise specified.
Transect samples were unable to be collected during the first quarter 2022 event due to site conditions.
[1] - Constituent triggered an Assessment of Corrective Measures for the Karn Bottom Ash Pond as described in TRC's letter report dated Janurary 14, 2019.
[2] - Compliance demonstrated on a mass flux basis.

Table 2
Summary of Groundwater Sampling Results (Analytical)
DE Karn Nature and Extent GSI Monitoring Locations
Essexville, Michigan

										T4-3GSI				T5-3GSI				T6-3GSI			
									Sample Location:												
									Sample Date:	7/25/2022	10/3/2022	3/6/2023	5/3/2023	7/25/2022	10/3/2022	3/6/2023	5/3/2023	7/25/2022	10/3/2022	3/6/2023	5/3/2023
Constituent	Unit	GWPS*	MI Residential**	MI Non-Residential**	MI GSI^	MI AMV***	MI FAV***	Chronic MZ^^	Acute MZ^^												
Appendix III																					
Boron	ug/L	NA	500	500	4,000	34,000	69,000	44,000	69,000	**878**	**448**	--	**355**	**1,600**	**1,150**	--	**223**	**321**	**139**	--	**35**
Calcium	mg/L	NA	NC	NC	500[EE]	NC	NC	NC	NC	**104**	**73.5**	--	**56.1**	**101**	**62.8**	--	**172**	**73.5**	**51.1**	--	**69.4**
Chloride	mg/L	NA	250[E]	250[E]	50	320,000	640,000	NC	NC	**47.5**	**48.3**	--	**37.8**	**18.4**	**48.3**	--	**45.7**	**31.5**	**54.4**	--	**34.9**
Sulfate	mg/L	NA	250[E]	250[E]	500[EE]	600,000	1,200,000	NC	NC	< 1	< 1	--	**17**	**172**	**6.95**	--	**438**	**28.9**	**13.9**	--	**87.3**
pH, Field	su	NA	6.5 - 8.5[E]	6.5 - 8.5[E]	6.5 - 9.0	NC	NC	NC	NC	**7.1**	**7.2**	--	**7.8**	**7.2**	**7.4**	--	**7.6**	**7.4**	**7.6**	--	**8.2**
Appendix IV																					
Arsenic	ug/L	21[1]	10	10	10	340	680	100[2]	680	**84**	**6**	--	**17**	**525**	**187**	--	**349**	**2**	**1**	--	**1**
Chromium	ug/L	100	100	100	11	16	32	NC	NC	**2**	**1**	--	**1**	**2**	**1**	--	**1**	< 1	< 1	--	**1**
Lithium	ug/L	180	170	350	440	910	1,800	NC	NC	**22**	**35**	--	**25**	**62**	**43**	--	**30**	**32**	**18**	--	**11**
Molybdenum	ug/L	100	73	210	120	29,000	58,000	NC	NC	< 5	< 5	--	< 5	< 5	< 5	--	< 5	< 5	**6**	--	< 5
Selenium	ug/L	50	50	50	5.0	62	120	NC	NC	**2**	< 1	--	**2**	**1**	< 1	--	**2**	**1**	< 1	--	< 1
MI Part 115 Parameters																					
Iron	ug/L	NA	300[E]	300[E]	500,000[EE]	NC	NC	NC	NC	**14,300**	**770**	--	**151**	**149**	**86**	--	**224**	**220**	**84**	--	**84**
Vanadium	ug/L	NA	4.5	62	27	260	520	NC	NC	< 2	< 2	--	< 2	< 2	< 2	--	< 2	< 2	< 2	--	< 2

Notes:
ug/L - micrograms per liter; mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
* - GWPS (Groundwater Protection Standard) is the higher of the Maximum Contaminant Level (MCL)/Regional Screening Level from 83 FR 36435 (RSL) and Upper Tolerance Limit (UTL) as established in TRC's Technical Memorandum dated October 15, 2018.
** - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 21, 2020.
^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using hardness of 258 mg CaCO3/L (average of SW-01 [Lake Huron] and SW-02 [Saginaw River] collected in April 2018) per footnote {G} of Michigan Part 201 criteria tables. Chromium GSI criterion based on hexavalent chromium per footnote {H}. GSI criterion is protective for surface water used as a drinking water source as described in footnote {X}. GSI criterion for chloride is 50 mg/L when the discharge is to the Great Lakes or connecting waters per footnote {FF}.
*** - Aquatic Maximum (AMV) and Final Acute Values (FAV) are taken from EGLE Rule 323.1057 Part 4 - Water Quality Standards (Rule 57), March 15, 2018. Hardness-dependent criteria calculated using site-specific hardness of 258 mg CaCO3/L (average of SW-01 [Lake Huron] and SW-02 [Saginaw River] collected in April 2018). Chromium AMV & FAV criteria are based on hexavalent chromium.
^^ - Mixing Zone (MZ) GSI Criteria from Michigan Department of Environmental Quality (MDEQ) approval letter dated December 23, 2015.
[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 font denotes concentrations detected above laboratory reporting limits.
Result Indicates an exceedance of one or more applicable health-based drinking water and GSI criteria.
Result Indicates an exceedance of acute-based GSI criteria.
All metals were analyzed as total unless otherwise specified.
Transect samples were unable to be collected during the first quarter 2022 event due to site conditions.
[1] - Constituent triggered an Assessment of Corrective Measures for the Karn Bottom Ash Pond as described in TRC's letter report dated Janurary 14, 2019.
[2] - Compliance demonstrated on a mass flux basis.

