2020 Annual Groundwater Monitoring and Corrective Action Report

River Rouge Power Plant Bottom Ash Basin
Coal Combustion Residual Unit
1 Belanger Park Drive
River Rouge, Michigan

January 2021

Prepared For:

DTE Electric Company

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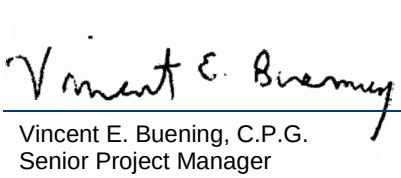

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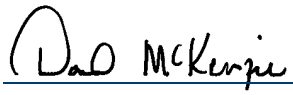

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Executive Summary

On April 17, 2015, the United States Environmental Protection Agency (USEPA) published the final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA) (the CCR Rule), as amended. The CCR Rule, which became effective on October 19, 2015 (with amendments in 2018 and 2020), applies to the DTE Electric Company (DTE Electric) River Rouge Power Plant (RRPP) Bottom Ash Basin (BAB) CCR unit. Pursuant to the CCR Rule, no later than January 31, 2018, and annually thereafter, the owner or operator of a CCR unit must prepare an annual groundwater monitoring and corrective action report for the CCR unit documenting the status of groundwater monitoring and corrective action for the preceding year in accordance with §257.90(e).

On behalf of DTE Electric, TRC Engineers Michigan, Inc., the engineering entity of TRC, has prepared this Annual Report for calendar year 2020 activities at the RRPP BAB CCR unit. Assessment monitoring is ongoing at the RRPP BAB CCR unit as specified in §257.95. Data that have been collected and evaluated in 2020 are presented in this report.

As documented in the January 31, 2018 *Annual Groundwater Monitoring Report for the River Rouge Power Plant,* covering calendar year 2017 activities, DTE Electric noted that boron, fluoride, and pH were observed within groundwater at downgradient monitoring well(s) with statistically significant increases (SSIs) above background limits. Therefore, DTE Electric initiated an assessment monitoring program for the RRPP BAB CCR unit pursuant to §257.95 of the CCR Rule that included sampling and analyzing groundwater within the groundwater monitoring system for all constituents listed in Appendix IV.

DTE Electric proactively constructed and has been operating a groundwater collection system since March 2, 2018 to mitigate any potential risk of migration of any water from the BAB. The installed collection system continues to control groundwater flow within the vicinity of the RRPP BAB CCR unit, and groundwater flow from the entire BAB perimeter is now directed inward toward the extraction wells. DTE Electric has continued to operate this groundwater collection system while proceeding with the prescribed steps per the CCR Rule to follow the assessment of corrective measures (ACM) process as described within this report.

As detailed in the *2018 Annual Groundwater Monitoring Report, DTE Electric Company, River Rouge Power Plant, Bottom Ash Basin Coal Combustion Residual Unit* dated January 2019 (2018 Annual Report), statistically significant groundwater concentrations were reported above the groundwater protection standards (GWPSs) for the Appendix IV constituents arsenic and lithium during the 2018 assessment monitoring events. DTE Electric proceeded with initiating an ACM per §257.96 by January 14, 2019, completed the ACM Report on April 15, 2019 and completed a Semi-Annual Progress Report on the remedy selection and design on October 15, 2019. The preferred alternative in the ACM was to close the RRPP BAB by CCR removal with offsite CCR disposal and to address the CCR-affected groundwater by continuing to operate the already in-place interim groundwater collection system. The system will be operated until the risk of migration of CCR constituents from the RRPP BAB CCR unit to receptors is effectively mitigated and groundwater data demonstrate that groundwater concentrations of Appendix IV constituents are below the relevant GWPSs.

In accordance with 40 CFR §257.101(a)(1), closure of the River Rouge BAB CCR unit was initiated 30-days after the last known receipt of waste. The RRPP ceased coal fired operations in May 2020 and the CCR closure by removal of the BAB was completed with mobilization in June 2020 and CCR removal occurring from July through September 2020 as documented in the *Bottom Ash Basin Closure Certification Report DTE Electric Company River Rouge Power Plant Bottom Ash Basin Coal Combustion Residual Unit, 1 Belanger Park Drive, River Rouge, Michigan* dated November 2020. After CCR removal was completed, the former BAB was repurposed into a non-CCR process water pond. Once engineering evaluations for the final groundwater remedy are completed, the final remedy for the RRPP BAB CCR unit source materials and affected groundwater will be formally selected per §257.97 at least 30-days after the public meeting required under §257.96(e) is held.

The statistical evaluation of the March 2020 and November 2020 Appendix IV groundwater data continue to show statistically significant groundwater concentrations above the GWPSs for arsenic and lithium at MW-16-01. There were no other results reported at statistically significant concentrations above the GWPSs for the remaining Appendix IV parameters for either 2020 semiannual assessment monitoring event.

DTE Electric continued to collect groundwater samples to define the nature and extent of the potential release of CCR per §257.95(g)(1) in 2020. Concentrations of the Appendix IV parameters were below the GWPSs in all nature and extent wells located around the perimeter of the RRPP BAB, delineating the extent of the potential CCR groundwater release to be within the capture zone of the groundwater extraction system that has been operational since March 2, 2018. Therefore, as groundwater conditions are monitored post-CCR removal, the potential CCR constituents within groundwater are located entirely within the capture zone of the groundwater extraction system; as long as the groundwater extraction system is in operation, there is no potential for affected groundwater to migrate off site. In addition, all of the land that overlies the potentially affected groundwater is owned by DTE Electric.

In 2021 for the RRPP BAB CCR unit per §257.96(b), DTE Electric will continue semiannual assessment monitoring as specified in §257.95, along with annual nature and extent monitoring per §257.95(g)(1).

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. The CCR Rule, which became effective on October 19, 2015 (with amendments in 2018 and 2020), applies to the DTE Electric Company (DTE Electric) River Rouge Power Plant (RRPP) Bottom Ash Basin (BAB). Pursuant to the CCR Rule, no later than January 31, 2018, and annually thereafter, the owner or operator of a CCR unit must prepare an annual groundwater monitoring and corrective action report for the CCR unit documenting the status of groundwater monitoring and corrective action for the preceding year in accordance with §257.90(e).

On behalf of DTE Electric, TRC Engineers Michigan, Inc., the engineering entity of TRC, has prepared this Annual Report for calendar year 2020 activities at the RRPP BAB CCR unit (2020 Annual Report). Assessment monitoring is ongoing at the RRPP BAB CCR unit as specified in §257.95. Data that have been collected and evaluated in 2020 are presented in this report.

1.1 Program Summary

As documented in the January 31, 2018 *Annual Groundwater Monitoring Report for the River Rouge Power Plant* (TRC, January 2018), covering calendar year 2017 activities, DTE Electric noted that boron, fluoride, and pH were observed within groundwater at downgradient monitoring well(s) with statistically significant increases (SSIs) above background limits. Therefore, DTE Electric initiated an assessment monitoring program for the RRPP BAB CCR unit pursuant to §257.95 of the CCR Rule that included sampling and analyzing groundwater within the groundwater monitoring system for all constituents listed in Appendix IV.

DTE Electric proactively constructed and has been operating a groundwater collection system since March 2, 2018 to mitigate any potential risk of migration of any water from the BAB. The installed collection system continues to control groundwater flow within the vicinity of the RRPP BAB CCR unit, and groundwater flow from the entire BAB perimeter is now directed inward toward the extraction wells. DTE Electric will continue to operate this groundwater collection system as the Company proceeds with the prescribed steps per the CCR Rule to follow the assessment of corrective measures process as described within this report.

As detailed in the *2018 Annual Groundwater Monitoring Report, DTE Electric Company, River Rouge Power Plant, Bottom Ash Basin Coal Combustion Residual Unit* dated January 2019 (2018 Annual Report), statistically significant groundwater concentrations were reported above the groundwater protection standards (GWPSs) for Appendix IV constituents arsenic and lithium during the 2018 assessment monitoring events. According to §257.95(g)(3), in the event that the facility determines, pursuant to §257.93(h), that a result is reported above GWPSs for one or more of the Appendix IV constituents, the facility will, within 90 days of performing the statistical analysis, initiate an Assessment of Corrective Measures (ACM) to prevent further releases, to remediate the release, and to restore the affected area.

DTE Electric proceeded with initiating an ACM per §257.96 by January 14, 2019, completed the ACM Report on April 15, 2019 and completed a Semi-Annual Progress Report on the remedy

selection and design on October 15, 2019 (TRC, April 2019 and October 2019, respectively). The preferred alternative in the ACM was to close the RRPP BAB by CCR removal with offsite CCR disposal and to address the CCR-affected groundwater by continuing to operate the already in-place interim groundwater collection system. If the groundwater extraction system is selected as part of the final remedy, the system will be operated until the risk of migration of CCR constituents from the RRPP BAB CCR unit to receptors is effectively mitigated and groundwater data demonstrate that groundwater concentrations of Appendix IV constituents are below the relevant GWPSs. DTE Electric completed Semi-Annual Progress Reports on the remedy selection and design on April 15, 2020 and October 15, 2020 (TRC April 2020 and October 2020, respectively). In addition, the RRPP BAB CCR unit Closure Plan was updated in July 2020 (TRC, July 2020).

In accordance with 40 CFR §257.101(a)(1), closure for the River Rouge BAB CCR unit was initiated 30-days after the last known receipt of waste. The RRPP ceased coal fired operations in May 2020 and the CCR closure by removal of the BAB was completed with mobilization in June 2020 and CCR removal in July through September 2020 as documented in the *Bottom Ash Basin Closure Certification Report DTE Electric Company River Rouge Power Plant Bottom Ash Basin Coal Combustion Residual Unit, 1 Belanger Park Drive, River Rouge, Michigan* (TRC, November 2020). After CCR removal was completed, the former BAB was repurposed into a non-CCR process water pond. Once engineering evaluations for the final groundwater remedy are completed, the final remedy for the RRPP BAB CCR unit and affected groundwater will be formally selected per §257.97 at least 30-days after the public meeting required under §257.96(e) is held.

This 2020 Annual Report presents the monitoring results and the statistical evaluation of the assessment monitoring parameters (Appendix IV to Part 257 of the CCR Rule) for the March and November 2020 assessment groundwater monitoring events for the RRPP BAB CCR unit. Assessment monitoring for these events was performed in accordance with the *CCR Groundwater Monitoring and Quality Assurance Project Plan – DTE Electric Company River Rouge Power Plant Bottom Ash Basin* (the QAPP) (TRC, July 2016; revised August 2017) and statistically evaluated per the *Groundwater Statistical Evaluation Plan – DTE Electric Company River Rouge Power Plant Coal Combustion Residual Bottom Ash Basin* (Stats Plan) (TRC, October 2017). During assessment monitoring, data are evaluated to identify Appendix IV constituents present at statistically significant levels exceeding a GWPS. In addition, nature and extent groundwater sampling data from existing monitoring wells around the BAB that was performed in November 2020 are presented in this report.

1.2 Site Overview

The RRPP BAB is located at 1 Belanger Park Drive, within the City of River Rouge in Wayne County, Michigan. The RRPP, including the BAB CCR unit, was originally constructed in the early 1950s, just northeast of the DTE Electric RRPP. The power plant property is located at the confluence of the Rouge River and the Detroit River.

The RRPP BAB was a sedimentation basin that was an incised CCR surface impoundment. The impoundment is sheet-piled around the perimeters to approximately 30 feet below ground

surface (ft bgs) into the native soil. The BAB was used for receiving sluiced bottom ash and other process flow effluent pumped from the power plant to the eastern end of the BAB. After CCR removal was completed in September 2020, the former BAB was repurposed into a non-CCR process water pond. There is a sheet pile weir near the middle of the BAB that maintains the water elevation in the eastern portion to approximately 577.5 feet through gravity flow. The water in the western portion of the BAB is maintained at an elevation of no higher than 577 feet before being recirculated back to the RRPP and/or is discharged into the Detroit River in accordance with a National Pollution Discharge Elimination System (NPDES) permit.

1.3 Geology/Hydrogeology

The RRPP BAB CCR unit is located immediately adjacent to the Rouge River to the northeast near the intersection of the Rouge River and Detroit River (Figure 1). The RRPP CCR unit is underlain initially by approximately 10 feet of surficial fill of various composition (gravel, sand, silt and clay, brick and/or concrete fragments). The fill is partially saturated in some areas, but is not continuously saturated across the RRPP, does not represent a significant, usable source of water, and is, therefore, not an aquifer. An organic layer is often encountered beneath the surficial fill that is then underlain by a silt/clay-rich unit that ranges from 3 to about 8 feet thick in the area of the BAB. Beneath the silt/clay-rich unit, there is a saturated sand and gravel unit that often coarsens from sand to gravel with depth. This coarse-grained sand and gravel unit is present from as shallow as 15 ft bgs to as deep as 25.5 ft bgs. This same coarse-grained unit is observed in most of the historical boring logs across the RRPP and appears to be a relatively continuous unit across the RRPP. Based on this information, this coarse-grained sand and gravel unit represents the uppermost aquifer present at the RRPP BAB CCR unit.

The coarse-grained sand and gravel uppermost aquifer is underlain by a more than 60-foot-thick contiguous silty clay-rich deposit that serves as a natural lower confining hydraulic barrier that isolates the uppermost aquifer from the underlying Dundee limestone that represents the next aquifer. There is no apparent hydraulic connection between the uppermost aquifer and the Dundee limestone aquifer, and the limestone aquifer is artesian.

Historically, a definitive groundwater flow direction to the northeast with an average gradient of 0.00067 foot/foot (using data from June 2016 through September 2017) within the uppermost aquifer was evident around the RRPP BAB CCR unit, with potential groundwater flow rates within the uppermost aquifer ranging from approximately 5.8 to 73 feet/year. Due to the installation and continuous operation of the eleven extraction wells within the groundwater extraction system since March 2, 2018, the current groundwater flow regime is significantly different from previous monitoring events. The series of eleven groundwater extraction wells surrounding the basin creates an inward gradient that extends to the edge of the Rouge River. The radius of influence extends beyond all CCR monitoring wells, with the exception of the upgradient monitoring well MW-17-07 that is a background well located more than 1,500 feet up hydraulic gradient of the RRPP BAB CCR unit. Additionally, there is an eastern groundwater flow component on the southeast edge of the site toward the Detroit River (from MW-17-07 to the Detroit River). The groundwater extraction system well layout is shown on Figure 2.

2.0 Groundwater Monitoring

2.1 Monitoring Well Network

A groundwater monitoring system has been established for the RRPP BAB CCR unit as detailed in the *Groundwater Monitoring System Summary Report – DTE Electric Company River Rouge Power Plant Bottom Ash Basin Coal Combustion Residual Unit* (GWMS Report) (TRC, October 2017). The monitoring well network for the BAB CCR unit currently consists of five monitoring wells that are screened in the uppermost aquifer. The monitoring well locations are shown on Figure 2. Monitoring wells MW-17-06 and MW-17-07 are located south-southwest of the RRPP BAB and provide data on background groundwater quality that has not been affected by the CCR unit (total of two background wells). Monitoring wells MW-16-01 through MW-16-03 are located north-northeast, historically downgradient of the RRPP BAB CCR unit (total of three downgradient monitoring wells).

As shown on Figure 2, monitoring well MW-16-04S is used for water level measurements only. MW-16-04S was originally installed as a potential background monitoring well. However, based on concentrations of several Appendix III parameters, the proximity of the well to the BAB and the hydrogeology of the area, monitoring well MW-16-04S did not appear to be representative of background groundwater conditions; therefore, this well was excluded from the background monitoring network. As such, in June 2017, two additional monitoring wells (MW-17-06 and MW-17-07) were installed in the uppermost aquifer further upgradient on the southwest side of the RRPP main building for use as background wells (Figure 2).

In addition, eleven groundwater recovery wells were installed as part of a groundwater extraction system (Figure 2) and additional monitoring wells were added to evaluate the groundwater extraction system groundwater capture (Figure 2) in 2018. Although the groundwater extraction system has changed groundwater flow significantly in the RRPP BAB CCR unit since beginning operation in early March 2018, the three compliance monitoring wells (MW-16-01 through MW-16-03) are appropriately positioned to evaluate groundwater quality in the vicinity of the RRPP BAB CCR unit. However, while the groundwater extraction system is operational, inward hydraulic gradients are maintained toward the extraction wells and the RRPP BAB CCR unit. Therefore, monitoring wells (MW-16-01 through MW-16-03) are not immediately downgradient of the RRPP BAB CCR unit. Rather, they are on the upgradient edge of the groundwater capture zone on the downgradient side of the RRPP BAB CCR unit, adjacent to the Rouge River (Figures 3 and 4).

2.2 Semiannual Assessment Groundwater Monitoring

Per §257.95(d), all wells in the CCR unit monitoring program must be sampled at least semiannually. One semiannual event must include analysis for all parameters from Appendix III and Appendix IV and one semiannual event may include analysis for all Appendix III indicator parameters and those Appendix IV parameters that were detected during prior sampling. In addition to the Appendix III and IV parameters, field parameters including pH, dissolved oxygen, oxidation reduction potential, specific conductivity, temperature, and turbidity were collected at each well. Samples were collected and analyzed in accordance with the QAPP.

