2019 Annual Groundwater Monitoring and Corrective Action Report

Former BC Cobb Power Plant
Bottom Ash Pond & Ponds 0-8
Muskegon, Michigan

January 2020

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Prepared For
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Executive Summary

On behalf of Consumers Energy, TRC has prepared this Annual Groundwater Monitoring Report for the BCC Ponds to cover the period of January 1, 2019 to December 31, 2019. The BCC Ponds were in assessment monitoring at the beginning and the end of the period covered by this report. Data that have been collected and evaluated in 2019, including assessment monitoring data from November 2018, are presented in this report.

Consumers Energy first reported the potential for statistically significant increases (SSIs) for Appendix III constituents in the *"Annual Groundwater Monitoring Report Former BC Cobb Power Plant Bottom Ash Pond & Ponds 0-8 CCR Unit"* (TRC, January 2018). The statistical evaluation of the Appendix III indicator parameters confirming SSIs over background were as follows:

- Boron at BCC-MW-15009, BCC-MW-15010, BCC-MW-15011, and BCC-MW-15014;
- Fluoride at BCC-MW-15012;
- Field pH at BCC-MW-15009, BCC-MW-15011, BCC-MW-15012, BCC-MW-15014, BCC-MW-15015, and BCC-MW-15017.

On April 25, 2018, Consumers Energy entered assessment monitoring upon determining that an Alternate Source Demonstration for the Appendix III constituents was not successful. After subsequent sampling for Appendix IV constituents, Consumers Energy provided notification that lithium was present at statistically significant levels above the Ground Water Protection Standards (GWPS) established at 40 ug/L (TRC, 2019) in two out of fifteen downgradient monitoring wells at the BCC Ponds as follows:

- Lithium at BCC-MW-17001 and BCC-MW-17002.

The notification was followed up with a Response Action Plan submitted to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) on March 15, 2019 laying out the preliminary understanding of water quality and actions that were underway to mitigate or eliminate unacceptable risk associated with the identified release from the CCR unit. The *Assessment of Corrective Measures* (ACM) was initiated on April 15, 2019 and was certified and submitted to the EGLE on September 11, 2019 in accordance with the schedule in §257.96 and provided in the Response Action Plan. The certification for a 60-day time extension to the 90-day completion period of the ACM required per §257.96(a) is included in this report.

The ACM documents that the groundwater nature and extent has been defined, as required in §257.95(g)(1). The property containing the site is owned and operated by Consumers Energy and on-site groundwater is not used for drinking water. The nearest off-site drinking water well is more than 2,000 feet away on the other side of the North Branch of the Muskegon River.

Per §257.96(b), Consumers Energy is continuing to monitor groundwater in accordance with the assessment monitoring program as specified in §257.95. Overall, the statistical assessments have confirmed that lithium is the only Appendix IV constituent present at statistically significant levels above the GWPS and groundwater chemistry already appears to be improving as a result of discontinuing the hydraulic loading to the BCC Ponds and is expected to further improve following the completed source removal of CCR.

Consumers Energy has not selected a remedy pursuant to §257.97. The semiannual progress report describing the progress in selecting and designing the remedy required pursuant to §257.97(a) is included in this report. As documented in the March 30, 2018 *Notification of Intent to Initiate Closure* letter submitted in accordance with §257.102(g), Consumers Energy intends to close the BCC Ponds under the CCR Rule's closure by removal provisions in §257.102(c). Consumers Energy has also submitted a closure work plan to EGLE. The closure work plan was reviewed and approved by EGLE on October 16, 2018. Field activities are scheduled to begin in 2020.

In 2020, evaluation of corrective measures in accordance with §257.96 and §257.97 as outlined in the ACM will continue according to the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98, which includes semiannual assessment monitoring in accordance with §257.95 to monitor site groundwater conditions and inform the remedy selection. The next semiannual assessment monitoring events are scheduled to occur in the second and fourth calendar quarters of 2020.

Section 1
Introduction

On April 17, 2015, the United States Environmental Protection Agency (USEPA) published the final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA) (the CCR Rule) (USEPA, April 2015), as amended (USEPA, July 2018). Standards for groundwater monitoring and corrective action codified in the CCR Rule apply to the Consumers Energy Company (Consumers Energy) Bottom Ash Pond and Ponds 0-8 (BCC Ponds) at the former BC Cobb Power Plant Site (the Site) located in Muskegon, Michigan. Pursuant to the CCR Rule, no later than January 31, 2018, and annually thereafter, the owner or operator of a CCR unit must prepare an annual groundwater monitoring and corrective action report for the CCR unit documenting the status of groundwater monitoring and corrective action for the preceding year in accordance with §257.90(e).

On behalf of Consumers Energy, TRC has prepared this report for calendar year 2019 activities at the BCC Ponds. The BCC Ponds were in assessment monitoring at the beginning and the end of the period covered by this report. Data that have been collected and evaluated in 2019, including assessment monitoring data from November 2018, are presented in this report.

1.1 Program Summary

Consumers Energy first reported the potential for statistically significant increases (SSIs) for Appendix III constituents in the "*Annual Groundwater Monitoring Report Former BC Cobb Power Plant Bottom Ash Pond & Ponds 0-8 CCR Unit*" (TRC, January 2018). The statistical evaluation of the Appendix III indicator parameters confirming SSIs over background were as follows:

- Boron at BCC-MW-15009, BCC-MW-15010, BCC-MW-15011, and BCC-MW-15014;
- Fluoride at BCC-MW-15012;
- Field pH at BCC-MW-15009, BCC-MW-15011, BCC-MW-15012, BCC-MW-15014, BCC-MW-15015, and BCC-MW-15017.

As discussed in the *2018 Annual Groundwater Monitoring Report* (2018 Annual Report) for the former BC Cobb Plant Bottom Ash Pond and Ponds 0-8 (TRC, January 2019), Consumers Energy initiated an Assessment Monitoring Program for the BCC Ponds pursuant to §257.95 of the CCR Rule that included sampling and analyzing groundwater within the groundwater monitoring system for all constituents listed in Appendix III and Appendix IV. On April 25, 2018, Consumers Energy entered assessment monitoring upon determining that an Alternate Source Demonstration for the Appendix III constituents was not successful. After subsequent sampling for Appendix IV constituents, Consumers Energy provided notification that lithium was

present at statistically significant levels above the Ground Water Protection Standards (GWPS) established at 40 ug/L (TRC, 2019) in two out of fifteen downgradient monitoring wells at the BCC Ponds as follows:

- Lithium at BCC-MW-17001 and BCC-MW-17002.

On January 14, 2019, Consumers Energy provided notification that lithium was present at statistically significant levels above the federal GWPS in one or more downgradient monitoring wells at the BCC Ponds. The notification was followed by a Response Action Plan submitted to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) on March 15, 2019 laying out the preliminary understanding of water quality and actions that were underway to mitigate or eliminate unacceptable risk associated with the identified release from the CCR unit. The CCR Rule 40 CFR §257.96(a) requires that an owner or operator initiate an assessment of corrective measures (ACM) to prevent further release, to remediate any releases, and to restore impacted areas to original conditions if any Appendix IV constituent has been detected at a statistically significant level exceeding a GWPS. The *Assessment of Corrective Measures* (ACM) (TRC, September 2019) was initiated on April 15, 2019 and was certified and submitted to EGLE on September 11, 2019 in accordance with the schedule in §257.96 and presented in the Response Action Plan.

The ACM documents that the groundwater nature and extent has been defined, as required in §257.95(g)(1), based on the site-specific hydrogeology and the presence of surrounding surface water features. Although lithium concentrations exceed the GWPS in on-site groundwater, the property containing the site is owned and operated by Consumers Energy and on-site groundwater is not used for drinking water. Off-site migration potential and risk to off-site drinking water in the deeper sand is very low given that groundwater in the deeper sand has a very low flow rate and at times flows southeast, away from the North Branch of the Muskegon River (away from the nearest residential drinking water wells located more than 2,000 feet away on the opposite side of the North Branch of the Muskegon River), and if groundwater were to flow toward the northwest for an extended period of time, flow would likely be upward toward the regional surface water discharge features that are present between the Site and the nearest residential wells. In addition, the underlying clay unit prevents the downward vertical migration of groundwater.

To further mitigate potential risk associated with groundwater at the site, CCR removal is planned as documented in the March 30, 2018 *Notification of Intent to Initiate Closure* letter submitted in accordance with §257.102(g). Consumers Energy also submitted the *B.C. Cobb Generating Facility Bottom Ash Pond and Ponds 0-8 Closure Work Plan,* (Golder, 2018) to EGLE for agreement on Consumers Energy's plan to remove CCR on May 31, 2018 and clarified on August 13, 2018 *(*Golder, 2018b*)*. EGLE provided written concurrence with the plan on October 16, 2018. Field activities are scheduled to begin in 2020.

Consumers Energy will continue to evaluate corrective measures in accordance with §257.96 and §257.97, as outlined in the ACM, and will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98, which includes semiannual assessment monitoring in accordance with §257.95 as presented in this report.

1.2 Site Overview

The former BC Cobb coal-fired power generation facility is located east of Muskegon Lake, south of Cedar Creek, northwest of the CSX rail line, and west of the Muskegon River marsh in Muskegon, Michigan (Figure 1). The plant began generating electricity in 1948, and plant operations ceased in April 2016. From 1984 through plant closure in 2016, CCR have been deposited in the BCC Ponds by utilizing sluicing methods, allowing CCR particles to settle through a series of ponds and then discharged to a National Pollutant Discharge Elimination System (NPDES) outfall located on the Discharge Channel. CCR was periodically removed from the ponds and disposed or beneficially reused.

During operation of the CCR units, the pond surface water elevations were at 588 feet. Since plant closure in 2016, the pond water elevation has been decreased through dewatering to the groundwater level of approximately 580 feet. Site features are shown on Figure 2.

1.3 Geology/Hydrogeology

The majority of the BCC Ponds are comprised of surficial CCR and sand fill. USGS topographic maps and aerial photographs dating back to 1929, in addition to field descriptions of subsurface soil at the site, indicate that the area currently occupied by the ash ponds was originally marsh land. The subsurface materials encountered in the pond area generally consist of CCR ranging from 3 to 28 feet below ground surface (ft bgs) overlying 10 to 20 feet of poorly graded, fine-grained sand. Discontinuous layers of organic materials (i.e., humus) and peat (on the order of 0.5 to 1.0 feet thick), and organic-rich zones or sand and silt are present within the fine-grained sand. Organic-rich silt was also encountered at depths ranging from 20 to 30 ft bgs, beneath the fine-grained sand, ranging in thickness from approximately 1 to 13 feet. The organic-rich silt deposits are thickest in the perimeter berms along the southernmost edge of the pond area (toward Muskegon Lake). Thinner deposits of the organic-rich silt were encountered toward the northernmost edge of the pond area. Silty clay and/or poorly graded, fine- to medium-grained sand is generally observed within 30 to 40 ft bgs, beneath the organic-rich silt. An underlying gray clay was encountered throughout the pond area at approximately 40 ft bgs, beneath the fine to medium-grained sand.

Bedrock and quaternary geologic maps of Michigan and local water well records indicate that 120 to 190 feet of glacio-lacustrine sand, gravel, moraine and lacustrine clay deposits are present throughout Muskegon County. These lacustrine deposits are situated on top of the sandstone

bedrock that is part of the Marshall Formation, typically encountered at approximately 200 to 250 ft bgs throughout Muskegon County. Glacial moraine deposits are more prevalent in the northern and eastern portions of the County, while glacio-lacustrine sands dominate in the western and southern areas surrounding Muskegon Lake, and the area approaching Lake Michigan. The BCC ponds are located in the central area of the County.

The BCC Ponds are bound by several surface water features (Figure 2): The North Branch of the Muskegon River and former plant-associated discharge channel adjoin the northwestern and southernmost boundaries of the pond area, and Veterans Memorial Pond is located northeast of the pond area, approximately 100 feet northeast of Michigan Highway 120.

Significant changes occurred in the ash management area during the CCR Rule baseline period that caused variations in groundwater flow at the Site. The monitoring well system was installed in October 2015 while the plant and the pond system were in operation. The plant shut down in April 2016 and ceased sluicing ash to the BCC Ponds and the ponds began dewatering. Veterans Memorial Pond to the north of the BCC Ponds was dewatered for maintenance activities sometime during the period between August and December 2017. These changes have had a profound effect on groundwater flow rates and directions at both the upgradient and downgradient monitoring wells.

While the ponds were in operation, groundwater mounded within the pond area and flowed radially toward the surrounding water bodies. Starting with the July 2016 groundwater sampling round, groundwater continued to flow radially to the surrounding water bodies, but with a much lower gradient. When Veterans Memorial Pond was drained, a stronger gradient was established along the eastern side of the peninsula toward the Veterans Memorial Pond area. Veterans Memorial Pond is no longer drained and hydraulic loading of the BCC Ponds was discontinued back in 2016. Although the overall gradient has diminished compared to pre-2018 monitoring events due to the discontinued hydraulic loading and Veterans Memorial Pond dewatering, groundwater is typically encountered at a similar elevation relative to the surrounding surface water features.

Section 2
Groundwater Monitoring

2.1 Monitoring Well Network

In accordance with 40 CFR 257.91, Consumers Energy established a groundwater monitoring system for the BCC Ponds, which had initially consisted of 22 monitoring wells (seven background monitoring wells and 15 downgradient monitoring wells) that are screened in the uppermost aquifer. Six additional downgradient monitoring wells were installed in late 2017 and incorporated into the groundwater monitoring system in 2018 (BCC-MW-17001 through BCC-MW-17006). Seven monitoring wells located southwest of the BCC Ponds provide data on background groundwater quality that has not been affected by the CCR unit (BCC-MW-15002 through BCC-MW-15008). The monitoring well locations are shown on Figure 2.

Monitoring wells BCC-MW-15009 through BCC-MW-15014 encircle the BAP, while BCC-MW-15015 through BCC-MW-15023 and BCC-MW-17001 through BCC-MW-17006 are located at the outer edge of the peninsula formed by the bottom ash pond system. Because the perimeter and interior berms within the ash management area were constructed in part with ash and bodies of water surround the ash management area, wells could not be installed entirely beyond the CCR material boundary.

2.2 November 2018 Assessment Groundwater Monitoring

As discussed in the 2018 Annual Report, the second 2018 semiannual monitoring event was conducted in November 2018, but laboratory analysis and data quality review were ongoing as of writing the 2018 Annual Report. A summary of the November 2018 assessment monitoring event was prepared under a separate cover, submitted to the EGLE on March 15, 2019 as part of the Response Action Plan, and is included in Appendix A.

2.3 2019 Semiannual Assessment Groundwater Monitoring

Per §257.95, all wells in the CCR unit monitoring program must be sampled at least semiannually. One semiannual event must include analysis for all constituents from Appendix III and Appendix IV constituents and one semiannual event may include analysis for those constituents in Appendix IV of the CCR Rule that were detected during prior sampling. In addition to the Appendix III and IV constituents, field parameters including dissolved oxygen, oxidation reduction potential, specific conductivity, temperature, and turbidity were collected at each well during each sampling event. Samples were collected and analyzed according to the *BC Cobb Monitoring Program Sample and Analysis Plan* (SAP) (ARCADIS, 2016).

2.3.1 Data Summary

The first semiannual groundwater assessment monitoring event for 2019 was performed on April 8 through April 12, 2019 and the second semiannual groundwater assessment monitoring event for 2019 was performed on September 24 through September 26, 2019. Both events were performed by TRC personnel, and samples were analyzed by TestAmerica in accordance with the SAP. Static water elevation data were collected at all monitoring well locations during each event. Groundwater samples and field parameters were collected from the 7 background monitoring wells and 21 downgradient monitoring wells and analyzed for the full list of Appendix III and Appendix IV constituents during the April 2019 event, and the full list of Appendix III and Appendix IV constituents detected in the first semiannual event during the September 2019 event.

A summary of the groundwater data collected during the April 2019 and September 2019 events is provided on Table 1 (static groundwater elevation data), Table 2 (field data), Table 3 (background well analytical results), and Table 4 (downgradient well analytical results).

2.3.2 Data Quality Review

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

2.3.3 Groundwater Flow Rate and Direction

Groundwater elevation data collected during the April 2019 and September 2019 assessment monitoring events are provided in Table 1. The April 2019 and September 2019 groundwater elevation data were used to construct groundwater contour maps (Figure 3 and Figure 4, respectively).

Groundwater elevation data collected during the April 2019 assessment monitoring sampling event showed slight groundwater flow radially outward toward the bounding surface water features from the BCC Ponds. The average gradient observed on April 8, 2019, using well pairs BCC-MW-15012/BCC-MW-15013, BCC-MW-15012/BCC-MW-17004, and BCC-MW-15012/BCC-MW-15022, showed a horizontal gradient of approximately 0.00036 ft/ft with minimal discernible overall flow direction across the BCC Ponds. Using the average hydraulic conductivity measured at the Ponds 0-8 monitoring wells of 58 feet/day (ARCADIS, 2016), and an assumed effective porosity of

0.3, this results in groundwater flow rate of approximately 0.070 feet/day (approximately 26 feet/year).

Groundwater elevation data collected during the September 2019 assessment monitoring sampling event showed slight groundwater flow across the BCC Ponds area to the north-northeast toward the Veterans Memorial. The average gradient observed on September 24, 2019, using well pairs BCC-MW-17001/BCC-MW-15023, BCC-MW-15014/BCC-MW-15022, and BCC-MW-15015/BCC-MW-17006, showed a horizontal gradient of approximately 0.00093 ft/ft with minimal flow towards the northeast across the BCC Ponds. Using the average hydraulic conductivity measured at the Ponds 0-8 monitoring wells of 58 feet/day (ARCADIS, 2016), and an assumed effective porosity of 0.3, this results in groundwater flow rate of approximately 0.18 feet/day (approximately 66 feet/year).

The low hydraulic gradient and lack of general flow direction is similar to that identified in recent sampling events, although the September 2019 event shows surface water as being slightly higher than the groundwater table in the BCC Ponds area and exhibits a slight gradient inward toward the site, which can be attributed to precipitation prior to the monitoring event and/or continued rise in Great Lakes water levels. In the past, groundwater was typically encountered at a similar or slightly higher elevation relative to the surrounding surface water features, generally flowing outward toward the bounding surface water features and has undergone several changes over time due to permanent discontinuation of hydraulic loading in the BCC Ponds area and the dewatering of Veterans Memorial Pond in 2017 (as discussed in the 2017 Annual Report). Although slight variations in flow direction continue to occur, downgradient wells are appropriately positioned to detect the presence of Appendix III/IV constituents that could potentially migrate from the BCC Ponds.

Section 3
Statistical Evaluation

Assessment monitoring is continuing at the BCC Ponds 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 2019 groundwater data in accordance with the assessment monitoring program. The statistical evaluation details are provided in Appendix A (*November 2018 Assessment Monitoring Data Summary and Statistical Evaluation),* Appendix C *(June 2018 Statistical Evaluation of Initial Assessment Monitoring Sampling Event),* Appendix D *(April 2019 Assessment Monitoring Data Summary and Statistical Evaluation), and* Appendix E *(September 2019 Assessment Monitoring Data Summary and Statistical Evaluation).*

3.1 Establishing Groundwater Protection Standards

The Groundwater Protection Standards (GWPSs) are used to assess whether Appendix IV constituent concentrations are present in groundwater at unacceptable levels as a result of CCR Unit operations by statistically comparing concentrations in the downgradient wells to the GWPSs for each Appendix IV constituent. In accordance with §257.95(h) and the *Groundwater Statistical Evaluation Plan* (Stats Plan) (TRC, October 2017), GWPSs were established for the Appendix IV constituents following the preliminary assessment monitoring event using nine rounds of data collected from the background monitoring wells BCC-MW-15002 through BCC-MW-15008 (December 2015 through April 2018). The calculation of the GWPSs is documented in the *Groundwater Protection Standards* technical memorandum included as Appendix C of the 2018 Annual Report. 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

Consistent with the *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (Unified Guidance) (USEPA, 2009), the preferred method for comparisons to a fixed standard are confidence limits. An exceedance of the standard occurs when the 99 percent lower confidence level of the downgradient data exceeds the GWPS. As documented in the January 14, 2019 *Notification of Appendix IV Constituent Exceeding Groundwater Protection Standard per* §257.95(g), lithium was present at statistically significant levels above the federal GWPS in two of the downgradient wells at the BCC Ponds based on the statistical data comparison for the first semiannual assessment monitoring event (June 2018) (Appendix C). Therefore, Consumers

Energy initiated an Assessment of Corrective Measures (ACM). Assessment monitoring is ongoing.

Overall, the statistical assessments have confirmed that lithium is the only Appendix IV constituent present at statistically significant levels above the GWPS. A summary of the confidence intervals for April 2019 and September 2019 are provided in Table 5 and Table 6, respectively.

Groundwater chemistry already appears to be improving as a result of discontinuing the hydraulic loading to the BCC Ponds and is expected to further improve following the completed source removal of CCR. Although the lower confidence limits for lithium continue to be above the GWPS for BCC-MW-17001 and BCC-MW-17002, lithium concentrations show an overall decrease at those locations as shown on time-series charts (Appendix E: Attachment 1). In addition, arsenic concentrations have steadily decreased at downgradient well BCC-MW-15009 and exhibit a statistically significant downward trend (Appendix E), with concentrations below the GWPS for five consecutive sampling events. Also, as detailed in the September 2019 statistical evaluation (Appendix E), no statistically significant increasing trends were observed for any of the Appendix IV constituents for which confidence intervals were calculated. Groundwater conditions will continue to be monitored while corrective measures continue to be evaluated and a remedy is selected. There is still some uncertainty surrounding how changes in redox conditions may affect contaminant transport as a result of changing conditions, including future CCR removal activities.

Section 4
Corrective Action

Consumers Energy provided notification that lithium was present at statistically significant levels above the Ground Water Protection Standards (GWPS) established at 40 ug/L (TRC, 2019) in two out of fifteen downgradient monitoring wells at the BCC Ponds as follows:

- Lithium at BCC-MW-17001 and BCC-MW-17002.

The CCR Rule 40 CFR §257.96(a) requires that an owner or operator initiate an assessment of corrective measures (ACM) to prevent further release, to remediate any releases, and to restore impacted areas to original conditions if any Appendix IV constituent has been detected at a statistically significant level exceeding a GWPS. The *Assessment of Corrective Measures* (ACM) (TRC, September 2019) was initiated on April 15, 2019 and was certified and submitted to EGLE on September 11, 2019 in accordance with the schedule in §257.96 and presented in the Response Action Plan.

4.1 Nature and Extent Sampling

Per §257.95(g)(1), in the event that the facility determines, pursuant to §257.93(h), that there is a statistical exceedance of the GWPSs for one or more of the Appendix IV constituents, the facility must characterize the nature and extent of the release of CCR as well as any site conditions that may affect the remedy selected. As discussed in the ACM, nature and extent characterization of groundwater was performed using data collected from the existing groundwater monitoring wells presented in this annual report and previously submitted annual reports. Therefore, no additional data associated with the characterization of nature and extent are included in this report.

4.2 Assessment of Corrective Measures

The ACM was completed on September 11, 2019 as a step towards developing a final remedy. The certification for a 60-day time extension to the 90-day completion period of the ACM required per §257.96(a) is included in Appendix F of this report.

Several groundwater remediation alternatives evaluated in the ACM are considered technically feasible to reduce on-site groundwater concentrations. The following corrective measures were retained for further evaluation for the BCC Ponds:

- Source Removal with Groundwater Monitoring and Institutional Controls;
- Source Removal with Post Source Control/Removal Monitoring;

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

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

4.3 Remedy Selection

Consumers Energy has not selected a remedy pursuant to §257.97. The semiannual progress report describing the progress in selecting and designing the remedy required pursuant to §257.97(a) is included in Appendix G of this report. As documented in the March 30, 2018 *Notification of Intent to Initiate Closure* letter submitted in accordance with §257.102(g), Consumers Energy intends to close the BCC Ponds under the CCR Rule's closure by removal provisions in §257.102(c). Consumers Energy has also submitted a closure work plan to EGLE. The closure work plan was reviewed and approved by EGLE on October 16, 2018. Field activities are scheduled to begin in 2020.

It is anticipated that the remedy selection process for addressing affected groundwater will proceed following the implementation of the CCR source material management strategies. Additionally, Consumers Energy will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98, which includes semiannual assessment monitoring in accordance with §257.95 to monitor groundwater conditions and inform the remedy selection. The final remedy will be formally selected per §257.97 once the selected option is reviewed and commented on by EGLE and a public meeting is conducted at least 30days prior to the final selection as required under §257.96(e).

Section 5
Conclusions and Recommendations

Overall, the statistical assessments have confirmed that lithium is the only Appendix IV constituent present at statistically significant levels above the GWPS. Groundwater chemistry already appears to be improving as a result of discontinuing the hydraulic loading to the BCC Ponds (e.g. lithium and arsenic) and is expected to further improve following the completion of planned source removal of CCR.

The ACM documents that the groundwater nature and extent has been defined, as required in §257.95(g)(1). Although lithium concentrations exceed the GWPS in on-site groundwater, the property containing the site is owned and operated by Consumers Energy and on-site groundwater is not used for drinking water. The nearest off-site drinking water well is more than 2,000 feet away on the other side of the North Branch of the Muskegon River. As documented in the March 30, 2018 *Notification of Intent to Initiate Closure* letter submitted in accordance with §257.102(g), Consumers Energy intends to close the BCC Ponds under the CCR Rule's closure by removal provisions in §257.102(c). Consumers Energy has also submitted a closure work plan to EGLE. The closure work plan was reviewed and approved by EGLE on October 16, 2018. Field activities are scheduled to begin in 2020.

Corrective measures will continue to be evaluated in accordance with §257.96 and §257.97 as outlined in the ACM and the self-implementing groundwater compliance schedule will continue to be implemented in conformance with §257.90 - §257.98, which includes semiannual assessment monitoring in accordance with §257.95 to monitor site groundwater conditions and inform the remedy selection. The next semiannual monitoring events are tentatively scheduled for the second and fourth calendar quarters of 2020.

Section 6
References

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Tables

Table 1
Summary of Groundwater Elevation Data
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

Well Location	Ground Surface Elevation (ft)	TOC Elevation (ft)	Geologic Unit of Screen Interval	Screen Interval Elevation (ft)			Borehole Terminus Depth (ft BGS)	Borehole Terminus Elevation (ft)	April 8, 2019		September 24, 2019		October 16, 2019[2]	
									Depth to Water (ft BTOC)	Groundwater Elevation (ft)	Depth to Water (ft BTOC)	Groundwater Elevation (ft)	Depth to Water (ft BTOC)	Groundwater Elevation (ft)
Background														
BCC-MW-15001	583.6	586.52	Sand with organic seam at 18.8 ft bgs	573.6	to	563.6	20.0	563.6	5.08	581.44	NM[1]	NM	4.95	581.57
BCC-MW-15002	583.8	586.87	Sand	568.8	to	563.8	20.0	563.8	5.34	581.53	5.08	581.79	4.77	582.10
BCC-MW-15003	584.1	587.12	Sand	571.1	to	566.1	20.0	564.1	5.54	581.58	4.97	582.15	NM	NM
BCC-MW-15004	587.7	590.57	Sand	582.7	to	572.7	20.0	567.7	9.03	581.54	9.22	581.35	NM	NM
BCC-MW-15005	584.8	587.77	Sand	579.8	to	569.8	20.0	564.8	6.39	581.38	5.42	582.35	NM	NM
BCC-MW-15006	584.9	587.81	Sand	579.9	to	569.9	20.0	564.9	6.80	581.01	5.05	582.76	NM	NM
BCC-MW-15007	584.5	587.43	Sand	580.5	to	574.5	20.0	564.5	5.80	581.63	4.90	582.53	4.50	582.93
BCC-MW-15008	584.8	587.76	Sand	580.8	to	575.8	20.0	564.8	6.45	581.31	5.35	582.41	NM	NM
Downgradient														
BCC-MW-15009	586.3	589.27	Sand (14 - 17.2 ft bgs) and Clay/silt (17.2 - 24 ft bgs)	572.3	to	562.3	24.0	562.3	7.80	581.47	7.00	582.27	NM	NM
BCC-MW-15010	585.2	588.11	Sand with little silt and organic material	573.2	to	563.2	24.0	561.2	6.62	581.49	6.23	581.88	5.95	582.16
BCC-MW-15011	592.3	595.22	Sand with some silt	571.3	to	561.3	32.0	560.3	13.68	581.54	13.29	581.93	NM	NM
BCC-MW-15012	594.5	597.39	Sand	573.5	to	563.5	35.0	559.5	15.86	581.53	15.43	581.96	NM	NM
BCC-MW-15013	595.9	598.50	Sand with clay/silt and organic material from 36.5 - 37.5 ft bgs	565.9	to	555.9	40.0	555.9	17.15	581.35	16.40	582.10	NM	NM
BCC-MW-15014	596.2	599.04	Sand/silty sand	573.2	to	565.2	40.0	556.2	17.63	581.41	17.01	582.03	NM	NM
BCC-MW-15015	593.9	596.75	Sand with clay/silt and organic material from 29 - 29.5 ft bgs	573.9	to	563.9	30.0	563.9	15.51	581.24	14.69	582.06	NM	NM
BCC-MW-15016	586.2	589.05	Sand	551.2	to	546.2	45.0	541.2	7.75	581.30	6.93	582.12	NM	NM
BCC-MW-15017	585.7	588.61	Sand	550.7	to	545.7	40.0	545.7	7.38	581.23	6.47	582.14	NM	NM
BCC-MW-15018	589.4	592.43	Sand	551.9	to	546.9	45.0	544.4	11.23	581.20	10.30	582.13	NM	NM
BCC-MW-15019	589.4	592.42	Sand	552.4	to	547.4	45.0	544.4	11.22	581.20	10.35	582.07	NM	NM
BCC-MW-15020	589.5	592.23	Sand	554.5	to	549.5	45.0	544.5	10.96	581.27	10.20	582.03	NM	NM
BCC-MW-15021	590.7	593.73	Sand	551.2	to	548.2	50.0	540.7	12.34	581.39	11.78	581.95	NM	NM
BCC-MW-15022	592.6	595.82	Sand	568.6	to	562.6	45.0	547.6	14.35	581.47	14.41	581.41	NM	NM
BCC-MW-15023	585.4	588.08	Sand/silty sand	573.4	to	565.9	20.0	565.4	6.42	581.66	6.41	581.67	NM	NM
Shallow 2017 Wells														
BCC-MW-17001	586.1	589.29	Sand with some organic material	571.1	to	566.1	20.0	566.1	8.16	581.13	7.01	582.28	NM	NM
BCC-MW-17002	585.8	588.79	Sand	572.3	to	567.3	19.0	566.8	7.61	581.18	6.62	582.17	NM	NM
BCC-MW-17003	589.3	592.37	Sand	572.3	to	567.3	22.0	567.3	11.18	581.19	10.28	582.09	NM	NM
BCC-MW-17004	589.1	591.84	Sand	571.6	to	566.6	22.5	566.6	10.60	581.24	9.78	582.06	NM	NM
BCC-MW-17005	589.3	592.42	Sand	569.3	to	564.3	30.0	559.3	11.12	581.30	10.38	582.04	NM	NM
BCC-MW-17006	590.5	593.78	Sand	566.0	to	561.0	30.0	560.5	12.17	581.61	12.23	581.55	NM	NM

Notes:
Survey conducted by Williams & Works, November 2015, and Consumers Energy in January 2018.
Elevation in feet relative to North American Vertical Datum 1988 (NAVD 88).
TOC: Top of well casing.
ft BTOC: Feet below top of well casing.
ft BGS: Feet below ground surface.
NM = Not measured
(1) - BCC-MW-15001 static water level measurement was inadvertently not measured during the September 2019 event.
(2) - BCC-MW-15001 water level was collected on October 16, 2019, in addition to nearby monitoring wells.

Table 2

Summary of Field Parameter Results – April to September 2019

BC Cobb – RCRA CCR Monitoring Program

Muskegon, Michigan

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (SU)	Specific Conductivity (umhos/cm)	Temperature (°C)	Turbidity (NTU)
Background							
BCC-MW-15002	4/8/2019	0.20	-58.6	7.1	1,054	10.90	6.70
	9/25/2019	0.43	-96.0	7.3	1,610	14.90	0.88
BCC-MW-15003	4/8/2019	0.04	-67.5	7.2	1,549	8.60	5.10
	9/25/2019	0.30	-110.5	7.3	2,760	14.30	0.99
BCC-MW-15004	4/9/2019	0.39	-46.4	7.2	342	7.30	7.90
	9/25/2019	0.31	-96.0	7.0	1,321	16.00	0.93
BCC-MW-15005	4/9/2019	0.52	-22.4	7.4	824	7.70	7.20
	9/25/2019	0.27	-149.9	7.4	810	16.00	6.00
BCC-MW-15006	4/9/2019	2.05	-20.7	7.4	286	8.30	2.60
	9/24/2019	0.34	-118.5	7.4	430	19.00	0.37
BCC-MW-15007	4/9/2019	0.00	-86.7	6.8	2,469	6.70	3.70
	9/24/2019	0.38	-114.6	6.8	3,715	19.70	0.52
BCC-MW-15008	4/9/2019	-0.01	-81.7	7.5	953	6.90	3.50
	9/24/2019	0.30	-126.3	7.6	872	19.30	0.90
Downgradient							
BCC-MW-15009	4/9/2019	0.02	-254.3	9.4	349	13.20	2.80
	9/25/2019	0.31	-258.8	8.7	490	15.60	0.29
BCC-MW-15010	4/9/2019	0.02	-140.2	7.6	570	11.90	4.50
	9/24/2019	0.29	-120.3	7.4	798	14.80	1.00
BCC-MW-15011	4/10/2019	0.12	-204.2	8.8	300	13.00	2.50
	9/25/2019	0.38	-179.1	8.4	655	14.90	1.25
BCC-MW-15012	4/10/2019	0.65	-218.4	9.4	420	13.30	4.30
	9/25/2019	0.37	-288.7	10.1	1,123	15.10	1.41

Notes:

mg/L - Milligrams per Liter.

mV - Millivolts.

SU - Standard units.

umhos/cm - Micromhos per centimeter.

°C - Degrees Celcius

NTU - Nephelometric Turbidity Unit.

Table 2
Summary of Field Parameter Results – April to September 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (SU)	Specific Conductivity (umhos/cm)	Temperature (°C)	Turbidity (NTU)
Downgradient (Continued)							
BCC-MW-15013	4/11/2019	0.08	-126.9	7.3	304	12.00	3.10
	9/25/2019	0.35	-209.3	8.0	400	14.80	0.76
BCC-MW-15014	4/11/2019	0.04	-263.5	11.3	373	11.80	3.60
	9/25/2019	0.32	-286.5	11.3	524	14.60	0.25
BCC-MW-15015	4/11/2019	0.05	-190.0	7.6	419	10.20	7.50
	9/26/2019	0.40	-239.0	8.4	444	13.50	0.77
BCC-MW-15016	4/11/2019	0.04	-100.6	6.4	1,552	11.20	5.60
	9/26/2019	0.28	-109.8	6.6	2,143	15.00	4.45
BCC-MW-15017	4/11/2019	0.00	-185.8	6.4	1,590	10.70	1.50
	9/26/2019	0.29	-120.8	6.6	2,391	13.80	1.75
BCC-MW-15018	4/11/2019	0.05	-133.5	6.8	628	11.40	8.90
	9/26/2019	0.34	-100.7	6.9	854	14.70	6.90
BCC-MW-15019	4/12/2019	0.06	-142.1	6.7	560	10.90	8.20
	9/26/2019	0.20	-123.7	6.9	1,031	14.20	4.75
BCC-MW-15020	4/12/2019	0.06	-120.7	6.8	487	12.10	3.70
	9/26/2019	0.26	-115.4	6.8	1,380	14.30	1.65
BCC-MW-15021	4/12/2019	0.08	-124.9	6.7	762	11.30	3.40
	9/26/2019	0.32	-125.9	6.9	1,150	13.20	7.95
BCC-MW-15022	4/12/2019	0.08	-204.1	7.7	1,475	12.30	1.40
	9/25/2019	0.15	-279.0	7.5	2,296	15.90	0.20
BCC-MW-15023	4/12/2019	0.41	-30.7	7.0	602	11.10	5.20
	9/26/2019	0.35	-128.7	7.5	770	13.00	0.65

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

Table 2

Summary of Field Parameter Results – April to September 2019

BC Cobb – RCRA CCR Monitoring Program

Muskegon, Michigan

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (SU)	Specific Conductivity (umhos/cm)	Temperature (°C)	Turbidity (NTU)
Shallow 2017 Wells (Downgradient)							
BCC-MW-17001	4/11/2019	-0.01	-312.2	6.9	661	10.40	4.10
	9/26/2019	0.28	-149.8	7.0	862	15.50	0.55
BCC-MW-17002	4/11/2019	0.00	-339.3	6.6	946	10.30	0.30
	9/26/2019	0.35	-348.5	7.3	1,206	13.80	0.18
BCC-MW-17003	4/12/2019	0.06	-227.0	7.1	410	10.50	5.00
	9/26/2019	0.24	-219.3	7.5	701	13.70	0.23
BCC-MW-17004	4/12/2019	0.05	-191.8	7.5	387	10.70	6.90
	9/26/2019	0.35	-148.9	7.6	519	14.40	0.75
BCC-MW-17005	4/12/2019	0.07	-116.6	7.5	378	10.80	6.40
	9/26/2019	0.31	-126.0	7.3	900	14.40	0.99
BCC-MW-17006	4/12/2019	0.11	-156.7	7.5	732	12.00	1.70
	9/26/2019	0.39	-209.0	7.8	975	13.20	0.95

Notes:

mg/L - Milligrams per Liter.

mV - Millivolts.

SU - Standard units.

umhos/cm - Micromhos per centimeter.

°C - Degrees Celcius

NTU - Nephelometric Turbidity Unit.

Table 3
Summary of Background Well Groundwater Sampling Results (Analytical): April 2019 - September 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

					Sample Location:	BCC-MW-15002		BCC-MW-15003		BCC-MW-15004		BCC-MW-15005		BCC-MW-15006		BCC-MW-15007		BCC-MW-15008	
					Sample Date:	4/8/2019	9/25/2019	4/8/2019	9/25/2019	4/9/2019	9/25/2019	4/9/2019	9/25/2019	4/9/2019	9/24/2019	4/9/2019	9/24/2019	4/9/2019	9/24/2019
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	Background													
Appendix III																			
Boron	ug/L	NC	500	500	7,200	420	360	390	230	120	270	56	< 50	< 50	50	90	150	230	300
Calcium	mg/L	NC	NC	NC	500	130	120	100	150	59	95	76	58	63	64	130	160	100	87
Chloride	mg/L	**250****	**250**	**250**	**500**	170	**300**	**360**	**670**	20	240	150	89	2.0	10	**790**	**1,100**	200	81
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 5,000(1)	< 2,000	< 1,000	< 1,000
Sulfate	mg/L	**250****	250	250	**500**	< 2.0	< 20	< 2.0	< 20	7.4	< 20	5.4	3.8	9.2	11	< 10	4.4	2.0	2.1
Total Dissolved Solids	mg/L	**500****	**500**	**500**	**500**	**790**	**870**	**1,100**	**1,400**	280	**730**	**640**	460	240	310	**1,900**	**2,000**	**710**	470
pH, Field	SU	6.5 - 8.5**	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	7.1	7.3	7.2	7.3	7.2	7.0	7.4	7.4	7.4	7.4	6.8	6.8	7.5	7.6
Appendix IV																			
Antimony	ug/L	6	6.0	6.0	130	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--
Arsenic	ug/L	10	10	10	10	< 1.0	< 1.0	< 1.0	< 1.0	2.2	4.7	< 1.0	3.0	3.1	8.5	1.8	5.0	1.6	1.8
Barium	ug/L	2,000	2,000	2,000	690	100	100	79	110	24	60	160	150	16	25	100	150	130	92
Beryllium	ug/L	4	4.0	4.0	14	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--
Cadmium	ug/L	5	5.0	5.0	3.1	< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--
Chromium	ug/L	100	100	100	11	< 1.0	< 1.0	1.0	< 1.0	1.0	1.0	1.1	1.3	1.1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	40	100	100	< 6.0	--	< 6.0	--	< 6.0	--	< 6.0	--	< 6.0	--	< 6.0	--	< 6.0	--
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 5,000(1)	< 2,000	< 1,000	< 1,000
Lead	ug/L	NC	4.0	4.0	35	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--
Lithium	ug/L	NC	170	350	440	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	14	17
Mercury	ug/L	2	2.0	2.0	0.20#	< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--
Molybdenum	ug/L	NC	**73**	210	3,200	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	6.0	5.8	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NC	NC	NC	0.391	0.380	0.194	< 0.267	0.149	0.383	0.131	< 0.273	< 0.173	< 0.157	< 0.177	0.198	0.217	< 0.138
Radium-228	pCi/L	NC	NC	NC	NC	< 0.481	0.760	< 0.696	1.33	< 0.588	0.705	< 0.585	< 0.461	< 0.681	< 0.533	< 0.718	< 0.569	< 0.478	< 0.546
Radium-226/228	pCi/L	5	NC	NC	NC	0.499	1.14	< 0.696	1.58	< 0.588	1.09	< 0.585	< 0.461	< 0.681	< 0.533	< 0.718	< 0.569	0.532	< 0.546
Selenium	ug/L	50	50	50	5.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.8	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	2.0	2.0	3.7	< 2.0	--	< 2.0	--	< 2.0	--	< 2.0	--	< 2.0	--	< 2.0	--	< 2.0	--

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
NC - no criteria.
-- - not analyzed.
* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.
** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using site-specific hardness of 154 mg CaCO3/L as measured at surface water sample SW-01 collected on February 22, 2018 from the North Channel Muskegon River. Chromium GSI criterion based on hexavalent chromium per footnote {H}.
# - If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.
BOLD value indicates an exceedance of one or more of the listed criteria.
RED value indicates an exceedance of the MCL.
All metals were analyzed as total unless otherwise specified.
(1) Laboratory reporting limits exceeds one or more criteria due to sample dilutions performed as a result of the nature of the sample matix.

Table 4
Summary of Groundwater Sampling Results (Analytical): April 2019 - September 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15009		BCC-MW-15010		BCC-MW-15011		BCC-MW-15012		BCC-MW-15013		BCC-MW-15014		BCC-MW-15015	
						Sample Date:	4/9/2019	9/25/2019	4/9/2019	9/24/2019	4/10/2019	9/25/2019	4/10/2019	9/25/2019	4/11/2019	9/25/2019	4/11/2019	9/25/2019	4/11/2019	9/26/2019
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^		downgradient													
Appendix III																				
Boron	ug/L	NC	**500**	**500**	**7,200**		**1,600**	**1,500**	**1,700**	**1,100**	**1,600**	**1,600**	**1,300**	**1,300**	**1,200**	**1,300**	**1,500**	**1,400**	**630**	**510**
Calcium	mg/L	NC	NC	NC	500		33	51	110	130	41	63	61	140	50	45	49	50	68	46
Chloride	mg/L	**250****	**250**	**250**	**500**		32	41	22	42	38	37	20	22	21	24	20	23	20	17
Fluoride	ug/L	4,000	NC	NC	NC		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	**250****	**250**	**250**	**500**		49	30	49	2.9	38	97	190	**540**	4.8	53	12	25	88	69
Total Dissolved Solids	mg/L	**500****	**500**	**500**	**500**		300	290	490	450	260	380	380	**850**	260	250	260	250	360	250
pH, Field	SU	**6.5 - 8.5****	**6.5 - 8.5**	**6.5 - 8.5**	**6.5 - 9.0**		**9.4**	**8.7**	7.6	7.4	**8.8**	8.4	**9.4**	**10.1**	7.3	8.0	**11.3**	**11.3**	7.6	8.4
Appendix IV																				
Antimony	ug/L	6	6.0	6.0	130		< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--
Arsenic	ug/L	10	10	10	10		3.9	2.3	< 1.0	< 1.0	9.3	< 1.0	1.4	2.3	< 1.0	< 1.0	3.8	2.6	4.3	5.7
Barium	ug/L	2,000	2,000	2,000	**690**		16	27	78	61	31	39	79	190	45	31	620	560	63	44
Beryllium	ug/L	4	4.0	4.0	14		< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--
Cadmium	ug/L	5	5.0	5.0	3.1		< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--
Chromium	ug/L	100	100	100	11		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.0	< 1.0	< 1.0	< 1.0	< 2.0
Cobalt	ug/L	NC	40	100	100		< 6.0	--	< 6.0	--	< 6.0	--	< 6.0	--	< 6.0	--	< 6.0	--	< 6.0	--
Fluoride	ug/L	4,000	NC	NC	NC		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	4.0	4.0	35		< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--
Lithium	ug/L	NC	170	350	440		21	32	41	43	18	13	12	< 10	17	13	12	23	11	< 10
Mercury	ug/L	2	2.0	2.0	0.20#		< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--
Molybdenum	ug/L	NC	**73**	210	3,200		< 5.0	< 5.0	< 5.0	< 5.0	15	< 5.0	26	**75**	5.7	9.9	**120**	**99**	11	< 10
Radium-226	pCi/L	NC	NC	NC	NC		< 0.153	0.370	< 0.185	< 0.140	0.226	0.272	< 0.142	0.241	< 0.232	< 0.201	< 0.192	< 0.185	< 0.224	< 0.165
Radium-228	pCi/L	NC	NC	NC	NC		< 0.583	< 0.551	< 0.516	< 0.578	< 0.532	0.454	< 0.485	< 0.551	< 0.450	< 0.482	< 0.538	< 0.513	< 0.518	< 0.491
Radium-226/228	pCi/L	**5**	NC	NC	NC		< 0.583	0.807	< 0.516	< 0.578	< 0.532	0.726	< 0.485	0.776	< 0.450	0.508	< 0.538	< 0.513	< 0.518	< 0.491
Selenium	ug/L	50	50	50	**5.0**		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	2.2	< 1.0	< 1.0	**5.2**	4.7	< 1.0	< 2.0
Thallium	ug/L	2	2.0	2.0	3.7		< 2.0	--	< 2.0	--	< 2.0	--	< 2.0	--	< 2.0	--	< 2.0	--	< 2.0	--

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
NC - no criteria.
-- - data pending.
* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.
** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using site-specific hardness of 154 mg CaCO3/L as measured at surface water sample SW-01 collected on February 22, 2018 from the North Channel Muskegon River. Chromium GSI criterion based on hexavalent chromium per footnote {H}.
# - If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and EGLE policy and procedure 09-014 dated June 20, 2012.
BOLD value indicates an exceedance of one or more of the listed criteria.
RED value indicates an exceedance of the MCL.
All metals were analyzed as total unless otherwise specified.