Figures

Constituent	GWPS (Note 3)
Antimony	6 ug/L
Arsenic	21 ug/L
Barium	2,000 ug/L
Beryllium	4 ug/L
Cadmium	5 ug/L
Chromium	100 ug/L
Cobalt	15 ug/L
Fluoride	4,000 ug/L
Lead	15 ug/L
Lithium	180 ug/L
Mercury	2 ug/L
Molybdenum	100 ug/L
Radium-226/228	5 pCi/L
Selenium	50 ug/L
Thallium	2 ug/L

MW-03
MW-06
MW-06
Arsenic
MW-01
POREWATER SAMPLES COLLECTED UNDER MICHIGAN P115 PROGRAM TO DEMONSTRATE COMPLIANCE WITH THE GSI PATHWAY IN THIS AREA
Lake Huron
INTAKE CHANNEL
DEK-MW-15004
Arsenic *
DEK-MW-15004
KARN BOTTOM ASH POND
MW-22
Arsenic
MW-08
MW-08
Arsenic
MW-22
DEK-MW-15003
Arsenic *
OW-11
OW-11
Arsenic
DEK-MW-15003
MW-10
MW-10
Arsenic
DEK-MW-15005
Arsenic *
DEK-MW-15005
KARN LINED IMPOUNDMENT
OW-12
DEK-MW-15001
MW-12
MW-12
Arsenic
OW-12
Arsenic
DEK-MW-15006
Arsenic
DEK-MW-15006
DEK-MW-18001
OW-10
DEK-MW-18001
Arsenic *
DEK-MW-15002
MW-23
MW-23
Arsenic
MW-14
MW-14
Arsenic
MW-16
DE KARN GENERATING FACILITY
KARN LANDFILL
Saginaw River
DISCHARGE CHANNEL
WEADOCK LANDFILL
FORMER JC WEADOCK GENERATING FACILITY
SLURRY WALL

LEGEND

- DEK BOTTOM ASH POND MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- NATURE AND EXTENT WELL
- NO EXCEEDANCES
- TWO OR MORE EXCEEDANCES (NOTES 4 + 5)
- STATISTICALLY SIGNIFICANT GWPS EXCEEDANCE (NOTE 6)
- SLURRY WALL (APPROXIMATE)
- LINED IMPOUNDMENT (COVENANT BOUNDARY)
- POREWATER SAMPLING AREA
- * GWPS EXCEEDANCE TRIGGERED ASSESSMENT OF CORRECTIVE MEASURES PURSUANT TO §257.96

WELL ID
CONSTITUENT(S) EXCEEDING GWPS

NOTES

1. BASE MAP IMAGERY FROM NEARMAP, (10/3/2022).
2. MONITORING WELL AND SLURRY WALL LOCATIONS PROVIDED BY CEC; SG21733SHT2 REVB.DWG DATED 11/21/2018.
3. GWPS (GROUNDWATER PROTECTION STANDARD) IS THE HIGHER OF THE MAXIMUM CONTAMINANT LEVEL (MCL)/REGIONAL SCREENING LEVEL FROM 83 FR 36435 (RSL) AND UPPER TOLERANCE LIMIT (UTL) AS ESTABLISHED IN TRC'S TECHNICAL MEMORANDUM DATED OCTOBER 15, 2018.
4. GROUNDWATER DATA FROM JULY 2022 TO MAY 2023 ARE SCREENED AGAINST THE GWPS FOR EVALUATION PURPOSES ONLY. AN EXCEEDANCE IS DEFINED AS A SINGLE DETECTION ABOVE THE GWPS, HOWEVER, CONFIDENCE INTERVALS WILL BE USED TO DETERMINE COMPLIANCE PER THE CCR RULES.
5. AN EXCEEDANCE OF THE GWPS DOES NOT INDICATE UNACCEPTABLE RISK FROM GROUNDWATER EXPOSURE; THE DRINKING WATER PATHWAY IS NOT COMPLETE ON THE PROPERTY. GROUNDWATER CONDITIONS CONTINUE TO BE MONITORED TO INFORM THE DEK BOTTOM ASH POND REMEDY SELECTION.
6. LOWER CONFIDENCE LIMIT IS ABOVE GWPS BASED UPON MOST RECENT ASSESSMENT MONITORING STATISTICAL EVALUATION USING THE MOST RECENT EIGHT SAMPLING EVENTS.