2.2.1 Data Summary

The first semiannual groundwater assessment monitoring event for 2020 was performed on March 20 and 23, 2020 and the second semiannual groundwater assessment event was performed on November 11 to 13, 2020. Both events were performed by TRC personnel and samples were analyzed by Eurofins TestAmerica (Eurofins) in accordance with the QAPP. Static water elevation data were collected at all monitoring well locations in addition to surface water measuring points MP-01 through MP-04 established along the Rouge River and Detroit River (Figure 2). Groundwater samples were collected from the two background monitoring wells and three downgradient monitoring wells for the Appendix III and Appendix IV parameters and field parameters. A summary of the groundwater data collected during both the March 2020 event and November 2020 event is provided on Table 1 (static groundwater elevation data), Table 2 (field data), and Table 3 (analytical results).

2.2.2 Data Quality Review

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

2.2.3 Groundwater Flow Rate and Direction

Groundwater elevation data collected during the March and November 2020 sampling events show that groundwater within the uppermost aquifer in the vicinity of the RRPP BAB is being captured by the groundwater extraction well system. Similar to the groundwater sampling events reported in the 2019 annual report (TRC, January 2020), the series of eleven extraction wells surrounding the basin creates an inward gradient that extends to the edge of the river. The radius of influence extends beyond all CCR monitoring wells with the exception of MW-17-07 that is a background well located more than 1,500 feet up hydraulic gradient of the RRPP BAB CCR unit. Additionally, there is an eastern groundwater flow component on the southeast edge of the site toward the Detroit River (from MW-17-07 to the Detroit River). Groundwater elevations measured across the Site during the March and November 2020 sampling events are provided on Table 1 and were used to construct groundwater contour maps (Figures 3 and 4, respectively).

The current groundwater flow is similar to previous monitoring events. The average hydraulic gradients throughout the RRPP BAB CCR unit during the March and November 2020 events show a hydraulic gradient of approximately 0.006 ft/ft and 0.005 ft/ft, respectively. The gradients were calculated using the well pairs MW-17-06/MW-16-04S and MW-17-07/MW-17-06. Using the aforementioned low hydraulic conductivity of 9.5 feet/day and high hydraulic conductivity of 120 feet/day, and an assumed effective porosity of 0.4, the estimated groundwater flow velocity ranges from approximately 0.13 feet/day (approximately 49 feet/year) to approximately 1.7 feet/day (approximately 614 feet/year) for the March 2020 event and approximately 0.11 feet/day (approximately 39 feet/year) to approximately 1.4 feet/day (approximately 493 feet/year) for the November 2020 event.

3.0 Statistical Evaluation

Assessment monitoring is continuing at the RRPP BAB CCR unit while corrective measures are further evaluated in accordance with §257.96 and §257.97 as outlined in the ACM. The following section summarizes the statistical approach applied to assess the 2020 groundwater data in accordance with the assessment monitoring program. The statistical evaluation details are provided in Appendix B (Appendix IV Assessment Monitoring Statistical Evaluation – March 2020) and Appendix C (Appendix IV Assessment Monitoring Statistical Evaluation – November 2020).

3.1 Establishing Groundwater Protection Standards

The Appendix IV GWPSs are used to determine whether groundwater has been impacted from the RRPP BAB CCR unit by statistically comparing concentrations in the assessment monitoring wells to their respective GWPS for each Appendix IV parameter. In accordance with §257.95(h) and the Stats Plan, GWPSs were established for the Appendix IV parameters following the preliminary assessment monitoring event using nine rounds of data collected from the background monitoring wells MW-17-06 and MW-17-07 (July 2017 through April 2018). The calculation of the GWPSs is documented in the *Assessment Monitoring Data Summary and Statistical Evaluation* (Initial Assessment Monitoring Statistical Evaluation Memo) (TRC, October 2018a). The GWPS is established as the higher of the USEPA Maximum Contaminant Level (MCL) or statistically derived background level for constituents with MCLs and the higher of the USEPA Regional Screening Levels (RSLs) or background level for constituents with RSLs.

3.2 Data Comparison to Groundwater Protection Standards – First Semiannual Event (March 2020)

Consistent with the *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (Unified Guidance) (USEPA, 2009), the preferred method for comparisons to a fixed standard are confidence limits. An exceedance of the standard occurs when the 99 percent lower confidence level of the downgradient data exceeds the GWPS. Confidence intervals were established per the statistical methods detailed in the *Appendix IV Assessment Monitoring Statistical Evaluation for March 2020* technical memorandum provided in Appendix B.

For each detected constituent, the concentrations for each well were first compared directly to the GWPS. Parameter-well combinations that included a direct exceedance of the GWPS were retained for further statistical analysis using confidence limits as detailed in the Appendix B technical memorandum. The calculated upper and lower confidence limits and comparison of the lower confidence limits to the GWPSs are provided in Table 4 for the March 2020 event.

The statistical evaluation of the March 2020 Appendix IV parameters shows continued statistical exceedances of the GWPSs for:

- Arsenic at MW-16-01; and
- Lithium at MW-16-01.

No other constituents were observed at statistically significant levels exceeding the Appendix IV GWPSs during the March 2020 assessment monitoring event.

3.3 Data Comparison to Groundwater Protection Standards – Second Semiannual Event (November 2020)

Statistical analysis for the second semiannual monitoring event was performed using the same approach as the initial assessment monitoring statistical evaluation as discussed in the *Appendix IV Assessment Monitoring Statistical Evaluation for November 2020* technical memorandum provided in Appendix C. The calculated upper and lower confidence limits and comparison of the lower confidence limits to the GWPSs for the November 2020 event are provided in Table 5.

The statistical evaluation of the November 2020 Appendix IV parameters shows continued results above GWPSs for:

- Arsenic at MW-16-01; and
- Lithium at MW-16-01.

No other constituents were observed at statistically significant levels exceeding the Appendix IV GWPSs during the November 2020 assessment monitoring event.

4.0 Nature and Extent Groundwater Evaluation

4.1 Nature and Extent Groundwater Sampling

Per §257.95(g)(1), in the event that the facility determines, pursuant to §257.93(h), that there is a statistically significant 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. As such, nature and extent groundwater sampling was completed on November 11 to 13, 2020, by TRC personnel from existing CCR network monitoring wells and the nature and extent monitoring wells installed in 2018.

DTE collected groundwater elevation data at all site monitoring wells shown on Figure 4. In addition, DTE collected groundwater samples at monitoring wells MW-16-04S, MW-17-05, MW-17-14, MW-17-15, MW-17-18, and MW-17-20. Field parameters were stabilized at each monitoring well prior to collecting groundwater samples. Field parameters are summarized in Table 2. Groundwater samples were analyzed by Eurofins for the Appendix III constituents and detected Appendix IV parameters. A summary of the analytical groundwater data collected during the November 2020 nature and extent sampling event is provided on Table 6.

Concentrations of the previously detected Appendix IV parameters were below the GWPSs in all analyzed nature and extent samples collected for the RRPP BAB CCR unit. This delineates the extent of the potential CCR groundwater release to be within the capture zone of the groundwater extraction system (Figures 3 and 4) that has been operational since March 2, 2018. Therefore, as long as the groundwater extraction system is in operation, there is no potential for affected groundwater to migrate off site. In addition, all of the land that overlies the potentially affected groundwater is owned by DTE Electric.

5.0 Conclusions and Recommendations

In 2017, one or more Appendix III constituents were present in one or more downgradient well(s) with SSIs above background limits (TRC, January 2018). Therefore, in April 2018, DTE Electric initiated an assessment monitoring program for the RRPP BAB CCR unit pursuant to §257.95 of the CCR Rule that included sampling and analyzing groundwater within the groundwater monitoring system for all constituents listed in Appendix IV.

In addition, in 2018, an interim presumptive remedy groundwater collection system was installed and began operation on March 2, 2018 and continues to operate and maintain hydraulic control around the RRPP BAB to mitigate any risk of migration from the RRPP BAB to groundwater. This system effectively captures groundwater in the vicinity of the RRPP BAB CCR unit and eliminates the potential for Appendix III and Appendix IV parameters to migrate off-site from the RRPP BAB CCR unit as presented in Section 4 and shown on Figures 3 and 4.

In 2018, statistically significant groundwater concentrations were reported above the GWPSs for Appendix IV constituents (arsenic and lithium) during the 2018 assessment monitoring events, prompting DTE Electric to proceed with initiating and completing the ACM in 2019. The preferred alternative in the ACM was to close the RRPP BAB by CCR removal with offsite CCR disposal and to address the CCR-affected groundwater by continuing to operate the already in place interim groundwater collection system. However, with the completion of source removal activities in 2020, and ongoing performance monitoring, the final remedy is still being evaluated.

A Notice of Alternative Closure Per 40 CFR §257.103(b) was prepared on December 16, 2019 setting the time frame for shutdown of the RRPP coal-fired boiler(s) in May 2020, cessation of use of the RRPP BAB for CCR management by approximately July 2020, and the initiation of RRPP BAB CCR unit closure by August 31, 2020 In accordance with 40 CFR §257.101(a)(1), closure for the River Rouge BAB CCR unit was initiated 30-days after the last known receipt of waste. The RRPP ceased coal fired operations in May 2020 and the CCR closure by removal of the BAB was completed with mobilization in June 2020 and CCR removal occurring from July through September 2020 as documented in the *Bottom Ash Basin Closure Certification Report DTE Electric Company River Rouge Power Plant Bottom Ash Basin Coal Combustion Residual Unit, 1 Belanger Park Drive, River Rouge, Michigan* (TRC, November 2020). After CCR removal was completed, the former BAB was repurposed into a non-CCR process water pond.

In 2020, the semiannual assessment monitoring and annual nature and extent groundwater sampling continued, showing that there are no new constituents observed at statistically significant levels exceeding the Appendix IV GWPSs and the extent of the potential release of CCR continues to be well within the radius of influence of the existing groundwater extraction system during the 2020 reporting period.

Once engineering evaluations for the final groundwater remedy are completed, the final remedy for the RRPP BAB CCR unit source materials and affected groundwater will be formally selected per §257.97 at least 30-days after the public meeting required under §257.96(e) is held.

In 2021 for the RRPP BAB CCR unit per §257.96(b), DTE Electric will continue semiannual assessment monitoring as specified in §257.95, along with annual nature and extent monitoring per §257.95(g)(1).

6.0 Groundwater Monitoring Report Certification

The U.S. EPA's Disposal of Coal Combustion Residuals from Electric Utilities Final Rule Title 40 CFR Part 257 §257.90(e) requires that the owner or operator of an existing CCR unit prepare an annual groundwater monitoring and corrective action report.

Annual Groundwater Monitoring Report Certification
River Rouge Power Plant Bottom Ash Basin
River Rouge, Michigan

CERTIFICATION

I hereby certify that the annual groundwater and corrective action report presented within this document for the RRPP BAB CCR unit has been prepared to meet the requirements of Title 40 CFR §257.90(e) of the Federal CCR Rule. This document is accurate and has been prepared in accordance with good engineering practices, including the consideration of applicable industry standards, and with the requirements of Title 40 CFR §257.90(e).

Name: David B. McKenzie, P.E.	Expiration Date: October 31, 2021	
Company: TRC Engineers Michigan, Inc.	Date: January 29, 2021	

7.0 References

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Tables

Table 1
Summary of Nature and Extent Well Groundwater Elevation Data – March 2020 and November 2020
River Rouge Power Plant Bottom Ash Basins – RCRA CCR Monitoring Program
River Rouge, Michigan

Well ID	Date Installed	Reference Elevation	Geologic Unit of Screened Interval	Screened Interval Elevation	3/20/2020		11/11/2020	
					Depth to Water	Groundwater Elevation	Depth to Water	Groundwater Elevation
				ft	ft BTOC	ft	ft BTOC	ft
MP-01	6/23/2016	579.25[1]	NA	NA	2.37	576.88	2.35	576.90
MP-02	6/23/2016	579.15[1]	NA	NA	3.65	575.50	Not Measured	
MP-03	6/20/2017	578.42[1]	NA	NA	2.85	575.57	3.08	575.34[2]
MP-04	6/20/2017	579.17[1]	NA	NA	3.11	576.06	Not Measured	
MW-16-01	6/13/2016	583.02	Sand/Silty Clay/Gravel	562.0 to 557.0	13.73	569.29	13.70	569.32
MW-16-02	6/20/2017	582.79	Silty Sand/Sand/Clay/Gravel	561.4 to 556.4	10.21	572.58	9.13	573.66
MW-16-03	6/10/2016	582.75	Sand with Gravel	561.4 to 556.4	11.30	571.45	10.48	572.27
MW-16-04S	3/17/2016	582.41	Sand and Gravel	561.2 to 556.2	13.30	569.11	12.95	569.46
MW-17-01	6/7/2017	578.47	Sand/Silty Sand	558.0 to 563.0	2.25	576.22	3.08	575.39
MW-17-02	6/7/2017	581.24	Sand	553.8 to 558.8	5.65	575.59	6.40	574.84
MW-17-03	6/8/2017	580.20	Sand/Gravel with Sand/Clay	552.5 to 557.5	5.60	574.60	5.50	574.70
MW-17-04	6/8/2017	578.01	Sand	553.5 to 558.5	2.30	575.71	2.95	575.06
MW-17-05	6/9/2017	581.61	Sand/Silty Sand with Gravel	553.6 to 558.6	12.72	568.89	13.50	568.11
MW-17-06	6/7/2017	583.01	Silty Sand/Gravel with Sand	559.9 to 554.9	7.99	575.02	8.91	574.10
MW-17-07	6/14/2017	583.05	Silt with Sand/Clay	564.0 to 559.0	5.95	577.10	7.10	575.95
MW-17-08	6/12/2017	580.52	Clay/Sand/Gravel	553.0 to 558.0	5.32	575.20	5.70	574.82[2]
MW-17-09	6/13/2017	581.05	Clay/Sand/Gravel with Sand	553.6 to 558.6	4.80	576.25	5.85	575.20
MW-17-10	6/13/2017	581.41	Silty Sand/Clay/Sand	555.7 to 560.7	4.82	576.59	6.00	575.41
MW-17-12	12/12/2017	580.51	Silty Sand/Gravel with Sand	555.5 to 560.5	8.77	571.74	9.60	570.91
MW-17-13	12/6/2017	578.90	Silty Sand/Clay/Gravel with Sand	555.9 to 560.9	7.97	570.93	8.70	570.20
MW-17-14	12/7/2017	579.35	Clay/Gravel with Sand	554.9 to 559.9	9.31	570.04	10.20	569.15
MW-17-15	12/8/2017	579.75	Silty Sand/Clay/Gravel with Sand	556.0 to 561.0	9.16	570.59	4.80	574.95
MW-17-16	12/7/2017	579.73 / 579.80[3]	Sand with Silt/Clay with Silt/Gravel with Sand	558.2 to 567.2	7.67	572.06	8.10	571.70
MW-17-17	12/11/2017	579.35	Silty Sand/Sand with Gravel	557.8 to 562.8	7.31	572.04	5.90	573.45
MW-17-18	12/8/2017	579.00	Sand and Clay	557.7 to 562.7	8.72	570.28	9.40	569.60
MW-17-19	12/11/2017	577.99	Sand and Clay	551.4 to 556.4	4.50	573.49	5.13	572.86
MW-17-20	12/12/2017	579.40	Clay/Sand/Gravel with Sand	555.1 to 560.1	8.15	571.25	9.00	570.40

Notes:

Elevations are reported in feet relative to the North American Vertical Datum of 1988.

ft BTOC - feet below top of casing

NA - not applicable

(1) Elevation represents the point of reference used to collect surface water level measurements.

(2) Depth to water collected on November 12, 2020.

(3) MW-17-16 well casing was damaged during ash basin closure construction activities. Top of casing was repaired and resurveyed by Barton Malow Company in November 2020. Top of casing elevation is 579.80 ft in NAVD88 for the November 2020 event.

Table 2
Summary of Field Data – March 2020 & November 2020
River Rouge Power Plant Bottom Ash Basins – RCRA CCR Monitoring Program
River Rouge, Michigan

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (SU)	Specific Conductivity (umhos/cm)	Temperature (deg C)	Turbidity (NTU)
Background							
MW-17-06	3/23/2020	0.27	1.8	6.7	3,474	13.0	7.4
	11/11/2020	0.09	-64.0	6.7	3,437	16.0	6.9
MW-17-07	3/23/2020	0.10	11.1	6.7	8,407	11.8	28.1
	11/12/2020	0.07	-46.5	6.7	9,392	13.6	6.2
Downgradient							
MW-16-01	3/20/2020	0.16	-32.0	7.2	581	12.4	6.9
	11/11/2020	0.10	-100.2	7.3	613	14.4	3.0
MW-16-02	3/20/2020	0.15	-11.6	7.2	526	12.4	3.7
	11/11/2020	0.11	-85.9	7.3	494	13.1	2.7
MW-16-03	3/20/2020	0.17	-2.1	7.4	643	11.8	2.4
	11/11/2020	0.17	-43.5	7.1	598	12.6	2.7
MW-16-04S	11/12/2020	0.15	-63.4	7.0	2,531	12.6	3.0
MW-17-05	11/13/2020	0.11	-88.2	7.2	1,013	14.4	2.5
MW-17-06	11/11/2020	0.09	-64.0	6.7	3,437	16.0	6.9
MW-17-07	11/12/2020	0.07	-46.5	6.7	9,392	13.6	6.2
MW-17-08	11/12/2020	0.01	-82.2	7.2	913	12.9	4.4
MW-17-12	11/13/2020	0.01	-64.9	6.6	3,325	14.6	3.5
MW-17-13	11/12/2020	0.20	-50.4	6.9	1,092	13.1	2.6
MW-17-14	11/12/2020	1.02	-70.2	7.1	1,126	13.2	4.0
MW-17-15	11/12/2020	0.01	-56.0	6.8	2,133	14.4	19.0
MW-17-18	11/11/2020	0.09	-54.2	6.8	2,750	14.1	2.9
MW-17-19	11/13/2020	0.01	-92.0	7.1	2,984	13.1	3.2
MW-17-20	11/12/2020	0.12	-58.1	6.7	4,570	14.4	2.0

Notes:

mg/L - milligrams per liter.

mV - milliVolt.