Table 4
Summary of Groundwater Sampling Results (Analytical): April 2019 - September 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15016		BCC-MW-15017		BCC-MW-15018		BCC-MW-15019		BCC-MW-15020		BCC-MW-15021		BCC-MW-15022		BCC-MW-15023	
						Sample Date:	4/11/2019	9/26/2019	4/11/2019	9/26/2019	4/11/2019	9/26/2019	4/12/2019	9/26/2019	4/12/2019	9/26/2019	4/12/2019	9/26/2019	4/12/2019	9/25/2019	4/12/2019	9/26/2019
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^		downgradient															
Appendix III																						
Boron	ug/L	NC	**500**	**500**	**7,200**		110	100	100	93	**640**	**550**	**1,600**	**1,000**	**700**	**830**	**940**	**930**	**6,800**	**10,000**	**2,600**	**1,000**
Calcium	mg/L	NC	NC	NC	500		170	160	220	220	96	94	97	100	76	110	93	92	310	300	120	100
Chloride	mg/L	**250****	**250**	**250**	**500**		190	230	210	250	59	55	39	68	45	130	110	110	19	24	16	16
Fluoride	ug/L	4,000	NC	NC	NC		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	**250****	**250**	**250**	**500**		< 2.0	< 20	< 2.0	< 20	< 2.0	< 20	< 2.0	< 20	< 2.0	2.9	< 2.0	< 20	**1,100**	**1,200**	140	130
Total Dissolved Solids	mg/L	**500****	**500**	**500**	**500**		**1,000**	**980**	**1,200**	**1,200**	480	430	430	**530**	400	**660**	**590**	**570**	**1,900**	**1,900**	**600**	490
pH, Field	SU	**6.5 - 8.5****	**6.5 - 8.5**	**6.5 - 8.5**	**6.5 - 9.0**		**6.4**	6.6	**6.4**	6.6	6.8	6.9	6.7	6.9	6.8	6.8	6.7	6.9	7.7	7.5	7.0	7.5
Appendix IV																						
Antimony	ug/L	6	6.0	6.0	130		< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--
Arsenic	ug/L	10	10	10	10		1.6	1.4	1.9	1.8	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.4	4.0	< 1.0	< 1.0
Barium	ug/L	2,000	2,000	2,000	**690**		**700**	630	**960**	**900**	150	140	110	150	120	330	250	240	190	130	100	92
Beryllium	ug/L	4	4.0	4.0	14		< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--
Cadmium	ug/L	5	5.0	5.0	3.1		< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--
Chromium	ug/L	100	100	100	11		2.3	2.4	2.9	3.4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.1	1.2	1.2	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	40	100	100		< 6.0	--	< 6.0	--	< 6.0	--	< 6.0	--	< 6.0	--	< 6.0	--	< 6.0	--	< 6.0	--
Fluoride	ug/L	4,000	NC	NC	NC		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	4.0	4.0	35		< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--
Lithium	ug/L	NC	170	350	440		< 10	< 10	< 10	< 10	24	20	22	20	15	< 10	< 8.0	< 10	23	22	31	13
Mercury	ug/L	2	2.0	2.0	0.20#		< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--
Molybdenum	ug/L	NC	**73**	210	3,200		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	5.1
Radium-226	pCi/L	NC	NC	NC	NC		1.18	1.31	1.52	1.42	0.316	0.511	0.246	0.443	0.226	0.672	0.531	0.794	< 0.182	0.261	0.181	0.209
Radium-228	pCi/L	NC	NC	NC	NC		1.76	1.97	3.93	2.75	0.598	0.846	0.548	0.651	< 0.558	1.26	0.783	0.738	< 0.470	0.617	0.771	< 0.400
Radium-226/228	pCi/L	**5**	NC	NC	NC		2.94	3.27	**5.46**	4.16	0.915	1.36	0.794	1.09	< 0.558	1.94	1.31	1.53	< 0.470	0.877	0.952	0.527
Selenium	ug/L	50	50	50	**5.0**		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	2.0	2.0	3.7		< 2.0	--	< 2.0	--	< 2.0	--	< 2.0	--	< 2.0	--	< 2.0	--	< 2.0	--	< 2.0	--

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
NC - no criteria.
-- - data pending.
* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.
** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using site-specific hardness of 154 mg CaCO3/L as measured at surface water sample SW-01 collected on February 22, 2018 from the North Channel Muskegon River. Chromium GSI criterion based on hexavalent chromium per footnote {H}.
# - If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and EGLE policy and procedure 09-014 dated June 20, 2012.
BOLD value indicates an exceedance of one or more of the listed criteria.
RED value indicates an exceedance of the MCL.
All metals were analyzed as total unless otherwise specified.

Table 4
Summary of Groundwater Sampling Results (Analytical): April 2019 - September 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-17001		BCC-MW-17002		BCC-MW-17003		BCC-MW-17004		BCC-MW-17005		BCC-MW-17006	
						Sample Date:	4/11/2019	9/26/2019	4/11/2019	9/26/2019	4/12/2019	9/26/2019	4/12/2019	9/26/2019	4/12/2019	9/26/2019	4/12/2019	9/26/2019
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^		Shallow 2017 Wells (downgradient)											
Appendix III																		
Boron	ug/L	NC	**500**	**500**	**7,200**		**1,700**	**1,800**	**9,200**	**13,000**	380	350	440	**570**	400	490	**650**	**600**
Calcium	mg/L	NC	NC	NC	500		130	120	220	200	78	82	67	66	69	120	150	130
Chloride	mg/L	**250****	**250**	**250**	**500**		31	28	15	12	17	23	19	16	15	17	19	18
Fluoride	ug/L	4,000	NC	NC	NC		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	**250****	**250**	**250**	**500**		64	17	**690**	**540**	12	37	7.8	3.1	120	65	**290**	220
Total Dissolved Solids	mg/L	**500****	**500**	**500**	**500**		**570**	490	**1,000**	**860**	360	380	330	300	380	**550**	**800**	**680**
pH, Field	SU	**6.5 - 8.5****	**6.5 - 8.5**	**6.5 - 8.5**	**6.5 - 9.0**		6.9	7.0	6.6	7.3	7.1	7.5	7.5	7.6	7.5	7.3	7.5	7.8
Appendix IV																		
Antimony	ug/L	6	6.0	6.0	130		< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--
Arsenic	ug/L	10	10	10	10		< 1.0	< 1.0	1.6	1.8	3.8	9.4	1.7	< 1.0	< 1.0	< 1.0	5.9	4.3
Barium	ug/L	2,000	2,000	2,000	**690**		82	81	130	75	83	93	150	140	84	340	120	98
Beryllium	ug/L	4	4.0	4.0	14		< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--
Cadmium	ug/L	5	5.0	5.0	3.1		< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--
Chromium	ug/L	100	100	100	11		1.3	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.1	< 1.0	1.2
Cobalt	ug/L	NC	40	100	100		< 6.0	--	< 6.0	--	< 6.0	--	< 6.0	--	< 6.0	--	< 6.0	--
Fluoride	ug/L	4,000	NC	NC	NC		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	4.0	4.0	35		< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--	< 1.0	--
Lithium	ug/L	NC	170	350	440		43	60	100	140	15	14	< 8.0	< 10	< 8.0	14	35	28
Mercury	ug/L	2	2.0	2.0	0.20#		< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--	< 0.20	--
Molybdenum	ug/L	NC	**73**	210	3,200		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NC	NC	NC		0.314	0.260	0.233	0.501	0.205	0.347	0.182	0.271	0.270	0.497	< 0.225	0.497
Radium-228	pCi/L	NC	NC	NC	NC		< 0.413	0.821	< 0.598	< 0.527	< 0.483	< 0.521	0.539	< 0.546	< 0.479	< 0.564	< 0.556	< 0.437
Radium-226/228	pCi/L	**5**	NC	NC	NC		0.721	1.08	0.688	0.702	0.539	0.676	0.721	< 0.546	0.700	0.739	< 0.556	0.819
Selenium	ug/L	50	50	50	**5.0**		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	2.0	2.0	3.7		< 2.0	--	< 2.0	--	< 2.0	--	< 2.0	--	< 2.0	--	< 2.0	--

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
NC - no criteria.
-- - data pending.
* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.
** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using site-specific hardness of 154 mg CaCO3/L as measured at surface water sample SW-01 collected on February 22, 2018 from the North Channel Muskegon River. Chromium GSI criterion based on hexavalent chromium per footnote {H}.
# - If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and EGLE policy and procedure 09-014 dated June 20, 2012.
BOLD value indicates an exceedance of one or more of the listed criteria.
RED value indicates an exceedance of the MCL.
All metals were analyzed as total unless otherwise specified.

Table 5

Summary of Groundwater Protection Standard Exceedances – April 2019

BC Cobb – RCRA CCR Monitoring Program

Muskegon, Michigan

Constituent	Units	GWPS	BCC-MW-15009		BCC-MW-15010		BCC-MW-15014		BCC-MW-15017		BCC-MW-17001		BCC-MW-17002	
			LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
Arsenic	ug/L	10	1.9	13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lithium	ug/L	40	NA	NA	21	65	NA	NA	NA	NA	43	80	92	170
Molybdenum	ug/L	100	NA	NA	NA	NA	70	130	NA	NA	NA	NA	NA	NA
Radium 226/228	pCi/L	5	NA	NA	NA	NA	NA	NA	4.7	5.7	NA	NA	NA	NA

Notes:

ug/L - micrograms per Liter.

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

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

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

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

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

Table 6

Summary of Groundwater Protection Standard Exceedances – September 2019

BC Cobb – RCRA CCR Monitoring Program

Muskegon, Michigan

Constituent	Units	GWPS	BCC-MW-15009		BCC-MW-15010		BCC-MW-15014		BCC-MW-15017		BCC-MW-17001		BCC-MW-17002	
			LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
Arsenic	ug/L	10	1.6	12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lithium	ug/L	40	NA	NA	27	59	NA	NA	NA	NA	47	75	100	160
Molybdenum	ug/L	100	NA	NA	NA	NA	77	120	NA	NA	NA	NA	NA	NA
Radium 226/228	pCi/L	5	NA	NA	NA	NA	NA	NA	4.3	5.7	NA	NA	NA	NA

Notes:

ug/L - micrograms per Liter.

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

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

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

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

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

Figures

BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

N

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

0 3,000 6,000 FEET

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

PROJECT:

CONSUMERS ENERGY COMPANY
BC COBB BOTTOM ASH POND AND PONDS 0-8 AREA
MUSKEGON, MICHIGAN

TITLE:

SITE LOCATION MAP

DRAWN BY:	M. VAPHIADIS
CHECKED BY:	B. YELEN
APPROVED BY:	S. HOLMSTROM
DATE:	JANUARY 2020
PROJ. NO.:	322176-001
FILE:	322176-001-020slm.mxd

FIGURE 1

E:\ConsumersEnergy\CCR_GW\2017_269767\322176-001-020slm.mxd -- Saved By: SMAJOR on 1/17/2020, 13:10:04 PM

LEGEND

- BACKGROUND MONITORING WELL
- DOWNGRADIENT MONITORING WELL
- NATURE AND EXTENT WELL
- APPROXIMATE POND BOUNDARY

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 9/22/2018.
2. WELL LOCATIONS SURVEYED BY WILLIAMS & WORKS ON 11/23/2015.
3. MONITORING WELLS BCC-MW-17001 THROUGH BCC-MW-17006 SURVEYED BY CONSUMERS ENERGY CO. ON 1/16/2018.
4. DEEP SCREENED WELLS (DEEP) ARE CHARACTERIZED BY WELL SCREENS SET BELOW 555 FEET MSL.

N

0 300 600 Feet

1 " = 300 '

1:3,600

PROJECT:

CONSUMERS ENERGY COMPANY
BC COBB POWER PLANT
MUSKEGON, MICHIGAN

TITLE:

SITE PLAN WITH CCR MONITORING WELL LOCATIONS

DRAWN BY:	S. MAJOR	PROJ NO.:	322176
CHECKED BY:	B. YELEN		
APPROVED BY:	S. HOLMSTROM		**FIGURE 2**
DATE:	JANUARY 2020		

TRC

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

FILE NO.: 322176-001-011.mxd

Plot Date: 1/17/2020, 13:08:14 PM by SMAJOR -- LAYOUT: ANSI B (11"x17")
Path: E:\ConsumersEnergy\CCR_GW\2017_269767\322176-001-011.mxd
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

TRC - GIS

LEGEND

- BACKGROUND MONITORING WELL
- DOWNGRADIENT MONITORING WELL
- NATURE AND EXTENT WELL
- APPROXIMATE POND BOUNDARY
- (580.85) GROUNDWATER ELEVATION (FEET, MSL)
- GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 9/22/2018.
2. WELL LOCATIONS SURVEYED BY WILLIAMS & WORKS ON 11/23/2015.
3. MONITORING WELLS BCC-MW-17001 THROUGH BCC-MW-17006 SURVEYED BY CONSUMERS ENERGY CO. ON 1/16/2018.
4. DEEP SCREENED WELLS (DEEP) ARE CHARACTERIZ ED BY WELL SCREENS SET BELOW 555 FEET MSL.
5. GROUNDWATER ELEVATION DATA RECORDED ON APRIL 8, 2019.

N

0 300 600 Feet

1 " = 300 '

1:3,600

PROJECT:
CONSUMERS ENERGY COMPANY
BC COBB POWER PLANT
MUSKEGON, MICHIGAN

TITLE:
SHALLOW GROUNDWATER CONTOUR MAP
APRIL 8, 2019

DRAWN BY:	M. VAPHIADIS	PROJ NO.:	322176
CHECKED BY:	B. YELEN		
APPROVED BY:	S. HOLMSTROM		
DATE:	JANUARY 2020		

FIGURE 3

TRC
1540 Eisenhower Place
Ann Arbor, MI 48108-3284
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FILE NO.: 322176-001-016.mxd

TRC - GIS
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0
Plot Date: 1/17/2020, 13:12:24 PM by SMAJOR -- LAYOUT: ANSI B (11"x17")
Path: E:\ConsumersEnergy\CCR_GW\2017_269767\322176-001-016.mxd

LEGEND

- BACKGROUND MONITORING WELL
- DOWNGRADIENT MONITORING WELL
- NATURE AND EXTENT WELL
- APPROXIMATE POND BOUNDARY
- (580.85) GROUNDWATER ELEVATION (FEET, MSL)

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 9/22/2018.
2. WELL LOCATIONS SURVEYED BY WILLIAMS & WORKS ON 11/23/2015.
3. MONITORING WELLS BCC-MW-17001 THROUGH BCC-MW-17006 SURVEYED BY CONSUMERS ENERGY CO. ON 1/16/2018.
4. DEEP SCREENED WELLS (DEEP) ARE CHARACTERIZED BY WELL SCREENS SET BELOW 555 FEET MSL.
5. GROUNDWATER ELEVATION DATA RECORDED ON SEPTEMBER 24, 2019, EXCEPT FOR BCC-MW-15001 RECORDED ON OCTOBER 16, 2019.

0 300 600 Feet

1 " = 300 '

1:3,600

PROJECT:
CONSUMERS ENERGY COMPANY
BC COBB POWER PLANT
MUSKEGON, MICHIGAN

TITLE:
SHALLOW GROUNDWATER CONTOUR MAP SEPTEMBER 24, 2019

DRAWN BY:	M. VAPHIADIS	PROJ NO.:	322176
CHECKED BY:	B. YELEN		
APPROVED BY:	S. HOLMSTROM		**FIGURE 4**
DATE:	JANUARY 2020		

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

FILE NO.: 322176-001-017_Figure4.mxd

Plot Date: 1/17/2020, 13:15:36 PM by SMAJOR -- LAYOUT: ANSI B (11"x17")
Path: E:\Consumers Energy\CCR_GW\2017_269767\322176-001-017_Figure4.mxd
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

Appendix A
November 2018 Assessment Monitoring Data Summary

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March 14, 2019

Michelle Marion
Environmental Services
Consumers Energy Company
1945 W. Parnall Road
Jackson, MI 49201

Subject: November 2018 Assessment Monitoring Data Summary and Statistical Evaluation, Consumers Energy, BC Cobb Site, Bottom Ash Pond & Ponds 0-8 CCR Unit

Dear Ms. Marion:

Consumers Energy Company (CEC) is continuing semiannual assessment monitoring in accordance with §257.95 of the CCR Rule[1] for the BC Cobb Power Plant (BCC) Bottom Ash Pond and Ponds 0-8 (collectively the BCC Ponds) located in Muskegon, Michigan. During the statistical evaluation of the initial assessment monitoring event, lithium was present in one or more downgradient monitoring wells at statistically significant levels exceeding the Groundwater Protection Standards (GWPSs). Therefore, CEC will initiate an Assessment of Corrective Measures (ACM) within 90 days from when the Appendix IV exceedance was determined (no later than April 14, 2019). As discussed in the *2018 Annual Groundwater Monitoring Report* (2018 Annual Report) (TRC, January 2019), prepared by TRC on behalf of CEC, the second semiannual monitoring event was conducted in November 2018, but laboratory analysis and data quality review were ongoing as of the writing of the 2018 Annual Report. Therefore, the summary of the November 2018 groundwater data would be prepared under separate cover after laboratory analysis is complete and results have been reviewed for usability. This letter report has been prepared to provide the summary of the November 2018 assessment groundwater monitoring results, data quality review, and statistical data evaluation.

Assessment Monitoring Sampling Summary

TRC conducted the second semiannual assessment monitoring event of 2018 for Appendix III and IV constituents at the BCC Ponds, in accordance with the *BC Cobb Monitoring Program Sample and Analysis Plan* (ARCADIS, 2016) (SAP). The semiannual assessment monitoring event was performed

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

on November 27 through November 30, 2018. Downgradient monitoring wells BCC-MW-15009 through BCC-MW-15023, BCC-MW-17001 through BCC-MW-17006, and background monitoring wells BCC-MW-15002 through BCC-MW-15008 were sampled during this monitoring event. The locations of the monitoring wells are depicted on Figure 1.

TRC personnel collected static water level measurements at all monitoring wells in the BCC Ponds well network. Static water elevation data are summarized in Table 1 and groundwater elevation data are shown on Figure 2. Monitoring wells were purged with peristaltic pumps utilizing low-flow sampling methodology. Field parameters were stabilized at each monitoring well prior to collecting groundwater samples. Field parameters for each monitoring well are summarized in Table 2.

The groundwater samples were analyzed by Pace Analytical Services, LLC (Pace) for Appendix III and IV constituents in accordance with the SAP. The analytical results for the background wells are summarized in Table 3, and the analytical results for the downgradient monitoring wells are summarized in Table 4.

Groundwater Flow Rate and Direction

Groundwater elevation data collected during the November 2018 assessment monitoring event is provided in Table 1. The November 2018 groundwater elevation data was used to construct the groundwater contour map (Figure 2).

Groundwater elevation data collected during the November 2018 assessment monitoring sampling event showed slight groundwater flow radially outward toward the bounding surface water features from the BCC Ponds. The average gradient observed on November 27, 2018, using well pairs BCC-MW-15012/BCC-MW-15013, BCC-MW-15012/BCC-MW-17004, and BCC-MW-15012/BCC-MW-15022, showed a horizontal gradient of approximately 0.00069 ft/ft with minimal discernible overall flow direction across the BCC Ponds. Using the average hydraulic conductivity measured at the Ponds 0-8 monitoring wells of 58 feet/day (ARCADIS, 2016), and an assumed effective porosity of 0.3, this results in groundwater flow rate of approximately 0.13 feet/day (approximately 48 feet/year).

The groundwater flow conditions observed in November 2018 were generally consistent with previous conditions where groundwater was typically encountered at a similar or slightly higher elevation relative to the surrounding surface water features, flowing outward toward the bounding surface water features. Groundwater elevation data from November 2018 continued to exhibit a low hydraulic gradient and had a slight, but discernable, flow direction compared to the previous rounds of assessment monitoring in April and June 2018 where no discernable flow direction was observed. Groundwater flow at the BCC Ponds has undergone several changes over time due to permanent discontinuation of hydraulic loading in the BCC Ponds area and the dewatering of Veteran's Pond in 2017 (as discussed in the January 2018 Annual Report). Although the overall gradient has diminished compared to pre-2018 monitoring events due to the discontinued hydraulic loading and Veteran's

Pond dewatering, general groundwater flow is still slightly outward toward the river, or equal to the river, with groundwater flowing toward the BCC Ponds from the area of the background wells, and continues to demonstrate that the downgradient wells are appropriately positioned to detect the presence of Appendix III/IV constituents that could potentially migrate from the BCC Ponds.

Data Quality

Analytical data were found to be usable for assessment monitoring. The Data Quality Review, including a summary of data non-conformances, is included as Attachment A.

Assessment Monitoring Statistical Evaluation

Following the second semiannual assessment monitoring sampling event, the compliance well groundwater concentrations for Appendix IV constituents were compared to the GWPSs to determine if a statistically significant exceedance had occurred in accordance with §257.95. Consistent with the *Unified Guidance*[2], the preferred method for comparisons to a fixed standard are confidence limits. An exceedance of the standard occurs when the 99 percent lower confidence level of the downgradient data exceeds the GWPSs. GWPSs were established in accordance with §257.95(h), as detailed in the October 15, 2018 *Groundwater Protection Standards* technical memorandum, which was also included in 2018 Annual Report.

Confidence intervals were established per the statistical methods detailed in the *Statistical Evaluation of November 2018 Assessment Monitoring Sampling Event* technical memorandum provided in Attachment B. For each Appendix IV constituent, the concentrations were first compared directly to the GWPSs. Constituent-well combinations that included a direct exceedance of the GWPSs were retained for further statistical analysis using confidence limits.

The statistical evaluation of the assessment monitoring data indicates that the following constituent is present at statistically significant levels exceeding the GWPS in downgradient monitoring wells at the BCC Ponds:

Constituent	**GWPS**	**# Downgradient Wells Observed**
Lithium	40 ug/L	2 of 21

These results are consistent with the results of the initial assessment monitoring data statistical evaluation and CEC will continue to initiate an assessment of corrective measures by April 14, 2019, per §257.95(g). CEC will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

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

Sincerely,

TRC

Graham Crockford
Program Manager

Sarah B. Holmstrom
Hydrogeologist/Project Manager

Attachments

Table 1.	Summary of Groundwater Elevation Data
Table 2.	Summary of Field Parameter Results
Table 3.	Summary of Groundwater Sampling Results (Analytical)
Table 4.	Summary of Background Well Groundwater Sampling Results (Analytical)
Table 5.	Summary of Groundwater Protection Standard Exceedances – November 2018
Figure 1.	Site Plan with CCR Monitoring Well Locations
Figure 2.	Shallow Groundwater Contour Map – November 27, 2018
Attachment A	Data Quality Reviews
Attachment B	Statistical Evaluation of November 2018 Assessment Monitoring Sampling Event

Tables

Table 1
Summary of Groundwater Elevation Data
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

Well Location	Ground Surface Elevation (ft)	TOC Elevation (ft)	Geologic Unit of Screen Interval	Screen Interval Elevation (ft)			November 27, 2018	
							Depth to Water (ft BTOC)	Groundwater Elevation (ft)
Background								
BCC-MW-15001	583.6	586.52	Sand with organic seam at 18.8 ft bgs	573.6	to	563.6	5.42	581.10
BCC-MW-15002	583.8	586.87	Sand	568.8	to	563.8	5.67	581.20
BCC-MW-15003	584.1	587.12	Sand	571.1	to	566.1	5.93	581.19
BCC-MW-15004	587.7	590.57	Sand	582.7	to	572.7	9.34	581.23
BCC-MW-15005	584.8	587.77	Sand	579.8	to	569.8	6.75	581.02
BCC-MW-15006	584.9	587.81	Sand	579.9	to	569.9	6.43	581.38
BCC-MW-15007	584.5	587.43	Sand	580.5	to	574.5	6.50	580.93
BCC-MW-15008	584.8	587.76	Sand	580.8	to	575.8	6.62	581.14
Downgradient								
BCC-MW-15009	586.3	589.27	Sand (14 - 17.2 ft bgs) and Clay/silt (17.2 - 24 ft bgs)	572.3	to	562.3	8.03	581.24
BCC-MW-15010	585.2	588.11	Sand with little silt and organic material	573.2	to	563.2	6.91	581.20
BCC-MW-15011	592.3	595.22	Sand with some silt	571.3	to	561.3	14.20	581.02
BCC-MW-15012	594.5	597.39	Sand	573.5	to	563.5	16.06	581.33
BCC-MW-15013	595.9	598.50	Sand with clay/silt and organic material from 36.5 - 37.5 ft bgs	565.9	to	555.9	17.54	580.96
BCC-MW-15014	596.2	599.04	Sand/silty sand	573.2	to	565.2	17.97	581.07
BCC-MW-15015	593.9	596.75	Sand with clay/silt and organic material from 29 - 29.5 ft bgs	573.9	to	563.9	15.97	580.78
BCC-MW-15016	586.2	589.05	Sand	551.2	to	546.2	8.39	580.66
BCC-MW-15017	585.7	588.61	Sand	550.7	to	545.7	7.84	580.77
BCC-MW-15018	589.4	592.43	Sand	551.9	to	546.9	11.68	580.75
BCC-MW-15019	589.4	592.42	Sand	552.4	to	547.4	11.73	580.69
BCC-MW-15020	589.5	592.23	Sand	554.5	to	549.5	11.42	580.81
BCC-MW-15021	590.7	593.73	Sand	551.2	to	548.2	12.75	580.98
BCC-MW-15022	592.6	595.82	Sand	568.6	to	562.6	14.57	581.25
BCC-MW-15023	585.4	588.08	Sand/silty sand	573.4	to	565.9	6.78	581.30
Shallow 2017 Wells								
BCC-MW-17001	586.1	589.29	Sand with some organic material	571.1	to	566.1	8.58	580.71
BCC-MW-17002	585.8	588.79	Sand	572.3	to	567.3	8.07	580.72
BCC-MW-17003	589.3	592.37	Sand	572.3	to	567.3	11.58	580.79
BCC-MW-17004	589.1	591.84	Sand	571.6	to	566.6	10.98	580.86
BCC-MW-17005	589.3	592.42	Sand	569.3	to	564.3	11.47	580.95
BCC-MW-17006	590.5	593.78	Sand	566.0	to	561.0	12.52	581.26

Notes:
Survey conducted by Williams & Works, November 2015, and Consumers Energy Company in January 2018.
Elevation in feet relative to North American Vertical Datum 1988 (NAVD 88).
TOC: Top of well casing.
ft BTOC: Feet below top of well casing.

Table 2

Summary of Field Parameter Results – November 2018

BC Cobb – RCRA CCR Monitoring Program

Muskegon, Michigan

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (SU)	Specific Conductivity (umhos/cm)	Temperature (°C)	Turbidity (NTU)
Background							
BCC-MW-15002	11/28/2018	0.42	61.4	7.2	1,314	11.64	0.67
BCC-MW-15003	11/28/2018	0.28	60.3	7.2	3,225	11.54	2.16
BCC-MW-15004	11/28/2018	0.40	13.8	6.8	646	11.48	0.84
BCC-MW-15005	11/27/2018	0.71	35.1	7.4	385	8.64	9.80
BCC-MW-15006	11/27/2018	2.48	22.3	7.2	446	7.38	1.62
BCC-MW-15007	11/27/2018	0.23	-12.9	6.8	2,394	10.22	2.26
BCC-MW-15008	11/27/2018	0.38	32.4	7.4	757	10.40	1.14
Downgradient							
BCC-MW-15009	11/28/2018	0.28	-34.6	9.8	516	12.73	0.94
BCC-MW-15010	11/28/2018	0.38	68.1	7.5	1,003	12.15	2.83
BCC-MW-15011	11/28/2018	0.45	55.5	8.9	332	12.22	0.71
BCC-MW-15012	11/28/2018	0.34	6.5	9.8	556	12.04	0.66
BCC-MW-15013	11/29/2018	0.89	70.6	7.0	321	11.85	0.63
BCC-MW-15014	11/29/2018	0.36	-33.7	11.5	391	10.14	2.39
BCC-MW-15015	11/29/2018	0.29	-0.4	7.8	345	10.91	0.81
BCC-MW-15016	11/29/2018	0.37	-15.5	6.6	1,607	11.50	2.41
BCC-MW-15017	11/29/2018	0.42	-55.0	6.7	1,790	11.15	0.65

Notes:

mg/L - Milligrams per Liter.

mV - Millivolts.

SU - Standard units.

umhos/cm - Micromhos per centimeter.

°C - Degrees Celcius.

NTU - Nephelometric Turbidity Unit.

Table 2

Summary of Field Parameter Results – November 2018

BC Cobb – RCRA CCR Monitoring Program

Muskegon, Michigan

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (SU)	Specific Conductivity (umhos/cm)	Temperature (°C)	Turbidity (NTU)
Downgradient (Continued)							
BCC-MW-15018	11/29/2018	0.55	-6.3	6.9	648	10.08	0.70
BCC-MW-15019	11/30/2018	1.06	-10.4	6.9	812	11.65	2.48
BCC-MW-15020	11/30/2018	1.29	3.9	6.9	710	12.10	0.54
BCC-MW-15021	11/30/2018	1.96	-16.8	6.7	1,076	12.06	1.20
BCC-MW-15022	11/27/2018	0.21	1.2	7.8	1,605	11.77	0.66
BCC-MW-15023	11/29/2018	0.81	30.9	7.5	655	10.26	0.41
Shallow 2017 Wells (Downgradient)							
BCC-MW-17001	11/29/2018	0.28	-136.2	7.3	731	11.55	0.87
BCC-MW-17002	11/29/2018	0.43	-152.8	7.0	871	12.18	0.56
BCC-MW-17003	11/29/2018	0.62	0.3	7.3	516	11.17	0.70
BCC-MW-17004	11/30/2018	1.22	41.5	7.3	783	12.19	0.41
BCC-MW-17005	11/30/2018	1.23	45.8	7.6	496	12.22	1.69
BCC-MW-17006	11/30/2018	1.35	20.2	7.7	686	11.93	0.43

Notes:

mg/L - Milligrams per Liter.

mV - Millivolts.

SU - Standard units.

umhos/cm - Micromhos per centimeter.

°C - Degrees Celcius

NTU - Nephelometric Turbidity Unit.

Table 3
Summary of Background Well Groundwater Sampling Results (Analytical): November 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

					Sample Location:	**BCC-MW-15002**	**BCC-MW-15003**	**BCC-MW-15004**	**BCC-MW-15005**	**BCC-MW-15006**	**BCC-MW-15007**	**BCC-MW-15008**
					Sample Date:	11/28/2018	11/28/2018	11/28/2018	11/27/2018	11/27/2018	11/27/2018	11/27/2018
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	Background						
Appendix III												
Boron	ug/L	NC	500	500	7,200	434	313	158	38.5	42.5	91.0	269
Calcium	mg/L	NC	NC	NC	500	103	129	69.6	55.0	74.7	109	63.1
Chloride	mg/L	**250****	**250**	**250**	**500**	161	**737**	24.0	32.0	24.4	**718**	95.2
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250**	250	250	500	< 2.0	< 2.0	9.1	2.8	11.3	44.6	3.1
Total Dissolved Solids	mg/L	**500****	**500**	**500**	**500**	**644**	**1,550**	342	244	298	**1,620**	474
pH, Field	SU	6.5 - 8.5**	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	7.2	7.2	6.8	7.4	7.2	6.8	7.4
Appendix IV												
Antimony	ug/L	6	6.0	6.0	130	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	10	10	10	< 1.0	< 5.0	2.7	< 1.0	2.3	2.0	2.3
Barium	ug/L	2,000	2,000	2,000	690	76.0	108	26.3	94.4	19.1	81.4	64.1
Beryllium	ug/L	4	4.0	4.0	14	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	5.0	5.0	3.1	< 0.20	< 1.0	< 0.20	< 0.20	< 0.20	< 1.0	< 0.20
Chromium	ug/L	100	100	100	11	< 1.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	40	100	100	< 6.0	< 30.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	4.0	4.0	35	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 5.0	< 1.0
Lithium	ug/L	NC	170	350	440	< 10	11	< 10	< 10	< 10	< 10	19
Mercury	ug/L	2	2.0	2.0	0.20#	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	73	210	3,200	< 5.0	< 25.0	< 5.0	< 5.0	< 5.0	< 25.0	< 5.0
Radium-226	pCi/L	NC	NC	NC	NC	< 0.719	< 0.862	< 0.798	< 0.890	< 0.938	< 0.858	1.12
Radium-228	pCi/L	NC	NC	NC	NC	1.10	1.13	< 0.786	1.01	0.758	1.07	< 0.533
Radium-226/228	pCi/L	5	NC	NC	NC	< 1.58	1.85	< 1.58	< 1.43	< 1.69	< 1.61	1.53
Selenium	ug/L	50	50	50	5.0	< 1.0	< 1.0	< 1.0	< 1.0	1.1	< 1.0	< 1.0
Thallium	ug/L	2	2.0	2.0	3.7	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

pCi/L - picocuries per liter.

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

NC - no criteria.

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

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

^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using site-specific hardness of 154 mg CaCO3/L as measured at surface water sample SW-01 collected on February 22, 2018 from the North Channel Muskegon River. Chromium GSI criterion based on hexavalent chromium per footnote {H}.

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

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

RED value indicates an exceedance of the MCL.

All metals were analyzed as total unless otherwise specified.

Table 4
Summary of Groundwater Sampling Results (Analytical): November 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

					Sample Location:	BCC-MW-15009	BCC-MW-15010	BCC-MW-15011	BCC-MW-15012	BCC-MW-15013	BCC-MW-15014	BCC-MW-15015	BCC-MW-15016
					Sample Date:	11/28/2018	11/28/2018	11/28/2018	11/28/2018	11/29/2018	11/29/2018	11/29/2018	11/29/2018
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	downgradient							
Appendix III													
Boron	ug/L	NC	**500**	**500**	**7,200**	**1,690**	**1,850**	**1,650**	**1,280**	**1,070**	**1,400**	**505**	80.8
Calcium	mg/L	NC	NC	NC	500	27.9	115	29.5	55.7	50.8	51.1	50.8	169
Chloride	mg/L	250**	250	250	500	51.1	39.6	26.3	21.5	21.3	20.5	17.8	201
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	**250****	**250**	**250**	**500**	19.2	48.3	21.9	137	5.9	12.4	13.2	< 2.0
Total Dissolved Solids	mg/L	**500****	**500**	**500**	**500**	454	**590**	182	302	210	224	238	**968**
pH, Field	SU	**6.5 - 8.5****	**6.5 - 8.5**	**6.5 - 8.5**	**6.5 - 9.0**	**9.8**	7.5	**8.9**	**9.8**	7.0	**11.5**	7.8	6.6
Appendix IV													
Antimony	ug/L	6	6.0	6.0	130	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	10	10	10	4.1	< 1.0	7.3	1.3	< 1.0	4.0	4.3	1.3
Barium	ug/L	2,000	2,000	2,000	**690**	10.2	68.1	18.5	51.7	39.5	604	41.0	548
Beryllium	ug/L	4	4.0	4.0	14	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	5.0	5.0	3.1	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	100	100	11	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	2.3
Cobalt	ug/L	NC	40	100	100	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	4.0	4.0	35	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	170	350	440	20	51	18	10	23	21	14	< 10
Mercury	ug/L	2	2.0	2.0	0.20#	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	**73**	210	3,200	5.2	< 5.0	13.9	28.3	5.0	**106**	7.2	< 5.0
Radium-226	pCi/L	NC	NC	NC	NC	< 0.567	< 0.820	< 0.771	0.700	< 0.696	< 1.52	< 0.677	1.75
Radium-228	pCi/L	NC	NC	NC	NC	< 0.903	< 0.805	< 0.747	< 0.992	< 0.728	< 1.73	< 1.07	2.20
Radium-226/228	pCi/L	**5**	NC	NC	NC	< 1.47	< 1.63	< 1.52	1.27	< 1.42	< 3.25	< 1.75	3.95
Selenium	ug/L	50	50	50	5.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	2.6	< 1.0	< 1.0
Thallium	ug/L	2	2.0	2.0	3.7	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

pCi/L - picocuries per liter.

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

NC - no criteria.

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

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

^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using site-specific hardness of 154 mg CaCO3/L as measured at surface water sample SW-01 collected on February 22, 2018 from the North Channel Muskegon River. Chromium GSI criterion based on hexavalent chromium per footnote {H}.

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

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

RED value indicates an exceedance of the MCL.

All metals were analyzed as total unless otherwise specified.

Table 4
Summary of Groundwater Sampling Results (Analytical): November 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

					Sample Location:	BCC-MW-15017	BCC-MW-15018	BCC-MW-15019	BCC-MW-15020	BCC-MW-15021	BCC-MW-15022	BCC-MW-15023
					Sample Date:	11/29/2018	11/29/2018	11/30/2018	11/30/2018	11/30/2018	11/27/2018	11/29/2018
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	downgradient						
Appendix III												
Boron	ug/L	NC	**500**	**500**	**7,200**	73.2	488	**1,540**	**721**	**798**	**3,840**	**1,350**
Calcium	mg/L	NC	NC	NC	500	242	101	98.2	81.5	96.6	265	116
Chloride	mg/L	250**	250	250	500	193	49.1	42.6	49.6	120	23.1	17.0
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	**250****	**250**	**250**	**500**	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	**953**	156
Total Dissolved Solids	mg/L	**500****	**500**	**500**	**500**	**1,110**	426	**556**	428	**534**	**1,670**	**530**
pH, Field	SU	**6.5 - 8.5****	**6.5 - 8.5**	**6.5 - 8.5**	**6.5 - 9.0**	6.7	6.9	6.9	6.9	6.7	7.8	7.5
Appendix IV												
Antimony	ug/L	6	6.0	6.0	130	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	10	10	10	1.8	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Barium	ug/L	2,000	2,000	2,000	**690**	**824**	127	114	119	224	242	90.4
Beryllium	ug/L	4	4.0	4.0	14	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	5.0	5.0	3.1	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	100	100	11	3.1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	40	100	100	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	4.0	4.0	35	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	170	350	440	< 10	22	26	20	< 10	25	20
Mercury	ug/L	2	2.0	2.0	0.20#	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	**73**	210	3,200	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	47.6	6.6
Radium-226	pCi/L	NC	NC	NC	NC	1.93	< 0.842	< 0.880	1.14	1.49	< 0.596	< 0.537
Radium-228	pCi/L	NC	NC	NC	NC	3.19	< 0.997	1.16	0.925	1.12	< 0.807	< 1.18
Radium-226/228	pCi/L	**5**	NC	NC	NC	**5.12**	< 1.84	< 1.77	2.07	2.61	< 1.40	< 1.72
Selenium	ug/L	50	50	50	5.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	2.0	2.0	3.7	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

Notes:

ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
NC - no criteria.
* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.
** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using site-specific hardness of 154 mg CaCO3/L as measured at surface water sample SW-01 collected on February 22, 2018 from the North Channel Muskegon River. Chromium GSI criterion based on hexavalent chromium per footnote {H}.
# - If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.
BOLD value indicates an exceedance of one or more of the listed criteria.
RED value indicates an exceedance of the MCL.
All metals were analyzed as total unless otherwise specified.

Table 4
Summary of Groundwater Sampling Results (Analytical): November 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

					Sample Location:	**BCC-MW-17001**	**BCC-MW-17002**	**BCC-MW-17003**	**BCC-MW-17004**	**BCC-MW-17005**	**BCC-MW-17006**
					Sample Date:	11/29/2018	11/29/2018	11/29/2018	11/30/2018	11/30/2018	11/30/2018
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	Shallow 2017 Wells (downgradient)					
Appendix III											
Boron	ug/L	NC	**500**	**500**	**7,200**	**1,480**	**9,030**	410	**601**	350	**630**
Calcium	mg/L	NC	NC	NC	500	135	197	88.7	116	68.1	99.8
Chloride	mg/L	250**	250	250	500	29.0	16.8	19.1	18.7	18.5	20.4
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	**250****	**250**	**250**	**500**	148	**402**	49.6	166	42.1	102
Total Dissolved Solids	mg/L	**500****	**500**	**500**	**500**	**568**	**800**	362	500	318	432
pH, Field	SU	**6.5 - 8.5****	**6.5 - 8.5**	**6.5 - 8.5**	**6.5 - 9.0**	7.3	7.0	7.3	7.3	7.6	7.7
Appendix IV											
Antimony	ug/L	6	6.0	6.0	130	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	10	10	10	< 1.0	2.0	< 1.0	2.1	< 1.0	6.6
Barium	ug/L	2,000	2,000	2,000	**690**	74.4	97.7	92.7	252	131	68.6
Beryllium	ug/L	4	4.0	4.0	14	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	5.0	5.0	3.1	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	100	100	11	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	40	100	100	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	4.0	4.0	35	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	170	350	440	64	120	19	14	11	32
Mercury	ug/L	2	2.0	2.0	0.20#	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	**73**	210	3,200	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NC	NC	NC	< 0.942	< 0.968	< 0.685	< 0.766	< 0.592	1.13
Radium-228	pCi/L	NC	NC	NC	NC	0.989	2.01	< 0.695	< 0.790	< 0.656	1.06
Radium-226/228	pCi/L	**5**	NC	NC	NC	< 1.69	2.29	< 1.38	< 1.56	< 1.25	2.19
Selenium	ug/L	50	50	50	5.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	2.0	2.0	3.7	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
NC - no criteria.
* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.
** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using site-specific hardness of 154 mg CaCO3/L as measured at surface water sample SW-01 collected on February 22, 2018 from the North Channel Muskegon River. Chromium GSI criterion based on hexavalent chromium per footnote {H}.
# - If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.
BOLD value indicates an exceedance of one or more of the listed criteria.
RED value indicates an exceedance of the MCL.
All metals were analyzed as total unless otherwise specified.

Table 5

Summary of Groundwater Protection Standard Exceedances – November 2018

BC Cobb – RCRA CCR Monitoring Program

Muskegon, Michigan

Constituent	Units	GWPS	BCC-MW-15009		BCC-MW-15010		BCC-MW-15014		BCC-MW-15017		BCC-MW-17001		BCC-MW-17002	
			LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
Arsenic	ug/L	10	1.4	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lithium	ug/L	40	NA	NA	8.9	77	NA	NA	NA	NA	55	77	99	180
Molybdenum	ug/L	100	NA	NA	NA	NA	58	130	NA	NA	NA	NA	NA	NA
Radium 226/228	pCi/L	5	NA	NA	NA	NA	NA	NA	4.4	5.8	NA	NA	NA	NA

Notes:

ug/L - micrograms per Liter.

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

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

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

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

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

Figures

LEGEND

- BACKGROUND MONITORING WELL
- DOWNGRADIENT MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- APPROXIMATE POND BOUNDARY

NOTES

1. BASE MAP IMAGERY FROM NEARMAP, 3/29/2017.
2. WELL LOCATIONS SURVEYED BY WILLIAMS & WORKS ON 11/23/2015.
3. MONITORING WELLS BCC-MW-17001 THROUGH BCC-MW-17006 SURVEYED BY CONSUMERS ENERGY CO. ON 1/16/2018.
4. DEEP SCREENED WELLS (DEEP) ARE CHARACTERIZED BY WELL SCREENS SET BELOW 555 FEET MSL.

N

0 300 600 Feet

1 " = 300 '

1:3,600

PROJECT:

CONSUMERS ENERGY COMPANY
BC COBB POWER PLANT
MUSKEGON, MICHIGAN

TITLE:

SITE PLAN
WITH CCR MONITORING WELL LOCATIONS

DRAWN BY:	S. MAJOR	PROJ NO.:	284111-001
CHECKED BY:	C. SCIESZKA		
APPROVED BY:	S. HOLMSTROM		**FIGURE 1**
DATE:	OCTOBER 2018		

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

FILE NO.: 284111-001-011.mxd

TRC - GIS
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0
Plot Date: 10/16/2018, 11:13:29 AM by SMAJOR – LAYOUT: ANSI B(11"x17")
Path: E:\ConsumersEnergy\CCR_GW\2017_269767\284111-001-011.mxd

LEGEND

- BACKGROUND MONITORING WELL
- DOWNGRADIENT MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- APPROXIMATE POND BOUNDARY
- (580.85) GROUNDWATER ELEVATION (FEET, MSL)
- GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)

NOTES

1. BASE MAP IMAGERY FROM NEARMAP, 3/29/2017.
2. WELL LOCATIONS SURVEYED BY WILLIAMS & WORKS ON 11/23/2015.
3. MONITORING WELLS BCC-MW-17001 THROUGH BCC-MW-17006 SURVEYED BY CONSUMERS ENERGY CO. ON 1/16/2018.
4. DEEP SCREENED WELLS (DEEP) ARE CHRACTERIZED BY WELL SCREENS SET BELOW 555 FEET MSL, AND WERE NOT USED TO CONSTRUCT CONTOUR MAP.

N

0 300 600 Feet

1 " = 300 '

1:3,600

PROJECT:

CONSUMERS ENERGY COMPANY
BC COBB POWER PLANT
MUSKEGON, MICHIGAN

TITLE:

SHALLOW GROUNDWATER CONTOUR MAP NOVEMBER 27, 2018

DRAWN BY:	S. MAJOR	PROJ NO.:	322176-001
CHECKED BY:	K. LOWERY		
APPROVED BY:	S. HOLMSTROM		**FIGURE 2**
DATE:	MARCH 2019		

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

FILE NO.: 284111-001-014.mxd

TRC - GIS
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0
Plot Date: 3/14/2019, 09:37:34 AM by SMAJOR -- LAYOUT: ANSI B(11"x17")
Path: E:\ConsumersEnergy\CCR_GW\2017_269767\284111-001-014.mxd

Attachment A
Data Quality Reviews

Laboratory Data Quality Review
Groundwater Monitoring Event November 2018
CEC BC Cobb

Groundwater samples were collected by TRC for the November 2018 sampling event. Samples were analyzed for anions, total dissolved solids, alkalinity, and total metals by Pace Analytical Services, LLC (Pace), located in Grand Rapids, Michigan, and/or for radium by Pace located in Greensburg, Pennsylvania. The antimony and selenium analyses were subcontracted by Pace in Grand Rapids, MI to the Pace facility in Indianapolis, Indiana. The laboratory analytical results are reported in laboratory reports 4620712, 4620713, 4620843, 4620844, 4620845, and 4620846.

During the November 2018 sampling event, a groundwater sample was collected from each of the following wells:

4620712/4620713

- BCC-MW-15002
- BCC-MW-15003
- BCC-MW-15004
- BCC-MW-15005
- BCC-MW-15006
- BCC-MW-15007
- BCC-MW-15008
- BCC-MW-15009
- BCC-MW-15010
- BCC-MW-15011
- BCC-MW-15012
- BCC-MW-15022

4620843/4620844

- BCC-MW-15013
- BCC-MW-15014
- BCC-MW-15015
- BCC-MW-15016
- BCC-MW-15017
- BCC-MW-15018
- BCC-MW-15019
- BCC-MW-15020
- BCC-MW-15021
- BCC-MW-15023

4620845/4620846

- BCC-MW-17001
- BCC-MW-17002
- BCC-MW-17003
- BCC-MW-17004
- BCC-MW-17005
- BCC-MW-17006

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

Analyte Group	Method
Anions (Fluoride, Chloride, Sulfate)	EPA 300.0
Alkalinity*	SM 2320B-11
Total Dissolved Solids	SM 2540C-11
Total Metals	SW-846 6020A, SW-846 6010C, SW-846 7470A
Radium (Radium-226, Radium-228, Total Radium)*	EPA 903.1, EPA 904.0

*Note that samples in laboratory reports 4620712 and 4620843 were not analyzed for alkalinity.

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

Data Usability Review Procedure

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

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

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

This data usability report addresses the following items:

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

Review Summary

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

- The reviewed Appendix 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:

- Sample receipt:
  - The cooler temperatures for all but one cooler in all reviewed laboratory reports were >6°C (8.2-15.4 °C); the temperature was recorded as <6°C for one of the temperature blanks in laboratory report 4620712. Further, select coolers in all reviewed laboratory reports were noted as having no ice; the laboratory could not verify which samples were in each cooler. Potential low bias exists for the positive and nondetect results for anions, alkalinity, and/or TDS in several samples, as summarized in the attached table. Concentrations were within or above the range of historical results with the following exceptions:
    - Chloride at BCC-MW-17004 was below the range of historical concentrations;
    - Chloride at BCC-MW-17005 was below the range of historical concentrations;
    - TDS and bicarbonate and total alkalinity at BCC-MW-17006 were below the range of historical concentrations; and
    - TDS at BCC-MW-15014 was below the range of historical concentrations.
  - The laboratory performing radium analysis noted that 2.5 mLs of nitric acid were added to sample BCC-MW-15017 upon receipt at the laboratory in order to meet the sample preservation requirement of pH <2. Since the sample pH was adjusted prior to analysis, there was no impact on data usability.