N

0 600 1,200 Feet

1 " = 600 '
1:7,200

PROJECT:
CONSUMERS ENERGY COMPANY
DE KARN POWER PLANT
ESSEXVILLE, MICHIGAN

TITLE:
NATURE AND EXTENT SUMMARY
GWPS EXCEEDANCES

DRAWN BY:	E. YPSILANTIS	PROJ NO.:	464095.0001
CHECKED BY:	R. JORDAN		FIGURE 1
APPROVED BY:	D. LITZ		
DATE:	JULY 2023		

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

FILE NO.: 418426-ExceedancesNE_ACM_20211229.mxd

Plot Date: 7/20/2023, 10:45:32 AM by EYPSILANTIS -- LAYOUT: ANSI B (11"x17")
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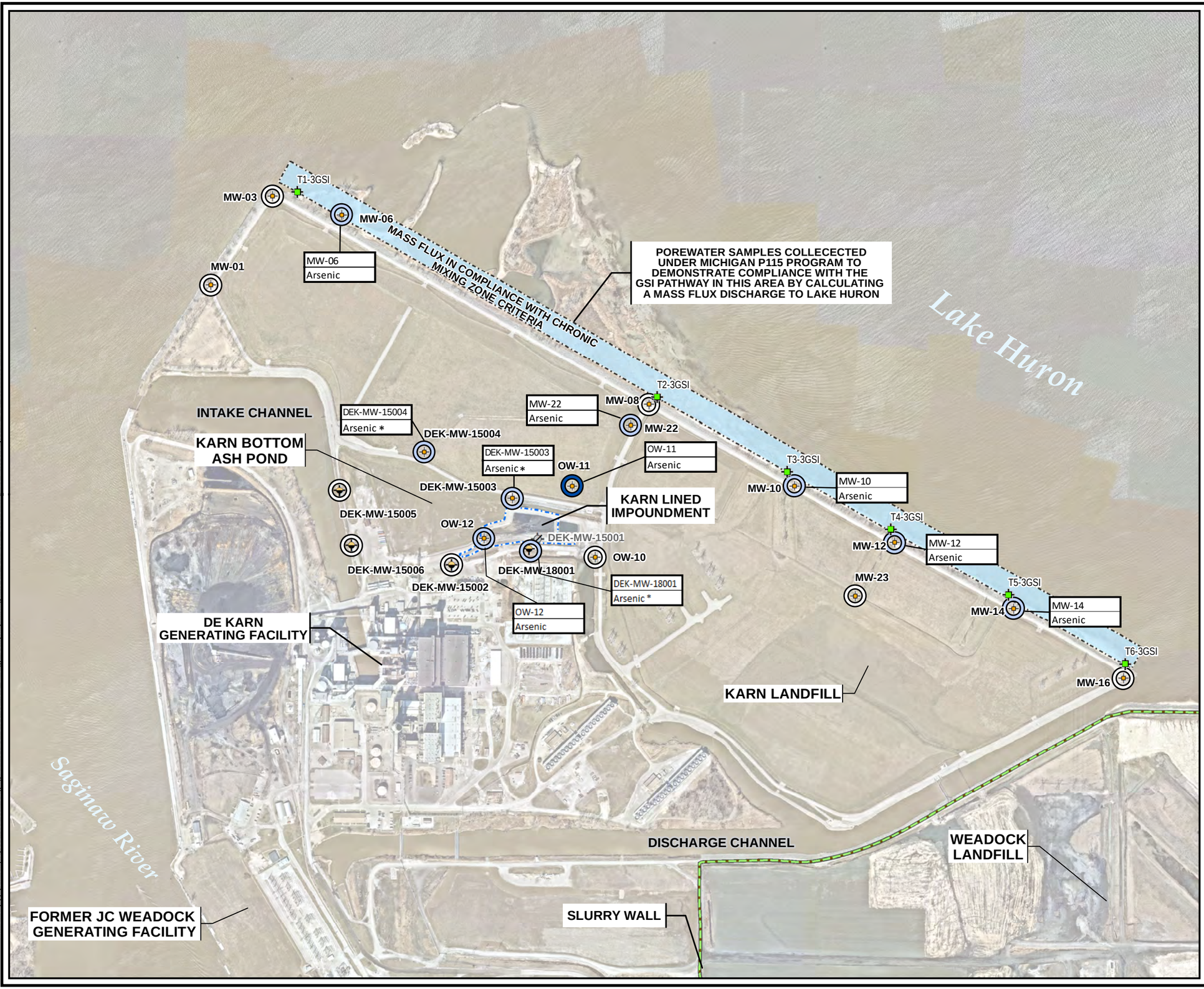
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
TRC - GIS



LEGEND

- DEK BOTTOM ASH POND MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- NATURE AND EXTENT WELL
- GSI TRANSECT LOCATION/POREWATER SAMPLE
- NO EXCEEDANCES
- TWO OR MORE DATA POINTS EXCEEDS CHRONIC MIXING ZONE GSI CRITERION (NOTES 3 + 4): (100 ug/L)
- TWO OR MORE DATA POINTS EXCEEDS ACUTE MIXING ZONE GSI CRITERION (FAV, 680 ug/L) (NOTES 3 + 4)
- SLURRY WALL (APPROXIMATE)
- LINED IMPOUNDMENT (COVENANT BOUNDARY)
- POREWATER SAMPLING AREA

WELL ID
CONSTITUENT(S) EXCEEDING GSI

* GROUNDWATER PROTECTION STANDARD (GWPS) EXCEEDANCE TRIGGERED ASSESSMENT OF CORRECTIVE MEASURES PURSUANT TO §257.96

NOTES

1. BASE MAP IMAGERY FROM NEARMAP, (10/3/2022).
2. MONITORING WELL AND SLURRY WALL LOCATIONS PROVIDED BY CEC; SG21733SHT2 REVB.DWG DATED 11/21/2018.
3. MIXING ZONE GROUNDWATER SURFACE WATER INTERFACE (GSI) CRITERIA FROM MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY (MDEQ) APPROVAL LETTER DATED DECEMBER 23, 2015.
4. GROUNDWATER CONCENTRATION DATA FROM JULY 2022 THROUGH MAY 2023 ARE SCREENED AGAINST THE MIXING ZONE CRITERIA. AN EXCEEDANCE IS DEFINED AS TWO DETECTIONS ABOVE CRITERIA. COMPLIANCE WITH THE CHRONIC MIXING ZONE CRITERIA CAN BE DEMONSTRATED ON A MASS FLUX BASIS.

0 600 1,200 Feet

1 " = 600 '

1:7,200

N

PROJECT:

CONSUMERS ENERGY COMPANY
DE KARN POWER PLANT
ESSEXVILLE, MICHIGAN

TITLE:

ARSENIC NATURE AND EXTENT SUMMARY GSI PATHWAY COMPLIANCE

DRAWN BY:	E. YPSILANTIS	PROJ NO.:	464095.0001
CHECKED BY:	R. JORDAN		
APPROVED BY:	D. LITZ		**FIGURE 2**
DATE:	JULY 2023		

TRC
1540 Eisenhower Place
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Phone: 734.971.7080
www.trccompanies.com