SU - standard unit.

umhos/cm - micro-mhos per centimeter.

deg C - degrees celcius.

NTU - nephelometric turbidity units.

Table 3
Summary of Groundwater Sampling Results (Analytical): March 2020 & November 2020
River Rouge Power Plant Bottom Ash Basin – RCRA CCR Monitoring Program
River Rouge, Michigan

						Sample Location:	MW-17-06		MW-17-07		MW-16-01		MW-16-02		MW-16-03		
						Sample Date:	3/23/2020	11/11/2020	3/23/2020	11/12/2020	3/20/2020	11/11/2020	3/20/2020	11/11/2020	3/20/2020	11/11/2020	
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		Background				downgradient						
Appendix III																	
Boron	ug/L	NC	NA	NA	NA		390	370	590	600	1,200	1,100	360	360	< 100	150	
Calcium	ug/L	NC	NA	NA	NA		290,000	250,000	360,000	370,000	61,000	62,000	54,000	50,000	53,000	65,000	
Chloride	mg/L	**250***	NA	NA	NA		650	550	2,300	2,100	45	46	52	33	96	38	
Fluoride	mg/L	4	NA	NA	NA		0.41	0.47	0.43	0.45	2.0	1.7	0.60	0.6	0.22	0.2	
pH, Field	su	6.5 - 8.5*	NA	NA	NA		6.7	6.7	6.7	6.7	7.2	7.3	7.2	7.3	7.4	7.1	
Sulfate	mg/L	**250***	NA	NA	NA		470	400	1,300	1,200	11	12	4.5	1.6	17	4.2	
Total Dissolved Solids	mg/L	**500***	NA	NA	NA		1,900	1,800	4,800	5,900	360	330	310	300	380	340	
Appendix IV																	
Antimony	ug/L	6	NA	2.0	6		< 2.0	--	< 2.0	--	< 2.0	--	< 2.0	--	< 2.0	--	
Arsenic	ug/L	**10**	NA	**32**	**32**		13	11	20	17	**170**	**130**	< 5.0	< 5.0	< 5.0	< 5.0	
Barium	ug/L	2,000	NA	150	2,000		120	97	28	29	130	130	24	21	21	24	
Beryllium	ug/L	4	NA	1.0	4		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Cadmium	ug/L	5	NA	1.0	5		< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	
Chromium	ug/L	100	NA	2.0	100		< 2.0	--	< 2.0	--	< 2.0	--	< 2.0	--	< 2.0	--	
Cobalt	ug/L	NC	6	23	23		1.2	< 1.0	8.9	8.4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Fluoride	mg/L	4	NA	1.3	4		0.41	0.47	0.43	0.45	2.0	1.7	0.60	0.60	0.22	0.20	
Lead	ug/L	NC	15	1.0	15		< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	
Lithium	ug/L	NC	**40**	**34**	**40**		18	18	24	26	**52**	**46**	14	13	< 8.0	< 8.0	
Mercury	ug/L	2	NA	0.20	2		< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--	
Molybdenum	ug/L	NC	100	22	100		< 10	7.8	13	13	< 10	5.4	< 10	< 5.0	< 10	< 5.0	
Radium-226	pCi/L	NC	NA	NA	NA		0.950	1.13	0.371	0.326	0.251	0.365	< 0.239	0.388	< 0.196	< 0.224	
Radium-228	pCi/L	NC	NA	NA	NA		1.89	1.17	1.01	0.950	< 0.557	< 0.490	0.771	< 0.612	< 0.481	< 0.536	
Radium-226/228	pCi/L	5	NA	2.83	5		0.942	2.30	0.641	1.28	< 0.557	0.807	0.958	<0.612	< 0.481	<0.536	
Selenium	ug/L	50	NA	5.0	50		< 5.0	--	< 5.0	--	< 5.0	--	< 5.0	--	< 5.0	--	
Thallium	ug/L	2	NA	1.0	2		< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	

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.
* - 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.

Table 4
Summary of Groundwater Protection Standard Exceedances - March 2020
River Rouge Power Plant Bottom Ash Basin – RCRA CCR Monitoring Program
River Rouge, Michigan

Appendix IV	Units	GWPS	MW-16-01		MW-16-02	
			LCL	UCL	LCL	UCL
Arsenic	ug/L	32	140	170	--	--
Lithium	ug/L	40	47	61	10	41

Notes:

ug/L - micrograms per liter.

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

GWPS - Groundwater Protection Standard.

UCL - Upper Confidence Limit (99%) of the downgradient data set.

LCL - Lower Confidence Limit (99%) of the downgradient data set.

Indicates a statistically significant exceedance of the GWPS. An exceedance occurs when the LCL exceeds the GWPS.

Table 5
Summary of Groundwater Protection Standard Exceedances - November 2020
River Rouge Power Plant Bottom Ash Basin – RCRA CCR Monitoring Program
River Rouge, Michigan

Appendix IV	Units	GWPS	MW-16-01		MW-16-02	
			LCL	UCL	LCL	UCL
Arsenic	ug/L	32	140	180	--	--
Lithium	ug/L	40	46	60	11	37

Notes:

ug/L - micrograms per liter.

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

GWPS - Groundwater Protection Standard.

UCL - Upper Confidence Limit (99%) of the downgradient data set.

LCL - Lower Confidence Limit (99%) of the downgradient data set.

Indicates a statistically significant exceedance of the GWPS. An exceedance occurs when the LCL exceeds the GWPS.

Table 6
Summary of Nature and Extent Analytical Data: November 2020
River Rouge Power Plant Bottom Ash Basin – RCRA CCR Monitoring Program
River Rouge, Michigan

						Sample Location:	**MW-16-04S**	**MW-17-05**	**MW-17-14**	**MW-17-15**	**MW-17-18**	**MW-17-20**
						Sample Date:	11/12/2020	11/13/2020	11/12/2020	11/12/2020	11/11/2020	11/12/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		Nature and Extent					
Appendix III												
Boron	ug/L	NC	NA	NA	NA		510	280	350	630	410	500
Calcium	ug/L	NC	NA	NA	NA		150,000	90,000	100,000	170,000	230,000	370,000
Chloride	mg/L	250*	NA	NA	NA		450	87	180	450	480	1,000
Fluoride	mg/L	4	NA	NA	NA		0.64	0.55	0.72	0.85	0.44	0.38
pH, Field	su	6.5 - 8.5*	NA	NA	NA		7.0	7.2	7.1	6.8	6.8	6.7
Sulfate	mg/L	250*	NA	NA	NA		140	59	58	31	150	380
Total Dissolved Solids	mg/L	500*	NA	NA	NA		1,500	590	760	1,200	1,400	2,400
Appendix IV												
Antimony	ug/L	6	NA	2.0	6		--	--	--	--	--	--
Arsenic	ug/L	10	NA	32	32		< 5.0	< 5.0	< 5.0	18	< 5.0	< 5.0
Barium	ug/L	2,000	NA	150	2,000		110	63	190	370	150	120
Beryllium	ug/L	4	NA	1.0	4		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	1.0	5		--	--	--	--	--	--
Chromium	ug/L	100	NA	2.0	100		--	--	--	--	--	--
Cobalt	ug/L	NC	6	23	23		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.1
Fluoride	mg/L	4	NA	1.3	4		0.64	0.55	0.72	0.85	0.44	0.38
Lead	ug/L	NC	15	1.0	15		--	--	--	--	--	--
Lithium	ug/L	NC	40	34	40		21	14	12	34	20	34
Mercury	ug/L	2	NA	0.20	2		--	--	--	--	--	--
Molybdenum	ug/L	NC	100	22	100		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		0.929	0.713	0.384	1.02	1.08	1.54
Radium-228	pCi/L	NC	NA	NA	NA		0.748	< 0.340	< 0.650	< 1.14	0.558	0.948
Radium-226/228	pCi/L	5	NA	2.83	5		1.68	0.968	< 0.527	1.65	1.64	2.49
Selenium	ug/L	50	NA	5.0	50		--	--	--	--	--	--
Thallium	ug/L	2	NA	1.0	2		--	--	--	--	--	--

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

pCi/L - picocuries per liter.

NA - not applicable.

NC - no criteria.

-- - not analyzed.

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

RSL - Regional Screening Level from 83 FR 36435.

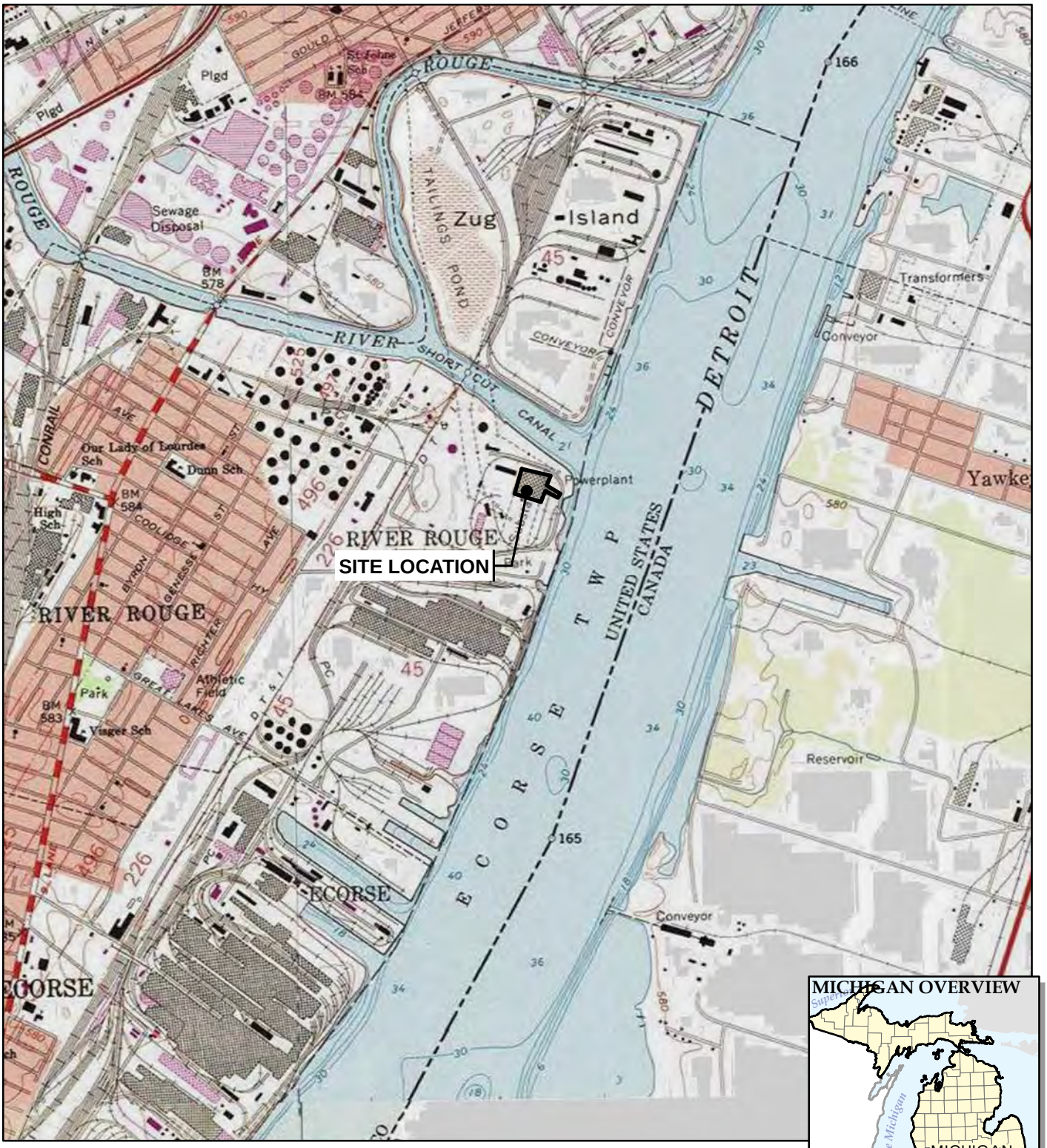
UTL - Upper Tolerance Limit (95%) of the background data set.

GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL.

* - 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.

Figures



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

N

1 " = 2,000 '
1:24,000

0 2,000 4,000
FEET

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

PROJECT:
DTE ELECTRIC COMPANY
RIVER ROUGE POWER PLANT
1 BELANGER PARK DRIVE
RIVER ROUGE, MICHIGAN

TITLE:
SITE LOCATION MAP

DRAWN BY:	S. MAJOR
CHECKED BY:	B. YELEN
APPROVED BY:	V. BUENING
DATE:	DECEMBER 2020
PROJ. NO.:	370029.0005
FILE:	370029-0005-001slm.mxd

FIGURE 1

E:\DTE\CCR_Sites\2017_265996\370029-0005-001slm.mxd -- Saved By: SMAJOR on 12/17/2020, 10:36:14 AM

LEGEND

- COMPLIANCE WELLS
- MONITORING POINT
- NATURE AND EXTENT WELLS
- EXTRACTION WELL

NOTES

1. BASE MAP IMAGERY FROM ESRI/MICROSOFT, "WORLD IMAGERY", WEB BASEMAP SERVICE LAYER.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN JUNE 2016 & JUNE 2017.

N

0 300 600 Feet

1 " = 300 '

1:3,600

PROJECT:

DTE ELECTRIC COMPANY
RIVER ROUGE POWER PLANT BOTTOM ASH BASIN
1 BELANGER PARK DRIVE
RIVER ROUGE, MICHIGAN

TITLE:

MONITORING NETWORK AND SITE PLAN

DRAWN BY:	S.MAJOR	PROJ NO.:	370029.0005.0000
CHECKED BY:	B. YELEN		
APPROVED BY:	V. BUENING		**FIGURE 2**
DATE:	JANUARY 2021		

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

FILE NO.: 370029-0005-002.mxd

Plot Date: 12/17/2020, 11:26:13 AM by SMAJOR -- LAYOUT: ANSI B (11"x17")
Path: E:\DTE\CCR_Sites\2017_265996\370029-0005-002.mxd

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

TRC - GIS

LEGEND

- COMPLIANCE WELLS
- MONITORING POINT
- NATURE AND EXTENT WELLS
- EXTRACTION WELL
- GROUNDWATER CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- INFERRED GROUNDWATER FLOW DIRECTION
- (575.86) ELEVATION FT (NAVD 88)

NOTES

1. BASE MAP IMAGERY FROM ESRI/MICROSOFT, "WORLD IMAGERY", WEB BASEMAP SERVICE LAYER.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN JUNE 2016 & JUNE 2017.
3. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO NORTH AMERICAN VERTICAL DATUM OF 1988.