- A method blank was analyzed with each analytical batch. For radium, normalized absolute difference comparisons between blank and sample that are between 1.96 and 2.58 may indicate biased high results and normalized absolute differences <1.96 may indicate a false positive sample result. Target analytes were not detected in the method blanks with the following exception:
    - Radium-228 was detected in the method blank in batch 322937 at 0.758 ± 0.377 pCi/L. The positive results for radium-228 in select samples associated with this method blank were potentially impacted, as summarized in the attached table; however, radium-228 concentrations from batch 322937 samples were within the range of historical radium-228 concentrations, with the exception of BCC-MW-17006 and Dup-04 . Radium-228 at BCC-MW-17006 and DUP-04 (BCC-MW-17001) were above the range of historical results. Normalized absolute difference comparisons between blank and sample that are > 2.58 are not impacted and therefore not discussed.
- Four equipment blanks (EB-01, EB-02, EB-03, EB-04) and three field blanks (FB-01, FB-02, and FB-04) were collected. For radium, normalized absolute difference comparisons between blank and sample that are between 1.96 and 2.58 may indicate biased high results and normalized absolute differences <1.96 may indicate a false positive sample result. Normalized absolute difference comparisons between blank and sample that are > 2.58 are not impacted and therefore not discussed. Target analytes were not detected in equipment blanks and field blanks with the following exceptions:
    - Radium-228 was detected in FB-01 at 0.924 ± 0.508 pCi/L and FB-04 at 0.720 ± 0.380 pCi/L. However, the positive result for radium-228 in these samples were potentially due to method blank contamination, as summarized in the attached table. Therefore, data usability was not further affected.
    - Radium-226 was detected in EB-01 at concentration of 0.516 ± 0.362 pCi/L. The positive results for radium-226 in samples associated with this equipment blank were potentially impacted, as summarized in the attached table; however, radium-226 concentrations were within the range of historical radium-226 concentrations, with the exception of BCC-MW-15016, which was above the range of historical results.
- LCS recoveries were within laboratory control limits for all analytes.
- MS and/or MSDs were performed on the following samples:
    - BCC-MW-15022 and BCC-MW-15009 for anions, mercury, metals, radium;
    - BCC-MW-15013 for mercury;
    - BCC-MW-15015 for select metals; and
    - BCC-MW-17006 for anions, mercury, metals, alkalinity, radium.
- The MS/MSD recoveries and relative percent differences (RPDs), where applicable, were within the acceptance limits with the following exceptions:
    - The recoveries for chloride and fluoride in the MS performed on sample BCC-MW-15022 in batch 39449 were below the laboratory control limits. Potential low bias exists for the results for chloride and fluoride in this sample, as summarized in the

attached table; however, fluoride and chloride concentrations from batch 39449 were within the range of historical fluoride and chloride concentrations.

- The recoveries for sulfate in the MS/MSD performed on sample BCC-MW-15009 in batch 39508 were above the laboratory control limits. Potential high bias exists for the positive results for sulfate in the samples in this batch, as summarized in the attached table; however, sulfate concentrations from batch 39508 were within the range of historical sulfate concentrations, with the exception of BCC-MW-15007, which was above the range of historical results.
- The recoveries for selenium in the MS/MSD performed on sample BCC-MW-15009 were below the lower laboratory control limit in batch 474699. Potential low bias exists for the result for selenium in this sample, as summarized in the attached table; however, selenium concentrations were within the range of historical selenium concentrations. Note that since a second MS/MSD was performed on a project sample in this QC batch with acceptable recoveries for selenium; only the parent sample was associated with the MS/MSD nonconformances.
- The recoveries for selenium in the MS/MSD performed on sample BCC-MW-17006 were below the lower laboratory control limit in batch 474702. Potential low bias exists for the results for selenium in the samples in this batch, as summarized in the attached table; however, selenium concentrations were within the range of historical selenium concentrations.
- The MS/MSD recoveries for calcium and/or boron in the MS/MSDs performed on samples BCC-MW-15022 and BCC-MW-15009 were outside of the acceptance criteria. The calcium and boron concentrations in the parent sample, BCC-MW-15022, and the boron concentration in the parent sample, BCC-MW-15009, were >4x the spike concentration; therefore, the laboratory control limits are not applicable. Data usability is not affected.

- Laboratory duplicates were performed on the following samples:
  - BCC-MW-15022 and BCC-MW-15009 for anions, TDS;
  - BCC-MW-15015 for anions;
  - BCC-MW-15023 for TDS;
  - BCC-MW-17006 for anions, alkalinity, TDS; and
  - Dup-04 for anions.
  - RPDs were within laboratory control limits.
- The field duplicate pair samples submitted with this data set are as follows:
  - Dup-01 corresponds with BCC-MW-15008
  - Dup-02 corresponds with BCC-MW-15004
  - Dup-03 corresponds with BCC-MW-15020
  - Dup-04 corresponds with BCC-MW-17001

- RPDs between the parent and duplicate samples were within the QC limits for all analytes.

- Carrier and tracer recoveries, where applicable, were within 30-110%.
- Reporting limits for arsenic, cadmium, chromium, cobalt, and molybdenum in BCC-MW-15003 were elevated due to a 5x dilution. These are background wells and elevated reporting limits will be taken into consideration during future statistical evaluations using background data.
- Reporting limits for cadmium, lead, molybdenum, and thallium in BCC-MW-15007 were elevated due to a 5x dilution. These are background wells and elevated reporting limits will be taken into consideration during future statistical evaluations using background data.

Attachment A

Summary of Data Non-Conformances for Groundwater Analytical Data
BC Cobb - RCRA CCR Detection Monitoring Program
Muskegon, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
BCC-MW-15013_20181129	11/29/2018	Fluoride, Chloride, Sulfate, TDS	Cooler(s) was received with temperature >6°C and no ice in one or more coolers. Sample results may be biased low.
BCC-MW-15014_20181129			
BCC-MW-15015_20181129			
BCC-MW-15016_20181129			
BCC-MW-15017_20181129			
BCC-MW-15018_20181129			
BCC-MW-15023_20181129			
EB-01_20181129			
EB-02_20181129			
FB-01_20181129			
BCC-MW-15019_20181130	11/30/2018		
BCC-MW-15020_20181130			
BCC-MW-15021_20181130			
EB-03_20181130			
FB-02_20181130			
Dup-03_20181130			
BCC-MW-17001_20181129	11/29/2018	Fluoride, Chloride, Sulfate, Total Alkalinity, Bicarbonate Alkalinity, Carbonate Alkalinity, TDS	
BCC-MW-17002_20181129			
BCC-MW-17003_20181129			
Dup-04_20181129			
FB-04_20181129			
BCC-MW-17004_20181130	11/30/2018		
BCC-MW-17005_20181130			
BCC-MW-17006_20181130			
EB-04_20181130			
BCC-MW-15005_20181127	11/27/2018	Fluoride, Chloride, Sulfate, TDS	
BCC-MW-15006_20181127			
BCC-MW-15007_20181127			
BCC-MW-15008_20181127			
BCC-MW-15022_20181127			
Dup-01_20181127			
BCC-MW-15002_20181128	11/28/2018		
BCC-MW-15003_20181128			
BCC-MW-15004_20181128			
BCC-MW-15009_20181128			
BCC-MW-15010_20181128			
BCC-MW-15011_20181128			
BCC-MW-15012_20181128			
Dup-02_20181128			

Attachment A

Summary of Data Non-Conformances for Groundwater Analytical Data
BC Cobb - RCRA CCR Detection Monitoring Program
Muskegon, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
FB-01_20181129	11/29/2018	Radium-228	Detection in the method blank. Normalized absolute difference between blank and samples <1.96; indicates possible false positive results.
BCC-MW-15016_20181129	11/29/2018		
BCC-MW-17001_20181129	11/29/2018		
BCC-MW-17002_20181129	11/29/2018		
BCC-MW-17006_20181130	11/30/2018		
Dup-04_20181129	11/29/2018		
FB-04_20181129	11/29/2018		
BCC-MW-15016_20181129	11/29/2018	Radium-226	Detection in the equipment blank (EB-01). Normalized absolute difference between blank and samples <1.96; indicates possible false positive results.
BCC-MW-15017_20181129	11/29/2018		
BCC-MW-15004_20181128	11/28/2018	Sulfate	MS/MSD recoveries above the upper laboratory control limits. Sample result may be biased high.
BCC-MW-15005_20181127	11/27/2018		
BCC-MW-15006_20181127	11/27/2018		
BCC-MW-15007_20181127	11/27/2018		
BCC-MW-15008_20181127	11/27/2018		
BCC-MW-15009_20181128	11/28/2018		
BCC-MW-15010_20181128	11/28/2018		
BCC-MW-15011_20181128	11/28/2018		
BCC-MW-15012_20181128	11/28/2018		
Dup-01_20181127	11/27/2018		
Dup-02_20181128	11/28/2018		
BCC-MW-17001_20181129	11/29/2018	Selenium	MS/MSD recoveries below the lower laboratory control limits. Sample result may be biased low; however, data were within range of historical concentrations.
BCC-MW-17002_20181129	11/29/2018		
BCC-MW-17003_20181129	11/29/2018		
BCC-MW-17004_20181130	11/30/2018		
BCC-MW-17005_20181130	11/30/2018		
BCC-MW-17006_20181130	11/30/2018		
Dup-04_20181129	11/29/2018		
EB-04_20181130	11/30/2018		
FB-04_20181129	11/29/2018		
BCC-MW-15009_20181128	11/28/2018		
BCC-MW-15022_20181127	11/27/2018	Fluoride, chloride	MS recoveries below the lower laboratory control limits. Sample result may be biased low; however, data were within range of historical concentrations.

Attachment B
Statistical Evaluation of November 2018 Assessment Monitoring Sampling Event

Technical Memorandum

Date: March 14, 2019

To: Michelle Marion, CEC

cc: Brad Runkel, CEC
JR Register, CEC
Bethany Swanberg, CEC

From: Darby Litz, TRC
Sarah Holmstrom, TRC
Kristin Lowery, TRC

Project No.: 284111.0000.0000

Subject: Statistical Evaluation of November 2018 Assessment Monitoring Sampling Event
BC Cobb Bottom Ash Pond & Ponds 0-8 CCR Unit, Consumers Energy Company, Muskegon, Michigan

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During the statistical evaluation of the initial assessment monitoring event, lithium was present in one or more downgradient monitoring wells at statistically significant levels exceeding the Groundwater Protection Standards (GWPSs). Therefore, Consumers Energy Company (CEC) will initiate an Assessment of Corrective Measures (ACM) within 90 days from when the Appendix IV exceedance was determined (no later than April 14, 2019).

Currently, CEC is continuing semiannual assessment monitoring in accordance with §257.95 of the CCR Rule[1] at the BC Cobb Power Plant (BCC) Bottom Ash Pond and Ponds 0-8 (collectively the BCC Ponds). The second semiannual assessment monitoring event for 2018 was conducted on November 27 through November 30, 2018. In accordance with §257.95, the assessment monitoring data must be compared to GWPSs to determine whether or not Appendix IV constituents are detected at statistically significant levels above the GWPSs. GWPSs were established in accordance with §257.95(h), as detailed in the October 15, 2018 *Groundwater Protection Standards* technical memorandum, which was also included in the *2018 Annual Groundwater Monitoring Report* (TRC, January 2019). The following

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

narrative describes the methods employed and the results obtained and the Sanitas™ output files are included as an attachment.

The statistical evaluation of the second semiannual assessment monitoring event data indicates that the following constituent is present at statistically significant levels exceeding the GWPS in downgradient monitoring wells at the BCC Ponds:

Constituent	GWPS	# Downgradient Wells Observed
Lithium	40 ug/L	2 of 21

These results are consistent with the results of the initial assessment monitoring data statistical evaluation and CEC will continue to initiate an assessment of corrective measures per §257.95(g). CEC will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

Assessment Monitoring Statistical Evaluation

The compliance monitoring wells BCC-MW-15009 through BCC-MW-15014 encircle the BAP, while BCC-MW-15015 through BCC-MW-15023 and BCC-MW-17001 through BCC-MW-17006 are located at the outer edge of the peninsula formed by the bottom ash pond system. Because the perimeter and interior berms within the ash management area were constructed in part with ash and bodies of water surround the ash management area, wells could not be installed entirely beyond the CCR material boundary.

Following the second semiannual assessment monitoring event, compliance well data for the BCC Ponds were evaluated in accordance with the *Groundwater Statistical Evaluation Plan* (Stats Plan) (TRC, October 2017). An assessment monitoring program was developed to evaluate concentrations of CCR constituents present in the uppermost aquifer relative to acceptable levels (i.e. GWPSs). In order to decide as to whether or not the GWPSs have been exceeded, the change in concentration observed at the downgradient wells during a given assessment monitoring event must be large enough, after accounting for variability in the sample data, that the result is unlikely to have occurred merely by chance. Consistent with the Unified Guidance[2], the preferred method for comparisons to a fixed standard are confidence limits. Based on the number of historical observations in the representative sample population, the population mean, the population standard deviation, and a selected confidence level (*i.e.* 99 percent), an upper and lower confidence limit is calculated. The true concentration, with 99 percent confidence, will fall between and lower and upper confidence limits.

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

The concentrations observed in the downgradient wells are deemed to be a statistically significant exceedance when the 99 percent lower confidence limit of the downgradient data exceeds the GWPS. If the confidence interval straddles the GWPS (i.e. the lower confidence level is below the GWPS but the upper confidence level is above), the statistical test results are inconclusive and there is not compelling evidence that the measured concentration is a result of a release from the CCR unit versus the inherent variability of the sample data. This statistical approach is consistent with the statistical methods for assessment monitoring presented in §257.93(f) and (g). Statistical evaluation methodologies built into the CCR Rule, and numerous other federal rules, are key in determining whether or not individually measured data points represent a concentration increase over the baseline or a fixed standard (such as a GWPS in an assessment monitoring program).

For each detected Appendix IV constituent, the concentrations for each well were first compared directly to the GWPS, as shown on Table A1. Due to the significant operational changes that occurred within the ash management area and immediately adjacent to it during the CCR Rule baseline period, where groundwater flow rates and directions were changed drastically over relatively short periods of time, the data set used for statistical evaluation was limited to the four most recent events relative to the timeline of other factors that could be affecting observations of constituents in groundwater that are unrelated to releases from the ponds. Limiting the data set to the four most recent data points is appropriate for the BCC Ponds to allow for evaluation of groundwater quality that is representative of current conditions that excludes variability in the sample data set caused by the observed changes in site conditions that would not be indicative of a release from the BCC Ponds. Those observed changes are attributed to several possibilities including cessation of hydraulic loading in the BCC Ponds in April 2016, changes in the analytical laboratory being used, and pumping from Veteran's Memorial Pond (pumping influence observed from July 2017 through September 2017; construction completed in December 2017). These activities have the potential to influence the results of the statistical analysis by including data that may have different reporting limits or may have been biased low or high due to changing site conditions, introducing additional variability and uncertainty in the results that is inconsistent with the natural groundwater data distribution. Use of the four most recent data points relative to the timeline of other site factors is adequate in providing the minimum density of data for the statistical analysis as recommended per the Unified Guidance; therefore, no less than four data points are used to minimize bias from external influences.

For the BCC-MW-15000-series monitoring wells, the confidence interval tests included data collected between July 2017 and November 2018. For the BCC-MW-17000-series wells, the confidence interval tests included data collected between February 2018 and November 2018 (four out of the five data points accumulated since wells were installed in December 2017). Parameter-well combinations that included a direct exceedance of the GWPS during these timeframes were retained for further analysis. Arsenic in BCC-MW-15009, lithium in BCC-MW-15010, BCC-MW-17001, and BCC-MW-17002, molybdenum in BCC-MW-15014, and radium 226/228 in BCC-MW-15017 had individual results exceeding the GWPS.

Groundwater data were then evaluated utilizing Sanitas™ statistical software. Sanitas™ is a software tool that is commercially available for performing statistical evaluation consistent with procedures outlined in the Unified Guidance. Within the Sanitas™ statistical program, confidence limits were selected to perform the statistical comparison of compliance data to a fixed standard. Parametric and non-parametric confidence intervals were calculated, as appropriate, 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 Sanitas™ output files are included as an attachment.

The statistical data evaluation included the following steps:

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

The results of these evaluations are presented and discussed below.

Data from each round were evaluated for completeness, overall quality, and usability and were deemed appropriate for the purposes of the CCR assessment monitoring program. Initially, the recent baseline for the BCC-MW-15000-series monitoring wells (from July 2017 to November 2018) and for the BCC-MW-17000-series wells (February 2018 to November 2018) were observed visually for potential trends. No outliers or significant trends were identified.

The Sanitas™ software was then used to test compliance at the downgradient monitoring wells using the confidence interval method for the most recent four sampling events. The software outputs are included in Attachment 1 along with data reports showing the values used for the evaluation. The percentage of non-detect observations are also included in Attachment 1. Non-detect data was handled in accordance with the Stats Plan for the purposes of calculating the confidence intervals. The tests were run with a per-well significance of $\alpha = 0.01$.

The Sanitas™ software generates an output that includes graphs of the parametric or non-parametric confidence intervals for each well along with notes on data transformations, as appropriate. The data sets with direct exceedances of the GWPS were found to be normally distributed. The confidence interval test compares the lower confidence limit to the GWPS.

The statistical evaluation of the Appendix IV parameters shows exceedances for lithium at BCC-MW-17001 and BCC-MW-17002. The lower confidence limits for the other Appendix IV constituents statistically evaluated at BCC-MW-15009, BCC-MW-15010, BCC-MW-15014, and BCC-MW-15017 were below their respective GWPSs. These results are consistent with the results of the initial assessment monitoring data statistical evaluation and CEC will continue to initiate an assessment of corrective measures per §257.95(g). CEC will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

Although the four most recent data points are used to statistically evaluate the November 2018 data, statistical analysis using the eight most recent data points are also included in Attachment 2 for reference to compare the outcome using both approaches. Using eight data points results in the same outcome as using the four most recent data points and shows exceedances for lithium at BCC-MW-17001 and BCC-MW-17002. For the BCC-MW-15000-series monitoring wells, the confidence interval tests included data collected between July 2016 and November 2018. For the BCC-MW-17000-series wells, the confidence interval tests included data collected between December 2017 and November 2018 (only five data points are available since wells were installed in December 2017). Statistically significant decreasing trends were observed for arsenic in BCC-MW-15009 and BCC-MW-15017 (note that these trends are not present in the statistical evaluation based on the four most recent data points). Potential outliers were identified for arsenic (high values in December 2017 at BCC-MW-17002 and BCC-MW-17003) and lithium (low value in December 2017 at BCC-MW-17002).

The Dixon's Outlier Test in Sanitas™ was used to test the potential outlier in the arsenic and lithium data sets for BCC-MW-17002 and BCC-MW-17003 that were identified in the time versus concentration graphs (Attachment 2). The suspect arsenic value for BCC-MW-17002 was found to be an outlier at the 0.05 significance level. With the outlier removed, Sanitas™ found that the arsenic data at BCC-MW-17002 was normally distributed at the 0.01 significance level. The outlier data point was excluded from the confidence interval calculations. The suspect arsenic value at BCC-MW-17003 and lithium value at BCC-MW-17002 were found to not be outliers at the 0.05 significance level and were included in the confidence interval calculations that use available data up to eight data points. The data sets with direct exceedances of the GWPS were found to be normally distributed, with the exception of arsenic in BCC-MW-17003 and lithium in BCC-MW-15010. The software outputs are included in Attachment 2 along with data reports showing the values used for the evaluation.

Sincerely,

TRC

Graham Crockford
Program Manager

Sarah B. Holmstrom
Project Hydrogeologist

Attachments

Table A1.	Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to November 2018
Attachment 1	Sanitas™ Output (n=4)
Attachment 2	Sanitas™ Output (n=8)

Table

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to November 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15009											
						Sample Date:	12/1/2015	2/17/2016	4/18/2016	7/12/2016	9/28/2016	2/14/2017	4/5/2017	7/11/2017	7/11/2017	9/13/2017	4/16/2018	6/13/2018	11/28/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient								Field Dup				
Appendix III																			
Boron	ug/L	NC	NA	1,320	NA		2,380	2,520	2,170	2,070	2,190	2,110	2,190	2,210	1,690	2,120	--	1,670	1,690
Calcium	mg/L	NC	NA	259	NA		42.7	44.1	40.1	44.1	46.7	37.7	38.2	37.6	36.5	34.9	--	42.4	27.9
Chloride	mg/L	250*	NA	5,980	NA		24	24.0	27.1	26.9	24.3	22.8	24.9	26.3	26.3	26	--	95.7	51.1
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		63	39.3	49.5	55.2	49.1	31.6	39.8	43.0	47.2	41.7	--	< 2.0	19.2
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		240	230	220	220	230	200	190	216	246	188	--	456	454
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		10.6	10.8	10.3	10.0	10.0	10.2	10.1	9.6	--	10.2	9.8	9.8	9.8
Appendix IV																			
Antimony	ug/L	6	NA	1	6		1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		**45**	**31**	**24**	**24**	**20**	**14**	**13**	**12**	**10.8**	--	9.4	8.5	4.1
Barium	ug/L	2,000	NA	340	2,000		16	12	11	11	11	9	10	13.2	10.8	--	16.5	13.8	10.2
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	< 1	1	2	< 1	< 1	< 1	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	< 15.0	--	< 15.0	< 15.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		15.6	14.6	15	14	14	13	14	19	19	--	24	21	20
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		57	60	50	49	49	40	38	43.7	41.8	--	16.0	11.6	5.2
Radium-226	pCi/L	NC	NA	NA	NA		< 0.166	< 0.157	< 0.209	< 0.158	< 0.269	< 0.159	< 0.347	< 0.756	< 0.887	--	< 0.934	< 0.580	< 0.567
Radium-228	pCi/L	NC	NA	NA	NA		< 0.451	< 0.475	< 0.467	< 0.461	< 0.628	0.678	< 0.502	< 1.96	< 2.96	--	< 0.957	< 3.27	< 0.903
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.451	< 0.475	< 0.467	< 0.461	< 0.628	0.747	< 0.502	< 2.72	< 3.85	--	< 1.89	< 3.85	< 1.47
Selenium	ug/L	50	NA	3	50		< 1	< 1	2	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to November 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15010											
						Sample Date:	12/1/2015	2/17/2016	4/13/2016	7/13/2016	9/28/2016	2/14/2017	4/5/2017	7/11/2017	9/13/2017	9/13/2017	4/16/2018	6/14/2018	11/28/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient									Field Dup			
Appendix III																			
Boron	ug/L	NC	NA	1,320	NA		1,970	1,510	1,340	1,270	1,570	1,440	1,760	1,340	1,770	1,770	--	2,100	1,850
Calcium	mg/L	NC	NA	259	NA		71.2	51.9	37.4	58.2	66.4	49.8	80.5	40.7	129	133	--	133	115
Chloride	mg/L	250*	NA	5,980	NA		23	22.5	21.5	22.7	25.1	22.3	24.2	25.5	24.5	24.4	--	29.3	39.6
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		120	52.6	31.0	50.7	69.7	24.2	53.5	24.8	143	143	--	73.7	48.3
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		410	270	220	260	320	250	360	288	570	618	--	636	590
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.7	7.8	7.8	7.8	8.0	8.0	7.8	7.8	7.8	--	7.8	7.4	7.5
Appendix IV																			
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	--	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	--	< 1.0	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		49	34	28	42	45	31	51	29.2	--	--	63.4	64.8	68.1
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	--	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	--	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	< 1	2	< 1	< 1	1	< 1	< 1.0	--	--	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	--	< 15.0	< 15.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	--	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		36.1	22.7	18	15	22	14	18	21	--	--	**46**	**54**	**51**
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	--	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		33	29	27	15	20	9	7	16.2	--	--	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		< 0.302	< 0.217	< 0.244	< 0.145	< 0.297	< 0.179	< 0.216	< 0.642	--	--	< 0.869	0.661	< 0.820
Radium-228	pCi/L	NC	NA	NA	NA		0.849	< 0.502	< 0.447	0.420	0.728	< 0.363	< 0.380	< 0.956	--	--	< 0.877	< 0.978	< 0.805
Radium-226/228	pCi/L	5	NA	2.42	**5**		0.973	< 0.502	< 0.447	0.451	0.82	< 0.363	< 0.38	< 1.60	--	--	< 1.75	< 1.45	< 1.63
Selenium	ug/L	50	NA	3	50		< 1	< 1	1	1	< 1	< 1	< 1	< 1.0	--	--	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	--	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to November 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15011										
						Sample Date:	12/1/2015	2/17/2016	4/13/2016	7/12/2016	9/28/2016	2/14/2017	4/5/2017	7/11/2017	9/13/2017	4/16/2018	6/13/2018	11/28/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient											
Appendix III																		
Boron	ug/L	NC	NA	1,320	NA		1,680	1,420	1,340	1,210	1,180	1,280	1,340	1,060	1,490	--	1,630	1,650
Calcium	mg/L	NC	NA	259	NA		53	47.6	36.9	47.3	48.0	47.9	52.0	42.2	23.9	--	22.6	29.5
Chloride	mg/L	250*	NA	5,980	NA		22	20.7	22.1	24.8	21.0	19.5	22.2	22.9	24.0	--	23.2	26.3
Fluoride	ug/L	4,000	NA	1,000	NA		1,200	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		50	30.8	35.8	43.8	38.5	37.2	42.8	29.1	6.4	--	12.3	21.9
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		270	230	210	240	230	230	240	224	140	--	244	182
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		8.7	8.5	8.2	8.5	8.7	9.2	9.0	8.2	8.5	9.1	8.5	8.9
Appendix IV																		
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		5	3	3	4	6	7	8	< 1.0	--	6.4	1.5	7.3
Barium	ug/L	2,000	NA	340	2,000		36	29	25	30	31	31	32	30.7	--	15.2	16.6	18.5
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		1	< 1	2	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		1,200	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		17.2	16	14	15	16	17	17	20	--	21	11	18
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		20	29	35	26	27	25	22	21.4	--	8.9	5.8	13.9
Radium-226	pCi/L	NC	NA	NA	NA		< 0.199	< 0.141	< 0.319	< 0.166	< 0.284	< 0.160	< 0.296	< 1.12	--	< 0.742	0.350	< 0.771
Radium-228	pCi/L	NC	NA	NA	NA		0.956	< 0.447	< 0.435	< 0.402	< 0.496	< 0.394	< 0.599	< 0.954	--	< 0.872	< 0.923	< 0.747
Radium-226/228	pCi/L	5	NA	2.42	**5**		1.01	< 0.447	< 0.435	< 0.402	< 0.496	< 0.394	< 0.599	< 2.07	--	< 1.61	< 1.25	< 1.52
Selenium	ug/L	50	NA	3	50		< 1	< 1	< 1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to November 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15012										
						Sample Date:	12/1/2015	2/17/2016	4/13/2016	7/13/2016	9/29/2016	2/14/2017	4/5/2017	7/12/2017	9/13/2017	4/17/2018	6/13/2018	11/28/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient											
Appendix III																		
Boron	ug/L	NC	NA	1,320	NA		961	1,390	1,830	1,450	1,470	1,380	1,500	1,340	1,140	--	1,450	1,280
Calcium	mg/L	NC	NA	259	NA		49.5	82.1	65.5	44.5	43.5	32.0	34.9	24.6	48.7	--	95.1	55.7
Chloride	mg/L	250*	NA	5,980	NA		20	20.4	23.7	23.0	22.6	19.7	22.7	24.1	23.3	--	22.7	21.5
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,200	1,100	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		69	111	106	65.6	50.9	55.7	57.2	21.8	59.6	--	355	137
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		300	370	340	250	210	190	200	168	318	--	902	302
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		8.0	8.1	8.1	8.9	9.2	8.6	8.5	9.9	11.4	9.7	10.2	9.8
Appendix IV																		
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		< 1	2	8	**12**	9	2	3	6.1	--	1.8	3.4	1.3
Barium	ug/L	2,000	NA	340	2,000		40	63	68	34	22	25	28	14.3	--	109	105	51.7
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	< 1	1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,200	1,100	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		15.6	20.8	19	18	15	11	12	12	--	13	11	10
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		29	9	35	37	44	35	27	94.5	--	50.8	71.3	28.3
Radium-226	pCi/L	NC	NA	NA	NA		< 0.164	< 0.243	< 0.256	< 0.216	< 0.335	< 0.153	< 0.243	0.436	--	< 0.693	< 0.526	0.700
Radium-228	pCi/L	NC	NA	NA	NA		< 0.471	< 0.634	0.827	< 0.539	< 0.548	< 0.416	< 0.554	< 2.08	--	< 0.733	< 0.789	< 0.992
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.471	< 0.634	0.919	< 0.539	< 0.548	< 0.416	< 0.554	< 2.28	--	< 1.43	< 1.32	1.27
Selenium	ug/L	50	NA	3	50		< 1	< 1	< 1	< 1	< 1	< 1	< 1	1.2	--	1.2	3.3	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to November 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15013												
						Sample Date:	12/1/2015	2/18/2016	4/13/2016	7/13/2016	9/29/2016	2/14/2017	4/5/2017	7/12/2017	9/13/2017	4/17/2018	4/17/2018	6/13/2018	6/13/2018	11/29/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient													
Appendix III																	Field Dup		Field Dup	
Boron	ug/L	NC	NA	1,320	NA		1,140	1,290	1,180	1,080	1,090	1,050	1,120	916	1,270	--	--	1,130	1,100	1,070
Calcium	mg/L	NC	NA	259	NA		65.2	58.3	47.5	48.4	59.7	52.5	50.9	43.9	34.4	--	--	47.3	48.9	50.8
Chloride	mg/L	250*	NA	5,980	NA		21	20.9	21.5	21.0	22.9	19.8	19.9	23.4	21.2	--	--	21.5	21.6	21.3
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		89	44.3	34.3	27.5	31.3	23.1	15.1	8.7	59.9	--	--	8.7	7.9	5.9
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		330	290	260	250	250	260	250	240	192	--	--	324	268	210
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.6	7.2	7.4	7.3	7.4	7.7	7.4	7.4	7.9	7.6	--	7.7	--	7.0
Appendix IV																				
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		71	58	49	47	51	52	48	41.9	--	43.3	44.7	43.9	41.1	39.5
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	< 1	2	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 15.0	< 15.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		17.5	19.9	18	17	18	18	17	23	--	27	28	24	24	23
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		17	20	21	12	11	10	9	7.7	--	< 5.0	< 5.0	< 5.0	< 5.0	5.0
Radium-226	pCi/L	NC	NA	NA	NA		0.272	< 0.299	0.173	< 0.181	< 0.215	< 0.230	< 0.215	0.731	--	< 0.505	< 0.506	< 0.546	< 0.585	< 0.696
Radium-228	pCi/L	NC	NA	NA	NA		0.914	< 0.527	0.727	0.483	< 0.598	< 0.481	< 0.516	< 0.940	--	< 0.633	< 0.780	< 0.754	< 0.903	< 0.728
Radium-226/228	pCi/L	5	NA	2.42	**5**		1.19	< 0.527	0.9	0.596	< 0.598	< 0.481	< 0.516	< 1.56	--	< 1.14	< 1.29	< 1.30	< 1.49	< 1.42
Selenium	ug/L	50	NA	3	50		< 1	< 1	< 1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to November 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15014										
						Sample Date:	12/1/2015	2/18/2016	4/18/2016	7/13/2016	9/29/2016	2/14/2017	4/5/2017	7/12/2017	9/13/2017	4/17/2018	6/13/2018	11/29/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient											
Appendix III																		
Boron	ug/L	NC	NA	1,320	NA		2,560	2,230	1,840	1,630	1,690	1,530	1,560	1,300	1,410	--	1,370	1,400
Calcium	mg/L	NC	NA	259	NA		75.6	75.3	63.9	73.5	64.7	66.3	65.3	61.8	57.8	--	50.8	51.1
Chloride	mg/L	250*	NA	5,980	NA		21	21.9	21.9	22.0	22.7	18.6	22.1	22.4	22.5	--	21.3	20.5
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		43	34.7	31.4	35.6	23.7	27.8	23.9	24.9	19.2	--	2.4	12.4
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		350	310	270	290	250	280	270	292	282	--	338	224
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		11.5	11.6	11.2	11.0	11.1	11.5	11.3	11.5	12.0	11.6	11.4	11.5
Appendix IV																		
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	1.7	--	1.1	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		**15**	**11**	**11**	8	9	7	7	8.4	--	6.2	5.5	4.0
Barium	ug/L	2,000	NA	340	2,000		329	376	257	508	357	571	546	732	--	779	607	604
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	2	1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		< 10	< 10	< 10	< 10	< 10	< 10	< 10	19	--	27	16	21
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		**119**	76	58	69	81	80	77	70.9	--	94.7	100	**106**
Radium-226	pCi/L	NC	NA	NA	NA		< 0.176	< 0.175	< 0.177	0.214	< 0.218	< 0.211	< 0.289	< 0.511	--	< 1.11	< 1.17	< 1.52
Radium-228	pCi/L	NC	NA	NA	NA		1.23	< 0.735	< 0.562	< 0.606	< 0.485	0.810	< 0.423	< 1.07	--	< 0.972	< 1.85	< 1.73
Radium-226/228	pCi/L	5	NA	2.42	**5**		1.31	< 0.735	< 0.562	< 0.606	< 0.485	0.883	< 0.423	< 1.58	--	< 2.08	< 3.02	< 3.25
Selenium	ug/L	50	NA	3	50		< 1	1	< 1	< 1	< 1	1	8	2.3	--	1.2	1.2	2.6
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to November 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15015												
						Sample Date:	12/1/2015	2/18/2016	4/13/2016	7/13/2016	9/29/2016	2/14/2017	4/5/2017	7/12/2017	7/12/2017	9/13/2017	9/13/2017	4/17/2018	6/13/2018	11/29/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient													
Appendix III															Field Dup		Field Dup			
Boron	ug/L	NC	NA	1,320	NA		1,190	1,170	963	614	656	662	599	489	678	433	374	--	398	505
Calcium	mg/L	NC	NA	259	NA		32.8	33.0	30.6	36.2	40.1	38.4	37.6	29.4	32.3	36.9	38.8	--	45.0	50.8
Chloride	mg/L	250*	NA	5,980	NA		21	22.0	21.6	20.4	19.5	19.2	22.7	20.1	20.0	20.3	20.3	--	19.5	17.8
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		7.8	6.56	8.34	13.9	9.26	10.4	13.8	18.8	17.9	16.1	15.6	--	12.6	13.2
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		220	200	190	180	180	200	190	166	190	192	274	--	316	238
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.6	7.4	7.4	7.4	7.8	7.7	7.6	8.4	--	8.7	--	8.3	7.9	7.8
Appendix IV																				
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		2	2	2	6	5	5	6	6.4	7.6	--	--	4.7	5.5	4.3
Barium	ug/L	2,000	NA	340	2,000		23	22	21	25	28	30	28	30.1	33.6	--	--	39.9	37.9	41.0
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	< 1	1	1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	< 15.0	--	--	< 15.0	< 15.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		< 10	< 10	< 10	< 10	< 10	< 10	< 10	12	11	--	--	16	13	14
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		17	14	17	11	10	9	11	11.9	13.0	--	--	9.4	7.0	7.2
Radium-226	pCi/L	NC	NA	NA	NA		< 0.193	< 0.157	< 0.242	< 0.133	< 0.378	< 0.166	< 0.340	< 0.832	< 0.698	--	--	< 0.467	< 0.475	< 0.677
Radium-228	pCi/L	NC	NA	NA	NA		< 0.578	< 0.577	< 0.521	< 0.467	0.850	< 0.408	< 0.420	< 0.799	< 0.748	--	--	< 0.730	< 0.763	< 1.07
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.578	< 0.577	< 0.521	< 0.467	0.85	< 0.408	< 0.42	< 1.63	< 1.45	--	--	< 1.20	< 1.24	< 1.75
Selenium	ug/L	50	NA	3	50		< 1	< 1	< 1	1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	--	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to November 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15016										
						Sample Date:	12/1/2015	2/18/2016	4/13/2016	7/13/2016	9/29/2016	2/14/2017	4/5/2017	7/12/2017	9/13/2017	4/17/2018	6/12/2018	11/29/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient											
Appendix III																		
Boron	ug/L	NC	NA	1,320	NA		108	119	86	100	88	92	83	85.9	83	--	76.6	80.8
Calcium	mg/L	NC	NA	259	NA		172	184	164	172	181	176	172	170	182	--	168	169
Chloride	mg/L	250*	NA	5,980	NA		200	204	203	165	204	196	200	10.4	226	--	197	201
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	< 2.0	< 2.0
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		980	1,000	980	920	930	990	1,000	1,050	995	--	986	968
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		6.6	6.5	6.4	6.3	6.4	6.4	6.6	6.4	6.6	6.8	6.5	6.6
Appendix IV																		
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		2	2	3	3	2	2	2	1.5	--	1.5	1.3	1.3
Barium	ug/L	2,000	NA	340	2,000		656	647	614	619	621	666	613	596	--	649	652	548
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		2	3	3	4	3	3	3	1.9	--	2.1	2.0	2.3
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	--	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5.0	--	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		< 0.263	1.51	1.31	1.50	1.06	1.17	1.60	1.30	--	1.56	< 0.810	1.75
Radium-228	pCi/L	NC	NA	NA	NA		2.29	2.32	1.69	1.68	1.68	2.37	2.06	1.06	--	2.08	1.81	2.20
Radium-226/228	pCi/L	5	NA	2.42	**5**		2.29	3.83	3	3.18	2.74	3.54	3.66	2.36	--	3.64	2.50	3.95
Selenium	ug/L	50	NA	3	50		2	4	2	7	1	2	2	3.6	--	1.5	1.4	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to November 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15017											
						Sample Date:	12/1/2015	2/18/2016	4/18/2016	7/13/2016	9/29/2016	2/14/2017	4/5/2017	7/12/2017	9/13/2017	4/17/2018	6/12/2018	6/12/2018	11/29/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient											Field Dup	
Appendix III																			
Boron	ug/L	NC	NA	1,320	NA		59	90	66	76	78	76	75	75	82.8	--	83.8	79.0	73.2
Calcium	mg/L	NC	NA	259	NA		225	247	220	232	252	232	232	203	245	--	243	232	242
Chloride	mg/L	250*	NA	5,980	NA		200	201	184	204	182	192	187	199	224	--	224	224	193
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	< 2.0	< 2.0	< 2.0
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		850	1,100	1,200	1,100	1,100	1,200	1,100	1,230	1,130	--	1,120	1,170	1,110
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		6.5	6.4	6.4	6.4	6.4	6.6	6.5	6.4	6.5	6.8	6.5	--	6.7
Appendix IV																			
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		**13**	7	5	**12**	**12**	5	4	3	--	2.3	2.1	2.1	1.8
Barium	ug/L	2,000	NA	340	2,000		1,030	981	924	985	955	968	876	772	--	955	936	953	824
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		4	4	4	9	11	5	5	5.3	--	3.4	3.4	3.3	3.1
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 15.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	--	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5.0	--	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		1.61	2.38	2.18	1.91	1.94	1.82	1.56	1.97	--	2.23	2.13	2.87	1.93
Radium-228	pCi/L	NC	NA	NA	NA		2.69	2.97	3.50	3.98	2.50	3.15	2.78	2.78	--	2.93	3.30	2.72	3.19
Radium-226/228	pCi/L	5	NA	2.42	**5**		4.3	**5.35**	**5.68**	**5.89**	4.44	4.97	4.34	4.75	--	**5.16**	**5.43**	**5.59**	**5.12**
Selenium	ug/L	50	NA	3	50		3	4	3	8	2	2	3	2.7	--	1.7	2.4	2.5	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to November 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15018												
						Sample Date:	12/2/2015	2/18/2016	4/14/2016	7/14/2016	9/29/2016	2/14/2017	4/5/2017	7/11/2017	7/11/2017	9/13/2017	9/13/2017	4/18/2018	4/18/2018	6/12/2018	11/29/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient								Field Dup		Field Dup		Field Dup		
Appendix III																					
Boron	ug/L	NC	NA	1,320	NA		487	526	478	399	438	479	493	538	446	492	502	--	--	559	488
Calcium	mg/L	NC	NA	259	NA		88.6	100	87.9	86.8	98.5	100	92.1	84.8	81.1	90.7	89.1	--	--	87.6	101
Chloride	mg/L	250*	NA	5,980	NA		38.0	38.0	40.8	39.3	37.5	43.6	44.4	53.4	52.6	49.1	50.2	--	--	48.9	49.1
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	< 2.0	< 2.0	--	--	< 2.0	< 2.0
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		290	400	430	390	410	450	410	420	438	392	380	--	--	598	426
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.0	6.9	6.8	6.5	6.5	6.7	6.8	6.8	--	6.8	--	6.9	--	6.8	6.9
Appendix IV																					
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		1	< 1	< 1	2	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		155	149	139	133	143	171	149	153	143	--	--	139	141	156	127
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	1	1	1	1	< 1	1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	< 15.0	--	--	< 15.0	< 15.0	< 15.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		21.4	23.1	24	12	14	21	21	26	26	--	--	29	27	26	22
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5.0	< 5.0	--	--	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		0.227	0.394	0.430	0.234	0.522	0.363	< 0.314	< 0.479	< 1.02	--	--	< 0.843	0.290	< 0.756	< 0.842
Radium-228	pCi/L	NC	NA	NA	NA		< 0.586	0.778	0.649	0.845	0.803	0.996	1.08	< 0.767	< 0.950	--	--	0.869	0.622	1.39	< 0.997
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.586	1.17	1.08	1.08	1.33	1.36	1.37	< 1.25	< 1.97	--	--	1.59	0.912	1.77	< 1.84
Selenium	ug/L	50	NA	3	50		< 1	< 1	1	4	< 1	< 1	< 1	< 1.0	1	--	--	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	--	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to November 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15019										
						Sample Date:	12/2/2015	2/18/2016	4/14/2016	7/13/2016	9/30/2016	2/15/2017	4/5/2017	7/11/2017	9/13/2017	4/18/2018	6/12/2018	11/30/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient											
Appendix III																		
Boron	ug/L	NC	NA	1,320	NA		1,530	1,590	1,440	1,320	1,260	1,370	1,410	1,430	1,010	--	1,170	1,540
Calcium	mg/L	NC	NA	259	NA		84.6	93.6	83.0	90.0	92.6	91.8	92.8	90.1	107	--	97.7	98.2
Chloride	mg/L	250*	NA	5,980	NA		34	32.4	33.7	37.7	35.6	34.5	33.6	52.5	73.9	--	67.7	42.6
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	< 2.0	< 2.0
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		340	390	440	410	370	410	420	470	618	--	524	556
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.0	6.8	6.9	6.7	6.4	6.8	6.9	6.8	6.7	7.0	6.7	6.9
Appendix IV																		
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		91	94	88	88	96	93	90	109	--	161	187	114
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	< 1	1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		23.7	27.9	26	24	22	23	22	27	--	25	23	26
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5.0	--	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		0.333	0.279	0.465	0.282	0.315	0.329	< 0.36	< 0.620	--	< 0.717	< 0.594	< 0.880
Radium-228	pCi/L	NC	NA	NA	NA		< 0.484	< 0.567	0.532	< 0.718	< 0.739	1.80	0.872	< 1.02	--	< 0.742	1.36	1.16
Radium-226/228	pCi/L	5	NA	2.42	**5**		0.674	0.798	0.997	0.969	< 0.739	2.13	0.974	< 1.64	--	< 1.46	1.75	< 1.77
Selenium	ug/L	50	NA	3	50		< 1	< 1	< 1	2	< 1	< 1	< 1	1.2	--	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to November 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15020											
						Sample Date:	12/2/2015	2/18/2016	4/14/2016	7/14/2016	9/30/2016	2/15/2017	4/5/2017	7/11/2017	9/13/2017	4/18/2018	6/12/2018	6/12/2018	11/30/2018	11/30/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient													
Appendix III																		Field Dup		Field Dup
Boron	ug/L	NC	NA	1,320	NA		630	738	638	603	608	621	667	618	745	--	708	699	721	930
Calcium	mg/L	NC	NA	259	NA		61	67.6	59.1	60.7	66.5	67.0	66.6	68.1	107	--	96.3	91.6	81.5	81.7
Chloride	mg/L	250*	NA	5,980	NA		39	35.4	34.3	69.6	33.5	33.3	33.9	45.7	87.8	--	92.1	92.0	49.6	49.6
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		2.2	2.34	< 2	< 2	< 2	< 2	< 2	< 2.0	3	--	< 2.0	< 2.0	< 2.0	< 2.0
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		320	310	320	310	310	330	320	388	608	--	622	508	428	382
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.3	7.2	7.0	6.9	6.9	7.0	7.1	7.0	6.8	7.0	6.7	--	6.9	--
Appendix IV																				
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		48	52	51	47	54	53	52	60.4	--	148	197	196	119	115
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	2	< 1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		15.1	17.8	16	14	14	14	14	18	--	16	16	16	20	20
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5.0	--	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		< 0.269	< 0.240	< 0.341	< 0.190	< 0.276	< 0.294	< 0.290	< 0.761	--	0.744	< 0.899	< 0.774	1.14	< 1.06
Radium-228	pCi/L	NC	NA	NA	NA		< 0.467	0.731	0.474	< 0.598	0.682	< 0.591	0.543	< 0.627	--	0.813	1.75	1.47	0.925	1.30
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.467	0.847	0.73	< 0.598	0.724	< 0.591	0.652	< 1.39	--	1.56	2.64	2.00	2.07	1.79
Selenium	ug/L	50	NA	3	50		< 1	1	< 1	2	< 1	< 1	< 1	1.4	--	< 1.0	< 1.0	1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to November 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15021										
						Sample Date:	12/2/2015	2/18/2016	4/14/2016	7/13/2016	10/5/2016	2/15/2017	4/6/2017	7/12/2017	9/13/2017	4/18/2018	6/12/2018	11/30/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient											
Appendix III																		
Boron	ug/L	NC	NA	1,320	NA		362	489	400	425	491	465	519	519	602	--	809	798
Calcium	mg/L	NC	NA	259	NA		86.4	98.5	89.6	97.4	96.9	97.9	96.3	86.8	91.3	--	89.4	96.6
Chloride	mg/L	250*	NA	5,980	NA		88	82.7	87.2	98.3	98.9	94.6	93.9	97.0	108	--	112	120
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	< 2.0	< 2.0
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		610	540	570	590	620	570	560	548	490	--	576	534
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		6.8	6.8	6.8	6.7	6.8	6.9	6.9	6.8	6.8	7.1	6.8	6.7
Appendix IV																		
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		3	1	1	2	2	2	2	1.0	--	< 1.0	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		274	244	236	233	252	240	228	211	--	236	238	224
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	2	2	2	1	2	2	< 1.0	--	< 1.0	1.1	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	--	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5.0	--	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		0.569	0.629	0.563	0.429	0.483	0.524	< 0.215	< 0.768	--	< 0.461	< 0.689	1.49
Radium-228	pCi/L	NC	NA	NA	NA		0.984	0.782	0.846	0.871	1.52	< 0.582	< 0.354	< 0.697	--	< 1.50	1.60	1.12
Radium-226/228	pCi/L	5	NA	2.42	**5**		1.55	1.41	1.41	1.3	2	0.966	< 0.354	< 1.47	--	< 1.96	1.97	2.61
Selenium	ug/L	50	NA	3	50		1	2	1	4	< 1	< 1	1	1.6	--	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to November 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15022											
						Sample Date:	12/2/2015	2/18/2016	4/14/2016	7/14/2016	10/5/2016	2/15/2017	4/6/2017	7/12/2017	9/13/2017	4/18/2018	6/11/2018	11/27/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient											
Appendix III																		
Boron	ug/L	NC	NA	1,320	NA		250	388	387	362	391	394	434	478	833	--	1,170	3,840
Calcium	mg/L	NC	NA	259	NA		46.7	46.4	47.8	43.0	43.7	54.1	49.3	51.8	35.2	--	38.2	265
Chloride	mg/L	250*	NA	5,980	NA		25	18.7	17.6	16.8	17.1	18.2	18.6	22.1	23.3	--	21.5	23.1
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		39	38.3	29.9	34.3	32.8	34.1	32.8	45.9	44.1	--	24.1	953
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		270	210	250	250	210	250	230	254	266	--	210	1,670
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		8.3	8.5	8.2	8.2	8.1	7.8	8.1	8.4	7.6	7.8	8.3	7.8
Appendix IV																		
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	1.9	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		6	7	8	8	6	4	4	5.8	--	< 1.0	1.1	< 1.0
Barium	ug/L	2,000	NA	340	2,000		139	119	155	116	119	137	129	138	--	102	104	242
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	1	2	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	--	13	11	25
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		22	16	11	17	19	12	14	13.6	--	< 5.0	< 5.0	47.6
Radium-226	pCi/L	NC	NA	NA	NA		0.246	< 0.242	< 0.247	< 0.150	< 0.346	< 0.217	< 0.291	< 0.468	--	0.666	< 0.708	< 0.596
Radium-228	pCi/L	NC	NA	NA	NA		< 0.484	< 0.450	0.740	< 0.472	< 0.514	< 0.477	0.709	< 0.799	--	< 0.644	< 0.742	< 0.807
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.484	< 0.45	0.812	< 0.472	< 0.514	< 0.477	0.862	< 1.27	--	1.13	< 1.45	< 1.40
Selenium	ug/L	50	NA	3	50		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to November 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15023										
						Sample Date:	12/2/2015	2/18/2016	4/14/2016	7/14/2016	10/5/2016	2/15/2017	4/5/2017	7/11/2017	9/13/2017	4/18/2018	6/11/2018	11/29/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient											
Appendix III																		
Boron	ug/L	NC	NA	1,320	NA		414	284	267	308	526	484	1,590	701	504	--	1,650	1,350
Calcium	mg/L	NC	NA	259	NA		59.7	59.4	53.3	54.1	64.0	59.9	74.5	50.8	60.9	--	98.9	116
Chloride	mg/L	250*	NA	5,980	NA		30	26.9	24.6	28.7	24.8	23.8	24.6	26.8	25.5	--	19.4	17.0
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		20	26.5	28.9	25.0	24.3	21.0	22.5	22.6	36.2	--	139	156
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		240	270	270	290	290	280	300	290	408	--	474	530
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.4	7.5	7.5	7.5	7.4	7.6	7.6	7.6	7.6	7.6	7.4	7.5
Appendix IV																		
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		2	2	1	3	2	2	< 1	1.9	--	< 1.0	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		57	48	43	40	47	42	46	38.0	--	97.1	87.8	90.4
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	< 1	2	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		12.1	10.6	< 10	< 10	< 10	< 10	11	< 10	--	19	18	20
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		8	6	< 5	7	6	6	< 5	6.0	--	< 5.0	7.1	6.6
Radium-226	pCi/L	NC	NA	NA	NA		0.232	< 0.237	< 0.242	0.226	< 0.309	0.257	0.455	< 0.889	--	< 0.572	< 0.958	< 0.537
Radium-228	pCi/L	NC	NA	NA	NA		< 0.530	0.426	< 0.456	< 0.545	< 0.355	< 0.400	0.963	< 0.636	--	< 0.749	< 0.891	< 1.18
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.53	0.599	< 0.456	< 0.545	< 0.355	0.426	1.42	< 1.53	--	< 1.32	< 1.85	< 1.72
Selenium	ug/L	50	NA	3	50		< 1	< 1	< 1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to November 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-17001						BCC-MW-17002				
						Sample Date:	12/7/2017	2/20/2018	6/15/2018	8/6/2018	11/29/2018	11/29/2018	12/7/2017	2/20/2018	6/15/2018	8/6/2018	11/29/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		Shallow 2017 Wells										
Appendix III												Field Dup					
Boron	ug/L	NC	NA	1,320	NA		991	827	1,100	1,220	1,480	1,550	8,280	12,800	13,300	9,440	9,030
Calcium	mg/L	NC	NA	259	NA		118	118	124	117	135	134	178	201	224	194	197
Chloride	mg/L	250*	NA	5,980	NA		27.3	28.5	29.1	29.1	29.0	29.2	15.3	14.2	13.2	15.4	16.8
Fluoride	ug/L	4,000	NA	1,000	NA		<1,000	<1,000	<1,000	<1,000	< 1,000	< 1,000	<1,000	<1,000	<1,000	<1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		156	135	90.8	18.7	148	140	330	325	332	226	402
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		558	552	566	476	568	554	726	892	936	740	800
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.1	7.0	7.2	6.9	7.3	--	7.0	7.1	7.2	7.1	7.0
Appendix IV																	
Antimony	ug/L	6	NA	1	6		< 1.0	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0	1.5	< 1.0	< 1.0	< 2.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		5.2	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	**45.5**	2.0	2.6	3.8	2.0
Barium	ug/L	2,000	NA	340	2,000		85.6	71.3	65.8	73.8	74.4	70.6	148	76.7	62.8	57.6	97.7
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	< 15.0	< 15.0	< 15.0	< 15.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		<1,000	<1,000	<1,000	<1,000	< 1,000	< 1,000	<1,000	<1,000	<1,000	<1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		**55**	**73**	**65**	**62**	**64**	**63**	**75**	**160**	**150**	**130**	**120**
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	30.1	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		< 0.509	< 0.890	< 0.766	< 0.616	< 0.942	< 0.754	< 1.03	< 1.07	< 0.757	0.306	< 0.968
Radium-228	pCi/L	NC	NA	NA	NA		< 0.830	< 0.901	< 0.947	< 0.822	0.989	1.20	< 0.996	< 3.77	< 2.35	1.25	2.01
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 1.34	< 1.79	< 1.71	< 1.44	< 1.69	< 1.45	< 2.03	< 4.84	< 3.11	1.56	2.29
Selenium	ug/L	50	NA	3	50		< 1.0	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0	1.1	< 1.0	< 1.0	< 2.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to November 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-17003						BCC-MW-17004				
						Sample Date:	12/7/2017	2/20/2018	6/15/2018	8/7/2018	8/7/2018	11/29/2018	12/6/2017	2/20/2018	6/15/2018	8/7/2018	11/30/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		Shallow 2017 Wells										
Appendix III											Field Dup						
Boron	ug/L	NC	NA	1,320	NA		413	394	369	383	377	410	367	429	525	425	601
Calcium	mg/L	NC	NA	259	NA		74.3	55.7	63.2	74.6	76.9	88.7	53.7	48.1	73.1	68.9	116
Chloride	mg/L	250*	NA	5,980	NA		18.3	21.5	22.7	21.9	21.8	19.1	21.3	21.3	21.4	21.2	18.7
Fluoride	ug/L	4,000	NA	1,000	NA		<1,000	<1,000	<1,000	<1,000	<1,000	< 1,000	<1,000	<1,000	<1,000	<1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		48.4	< 2.0	< 2.0	17.7	25.9	49.6	< 2.0	< 2.0	8.3	< 2.0	166
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		324	330	412	326	324	362	228	238	410	320	500
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.0	7.2	7.4	7.3	--	7.3	7.2	7.3	7.4	7.3	7.3
Appendix IV																	
Antimony	ug/L	6	NA	1	6		1.1	< 1.0	< 1.0	< 2.0	< 2.0	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		**26**	< 1.0	< 1.0	1.0	1.1	< 1.0	2.5	1.8	1.1	< 1.0	2.1
Barium	ug/L	2,000	NA	340	2,000		128	78.1	66.5	77.9	83.3	92.7	145	116	175	148	252
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.2	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 6.0	< 15.0	< 15.0	< 15.0	< 15.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		<1,000	<1,000	<1,000	<1,000	<1,000	< 1,000	<1,000	<1,000	<1,000	<1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		19	17	13	18	18	19	< 10	< 10	< 10	< 10	14
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		48.8	6.3	< 5.0	< 5.0	< 5.0	< 5.0	9.9	5.9	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		< 0.889	< 0.755	< 0.594	< 0.687	0.353	< 0.685	< 0.945	< 0.723	< 0.441	< 0.519	< 0.766
Radium-228	pCi/L	NC	NA	NA	NA		< 0.663	< 0.707	< 0.828	0.932	< 0.871	< 0.695	< 0.804	< 0.719	< 0.810	1.03	< 0.790
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 1.55	< 1.46	< 1.42	< 1.49	< 1.03	< 1.38	< 1.75	< 1.44	< 1.25	< 1.46	< 1.56
Selenium	ug/L	50	NA	3	50		< 1.0	2.2	< 1.0	< 2.0	< 2.0	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to November 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-17005								BCC-MW-17006				
						Sample Date:	12/6/2017	12/6/2017	2/20/2018	2/20/2018	6/15/2018	6/15/2018	8/7/2018	11/30/2018	12/6/2017	2/20/2018	6/15/2018	8/7/2018	11/30/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		Shallow 2017 Wells												
Appendix III								Field Dup		Field Dup		Field Dup							
Boron	ug/L	NC	NA	1,320	NA		191	208	238	228	377	353	342	350	669	594	653	765	630
Calcium	mg/L	NC	NA	259	NA		51.9	54.0	54.2	53.1	71.2	71.1	68.1	68.1	106	95.0	97.5	90.4	99.8
Chloride	mg/L	250*	NA	5,980	NA		19.4	19.4	21.6	21.3	20.5	20.5	19.6	18.5	19.0	20.3	20.9	21.5	20.4
Fluoride	ug/L	4,000	NA	1,000	NA		<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	< 1,000	<1,000	<1,000	<1,000	<1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		11.5	11.00	< 2.0	< 2.0	9.6	9.0	4.3	42.1	129	93.1	69.8	46.2	102
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		262	220	310	266	358	416	318	318	474	472	478	438	432
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.3	--	7.3	--	7.4	--	7.3	7.6	7.7	7.3	7.5	7.5	7.7
Appendix IV																			
Antimony	ug/L	6	NA	1	6		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		2.9	2.8	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	4.9	2.4	4.6	< 1.0	6.6
Barium	ug/L	2,000	NA	340	2,000		168	167	123	128	161	149	179	131	83.3	79.0	70.3	73	68.6
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 6.0	< 15.0	< 15.0	< 15.0	< 15.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	< 1,000	<1,000	<1,000	<1,000	<1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		10	12	11	11	< 10	< 10	13	11	38	37	31	36	32
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		< 0.863	1.56	< 0.804	0.910	< 0.692	< 0.610	0.440	< 0.592	< 0.930	< 0.766	< 0.862	< 0.582	1.13
Radium-228	pCi/L	NC	NA	NA	NA		< 0.722	< 0.649	< 0.904	< 0.945	< 0.796	< 0.853	< 0.741	< 0.656	< 0.833	< 0.716	< 0.888	< 0.757	1.06
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 1.59	< 1.61	< 1.71	< 1.80	< 1.49	< 1.46	< 1.15	< 1.25	< 1.76	< 1.48	< 1.75	< 1.34	2.19
Selenium	ug/L	50	NA	3	50		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Attachment 1
Sanitas™ Output (n=4)