FILE NO.: 418425-ExceedancesNE_GSI_20211229.mxd

Plot Date: 7/20/2023, 13:32:22 PM by EYPSILANTIS -- LAYOUT: ANSI B(11"x17")
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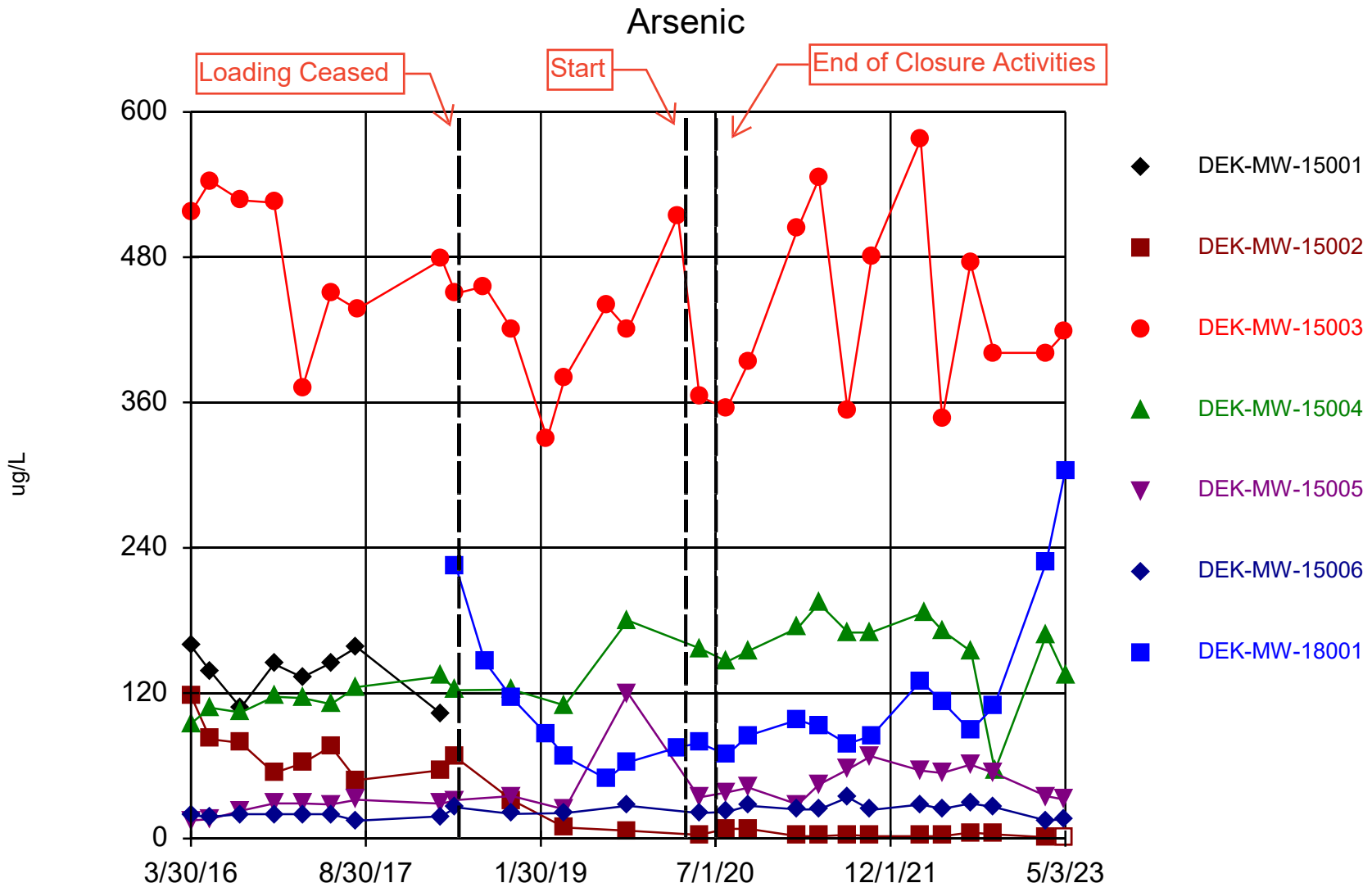
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0
TRC - GIS

Attachment A
Statistical Evaluation

Hollow symbols indicate censored values.



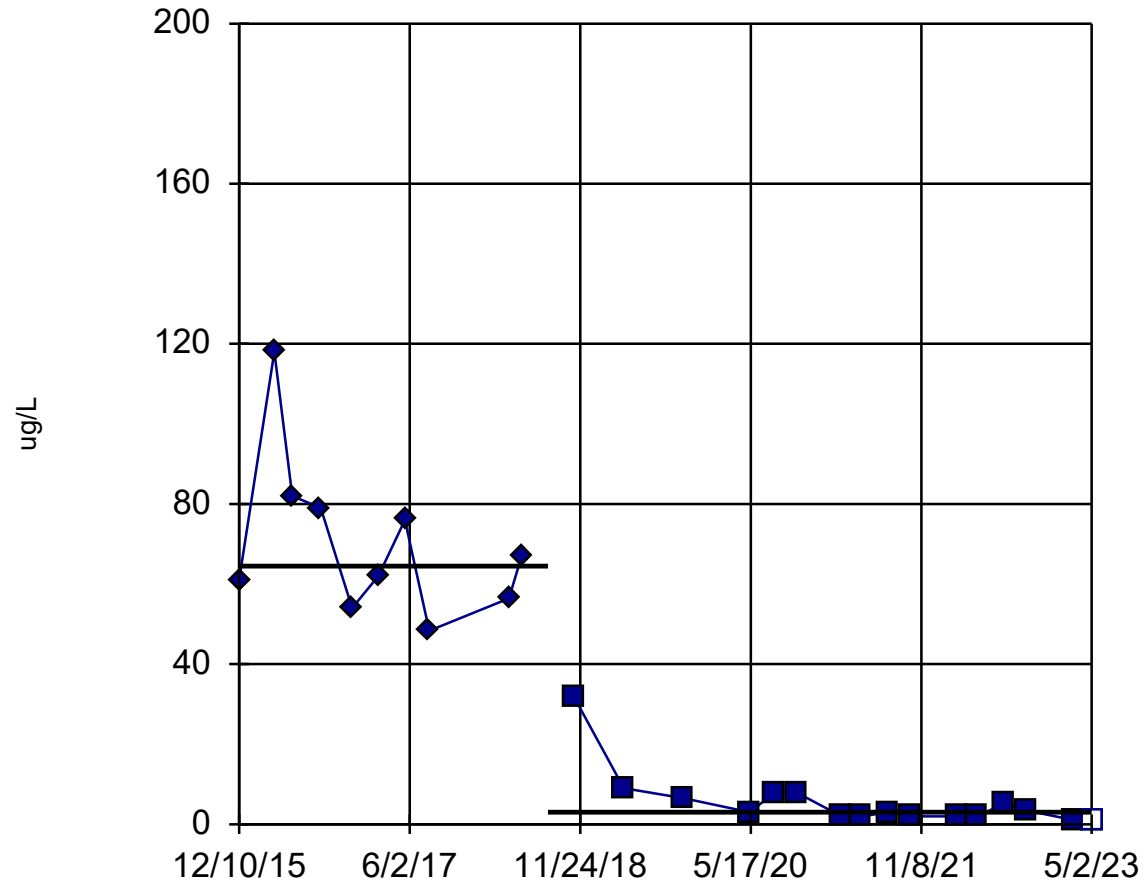
Time Series Analysis Run 6/12/2023 12:55 PM

Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_23Q2

Hollow symbols indicate censored values.