N

0 300 600 Feet

1 " = 300 '

1:3,600

PROJECT:
DTE ELECTRIC COMPANY
RIVER ROUGE POWER PLANT BOTTOM ASH BASIN
1 BELANGER PARK DRIVE
RIVER ROUGE, MICHIGAN

TITLE:
GROUNDWATER POTENTIOMETRIC SURFACE MAP
MARCH 2020

DRAWN BY:	S. MAJOR	PROJ NO.:	370029.0005.0000
CHECKED BY:	B. YELEN		
APPROVED BY:	V. BUENING		**FIGURE 3**
DATE:	JANUARY 2021		

TRC
1540 Eisenhower Place
Ann Arbor, MI 48108-3284
Phone: 734.971.7080
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FILE NO.: 370029-0005-003.mxd

TRC - GIS
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0
Plot Date: 12/17/2020, 15:12:28 PM by SMAJOR – LAYOUT: ANSI B (11"x17")
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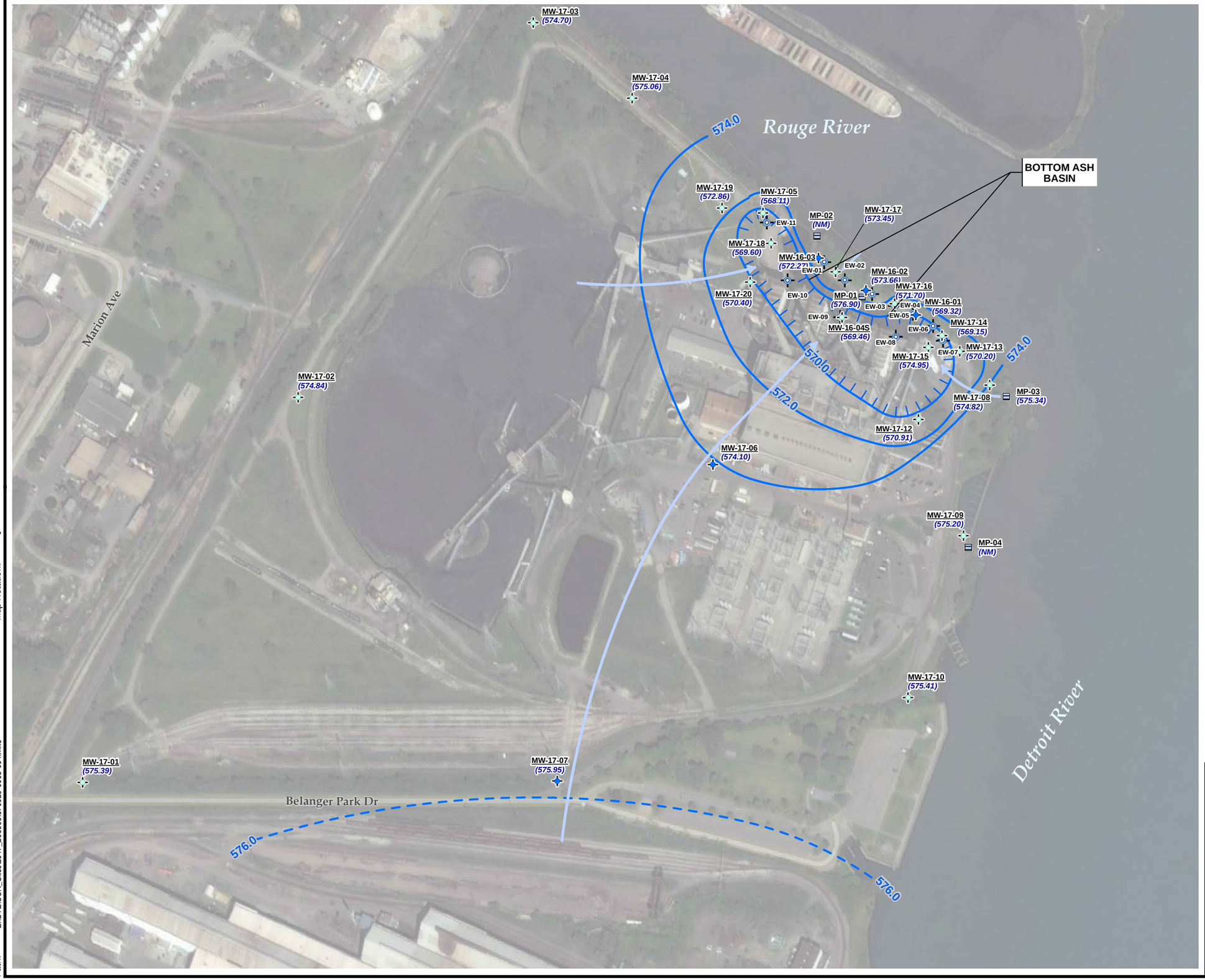

LEGEND

- COMPLIANCE WELLS
- MONITORING POINT
- NATURE AND EXTENT WELLS
- EXTRACTION WELL
- GROUNDWATER CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- INFERRED GROUNDWATER FLOW DIRECTION
- (575.86) ELEVATION FT (NAVD 88)

NOTES

1. BASE MAP IMAGERY FROM ESRI/MICROSOFT, "WORLD IMAGERY", WEB BASEMAP SERVICE LAYER.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN JUNE 2016 & JUNE 2017.
3. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO NORTH AMERICAN VERTICAL DATUM OF 1988.

0 300 600 Feet

1 " = 300 '

1:3,600

PROJECT:
DTE ELECTRIC COMPANY
RIVER ROUGE POWER PLANT BOTTOM ASH BASIN
1 BELANGER PARK DRIVE
RIVER ROUGE, MICHIGAN

TITLE:
GROUNDWATER POTENTIOMETRIC SURFACE MAP
NOVEMBER 2020

DRAWN BY:	S. MAJOR	PROJ NO.:	370029.0005.0000
CHECKED BY:	B. YELEN		
APPROVED BY:	V. BUENING		**FIGURE 4**
DATE:	JANUARY 2021		

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

FILE NO.: 370029-0005-004.mxd

Plot Date: 12/17/2020, 16:33:13 PM by SMAJOR -- LAYOUT: ANSI B(11"x17")
Path: E:\DTE\CCR_Sites\2017_265996\370029-0005-004.mxd
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0
TRC - GIS

Appendix A
Data Quality Reviews

Laboratory Data Quality Review
Groundwater Monitoring Event March 2020
DTE Electric Company River Rouge Power Plant (DTE RRPP)

Groundwater samples were collected by TRC for the March 2020 sampling event for the Bottom Ash Basin at the DTE RRPP. Samples were analyzed for anions, total dissolved solids, and total metals by Eurofins-Test America Laboratories, Inc. (Test America) located in North Canton, Ohio and radium by Eurofins-Test America located in St. Louis, Missouri. The laboratory analytical results are reported in laboratory reports 240-128109-1 and 240-128146-1.

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

- MW-16-01
- MW-16-02
- MW-16-03
- MW-17-06
- MW-17-07
- EW-01
- EW-03
- EW-04
- EW-05
- EW-06
- EW-07
- EW-08
- EW-09
- EW-10
- EW-11

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

Analyte Group	Method
Anions (Fluoride, Chloride, Sulfate)	SW846 9056A
Total Dissolved Solids (TDS)	SM 2540C
Total Metals	SW846 6010B/6020/7470A
Radium (Radium-226, Radium-228, Total Radium)	SW846 9315, SW846 9320

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

Data Quality Review Procedure

The analytical data were reviewed using the USEPA National Functional Guidelines for Inorganic Superfund Data Review (USEPA, 2017) and the Department of Energy Evaluation of Radiochemical Data Usability (USDOE, 1997). The following items were included in the evaluation of the data:

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

- Data for laboratory control samples (LCSs) and laboratory control sample duplicates (LCSDs). The LCS/LCSDs are used to assess the accuracy and precision 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;
- Percent recoveries for the carriers for radium-226 and radium-228 analyses for radiochemistry only. Carriers are used to assess the chemical yield for the preparation and/or instrument efficiency; and
- Overall usability of the data.

This data usability report addresses the following items:

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

Review Summary

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

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

QA/QC Sample Summary:

- The holding time for TDS for sample MW-17-06 exceeded the 7-day holding time criteria by approximately two hours. This result should be considered estimated and may be biased low as summarized in the attached table.
- A method blank was analyzed with each analytical batch. Target analytes were not detected in the method blank samples.
- LCS and/or LCSD recoveries and relative percent differences (RPDs), where applicable, were within laboratory acceptance limits.
- MS/MSD analyses were performed on sample MW-16-01 for anions; the percent recoveries (%Rs) and relative percent differences (RPDs) were acceptable.

- MS/MSD analyses were not performed for metals in this data set. Per the project QAPP, MS/MSD analyses are required for metals at a frequency of 1 per 20 samples.
- Laboratory duplicate analyses were not performed for TDS. Per the project QAPP, laboratory duplicate analyses are required for TDS at a frequency of 1 per 20 samples.
- The field duplicate pair samples were DUP-01/MW-16-03 and DUP-02/EW-07. The RPDs and/or duplicate error ratios (DERs) between the parent and duplicate samples were within acceptance limits.
- Carrier recoveries, where applicable, were within 40-110%.
- In laboratory report 240-128109-1, samples did not undergo the full 36-hour ingrowth period prior to radium-228 analysis; however, combined radium results were all < 5 pCi/L so there is no impact on data usability.

Attachment A2
Summary of Data Non-Conformances for Groundwater Analytical Data
DTE RRPP – RCRA CCR Monitoring Program
River Rouge, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
MW-17-06	3/23/2020	TDS	Holding time exceeded; positive result may be biased low.

Laboratory Data Quality Review
Groundwater Monitoring Event November 2020
DTE Electric Company River Rouge Power Plant (DTE RRPP)

Groundwater samples were collected by TRC for the November 2020 sampling event for the Bottom Ash Impoundment at the DTE RRPP. Samples were analyzed for anions, total dissolved solids, and total recoverable metals by Eurofins-Test America Laboratories, Inc. (Eurofins-TA) located in North Canton, Ohio. The laboratory analytical results are reported in laboratory reports 240-140288-1 and 240-140289-1.

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

- MW-16-01
- MW-16-02
- MW-16-03
- MW-17-06
- MW-17-07

During the November 2020 sampling event, a groundwater sample was also collected from each of the following nature and extent wells:

- MW-17-05
- MW-17-14
- MW-17-15
- MW-17-18
- MW-17-20

In addition, a groundwater sample was collected from non-compliance monitoring well MW-16-04S which was submitted for analysis along with the compliance well samples and is included for quality review purposes.

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

Analyte Group	Method
Anions (Fluoride, Chloride, Sulfate)	SW846 9056A
Total Dissolved Solids (TDS)	SM 2540C
Total Recoverable Metals	SW846 6010B, SW846 6020

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

Data Quality Review Procedure

The analytical data were reviewed using the USEPA National Functional Guidelines for Inorganic Superfund Data Review (USEPA, 2017). The following items were included in the evaluation of the data:

- Sample receipt, as noted in the cover page or case narrative;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;

- Data for method blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures;
- Data for laboratory control samples (LCSs) and laboratory control sample duplicates (LCSDs). The LCS/LCSDs are used to assess the accuracy and precision of the analytical method using a clean matrix;
- Percent recoveries for matrix spike (MS) and matrix spike duplicates (MSD). 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;
- Overall usability of the data.

This data usability report addresses the following items:

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

Review Summary

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

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

QA/QC Sample Summary:

- Target analytes were not detected in the method blanks.
- LCS recoveries for all target analytes were within laboratory control limits.
- MS/MSD analyses were performed on sample MW16-01_20201111 for total recoverable boron, sample MW-16-02_20201111 for total recoverable metals, and DUP-01_20201111 for anions. The percent recoveries (%Rs) and relative percent differences (RPDs) for the MS/MSD analyses met the method acceptance criteria.
- Laboratory duplicate analyses were performed on samples MW-16-01_20201111 for TDS; the RPD was within the QC limits.
- The field duplicate pair samples were DUP-01_20201111/ MW-16-03_20201111 and DUP-02_20201112/ MW-17-14_20201112. The RPDs between the parent and duplicate samples were within acceptance limits.

- TDS was analyzed less than one day past the holding time for all groundwater samples except sample MW-17-18_20201111. The positive results for TDS in these samples are potentially biased low, as summarized in the attached table, Appendix A4.
- The case narrative noted that for TDS, constant weight was not achieved after three drying cycles for samples MW-17-07_20201112 and MW-17-20_20201112; potential uncertainty exists in the positive results for TDS, as summarized in the attached table, Appendix A4.
- Molybdenum and boron were reported at RLs lower than required in the QAPP. Molybdenum was detected in samples MW-16-01_20201111 (5.4 ug/L) and MW-17-06_20201111 (7.8 ug/L) below the QAPP RL of 10 ug/L. Boron was detected in samples MW-16-03_20201111 (150 ug/L) and DUP-01_20201111 (150 ug/L) below the QAPP RL of 200 ug/L.

Appendix A4
Summary of Data Non-Conformances for River Rouge Power Plant CCR Groundwater Analytical Data
DTE Electric Company Monitoring Program
River Rouge, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
MW-16-01_20201111	11/11/2020	TDS	Sample analyzed past hold time; potential low bias
MW-16-02_20201111	11/11/2020		
MW-16-03_20201111	11/11/2020		
MW-17-06_20201111	11/11/2020		
MW-17-07_20201112	11/12/2020		
DUP-01_20201111	11/11/2020		
MW-16-04S_20201112	11/12/2020		
MW-17-05_20201113	11/13/2020		
MW-17-14_20201112	11/12/2020		
MW-17-15_20201112	11/12/2020		
MW-17-20_20201112	11/12/2020		
DUP-02_20201112	11/12/2020		
MW-17-07_20201112	11/12/2020	TDS	Constant weight not achieved after three drying cycles; potential uncertainty
MW-17-20_20201112	11/12/2020		

Appendix B
Appendix IV Assessment Monitoring Statistical Evaluation – March 2020

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Technical Memorandum

Date:	January 7, 2021
To:	DTE Electric Company
From:	Sarah Holmstrom, TRC Kristin Lowery, TRC
Project No.:	370029.0005.0000 Phase 001, Task 001
Subject:	Appendix IV Assessment Monitoring Statistical Evaluation for March 2020 Groundwater Monitoring Event – DTE Electric Company, River Rouge Power Plant, Bottom Ash Basin Coal Combustion Residual Unit

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. The CCR Rule, which became effective on October 19, 2015, applies to DTE Electric Company (DTE Electric) River Rouge Power Plant (RRPP) Coal Combustion Residual Bottom Ash Basin (BAB) CCR unit located in River Rouge, Michigan (the Site).

On October 15, 2018, it was determined that pursuant to §257.93 (h) that arsenic and lithium are present at statistically significant levels above their respective Groundwater Protection Standards (GWPSs) at one or more down gradient well locations at the RRPP BAB CCR unit[1]. Although DTE Electric has completed an assessment of corrective measures per §257.95(g)(3) and the formal final remedy has not yet been selected, DTE Electric is currently operating a groundwater extraction system as a presumptive remedy to maintain hydraulic control around the RRPP BAB to address the uncertainty around the potential migration of CCR constituents from the RRPP BAB to groundwater. This system has effectively captured groundwater in the vicinity of the RRPP BAB CCR unit since it began operation on March 2, 2018 and eliminates the potential for Appendix III and Appendix IV parameters to migrate from the RRPP BAB CCR unit.

[1] TRC. 2018. *Notification of Appendix IV Constituents at Statistically Significant Levels Above the Groundwater Protection Standards; River Rouge Power Plant Bottom Ash Basin Coal Combustion Residual Unit,* October.

In accordance with §257.96(b), DTE Electric is continuing assessment monitoring for the RRPP BAB CCR unit. The first semiannual assessment monitoring event of 2020 for the Appendix III and Appendix IV constituents was conducted on March 20, 2020. In accordance with §257.95, the assessment monitoring data must be compared to determine whether or not Appendix IV constituents are detected at statistically significant levels above the GWPSs. This memorandum presents the confidence limits derived for the Appendix IV parameters for the RRPP BAB CCR unit that will be used to compare to the established GWPSs.

Assessment Monitoring Statistical Evaluation

The three compliance wells utilized for the RRPP BAB CCR unit are MW-16-01, MW-16-02 and MW-16-03. Following the first semiannual assessment monitoring sampling event for 2020, compliance well data for the RRPP BAB were evaluated in accordance with the *Groundwater Statistical Evaluation Plan* (Stats Plan) (TRC, October 2017; Revised December 2017). For each detected constituent, the concentrations for each well were first compared directly to the GWPS within the dataset collected subsequent to the groundwater extraction system operation. Parameter-well combinations that included a direct exceedance of the GWPS were retained for further analysis. As a result, arsenic was retained for evaluation at MW-16-01 and lithium at MW-16-01 and MW-16-02.

Groundwater data were then evaluated utilizing ChemStat™ statistical software. ChemStat™ is a software tool that is commercially available for performing statistical evaluation consistent with procedures outlined in U.S. EPA's Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (Unified Guidance; UG). Within the ChemStat™ statistical program (and the UG), 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 parameters using a 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 ChemStat™ output files are included as an attachment.

Due to the initiation of operation of the groundwater extraction system to establish groundwater capture in the area of the BAB in March of 2018 and subsequent changes in groundwater flow rate and direction, the data set used for the March 2020 statistical evaluation was limited to the data collected subsequent to the operation of the groundwater extraction system (April 2018 to March 2020). Use of the post-system startup dataset includes four to six data points for each well/constituent pair for the March 2020 event and provides the minimum density of data (at least 4 data points) as recommended per the UG and is representative of current conditions at the BAB under the hydraulic influence of the groundwater extraction system. Additional data collected from monitoring events performed subsequent to March 2018 will continue to be incorporated into the statistical evaluation moving forward and will roll after eight rounds have accumulated, as appropriate.

The statistical data evaluation included the following steps:

- Review of data quality checklists for the assessment monitoring data sets for CCR Appendix IV constituents;
- Evaluation of percentage of non-detects for each downgradient well-constituent pair;

- Graphical representation of the assessment monitoring data as time versus concentration (T v. C) 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;
- 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 Quality

Data from the first semiannual monitoring event for 2020 sampling round were evaluated for completeness, overall quality and usability, method-specified sample holding times, precision and accuracy, and potential sample contamination. The review was completed using the following quality control (QC) information which at a minimum included chain-of-custody forms, investigative sample results including blind field duplicates, and, as provided by the laboratory, method blanks, laboratory control spikes, laboratory duplicates. The data were found to be complete and usable for the purposes of the CCR monitoring program.

Percentage of Non-detects

The percentage of non-detect observations for constituents with one or more detection above a GWPS is included in Table 1. Non-detect data was handled in accordance with the Stats Plan for the purposes of calculating confidence intervals.

Time versus Concentration Graphs

The T v. C graphs did not show any potential outliers. The T v. C graphs showed potential trending for some Appendix IV well/constituent pairs. These were tested by the ChemStat™ software to assess whether the trends are statistically significant.

Outlier Testing

No potential outliers were observed on the T v. C graphs; therefore, no outlier testing was performed.