Summary Report

Constituent: Antimony, Total Analysis Run 2/18/2019 10:21 AM
Client: Consumers Energy Data: BCC_Sanitas_19.02.18

For observations made between 12/1/2015 and 11/30/2018, a summary of the selected data set:

Observations = 195
ND/Trace = 189
Wells = 21
Minimum Value = 1
Maximum Value = 2
Mean Value = 1.043
Median Value = 1
Standard Deviation = 0.1929
Coefficient of Variation = 0.185
Skewness = 4.511

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	11	10	1	1	1	1	0	0	NaN
BCC-MW-15010	11	11	1	1	1	1	0	0	NaN
BCC-MW-15011	11	11	1	1	1	1	0	0	NaN
BCC-MW-15012	11	11	1	1	1	1	0	0	NaN
BCC-MW-15013	11	11	1	1	1	1	0	0	NaN
BCC-MW-15014	11	9	1	1.7	1.073	1	0.2102	0.1959	2.749
BCC-MW-15015	11	11	1	1	1	1	0	0	NaN
BCC-MW-15016	11	11	1	1	1	1	0	0	NaN
BCC-MW-15017	11	11	1	1	1	1	0	0	NaN
BCC-MW-15018	11	11	1	1	1	1	0	0	NaN
BCC-MW-15019	11	11	1	1	1	1	0	0	NaN
BCC-MW-15020	11	11	1	1	1	1	0	0	NaN
BCC-MW-15021	11	11	1	1	1	1	0	0	NaN
BCC-MW-15022	11	10	1	1.9	1.082	1	0.2714	0.2508	2.846
BCC-MW-15023	11	11	1	1	1	1	0	0	NaN
BCC-MW-17001	5	5	1	2	1.2	1	0.4472	0.3727	1.5
BCC-MW-17002	5	4	1	2	1.3	1	0.4472	0.344	0.8437
BCC-MW-17003	5	4	1	2	1.22	1	0.4382	0.3592	1.465
BCC-MW-17004	5	5	1	2	1.2	1	0.4472	0.3727	1.5
BCC-MW-17005	5	5	1	2	1.2	1	0.4472	0.3727	1.5
BCC-MW-17006	5	5	1	2	1.2	1	0.4472	0.3727	1.5

Summary Report

Constituent: Arsenic, Total Analysis Run 2/18/2019 10:21 AM
Client: Consumers Energy Data: BCC_Sanitas_19.02.18

For observations made between 12/1/2015 and 11/30/2018, a summary of the selected data set:

Observations = 195
ND/Trace = 77
Wells = 21
Minimum Value = 1
Maximum Value = 45.5
Mean Value = 4.151
Median Value = 2
Standard Deviation = 6.28
Coefficient of Variation = 1.513
Skewness = 4.014

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	11	0	4.1	45	18.58	14	11.88	0.6395	0.9497
BCC-MW-15010	11	11	1	1	1	1	0	0	NaN
BCC-MW-15011	11	1	1	8	4.745	5	2.404	0.5066	-0.2163
BCC-MW-15012	11	1	1	12	4.509	3	3.702	0.821	0.8785
BCC-MW-15013	11	11	1	1	1	1	0	0	NaN
BCC-MW-15014	11	0	4	15	8.373	8	3.068	0.3664	0.7438
BCC-MW-15015	11	0	2	7	4.5	5	1.763	0.3918	-0.445
BCC-MW-15016	11	0	1.3	3	1.964	2	0.5887	0.2998	0.7416
BCC-MW-15017	11	0	1.8	13	6.109	5	4.283	0.701	0.6608
BCC-MW-15018	11	9	1	2	1.091	1	0.3015	0.2764	2.846
BCC-MW-15019	11	11	1	1	1	1	0	0	NaN
BCC-MW-15020	11	11	1	1	1	1	0	0	NaN
BCC-MW-15021	11	3	1	3	1.545	1	0.6876	0.4449	0.8
BCC-MW-15022	11	2	1	8	4.718	5.8	2.701	0.5726	-0.3344
BCC-MW-15023	11	4	1	3	1.627	1.9	0.6695	0.4114	0.5523
BCC-MW-17001	5	4	1	5.2	1.84	1	1.878	1.021	1.5
BCC-MW-17002	5	0	2	45.5	11.18	2.6	19.2	1.717	1.495
BCC-MW-17003	5	3	1	26	6.01	1	11.17	1.859	1.5
BCC-MW-17004	5	1	1	2.5	1.7	1.8	0.6442	0.3789	0.01882
BCC-MW-17005	5	4	1	2.85	1.37	1	0.8273	0.6039	1.5
BCC-MW-17006	5	1	1	6.6	3.9	4.6	2.205	0.5653	-0.1758

Summary Report

Constituent: Barium, Total Analysis Run 2/18/2019 10:21 AM
Client: Consumers Energy Data: BCC_Sanitas_19.02.18

For observations made between 12/1/2015 and 11/30/2018, a summary of the selected data set:

Observations = 195
ND/Trace = 0
Wells = 21
Minimum Value = 9
Maximum Value = 1030
Mean Value = 188.7
Median Value = 88
Standard Deviation = 248.7
Coefficient of Variation = 1.318
Skewness = 1.961

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	11	0	9	16.5	12.05	11	2.423	0.2012	0.8046
BCC-MW-15010	11	0	28	68.1	45.95	45	14.73	0.3206	0.2431
BCC-MW-15011	11	0	15.2	36	26.82	30	6.986	0.2605	-0.6326
BCC-MW-15012	11	0	14.3	109	50.91	40	32.43	0.637	0.7759
BCC-MW-15013	11	0	39.5	71	49.45	48	8.881	0.1796	1.308
BCC-MW-15014	11	0	257	779	515.1	546	168.2	0.3265	-0.0001905
BCC-MW-15015	11	0	21	41	29.79	28	7.151	0.2401	0.4026
BCC-MW-15016	11	0	548	666	625.5	621	33.93	0.05425	-0.967
BCC-MW-15017	11	0	772	1030	928.6	955	75.93	0.08177	-0.877
BCC-MW-15018	11	0	127	171	146.4	148	12.04	0.08229	0.3717
BCC-MW-15019	11	0	88	187	110.1	94	33.19	0.3015	1.544
BCC-MW-15020	11	0	47	196.5	79.9	53	50.87	0.6367	1.412
BCC-MW-15021	11	0	211	274	237.8	236	16.09	0.06767	0.6913
BCC-MW-15022	11	0	102	242	136.4	129	38.49	0.2823	2.007
BCC-MW-15023	11	0	38	97.1	57.85	47	22.44	0.388	0.9019
BCC-MW-17001	5	0	65.8	85.6	73.8	72.5	7.266	0.09846	0.8111
BCC-MW-17002	5	0	57.6	148	88.56	76.7	36.67	0.4141	0.92
BCC-MW-17003	5	0	66.5	128	89.18	80.6	23.61	0.2648	0.953
BCC-MW-17004	5	0	116	252	167.2	148	51.8	0.3098	0.9209
BCC-MW-17005	5	0	125.5	179	151.6	155	23.03	0.1519	-0.04331
BCC-MW-17006	5	0	68.6	83.3	74.84	73	6.161	0.08232	0.4001

Summary Report

Constituent: Beryllium, Total Analysis Run 2/18/2019 10:21 AM
Client: Consumers Energy Data: BCC_Sanitas_19.02.18

For observations made between 12/1/2015 and 11/30/2018, a summary of the selected data set:

Observations = 195
ND/Trace = 195
Wells = 21
Minimum Value = 1
Maximum Value = 1
Mean Value = 1
Median Value = 1
Standard Deviation = 0
Coefficient of Variation = 0
Skewness = NaN

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	11	11	1	1	1	1	0	0	NaN
BCC-MW-15010	11	11	1	1	1	1	0	0	NaN
BCC-MW-15011	11	11	1	1	1	1	0	0	NaN
BCC-MW-15012	11	11	1	1	1	1	0	0	NaN
BCC-MW-15013	11	11	1	1	1	1	0	0	NaN
BCC-MW-15014	11	11	1	1	1	1	0	0	NaN
BCC-MW-15015	11	11	1	1	1	1	0	0	NaN
BCC-MW-15016	11	11	1	1	1	1	0	0	NaN
BCC-MW-15017	11	11	1	1	1	1	0	0	NaN
BCC-MW-15018	11	11	1	1	1	1	0	0	NaN
BCC-MW-15019	11	11	1	1	1	1	0	0	NaN
BCC-MW-15020	11	11	1	1	1	1	0	0	NaN
BCC-MW-15021	11	11	1	1	1	1	0	0	NaN
BCC-MW-15022	11	11	1	1	1	1	0	0	NaN
BCC-MW-15023	11	11	1	1	1	1	0	0	NaN
BCC-MW-17001	5	5	1	1	1	1	0	0	NaN
BCC-MW-17002	5	5	1	1	1	1	0	0	NaN
BCC-MW-17003	5	5	1	1	1	1	0	0	NaN
BCC-MW-17004	5	5	1	1	1	1	0	0	NaN
BCC-MW-17005	5	5	1	1	1	1	0	0	NaN
BCC-MW-17006	5	5	1	1	1	1	0	0	NaN

Summary Report

Constituent: Cadmium, Total Analysis Run 2/18/2019 10:21 AM
Client: Consumers Energy Data: BCC_Sanitas_19.02.18

For observations made between 12/1/2015 and 11/30/2018, a summary of the selected data set:

Observations = 195
ND/Trace = 195
Wells = 21
Minimum Value = 0.2
Maximum Value = 0.2
Mean Value = 0.2
Median Value = 0.2
Standard Deviation = 0
Coefficient of Variation = 0
Skewness = NaN

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15010	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15011	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15012	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15013	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15014	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15015	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15016	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15017	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15018	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15019	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15020	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15021	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15022	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15023	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17001	5	5	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17002	5	5	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17003	5	5	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17004	5	5	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17005	5	5	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17006	5	5	0.2	0.2	0.2	0.2	0	0	NaN

Summary Report

Constituent: Chromium, Total Analysis Run 2/18/2019 10:21 AM
Client: Consumers Energy Data: BCC_Sanitas_19.02.18

For observations made between 12/1/2015 and 11/30/2018, a summary of the selected data set:

Observations = 195
ND/Trace = 135
Wells = 21
Minimum Value = 1
Maximum Value = 11
Mean Value = 1.399
Median Value = 1
Standard Deviation = 1.188
Coefficient of Variation = 0.8496
Skewness = 4.875

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	11	9	1	2	1.091	1	0.3015	0.2764	2.846
BCC-MW-15010	11	9	1	2	1.091	1	0.3015	0.2764	2.846
BCC-MW-15011	11	8	1	2	1.091	1	0.3015	0.2764	2.846
BCC-MW-15012	11	9	1	1	1	1	0	0	NaN
BCC-MW-15013	11	9	1	2	1.091	1	0.3015	0.2764	2.846
BCC-MW-15014	11	8	1	2	1.091	1	0.3015	0.2764	2.846
BCC-MW-15015	11	9	1	1	1	1	0	0	NaN
BCC-MW-15016	11	0	1.9	4	2.664	3	0.6531	0.2452	0.4969
BCC-MW-15017	11	0	3.1	11	5.195	4	2.521	0.4853	1.468
BCC-MW-15018	11	6	1	1	1	1	0	0	NaN
BCC-MW-15019	11	9	1	1	1	1	0	0	NaN
BCC-MW-15020	11	9	1	2	1.091	1	0.3015	0.2764	2.846
BCC-MW-15021	11	4	1	2	1.464	1.1	0.5143	0.3514	0.1735
BCC-MW-15022	11	8	1	2	1.091	1	0.3015	0.2764	2.846
BCC-MW-15023	11	9	1	2	1.091	1	0.3015	0.2764	2.846
BCC-MW-17001	5	5	1	1	1	1	0	0	NaN
BCC-MW-17002	5	5	1	1	1	1	0	0	NaN
BCC-MW-17003	5	5	1	1	1	1	0	0	NaN
BCC-MW-17004	5	4	1	1.2	1.04	1	0.08944	0.086	1.5
BCC-MW-17005	5	5	1	1	1	1	0	0	NaN
BCC-MW-17006	5	5	1	1	1	1	0	0	NaN

Summary Report

Constituent: Cobalt, Total Analysis Run 2/18/2019 10:21 AM
Client: Consumers Energy Data: BCC_Sanitas_19.02.18

For observations made between 12/1/2015 and 11/30/2018, a summary of the selected data set:

Observations = 195
ND/Trace = 195
Wells = 21
Minimum Value = 6
Maximum Value = 15
Mean Value = 14.03
Median Value = 15
Standard Deviation = 2.797
Coefficient of Variation = 0.1994
Skewness = -2.531

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	11	11	6	15	14.18	15	2.714	0.1913	-2.846
BCC-MW-15010	11	11	6	15	14.18	15	2.714	0.1913	-2.846
BCC-MW-15011	11	11	6	15	14.18	15	2.714	0.1913	-2.846
BCC-MW-15012	11	11	6	15	14.18	15	2.714	0.1913	-2.846
BCC-MW-15013	11	11	6	15	14.18	15	2.714	0.1913	-2.846
BCC-MW-15014	11	11	6	15	14.18	15	2.714	0.1913	-2.846
BCC-MW-15015	11	11	6	15	14.18	15	2.714	0.1913	-2.846
BCC-MW-15016	11	11	6	15	14.18	15	2.714	0.1913	-2.846
BCC-MW-15017	11	11	6	15	14.18	15	2.714	0.1913	-2.846
BCC-MW-15018	11	11	6	15	14.18	15	2.714	0.1913	-2.846
BCC-MW-15019	11	11	6	15	14.18	15	2.714	0.1913	-2.846
BCC-MW-15020	11	11	6	15	14.18	15	2.714	0.1913	-2.846
BCC-MW-15021	11	11	6	15	14.18	15	2.714	0.1913	-2.846
BCC-MW-15022	11	11	6	15	14.18	15	2.714	0.1913	-2.846
BCC-MW-15023	11	11	6	15	14.18	15	2.714	0.1913	-2.846
BCC-MW-17001	5	5	6	15	13.2	15	4.025	0.3049	-1.5
BCC-MW-17002	5	5	6	15	13.2	15	4.025	0.3049	-1.5
BCC-MW-17003	5	5	6	15	13.2	15	4.025	0.3049	-1.5
BCC-MW-17004	5	5	6	15	13.2	15	4.025	0.3049	-1.5
BCC-MW-17005	5	5	6	15	13.2	15	4.025	0.3049	-1.5
BCC-MW-17006	5	5	6	15	13.2	15	4.025	0.3049	-1.5

Summary Report

Constituent: Fluoride Analysis Run 2/18/2019 10:21 AM
Client: Consumers Energy Data: BCC_Sanitas_19.02.18

For observations made between 12/1/2015 and 11/30/2018, a summary of the selected data set:

Observations = 210
ND/Trace = 206
Wells = 21
Minimum Value = 1000
Maximum Value = 1200
Mean Value = 1002
Median Value = 1000
Standard Deviation = 20.61
Coefficient of Variation = 0.02056
Skewness = 8.959

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	12	12	1000	1000	1000	1000	0	0	NaN
BCC-MW-15010	12	12	1000	1000	1000	1000	0	0	NaN
BCC-MW-15011	12	10	1000	1200	1017	1000	57.74	0.05679	3.015
BCC-MW-15012	12	10	1000	1200	1025	1000	62.16	0.06064	2.224
BCC-MW-15013	12	12	1000	1000	1000	1000	0	0	NaN
BCC-MW-15014	12	12	1000	1000	1000	1000	0	0	NaN
BCC-MW-15015	12	12	1000	1000	1000	1000	0	0	NaN
BCC-MW-15016	12	12	1000	1000	1000	1000	0	0	NaN
BCC-MW-15017	12	12	1000	1000	1000	1000	0	0	NaN
BCC-MW-15018	12	12	1000	1000	1000	1000	0	0	NaN
BCC-MW-15019	12	12	1000	1000	1000	1000	0	0	NaN
BCC-MW-15020	12	12	1000	1000	1000	1000	0	0	NaN
BCC-MW-15021	12	12	1000	1000	1000	1000	0	0	NaN
BCC-MW-15022	12	12	1000	1000	1000	1000	0	0	NaN
BCC-MW-15023	12	12	1000	1000	1000	1000	0	0	NaN
BCC-MW-17001	5	5	1000	1000	1000	1000	0	0	NaN
BCC-MW-17002	5	5	1000	1000	1000	1000	0	0	NaN
BCC-MW-17003	5	5	1000	1000	1000	1000	0	0	NaN
BCC-MW-17004	5	5	1000	1000	1000	1000	0	0	NaN
BCC-MW-17005	5	5	1000	1000	1000	1000	0	0	NaN
BCC-MW-17006	5	5	1000	1000	1000	1000	0	0	NaN

Summary Report

Constituent: Lead, Total Analysis Run 2/18/2019 10:21 AM
Client: Consumers Energy Data: BCC_Sanitas_19.02.18

For observations made between 12/1/2015 and 11/30/2018, a summary of the selected data set:

Observations = 195
ND/Trace = 195
Wells = 21
Minimum Value = 1
Maximum Value = 1
Mean Value = 1
Median Value = 1
Standard Deviation = 0
Coefficient of Variation = 0
Skewness = NaN

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	11	11	1	1	1	1	0	0	NaN
BCC-MW-15010	11	11	1	1	1	1	0	0	NaN
BCC-MW-15011	11	11	1	1	1	1	0	0	NaN
BCC-MW-15012	11	11	1	1	1	1	0	0	NaN
BCC-MW-15013	11	11	1	1	1	1	0	0	NaN
BCC-MW-15014	11	11	1	1	1	1	0	0	NaN
BCC-MW-15015	11	11	1	1	1	1	0	0	NaN
BCC-MW-15016	11	11	1	1	1	1	0	0	NaN
BCC-MW-15017	11	11	1	1	1	1	0	0	NaN
BCC-MW-15018	11	11	1	1	1	1	0	0	NaN
BCC-MW-15019	11	11	1	1	1	1	0	0	NaN
BCC-MW-15020	11	11	1	1	1	1	0	0	NaN
BCC-MW-15021	11	11	1	1	1	1	0	0	NaN
BCC-MW-15022	11	11	1	1	1	1	0	0	NaN
BCC-MW-15023	11	11	1	1	1	1	0	0	NaN
BCC-MW-17001	5	5	1	1	1	1	0	0	NaN
BCC-MW-17002	5	5	1	1	1	1	0	0	NaN
BCC-MW-17003	5	5	1	1	1	1	0	0	NaN
BCC-MW-17004	5	5	1	1	1	1	0	0	NaN
BCC-MW-17005	5	5	1	1	1	1	0	0	NaN
BCC-MW-17006	5	5	1	1	1	1	0	0	NaN

Summary Report

Constituent: Lithium, Total Analysis Run 2/18/2019 10:21 AM
Client: Consumers Energy Data: BCC_Sanitas_19.02.18

For observations made between 12/1/2015 and 11/30/2018, a summary of the selected data set:

Observations = 195
ND/Trace = 65
Wells = 21
Minimum Value = 10
Maximum Value = 160
Mean Value = 20.25
Median Value = 14
Standard Deviation = 20.93
Coefficient of Variation = 1.033
Skewness = 4.425

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	11	0	13	24	16.75	15	3.633	0.217	0.8166
BCC-MW-15010	11	0	14	54	28.89	22	15.05	0.5208	0.6896
BCC-MW-15011	11	0	11	21	16.56	17	2.738	0.1653	-0.3168
BCC-MW-15012	11	0	10	20.8	14.31	13	3.643	0.2546	0.5423
BCC-MW-15013	11	0	17	27.5	20.26	18	3.546	0.175	0.8152
BCC-MW-15014	11	7	10	27	13.91	10	5.991	0.4307	1.133
BCC-MW-15015	11	7	10	16	11.32	10	2.101	0.1856	1.251
BCC-MW-15016	11	11	10	10	10	10	0	0	NaN
BCC-MW-15017	11	11	10	10	10	10	0	0	NaN
BCC-MW-15018	11	0	12	28	21.68	22	4.883	0.2252	-0.8403
BCC-MW-15019	11	0	22	27.9	24.51	24	2.011	0.08206	0.2845
BCC-MW-15020	11	0	14	20	15.9	16	1.998	0.1257	0.7502
BCC-MW-15021	11	11	10	10	10	10	0	0	NaN
BCC-MW-15022	11	8	10	25	11.73	10	4.496	0.3834	2.652
BCC-MW-15023	11	5	10	20	12.79	10.6	4.063	0.3177	0.9852
BCC-MW-17001	5	0	55	73	63.7	63.5	6.458	0.1014	0.1486
BCC-MW-17002	5	0	75	160	127	130	33.09	0.2606	-0.716
BCC-MW-17003	5	0	13	19	17.2	18	2.49	0.1448	-1.121
BCC-MW-17004	5	4	10	14	10.8	10	1.789	0.1656	1.5
BCC-MW-17005	5	1	10	13	11.2	11	1.095	0.09781	0.8675
BCC-MW-17006	5	0	31	38	34.8	36	3.114	0.0895	-0.2931

Summary Report

Constituent: Mercury, Total Analysis Run 2/18/2019 10:21 AM
Client: Consumers Energy Data: BCC_Sanitas_19.02.18

For observations made between 12/1/2015 and 11/30/2018, a summary of the selected data set:

Observations = 195
ND/Trace = 195
Wells = 21
Minimum Value = 0.2
Maximum Value = 0.2
Mean Value = 0.2
Median Value = 0.2
Standard Deviation = 0
Coefficient of Variation = 0
Skewness = NaN

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15010	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15011	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15012	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15013	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15014	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15015	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15016	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15017	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15018	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15019	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15020	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15021	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15022	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15023	11	11	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17001	5	5	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17002	5	5	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17003	5	5	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17004	5	5	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17005	5	5	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17006	5	5	0.2	0.2	0.2	0.2	0	0	NaN

Summary Report

Constituent: Molybdenum, Total Analysis Run 2/18/2019 10:21 AM
Client: Consumers Energy Data: BCC_Sanitas_19.02.18

For observations made between 12/1/2015 and 11/30/2018, a summary of the selected data set:

Observations = 195
ND/Trace = 101
Wells = 21
Minimum Value = 5
Maximum Value = 119
Mean Value = 16.77
Median Value = 5
Standard Deviation = 22.11
Coefficient of Variation = 1.319
Skewness = 2.411

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	11	0	5.2	60	38.05	42.75	18.75	0.4927	-0.6822
BCC-MW-15010	11	3	5	33	15.56	15	10.43	0.6699	0.4501
BCC-MW-15011	11	0	5.8	35	21.27	22	8.753	0.4115	-0.4077
BCC-MW-15012	11	0	9	94.5	41.9	35	23.43	0.5592	1.038
BCC-MW-15013	11	2	5	21	11.15	10	5.845	0.524	0.575
BCC-MW-15014	11	0	58	119	84.69	80	18.12	0.214	0.4913
BCC-MW-15015	11	0	7	17	11.37	11	3.458	0.3042	0.5005
BCC-MW-15016	11	11	5	5	5	5	0	0	NaN
BCC-MW-15017	11	11	5	5	5	5	0	0	NaN
BCC-MW-15018	11	11	5	5	5	5	0	0	NaN
BCC-MW-15019	11	11	5	5	5	5	0	0	NaN
BCC-MW-15020	11	11	5	5	5	5	0	0	NaN
BCC-MW-15021	11	11	5	5	5	5	0	0	NaN
BCC-MW-15022	11	2	5	47.6	16.56	14	11.55	0.6973	1.816
BCC-MW-15023	11	3	5	8	6.155	6	0.9647	0.1568	0.3727
BCC-MW-17001	5	5	5	5	5	5	0	0	NaN
BCC-MW-17002	5	4	5	30.1	10.02	5	11.23	1.12	1.5
BCC-MW-17003	5	3	5	48.8	14.02	5	19.45	1.387	1.497
BCC-MW-17004	5	3	5	9.9	6.16	5	2.127	0.3452	1.384
BCC-MW-17005	5	5	5	5	5	5	0	0	NaN
BCC-MW-17006	5	5	5	5	5	5	0	0	NaN

Summary Report

Constituent: Radium-226 Analysis Run 2/18/2019 10:21 AM
Client: Consumers Energy Data: BCC_Sanitas_19.02.18

For observations made between 12/1/2015 and 11/30/2018, a summary of the selected data set:

Observations = 195
ND/Trace = 133
Wells = 21
Minimum Value = 0.133
Maximum Value = 2.5
Mean Value = 0.6269
Median Value = 0.509
Standard Deviation = 0.4873
Coefficient of Variation = 0.7772
Skewness = 1.578

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	11	11	0.157	0.934	0.403	0.269	0.2949	0.7317	0.8417
BCC-MW-15010	11	10	0.145	0.869	0.4175	0.297	0.273	0.654	0.6418
BCC-MW-15011	11	10	0.141	1.12	0.4135	0.296	0.32	0.774	1.176
BCC-MW-15012	11	9	0.153	0.7	0.3605	0.256	0.2002	0.5553	0.7451
BCC-MW-15013	11	8	0.173	0.731	0.373	0.272	0.214	0.5738	0.6862
BCC-MW-15014	11	10	0.175	1.52	0.5246	0.218	0.4959	0.9452	1.054
BCC-MW-15015	11	11	0.133	0.832	0.3691	0.34	0.228	0.6178	0.813
BCC-MW-15016	11	2	0.263	1.75	1.258	1.31	0.426	0.3387	-1.172
BCC-MW-15017	11	0	1.56	2.5	2.003	1.94	0.2958	0.1477	0.1582
BCC-MW-15018	11	4	0.227	1.02	0.5153	0.43	0.2588	0.5023	0.7085
BCC-MW-15019	11	5	0.279	0.88	0.4704	0.36	0.2034	0.4324	0.8077
BCC-MW-15020	11	9	0.19	1.1	0.4913	0.294	0.3202	0.6517	0.7852
BCC-MW-15021	11	4	0.215	1.49	0.62	0.563	0.323	0.521	1.808
BCC-MW-15022	11	9	0.15	0.708	0.3797	0.291	0.1967	0.5181	0.6217
BCC-MW-15023	11	7	0.226	0.958	0.4467	0.309	0.2677	0.5992	0.9565
BCC-MW-17001	5	5	0.509	0.942	0.7446	0.766	0.1821	0.2445	-0.2051
BCC-MW-17002	5	4	0.306	1.07	0.8262	0.968	0.3148	0.3811	-1.033
BCC-MW-17003	5	4	0.52	0.889	0.6886	0.685	0.1431	0.2079	0.2575
BCC-MW-17004	5	5	0.441	0.945	0.6788	0.723	0.2016	0.2969	0.07117
BCC-MW-17005	5	2	0.44	1.211	0.7585	0.692	0.2952	0.3891	0.6162
BCC-MW-17006	5	4	0.582	1.13	0.854	0.862	0.2023	0.2369	0.02224

Summary Report

Constituent: Radium-226/228 Analysis Run 2/18/2019 10:21 AM
Client: Consumers Energy Data: BCC_Sanitas_19.02.18

For observations made between 12/1/2015 and 11/30/2018, a summary of the selected data set:

Observations = 195
ND/Trace = 121
Wells = 21
Minimum Value = 0.354
Maximum Value = 5.89
Mean Value = 1.544
Median Value = 1.34
Standard Deviation = 1.198
Coefficient of Variation = 0.7761
Skewness = 1.716

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	11	10	0.451	3.85	1.345	0.628	1.325	0.9853	1.249
BCC-MW-15010	11	8	0.363	1.75	0.9424	0.82	0.5625	0.5969	0.3344
BCC-MW-15011	11	10	0.394	2.07	0.9303	0.599	0.5968	0.6415	0.6803
BCC-MW-15012	11	9	0.416	2.28	0.9437	0.634	0.578	0.6125	1.151
BCC-MW-15013	11	8	0.481	1.56	0.9607	0.9	0.4354	0.4532	0.1674
BCC-MW-15014	11	9	0.423	3.25	1.358	0.883	1.018	0.7499	0.8947
BCC-MW-15015	11	10	0.408	1.75	0.8765	0.578	0.4969	0.5669	0.6937
BCC-MW-15016	11	0	2.29	3.95	3.154	3.18	0.6109	0.1937	-0.1751
BCC-MW-15017	11	0	4.3	5.89	5.046	5.12	0.5437	0.1077	-0.02171
BCC-MW-15018	11	3	0.586	1.97	1.346	1.33	0.3967	0.2947	-0.07327
BCC-MW-15019	11	4	0.674	2.13	1.264	0.997	0.5005	0.3961	0.3648
BCC-MW-15020	11	4	0.467	2.32	1.074	0.73	0.6261	0.5832	0.8968
BCC-MW-15021	11	3	0.354	2.61	1.545	1.47	0.5958	0.3855	-0.2271
BCC-MW-15022	11	8	0.45	1.45	0.8474	0.812	0.401	0.4732	0.3811
BCC-MW-15023	11	8	0.355	1.85	0.9774	0.599	0.5852	0.5988	0.3113
BCC-MW-17001	5	5	1.34	1.79	1.594	1.69	0.1932	0.1212	-0.39
BCC-MW-17002	5	3	1.56	4.84	2.766	2.29	1.289	0.4659	0.8753
BCC-MW-17003	5	5	1.38	1.55	1.46	1.46	0.06519	0.04465	0.1816
BCC-MW-17004	5	5	1.25	1.75	1.492	1.46	0.1827	0.1224	0.1441
BCC-MW-17005	5	5	1.15	1.8	1.46	1.49	0.2642	0.181	0.05538
BCC-MW-17006	5	4	1.34	2.19	1.704	1.75	0.3256	0.1911	0.4501

Summary Report

Constituent: Radium-228 Analysis Run 2/18/2019 10:21 AM
Client: Consumers Energy Data: BCC_Sanitas_19.02.18

For observations made between 12/1/2015 and 11/30/2018, a summary of the selected data set:

Observations = 195
ND/Trace = 124
Wells = 21
Minimum Value = 0.354
Maximum Value = 3.98
Mean Value = 1.02
Median Value = 0.79
Standard Deviation = 0.7268
Coefficient of Variation = 0.7129
Skewness = 2.018

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	11	10	0.451	3.27	1.068	0.628	1.029	0.9635	1.56
BCC-MW-15010	11	8	0.363	0.978	0.6641	0.728	0.2432	0.3662	-0.03221
BCC-MW-15011	11	10	0.394	0.956	0.6568	0.599	0.2365	0.3601	0.1853
BCC-MW-15012	11	10	0.416	2.08	0.7803	0.634	0.4639	0.5945	2.192
BCC-MW-15013	11	8	0.481	0.94	0.6906	0.727	0.1791	0.2593	0.1529
BCC-MW-15014	11	9	0.423	1.85	0.9521	0.81	0.4838	0.5081	0.791
BCC-MW-15015	11	10	0.408	1.07	0.653	0.578	0.2073	0.3175	0.5663
BCC-MW-15016	11	0	1.06	2.37	1.931	2.06	0.3926	0.2033	-0.8545
BCC-MW-15017	11	0	2.5	3.98	3.044	2.97	0.4119	0.1353	1.016
BCC-MW-15018	11	3	0.586	1.39	0.8927	0.845	0.2249	0.2519	0.7667
BCC-MW-15019	11	6	0.484	1.8	0.9085	0.742	0.4009	0.4412	1.028
BCC-MW-15020	11	4	0.467	1.61	0.7499	0.627	0.338	0.4508	1.689
BCC-MW-15021	11	4	0.354	1.6	0.9869	0.871	0.408	0.4134	0.2503
BCC-MW-15022	11	9	0.45	0.807	0.6216	0.644	0.1434	0.2307	0.02636
BCC-MW-15023	11	9	0.355	1.18	0.6483	0.545	0.2664	0.4109	0.7515
BCC-MW-17001	5	4	0.822	1.095	0.9189	0.901	0.1109	0.1207	0.7815
BCC-MW-17002	5	3	0.996	3.77	2.075	2.01	1.095	0.5278	0.6532
BCC-MW-17003	5	4	0.663	0.9015	0.7589	0.707	0.1013	0.1335	0.5228
BCC-MW-17004	5	4	0.719	1.03	0.8306	0.804	0.1173	0.1412	1.117
BCC-MW-17005	5	5	0.656	0.945	0.7834	0.741	0.1148	0.1466	0.4026
BCC-MW-17006	5	4	0.716	1.06	0.8508	0.833	0.1346	0.1582	0.6798

Summary Report

Constituent: Selenium, Total Analysis Run 2/18/2019 10:21 AM
Client: Consumers Energy Data: BCC_Sanitas_19.02.18

For observations made between 12/1/2015 and 11/30/2018, a summary of the selected data set:

Observations = 195
ND/Trace = 141
Wells = 21
Minimum Value = 1
Maximum Value = 8
Mean Value = 1.358
Median Value = 1
Standard Deviation = 1.009
Coefficient of Variation = 0.7426
Skewness = 4.41

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	11	10	1	2	1.091	1	0.3015	0.2764	2.846
BCC-MW-15010	11	9	1	1	1	1	0	0	NaN
BCC-MW-15011	11	10	1	1	1	1	0	0	NaN
BCC-MW-15012	11	8	1	3.3	1.245	1	0.6861	0.5509	2.778
BCC-MW-15013	11	10	1	1	1	1	0	0	NaN
BCC-MW-15014	11	4	1	8	1.936	1	2.09	1.079	2.499
BCC-MW-15015	11	10	1	1	1	1	0	0	NaN
BCC-MW-15016	11	1	1	7	2.5	2	1.773	0.709	1.624
BCC-MW-15017	11	1	1	8	2.986	2.7	1.846	0.6182	1.917
BCC-MW-15018	11	8	1	4	1.273	1	0.9045	0.7107	2.846
BCC-MW-15019	11	9	1	2	1.109	1	0.3015	0.2719	2.664
BCC-MW-15020	11	7	1	2	1.127	1	0.3133	0.278	2.272
BCC-MW-15021	11	5	1	4	1.418	1	0.9185	0.6477	2.278
BCC-MW-15022	11	11	1	1	1	1	0	0	NaN
BCC-MW-15023	11	10	1	1	1	1	0	0	NaN
BCC-MW-17001	5	5	1	2	1.2	1	0.4472	0.3727	1.5
BCC-MW-17002	5	4	1	2	1.22	1	0.4382	0.3592	1.465
BCC-MW-17003	5	4	1	2.2	1.44	1	0.6066	0.4213	0.4495
BCC-MW-17004	5	5	1	2	1.2	1	0.4472	0.3727	1.5
BCC-MW-17005	5	5	1	2	1.2	1	0.4472	0.3727	1.5
BCC-MW-17006	5	5	1	2	1.2	1	0.4472	0.3727	1.5

Summary Report

Constituent: Thallium, Total Analysis Run 2/18/2019 10:21 AM
Client: Consumers Energy Data: BCC_Sanitas_19.02.18