Arsenic, Total

DEK-MW-15002



◆ DEK-MW-15002 background

■ DEK-MW-15002 compliance

background median = 64.5

compliance median = 3

t = -9.787 (two-tail)

Alpha	Table	Sig.
0.2	0.876	Yes
0.1	1.363	Yes
0.05	1.796	Yes
0.02	2.328	Yes
0.01	2.718	Yes

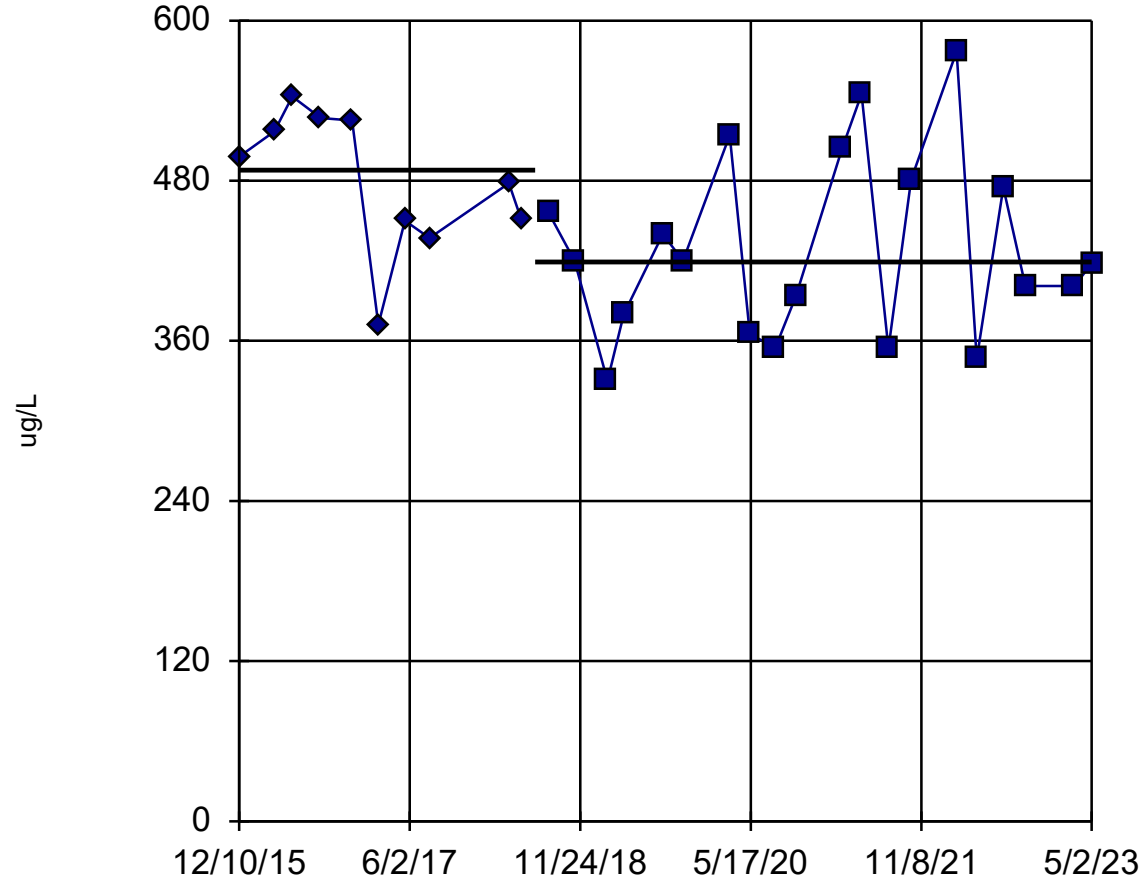
Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.8668, critical = 0.842.

Welch's t-test Analysis Run 6/12/2023 1:12 PM

Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_23Q2

Arsenic, Total

DEK-MW-15003



◆ DEK-MW-15003 background

■ DEK-MW-15003 compliance

background median = 488

compliance median = 419

t = -2.233 (two-tail)

Alpha	Table	Sig.
0.2	0.858	Yes
0.1	1.319	Yes
0.05	1.714	Yes
0.02	2.177	Yes
0.01	2.5	No

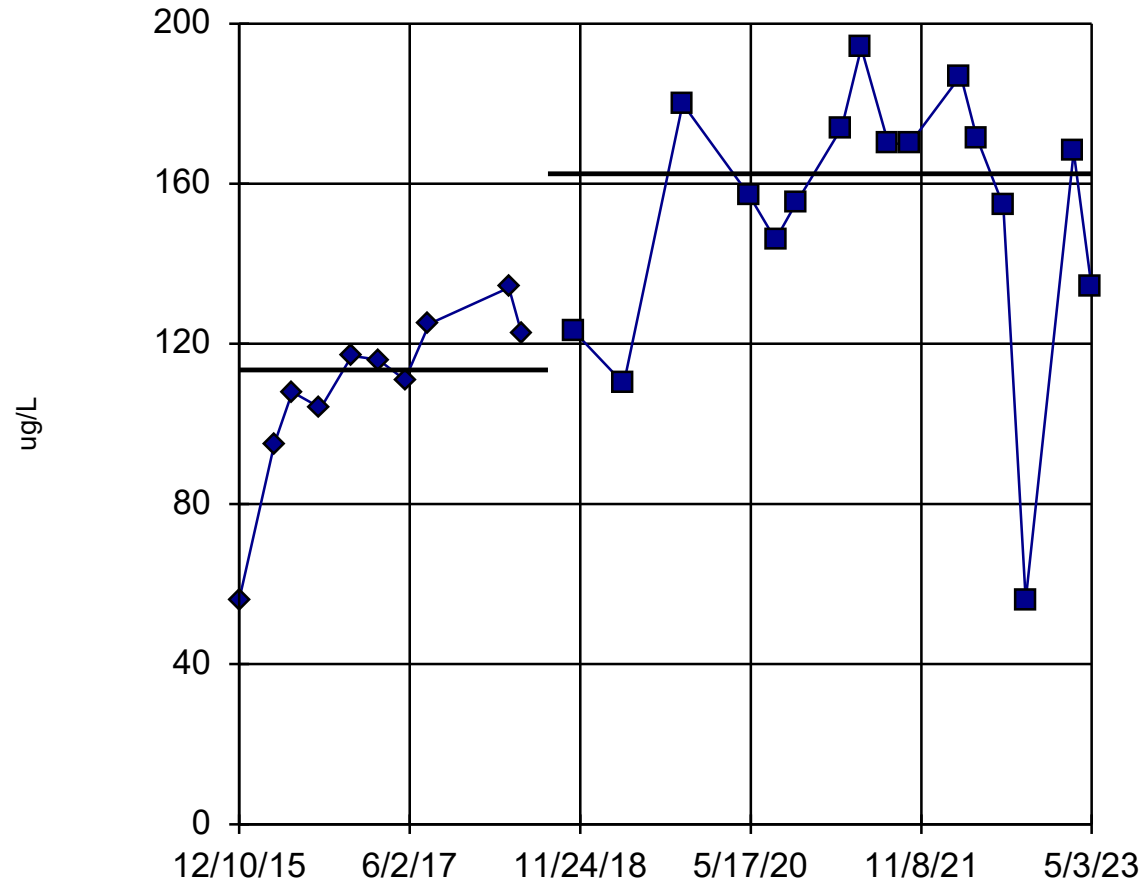
Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.9262, critical = 0.842.