Trend Analysis

Visual trends apparent in the T v. C graphs were evaluated in ChemStat™ using the Mann-Kendall Trend Analysis to determine if a subset of data should be used in calculating the confidence interval. Trends were evaluated using a 95-percent (one-tailed) confidence level, i.e., a significance level (α) of 0.05. A statistically significant decreasing trend was found in lithium at MW-16-02. This lithium decreasing trend will continue to be monitored and likely results from changes in groundwater quality due to operation of the groundwater extraction system.

Distribution of the Data Sets

ChemStat™ was utilized to evaluate each data set for normality. If the skewness coefficient was calculated to be between negative one and one, then the data were assumed to be approximately normally distributed. If the skewness coefficient was calculated as greater than one (or less than negative one) then the calculation was performed on the natural log (Ln) of the data. If the Ln of the data still determined that the data appeared to be skewed, then the Shapiro-Wilk test of normality (Shapiro-Wilk) was performed. The Shapiro-Wilk statistic was calculated on both non-transformed data, and the Ln-transformed data. If the Shapiro-Wilk statistic indicated that normal distributional assumptions were not valid, then the parameter was considered a candidate for non-parametric statistical evaluation. The data distributions are summarized in Table 1.

Confidence Intervals

Variability is recognized in the data set due to changing groundwater quality in response to the operation of the groundwater extraction system. Calculating a confidence interval around a trending data set incorporates not only variability present naturally in the underlying dataset but can exaggerate variability. The downward trend in lithium concentrations at MW-16-02 is likely causing the confidence interval to be much wider than expected given the confidence level (e.g., 99%) and sample size (n=6). However, lithium concentrations have already triggered assessment monitoring (e.g., not a newly identified GWPS exceedance) and remedial efforts are ongoing; therefore, traditional confidence interval calculations are presented in this statistical evaluation until more data are available. Once groundwater conditions stabilize under the current system operation with a more consistent trend, and additional post-treatment data are collected, confidence bands may be a more appropriate option to determine compliance with the CCR Rule. Confidence bands are selected 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.

Table 1 presents the calculated confidence intervals for each well-constituent pair. For normal and lognormal distributions, confidence intervals are calculated for 99 percent confidence using parametric methods. For non-normal datasets, a nonparametric confidence interval is utilized, resulting in the highest and lowest values from the contributing dataset as the confidence limits.

The confidence intervals calculated through the above-described process will be compared to the GWPS to determine if an exceedance has occurred. An exceedance of the standard occurs when the 99 percent lower confidence level of the downgradient data exceeds the GWPS.

Attachments

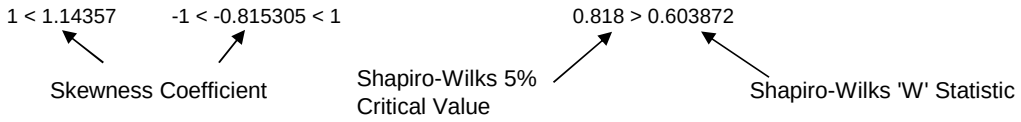
Table 1 – Summary of Descriptive Statistics and Confidence Interval Calculations
Attachment A – ChemStat™ Outputs

Table 1
Summary of Descriptive Statistics and Confidence Interval Calculations

Table 1
Summary of Descriptive Statistics and Confidence Interval Calculations
Assessment Monitoring Statistical Evaluation - March 2020
DTE Electric Company – River Rouge Power Plant

Parameter[1]	Percent Non-Detect	Outliers?	Trend?	Skewness		Shapiro-Wilks Test (5% Critical Value)		Parametric / Non-Parametric	Confidence Interval[2]
				Un-Transformed	Natural Log	Un-Transformed	Natural Log		
MW-16-01									
Arsenic	0%	No	No	-1.15979 < 1	-1.22587 < 1	0.788 > 0.772397	0.788 > 0.760921	Non-Parametric	[140, 170]
Lithium	0%	No	No	-1 < 0.660543 < 1	--	--	--	Parametric	[47, 61]
MW-16-02									
Lithium	0%	No	Yes	-1 < 0.905654 < 1	--	--	--	Parametric	[10, 41]

Notes:



(1) Well-parameter combinations that have one or more direct exceedances of the Groundwater Protection Standard within the most recent six sampling events.
(2) The most recent six data points are used to calculate the confidence interval to be representative of current conditions.

Attachment A
ChemStat™ Confidence Interval Outputs

Concentrations (ug/L)

Parameter: Arsenic

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 42
Total Non-Detect: 10
Percent Non-Detects: 23.8095%
Total Background Measurements: 0
There are 0 background locations

Loc.	Meas.	ND	Date	Conc.	Original

There are 3 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original
MW-16-01	14	0 (0%)	8/5/2016	37	37
			9/30/2016	37	37
			11/18/2016	39	39
			1/20/2017	40	40
			3/10/2017	38	38
			4/28/2017	37	37
			6/16/2017	35	35
			7/21/2017	36	36
			4/6/2018	160	160
			5/30/2018	170	170
			10/16/2018	160	160
			3/29/2019	170	170
			9/26/2019	140	140
			3/20/2020	170	170
MW-16-02	14	4 (28.5714%)	8/5/2016	24	24
			9/30/2016	27	27
			11/18/2016	30	30
			1/20/2017	31	31
			3/10/2017	29	29
			4/28/2017	30	30
			6/16/2017	30	30
			7/21/2017	27	27
			4/6/2018	15	15
			5/30/2018	ND<5 U	ND<5 U
			10/16/2018	7.9	7.9
			3/29/2019	ND<5 U	ND<5 U
			9/26/2019	ND<5 U	ND<5 U
			3/20/2020	ND<5 U	ND<5 U
MW-16-03	14	6 (42.8571%)	8/5/2016	91	91
			9/30/2016	40	40
			11/18/2016	21	21
			1/20/2017	13	13
			3/10/2017	12	12
			4/28/2017	12	12
			6/16/2017	12	12
			7/21/2017	12	12
			4/6/2018	ND<5 U	ND<5 U
			5/30/2018	ND<5 U	ND<5 U
			10/16/2018	ND<5 U	ND<5 U
			3/29/2019	ND<5 U	ND<5 U
			9/26/2019	ND<5 U	ND<5 U
			3/20/2020	ND<5 U	ND<5 U

There are 0 unused locations

Concentrations (ug/L)

Parameter: Lithium

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

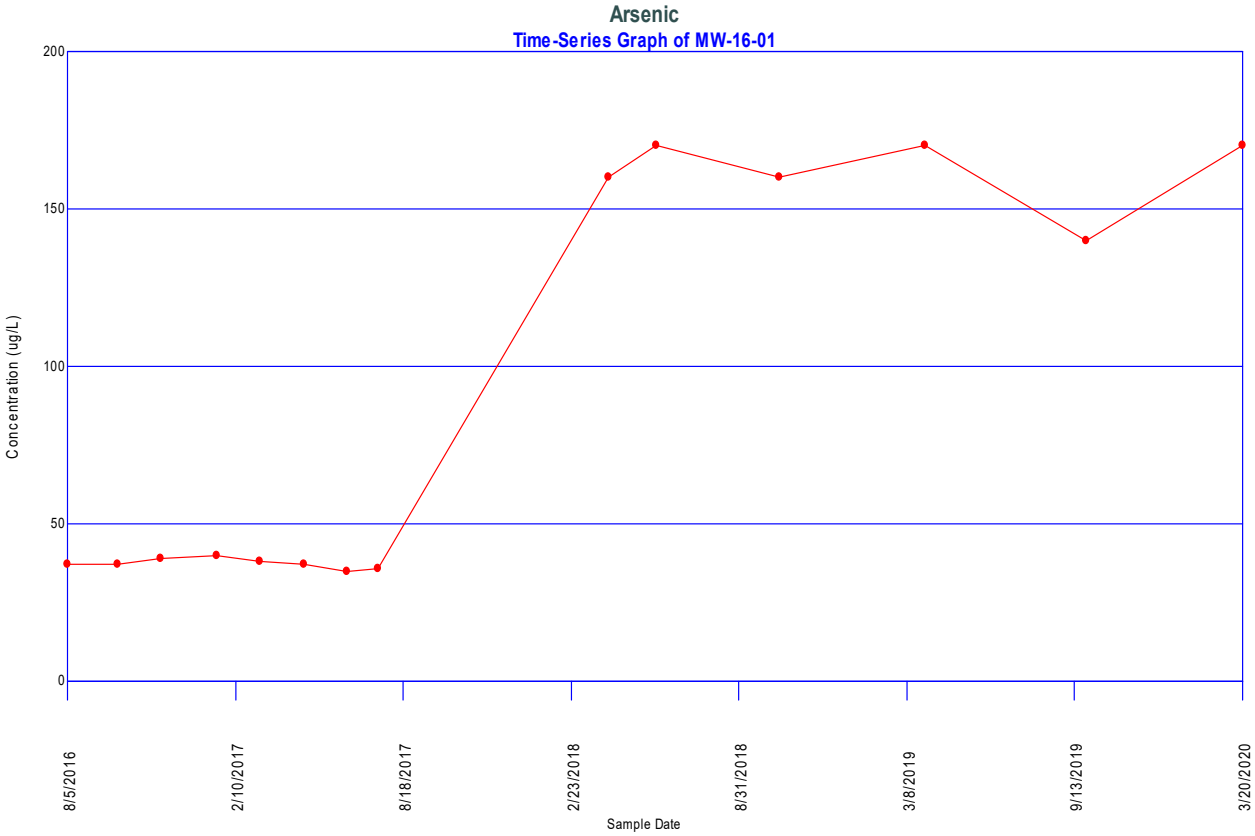
Total Measurements: 42
Total Non-Detect: 4
Percent Non-Detects: 9.52381%
Total Background Measurements: 0
There are 0 background locations

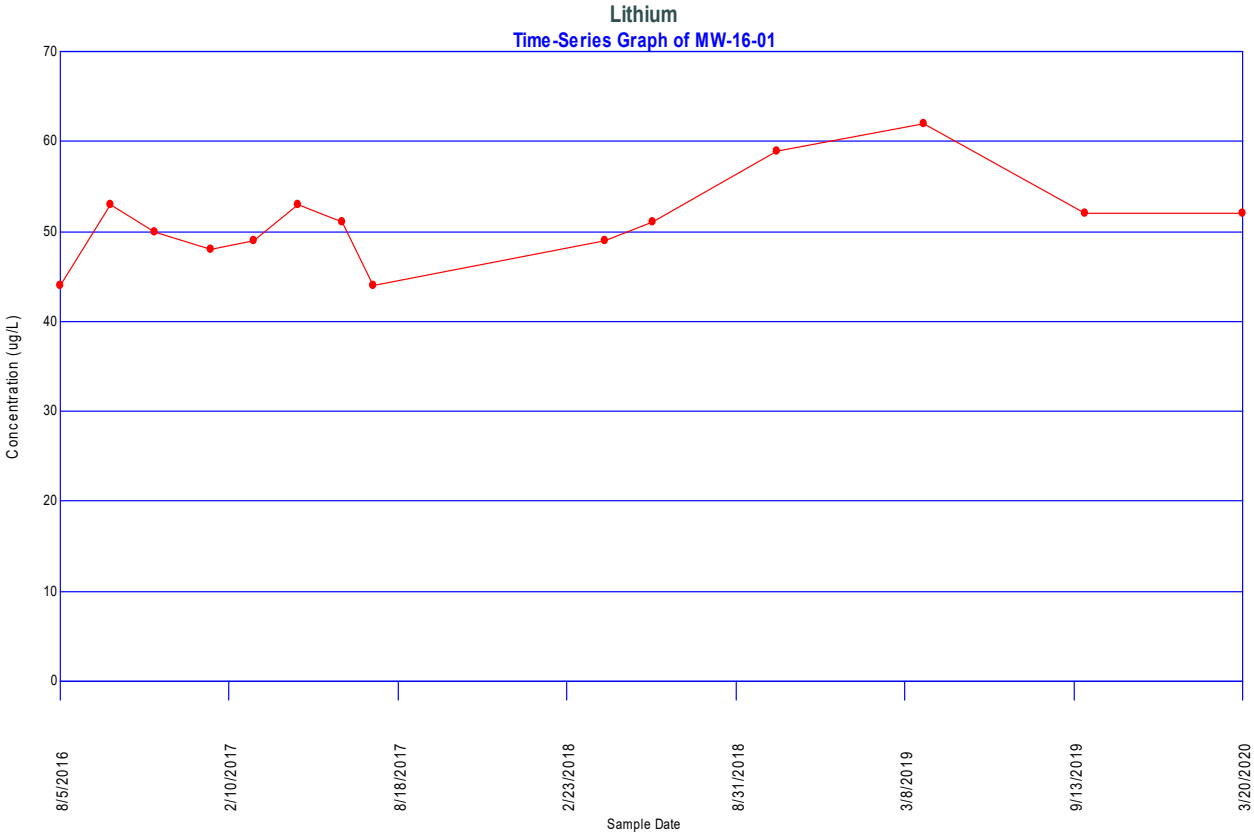
Loc.	Meas.	ND	Date	Conc.	Original

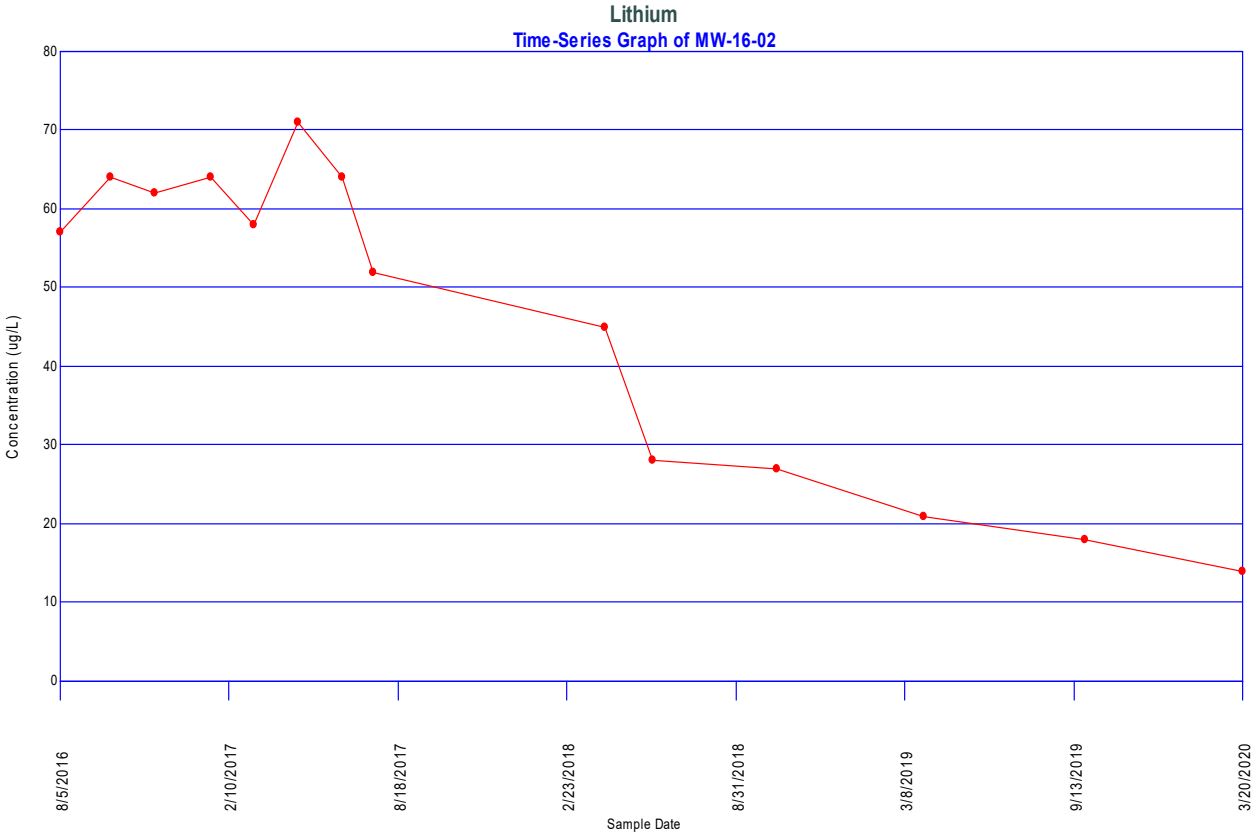
There are 3 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original
MW-16-01	14	0 (0%)	8/5/2016	44	44
			9/30/2016	53	53
			11/18/2016	50	50
			1/20/2017	48	48
			3/10/2017	49	49
			4/28/2017	53	53
			6/16/2017	51	51
			7/21/2017	44	44
			4/6/2018	49	49
			5/30/2018	51	51
			10/16/2018	59	59
			3/29/2019	62	62
			9/26/2019	52	52
			3/20/2020	52	52
MW-16-02	14	0 (0%)	8/5/2016	57	57
			9/30/2016	64	64
			11/18/2016	62	62
			1/20/2017	64	64
			3/10/2017	58	58
			4/28/2017	71	71
			6/16/2017	64	64
			7/21/2017	52	52
			4/6/2018	45	45
			5/30/2018	28	28
			10/16/2018	27	27
			3/29/2019	21	21
			9/26/2019	18	18
			3/20/2020	14	14
MW-16-03	14	4 (28.5714%)	8/5/2016	29	29
			9/30/2016	44	44
			11/18/2016	44	44
			1/20/2017	49	49
			3/10/2017	45	45
			4/28/2017	51	51
			6/16/2017	49	49
			7/21/2017	41	41
			4/6/2018	15	15
			5/30/2018	11	11
			10/16/2018	ND<8 U	ND<8 U
			3/29/2019	ND<8 U	ND<8 U
			9/26/2019	ND<8 U	ND<8 U
			3/20/2020	ND<8 U	ND<8 U