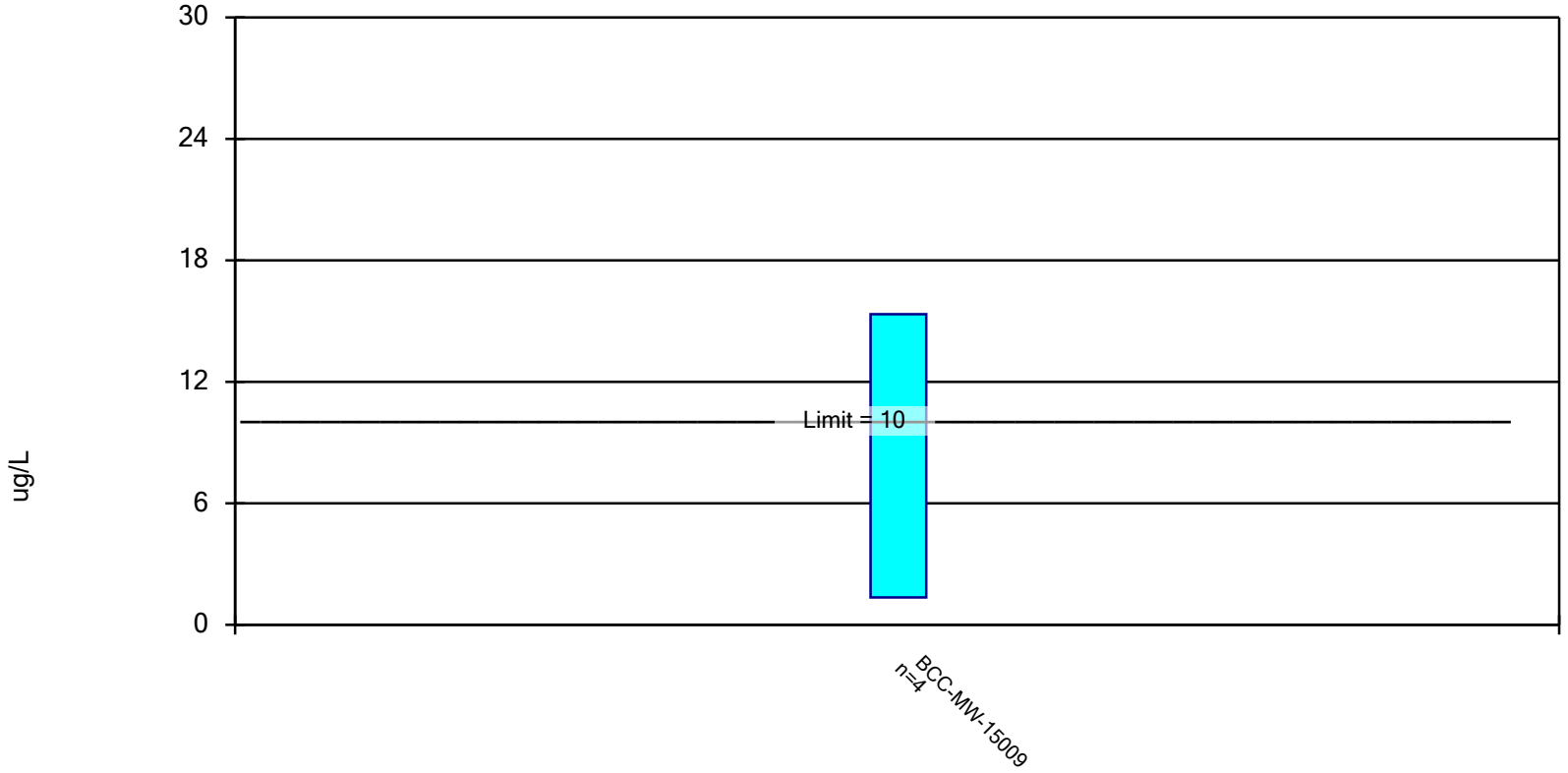
For observations made between 12/1/2015 and 11/30/2018, a summary of the selected data set:

Observations = 195
ND/Trace = 195
Wells = 21
Minimum Value = 2
Maximum Value = 2
Mean Value = 2
Median Value = 2
Standard Deviation = 0
Coefficient of Variation = 0
Skewness = NaN

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	11	11	2	2	2	2	0	0	NaN
BCC-MW-15010	11	11	2	2	2	2	0	0	NaN
BCC-MW-15011	11	11	2	2	2	2	0	0	NaN
BCC-MW-15012	11	11	2	2	2	2	0	0	NaN
BCC-MW-15013	11	11	2	2	2	2	0	0	NaN
BCC-MW-15014	11	11	2	2	2	2	0	0	NaN
BCC-MW-15015	11	11	2	2	2	2	0	0	NaN
BCC-MW-15016	11	11	2	2	2	2	0	0	NaN
BCC-MW-15017	11	11	2	2	2	2	0	0	NaN
BCC-MW-15018	11	11	2	2	2	2	0	0	NaN
BCC-MW-15019	11	11	2	2	2	2	0	0	NaN
BCC-MW-15020	11	11	2	2	2	2	0	0	NaN
BCC-MW-15021	11	11	2	2	2	2	0	0	NaN
BCC-MW-15022	11	11	2	2	2	2	0	0	NaN
BCC-MW-15023	11	11	2	2	2	2	0	0	NaN
BCC-MW-17001	5	5	2	2	2	2	0	0	NaN
BCC-MW-17002	5	5	2	2	2	2	0	0	NaN
BCC-MW-17003	5	5	2	2	2	2	0	0	NaN
BCC-MW-17004	5	5	2	2	2	2	0	0	NaN
BCC-MW-17005	5	5	2	2	2	2	0	0	NaN
BCC-MW-17006	5	5	2	2	2	2	0	0	NaN

Parametric Confidence Interval

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



Constituent: Arsenic, Total Analysis Run 3/5/2019 8:27 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

Confidence Interval

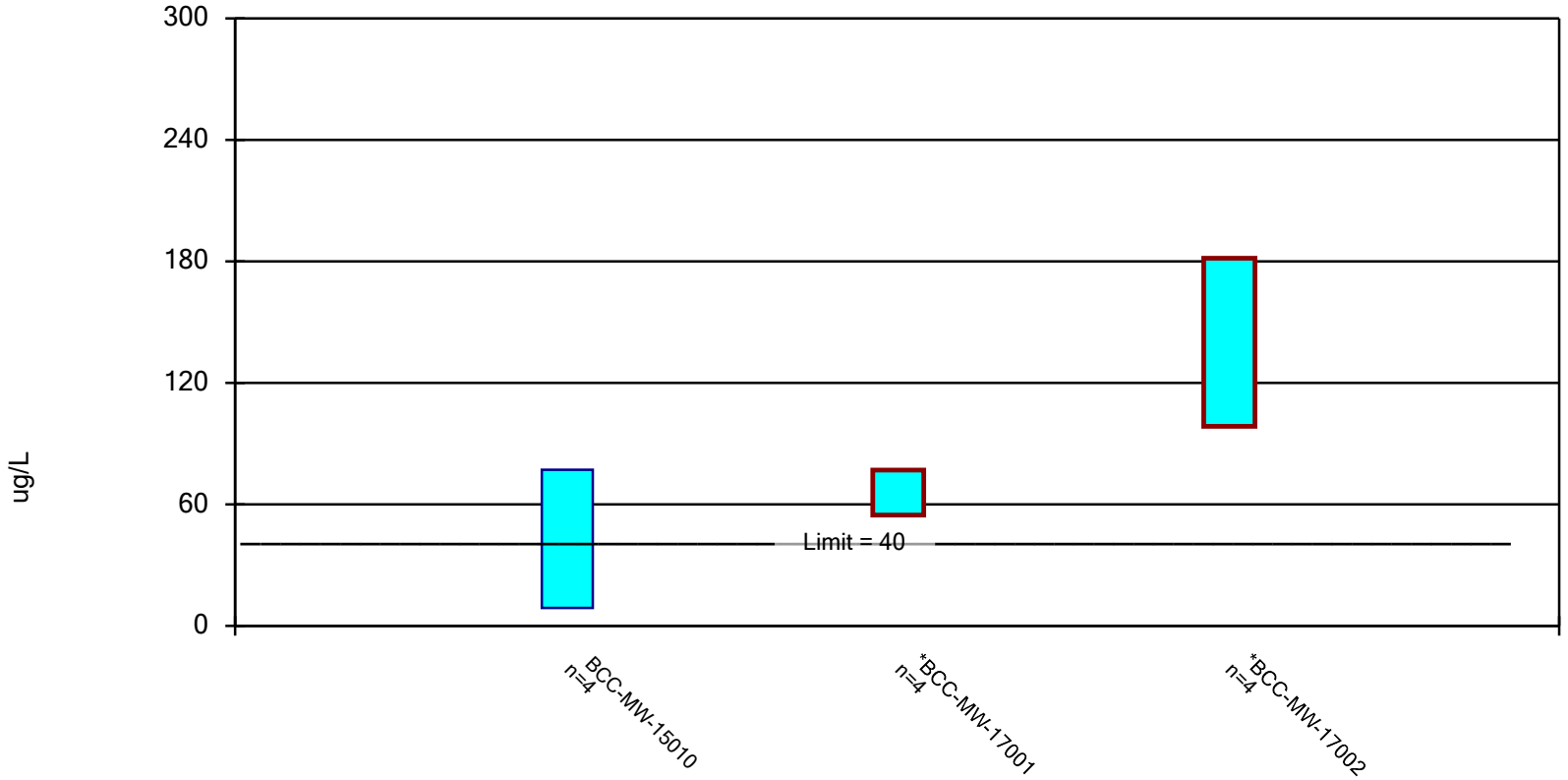
Constituent: Arsenic, Total (ug/L) Analysis Run 3/5/2019 8:28 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

	BCC-MW-15009
7/11/2017	11.4 (D)
4/16/2018	9.4
6/13/2018	8.5
11/28/2018	4.1
Mean	8.35
Std. Dev.	3.082
Upper Lim.	15.35
Lower Lim.	1.354

Parametric Confidence Interval

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



Constituent: Lithium, Total Analysis Run 3/5/2019 8:28 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

Confidence Interval

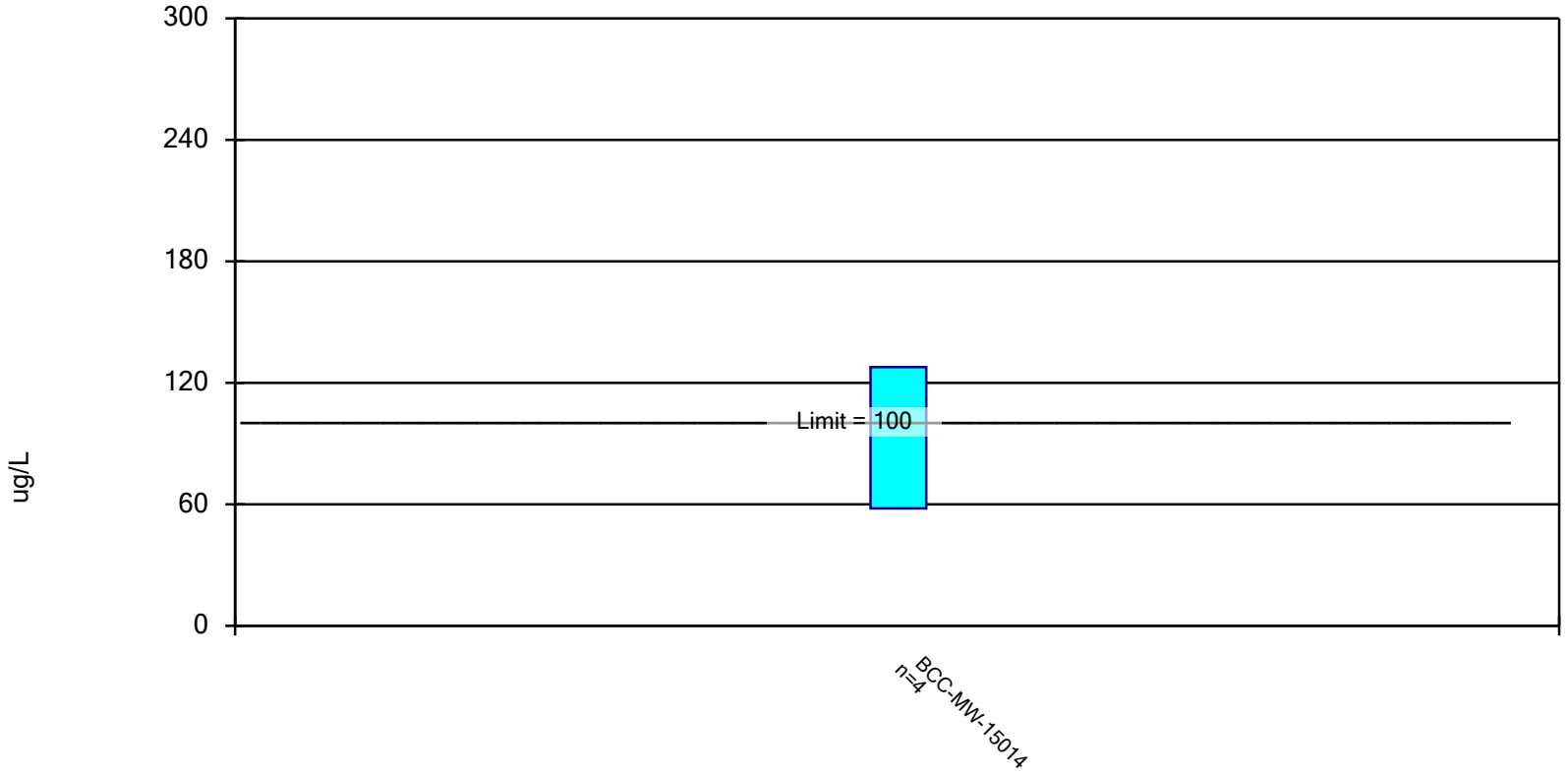
Constituent: Lithium, Total (ug/L) Analysis Run 3/5/2019 8:29 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

	BCC-MW-15010	BCC-MW-17001	BCC-MW-17002
7/11/2017	21		
2/20/2018		73	160
4/16/2018	46		
6/14/2018	54		
6/15/2018		65	150
8/6/2018		62	130
11/28/2018	51		
11/29/2018		63.5 (D)	120
Mean	43	65.88	140
Std. Dev.	15.03	4.905	18.26
Upper Lim.	77.13	77.01	181.5
Lower Lim.	8.869	54.74	98.55

Parametric Confidence Interval

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



Constituent: Molybdenum, Total Analysis Run 3/5/2019 8:29 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

Confidence Interval

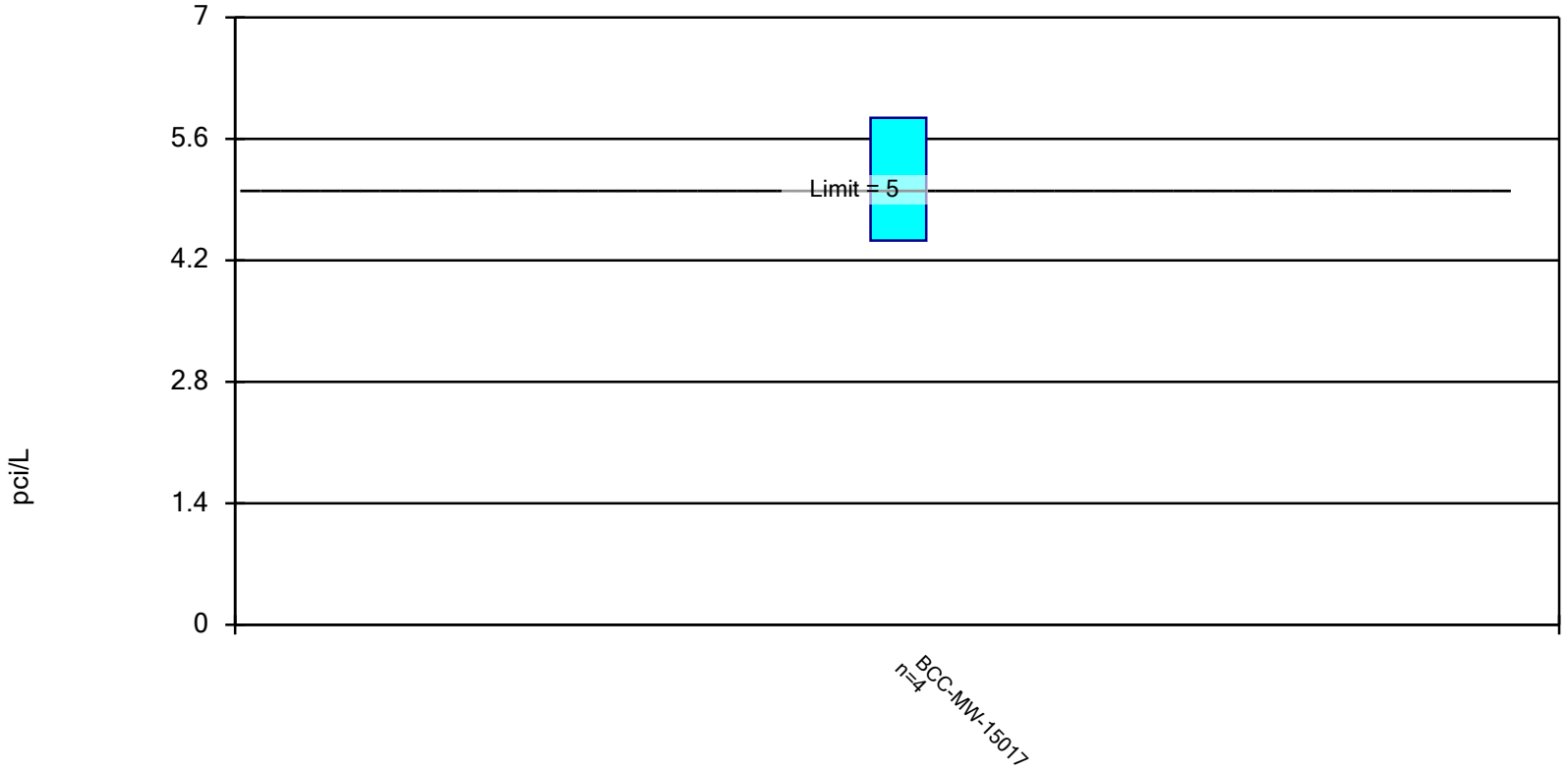
Constituent: Molybdenum, Total (ug/L) Analysis Run 3/5/2019 8:29 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

	BCC-MW-15014
7/12/2017	70.9
4/17/2018	94.7
6/13/2018	100
11/29/2018	106
Mean	92.9
Std. Dev.	15.38
Upper Lim.	127.8
Lower Lim.	57.99

Parametric Confidence Interval

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



Constituent: Radium-226/228 Analysis Run 3/5/2019 8:30 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

Confidence Interval

Constituent: Radium-226/228 (pci/L) Analysis Run 3/5/2019 8:30 AM

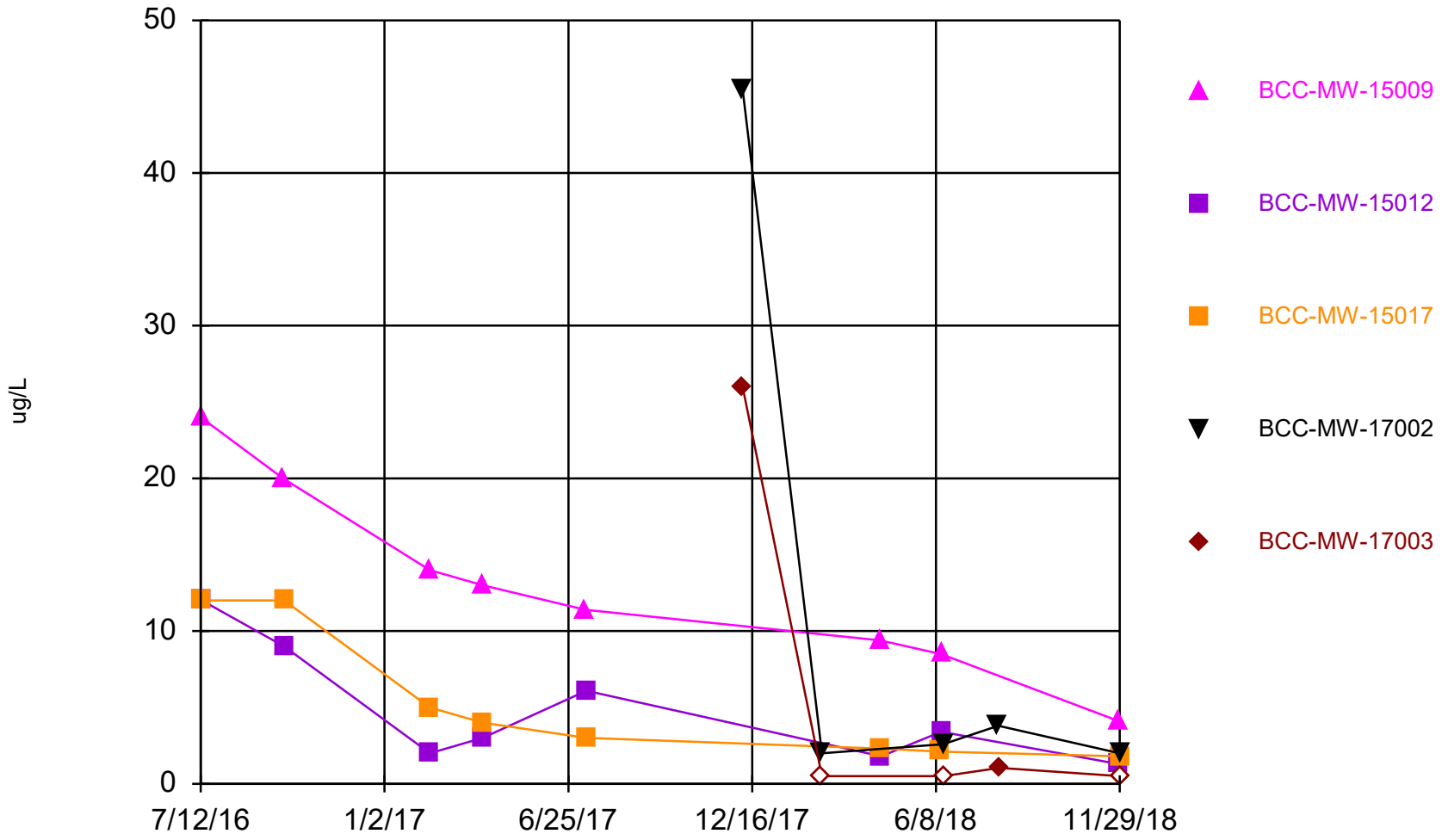
Client: Consumers Energy Data: BCC_Sanitas_19.02.18

	BCC-MW-15017
7/12/2017	4.75
4/17/2018	5.16
6/12/2018	5.51 (D)
11/29/2018	5.12
Mean	5.135
Std. Dev.	0.3108
Upper Lim.	5.841
Lower Lim.	4.429

Attachment 2
Sanitas™ Output (n=8)

Hollow symbols indicate censored values.

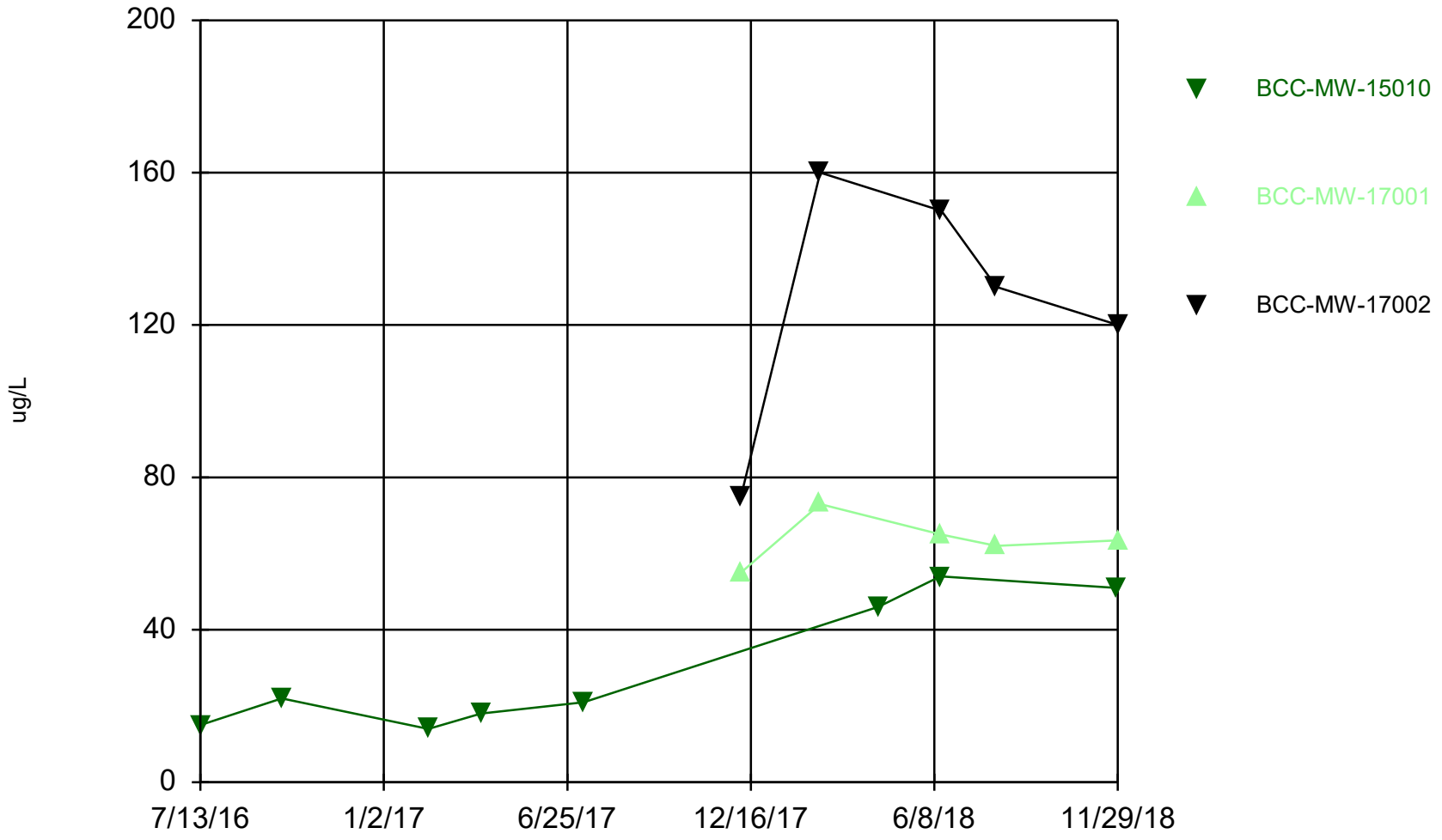
Time Series



Constituent: Arsenic, Total Analysis Run 3/14/2019 9:27 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

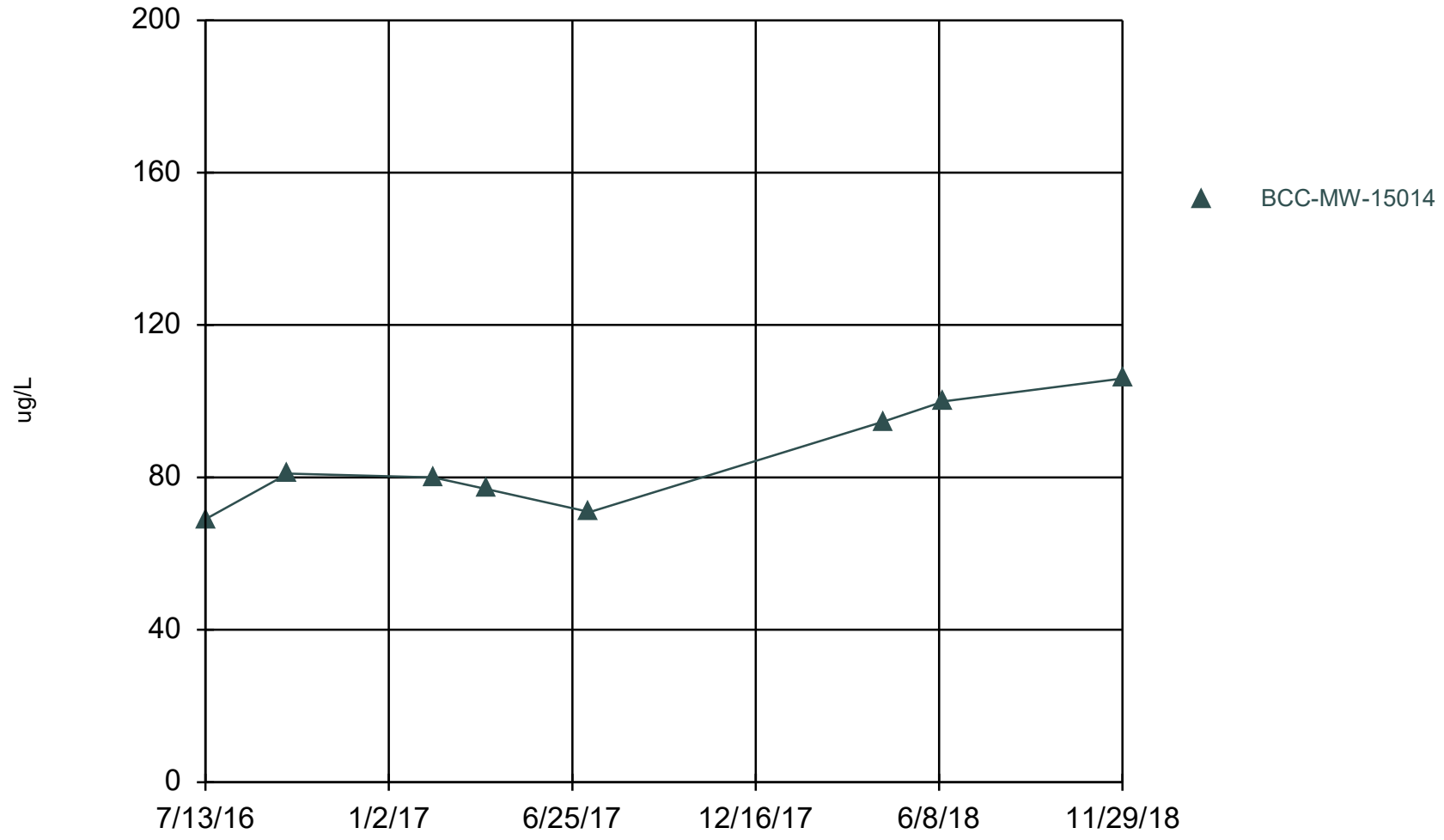
Time Series



Constituent: Lithium, Total Analysis Run 3/14/2019 9:27 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

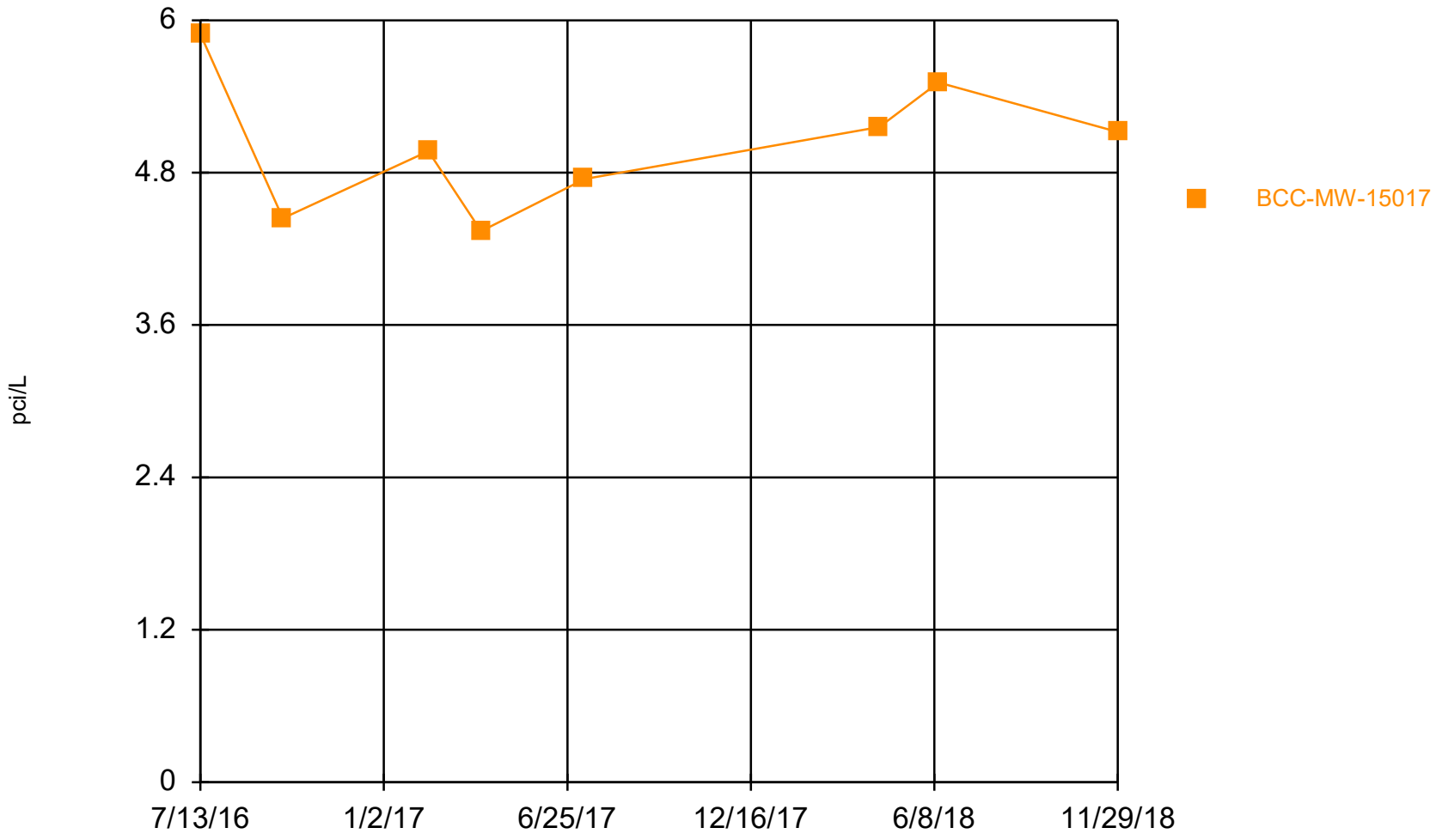
Time Series



Constituent: Molybdenum, Total Analysis Run 3/14/2019 9:27 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

Time Series

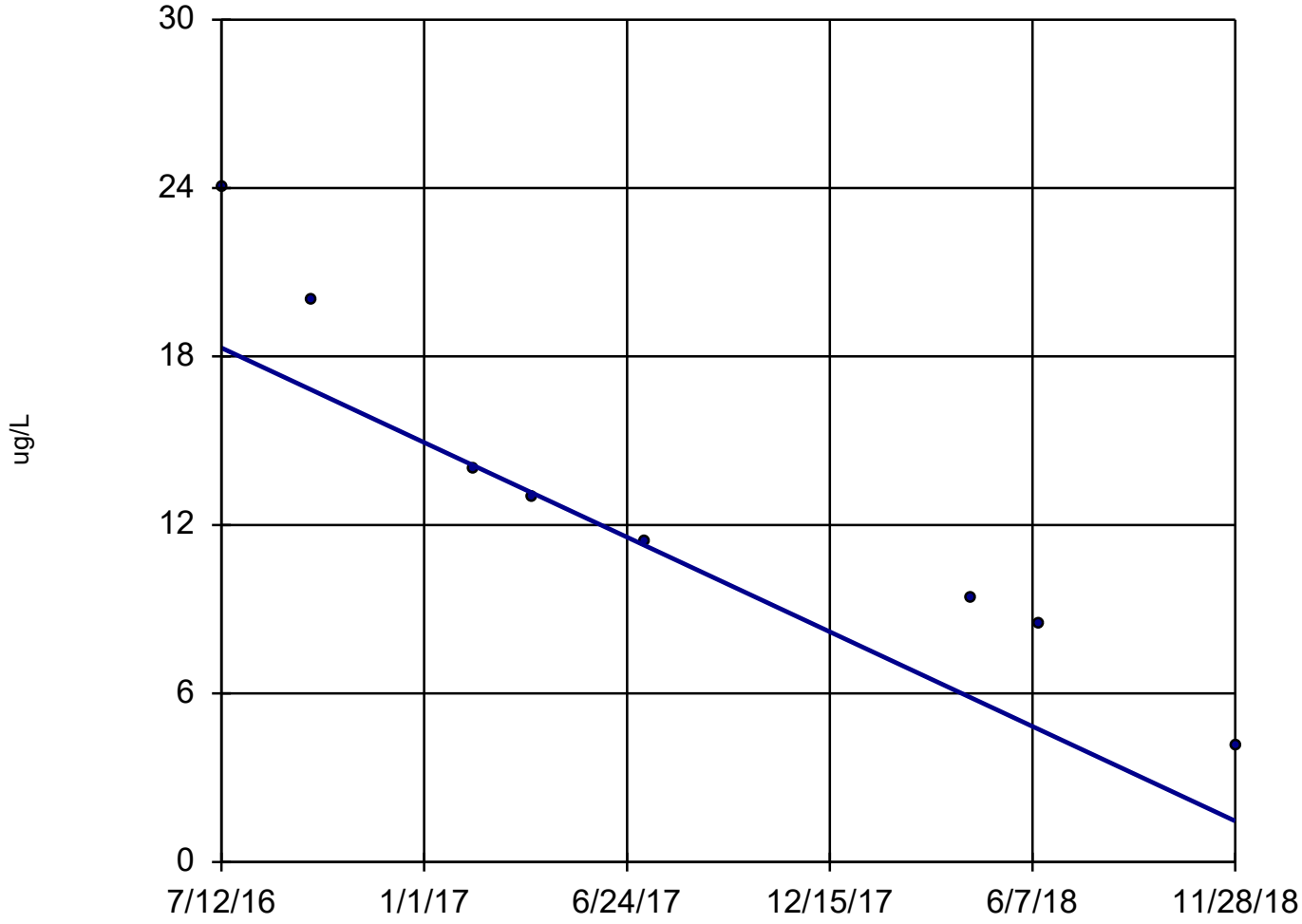


Constituent: Radium-226/228 Analysis Run 3/14/2019 9:27 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

Sen's Slope Estimator

BCC-MW-15009



n = 8

Slope = -7.074 units per year.

Mann-Kendall statistic = -28
critical = -20

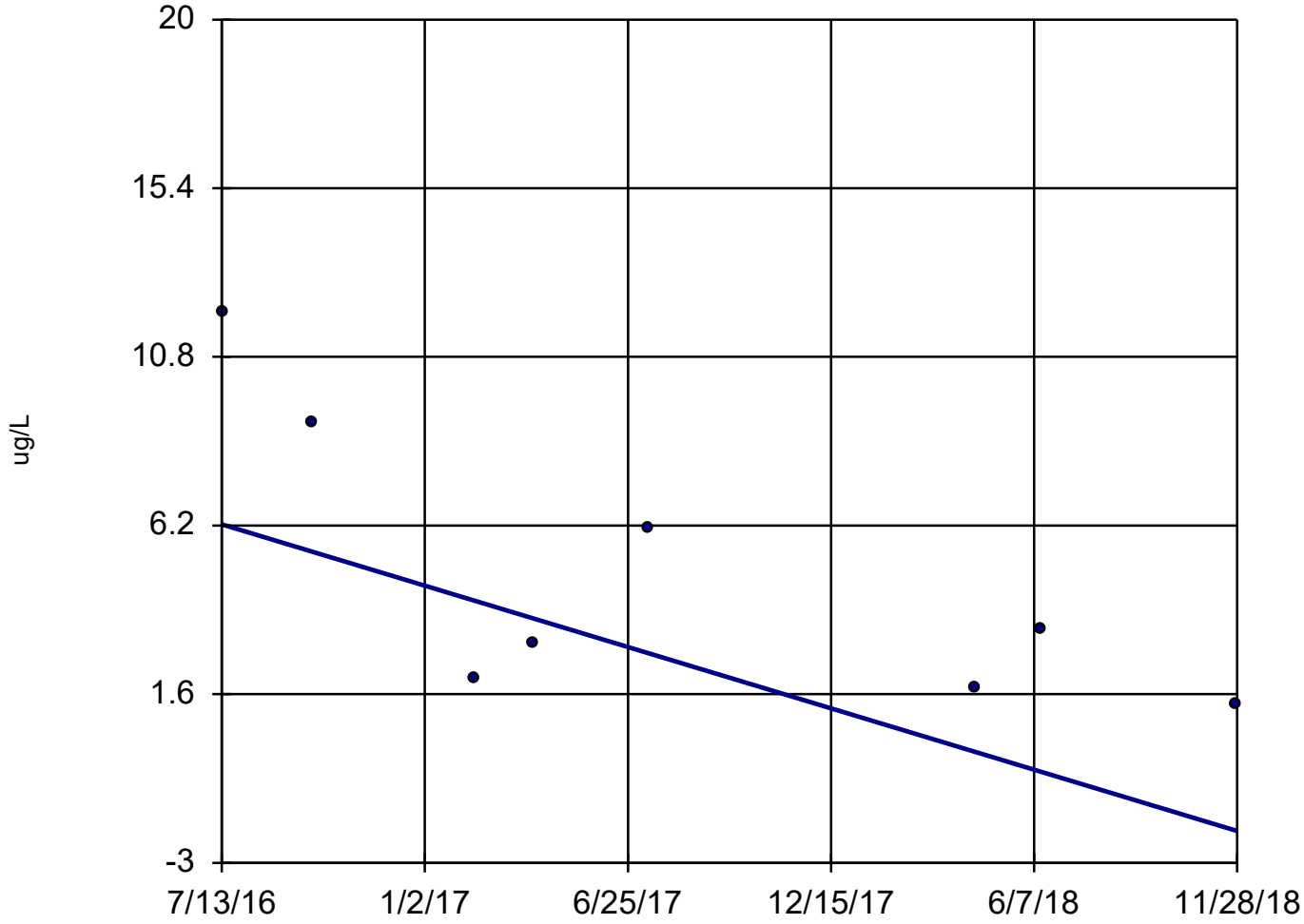
Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

Constituent: Arsenic, Total Analysis Run 3/12/2019 9:34 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

Sen's Slope Estimator

BCC-MW-15012



n = 8

Slope = -3.517 units per year.

Mann-Kendall statistic = -16
critical = -20

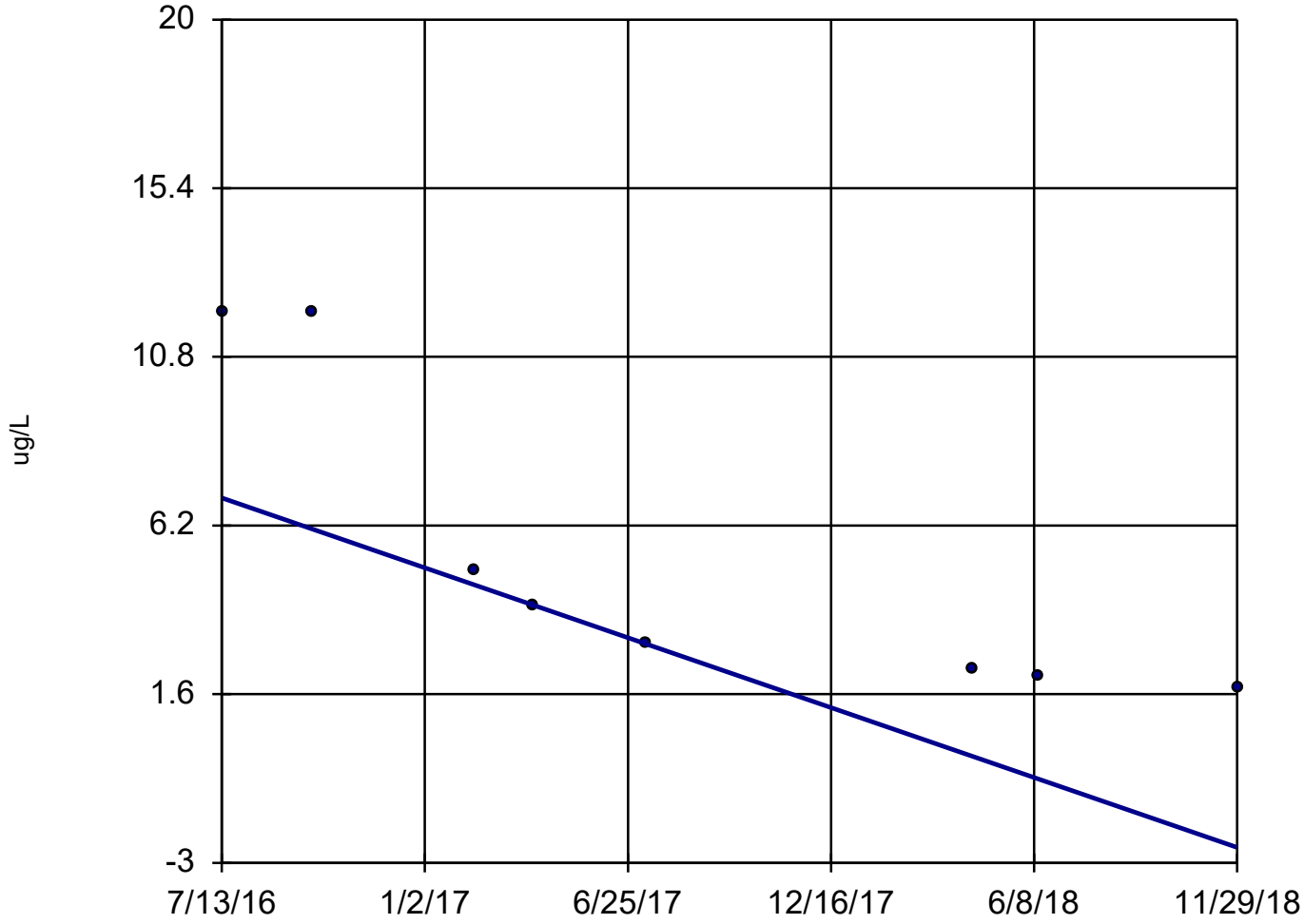
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Arsenic, Total Analysis Run 3/12/2019 9:34 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

Sen's Slope Estimator

BCC-MW-15017



n = 8

Slope = -4.004 units per year.