Welch's t-test Analysis Run 6/12/2023 1:13 PM

Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_23Q2

Arsenic, Total

DEK-MW-15004



◆ DEK-MW-15004 background

■ DEK-MW-15004 compliance

background median = 113.5

compliance median = 162.5

t = 4.03 (two-tail)

Alpha	Table	Sig.
0.2	0.857	Yes
0.1	1.318	Yes
0.05	1.711	Yes
0.02	2.172	Yes
0.01	2.492	Yes

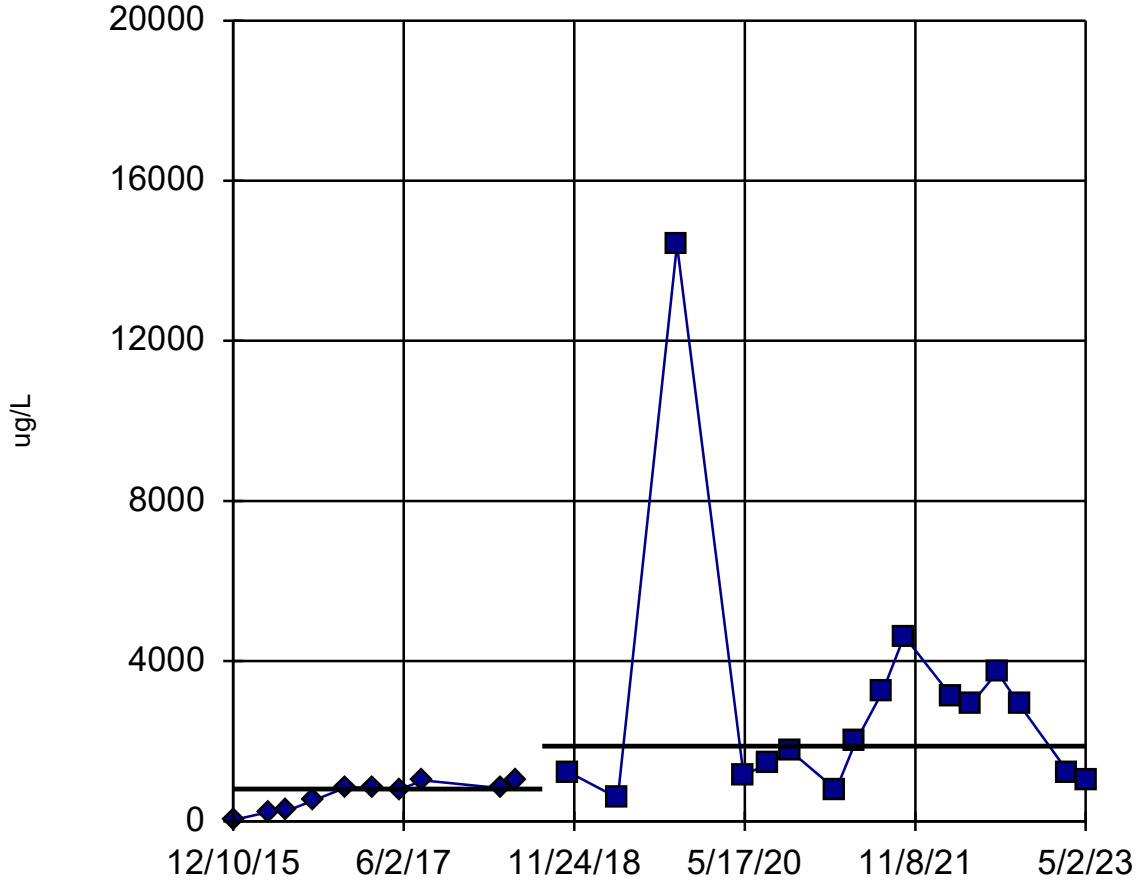
Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.852, critical = 0.842.

Welch's t-test Analysis Run 6/12/2023 1:13 PM

Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_23Q2

Arsenic, Total

DEK-MW-15005



◆ DEK-MW-15005 background

■ DEK-MW-15005 compliance

background median = 803.8

compliance median = 1872

t = 2.709 (two-tail)

Alpha	Table	Sig.
0.2	0.865	Yes
0.1	1.337	Yes
0.05	1.746	Yes
0.02	2.235	Yes
0.01	2.583	Yes