There are 0 unused locations


Arsenic
Time-Series Graph of MW-16-01
200
150
100
50
0
Concentration (ug/L)
8/5/2016
2/10/2017
8/18/2017
2/23/2018
8/31/2018
3/8/2019
9/13/2019
3/20/2020
Sample Date


Lithium
Time-Series Graph of MW-16-01
Concentration (ug/L)
70
60
50
40
30
20
10
0
8/5/2016
2/10/2017
8/18/2017
2/23/2018
8/31/2018
3/8/2019
9/13/2019
3/20/2020
Sample Date


Lithium
Time-Series Graph of MW-16-02
Concentration (ug/L)
80
70
60
50
40
30
20
10
0
8/5/2016
2/10/2017
8/18/2017
2/23/2018
8/31/2018
3/8/2019
9/13/2019
3/20/2020
Sample Date

Concentrations (ug/L)

Parameter: Arsenic

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 18
Total Non-Detect: 10
Percent Non-Detects: 55.5556%
Total Background Measurements: 0
There are 0 background locations

Loc.	Meas.	ND	Date	Conc.	Original

There are 3 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original
MW-16-01	6	0 (0%)	4/6/2018	160	160
			5/30/2018	170	170
			10/16/2018	160	160
			3/29/2019	170	170
			9/26/2019	140	140
			3/20/2020	170	170
			8/5/2016	**37**	**37**
			9/30/2016	**37**	**37**
			11/18/2016	**39**	**39**
			1/20/2017	**40**	**40**
			3/10/2017	**38**	**38**
			4/28/2017	**37**	**37**
			6/16/2017	**35**	**35**
			7/21/2017	**36**	**36**
MW-16-02	6	4 (66.6667%)	4/6/2018	15	15
			5/30/2018	ND<5 U	ND<5 U
			10/16/2018	7.9	7.9
			3/29/2019	ND<5 U	ND<5 U
			9/26/2019	ND<5 U	ND<5 U
			3/20/2020	ND<5 U	ND<5 U
			8/5/2016	**24**	**24**
			9/30/2016	**27**	**27**
			11/18/2016	**30**	**30**
			1/20/2017	**31**	**31**
			3/10/2017	**29**	**29**
			4/28/2017	**30**	**30**
			6/16/2017	**30**	**30**
			7/21/2017	**27**	**27**
MW-16-03	6	6 (100%)	4/6/2018	ND<5 U	ND<5 U
			5/30/2018	ND<5 U	ND<5 U
			10/16/2018	ND<5 U	ND<5 U
			3/29/2019	ND<5 U	ND<5 U
			9/26/2019	ND<5 U	ND<5 U
			3/20/2020	ND<5 U	ND<5 U
			8/5/2016	**91**	**91**
			9/30/2016	**40**	**40**
			11/18/2016	**21**	**21**
			1/20/2017	**13**	**13**
			3/10/2017	**12**	**12**
			4/28/2017	**12**	**12**
			6/16/2017	**12**	**12**
			7/21/2017	**12**	**12**

There are 0 unused locations

Concentrations (ug/L)

Parameter: Lithium

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 18
Total Non-Detect: 4
Percent Non-Detects: 22.2222%
Total Background Measurements: 0
There are 0 background locations

Loc.	Meas.	ND	Date	Conc.	Original

There are 3 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original
MW-16-01	6	0 (0%)	4/6/2018	49	49
			5/30/2018	51	51
			10/16/2018	59	59
			3/29/2019	62	62
			9/26/2019	52	52
			3/20/2020	52	52
			8/5/2016	**44**	**44**
			9/30/2016	**53**	**53**
			11/18/2016	**50**	**50**
			1/20/2017	**48**	**48**
			3/10/2017	**49**	**49**
			4/28/2017	**53**	**53**
			6/16/2017	**51**	**51**
			7/21/2017	**44**	**44**
MW-16-02	6	0 (0%)	4/6/2018	45	45
			5/30/2018	28	28
			10/16/2018	27	27
			3/29/2019	21	21
			9/26/2019	18	18
			3/20/2020	14	14
			8/5/2016	**57**	**57**
			9/30/2016	**64**	**64**
			11/18/2016	**62**	**62**
			1/20/2017	**64**	**64**
			3/10/2017	**58**	**58**
			4/28/2017	**71**	**71**
			6/16/2017	**64**	**64**
			7/21/2017	**52**	**52**
MW-16-03	6	4 (66.6667%)	4/6/2018	15	15
			5/30/2018	11	11
			10/16/2018	ND<8 U	ND<8 U
			3/29/2019	ND<8 U	ND<8 U
			9/26/2019	ND<8 U	ND<8 U
			3/20/2020	ND<8 U	ND<8 U
			8/5/2016	**29**	**29**
			9/30/2016	**44**	**44**
			11/18/2016	**44**	**44**
			1/20/2017	**49**	**49**
			3/10/2017	**45**	**45**
			4/28/2017	**51**	**51**
			6/16/2017	**49**	**49**
			7/21/2017	**41**	**41**

There are 0 unused locations

Mann-Kendall Trend Analysis

Parameter: Lithium

Location: MW-16-02

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
28	45	-17	0	1
27	45	-18	0	2
21	45	-24	0	3
18	45	-27	0	4
14	45	-31	0	5
27	28	-1	0	6
21	28	-7	0	7
18	28	-10	0	8
14	28	-14	0	9
21	27	-6	0	10
18	27	-9	0	11
14	27	-13	0	12
18	21	-3	0	13
14	21	-7	0	14
14	18	-4	0	15

S Statistic = 0 - 15 = -15

Comparing at 95% confidence level (downward trend)

Probability of obtaining S >= 15 is 0.0014

S < 0 and 0.0014 < 0.05 indicating a downward trend

Skewness Coefficient

Parameter: Arsenic

Original Data (Not Transformed)

Non-Detects Replaced with 1/2 DL

Skewness > 1 indicates positively skewed data
Skewness < -1 indicates negatively skewed data

Compliance Locations

Location	Obs.	Mean	Std. Dev.	Skewness
MW-16-01	6	161.667	11.6905	**-1.15797**
MW-16-02	6	5.48333	5.13826	**1.24323**
MW-16-03	6	2.5	0	**Div 0**

All Locations

Obs.	Mean	Std. Dev.	Skewness
18	56.55	76.8067	0.849279

Skewness Coefficient

Parameter: Arsenic

Natural Logarithm Transformation

Non-Detects Replaced with 1/2 DL

Skewness > 1 indicates positively skewed data
Skewness < -1 indicates negatively skewed data

Compliance Locations

Location	Obs.	Mean	Std. Dev.	Skewness
MW-16-01	6	5.08323	0.0754548	**-1.22587**
MW-16-02	6	1.40668	0.786299	0.91034
MW-16-03	6	0.916291	0	**Div 0**

All Locations

Obs.	Mean	Std. Dev.	Skewness
18	2.46873	1.96082	0.742133

Shapiro-Wilks Test of Normality

Parameter: Arsenic
Location: MW-16-01
Normality Test of Parameter Concentrations
Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL
K = 3 for 6 measurements

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	140	170	30	0.6431	19.293
2	160	170	10	0.2806	2.806
3	160	170	10	0.0875	0.875
4	170	160	-10		
5	170	160	-10		
6	170	140	-30		

Sum of b values = 22.974
Sample Standard Deviation = 11.6905
W Statistic = 0.772397

5% Critical value of 0.788 exceeds 0.772397
Evidence of non-normality at 95% level of significance

1% Critical value of 0.713 is less than 0.772397
Data is normally distributed at 99% level of significance

Shapiro-Wilks Test of Normality

Parameter: Arsenic
Location: MW-16-01
Normality Test of Parameter Concentrations
Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL
K = 3 for 6 measurements

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	4.94164	5.1358	0.194156	0.6431	0.124862
2	5.07517	5.1358	0.0606246	0.2806	0.0170113
3	5.07517	5.1358	0.0606246	0.0875	0.00530465
4	5.1358	5.07517	-0.0606246		
5	5.1358	5.07517	-0.0606246		
6	5.1358	4.94164	-0.194156		

Sum of b values = 0.147178
Sample Standard Deviation = 0.0754548
W Statistic = 0.760921

5% Critical value of 0.788 exceeds 0.760921
Evidence of non-normality at 95% level of significance

1% Critical value of 0.713 is less than 0.760921
Data is normally distributed at 99% level of significance

Skewness Coefficient

Parameter: Lithium

Original Data (Not Transformed)

Non-Detects Replaced with 1/2 DL

Skewness > 1 indicates positively skewed data
Skewness < -1 indicates negatively skewed data

Compliance Locations

Location	Obs.	Mean	Std. Dev.	Skewness
MW-16-01	6	54.1667	5.11534	0.660543
MW-16-02	6	25.5	10.9316	0.905654
MW-16-03	6	7	4.81664	0.91756

All Locations

Obs.	Mean	Std. Dev.	Skewness
18	28.8889	21.174	0.231149

Confidence Interval

Parameter: Lithium

Original Data (Not Transformed)

Non-Detects Replaced with 1/2 DL

Compliance Locations

Location	**MW-16-01**
Mean	54.1667
Std Dev	5.11534
Degrees of Freedom	5
Comparison Level	**40**
Untransformed Comp. Level	40

Confidence	**t-Stat**	**Interval**	**Mid-Point**	**Significant**
99%	3.36493	[47.1396, 61.1937]	54.1667	**TRUE**
95%	2.01505	[49.9586, 58.3747]	54.1667	**TRUE**

Location	**MW-16-02**
Mean	25.5
Std Dev	10.9316
Degrees of Freedom	5
Comparison Level	**40**
Untransformed Comp. Level	40

Confidence	**t-Stat**	**Interval**	**Mid-Point**	**Significant**
99%	3.36493	[10.483, 40.517]	25.5	FALSE
95%	2.01505	[16.5072, 34.4928]	25.5	FALSE

Location	**MW-16-03**
Mean	7
Std Dev	4.81664
Degrees of Freedom	5
Comparison Level	**40**
Untransformed Comp. Level	40

Confidence	**t-Stat**	**Interval**	**Mid-Point**	**Significant**
99%	3.36493	[0.383254, 13.6167]	7	FALSE
95%	2.01505	[3.03764, 10.9624]	7	FALSE

Non-Parametric Confidence Interval

Parameter: Arsenic

Well: MW-16-01

Original Data (Not Transformed)

Non-Detects Replaced with 1/2 DL

99% Comparion Level

Total measurements = 6

Ranks

Point	Date	Value	Rank	Bkgrnd
MW-16-01	9/26/2019	140	1	TRUE
MW-16-01	10/16/2018	160	2.5	TRUE
MW-16-01	4/6/2018	160	2.5	TRUE
MW-16-01	5/30/2018	170	5	TRUE
MW-16-01	3/29/2019	170	5	TRUE
MW-16-01	3/20/2020	170	5	TRUE

M = 6

n + 1 - M = 1

Two Sided Confidence Level = 96.9%

Upper Confidence Interval X(6) = 170

Lower Confidence Inverval X(1) = 140

140 > 32 Indicating Statistical Significance

Appendix C
Appendix IV Assessment Monitoring Statistical Evaluation – November 2020

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Technical Memorandum

Date:	January 7, 2021
To:	DTE Electric Company
From:	Sarah Holmstrom, TRC Kristin Lowery, TRC
Project No.:	370029.0005.0000 Phase 001, Task 001
Subject:	Appendix IV Assessment Monitoring Statistical Evaluation for November 2020 Groundwater Monitoring Event – DTE Electric Company, River Rouge Power Plant, Bottom Ash Basin Coal Combustion Residual Unit

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. The CCR Rule, which became effective on October 19, 2015, applies to DTE Electric Company (DTE Electric) River Rouge Power Plant (RRPP) Coal Combustion Residual Bottom Ash Basin (BAB) CCR unit located in River Rouge, Michigan (the Site).

On October 15, 2018, it was determined that pursuant to §257.93 (h) that arsenic and lithium are present at statistically significant levels above their respective groundwater protection standards (GWPSs) at one or more down gradient well locations at the RRPP BAB CCR unit[1].

DTE Electric has completed an assessment of corrective measures per §257.95(g)(3), the RRPP ceased coal fired operations in May 2020, and the CCR closure by removal of the BAB was completed from June through September 2020 as documented in the *Bottom Ash Basin Closure Certification Report DTE Electric Company River Rouge Power Plant Bottom Ash Basin Coal Combustion Residual Unit, 1 Belanger Park Drive, River Rouge, Michigan* dated November 2020. Although CCR removal corrective measures have been implemented a final remedy has not yet been formally selected. DTE Electric has continued operating a groundwater extraction system as a presumptive remedy to maintain hydraulic control around the RRPP BAB to address the uncertainty around the potential migration of CCR constituents from the RRPP BAB to groundwater. This system has effectively captured groundwater in the vicinity of the RRPP BAB CCR unit since it began operation on March 2, 2018 and eliminates the potential for Appendix III and Appendix IV parameters to migrate from the RRPP

[1] TRC. 2018. *Notification of Appendix IV Constituents at Statistically Significant Levels Above the Groundwater Protection Standards; River Rouge Power Plant Bottom Ash Basin Coal Combustion Residual Unit,* October.

BAB CCR unit.

In accordance with §257.96(b), DTE Electric is continuing assessment monitoring for the RRPP BAB CCR unit. The second semiannual assessment monitoring event of 2020 for the Appendix III and Appendix IV constituents was conducted on November 11, 2020. In accordance with §257.95, the assessment monitoring data must be compared to determine whether or not Appendix IV constituents are detected at statistically significant levels above the GWPSs. This memorandum presents the confidence limits derived for the Appendix IV parameters for the RRPP BAB CCR unit that will be used to compare to the established GWPSs.

Assessment Monitoring Statistical Evaluation

The three compliance wells utilized for the RRPP BAB CCR unit are MW-16-01, MW-16-02 and MW-16-03. Following the second semiannual assessment monitoring sampling event for 2020, compliance well data for the RRPP BAB were evaluated in accordance with the Groundwater Statistical Evaluation Plan (Stats Plan) (TRC, October 2017; Revised December 2017). For each detected constituent, the concentrations for each well were first compared directly to the GWPS within the dataset collected subsequent to the groundwater extraction system operation. Parameter-well combinations that included a direct exceedance of the GWPS were retained for further analysis. As a result, arsenic was retained for evaluation at MW-16-01 and lithium at MW-16-01 and MW-16-02.

Groundwater data were then evaluated utilizing ChemStat™ statistical software. ChemStat™ is a software tool that is commercially available for performing statistical evaluation consistent with procedures outlined in U.S. EPA's Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (Unified Guidance; UG). Within the ChemStat™ statistical program (and the UG), 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 parameters using a 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 ChemStat™ output files are included as an attachment.

Due to the initiation of operation of the groundwater extraction system to establish groundwater capture in the area of the BAB in March of 2018 and subsequent changes in groundwater flow rate and direction, the data set used for the November 2020 statistical evaluation was limited to the data collected subsequent to the operation of the groundwater extraction system (April 2018 to November 2020). Use of the seven most recent data points post-system startup includes five to seven data points for each well/constituent pair for the November 2020 event and provides more than the minimum density of data (at least 4 data points) as recommended per the UG and is representative of current conditions at the BAB under the hydraulic influence of the groundwater extraction system. Additional data collected from monitoring events performed subsequent to March 2018 will continue to be incorporated into the statistical evaluation moving forward and will roll after eight rounds have accumulated, as appropriate.

The statistical data evaluation included the following steps:

- Review of data quality checklists for the assessment monitoring data sets for CCR Appendix IV constituents;

- Evaluation of percentage of non-detects for each downgradient well-constituent pair;
- Graphical representation of the assessment monitoring data as time versus concentration (T v. C) 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;
- 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 Quality

Data from the second semiannual monitoring event for 2020 were evaluated for completeness, overall quality and usability, method-specified sample holding times, precision and accuracy, and potential sample contamination. The review was completed using the following quality control (QC) information which at a minimum included chain-of-custody forms, investigative sample results including blind field duplicates, and, as provided by the laboratory, method blanks, laboratory control spikes, laboratory duplicates. The data were found to be complete and usable for the purposes of the CCR monitoring program.

Percentage of Non-detects

The percentage of non-detect observations for constituents with one or more detection above a GWPS is included in Table 1. Non-detect data was handled in accordance with the Stats Plan for the purposes of calculating confidence intervals.

Time versus Concentration Graphs

The T v. C graphs did not show any potential outliers. The T v. C graphs showed potential trending for some Appendix IV well/constituent pairs. These were tested by the ChemStat™ software to assess whether the trends are statistically significant.

Outlier Testing

No potential outliers were observed on the T v. C graphs; therefore, no outlier testing was performed.