Mann-Kendall statistic = -27
critical = -20

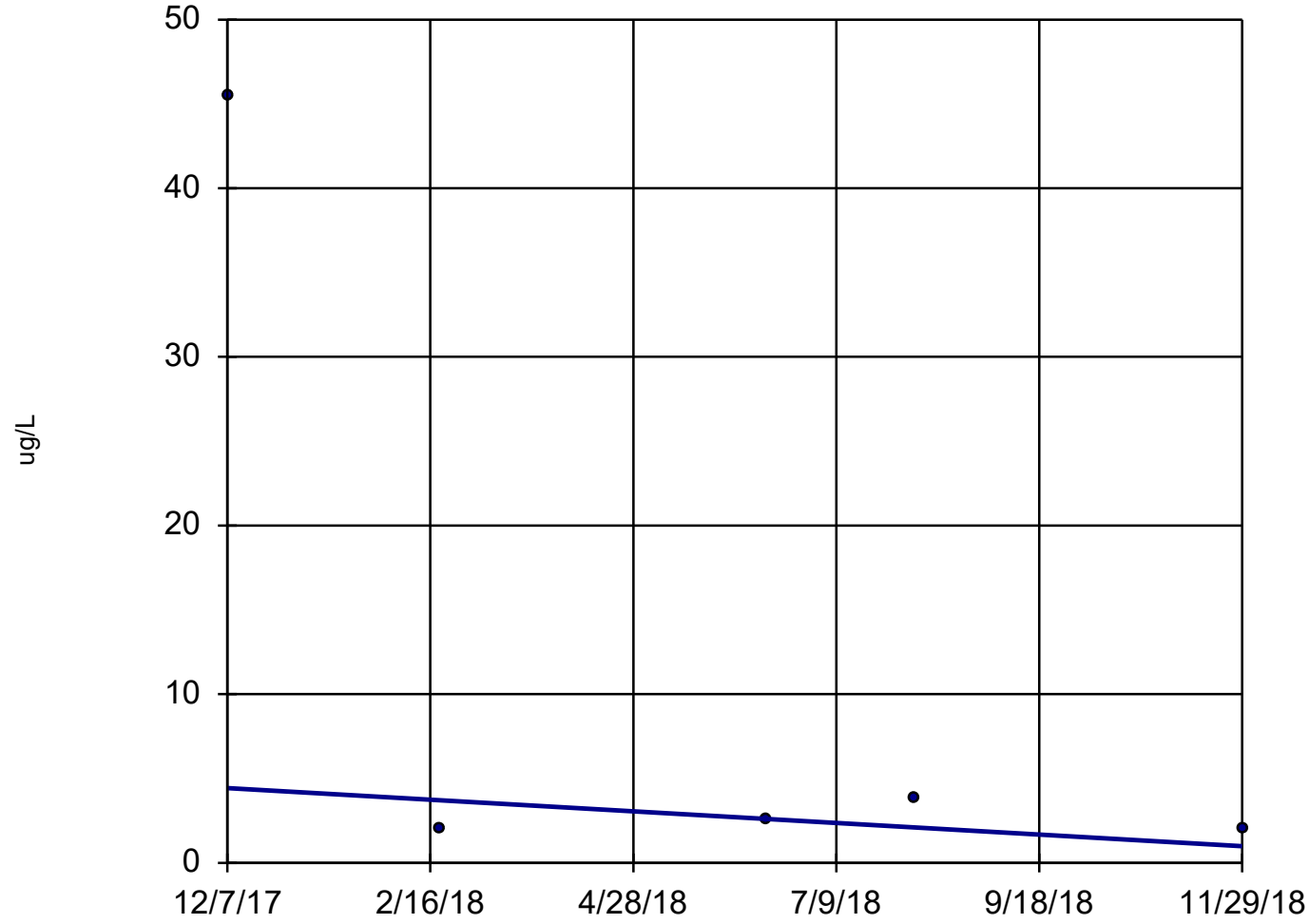
Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

Constituent: Arsenic, Total Analysis Run 3/12/2019 9:34 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

Sen's Slope Estimator

BCC-MW-17002



n = 5

Slope = -3.512 units per year.

Mann-Kendall statistic = -3
critical = -10

Trend not significant at 98% confidence level (α = 0.01 per tail).

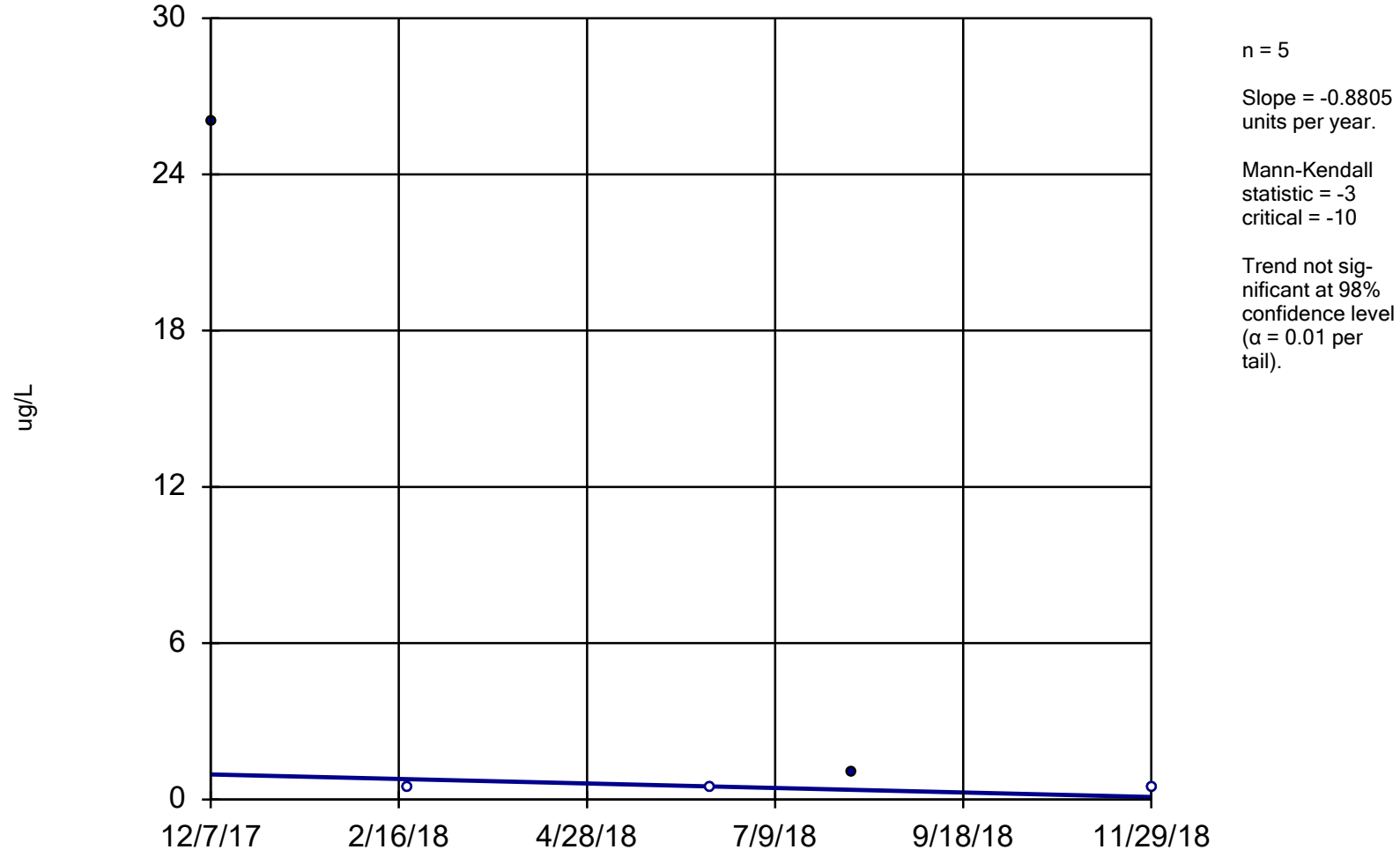
Constituent: Arsenic, Total Analysis Run 3/12/2019 9:34 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

Hollow symbols indicate censored values.

Sen's Slope Estimator

BCC-MW-17003



n = 5

Slope = -0.8805 units per year.

Mann-Kendall statistic = -3
critical = -10

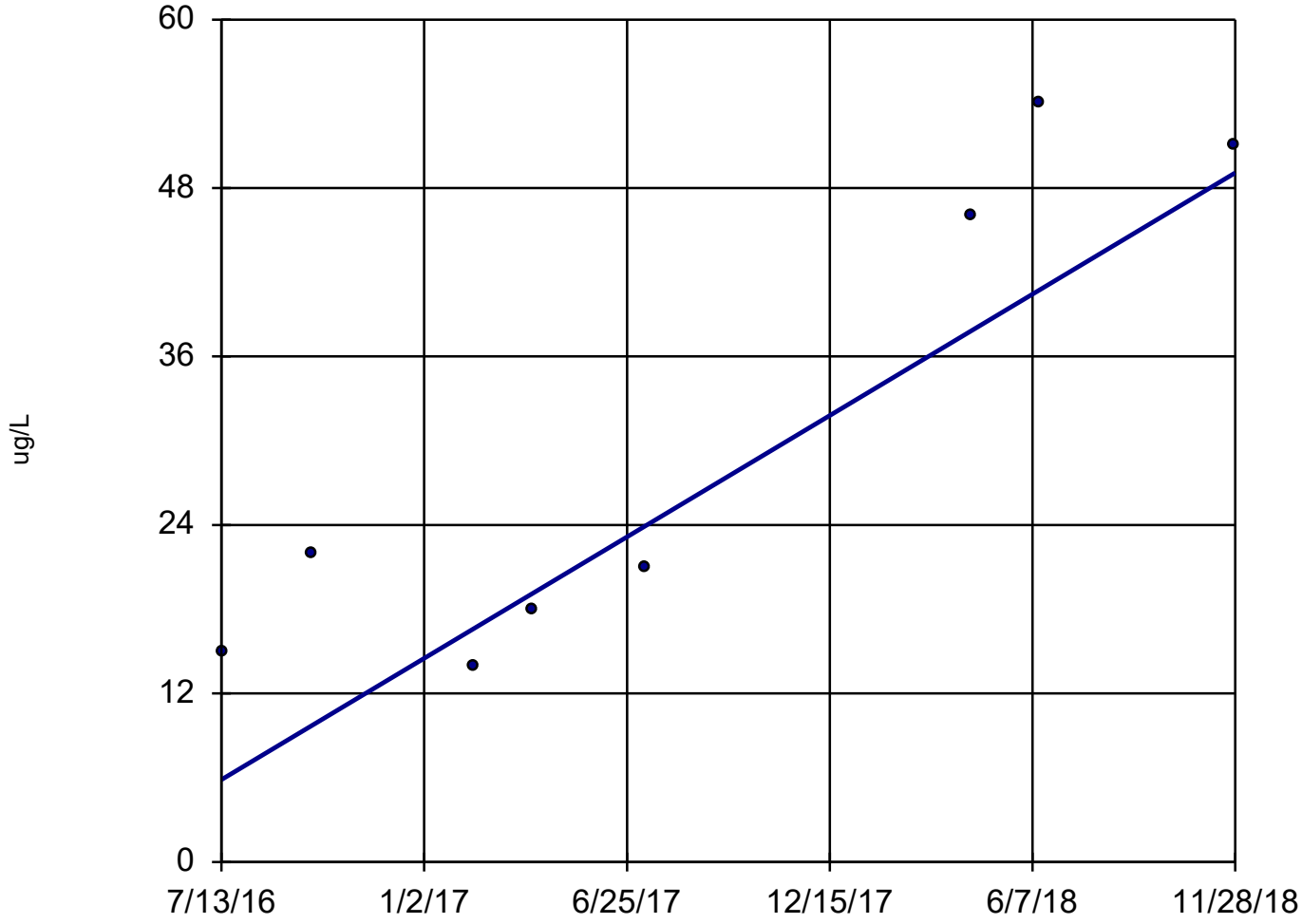
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Arsenic, Total Analysis Run 3/12/2019 9:34 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

Sen's Slope Estimator

BCC-MW-15010



n = 8

Slope = 18.17 units per year.

Mann-Kendall statistic = 18
critical = 20

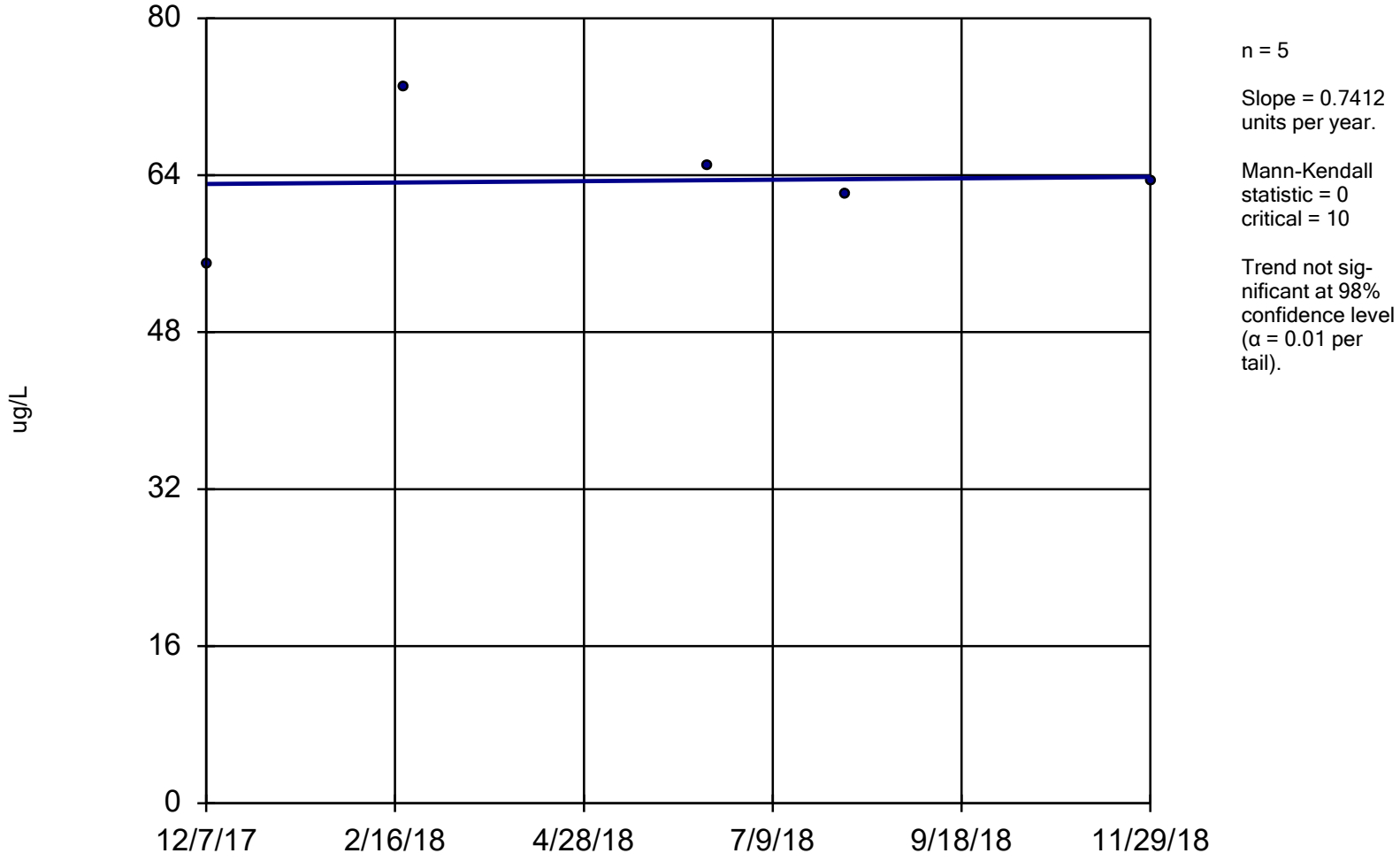
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Lithium, Total Analysis Run 3/12/2019 9:34 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

Sen's Slope Estimator

BCC-MW-17001

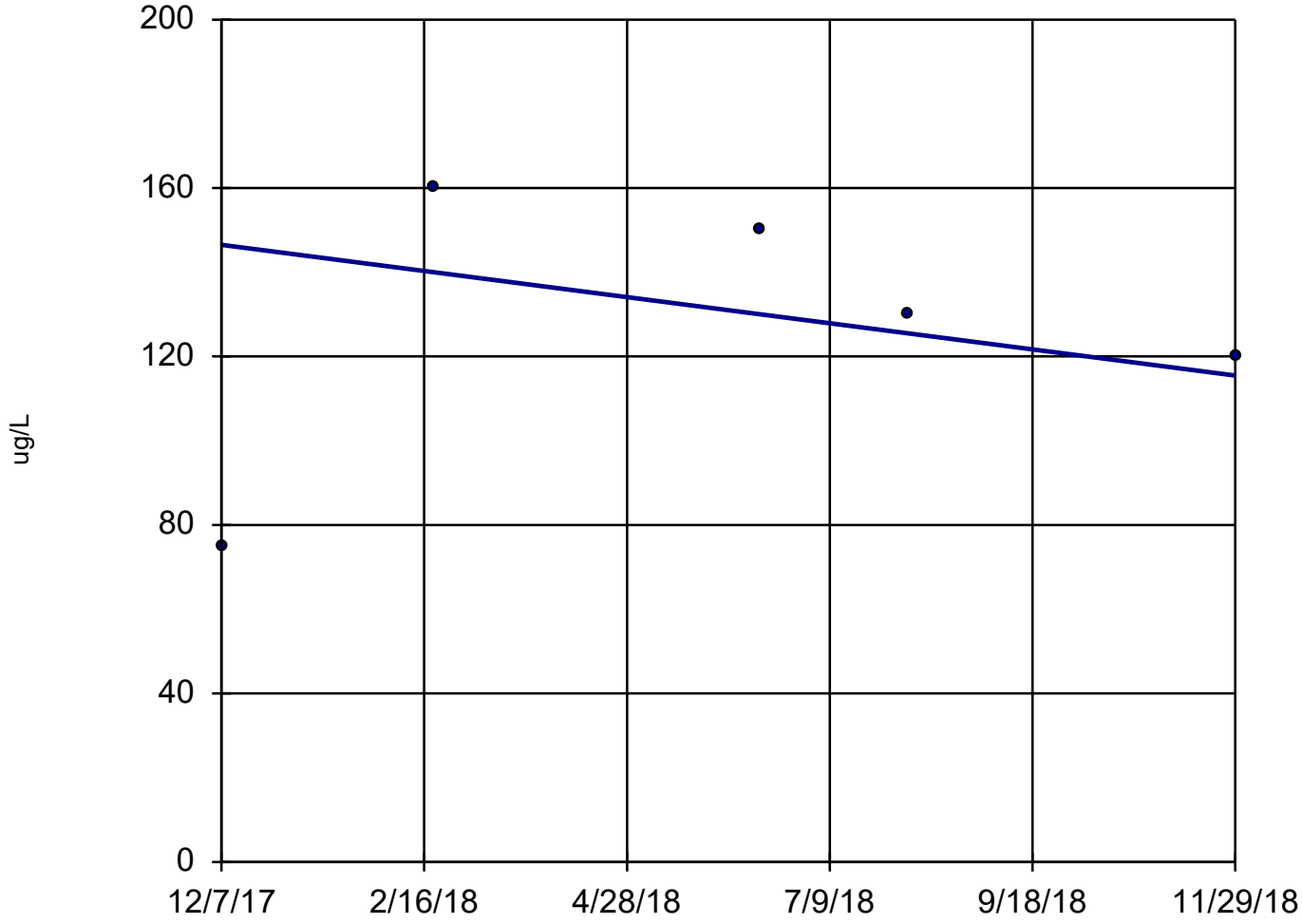


Constituent: Lithium, Total Analysis Run 3/12/2019 9:34 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

Sen's Slope Estimator

BCC-MW-17002



n = 5

Slope = -31.74 units per year.

Mann-Kendall statistic = -2
critical = -10

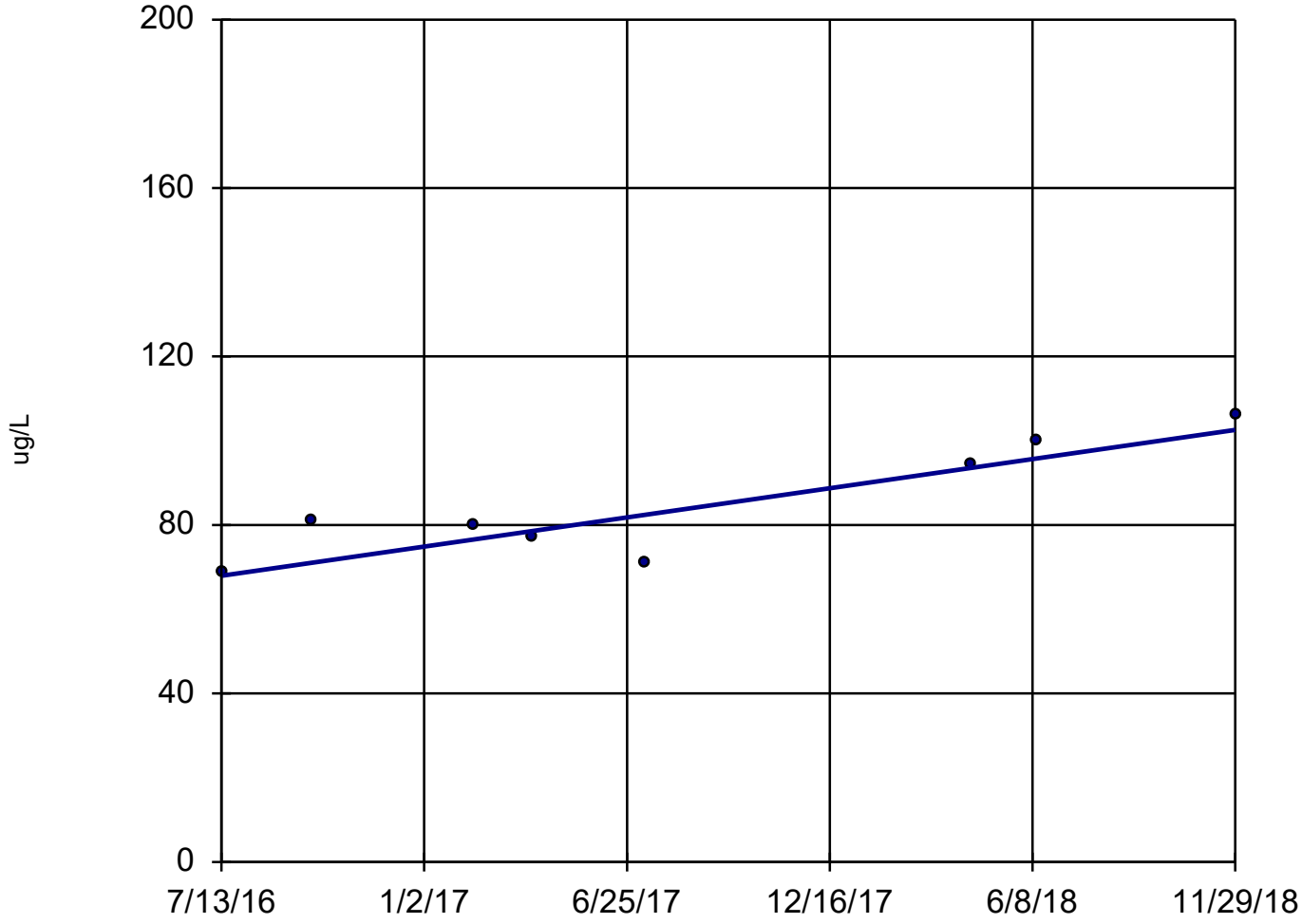
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Lithium, Total Analysis Run 3/12/2019 9:34 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

Sen's Slope Estimator

BCC-MW-15014



n = 8

Slope = 14.56 units per year.

Mann-Kendall statistic = 16
critical = 20

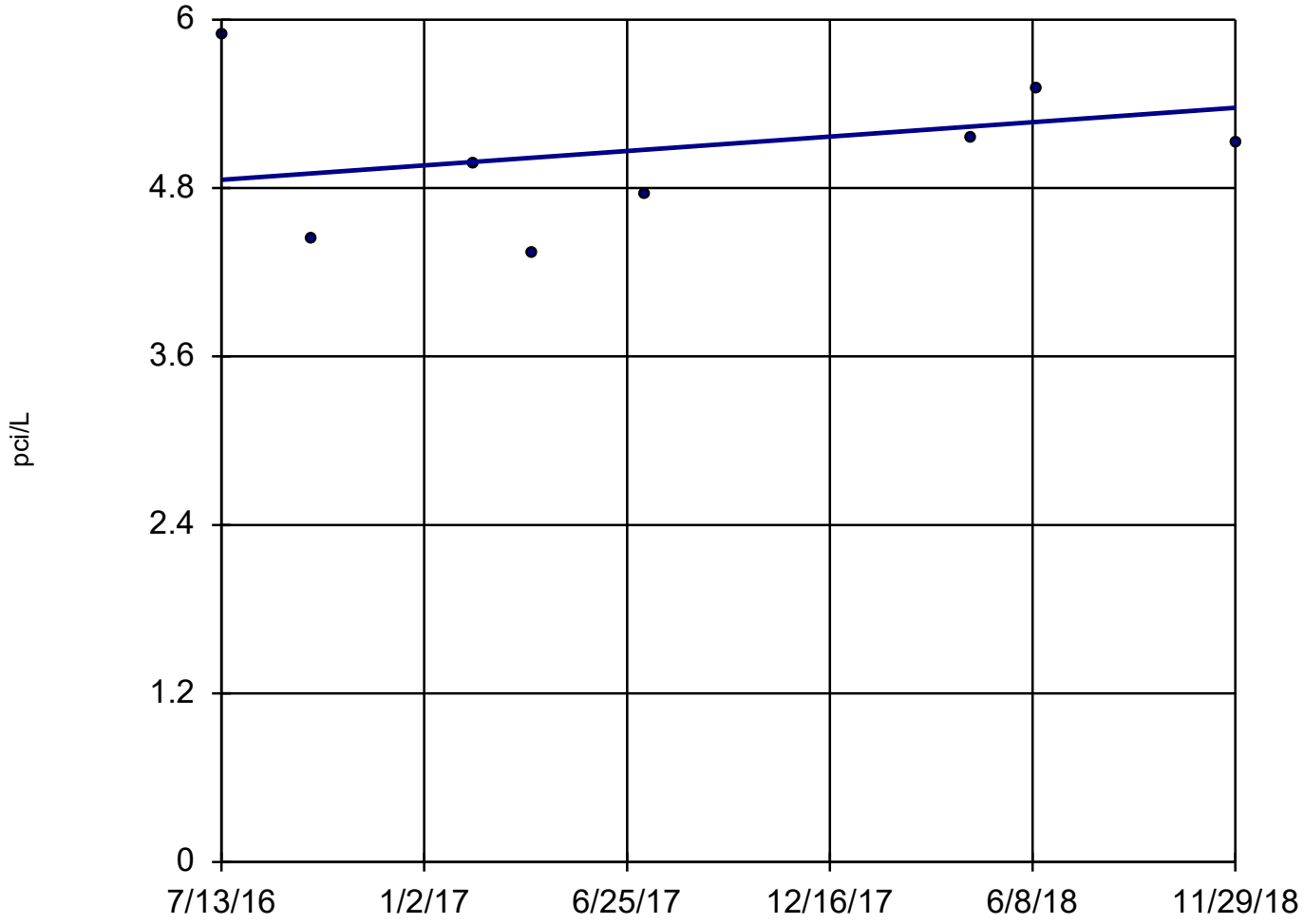
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Molybdenum, Total Analysis Run 3/12/2019 9:34 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

Sen's Slope Estimator

BCC-MW-15017



n = 8

Slope = 0.2149 units per year.

Mann-Kendall statistic = 4
critical = 20

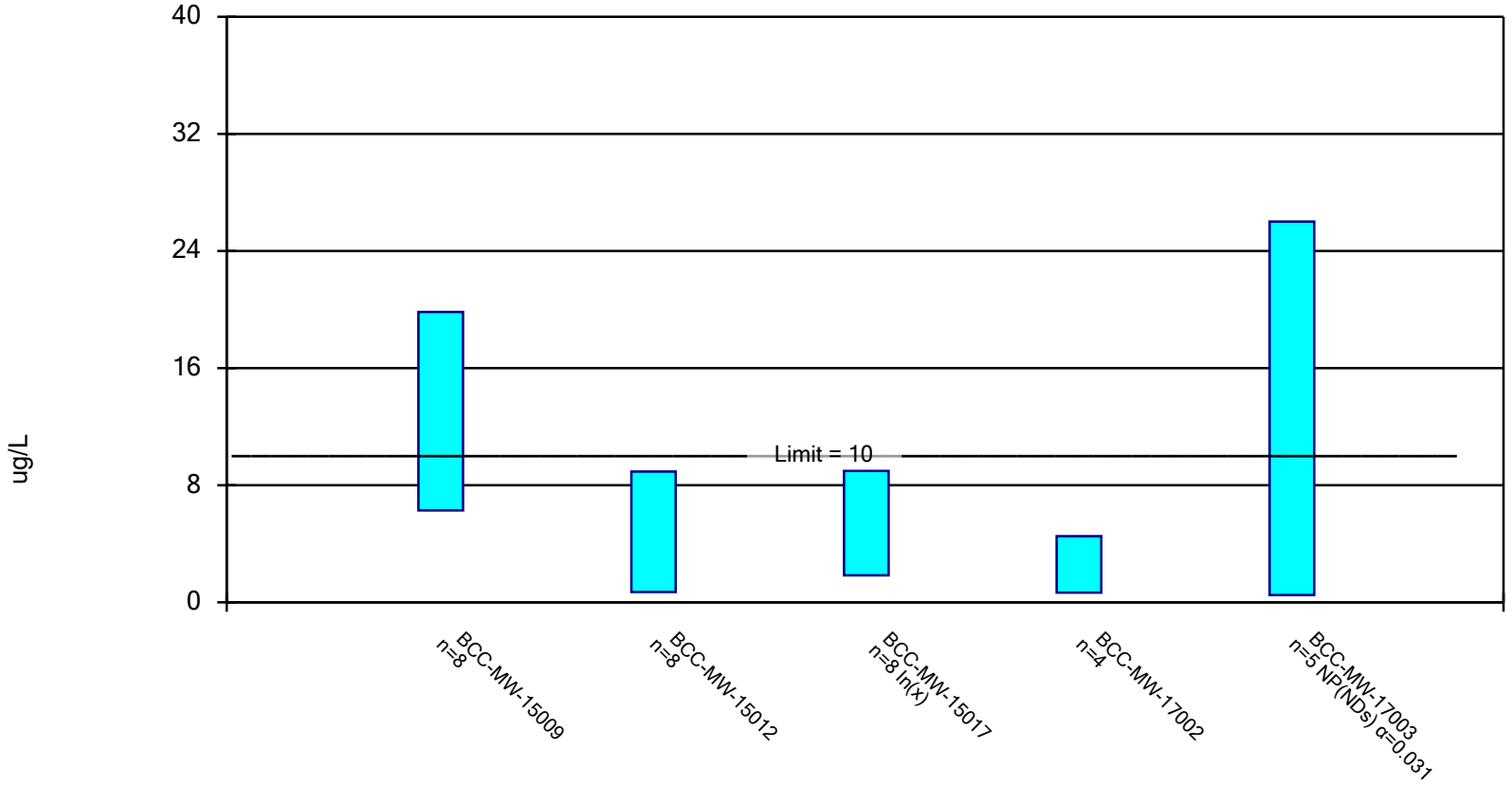
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Radium-226/228 Analysis Run 3/12/2019 9:34 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

Parametric and Non-Parametric (NP) Confidence Interval

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



Constituent: Arsenic, Total Analysis Run 3/12/2019 9:53 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

Confidence Interval

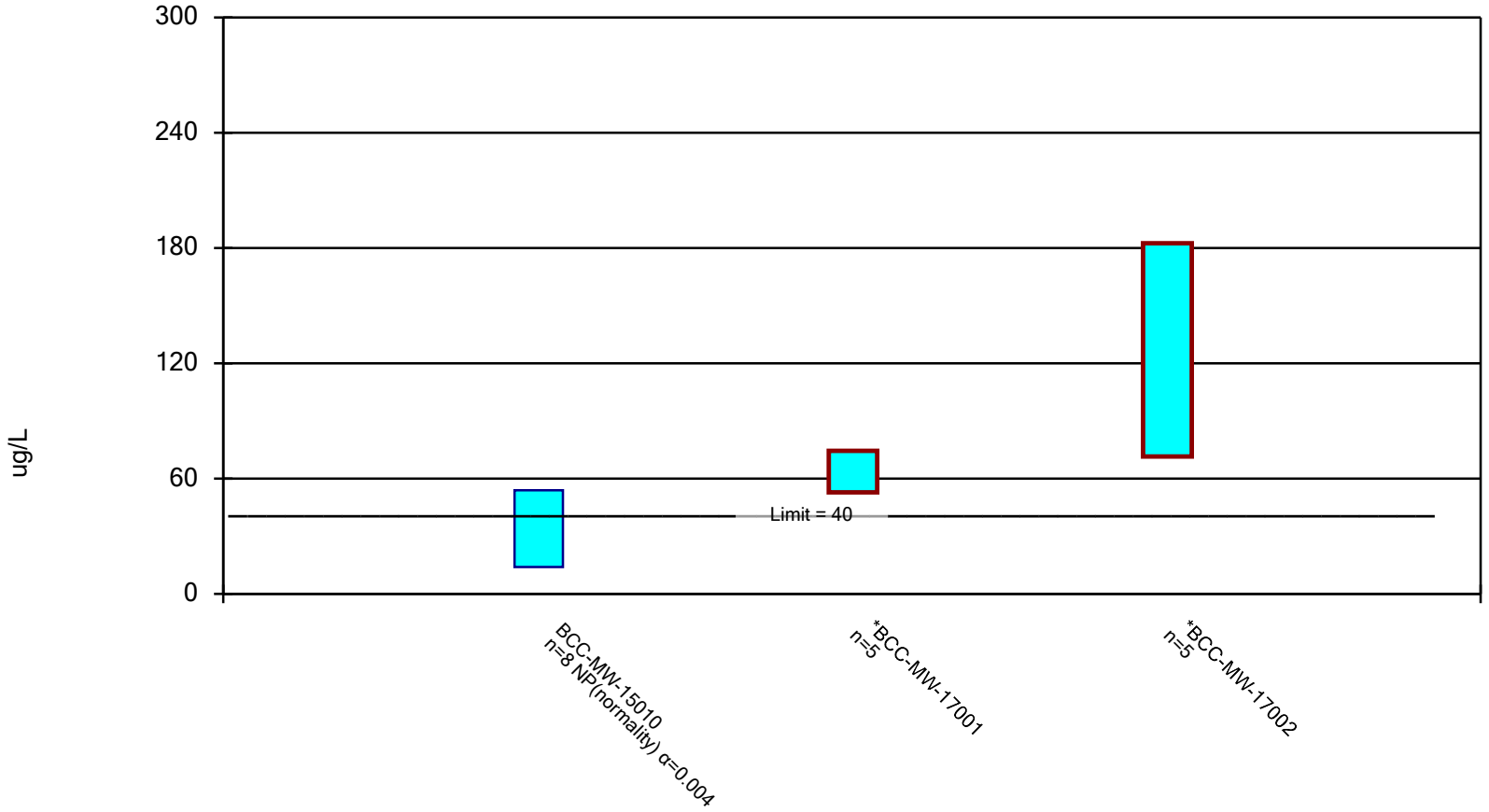
Constituent: Arsenic, Total (ug/L) Analysis Run 3/12/2019 9:54 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

	BCC-MW-15009	BCC-MW-15012	BCC-MW-15017	BCC-MW-17002	BCC-MW-17003
7/12/2016	24				
7/13/2016		12	12		
9/28/2016	20				
9/29/2016		9	12		
2/14/2017	14	2	5		
4/5/2017	13	3	4		
7/11/2017	11.4 (D)				
7/12/2017		6.1	3		
12/7/2017					26
2/20/2018				2	<1
4/16/2018	9.4				
4/17/2018		1.8	2.3		
6/12/2018			2.1 (D)		
6/13/2018	8.5	3.4			
6/15/2018				2.6	<1
8/6/2018				3.8	
8/7/2018					1.05 (D)
11/28/2018	4.1	1.3			
11/29/2018			1.8	2	<1
Mean	13.05	4.825	5.275	2.6	5.71
Std. Dev.	6.392	3.881	4.282	0.8485	11.34
Upper Lim.	19.82	8.939	8.978	4.526	26
Lower Lim.	6.275	0.711	1.844	0.6735	0.5

Parametric and Non-Parametric (NP) Confidence Interval

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



Constituent: Lithium, Total Analysis Run 3/12/2019 9:33 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

Confidence Interval

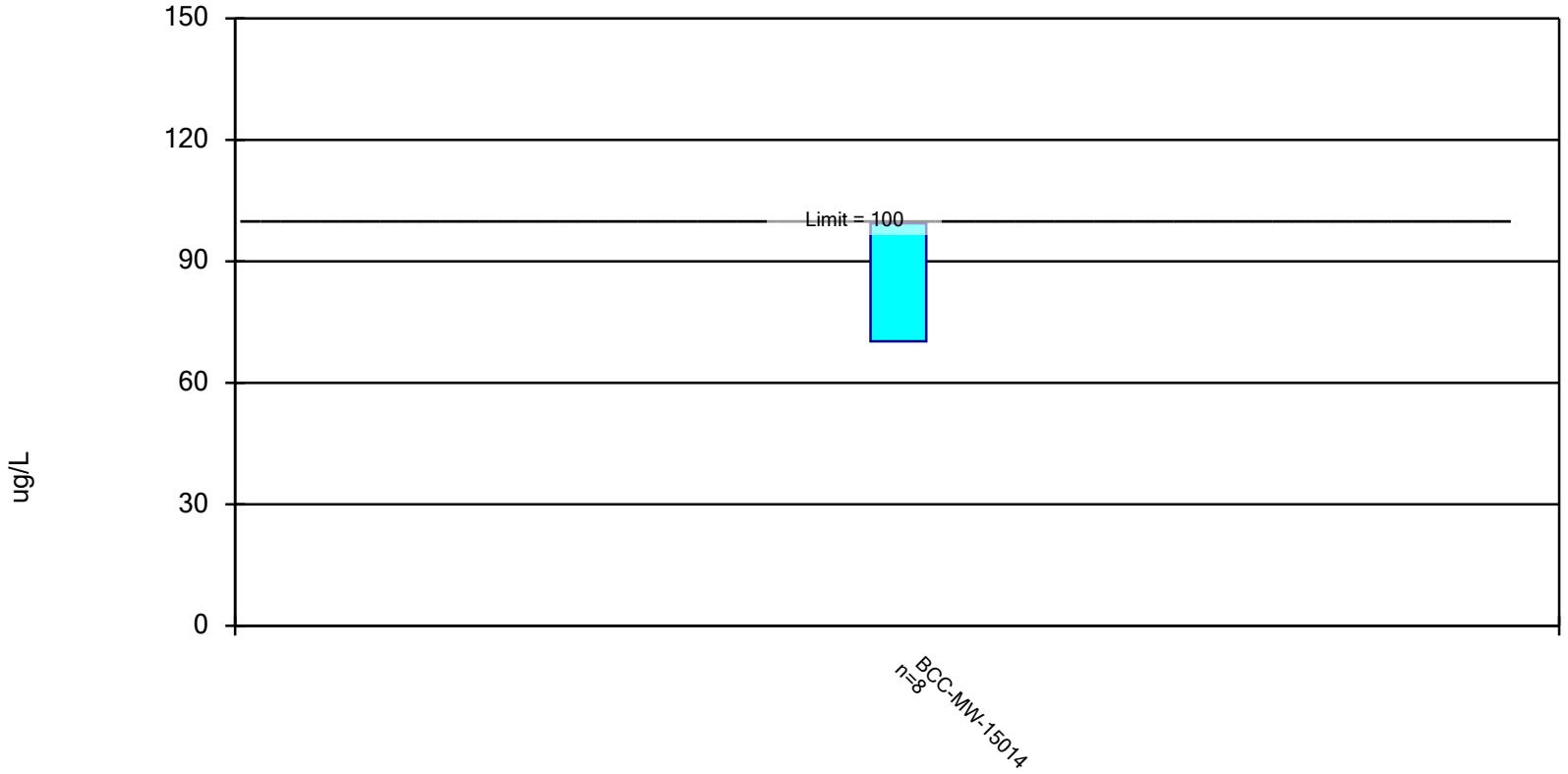
Constituent: Lithium, Total (ug/L) Analysis Run 3/12/2019 9:33 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

	BCC-MW-15010	BCC-MW-17001	BCC-MW-17002
7/13/2016	15		
9/28/2016	22		
2/14/2017	14		
4/5/2017	18		
7/11/2017	21		
12/7/2017		55	75
2/20/2018		73	160
4/16/2018	46		
6/14/2018	54		
6/15/2018		65	150
8/6/2018		62	130
11/28/2018	51		
11/29/2018		63.5 (D)	120
Mean	30.13	63.7	127
Std. Dev.	17.08	6.458	33.09
Upper Lim.	54	74.52	182.4
Lower Lim.	14	52.88	71.55

Parametric Confidence Interval

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



Constituent: Molybdenum, Total Analysis Run 3/12/2019 9:33 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

Confidence Interval

Constituent: Molybdenum, Total (ug/L) Analysis Run 3/12/2019 9:33 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

	BCC-MW-15014
7/13/2016	69
9/29/2016	81
2/14/2017	80
4/5/2017	77
7/12/2017	70.9
4/17/2018	94.7
6/13/2018	100
11/29/2018	106
Mean	84.83
Std. Dev.	13.73
Upper Lim.	99.38
Lower Lim.	70.27

Parametric Confidence Interval

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

Constituent: Radium-226/228 Analysis Run 3/12/2019 9:33 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

Confidence Interval

Constituent: Radium-226/228 (pci/L) Analysis Run 3/12/2019 9:33 AM

Client: Consumers Energy Data: BCC_Sanitas_19.02.18

	BCC-MW-15017
7/13/2016	5.89
9/29/2016	4.44
2/14/2017	4.97
4/5/2017	4.34
7/12/2017	4.75
4/17/2018	5.16
6/12/2018	5.51 (D)
11/29/2018	5.12
Mean	5.023
Std. Dev.	0.5211
Upper Lim.	5.575
Lower Lim.	4.47

Appendix B
Data Quality Review

Laboratory Data Quality Review
Groundwater Monitoring Event April 2019
CEC BC Cobb

Groundwater samples were collected by TRC for the April 2019 sampling event. Samples were analyzed for anions, total dissolved solids, and total metals by Eurofins TestAmerica, located in Irvine, California (Eurofins TA - Irvine). The lithium analyses by method SW-846 6020 were subcontracted to Eurofins TA in North Canton, Ohio (Eurofins TA – Canton) and the radium analyses were subcontracted to Eurofins TA in St. Louis, MO (Eurofins TA – St. Louis). The laboratory analytical results were reported in laboratory sample delivery groups (SDGs) 440-238859-1, 440-239119-1, 440-238857-1, and 440-239127-1.

During the April 2019 sampling event, a groundwater sample was collected from each of the following wells:

440-238859-1/440-238857-1

- BCC-MW-15002
- BCC-MW-15003
- BCC-MW-15004
- BCC-MW-15005
- BCC-MW-15006
- BCC-MW-15007
- BCC-MW-15008
- BCC-MW-15009
- BCC-MW-15010
- BCC-MW-15011
- BCC-MW-15012
- BCC-MW-15013
- BCC-MW-15014
- BCC-MW-15015
- BCC-MW-15016
- BCC-MW-15017
- BCC-MW-15018
- BCC-MW-17001
- BCC-MW-17002
- BCC-MW-17003

440-239119-1/440-239127-1

- BCC-MW-15019
- BCC-MW-15020
- BCC-MW-15021
- BCC-MW-15022
- BCC-MW-15023
- BCC-MW-17004
- BCC-MW-17005
- BCC-MW-17006

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

Analyte Group	Method
Anions (Fluoride, Chloride, Sulfate)	EPA 300.0
Total Dissolved Solids	SM 2540C-11
Total Metals	SW-846 6020B/6010C/7470A
Radium (Radium-226, Radium-228, Total Radium)	EPA 903.0, EPA 904.0

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

Data Usability Review Procedure

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

- Sample receipt;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;
- Data for method blanks and field blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Field blanks are used to assess potential contamination arising from field procedures;
- Data for laboratory control samples (LCSs). The LCSs are used to assess the accuracy of the analytical method using a clean matrix;
- Percent recoveries for matrix spike (MS) and matrix spike duplicates (MSD), when performed on project samples. Percent recoveries are calculated for each analyte spiked and used to assess bias due to sample matrix effects;
- Data for laboratory duplicates, when performed on project samples. The laboratory duplicates are replicate analyses of one sample and are used to assess the precision of the analytical method;
- Percent recoveries for carriers, where applicable, for radiochemistry only. Carriers are used to assess the chemical yield for the preparation and/or instrument efficiency;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

This data usability report addresses the following items:

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

Review Summary

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

- The reviewed Appendix 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:

- Sample receipt:
  - The laboratory noted that the pH of the 6010 metals container for sample BCC-MW-15017 upon receipt at the laboratory was 3; the sample was properly preserved by the laboratory in order to meet the sample preservation requirement of pH <2 13 days after collection. Since the pH was just slightly above the acceptance criteria, there was no significant impact on data usability.
- Holding time criteria were met except the TDS holding time for samples BCC-MW-15004 and BCC-MW-15014 exceeded the 7-day holding time criteria by 6 minutes and by 18 minutes, respectively. These results may be estimated, 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 blanks.
- Four equipment blanks (EB-01, EB-02, EB-03, EB-04) and three field blanks (FB-01, FB-02, and FB-04) were collected. Target analytes were not detected in equipment blanks and field blanks.
- LCS and/or LCSD recoveries and relative percent differences (RPDs) recoveries were within laboratory control limits with the following exception:
  - The recovery for radium 226 in the LCS performed in batch 160-429160 was below the laboratory control limits. Potential low bias exists for the positive and nondetect results for radium 226 in select samples in this data set, as summarized in the attached table.
- MS/MSDs were performed on the following samples:
    - BCC-MW-15009, BCC-MW-15022, and BCC-MW-17006 for anions, mercury, metals;
    - BCC-MW-15019 for mercury;
    - BCC-MW-15014 for anions; and
    - BCC-MW-17003 for select metals (calcium and boron).
- The MS/MSD recoveries and RPDs were within the acceptance limits with the following exceptions:
  - The recoveries for sulfate, calcium, and boron in the MS and/or MSD performed on sample BCC-MW-15022, and the recovery for calcium in the MSD performed on sample

BCC-MW-17003 were outside of the laboratory control limits. However, the concentrations of these analytes in the parent samples were >4x the spike concentration; therefore, the laboratory control limits are not applicable. Data usability is not affected.

- The recoveries for barium in the MS/MSD performed on sample BCC-MW-15022 were above the laboratory control limits and the post digestion spike (PDS) recoveries were within the control limits. Potential high bias exists for the positive results for barium in select groundwater samples in this data set, as summarized in the attached table.
- The recoveries for selenium in the MS/MSDs performed on samples BCC-MW-15009, BCC-MW-15022, and BCC-MW-17006 were below the lower laboratory control limits and the PDS recoveries were within the control limits. Potential low bias exists for the results for selenium in all groundwater samples in this data set, as summarized in the attached table.

- Laboratory duplicates were performed on the samples BCC-MW-15009, BCC-MW-15022. and BCC-MW-17006 for TDS. RPDs were within laboratory control limits.
- The field duplicate pair samples submitted with this data set are as follows:
    - Dup-01 corresponds with BCC-MW-15012
    - Dup-02 corresponds with BCC-MW-15014
    - Dup-03 corresponds with BCC-MW-15019
    - Dup-04 corresponds with BCC-MW-17004
  - RPDs between the parent and duplicate samples were within the QC limits for all analytes with one exception. The RPD for selenium (66.7%) was above the acceptance criteria in the field duplicate pair Dup-02/BCC-MW-15014. Potential uncertainty exists for the results for selenium in select groundwater samples in this data set, as summarized in the attached table.
- Carrier recoveries, where applicable, were within 40-110%.
- Reporting limits (RLs) for fluoride (5 mg/L) and sulfate (10 mg/L) in sample BCC-MW-15007 were elevated due to a 5-fold dilution required due to the elevated concentration of chloride in this sample. Project-specified RLs (1 mg/L and 2 mg/L, respectively) were not met.