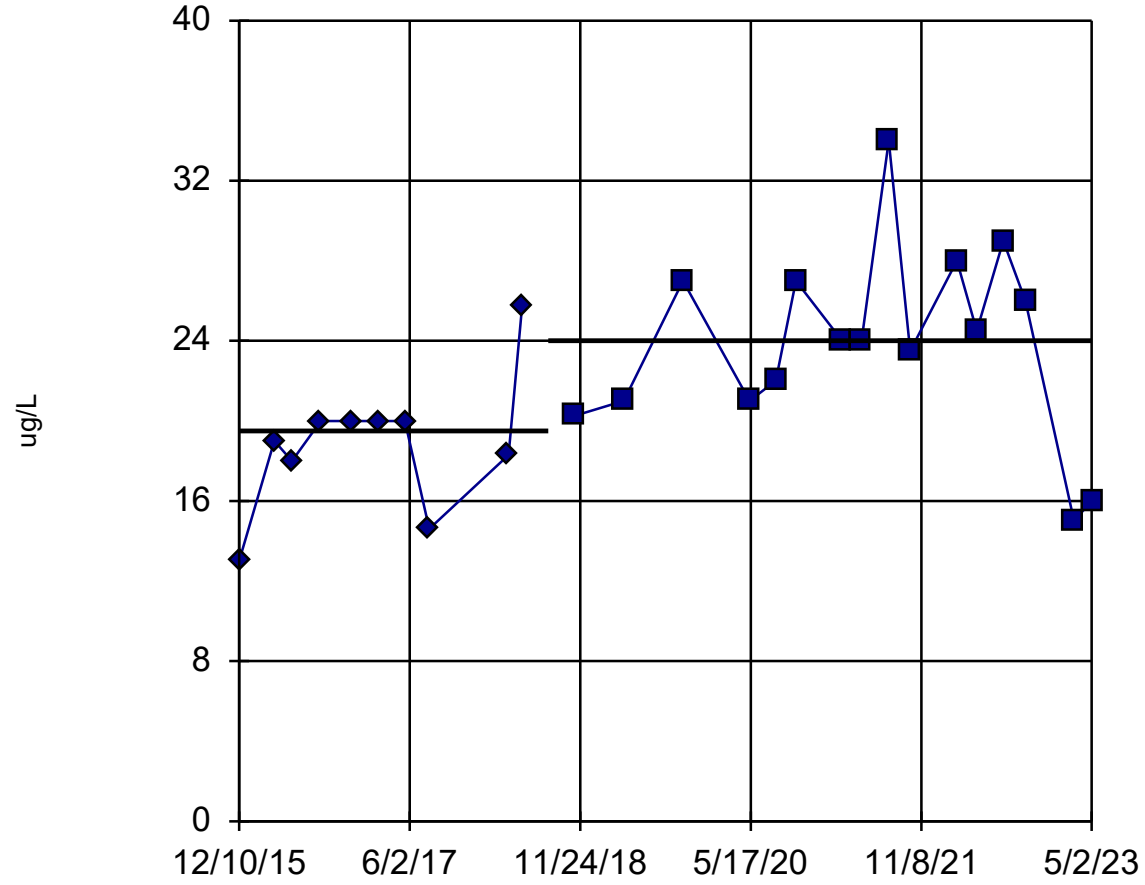
Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.8767 after square transformation, critical = 0.842.

Welch's t-test Analysis Run 6/12/2023 1:14 PM

Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_23Q2

Arsenic, Total

DEK-MW-15006



◆ DEK-MW-15006 background

■ DEK-MW-15006 compliance

background median = 19.5

compliance median = 24

t = 3.115 (two-tail)

Alpha	Table	Sig.
0.2	0.858	Yes
0.1	1.319	Yes
0.05	1.714	Yes
0.02	2.177	Yes
0.01	2.5	Yes

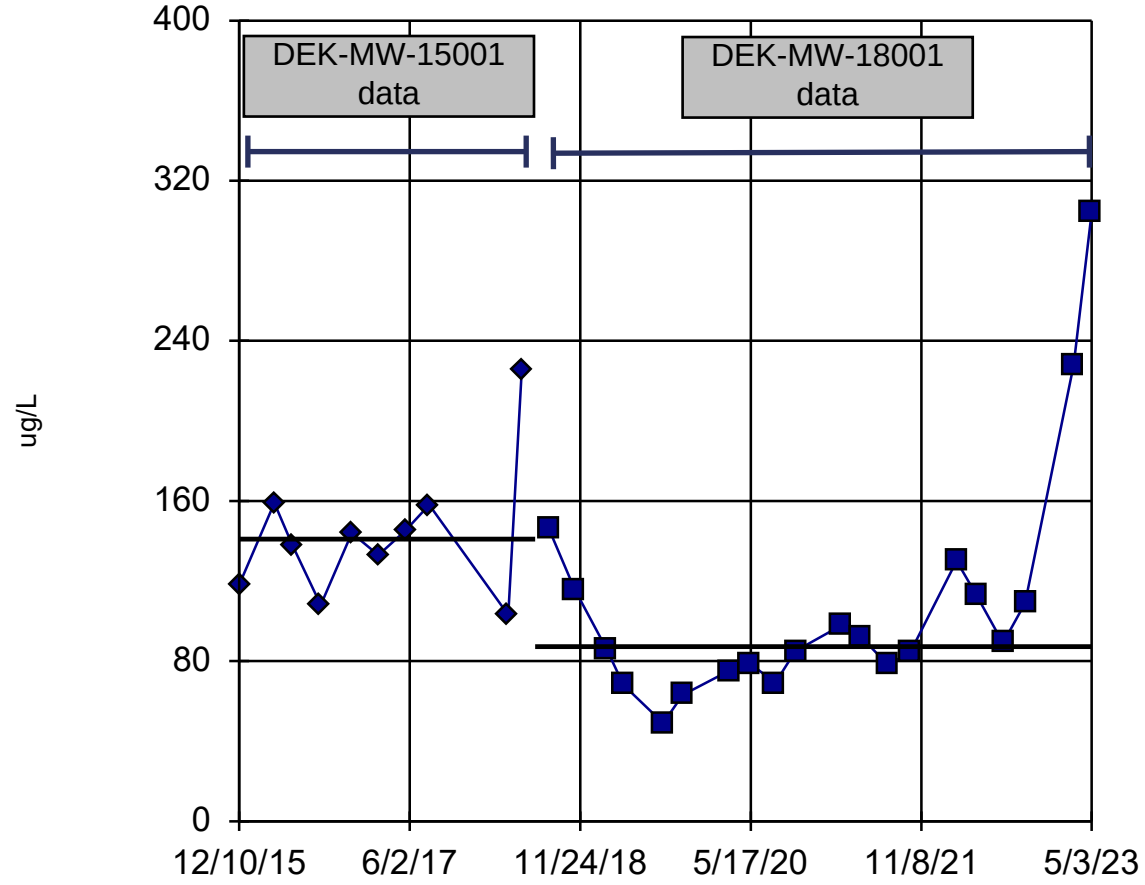
Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.8992, critical = 0.842.