Trend Analysis

Visual trends apparent in the T v. C graphs were evaluated in ChemStat™ using the Mann-Kendall Trend Analysis to determine if a subset of data should be used in calculating the confidence interval. Trends were evaluated using a 95-percent (one-tailed) confidence level, i.e., a significance level (α) of 0.05. No statistically significant trends were identified.

Distribution of the Data Sets

ChemStat™ was utilized to evaluate each data set for normality. If the skewness coefficient was calculated to be between negative one and one, then the data were assumed to be approximately normally distributed. If the skewness coefficient was calculated as greater than one (or less than

negative one) then the calculation was performed on the natural log (Ln) of the data. If the Ln of the data still determined that the data appeared to be skewed, then the Shapiro-Wilk test of normality (Shapiro-Wilk) was performed. The Shapiro-Wilk statistic was calculated on both non-transformed data, and the Ln-transformed data. If the Shapiro-Wilk statistic indicated that normal distributional assumptions were not valid, then the parameter was considered a candidate for non-parametric statistical evaluation. The data distributions are summarized in Table 1.

Confidence Intervals

Variability is recognized in the data set due to changing groundwater quality in response to the operation of the groundwater extraction system. Calculating a confidence interval around a trending data set incorporates not only variability present naturally in the underlying dataset but can exaggerate variability. Data collected since the initiation of operation of the groundwater extraction system in March 2018 has been generally stable and do not exhibit statistically significant trends.

Table 1 presents the calculated confidence intervals for each well-constituent pair. For normal and lognormal distributions, confidence intervals are calculated for 99 percent confidence using parametric methods. For non-normal datasets, a nonparametric confidence interval is utilized, resulting in the highest and lowest values from the contributing dataset as the confidence limits. .

The confidence intervals calculated through the above-described process will be compared to the GWPS to determine if an exceedance has occurred. An exceedance of the standard occurs when the 99 percent lower confidence level of the downgradient data exceeds the GWPS.

Attachments

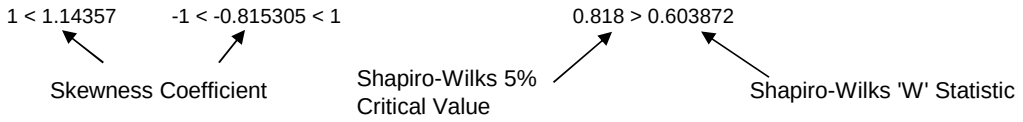
Table 1 – Summary of Descriptive Statistics and Confidence Interval Calculations
Attachment A – ChemStat™ Outputs

Table 1
Summary of Descriptive Statistics and Confidence Interval Calculations

Table 1
Summary of Descriptive Statistics and Confidence Interval Calculations
Assessment Monitoring Statistical Evaluation - November 2020
DTE Electric Company – River Rouge Power Plant

Parameter[1]	Percent Non-Detect	Outliers?	Trend?	Skewness		Shapiro-Wilks Test (5% Critical Value)		Parametric / Non-Parametric	Confidence Interval[2]
				Un-Transformed	Natural Log	Un-Transformed	Natural Log		
MW-16-01									
Arsenic	0%	No	No	-1 < -0.812567 < 1				Parametric	[140, 180]
Lithium	0%	No	No	-1 < 0.541934 < 1	--	--	--	Parametric	[46, 60]
MW-16-02									
Lithium	0%	No	No	-1 < 0.990426 < 1	--	--	--	Parametric	[11, 37]

Notes:



(1) Well-parameter combinations that have one or more direct exceedances of the Groundwater Protection Standard within the most recent seven sampling events.
(2) The most recent seven data points are used to calculate the confidence interval to be representative of current conditions.

Attachment A
ChemStat™ Confidence Interval Outputs

Concentrations (ug/L)

Parameter: Arsenic

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 45
Total Non-Detect: 12
Percent Non-Detects: 26.6667%
Total Background Measurements: 0
There are 0 background locations

Loc.	Meas.	ND	Date	Conc.	Original

There are 3 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original
MW-16-01	15	0 (0%)	8/5/2016	37	37
			9/30/2016	37	37
			11/18/2016	39	39
			1/20/2017	40	40
			3/10/2017	38	38
			4/28/2017	37	37
			6/16/2017	35	35
			7/21/2017	36	36
			4/6/2018	160	160
			5/30/2018	170	170
			10/16/2018	160	160
			3/29/2019	170	170
			9/26/2019	140	140
			3/20/2020	170	170
			11/11/2020	130	130
MW-16-02	15	5 (33.3333%)	8/5/2016	24	24
			9/30/2016	27	27
			11/18/2016	30	30
			1/20/2017	31	31
			3/10/2017	29	29
			4/28/2017	30	30
			6/16/2017	30	30
			7/21/2017	27	27
			4/6/2018	15	15
			5/30/2018	ND<5 U	ND<5 U
			10/16/2018	7.9	7.9
			3/29/2019	ND<5 U	ND<5 U
			9/26/2019	ND<5 U	ND<5 U
			3/20/2020	ND<5 U	ND<5 U
			11/11/2020	ND<5 U	ND<5 U
MW-16-03	15	7 (46.6667%)	8/5/2016	91	91
			9/30/2016	40	40
			11/18/2016	21	21
			1/20/2017	13	13
			3/10/2017	12	12
			4/28/2017	12	12
			6/16/2017	12	12
			7/21/2017	12	12
			4/6/2018	ND<5 U	ND<5 U
			5/30/2018	ND<5 U	ND<5 U
			10/16/2018	ND<5 U	ND<5 U
			3/29/2019	ND<5 U	ND<5 U
			9/26/2019	ND<5 U	ND<5 U
			3/20/2020	ND<5 U	ND<5 U
			11/11/2020	ND<5 U	ND<5 U

There are 0 unused locations

Concentrations (ug/L)

Parameter: Lithium

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

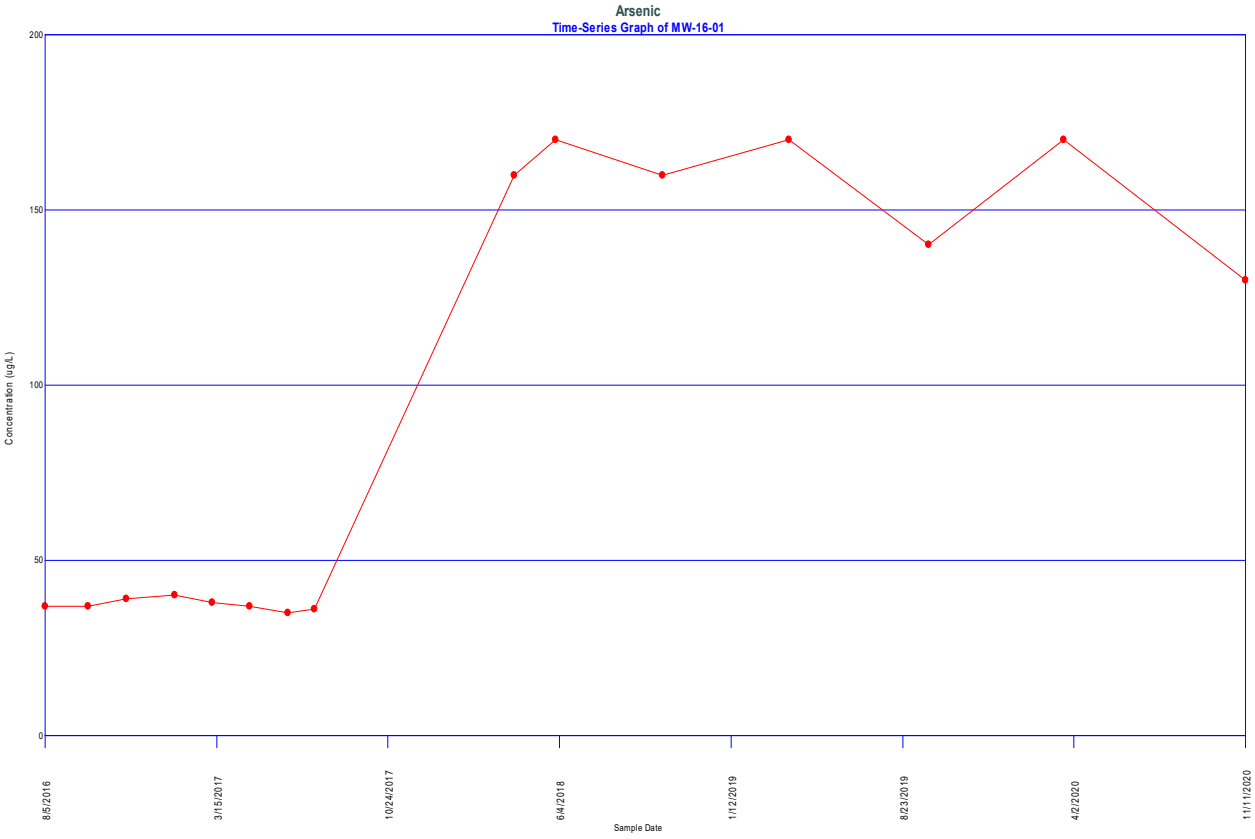
Total Measurements: 45
Total Non-Detect: 5
Percent Non-Detects: 11.1111%
Total Background Measurements: 0
There are 0 background locations

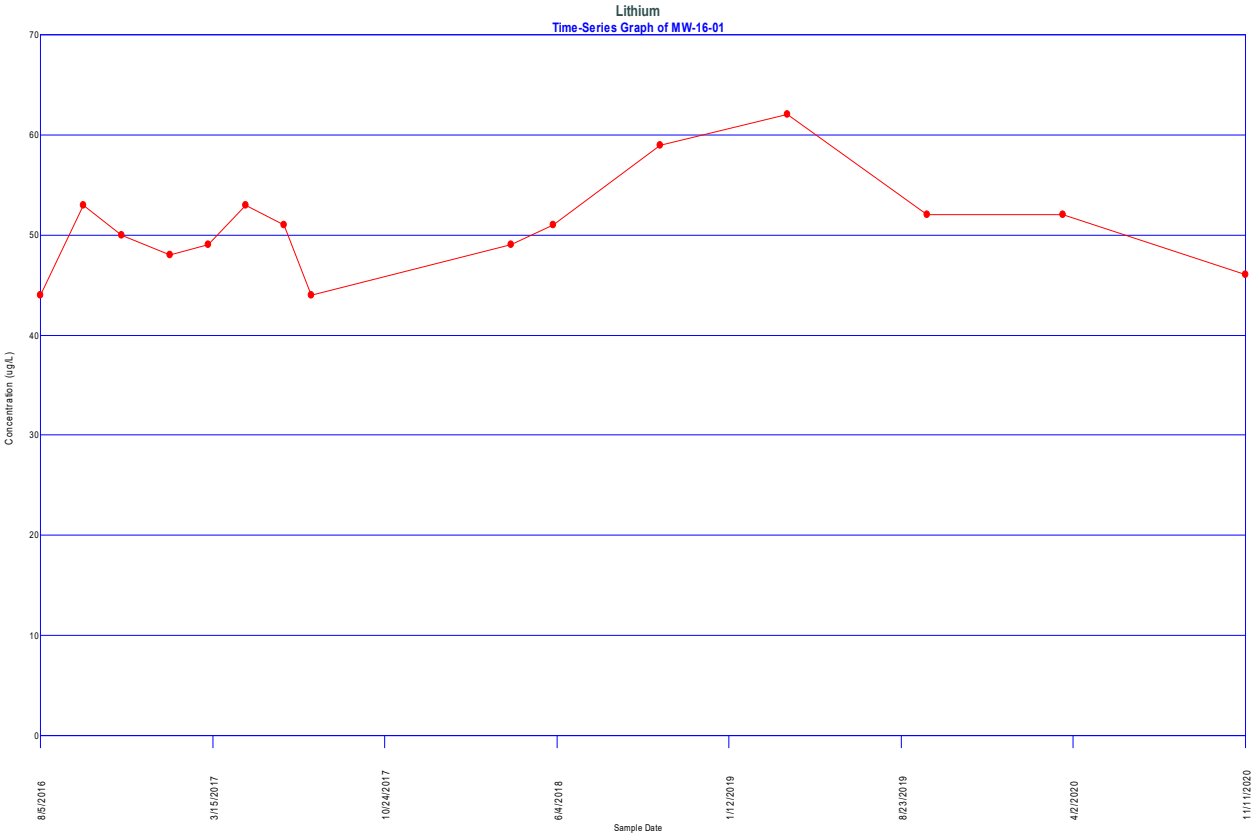
Loc.	Meas.	ND	Date	Conc.	Original

There are 3 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original
MW-16-01	15	0 (0%)	8/5/2016	44	44
			9/30/2016	53	53
			11/18/2016	50	50
			1/20/2017	48	48
			3/10/2017	49	49
			4/28/2017	53	53
			6/16/2017	51	51
			7/21/2017	44	44
			4/6/2018	49	49
			5/30/2018	51	51
			10/16/2018	59	59
			3/29/2019	62	62
			9/26/2019	52	52
			3/20/2020	52	52
			11/11/2020	46	46
MW-16-02	15	0 (0%)	8/5/2016	57	57
			9/30/2016	64	64
			11/18/2016	62	62
			1/20/2017	64	64
			3/10/2017	58	58
			4/28/2017	71	71
			6/16/2017	64	64
			7/21/2017	52	52
			4/6/2018	45	45
			5/30/2018	28	28
			10/16/2018	27	27
			3/29/2019	21	21
			9/26/2019	18	18
			3/20/2020	14	14
			11/11/2020	13	13
MW-16-03	15	5 (33.3333%)	8/5/2016	29	29
			9/30/2016	44	44
			11/18/2016	44	44
			1/20/2017	49	49
			3/10/2017	45	45
			4/28/2017	51	51
			6/16/2017	49	49
			7/21/2017	41	41
			4/6/2018	15	15
			5/30/2018	11	11
			10/16/2018	ND<8 U	ND<8 U
			3/29/2019	ND<8 U	ND<8 U
			9/26/2019	ND<8 U	ND<8 U
			3/20/2020	ND<8 U	ND<8 U
			11/11/2020	ND<8 U	ND<8 U

There are 0 unused locations


Arsenic
Time-Series Graph of MW-16-01
200
150
100
50
0
Concentration (ug/L)
8/5/2016
3/15/2017
10/24/2017
6/4/2018
1/12/2019
8/23/2019
4/2/2020
11/11/2020
Sample Date


Lithium
Time-Series Graph of MW-16-01
70
60
50
40
30
20
10
0
Concentration (ug/L)
8/5/2016
3/15/2017
10/24/2017
6/4/2018
1/12/2019
8/23/2019
4/2/2020
11/11/2020
Sample Date


Lithium
Time-Series Graph of MW-16-02
Concentration (ug/L)
80
70
60
50
40
30
20
10
0
8/5/2016
3/15/2017
10/24/2017
6/4/2018
1/12/2019
8/23/2019
4/2/2020
11/11/2020
Sample Date

Concentrations (ug/L)

Parameter: Arsenic

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 21
Total Non-Detect: 12
Percent Non-Detects: 57.1429%
Total Background Measurements: 0
There are 0 background locations

Loc.	Meas.	ND	Date	Conc.	Original

There are 3 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original
MW-16-01	7	0 (0%)	4/6/2018	160	160
			5/30/2018	170	170
			10/16/2018	160	160
			3/29/2019	170	170
			9/26/2019	140	140
			3/20/2020	170	170
			11/11/2020	130	130
			8/5/2016	**37**	**37**
			9/30/2016	**37**	**37**
			11/18/2016	**39**	**39**
			1/20/2017	**40**	**40**
			3/10/2017	**38**	**38**
			4/28/2017	**37**	**37**
			6/16/2017	**35**	**35**
			7/21/2017	**36**	**36**
MW-16-02	7	5 (71.4286%)	4/6/2018	15	15
			5/30/2018	ND<5 U	ND<5 U
			10/16/2018	7.9	7.9
			3/29/2019	ND<5 U	ND<5 U
			9/26/2019	ND<5 U	ND<5 U
			3/20/2020	ND<5 U	ND<5 U
			11/11/2020	ND<5 U	ND<5 U
			8/5/2016	**24**	**24**
			9/30/2016	**27**	**27**
			11/18/2016	**30**	**30**
			1/20/2017	**31**	**31**
			3/10/2017	**29**	**29**
			4/28/2017	**30**	**30**
			6/16/2017	**30**	**30**
			7/21/2017	**27**	**27**
MW-16-03	7	7 (100%)	4/6/2018	ND<5 U	ND<5 U
			5/30/2018	ND<5 U	ND<5 U
			10/16/2018	ND<5 U	ND<5 U
			3/29/2019	ND<5 U	ND<5 U
			9/26/2019	ND<5 U	ND<5 U
			3/20/2020	ND<5 U	ND<5 U
			11/11/2020	ND<5 U	ND<5 U
			8/5/2016	**91**	**91**
			9/30/2016	**40**	**40**
			11/18/2016	**21**	**21**
			1/20/2017	**13**	**13**
			3/10/2017	**12**	**12**
			4/28/2017	**12**	**12**
			6/16/2017	**12**	**12**
			7/21/2017	**12**	**12**

There are 0 unused locations

Concentrations (ug/L)