Attachment A
Summary of Data Non-Conformances for Groundwater Analytical Data
BC Cobb - RCRA CCR Detection Monitoring Program
Muskegon, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
BCC-MW-15004	4/9/2019	TDS	Analysis performed past holding time; sample results may be biased low.
BCC-MW-15014	4/11/2019		
BCC-MW-15002	4/8/2019	Barium	MS/MSD recoveries above the upper laboratory control limits. Sample result may be biased high.
BCC-MW-15003	4/8/2019		
BCC-MW-15004	4/9/2019		
BCC-MW-15005	4/9/2019		
BCC-MW-15006	4/9/2019		
BCC-MW-15007	4/9/2019		
BCC-MW-15008	4/9/2019		
BCC-MW-15010	4/9/2019		
BCC-MW-15011	4/10/2019		
BCC-MW-15012	4/10/2019		
BCC-MW-15013	4/11/2019		
BCC-MW-15014	4/11/2019		
BCC-MW-15015	4/11/2019		
BCC-MW-15016	4/11/2019		
BCC-MW-15017	4/11/2019		
BCC-MW-15018	4/11/2019		
BCC-MW-17001	4/11/2019		
BCC-MW-17002	4/11/2019		
BCC-MW-17003	4/12/2019		
DUP-01	4/10/2019		
DUP-02	4/11/2019		
BCC-MW-15019	4/12/2019		
BCC-MW-15020	4/12/2019		
BCC-MW-15021	4/12/2019		
BCC-MW-15022	4/12/2019		
BCC-MW-15023	4/12/2019		
BCC-MW-17004	4/12/2019		
BCC-MW-17005	4/12/2019		
DUP-03	4/12/2019		
DUP-04	4/12/2019		

Attachment A
Summary of Data Non-Conformances for Groundwater Analytical Data
BC Cobb - RCRA CCR Detection Monitoring Program
Muskegon, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
BCC-MW-15002	4/8/2019	Selenium	MS/MSD recoveries below the lower laboratory control limits. Sample result may be biased low.
BCC-MW-15003	4/8/2019		
BCC-MW-15004	4/9/2019		
BCC-MW-15005	4/9/2019		
BCC-MW-15006	4/9/2019		
BCC-MW-15007	4/9/2019		
BCC-MW-15008	4/9/2019		
BCC-MW-15009	4/9/2019		
BCC-MW-15010	4/9/2019		
BCC-MW-15011	4/10/2019		
BCC-MW-15012	4/10/2019		
BCC-MW-15013	4/11/2019		
BCC-MW-15014	4/11/2019		
BCC-MW-15015	4/11/2019		
BCC-MW-15016	4/11/2019		
BCC-MW-15017	4/11/2019		
BCC-MW-15018	4/11/2019		
BCC-MW-17001	4/11/2019		
BCC-MW-17002	4/11/2019		
BCC-MW-17003	4/12/2019		
DUP-01	4/10/2019		
DUP-02	4/11/2019		
BCC-MW-15019	4/12/2019		
BCC-MW-15020	4/12/2019		
BCC-MW-15021	4/12/2019		
BCC-MW-15022	4/12/2019		
BCC-MW-15023	4/12/2019		
BCC-MW-17004	4/12/2019		
BCC-MW-17005	4/12/2019		
BCC-MW-17006	4/12/2019		
DUP-03	4/12/2019		
DUP-04	4/12/2019		

Attachment A
Summary of Data Non-Conformances for Groundwater Analytical Data
BC Cobb - RCRA CCR Detection Monitoring Program
Muskegon, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
BCC-MW-15002	4/8/2019	Selenium	Field duplicate RPD >30%. Sample result may be estimated.
BCC-MW-15003	4/8/2019		
BCC-MW-15004	4/9/2019		
BCC-MW-15005	4/9/2019		
BCC-MW-15006	4/9/2019		
BCC-MW-15007	4/9/2019		
BCC-MW-15008	4/9/2019		
BCC-MW-15009	4/9/2019		
BCC-MW-15010	4/9/2019		
BCC-MW-15011	4/10/2019		
BCC-MW-15013	4/11/2019		
BCC-MW-15014	4/11/2019		
BCC-MW-15015	4/11/2019		
BCC-MW-15016	4/11/2019		
BCC-MW-15017	4/11/2019		
BCC-MW-15018	4/11/2019		
BCC-MW-17001	4/11/2019		
BCC-MW-17002	4/11/2019		
BCC-MW-17003	4/12/2019		
DUP-02	4/11/2019		
BCC-MW-15020	4/12/2019		
BCC-MW-15021	4/12/2019		
BCC-MW-15022	4/12/2019		
BCC-MW-15023	4/12/2019		
BCC-MW-17005	4/12/2019		
BCC-MW-17006	4/12/2019		
BCC-MW-15019	4/12/2019	Radium 226	LCS recovery below the lower laboratory control limits. Sample result may be biased low.
BCC-MW-15020	4/12/2019		
BCC-MW-15021	4/12/2019		
BCC-MW-15022	4/12/2019		
BCC-MW-15023	4/12/2019		
BCC-MW-17004	4/12/2019		
BCC-MW-17005	4/12/2019		
BCC-MW-17006	4/12/2019		
EB-04	4/12/2019		
DUP-03	4/12/2019		
DUP-04	4/12/2019		

Notes:
LCS - Laboratroy control sample.
MS/MSD - Matrix spike/matrix spike duplicate.
RPD - Relative percent difference.

Laboratory Data Quality Review
Groundwater Monitoring Event September 2019
Consumers Energy BC Cobb

Groundwater samples were collected by TRC for the September 2019 sampling event. Samples were analyzed for lithium, anions, and total dissolved solids by Eurofins TA in North Canton, Ohio (Eurofins TA – Canton). The remaining metals analyses were subcontracted to Eurofins TA in Irvine, California (Eurofins TA - Irvine). The radium analyses were subcontracted to Eurofins TA in St. Louis, Missouri (Eurofins TA – St. Louis). The laboratory analytical results were reported in laboratory sample delivery groups (SDGs) 240-119709-1, 240-119709-2, 240-119386-1, 240-119386-2, 240-119637-1, 240-119637-2, 240-119643-1, and 240-119643-2.

During the September 2019 sampling event, a groundwater sample was collected from each of the following wells:

- BCC-MW-15002
- BCC-MW-15003
- BCC-MW-15004
- BCC-MW-15005
- BCC-MW-15006
- BCC-MW-15007
- BCC-MW-15008
- BCC-MW-15009
- BCC-MW-15010
- BCC-MW-15011
- BCC-MW-15012
- BCC-MW-15013
- BCC-MW-15014
- BCC-MW-15015
- BCC-MW-15016
- BCC-MW-15017
- BCC-MW-15018
- BCC-MW-15019
- BCC-MW-15020
- BCC-MW-15021
- BCC-MW-15022
- BCC-MW-15023
- BCC-MW-17001
- BCC-MW-17002
- BCC-MW-17003
- BCC-MW-17004
- BCC-MW-17005
- BCC-MW-17006

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

Analyte Group	Method
Anions (Fluoride, Chloride, Sulfate)	EPA 300.0
Total Dissolved Solids	SM 2540C-11
Total Metals	SW-846 6020, SW-846 6010B
Radium (Radium-226, Radium-228, Combined Radium)	EPA 903.0, EPA 904.0

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

Data Usability Review Procedure

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

- Sample receipt;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;
- Data for method blanks and field blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Field blanks are used to assess potential contamination arising from field procedures;
- Data for laboratory control samples (LCSs) and LCS duplicates (LCSD), when performed. The LCS/LCSDs are used to assess the accuracy and precision, where applicable, of the analytical method using a clean matrix;
- Percent recoveries for matrix spike (MS) and matrix spike duplicates (MSD), when performed on project samples. Percent recoveries are calculated for each analyte spiked and used to assess bias due to sample matrix effects;
- Data for laboratory duplicates, when performed on project samples. The laboratory duplicates are replicate analyses of one sample and are used to assess the precision of the analytical method;
- Percent recoveries for carriers, where applicable, for radiochemistry only. Carriers are used to assess the chemical yield for the preparation and/or instrument efficiency;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

This data usability report addresses the following items:

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

Review Summary

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

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

QA/QC Sample Summary:

- A method blank was analyzed with each analytical batch. For radium, normalized absolute difference comparisons between blank and sample that are between 1.96 and 2.58 may indicate biased high results and normalized absolute differences <1.96 may indicate a false positive sample result. Normalized absolute difference comparisons between blank and sample that are > 2.58 are not impacted and therefore not discussed. Target analytes were not detected in method blanks with the following exception:
    - Radium-228 was detected in the method blank in preparation batch 446859 at a concentration of 0.4541 ± 0.239 pCi/L. The positive results for radium-228 in samples associated with this blank were potentially impacted, as summarized in the attached table, Attachment A.
- Four equipment blanks (EB #01, EB #02, EB #03, EB #04) and three field blanks (FB #01, FB #02, and FB #04) were collected. For radium, normalized absolute difference comparisons between blank and sample that are between 1.96 and 2.58 may indicate biased high results and normalized absolute differences <1.96 may indicate a false positive sample result. Normalized absolute difference comparisons between blank and sample that are > 2.58 are not impacted and therefore not discussed. Target analytes were not detected in equipment blanks and field blanks with the following exceptions:
    - Radium-228 was detected in EB #04 at a concentration of 0.567 ± 0.322 pCi/L. The positive results for radium-228 in select samples associated with this blank were potentially impacted, as summarized in the attached table, Attachment A.
    - Combined Radium was detected in EB #04 at a concentration of 0.691 ± 0.343 pCi/L. The positive results for combined radium in select samples associated with this blank were potentially impacted, as summarized in the attached table, Attachment A.
    - Chromium was detected in EB #02 at a concentration of 0.0012 mg/L and in EB #03 at a concentration of 0.0010 mg/L. The positive results for chromium in select samples associated with these blanks were potentially impacted, as summarized in the attached table, Attachment A.
- LCS and/or LCSD recoveries and relative percent differences (RPDs), where applicable, were within laboratory control limits for all analytes.
- MS and/or MSDs were performed on the following samples:
    - BCC-MW-17003 and DUP #01 for anions

- BCC-MW-15006 for calcium and boron
- BCC-MW-15009 for all metals and anions
- BCC-MW-15022 for all metals and anions
- BCC-MW-17006 for all metals and anions

The MS/MSD recoveries and RPDs, where applicable, were within the acceptance limits with the following exceptions:

- The recovery for fluoride in the MS performed on sample BCC-MW-15009 was above the upper laboratory control limit. However, there was no impact on data usability since fluoride was not detected in this sample.
- The recoveries for selenium in the MS/MSD performed on samples BCC-MW-15009, BCC-MW-15022, and BCC-MW-17006 were below the lower laboratory control limits. Potential low bias exists for positive and nondetect results for all groundwater samples collected during this event as summarized in the attached table, Attachment A.
- The recoveries for boron and/or calcium were outside of the acceptance limits in the MS/MSD analyses performed on samples BCC-MW-17006, BCC-MW-15009, and BCC-MW-15022. However, the concentrations in the parent sample for calcium in BCC-MW-17006, BCC-MW-15022, and BCC-MW-15009, and boron in BCC-MW-15022, were >4x the spike concentration; therefore, the MS/MSD results are not applicable. Data usability is not affected.

- Laboratory duplicates were performed on samples BCC-MW-17002 , BCC-MW-15022, BCC-MW-17006, and BCC-MW-15009 for TDS; RPDs were within laboratory control limits.
- The field duplicate pair samples submitted with this data set are as follows:
  - Dup#01 corresponds with BCC-MW-15006
  - Dup#02 corresponds with BCC-MW-15011
  - Dup#03 corresponds with BCC-MW-15021
  - Dup#04 corresponds with BCC-MW-17005
  - RPDs between the parent and duplicate samples were within the QC limits for all analytes with the following exceptions.
    - The absolute difference was > the RL for chromium in Dup#01/BCC-MW-15006. Potential uncertainty exists for the results for chromium in samples in SDG 240-119386-1 as summarized in the attached table, Attachment A.
    - The absolute difference was > the RL for chromium in Dup#04/BCC-MW-17005. However, these results are potential false positives due to equipment blank contamination (EB #03). Therefore, there is no impact on sample data.

- Carrier recoveries, where applicable, were within 40-110% with one exception. The barium carrier recovery (35%) in the radium-226 and combined radium 226+228 analyses of sample BCC-MW-15004 was below the control limits. The laboratory noted there was physical evidence of matrix interference apparent during the preparation of the sample and that the sample was re-plated which could have resulted in low recovery. Potential low bias exists for radium-226 and combined radium 226+228 in sample BCC-MW-15004 as summarized in the attached table, Attachment A.
- RLs for the following analytes were elevated due to various dilutions required:
  - Sulfate in select samples were above the project-specified RL (2.0 mg/L): BCC-MW-15016, BCC-MW-15017, , BCC-MW-15018, BCC-MW-15002, BCC-MW-15003, BCC-MW-15004, BCC-MW-15021, DUP #03, and BCC-MW-15019 due to matrix and/or non-target interference;
  - Fluoride in sample BCC-MW-15007 (2.0 mg/L) was above the project-specified RL (1.0 mg/L) due to elevated chloride; and
  - Chromium, molybdenum, and selenium in sample BCC-MW-15015 were above the project-specified RLs (0.001 mg/L, 0.005 mg/L, and 0.001 mg/L, respectively) due to matrix interference.
- Results for lithium were not originally reported in the MS/MSD analyses performed on samples BCC-MW-15009 and BCC-MW-15022; however, results for lithium were originally reported in the parent samples. Since lithium was requested on the MS/MSD analyses for samples BCC-MW-15009 and BCC-MW-15022 during this review, the laboratory had to re-analyze the parent samples for lithium as well. The re-analyzed results for lithium in samples BCC-MW-15009 and BCC-MW-15022 that were reported in SDG 240-119637-1, Revision 1, should be used for project objectives.

Attachment A

Summary of Data Non-Conformances for Groundwater Analytical Data
BC Cobb - RCRA CCR Detection Monitoring Program
Muskegon, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
BCC-MW-15018	9/26/2019	Radium-228	Detection in the equipment blank (EB #04). Normalized absolute difference between blank and samples <1.96; indicates possible false positive results.
BCC-MW-17001	9/26/2019		
BCC-MW-15018	9/26/2019	Combined Radium 226+228	Detection in the equipment blank (EB #04). Normalized absolute difference between blank and samples <1.96; indicates possible false positive results.
BCC-MW-17001	9/26/2019		
BCC-MW-17002	9/26/2019		
BCC-MW-17003	9/26/2019		
BCC-MW-15002	9/25/2019	Radium-228	Detection in the associated method blank. Normalized absolute difference between blank and samples <1.96; indicates possible false positive results.
BCC-MW-15003	9/25/2019		
BCC-MW-15004	9/25/2019		
BCC-MW-15011	9/25/2019		
BCC-MW-15022	9/25/2019		
BCC-MW-15004	9/25/2019	Chromium	Detection in the equipment blank (EB #02). Results <5x the blank concentration; indicates possible false positive results.
BCC-MW-15005	9/25/2019		
BCC-MW-15013	9/25/2019		
BCC-MW-15021	9/26/2019	Chromium	Detection in the equipment blank (EB #03). Results <5x the blank concentration; indicates possible false positive results.
DUP #03	9/26/2019		
BCC-MW-17006	9/26/2019		
BCC-MW-15020	9/26/2019		
BCC-MW-17005	9/26/2019		
DUP #04	9/26/2019		
BCC-MW-15006	9/24/2019	Chromium	Field duplicate variability; absolute difference between parent and duplicate sample > the reporting limit. Sample result may be uncertain.
BCC-MW-15007	9/24/2019		
BCC-MW-15008	9/24/2019		
DUP #01	9/24/2019		
BCC-MW-15010	9/24/2019		

Attachment A

Summary of Data Non-Conformances for Groundwater Analytical Data
BC Cobb - RCRA CCR Detection Monitoring Program
Muskegon, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
BCC-MW-15006	9/24/2019	Selenium	MS/MSD recoveries below the lower laboratory control limits. Sample result may be biased low.
BCC-MW-15007	9/24/2019		
BCC-MW-15008	9/24/2019		
DUP #01	9/24/2019		
BCC-MW-15010	9/24/2019		
BCC-MW-15002	9/25/2019		
BCC-MW-15003	9/25/2019		
BCC-MW-15004	9/25/2019		
BCC-MW-15005	9/25/2019		
BCC-MW-15011	9/25/2019		
DUP #02	9/25/2019		
BCC-MW-15012	9/25/2019		
BCC-MW-15014	9/25/2019		
BCC-MW-15013	9/25/2019		
BCC-MW-15009	9/25/2019		
BCC-MW-15022	9/25/2019		
BCC-MW-15015	9/26/2019		
BCC-MW-15021	9/26/2019		
DUP #03	9/26/2019		
BCC-MW-17006	9/26/2019		
BCC-MW-15023	9/26/2019		
BCC-MW-15020	9/26/2019		
BCC-MW-17005	9/26/2019		
DUP #04	9/26/2019		
BCC-MW-17004	9/26/2019		
BCC-MW-15019	9/26/2019		
BCC-MW-15016	9/26/2019		
BCC-MW-15017	9/26/2019		
BCC-MW-15018	9/26/2019		
BCC-MW-17001	9/26/2019		
BCC-MW-17002	9/26/2019		
BCC-MW-17003	9/26/2019		
BCC-MW-15004	9/25/2019	Radium-226, Combined Radium 226+228	Low barium carrier recovery; sample result may be biased low.

Appendix C
June 2018 Statistical Evaluation of Initial Assessment Monitoring Sampling Event

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January 14, 2019

Michell Marion
Environmental Services
Consumers Energy Company
1945 W. Parnall Road
Jackson, MI 49201

Subject: Statistical Evaluation of Initial Assessment Monitoring Sampling Event
BC Cobb Bottom Ash Pond & Ponds 0-8 CCR Unit, Consumers Energy Company,
Muskegon, Michigan

Dear Ms. Marion:

Consumers Energy Company (CEC) reported in the January 31, 2018 *Annual Groundwater Monitoring Report for the Former BC Cobb Power Plant Bottom Ash Pond & Ponds 0-8 CCR Unit* for the BC Cobb (BCC) site in Muskegon, Michigan, that boron, fluoride, and pH were observed within groundwater at one or more downgradient monitoring well(s) with potential statistically significant increases (SSIs) above background concentration levels. TRC completed an Alternate Source Demonstration for the parameters listed above and did not find strong enough evidence within 90 days to determine the observation of constituents above background was attributable to an error or source other than the coal combustion residual (CCR) unit.

Therefore, CEC initiated an Assessment Monitoring Program for the Bottom Ash Pond and Ponds 0-8 CCR Unit (BCC Ponds) pursuant to §257.95 of the CCR Rule[1] that included sampling and analyzing groundwater within the groundwater monitoring system for all constituents listed in Appendix IV. The results from the initial assessment monitoring sampling event were used to establish groundwater protection standards (GWPSs) for the Appendix IV constituents in accordance with §257.95(h), as presented in the October 15, 2018 *Assessment Monitoring Data Summary and Establishment of Groundwater Protection Standards.* The GWPS is established as the higher of the EPA Maximum Contaminant Level (MCL) or statistically derived background level for constituents with MCLs and the higher of the EPA Regional Screening Levels (RSLs) or background level for Appendix IV constituents with RSLs. The

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

BCC Ponds monitoring system was subsequently sampled for the Appendix III and Appendix IV constituents within 90 days from the initial Appendix IV sampling event (June 2018). In accordance with §257.95, the assessment monitoring data must be compared to GWPSs to determine whether or not Appendix IV constituents are detected at statistically significant levels above the GWPSs.

This letter report presents a summary of the collected assessment monitoring data and the comparison of the assessment monitoring data to the GWPSs. The results of the assessment monitoring evaluation indicate that the following constituent is present at statistically significant levels exceeding the GWPS in downgradient monitoring wells at the BCC Ponds:

Constituent	GWPS	# Downgradient Wells Observed
Lithium	40 ug/L	2 of 21

As such, per §257.95(g), the facility must either conduct an alternate source demonstration or initiate an assessment of corrective measures according to §257.96 within 90 days of detecting a statistical exceedance of the GWPSs.

Background

The former BC Cobb coal-fired power generation facility is located east of Muskegon Lake, south of Cedar Creek, northwest of the CSX rail line, and west of the Muskegon River marsh in Muskegon, Michigan (Figure 1). The plant began operations in 1948 and ceased operations in April 2016. There are two RCRA CCR units associated with the plant—the Bottom Ash Pond and Ponds 0-8, both of which were wet ash dewatering areas, monitored using a multiunit groundwater monitoring system. From 1984 through plant closure in 2016, CCR have been deposited in the ash ponds by utilizing sluicing methods. These CCR units are surrounded by perimeter dikes that were primarily constructed of native material dredged to form the ponds during their initial construction and bottom ash. Site features are shown on Figure 2.

CEC provided notification of initiation of closure on March 30, 2018 to the Michigan Department of Environmental Quality (MDEQ) to implement the certified closure plan by removal of CCR under the self-implementing requirements and schedule of the CCR Rule.

Groundwater Monitoring System

In accordance with 40 CFR 257.91, CEC established a groundwater monitoring system for the BCC Ponds CCR unit, which had initially consisted of 22 monitoring wells (seven background monitoring wells and 15 downgradient monitoring wells) that are screened in the uppermost aquifer. Six additional downgradient monitoring wells were installed in late 2017 and incorporated into the groundwater monitoring system in 2018. Seven monitoring wells located southwest of the BCC Ponds provide data

on background groundwater quality that has not been affected by the CCR unit (BCC-MW-15002 through BCC-MW-15008). The monitoring well locations are shown on Figure 2.

Monitoring wells BCC-MW-15009 through BCC-MW-15014 encircle the BAP, while BCC-MW-15015 through BCC-MW-15023 and BCC-MW-17001 through BCC-MW-17006 are located at the outer edge of the peninsula formed by the bottom ash pond system. Because the perimeter and interior berms within the ash management area were constructed in part with ash and bodies of water surround the ash management area, wells could not be installed entirely beyond the CCR material boundary.

Significant changes occurred in the ash management area during the CCR Rule baseline period. The monitoring well system was installed in October 2015 while the plant and the pond system were in operation. The plant shut down in April 2016 and ceased sluicing ash to the CCR Rule units. The ponds were then dewatered. Veterans Pond to the north of the CCR ponds was dewatered sometime during the period between August and December 2017. These changes effected groundwater flow rates and directions at both the upgradient and downgradient monitoring wells. While the ponds were in operation, groundwater mounded within the pond area and flowed radially toward the surrounding water bodies. Starting with the July 2016 groundwater sampling round, groundwater continued to flow radially to the surrounding water bodies, but with a much lower gradient. When Veterans Pond was drained, a stronger gradient was established along the eastern side of the peninsula toward the Veterans Pond area. Veterans Pond is no longer drained and hydraulic loading of the BCC Ponds was discontinued back in 2016, so groundwater flow gradients in the BCC Ponds are essentially flat. The groundwater contour map for June 2018 is representative of current groundwater conditions at the site and is provided as Figure 3.

Data Quality

Data from each 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.

Assessment Monitoring Statistical Evaluation

Following the initial and resample assessment monitoring events, compliance well data for the BCC Ponds were evaluated in accordance with the *Groundwater Statistical Evaluation Plan* (Stats Plan) (TRC, October 2017). Consistent with the Unified Guidance[2], the preferred method for comparisons to a

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

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.

For each detected Appendix IV constituent, the concentrations for each well were first compared directly to the GWPS, as shown on Table 1. Due to the aforementioned significant changes that occurred in the ash management area during the CCR Rule baseline period, where groundwater flow rates and directions were changed drastically over relatively short periods of time, the data set used for statistical evaluation was limited to the four most recent events. Use of the four most recent data points provides the minimum density of data as recommended per the Unified Guidance and, for the BCC Ponds, is appropriate in order to capture re-stabilized groundwater quality that is representative of the most current conditions, after hydraulic loading ceased and pumping from Veteran's Pond was completed. For the BCC-MW-15000-series monitoring wells, the confidence interval tests included data collected between April 2017 and June 2018. For the BCC-MW-17000-series wells, the confidence interval tests included data collected between December 2017 and August 2018. Parameter-well combinations that included a direct exceedance of the GWPS during these timeframes were retained for further analysis. Arsenic in BCC-MW-15009, BCC-MW-17002, and BCC-MW-17003, lithium in BCC-MW-15010, BCC-MW-17001, and BCC-MW-17002, and radium 226/228 in BCC-MW-15017 had individual results exceeding the GWPS.

Groundwater data were then evaluated utilizing Sanitas™ statistical software. Sanitas™ is a software tool that is commercially available for performing statistical evaluation consistent with procedures outlined in the Unified Guidance. Within the Sanitas™ statistical program, confidence limits were selected to perform the statistical comparison of compliance data to a fixed standard. Parametric and non-parametric confidence intervals were calculated, as appropriate, 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 Sanitas™ output files are included as an attachment.

The statistical data evaluation included the following steps:

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

The results of these evaluations are presented and discussed below.

Initially, the recent baseline for the BCC-MW-15000-series monitoring wells (from April 2017 and June 2018) and for the BCC-MW-17000-series wells (December 2017 and August 2018) were observed visually for potential trends. No significant trends were identified. The Sanitas™ software was then used to test compliance at the downgradient monitoring wells using the confidence interval method for the most recent four sampling events. The software outputs are included in Attachment A along with data reports showing the values used for the evaluation. The percentage of non-detect observations are also included in Attachment A. Non-detect data was handled in accordance with the Stats Plan for the purposes of calculating the confidence intervals. The tests were run with a per-well significance of $\alpha = 0.01$.

The Sanitas™ software generates an output that includes graphs of the parametric or non-parametric confidence intervals for each well along with notes on data transformations, as appropriate. The data sets with direct exceedances of the GWPS were found to be normally distributed, with the exception of arsenic in BCC-MW-17002 and BCC-MW-17003. The confidence interval test compares the lower confidence limit to the GWPS. The calculated upper and lower confidence limits and comparison of the lower confidence limits to the GWPSs are also summarized in Table 2.

The statistical evaluation of the Appendix IV parameters shows exceedances for lithium at BCC-MW-17001 and BCC-MW-17002. The lower confidence limits for the other Appendix IV constituents statistically evaluated at BCC-MW-15009, BCC-MW-15010, BCC-MW-15017, and BCC-MW-17003 were below their respective GWPSs. Per §257.95(g), the facility must either conduct an alternate source demonstration or initiate an assessment of corrective measures according to §257.96 within 90 days of detecting a statistical exceedance of the GWPSs.

Next Steps

In accordance with the CCR Rule, CEC will enter this statistical evaluation of the assessment monitoring data into the operating record by January 14, 2019. The notification of the GWPS exceedances to the state will be posted by CEC to a public CCR compliance website as required by §257.105(h)(8) by February 13, 2019. By April 14, 2019, in accordance with §257.95(g)(3), an assessment of corrective measures will be initiated. This assessment will be completed no later than September 11, 2019 in accordance with the timeframes provided in §257.96(a)(1).

Sincerely,

TRC

Graham Crockford
Program Manager

Sarah B. Holmstrom
Project Hydrogeologist

Attachments

Table 1.	Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to August 2018
Table 2.	Summary of Groundwater Protection Standard Exceedances – June and August 2018
Figure 1.	Site Location Map
Figure 2.	Site Plan
Figure 3.	Shallow Groundwater Contour Map – June 2018
Attachment A	Sanitas™ Output

cc: Brad Runkel, Consumers Energy
JR Register, Consumers Energy
Bethany Swanberg, Consumers Energy
Central Files

Tables

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to August 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15009											
						Sample Date:	12/1/2015	2/17/2016	4/18/2016	7/12/2016	9/28/2016	2/14/2017	4/5/2017	7/11/2017	7/11/2017	9/13/2017	4/16/2018	6/13/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient								Field Dup			
Appendix III																		
Boron	ug/L	NC	NA	1,320	NA		2,380	2,520	2,170	2,070	2,190	2,110	2,190	2,210	1,690	2,120	--	1,670
Calcium	mg/L	NC	NA	259	NA		42.7	44.1	40.1	44.1	46.7	37.7	38.2	37.6	36.5	34.9	--	42.4
Chloride	mg/L	250*	NA	5,980	NA		24	24	27.1	26.9	24.3	22.8	24.9	26.3	26.3	26	--	95.7
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		10.6	10.8	10.3	10.0	10.0	10.2	10.1	9.6	--	10.2	9.8	9.8
Sulfate	mg/L	250*	NA	200	NA		63	39.3	49.5	55.2	49.1	31.6	39.8	43	47.2	41.7	--	< 2.0
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		240	230	220	220	230	200	190	216	246	188	--	456
Appendix IV																		
Antimony	ug/L	6	NA	1	6		1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		**45**	**31**	**24**	**24**	**20**	**14**	**13**	**12**	**10.8**	--	9.4	8.5
Barium	ug/L	2,000	NA	340	2,000		16	12	11	11	11	9	10	13.2	10.8	--	16.5	13.8
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	< 0.20	--	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	< 1	1	2	< 1	< 1	< 1	< 1.0	< 1.0	--	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	< 15.0	--	< 15.0	< 15.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	< 1.0	< 1.0
Lithium	ug/L	NC	40	2	**40**		15.6	14.6	15	14	14	13	14	19	19	--	24	21
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	< 0.20	--	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		57	60	50	49	49	40	38	43.7	41.8	--	16.0	11.6
Radium-226	pCi/L	5	NA	NA	NA		< 0.166	< 0.157	< 0.209	< 0.158	< 0.269	< 0.159	< 0.347	< 0.756	< 0.887	--	< 0.934	< 0.580
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.451	< 0.475	< 0.467	< 0.461	< 0.628	0.747	< 0.502	< 2.72	< 3.85	--	< 1.89	< 3.85
Radium-228	pCi/L	5	NA	NA	NA		< 0.451	< 0.475	< 0.467	< 0.461	< 0.628	0.678	< 0.502	< 1.96	< 2.96	--	< 0.957	< 3.27
Selenium	ug/L	50	NA	3	50		< 1	< 1	2	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.

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

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

All metals were analyzed as total unless otherwise specified.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to August 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15010											
						Sample Date:	12/1/2015	2/17/2016	4/13/2016	7/13/2016	9/28/2016	2/14/2017	4/5/2017	7/11/2017	9/13/2017	9/13/2017	4/16/2018	6/14/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient									Field Dup		
Appendix III																		
Boron	ug/L	NC	NA	1,320	NA		1,970	1,510	1,340	1,270	1,570	1,440	1,760	1,340	1,770	1,770	--	2,100
Calcium	mg/L	NC	NA	259	NA		71.2	51.9	37.4	58.2	66.4	49.8	80.5	40.7	129	133	--	133
Chloride	mg/L	250*	NA	5,980	NA		23	22.5	21.5	22.7	25.1	22.3	24.2	25.5	24.5	24.4	--	29.3
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.7	7.8	7.8	7.8	8.0	8.0	7.8	7.8	7.8	--	7.8	7.4
Sulfate	mg/L	250*	NA	200	NA		120	52.6	31	50.7	69.7	24.2	53.5	24.8	143	143	--	73.7
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		410	270	220	260	320	250	360	288	570	618	--	636
Appendix IV																		
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	--	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	--	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		49	34	28	42	45	31	51	29.2	--	--	63.4	64.8
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	--	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	--	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	< 1	2	< 1	< 1	1	< 1	< 1.0	--	--	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	--	< 15.0	< 15.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	--	< 1.0	< 1.0
Lithium	ug/L	NC	40	2	**40**		36.1	22.7	18	15	22	14	18	21	--	--	**46**	**54**
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	--	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		33	29	27	15	20	9	7	16.2	--	--	< 5.0	< 5.0
Radium-226	pCi/L	5	NA	NA	NA		< 0.302	< 0.217	< 0.244	< 0.145	< 0.297	< 0.179	< 0.216	< 0.642	--	--	< 0.869	0.661
Radium-226/228	pCi/L	5	NA	2.42	**5**		0.973	< 0.502	< 0.447	0.451	0.82	< 0.363	< 0.38	< 1.60	--	--	< 1.75	< 1.45
Radium-228	pCi/L	5	NA	NA	NA		0.849	< 0.502	< 0.447	0.42	0.728	< 0.363	< 0.38	< 0.956	--	--	< 0.877	< 0.978
Selenium	ug/L	50	NA	3	50		< 1	< 1	1	1	< 1	< 1	< 1	< 1.0	--	--	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	--	< 2.0	< 2.0

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.

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RSL - Regional Screening Level from 83 FR 36435.

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

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

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

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

All metals were analyzed as total unless otherwise specified.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to August 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15011										
						Sample Date:	12/1/2015	2/17/2016	4/13/2016	7/12/2016	9/28/2016	2/14/2017	4/5/2017	7/11/2017	9/13/2017	4/16/2018	6/13/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient										
Appendix III																	
Boron	ug/L	NC	NA	1,320	NA		1,680	1,420	1,340	1,210	1,180	1,280	1,340	1,060	1,490	--	1,630
Calcium	mg/L	NC	NA	259	NA		53	47.6	36.9	47.3	48	47.9	52	42.2	23.9	--	22.6
Chloride	mg/L	250*	NA	5,980	NA		22	20.7	22.1	24.8	21	19.5	22.2	22.9	24	--	23.2
Fluoride	ug/L	4,000	NA	1,000	NA		1,200	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,000	< 1,000	< 1,000
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		8.7	8.5	8.2	8.5	8.7	9.2	9.0	8.2	8.5	9.1	8.5
Sulfate	mg/L	250*	NA	200	NA		50	30.8	35.8	43.8	38.5	37.2	42.8	29.1	6.4	--	12.3
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		270	230	210	240	230	230	240	224	140	--	244
Appendix IV																	
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		5	3	3	4	6	7	8	< 1.0	--	6.4	1.5
Barium	ug/L	2,000	NA	340	2,000		36	29	25	30	31	31	32	30.7	--	15.2	16.6
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		1	< 1	2	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0
Fluoride	ug/L	4,000	NA	1,000	4,000		1,200	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Lithium	ug/L	NC	40	2	**40**		17.2	16	14	15	16	17	17	20	--	21	11
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		20	29	35	26	27	25	22	21.4	--	8.9	5.8
Radium-226	pCi/L	5	NA	NA	NA		< 0.199	< 0.141	< 0.319	< 0.166	< 0.284	< 0.16	< 0.296	< 1.12	--	< 0.742	0.35
Radium-226/228	pCi/L	5	NA	2.42	**5**		1.01	< 0.447	< 0.435	< 0.402	< 0.496	< 0.394	< 0.599	< 2.07	--	< 1.61	< 1.25
Radium-228	pCi/L	5	NA	NA	NA		0.956	< 0.447	< 0.435	< 0.402	< 0.496	< 0.394	< 0.599	< 0.954	--	< 0.872	< 0.923
Selenium	ug/L	50	NA	3	50		< 1	< 1	< 1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.

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

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

All metals were analyzed as total unless otherwise specified.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to August 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15012										
						Sample Date:	12/1/2015	2/17/2016	4/13/2016	7/13/2016	9/29/2016	2/14/2017	4/5/2017	7/12/2017	9/13/2017	4/17/2018	6/13/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient										
Appendix III																	
Boron	ug/L	NC	NA	1,320	NA		961	1,390	1,830	1,450	1,470	1,380	1,500	1,340	1,140	--	1,450
Calcium	mg/L	NC	NA	259	NA		49.5	82.1	65.5	44.5	43.5	32	34.9	24.6	48.7	--	95.1
Chloride	mg/L	250*	NA	5,980	NA		20	20.4	23.7	23	22.6	19.7	22.7	24.1	23.3	--	22.7
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,200	1,100	< 1,000	< 1,000
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		8.0	8.1	8.1	8.9	9.2	8.6	8.5	9.9	11.4	9.7	10.2
Sulfate	mg/L	250*	NA	200	NA		69	111	106	65.6	50.9	55.7	57.2	21.8	59.6	--	355
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		300	370	340	250	210	190	200	168	318	--	902
Appendix IV																	
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		< 1	2	8	**12**	9	2	3	6.1	--	1.8	3.4
Barium	ug/L	2,000	NA	340	2,000		40	63	68	34	22	25	28	14.3	--	109	105
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	< 1	1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,200	1,100	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Lithium	ug/L	NC	40	2	**40**		15.6	20.8	19	18	15	11	12	12	--	13	11
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		29	9	35	37	44	35	27	94.5	--	50.8	71.3
Radium-226	pCi/L	5	NA	NA	NA		< 0.164	< 0.243	< 0.256	< 0.216	< 0.335	< 0.153	< 0.243	0.436	--	< 0.693	< 0.526
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.471	< 0.634	0.919	< 0.539	< 0.548	< 0.416	< 0.554	< 2.28	--	< 1.43	< 1.32
Radium-228	pCi/L	5	NA	NA	NA		< 0.471	< 0.634	0.827	< 0.539	< 0.548	< 0.416	< 0.554	< 2.08	--	< 0.733	< 0.789
Selenium	ug/L	50	NA	3	50		< 1	< 1	< 1	< 1	< 1	< 1	< 1	1.2	--	1.2	3.3
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.

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

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

All metals were analyzed as total unless otherwise specified.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to August 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15013											
						Sample Date:	12/1/2015	2/18/2016	4/13/2016	7/13/2016	9/29/2016	2/14/2017	4/5/2017	7/12/2017	9/13/2017	4/17/2018	4/17/2018	6/13/2018	6/13/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient												
Appendix III																	Field Dup		Field Dup
Boron	ug/L	NC	NA	1,320	NA		1,140	1,290	1,180	1,080	1,090	1,050	1,120	916	1,270	--	--	1,130	1,100
Calcium	mg/L	NC	NA	259	NA		65.2	58.3	47.5	48.4	59.7	52.5	50.9	43.9	34.4	--	--	47.3	48.9
Chloride	mg/L	250*	NA	5,980	NA		21	20.9	21.5	21	22.9	19.8	19.9	23.4	21.2	--	--	21.5	21.6
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.6	7.2	7.4	7.3	7.4	7.7	7.4	7.4	7.9	7.6	--	7.7	--
Sulfate	mg/L	250*	NA	200	NA		89	44.3	34.3	27.5	31.3	23.1	15.1	8.7	59.9	--	--	8.7	7.9
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		330	290	260	250	250	260	250	240	192	--	--	324	268
Appendix IV																			
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		71	58	49	47	51	52	48	41.9	--	43.3	44.7	43.9	41.1
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	< 1	2	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 15.0	< 15.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	2	**40**		17.5	19.9	18	17	18	18	17	23	--	27	28	24	24
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		17	20	21	12	11	10	9	7.7	--	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	5	NA	NA	NA		0.272	< 0.299	0.173	< 0.181	< 0.215	< 0.23	< 0.215	0.731	--	< 0.505	< 0.506	< 0.546	< 0.585
Radium-226/228	pCi/L	5	NA	2.42	**5**		1.19	< 0.527	0.9	0.596	< 0.598	< 0.481	< 0.516	< 1.56	--	< 1.14	< 1.29	< 1.30	< 1.49
Radium-228	pCi/L	5	NA	NA	NA		0.914	< 0.527	0.727	0.483	< 0.598	< 0.481	< 0.516	< 0.940	--	< 0.633	< 0.780	< 0.754	< 0.903
Selenium	ug/L	50	NA	3	50		< 1	< 1	< 1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.

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

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

All metals were analyzed as total unless otherwise specified.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to August 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15014										
						Sample Date:	12/1/2015	2/18/2016	4/18/2016	7/13/2016	9/29/2016	2/14/2017	4/5/2017	7/12/2017	9/13/2017	4/17/2018	6/13/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient										
Appendix III																	
Boron	ug/L	NC	NA	1,320	NA		2,560	2,230	1,840	1,630	1,690	1,530	1,560	1,300	1,410	--	1,370
Calcium	mg/L	NC	NA	259	NA		75.6	75.3	63.9	73.5	64.7	66.3	65.3	61.8	57.8	--	50.8
Chloride	mg/L	250*	NA	5,980	NA		21	21.9	21.9	22	22.7	18.6	22.1	22.4	22.5	--	21.3
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		11.5	11.6	11.2	11.0	11.1	11.5	11.3	11.5	12.0	11.6	11.4
Sulfate	mg/L	250*	NA	200	NA		43	34.7	31.4	35.6	23.7	27.8	23.9	24.9	19.2	--	2.4
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		350	310	270	290	250	280	270	292	282	--	338
Appendix IV																	
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	1.7	--	1.1	< 1.0
Arsenic	ug/L	10	NA	10	**10**		**15**	**11**	**11**	8	9	7	7	8.4	--	6.2	5.5
Barium	ug/L	2,000	NA	340	2,000		329	376	257	508	357	571	546	732	--	779	607
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	2	1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Lithium	ug/L	NC	40	2	**40**		< 10	< 10	< 10	< 10	< 10	< 10	< 10	19	--	27	16
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		**119**	76	58	69	81	80	77	70.9	--	94.7	100
Radium-226	pCi/L	5	NA	NA	NA		< 0.176	< 0.175	< 0.177	0.214	< 0.218	< 0.211	< 0.289	< 0.511	--	< 1.11	< 1.17
Radium-226/228	pCi/L	5	NA	2.42	**5**		1.31	< 0.735	< 0.562	< 0.606	< 0.485	0.883	< 0.423	< 1.58	--	< 2.08	< 3.02
Radium-228	pCi/L	5	NA	NA	NA		1.23	< 0.735	< 0.562	< 0.606	< 0.485	0.81	< 0.423	< 1.07	--	< 0.972	< 1.85
Selenium	ug/L	50	NA	3	50		< 1	1	< 1	< 1	< 1	1	8	2.3	--	1.2	1.2
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.

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

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

All metals were analyzed as total unless otherwise specified.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to August 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15015											
						Sample Date:	12/1/2015	2/18/2016	4/13/2016	7/13/2016	9/29/2016	2/14/2017	4/5/2017	7/12/2017	7/12/2017	9/13/2017	9/13/2017	4/17/2018	6/13/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient												
Appendix III															Field Dup		Field Dup		
Boron	ug/L	NC	NA	1,320	NA		1,190	1,170	963	614	656	662	599	489	678	433	374	--	398
Calcium	mg/L	NC	NA	259	NA		32.8	33	30.6	36.2	40.1	38.4	37.6	29.4	32.3	36.9	38.8	--	45
Chloride	mg/L	250*	NA	5,980	NA		21	22	21.6	20.4	19.5	19.2	22.7	20.1	20	20.3	20.3	--	19.5
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.6	7.4	7.4	7.4	7.8	7.7	7.6	8.4	--	8.7	--	8.3	7.9
Sulfate	mg/L	250*	NA	200	NA		7.8	6.56	8.34	13.9	9.26	10.4	13.8	18.8	17.9	16.1	15.6	--	12.6
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		220	200	190	180	180	200	190	166	190	192	274	--	316
Appendix IV																			
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		2	2	2	6	5	5	6	6.4	7.6	--	--	4.7	5.5
Barium	ug/L	2,000	NA	340	2,000		23	22	21	25	28	30	28	30.1	33.6	--	--	39.9	37.9
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	< 0.20	--	--	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	< 1	1	1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	< 15.0	--	--	< 15.0	< 15.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0
Lithium	ug/L	NC	40	2	**40**		< 10	< 10	< 10	< 10	< 10	< 10	< 10	12	11	--	--	16	13
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	< 0.20	--	--	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		17	14	17	11	10	9	11	11.9	13.0	--	--	9.4	7.0
Radium-226	pCi/L	5	NA	NA	NA		< 0.193	< 0.157	< 0.242	< 0.133	< 0.378	< 0.166	< 0.34	< 0.832	< 0.698	--	--	< 0.467	< 0.475
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.578	< 0.577	< 0.521	< 0.467	0.85	< 0.408	< 0.42	< 1.63	< 1.45	--	--	< 1.20	< 1.24
Radium-228	pCi/L	5	NA	NA	NA		< 0.578	< 0.577	< 0.521	< 0.467	0.85	< 0.408	< 0.42	< 0.799	< 0.748	--	--	< 0.730	< 0.763
Selenium	ug/L	50	NA	3	50		< 1	< 1	< 1	1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	--	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.

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

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

All metals were analyzed as total unless otherwise specified.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to August 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15016										
						Sample Date:	12/1/2015	2/18/2016	4/13/2016	7/13/2016	9/29/2016	2/14/2017	4/5/2017	7/12/2017	9/13/2017	4/17/2018	6/12/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient										
Appendix III																	
Boron	ug/L	NC	NA	1,320	NA		108	119	86	100	88	92	83	85.9	83	--	76.6
Calcium	mg/L	NC	NA	259	NA		172	184	164	172	181	176	172	170	182	--	168
Chloride	mg/L	250*	NA	5,980	NA		200	204	203	165	204	196	200	10.4	226	--	197
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		6.6	6.5	6.4	6.3	6.4	6.4	6.6	6.4	6.6	6.8	6.5
Sulfate	mg/L	250*	NA	200	NA		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	< 2.0
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		980	1,000	980	920	930	990	1,000	1,050	995	--	986
Appendix IV																	
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		2	2	3	3	2	2	2	1.5	--	1.5	1.3
Barium	ug/L	2,000	NA	340	2,000		656	647	614	619	621	666	613	596	--	649	652
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		2	3	3	4	3	3	3	1.9	--	2.1	2.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Lithium	ug/L	NC	40	2	**40**		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	--	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5.0	--	< 5.0	< 5.0
Radium-226	pCi/L	5	NA	NA	NA		< 0.263	1.51	1.31	1.5	1.06	1.17	1.6	1.3	--	1.56	< 0.810
Radium-226/228	pCi/L	5	NA	2.42	**5**		2.29	3.83	3	3.18	2.74	3.54	3.66	2.36	--	3.64	2.50
Radium-228	pCi/L	5	NA	NA	NA		2.29	2.32	1.69	1.68	1.68	2.37	2.06	1.06	--	2.08	1.81
Selenium	ug/L	50	NA	3	50		2	4	2	7	1	2	2	3.6	--	1.5	1.4
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.

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

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

All metals were analyzed as total unless otherwise specified.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to August 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15017										
						Sample Date:	12/1/2015	2/18/2016	4/18/2016	7/13/2016	9/29/2016	2/14/2017	4/5/2017	7/12/2017	9/13/2017	4/17/2018	6/12/2018	6/12/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient											
Appendix III																		Field Dup
Boron	ug/L	NC	NA	1,320	NA		59	90	66	76	78	76	75	75	82.8	--	83.8	79
Calcium	mg/L	NC	NA	259	NA		225	247	220	232	252	232	232	203	245	--	243	232
Chloride	mg/L	250*	NA	5,980	NA		200	201	184	204	182	192	187	199	224	--	224	224
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		6.5	6.4	6.4	6.4	6.4	6.6	6.5	6.4	6.5	6.8	6.5	--
Sulfate	mg/L	250*	NA	200	NA		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	< 2.0	< 2.0
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		850	1,100	1,200	1,100	1,100	1,200	1,100	1,230	1,130	--	1,120	1,170
Appendix IV																		
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		**13**	7	5	**12**	**12**	5	4	3	--	2.3	2.1	2.1
Barium	ug/L	2,000	NA	340	2,000		1,030	981	924	985	955	968	876	772	--	955	936	953
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		4	4	4	9	11	5	5	5.3	--	3.4	3.4	3.3
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 15.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	2	**40**		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	--	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5.0	--	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	5	NA	NA	NA		1.61	2.38	2.18	1.91	1.94	1.82	1.56	1.97	--	2.23	2.13	2.87
Radium-226/228	pCi/L	5	NA	2.42	**5**		4.3	**5.35**	**5.68**	**5.89**	4.44	4.97	4.34	4.75	--	**5.16**	**5.43**	**5.59**
Radium-228	pCi/L	5	NA	NA	NA		2.69	2.97	3.5	3.98	2.5	3.15	2.78	2.78	--	2.93	3.3	2.72
Selenium	ug/L	50	NA	3	50		3	4	3	8	2	2	3	2.7	--	1.7	2.4	2.5
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.