Welch's t-test Analysis Run 6/12/2023 1:15 PM

Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_23Q2

Arsenic, Total

DEK-MW-18001



◆ DEK-MW-18001 background

■ DEK-MW-18001 compliance

background median = 141

compliance median = 87.25

t = -2.021 (two-tail)

Alpha	Table	Sig.
0.2	0.855	Yes
0.1	1.314	Yes
0.05	1.703	Yes
0.02	2.158	No
0.01	2.473	No

Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.8737, critical = 0.842.

Welch's t-test Analysis Run 6/12/2023 1:31 PM

Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_23Q2

Welch's t-test

Constituent: Arsenic, Total (ug/L) Analysis Run 6/12/2023 1:50 PM

Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_23Q2

	DEK-MW-15002	DEK-MW-15002
12/10/2015	61	
3/30/2016	118	
5/26/2016	82	
8/24/2016	79	
12/1/2016	54	
2/23/2017	62	
5/18/2017	76	
8/3/2017	48.3	
4/12/2018	56.4	
5/23/2018	67	
11/5/2018		31.7
4/11/2019		9
10/15/2019		6.5
5/13/2020		3
8/3/2020		8
10/6/2020		8 (D)
3/1/2021		2
5/3/2021		2
7/28/2021		3 (D)
10/4/2021		2
3/1/2022		2 (D)
5/3/2022		2
7/26/2022		5
10/4/2022		3.5 (D)
3/8/2023		1 (D)
5/2/2023		<1

Welch's t-test

Constituent: Arsenic, Total (ug/L) Analysis Run 6/12/2023 1:50 PM

Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_23Q2

	DEK-MW-15003	DEK-MW-15003
12/10/2015	498	
3/30/2016	517	
5/26/2016	543	
8/24/2016	527	
12/1/2016	525	
2/23/2017	372	
5/18/2017	450	
8/4/2017	437	
4/12/2018	478	
5/23/2018	450	
8/16/2018		456
11/6/2018		420
2/18/2019		330
4/11/2019		380
8/13/2019		440
10/15/2019		420
3/11/2020		514 (D)
5/14/2020		365
8/3/2020		355
10/6/2020		393
3/2/2021		504
5/3/2021		545
7/27/2021		354
10/7/2021		481
2/28/2022		577
5/3/2022		346.5 (D)
7/26/2022		475
10/4/2022		401
3/8/2023		401
5/2/2023		418

Welch's t-test

Constituent: Arsenic, Total (ug/L) Analysis Run 6/12/2023 1:48 PM

Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_23Q2

	DEK-MW-15004	DEK-MW-15004
12/10/2015	56	
3/30/2016	95	
5/26/2016	108	
8/24/2016	104	
12/1/2016	117	
2/23/2017	116	
5/18/2017	111	
8/3/2017	125 (D)	
4/12/2018	134	
5/23/2018	122.5 (D)	
11/6/2018		123
4/11/2019		110
10/15/2019		180
5/14/2020		157
8/4/2020		146
10/7/2020		155
3/2/2021		174
5/3/2021		194
7/28/2021		170
10/4/2021		170
3/14/2022		187
5/4/2022		171.5 (D)
7/27/2022		154.5 (D)
10/6/2022		56
3/7/2023		168
5/3/2023		134

Welch's t-test

Constituent: Arsenic, Total (ug/L) Analysis Run 6/12/2023 1:47 PM

Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_23Q2

	DEK-MW-15005	DEK-MW-15005
12/10/2015	5	
3/30/2016	15	
5/26/2016	16	
8/24/2016	23	
12/1/2016	29	
2/23/2017	29	
5/18/2017	28	
8/3/2017	31.9	
4/11/2018	28.7 (D)	
5/24/2018	31.7	
11/6/2018		35
4/11/2019		24 (D)
10/15/2019		120 (D)
5/13/2020		34 (D)
8/3/2020		38 (D)
10/7/2020		42
3/2/2021		28 (D)
5/3/2021		44.5 (D)
7/28/2021		57
10/4/2021		68
3/1/2022		56
5/3/2022		54
7/26/2022		61 (D)
10/4/2022		54
3/7/2023		35
5/2/2023		32 (D)

Welch's t-test

Constituent: Arsenic, Total (ug/L) Analysis Run 6/12/2023 1:46 PM

Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_23Q2

	DEK-MW-15006	DEK-MW-15006
12/10/2015	13	
3/30/2016	19	
5/25/2016	18	
8/24/2016	20	
12/1/2016	20	
2/23/2017	20	
5/18/2017	20	
8/3/2017	14.6	
4/11/2018	18.3	
5/24/2018	25.7	
11/5/2018		20.25 (D)
4/11/2019		21
10/15/2019		27
5/13/2020		21
8/4/2020		22
10/7/2020		27
3/2/2021		24
5/3/2021		24
7/28/2021		34
10/4/2021		23.5 (D)
3/1/2022		28
5/3/2022		24.5 (D)
7/26/2022		29
10/4/2022		26
3/7/2023		15
5/2/2023		16

Welch's t-test

Constituent: Arsenic, Total (ug/L) Analysis Run 6/12/2023 1:32 PM

Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_23Q2

	DEK-MW-18001	DEK-MW-18001
12/10/2015	118	
3/30/2016	159	
5/26/2016	138	
8/24/2016	108	
12/1/2016	144	
2/23/2017	133	
5/18/2017	145	
8/3/2017	158	
4/10/2018	103	
5/23/2018	225	
8/17/2018		146
11/6/2018		116
2/18/2019		85.5 (D)
4/10/2019		68
8/14/2019		49
10/15/2019		63
3/9/2020		75
5/14/2020		79
8/3/2020		69
10/6/2020		85
3/2/2021		98
5/3/2021		92
7/27/2021		78
10/7/2021		85
3/1/2022		130
5/3/2022		113
7/26/2022		89
10/4/2022		109
3/7/2023		228
5/3/2023		304