Parameter: Lithium

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

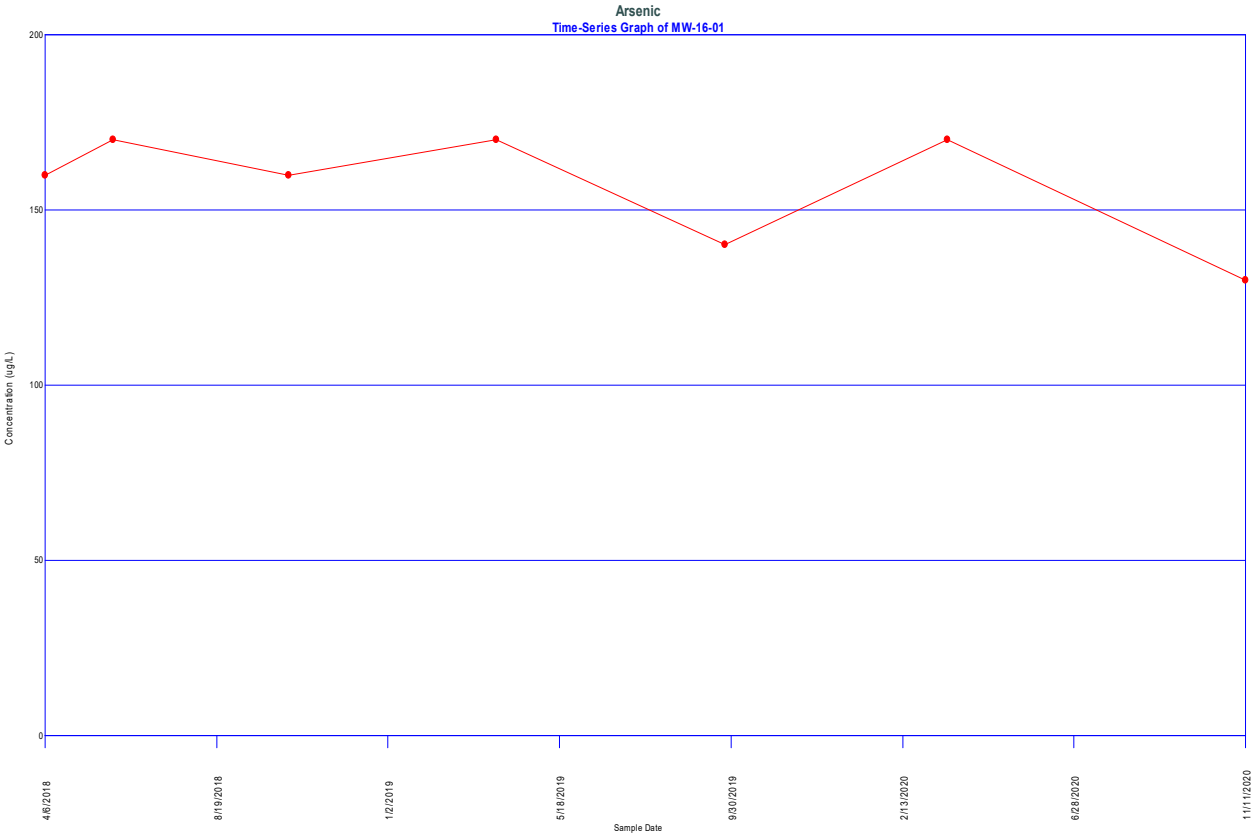
Total Measurements: 21
Total Non-Detect: 5
Percent Non-Detects: 23.8095%
Total Background Measurements: 0
There are 0 background locations

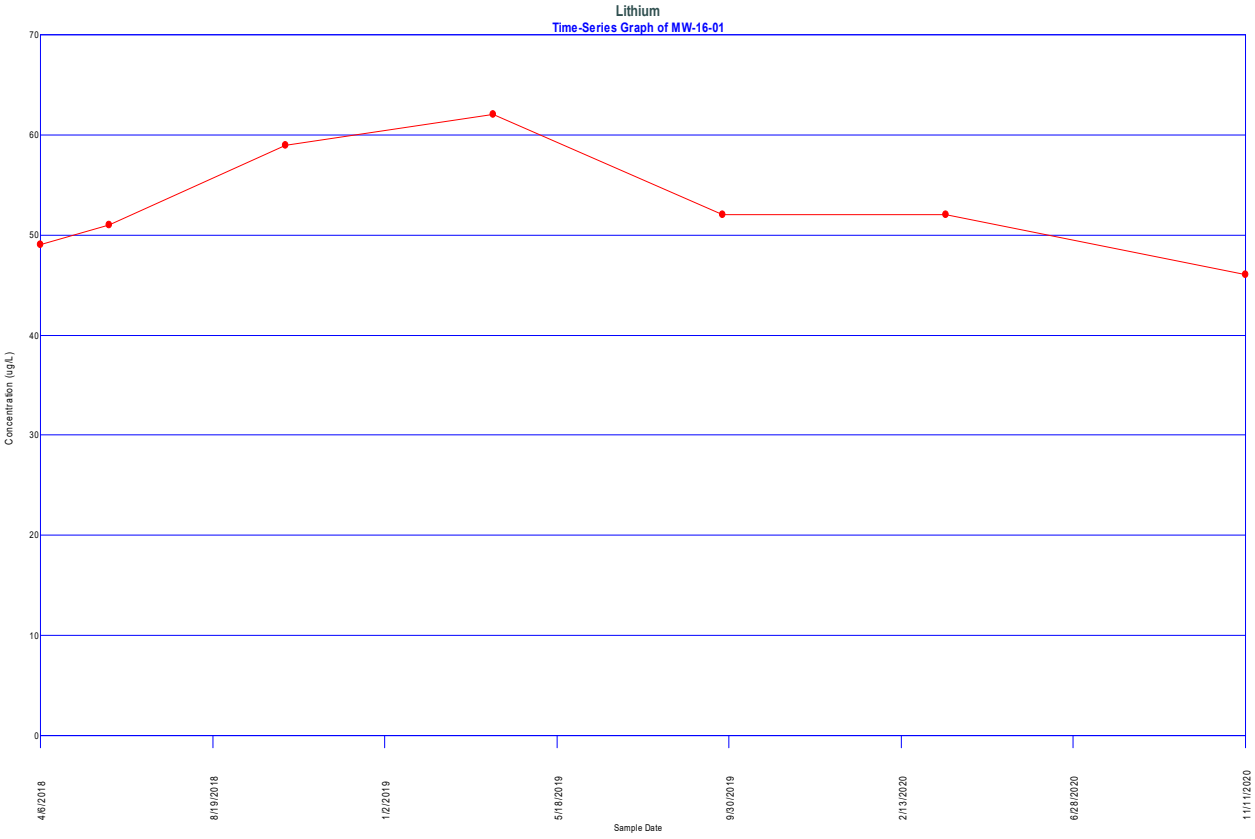
Loc.	Meas.	ND	Date	Conc.	Original

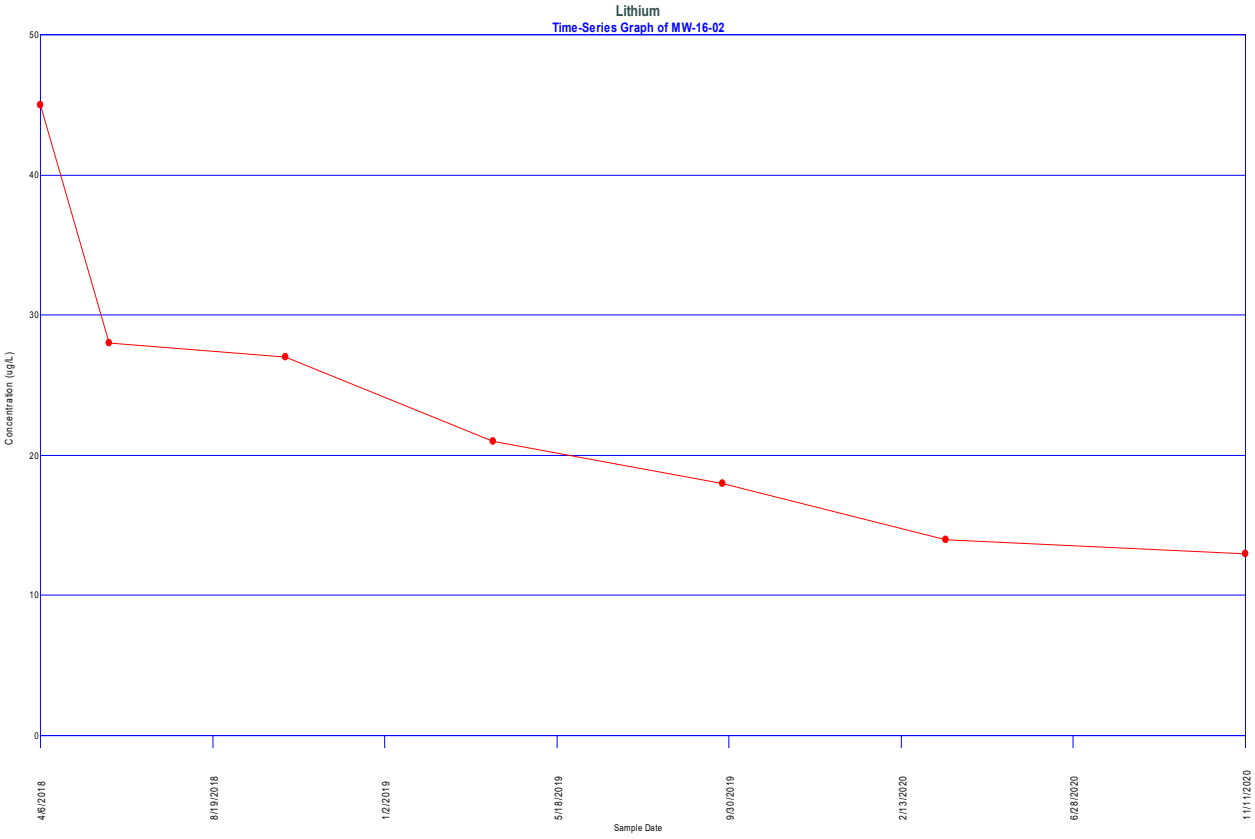
There are 3 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original
MW-16-01	7	0 (0%)	4/6/2018	49	49
			5/30/2018	51	51
			10/16/2018	59	59
			3/29/2019	62	62
			9/26/2019	52	52
			3/20/2020	52	52
			11/11/2020	46	46
			8/5/2016	**44**	**44**
			9/30/2016	**53**	**53**
			11/18/2016	**50**	**50**
			1/20/2017	**48**	**48**
			3/10/2017	**49**	**49**
			4/28/2017	**53**	**53**
			6/16/2017	**51**	**51**
			7/21/2017	**44**	**44**
MW-16-02	7	0 (0%)	4/6/2018	45	45
			5/30/2018	28	28
			10/16/2018	27	27
			3/29/2019	21	21
			9/26/2019	18	18
			3/20/2020	14	14
			11/11/2020	13	13
			8/5/2016	**57**	**57**
			9/30/2016	**64**	**64**
			11/18/2016	**62**	**62**
			1/20/2017	**64**	**64**
			3/10/2017	**58**	**58**
			4/28/2017	**71**	**71**
			6/16/2017	**64**	**64**
			7/21/2017	**52**	**52**
MW-16-03	7	5 (71.4286%)	4/6/2018	15	15
			5/30/2018	11	11
			10/16/2018	ND<8 U	ND<8 U
			3/29/2019	ND<8 U	ND<8 U
			9/26/2019	ND<8 U	ND<8 U
			3/20/2020	ND<8 U	ND<8 U
			11/11/2020	ND<8 U	ND<8 U
			8/5/2016	**29**	**29**
			9/30/2016	**44**	**44**
			11/18/2016	**44**	**44**
			1/20/2017	**49**	**49**
			3/10/2017	**45**	**45**
			4/28/2017	**51**	**51**
			6/16/2017	**49**	**49**
			7/21/2017	**41**	**41**

There are 0 unused locations


Arsenic
Time-Series Graph of MW-16-01
200
150
100
50
0
Concentration (ug/L)
4/6/2018
8/19/2018
1/2/2019
5/18/2019
9/30/2019
2/13/2020
6/28/2020
11/11/2020
Sample Date


Lithium
Time-Series Graph of MW-16-01
70
60
50
40
30
20
10
0
Concentration (ug/L)
4/6/2018
8/19/2018
1/2/2019
5/18/2019
9/30/2019
2/13/2020
6/28/2020
11/11/2020
Sample Date


Lithium
Time-Series Graph of MW-16-02
Concentration (ug/L)
50
40
30
20
10
0
4/6/2018
8/19/2018
1/2/2019
5/18/2019
9/30/2019
2/13/2020
6/28/2020
11/11/2020
Sample Date

Mann-Kendall Trend Analysis

Parameter: Arsenic
Location: MW-16-01
Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
170	160	10	1	0
160	160	0	1	0
170	160	10	2	0
140	160	-20	2	1
170	160	10	3	1
130	160	-30	3	2
160	170	-10	3	3
170	170	0	3	3
140	170	-30	3	4
170	170	0	3	4
130	170	-40	3	5
170	160	10	4	5
140	160	-20	4	6
170	160	10	5	6
130	160	-30	5	7
140	170	-30	5	8
170	170	0	5	8
130	170	-40	5	9
170	140	30	6	9
130	140	-10	6	10
130	170	-40	6	11

S Statistic = 6 - 11 = -5
Comparing at 95% confidence level (downward trend)
Probability of obtaining S >= 5 is 0.281
S > 0 or 0.281 > 0.05 indicating no evidence of a downward trend

Skewness Coefficient

Parameter: Arsenic

Original Data (Not Transformed)

Non-Detects Replaced with 1/2 DL

Skewness > 1 indicates positively skewed data
Skewness < -1 indicates negatively skewed data

Compliance Locations

Location	Obs.	Mean	Std. Dev.	Skewness
MW-16-01	7	157.143	16.0357	-0.812567
MW-16-02	7	5.05714	4.82419	**1.47888**
MW-16-03	7	2.5	0	**Div 0**

All Locations

Obs.	Mean	Std. Dev.	Skewness
21	54.9	74.6553	0.868048

Skewness Coefficient

Parameter: Lithium

Original Data (Not Transformed)

Non-Detects Replaced with 1/2 DL

Skewness > 1 indicates positively skewed data
Skewness < -1 indicates negatively skewed data

Compliance Locations

Location	Obs.	Mean	Std. Dev.	Skewness
MW-16-01	7	53	5.59762	0.541934
MW-16-02	7	23.7143	11.041	0.990426
MW-16-03	7	6.57143	4.54082	**1.15482**

All Locations

Obs.	Mean	Std. Dev.	Skewness
21	27.7619	20.9282	0.287746

Confidence Interval

Parameter: Arsenic

Original Data (Not Transformed)

Non-Detects Replaced with 1/2 DL

Compliance Locations

Location	**MW-16-01**
Mean	157.143
Std Dev	16.0357
Degrees of Freedom	6
Comparison Level	**32**
Untransformed Comp. Level	32

Confidence	**t-Stat**	**Interval**	**Mid-Point**	**Significant**
99%	3.14267	[138.095, 176.19]	157.143	**TRUE**
95%	1.94318	[145.365, 168.92]	157.143	**TRUE**

Location	**MW-16-02**
Mean	5.05714
Std Dev	4.82419
Degrees of Freedom	6
Comparison Level	**32**
Untransformed Comp. Level	32

Confidence	**t-Stat**	**Interval**	**Mid-Point**	**Significant**
99%	3.14267	[-0.673117, 10.7874]	5.05714	FALSE
95%	1.94318	[1.514, 8.60029]	5.05714	FALSE

Location	**MW-16-03**
Mean	2.5
Std Dev	0
Degrees of Freedom	6
Comparison Level	**32**
Untransformed Comp. Level	32

Confidence	**t-Stat**	**Interval**	**Mid-Point**	**Significant**
99%	3.14267	[2.5, 2.5]	2.5	FALSE
95%	1.94318	[2.5, 2.5]	2.5	FALSE

Confidence Interval

Parameter: Lithium

Original Data (Not Transformed)

Non-Detects Replaced with 1/2 DL

Compliance Locations

Location	**MW-16-01**
Mean	53
Std Dev	5.59762
Degrees of Freedom	6
Comparison Level	**40**
Untransformed Comp. Level	40

Confidence	**t-Stat**	**Interval**	**Mid-Point**	**Significant**
99%	3.14267	[46.3511, 59.6489]	53	**TRUE**
95%	1.94318	[48.8888, 57.1112]	53	**TRUE**

Location	**MW-16-02**
Mean	23.7143
Std Dev	11.041
Degrees of Freedom	6
Comparison Level	**40**
Untransformed Comp. Level	40

Confidence	**t-Stat**	**Interval**	**Mid-Point**	**Significant**
99%	3.14267	[10.5995, 36.829]	23.7143	FALSE
95%	1.94318	[15.6052, 31.8234]	23.7143	FALSE

Location	**MW-16-03**
Mean	6.57143
Std Dev	4.54082
Degrees of Freedom	6
Comparison Level	**40**
Untransformed Comp. Level	40

Confidence	**t-Stat**	**Interval**	**Mid-Point**	**Significant**
99%	3.14267	[1.17777, 11.9651]	6.57143	FALSE
95%	1.94318	[3.23641, 9.90645]	6.57143	FALSE