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

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

All metals were analyzed as total unless otherwise specified.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to August 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15018													
						Sample Date:	12/2/2015	2/18/2016	4/14/2016	7/14/2016	9/29/2016	2/14/2017	4/5/2017	7/11/2017	7/11/2017	9/13/2017	9/13/2017	4/18/2018	4/18/2018	6/12/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient													
Appendix III															Field Dup		Field Dup		Field Dup	
Boron	ug/L	NC	NA	1,320	NA		487	526	478	399	438	479	493	538	446	492	502	--	--	559
Calcium	mg/L	NC	NA	259	NA		88.6	100	87.9	86.8	98.5	100	92.1	84.8	81.1	90.7	89.1	--	--	87.6
Chloride	mg/L	250*	NA	5,980	NA		38	38	40.8	39.3	37.5	43.6	44.4	53.4	52.6	49.1	50.2	--	--	48.9
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.0	6.9	6.8	6.5	6.5	6.7	6.8	6.8	--	6.8	--	6.9	--	6.8
Sulfate	mg/L	250*	NA	200	NA		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	< 2.0	< 2.0	--	--	< 2.0
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		290	400	430	390	410	450	410	420	438	392	380	--	--	598
Appendix IV																				
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		1	< 1	< 1	2	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		155	149	139	133	143	171	149	153	143	--	--	139	141	156
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	1	1	1	1	< 1	1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	< 15.0	--	--	< 15.0	< 15.0	< 15.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	2	**40**		21.4	23.1	24	12	14	21	21	26	26	--	--	29	27	26
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5.0	< 5.0	--	--	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	5	NA	NA	NA		0.227	0.394	0.43	0.234	0.522	0.363	< 0.314	< 0.479	< 1.02	--	--	< 0.843	0.290	< 0.756
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.586	1.17	1.08	1.08	1.33	1.36	1.37	< 1.25	< 1.97	--	--	1.59	0.912	1.77
Radium-228	pCi/L	5	NA	NA	NA		< 0.586	0.778	0.649	0.845	0.803	0.996	1.08	< 0.767	< 0.950	--	--	0.869	0.622	1.39
Selenium	ug/L	50	NA	3	50		< 1	< 1	1	4	< 1	< 1	< 1	< 1.0	1	--	--	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	--	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.

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

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

All metals were analyzed as total unless otherwise specified.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to August 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15019										
						Sample Date:	12/2/2015	2/18/2016	4/14/2016	7/13/2016	9/30/2016	2/15/2017	4/5/2017	7/11/2017	9/13/2017	4/18/2018	6/12/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient										
Appendix III																	
Boron	ug/L	NC	NA	1,320	NA		1,530	1,590	1,440	1,320	1,260	1,370	1,410	1,430	1,010	--	1,170
Calcium	mg/L	NC	NA	259	NA		84.6	93.6	83	90	92.6	91.8	92.8	90.1	107	--	97.7
Chloride	mg/L	250*	NA	5,980	NA		34	32.4	33.7	37.7	35.6	34.5	33.6	52.5	73.9	--	67.7
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.0	6.8	6.9	6.7	6.4	6.8	6.9	6.8	6.7	7.0	6.7
Sulfate	mg/L	250*	NA	200	NA		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	< 2.0
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		340	390	440	410	370	410	420	470	618	--	524
Appendix IV																	
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		91	94	88	88	96	93	90	109	--	161	187
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	< 1	1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Lithium	ug/L	NC	40	2	**40**		23.7	27.9	26	24	22	23	22	27	--	25	23
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5.0	--	< 5.0	< 5.0
Radium-226	pCi/L	5	NA	NA	NA		0.333	0.279	0.465	0.282	0.315	0.329	< 0.36	< 0.620	--	< 0.717	< 0.594
Radium-226/228	pCi/L	5	NA	2.42	**5**		0.674	0.798	0.997	0.969	< 0.739	2.13	0.974	< 1.64	--	< 1.46	1.75
Radium-228	pCi/L	5	NA	NA	NA		< 0.484	< 0.567	0.532	< 0.718	< 0.739	1.8	0.872	< 1.02	--	< 0.742	1.36
Selenium	ug/L	50	NA	3	50		< 1	< 1	< 1	2	< 1	< 1	< 1	1.2	--	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to August 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15020											
						Sample Date:	12/2/2015	2/18/2016	4/14/2016	7/14/2016	9/30/2016	2/15/2017	4/5/2017	7/11/2017	9/13/2017	4/18/2018	6/12/2018	6/12/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient											
Appendix III																		Field Dup
Boron	ug/L	NC	NA	1,320	NA		630	738	638	603	608	621	667	618	745	--	708	699
Calcium	mg/L	NC	NA	259	NA		61	67.6	59.1	60.7	66.5	67	66.6	68.1	107	--	96.3	91.6
Chloride	mg/L	250*	NA	5,980	NA		39	35.4	34.3	69.6	33.5	33.3	33.9	45.7	87.8	--	92.1	92
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.3	7.2	7.0	6.9	6.9	7.0	7.1	7.0	6.8	7.0	6.7	--
Sulfate	mg/L	250*	NA	200	NA		2.2	2.34	< 2	< 2	< 2	< 2	< 2	< 2.0	3	--	< 2.0	< 2.0
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		320	310	320	310	310	330	320	388	608	--	622	508
Appendix IV																		
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		48	52	51	47	54	53	52	60.4	--	148	197	196
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	2	< 1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 15.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	2	**40**		15.1	17.8	16	14	14	14	14	18	--	16	16	16
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5.0	--	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	5	NA	NA	NA		< 0.269	< 0.24	< 0.341	< 0.19	< 0.276	< 0.294	< 0.29	< 0.761	--	0.744	< 0.899	< 0.774
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.467	0.847	0.73	< 0.598	0.724	< 0.591	0.652	< 1.39	--	1.56	2.64	2.00
Radium-228	pCi/L	5	NA	NA	NA		< 0.467	0.731	0.474	< 0.598	0.682	< 0.591	0.543	< 0.627	--	0.813	1.75	1.47
Selenium	ug/L	50	NA	3	50		< 1	1	< 1	2	< 1	< 1	< 1	1.4	--	< 1.0	< 1.0	1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.

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

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

All metals were analyzed as total unless otherwise specified.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to August 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15021										
						Sample Date:	12/2/2015	2/18/2016	4/14/2016	7/13/2016	10/5/2016	2/15/2017	4/6/2017	7/12/2017	9/13/2017	4/18/2018	6/12/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient										
Appendix III																	
Boron	ug/L	NC	NA	1,320	NA		362	489	400	425	491	465	519	519	602	--	809
Calcium	mg/L	NC	NA	259	NA		86.4	98.5	89.6	97.4	96.9	97.9	96.3	86.8	91.3	--	89.4
Chloride	mg/L	250*	NA	5,980	NA		88	82.7	87.2	98.3	98.9	94.6	93.9	97	108	--	112
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		6.8	6.8	6.8	6.7	6.8	6.9	6.9	6.8	6.8	7.1	6.8
Sulfate	mg/L	250*	NA	200	NA		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	< 2.0
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		610	540	570	590	620	570	560	548	490	--	576
Appendix IV																	
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		3	1	1	2	2	2	2	1.0	--	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		274	244	236	233	252	240	228	211	--	236	238
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	2	2	2	1	2	2	< 1.0	--	< 1.0	1.1
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Lithium	ug/L	NC	40	2	**40**		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	--	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5.0	--	< 5.0	< 5.0
Radium-226	pCi/L	5	NA	NA	NA		0.569	0.629	0.563	0.429	0.483	0.524	< 0.215	< 0.768	--	< 0.461	< 0.689
Radium-226/228	pCi/L	5	NA	2.42	**5**		1.55	1.41	1.41	1.3	2	0.966	< 0.354	< 1.47	--	< 1.96	1.97
Radium-228	pCi/L	5	NA	NA	NA		0.984	0.782	0.846	0.871	1.52	< 0.582	< 0.354	< 0.697	--	< 1.50	1.60
Selenium	ug/L	50	NA	3	50		1	2	1	4	< 1	< 1	1	1.6	--	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.

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

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

All metals were analyzed as total unless otherwise specified.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to August 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15022										
						Sample Date:	12/2/2015	2/18/2016	4/14/2016	7/14/2016	10/5/2016	2/15/2017	4/6/2017	7/12/2017	9/13/2017	4/18/2018	6/11/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient										
Appendix III																	
Boron	ug/L	NC	NA	1,320	NA		250	388	387	362	391	394	434	478	833	--	1,170
Calcium	mg/L	NC	NA	259	NA		46.7	46.4	47.8	43	43.7	54.1	49.3	51.8	35.2	--	38.2
Chloride	mg/L	250*	NA	5,980	NA		25	18.7	17.6	16.8	17.1	18.2	18.6	22.1	23.3	--	21.5
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		8.3	8.5	8.2	8.2	8.1	7.8	8.1	8.4	7.6	7.8	8.3
Sulfate	mg/L	250*	NA	200	NA		39	38.3	29.9	34.3	32.8	34.1	32.8	45.9	44.1	--	24.1
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		270	210	250	250	210	250	230	254	266	--	210
Appendix IV																	
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	1.9	< 1.0
Arsenic	ug/L	10	NA	10	**10**		6	7	8	8	6	4	4	5.8	--	< 1.0	1.1
Barium	ug/L	2,000	NA	340	2,000		139	119	155	116	119	137	129	138	--	102	104
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	1	2	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Lithium	ug/L	NC	40	2	**40**		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	--	13	11
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		22	16	11	17	19	12	14	13.6	--	< 5.0	< 5.0
Radium-226	pCi/L	5	NA	NA	NA		0.246	< 0.242	< 0.247	< 0.15	< 0.346	< 0.217	< 0.291	< 0.468	--	0.666	< 0.708
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.484	< 0.45	0.812	< 0.472	< 0.514	< 0.477	0.862	< 1.27	--	1.13	< 1.45
Radium-228	pCi/L	5	NA	NA	NA		< 0.484	< 0.45	0.74	< 0.472	< 0.514	< 0.477	0.709	< 0.799	--	< 0.644	< 0.742
Selenium	ug/L	50	NA	3	50		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.

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

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

All metals were analyzed as total unless otherwise specified.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to August 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15023										
						Sample Date:	12/2/2015	2/18/2016	4/14/2016	7/14/2016	10/5/2016	2/15/2017	4/5/2017	7/11/2017	9/13/2017	4/18/2018	6/11/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient										
Appendix III																	
Boron	ug/L	NC	NA	1,320	NA		414	284	267	308	526	484	1,590	701	504	--	1,650
Calcium	mg/L	NC	NA	259	NA		59.7	59.4	53.3	54.1	64	59.9	74.5	50.8	60.9	--	98.9
Chloride	mg/L	250*	NA	5,980	NA		30	26.9	24.6	28.7	24.8	23.8	24.6	26.8	25.5	--	19.4
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.4	7.5	7.5	7.5	7.4	7.6	7.6	7.6	7.6	7.6	7.4
Sulfate	mg/L	250*	NA	200	NA		20	26.5	28.9	25	24.3	21	22.5	22.6	36.2	--	139
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		240	270	270	290	290	280	300	290	408	--	474
Appendix IV																	
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		2	2	1	3	2	2	< 1	1.9	--	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		57	48	43	40	47	42	46	38.0	--	97.1	87.8
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	< 1	2	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Lithium	ug/L	NC	40	2	**40**		12.1	10.6	< 10	< 10	< 10	< 10	11	< 10	--	19	18
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		8	6	< 5	7	6	6	< 5	6.0	--	< 5.0	7.1
Radium-226	pCi/L	5	NA	NA	NA		0.232	< 0.237	< 0.242	0.226	< 0.309	0.257	0.455	< 0.889	--	< 0.572	< 0.958
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.53	0.599	< 0.456	< 0.545	< 0.355	0.426	1.42	< 1.53	--	< 1.32	< 1.85
Radium-228	pCi/L	5	NA	NA	NA		< 0.53	0.426	< 0.456	< 0.545	< 0.355	< 0.4	0.963	< 0.636	--	< 0.749	< 0.891
Selenium	ug/L	50	NA	3	50		< 1	< 1	< 1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to August 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-17001				BCC-MW-17002				BCC-MW-17003				
						Sample Date:	12/7/2017	2/20/2018	6/15/2018	8/6/2018	12/7/2017	2/20/2018	6/15/2018	8/6/2018	12/7/2017	2/20/2018	6/15/2018	8/7/2018	8/7/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		GSI												
Appendix III																			Field Dup
Boron	ug/L	NC	NA	1,320	NA		991	827	1,100	1,220	8,280	12,800	13,300	9,440	413	394	369	383	377
Calcium	mg/L	NC	NA	259	NA		118	118	124	117	178	201	224	194	74.3	55.7	63.2	74.6	76.9
Chloride	mg/L	250*	NA	5,980	NA		27.3	28.5	29.1	29.1	15.3	14.2	13.2	15.4	18.3	21.5	22.7	21.9	21.8
Fluoride	ug/L	4,000	NA	1,000	NA		<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.1	7.0	7.2	6.9	7.0	7.1	7.2	7.1	7.0	7.2	7.4	7.3	--
Sulfate	mg/L	250*	NA	200	NA		156	135	90.8	18.7	330	325	332	226	48.4	< 2.0	< 2.0	17.7	25.9
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		558	552	566	476	726	892	936	740	324	330	412	326	324
Appendix IV																			
Antimony	ug/L	6	NA	1	6		< 1.0	< 1.0	< 1.0	< 2.0	1.5	< 1.0	< 1.0	< 2.0	1.1	< 1.0	< 1.0	< 2.0	< 2.0
Arsenic	ug/L	10	NA	10	**10**		5.2	< 1.0	< 1.0	< 1.0	**45.5**	2	2.6	3.8	**26**	< 1.0	< 1.0	1	1.1
Barium	ug/L	2,000	NA	340	2,000		85.6	71.3	65.8	73.8	148	76.7	62.8	57.6	128	78.1	66.5	77.9	83.3
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0
Fluoride	ug/L	4,000	NA	1,000	4,000		<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
Lead	ug/L	NC	15	2	15		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	2	**40**		**55**	**73**	**65**	**62**	**75**	**160**	**150**	**130**	19	17	13	18	18
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		< 5.0	< 5.0	< 5.0	< 5.0	30.1	< 5.0	< 5.0	< 5.0	48.8	6.3	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	5	NA	NA	NA		< 0.509	< 0.890	< 0.766	< 0.616	< 1.03	< 1.07	< 0.757	0.306	< 0.889	< 0.755	< 0.594	< 0.687	0.353
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.830	< 0.901	< 0.947	< 0.822	< 0.996	< 3.77	< 2.35	1.25	< 0.663	< 0.707	< 0.828	0.932	< 0.871
Radium-228	pCi/L	5	NA	NA	NA		< 1.34	< 1.79	< 1.71	< 1.44	< 2.03	< 4.84	< 3.11	1.56	< 1.55	< 1.46	< 1.42	< 1.49	< 1.03
Selenium	ug/L	50	NA	3	50		< 1.0	< 1.0	< 1.0	< 2.0	1.1	< 1.0	< 1.0	< 2.0	< 1.0	2.2	< 1.0	< 2.0	< 2.0
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.

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

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

All metals were analyzed as total unless otherwise specified.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to August 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

					Sample Location:	BCC-MW-17004				BCC-MW-17005							BCC-MW-17006			
					Sample Date:	12/6/2017	2/20/2018	6/15/2018	8/7/2018	12/6/2017	12/6/2017	2/20/2018	2/20/2018	6/15/2018	6/15/2018	8/7/2018	12/6/2017	2/20/2018	6/15/2018	8/7/2018
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS	GSI					Field Dup		Field Dup		Field Dup					
Appendix III																				
Boron	ug/L	NC	NA	1,320	NA	367	429	525	425	191	208	238	228	377	353	342	669	594	653	765
Calcium	mg/L	NC	NA	259	NA	53.7	48.1	73.1	68.9	51.9	54	54.2	53.1	71.2	71.1	68.1	106	95	97.5	90.4
Chloride	mg/L	250*	NA	5,980	NA	21.3	21.3	21.4	21.2	19.4	19.4	21.6	21.3	20.5	20.5	19.6	19	20.3	20.9	21.5
Fluoride	ug/L	4,000	NA	1,000	NA	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA	7.2	7.3	7.4	7.3	7.3	--	7.3	--	7.4	--	7.3	7.7	7.3	7.5	7.5
Sulfate	mg/L	250*	NA	200	NA	< 2.0	< 2.0	8.3	< 2.0	11.5	11	< 2.0	< 2.0	9.6	9	4.3	129	93.1	69.8	46.2
Total Dissolved Solids	mg/L	500*	NA	5,170	NA	228	238	410	320	262	220	310	266	358	416	318	474	472	478	438
Appendix IV																				
Antimony	ug/L	6	NA	1	6	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0	< 1.0	< 2.0
Arsenic	ug/L	10	NA	10	**10**	2.5	1.8	1.1	< 1.0	2.9	2.8	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	4.9	2.4	4.6	< 1.0
Barium	ug/L	2,000	NA	340	2,000	145	116	175	148	168	167	123	128	161	149	179	83.3	79	70.3	73
Beryllium	ug/L	4	NA	1	4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100	< 1.0	< 1.0	1.2	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0
Fluoride	ug/L	4,000	NA	1,000	4,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
Lead	ug/L	NC	15	2	15	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	2	**40**	< 10	< 10	< 10	< 10	10	12	11	11	< 10	< 10	13	38	37	31	36
Mercury	ug/L	2	NA	0.2	2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**	9.9	5.9	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	5	NA	NA	NA	< 0.945	< 0.723	< 0.441	< 0.519	< 0.863	1.56	< 0.804	0.91	< 0.692	< 0.610	0.44	< 0.930	< 0.766	< 0.862	< 0.582
Radium-226/228	pCi/L	5	NA	2.42	**5**	< 0.804	< 0.719	< 0.810	1.03	< 0.722	< 0.649	< 0.904	< 0.945	< 0.796	< 0.853	< 0.741	< 0.833	< 0.716	< 0.888	< 0.757
Radium-228	pCi/L	5	NA	NA	NA	< 1.75	< 1.44	< 1.25	< 1.46	< 1.59	< 1.61	< 1.71	< 1.80	< 1.49	< 1.46	< 1.15	< 1.76	< 1.48	< 1.75	< 1.34
Selenium	ug/L	50	NA	3	50	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0	< 1.0	< 2.0
Thallium	ug/L	2	NA	2	2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.

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

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

All metals were analyzed as total unless otherwise specified.

Table 2
Summary of Groundwater Protection Standard Exceedances – June & August 2018
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

Constituent	Units	GWPS	BCC-MW-15009		BCC-MW-15010		BCC-MW-15017		BCC-MW-17001		BCC-MW-17002		BCC-MW-17003	
			LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
Arsenic	ug/L	10	6.0	15	NA	NA	NA	NA	NA	NA	2	46	0.5	26
Lithium	ug/L	40	NA	NA	-6.0	76	NA	NA	47	81	43	210	NA	NA
Radium 226/228	pCi/L	5	NA	NA	NA	NA	3.8	6.1	NA	NA	NA	NA	NA	NA

Notes:

ug/L - micrograms per Liter.

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

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

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

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

Figures

BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

N

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

0 3,000 6,000 FEET

TRC

1540 Eisenhower Place
Ann Arbor, MI 48108-3284
Phone: 734.971.7080

TRC - GIS

PROJECT:

CONSUMERS ENERGY COMPANY
BC COBB BOTTOM ASH POND AND PONDS 0-8 AREA
MUSKEGON, MICHIGAN

TITLE:

SITE LOCATION MAP

DRAWN BY:	J. PAPEZ
CHECKED BY:	S. HOLMSTROM
APPROVED BY:	G. CROCKFORD
DATE:	NOVEMBER 2018
PROJ. NO.:	269767-001
FILE:	269767-001-020slm.mxd

FIGURE 1

E:\ConsumersEnergy\CCR_GW\2017_269767\269767-001-020slm.mxd -- Saved By: SMAJOR on 11/30/2018, 12:01:46 PM

LEGEND

- BACKGROUND MONITORING WELL
- DOWNGRADIENT MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- APPROXIMATE POND BOUNDARY

NOTES

1. BASE MAP IMAGERY FROM NEARMAP, 3/29/2017.
2. WELL LOCATIONS SURVEYED BY WILLIAMS & WORKS ON 11/23/2015.
3. MONITORING WELLS BCC-MW-17001 THROUGH BCC-MW-17006 SURVEYED BY CONSUMERS ENERGY CO. ON 1/16/2018.
4. DEEP SCREENED WELLS (DEEP) ARE CHARACTERIZED BY WELL SCREENS SET BELOW 555 FEET MSL.

N

0 300 600 Feet

1 " = 300 '

1:3,600

PROJECT:

CONSUMERS ENERGY COMPANY
BC COBB POWER PLANT
MUSKEGON, MICHIGAN

TITLE:

SITE PLAN WITH CCR MONITORING WELL LOCATIONS

DRAWN BY:	S. MAJOR	PROJ NO.:	284111-001
CHECKED BY:	C. SCIESZKA		
APPROVED BY:	S. HOLMSTROM		**FIGURE 2**
DATE:	OCTOBER 2018		

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

FILE NO.: 284111-001-011.mxd

TRC - GIS
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0
Plot Date: 10/16/2018, 11:13:29 AM by SMAJOR – LAYOUT: ANSI B(11"x17")
Path: E:\ConsumersEnergy\CCR_GW\2017_269767\284111-001-011.mxd

LEGEND

- BACKGROUND MONITORING WELL
- DOWNGRADIENT MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- APPROXIMATE POND BOUNDARY
- (580.85) GROUNDWATER ELEVATION (FEET, MSL)
- GROUNDWATER ELEVATION CONTOUR (0.5' INTERVAL, DASHED WHERE INFERRED)

NOTES

1. BASE MAP IMAGERY FROM NEARMAP, 3/29/2017.
2. WELL LOCATIONS SURVEYED BY WILLIAMS & WORKS ON 11/23/2015.
3. MONITORING WELLS BCC-MW-17001 THROUGH BCC-MW-17006 SURVEYED BY CONSUMERS ENERGY CO. ON 1/16/2018.
4. DEEP SCREENED WELLS (DEEP) ARE CHRACTERIZED BY WELL SCREENS SET BELOW 555 FEET MSL, AND WERE NOT USED TO CONSTRUCT CONTOUR MAP.

N

0 300 600 Feet

1 " = 300 '

1:3,600

PROJECT:
CONSUMERS ENERGY COMPANY
BC COBB POWER PLANT
MUSKEGON, MICHIGAN

TITLE:
SHALLOW GROUNDWATER CONTOUR MAP JUNE 11, 2018

DRAWN BY:	S. MAJOR	PROJ NO.:	284111-001
CHECKED BY:	C. SCIESZKA		
APPROVED BY:	S. HOLMSTROM		**FIGURE 3**
DATE:	OCTOBER 2018		

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

FILE NO.: 284111-001-009.mxd

TRC - GIS
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0
Plot Date: 10/16/2018, 11:24:41 AM by SMAJOR -- LAYOUT: ANSI B (11"x17")
Path: E:\ConsumersEnergy\CCR_GW\2017_269767\284111-001-009.mxd

Attachment A
Sanitas™ Output

Summary Report

Constituent: Antimony, Total Analysis Run 11/16/2018 11:47 AM
Client: Consumers Energy Data: BCC_Sanitas

For observations made between 12/1/2015 and 8/8/2018, a summary of the selected data set:

Observations = 174
ND/Trace = 168
Wells = 21
Minimum Value = 1
Maximum Value = 2
Mean Value = 1.048
Median Value = 1
Standard Deviation = 0.2036
Coefficient of Variation = 0.1944
Skewness = 4.224

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	10	9	1	1	1	1	0	0	NaN
BCC-MW-15010	10	10	1	1	1	1	0	0	NaN
BCC-MW-15011	10	10	1	1	1	1	0	0	NaN
BCC-MW-15012	10	10	1	1	1	1	0	0	NaN
BCC-MW-15013	10	10	1	1	1	1	0	0	NaN
BCC-MW-15014	10	8	1	1.7	1.08	1	0.2201	0.2038	2.573
BCC-MW-15015	10	10	1	1	1	1	0	0	NaN
BCC-MW-15016	10	10	1	1	1	1	0	0	NaN
BCC-MW-15017	10	10	1	1	1	1	0	0	NaN
BCC-MW-15018	10	10	1	1	1	1	0	0	NaN
BCC-MW-15019	10	10	1	1	1	1	0	0	NaN
BCC-MW-15020	10	10	1	1	1	1	0	0	NaN
BCC-MW-15021	10	10	1	1	1	1	0	0	NaN
BCC-MW-15022	10	9	1	1.9	1.09	1	0.2846	0.2611	2.667
BCC-MW-15023	10	10	1	1	1	1	0	0	NaN
BCC-MW-17001	4	4	1	2	1.25	1	0.5	0.4	1.155
BCC-MW-17002	4	3	1	2	1.375	1.25	0.4787	0.3482	0.4934
BCC-MW-17003	4	3	1	2	1.275	1.05	0.4856	0.3809	1.123
BCC-MW-17004	4	4	1	2	1.25	1	0.5	0.4	1.155
BCC-MW-17005	4	4	1	2	1.25	1	0.5	0.4	1.155
BCC-MW-17006	4	4	1	2	1.25	1	0.5	0.4	1.155

Summary Report

Constituent: Arsenic, Total Analysis Run 11/16/2018 11:47 AM
Client: Consumers Energy Data: BCC_Sanitas

For observations made between 12/1/2015 and 8/8/2018, a summary of the selected data set:

Observations = 174
ND/Trace = 66
Wells = 21
Minimum Value = 1
Maximum Value = 45.5
Mean Value = 4.389
Median Value = 2
Standard Deviation = 6.578
Coefficient of Variation = 1.499
Skewness = 3.817

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	10	0	8.5	45	20.03	17	11.46	0.572	1.018
BCC-MW-15010	10	10	1	1	1	1	0	0	NaN
BCC-MW-15011	10	1	1	8	4.49	4.5	2.371	0.5281	-0.05597
BCC-MW-15012	10	1	1	12	4.83	3.2	3.738	0.7738	0.7552
BCC-MW-15013	10	10	1	1	1	1	0	0	NaN
BCC-MW-15014	10	0	5.5	15	8.81	8.2	2.85	0.3235	0.9701
BCC-MW-15015	10	0	2	7	4.52	5	1.857	0.4108	-0.4591
BCC-MW-15016	10	0	1.3	3	2.03	2	0.5755	0.2835	0.6995
BCC-MW-15017	10	0	2.1	13	6.54	5	4.256	0.6507	0.5523
BCC-MW-15018	10	8	1	2	1.1	1	0.3162	0.2875	2.667
BCC-MW-15019	10	10	1	1	1	1	0	0	NaN
BCC-MW-15020	10	10	1	1	1	1	0	0	NaN
BCC-MW-15021	10	2	1	3	1.6	1.5	0.6992	0.437	0.6578
BCC-MW-15022	10	1	1	8	5.09	5.9	2.534	0.4977	-0.5503
BCC-MW-15023	10	3	1	3	1.69	1.95	0.6707	0.3969	0.4124
BCC-MW-17001	4	3	1	5.2	2.05	1	2.1	1.024	1.155
BCC-MW-17002	4	0	2	45.5	13.48	3.2	21.36	1.585	1.15
BCC-MW-17003	4	2	1	26	7.263	1.025	12.49	1.72	1.155
BCC-MW-17004	4	1	1	2.5	1.6	1.45	0.6976	0.436	0.4489
BCC-MW-17005	4	3	1	2.85	1.463	1	0.925	0.6325	1.155
BCC-MW-17006	4	1	1	4.9	3.225	3.5	1.855	0.5753	-0.2578

Summary Report

Constituent: Barium, Total Analysis Run 11/16/2018 11:47 AM
Client: Consumers Energy Data: BCC_Sanitas

For observations made between 12/1/2015 and 8/8/2018, a summary of the selected data set:

Observations = 174
ND/Trace = 0
Wells = 21
Minimum Value = 9
Maximum Value = 1030
Mean Value = 189.5
Median Value = 84.45
Standard Deviation = 253
Coefficient of Variation = 1.335
Skewness = 1.956

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	10	0	9	16.5	12.23	11.5	2.471	0.2021	0.659
BCC-MW-15010	10	0	28	64.8	43.74	43.5	13.46	0.3078	0.3599
BCC-MW-15011	10	0	15.2	36	27.65	30.35	6.765	0.2447	-0.9512
BCC-MW-15012	10	0	14.3	109	50.83	37	34.18	0.6725	0.7471
BCC-MW-15013	10	0	41.9	71	50.44	48.5	8.692	0.1723	1.37
BCC-MW-15014	10	0	257	779	506.2	527	174.5	0.3447	0.1456
BCC-MW-15015	10	0	21	39.9	28.67	28	6.438	0.2246	0.5541
BCC-MW-15016	10	0	596	666	633.3	634	23.33	0.03684	-0.1161
BCC-MW-15017	10	0	772	1030	939.1	955	71.2	0.07582	-1.285
BCC-MW-15018	10	0	133	171	148.3	148.5	10.74	0.07242	0.6948
BCC-MW-15019	10	0	88	187	109.7	93.5	34.96	0.3187	1.511
BCC-MW-15020	10	0	47	196.5	76.19	52.5	52.03	0.6829	1.657
BCC-MW-15021	10	0	211	274	239.2	237	16.26	0.06798	0.5507
BCC-MW-15022	10	0	102	155	125.8	124	16.8	0.1336	0.1244
BCC-MW-15023	10	0	38	97.1	54.59	46.5	20.74	0.3799	1.324
BCC-MW-17001	4	0	65.8	85.6	74.13	72.55	8.348	0.1126	0.603
BCC-MW-17002	4	0	57.6	148	86.28	69.75	41.93	0.486	1.032
BCC-MW-17003	4	0	66.5	128	88.3	79.35	27.17	0.3077	0.9728
BCC-MW-17004	4	0	116	175	146	146.5	24.12	0.1652	-0.07138
BCC-MW-17005	4	0	125.5	179	156.8	161.3	23.02	0.1469	-0.5761
BCC-MW-17006	4	0	70.3	83.3	76.4	76	5.863	0.07675	0.1524

Summary Report

Constituent: Beryllium, Total Analysis Run 11/16/2018 11:47 AM
Client: Consumers Energy Data: BCC_Sanitas

For observations made between 12/1/2015 and 8/8/2018, a summary of the selected data set:

Observations = 174
ND/Trace = 174
Wells = 21
Minimum Value = 1
Maximum Value = 1
Mean Value = 1
Median Value = 1
Standard Deviation = 0
Coefficient of Variation = 0
Skewness = NaN

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	10	10	1	1	1	1	0	0	NaN
BCC-MW-15010	10	10	1	1	1	1	0	0	NaN
BCC-MW-15011	10	10	1	1	1	1	0	0	NaN
BCC-MW-15012	10	10	1	1	1	1	0	0	NaN
BCC-MW-15013	10	10	1	1	1	1	0	0	NaN
BCC-MW-15014	10	10	1	1	1	1	0	0	NaN
BCC-MW-15015	10	10	1	1	1	1	0	0	NaN
BCC-MW-15016	10	10	1	1	1	1	0	0	NaN
BCC-MW-15017	10	10	1	1	1	1	0	0	NaN
BCC-MW-15018	10	10	1	1	1	1	0	0	NaN
BCC-MW-15019	10	10	1	1	1	1	0	0	NaN
BCC-MW-15020	10	10	1	1	1	1	0	0	NaN
BCC-MW-15021	10	10	1	1	1	1	0	0	NaN
BCC-MW-15022	10	10	1	1	1	1	0	0	NaN
BCC-MW-15023	10	10	1	1	1	1	0	0	NaN
BCC-MW-17001	4	4	1	1	1	1	0	0	NaN
BCC-MW-17002	4	4	1	1	1	1	0	0	NaN
BCC-MW-17003	4	4	1	1	1	1	0	0	NaN
BCC-MW-17004	4	4	1	1	1	1	0	0	NaN
BCC-MW-17005	4	4	1	1	1	1	0	0	NaN
BCC-MW-17006	4	4	1	1	1	1	0	0	NaN

Summary Report

Constituent: Cadmium, Total Analysis Run 11/16/2018 11:47 AM
Client: Consumers Energy Data: BCC_Sanitas

For observations made between 12/1/2015 and 8/8/2018, a summary of the selected data set:

Observations = 174
ND/Trace = 174
Wells = 21
Minimum Value = 0.2
Maximum Value = 0.2
Mean Value = 0.2
Median Value = 0.2
Standard Deviation = 0
Coefficient of Variation = 0
Skewness = NaN

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15010	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15011	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15012	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15013	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15014	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15015	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15016	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15017	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15018	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15019	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15020	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15021	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15022	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15023	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17001	4	4	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17002	4	4	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17003	4	4	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17004	4	4	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17005	4	4	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17006	4	4	0.2	0.2	0.2	0.2	0	0	NaN

Summary Report

Constituent: Chromium, Total Analysis Run 11/16/2018 11:47 AM
Client: Consumers Energy Data: BCC_Sanitas

For observations made between 12/1/2015 and 8/8/2018, a summary of the selected data set:

Observations = 174
ND/Trace = 116
Wells = 21
Minimum Value = 1
Maximum Value = 11
Mean Value = 1.427
Median Value = 1
Standard Deviation = 1.242
Coefficient of Variation = 0.8705
Skewness = 4.701

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	10	8	1	2	1.1	1	0.3162	0.2875	2.667
BCC-MW-15010	10	8	1	2	1.1	1	0.3162	0.2875	2.667
BCC-MW-15011	10	7	1	2	1.1	1	0.3162	0.2875	2.667
BCC-MW-15012	10	8	1	1	1	1	0	0	NaN
BCC-MW-15013	10	8	1	2	1.1	1	0.3162	0.2875	2.667
BCC-MW-15014	10	7	1	2	1.1	1	0.3162	0.2875	2.667
BCC-MW-15015	10	8	1	1	1	1	0	0	NaN
BCC-MW-15016	10	0	1.9	4	2.7	3	0.6766	0.2506	0.3471
BCC-MW-15017	10	0	3.35	11	5.405	4.5	2.555	0.4726	1.38
BCC-MW-15018	10	5	1	1	1	1	0	0	NaN
BCC-MW-15019	10	8	1	1	1	1	0	0	NaN
BCC-MW-15020	10	8	1	2	1.1	1	0.3162	0.2875	2.667
BCC-MW-15021	10	3	1	2	1.51	1.55	0.5174	0.3426	-0.00954
BCC-MW-15022	10	7	1	2	1.1	1	0.3162	0.2875	2.667
BCC-MW-15023	10	8	1	2	1.1	1	0.3162	0.2875	2.667
BCC-MW-17001	4	4	1	1	1	1	0	0	NaN
BCC-MW-17002	4	4	1	1	1	1	0	0	NaN
BCC-MW-17003	4	4	1	1	1	1	0	0	NaN
BCC-MW-17004	4	3	1	1.2	1.05	1	0.1	0.09524	1.155
BCC-MW-17005	4	4	1	1	1	1	0	0	NaN
BCC-MW-17006	4	4	1	1	1	1	0	0	NaN

Summary Report

Constituent: Cobalt, Total Analysis Run 11/16/2018 11:47 AM
Client: Consumers Energy Data: BCC_Sanitas

For observations made between 12/1/2015 and 8/8/2018, a summary of the selected data set:

Observations = 174
ND/Trace = 174
Wells = 21
Minimum Value = 15
Maximum Value = 15
Mean Value = 15
Median Value = 15
Standard Deviation = 0
Coefficient of Variation = 0
Skewness = NaN

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	10	10	15	15	15	15	0	0	NaN
BCC-MW-15010	10	10	15	15	15	15	0	0	NaN
BCC-MW-15011	10	10	15	15	15	15	0	0	NaN
BCC-MW-15012	10	10	15	15	15	15	0	0	NaN
BCC-MW-15013	10	10	15	15	15	15	0	0	NaN
BCC-MW-15014	10	10	15	15	15	15	0	0	NaN
BCC-MW-15015	10	10	15	15	15	15	0	0	NaN
BCC-MW-15016	10	10	15	15	15	15	0	0	NaN
BCC-MW-15017	10	10	15	15	15	15	0	0	NaN
BCC-MW-15018	10	10	15	15	15	15	0	0	NaN
BCC-MW-15019	10	10	15	15	15	15	0	0	NaN
BCC-MW-15020	10	10	15	15	15	15	0	0	NaN
BCC-MW-15021	10	10	15	15	15	15	0	0	NaN
BCC-MW-15022	10	10	15	15	15	15	0	0	NaN
BCC-MW-15023	10	10	15	15	15	15	0	0	NaN
BCC-MW-17001	4	4	15	15	15	15	0	0	NaN
BCC-MW-17002	4	4	15	15	15	15	0	0	NaN
BCC-MW-17003	4	4	15	15	15	15	0	0	NaN
BCC-MW-17004	4	4	15	15	15	15	0	0	NaN
BCC-MW-17005	4	4	15	15	15	15	0	0	NaN
BCC-MW-17006	4	4	15	15	15	15	0	0	NaN

Summary Report

Constituent: Fluoride Analysis Run 11/16/2018 11:47 AM
Client: Consumers Energy Data: BCC_Sanitas

For observations made between 12/1/2015 and 8/8/2018, a summary of the selected data set:

Observations = 189
ND/Trace = 185
Wells = 21
Minimum Value = 1000
Maximum Value = 1200
Mean Value = 1003
Median Value = 1000
Standard Deviation = 21.72
Coefficient of Variation = 0.02166
Skewness = 8.482

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	11	11	1000	1000	1000	1000	0	0	NaN
BCC-MW-15010	11	11	1000	1000	1000	1000	0	0	NaN
BCC-MW-15011	11	9	1000	1200	1018	1000	60.3	0.05923	2.846
BCC-MW-15012	11	9	1000	1200	1027	1000	64.67	0.06295	2.077
BCC-MW-15013	11	11	1000	1000	1000	1000	0	0	NaN
BCC-MW-15014	11	11	1000	1000	1000	1000	0	0	NaN
BCC-MW-15015	11	11	1000	1000	1000	1000	0	0	NaN
BCC-MW-15016	11	11	1000	1000	1000	1000	0	0	NaN
BCC-MW-15017	11	11	1000	1000	1000	1000	0	0	NaN
BCC-MW-15018	11	11	1000	1000	1000	1000	0	0	NaN
BCC-MW-15019	11	11	1000	1000	1000	1000	0	0	NaN
BCC-MW-15020	11	11	1000	1000	1000	1000	0	0	NaN
BCC-MW-15021	11	11	1000	1000	1000	1000	0	0	NaN
BCC-MW-15022	11	11	1000	1000	1000	1000	0	0	NaN
BCC-MW-15023	11	11	1000	1000	1000	1000	0	0	NaN
BCC-MW-17001	4	4	1000	1000	1000	1000	0	0	NaN
BCC-MW-17002	4	4	1000	1000	1000	1000	0	0	NaN
BCC-MW-17003	4	4	1000	1000	1000	1000	0	0	NaN
BCC-MW-17004	4	4	1000	1000	1000	1000	0	0	NaN
BCC-MW-17005	4	4	1000	1000	1000	1000	0	0	NaN
BCC-MW-17006	4	4	1000	1000	1000	1000	0	0	NaN

Summary Report

Constituent: Lead, Total Analysis Run 11/16/2018 11:47 AM
Client: Consumers Energy Data: BCC_Sanitas

For observations made between 12/1/2015 and 8/8/2018, a summary of the selected data set:

Observations = 174
ND/Trace = 174
Wells = 21
Minimum Value = 1
Maximum Value = 1
Mean Value = 1
Median Value = 1
Standard Deviation = 0
Coefficient of Variation = 0
Skewness = NaN

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	10	10	1	1	1	1	0	0	NaN
BCC-MW-15010	10	10	1	1	1	1	0	0	NaN
BCC-MW-15011	10	10	1	1	1	1	0	0	NaN
BCC-MW-15012	10	10	1	1	1	1	0	0	NaN
BCC-MW-15013	10	10	1	1	1	1	0	0	NaN
BCC-MW-15014	10	10	1	1	1	1	0	0	NaN
BCC-MW-15015	10	10	1	1	1	1	0	0	NaN
BCC-MW-15016	10	10	1	1	1	1	0	0	NaN
BCC-MW-15017	10	10	1	1	1	1	0	0	NaN
BCC-MW-15018	10	10	1	1	1	1	0	0	NaN
BCC-MW-15019	10	10	1	1	1	1	0	0	NaN
BCC-MW-15020	10	10	1	1	1	1	0	0	NaN
BCC-MW-15021	10	10	1	1	1	1	0	0	NaN
BCC-MW-15022	10	10	1	1	1	1	0	0	NaN
BCC-MW-15023	10	10	1	1	1	1	0	0	NaN
BCC-MW-17001	4	4	1	1	1	1	0	0	NaN
BCC-MW-17002	4	4	1	1	1	1	0	0	NaN
BCC-MW-17003	4	4	1	1	1	1	0	0	NaN
BCC-MW-17004	4	4	1	1	1	1	0	0	NaN
BCC-MW-17005	4	4	1	1	1	1	0	0	NaN
BCC-MW-17006	4	4	1	1	1	1	0	0	NaN

Summary Report

Constituent: Lithium, Total Analysis Run 11/16/2018 11:47 AM
Client: Consumers Energy Data: BCC_Sanitas

For observations made between 12/1/2015 and 8/8/2018, a summary of the selected data set:

Observations = 174
ND/Trace = 62
Wells = 21
Minimum Value = 10
Maximum Value = 160
Mean Value = 19.48
Median Value = 14
Standard Deviation = 20.3
Coefficient of Variation = 1.042
Skewness = 4.791

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	10	0	13	24	16.42	14.8	3.657	0.2227	1.094
BCC-MW-15010	10	0	14	54	26.68	21.5	13.85	0.5191	1.021
BCC-MW-15011	10	0	11	21	16.42	16.5	2.842	0.1731	-0.1714
BCC-MW-15012	10	0	11	20.8	14.74	14	3.533	0.2397	0.4891
BCC-MW-15013	10	0	17	27.5	19.99	18	3.613	0.1808	1.05
BCC-MW-15014	10	7	10	27	13.2	10	5.808	0.44	1.564
BCC-MW-15015	10	7	10	16	11.05	10	2.006	0.1816	1.75
BCC-MW-15016	10	10	10	10	10	10	0	0	NaN
BCC-MW-15017	10	10	10	10	10	10	0	0	NaN
BCC-MW-15018	10	0	12	28	21.65	22.25	5.146	0.2377	-0.7822
BCC-MW-15019	10	0	22	27.9	24.36	23.85	2.055	0.08436	0.483
BCC-MW-15020	10	0	14	18	15.49	15.55	1.544	0.09966	0.4854
BCC-MW-15021	10	10	10	10	10	10	0	0	NaN
BCC-MW-15022	10	8	10	13	10.4	10	0.9661	0.09289	2.245
BCC-MW-15023	10	5	10	19	12.07	10.3	3.463	0.2869	1.389
BCC-MW-17001	4	0	55	73	63.75	63.5	7.455	0.1169	0.1097
BCC-MW-17002	4	0	75	160	128.8	140	37.94	0.2947	-0.8116
BCC-MW-17003	4	0	13	19	16.75	17.5	2.63	0.157	-0.8332
BCC-MW-17004	4	4	10	10	10	10	0	0	NaN
BCC-MW-17005	4	1	10	13	11.25	11	1.258	0.1118	0.652
BCC-MW-17006	4	0	31	38	35.5	36.5	3.109	0.08758	-0.9221

Summary Report

Constituent: Mercury, Total Analysis Run 11/16/2018 11:47 AM
Client: Consumers Energy Data: BCC_Sanitas

For observations made between 12/1/2015 and 8/8/2018, a summary of the selected data set:

Observations = 174
ND/Trace = 174
Wells = 21
Minimum Value = 0.2
Maximum Value = 0.2
Mean Value = 0.2
Median Value = 0.2
Standard Deviation = 0
Coefficient of Variation = 0
Skewness = NaN

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15010	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15011	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15012	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15013	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15014	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15015	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15016	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15017	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15018	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15019	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15020	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15021	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15022	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15023	10	10	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17001	4	4	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17002	4	4	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17003	4	4	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17004	4	4	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17005	4	4	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17006	4	4	0.2	0.2	0.2	0.2	0	0	NaN

Summary Report

Constituent: Molybdenum, Total Analysis Run 11/16/2018 11:47 AM
Client: Consumers Energy Data: BCC_Sanitas

For observations made between 12/1/2015 and 8/8/2018, a summary of the selected data set:

Observations = 174
ND/Trace = 88
Wells = 21
Minimum Value = 5
Maximum Value = 119
Mean Value = 17.16
Median Value = 5
Standard Deviation = 21.97
Coefficient of Variation = 1.281
Skewness = 2.313

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	10	0	11.6	60	41.34	45.88	16.08	0.389	-0.8644
BCC-MW-15010	10	2	5	33	16.62	15.6	10.35	0.6228	0.3141
BCC-MW-15011	10	0	5.8	35	22.01	23.5	8.859	0.4025	-0.6355
BCC-MW-15012	10	0	9	94.5	43.26	36	24.24	0.5602	0.8904
BCC-MW-15013	10	2	5	21	11.77	10.5	5.773	0.4905	0.4697
BCC-MW-15014	10	0	58	119	82.56	78.5	17.59	0.2131	0.7769
BCC-MW-15015	10	0	7	17	11.79	11	3.342	0.2836	0.4502
BCC-MW-15016	10	10	5	5	5	5	0	0	NaN
BCC-MW-15017	10	10	5	5	5	5	0	0	NaN
BCC-MW-15018	10	10	5	5	5	5	0	0	NaN
BCC-MW-15019	10	10	5	5	5	5	0	0	NaN
BCC-MW-15020	10	10	5	5	5	5	0	0	NaN
BCC-MW-15021	10	10	5	5	5	5	0	0	NaN
BCC-MW-15022	10	2	5	22	13.46	13.8	5.52	0.4101	-0.2613
BCC-MW-15023	10	3	5	8	6.11	6	1.005	0.1645	0.4984
BCC-MW-17001	4	4	5	5	5	5	0	0	NaN
BCC-MW-17002	4	3	5	30.1	11.28	5	12.55	1.113	1.155
BCC-MW-17003	4	2	5	48.8	16.28	5.65	21.69	1.333	1.152
BCC-MW-17004	4	2	5	9.9	6.45	5.45	2.339	0.3626	1.047
BCC-MW-17005	4	4	5	5	5	5	0	0	NaN
BCC-MW-17006	4	4	5	5	5	5	0	0	NaN

Summary Report

Constituent: Radium-226 Analysis Run 11/16/2018 11:47 AM
Client: Consumers Energy Data: BCC_Sanitas

For observations made between 12/1/2015 and 8/8/2018, a summary of the selected data set:

Observations = 174
ND/Trace = 118
Wells = 21
Minimum Value = 0.133
Maximum Value = 2.5
Mean Value = 0.5879
Median Value = 0.438
Standard Deviation = 0.4831
Coefficient of Variation = 0.8219
Skewness = 1.786

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	10	10	0.157	0.934	0.3866	0.239	0.3055	0.7902	0.9972
BCC-MW-15010	10	9	0.145	0.869	0.3772	0.2705	0.251	0.6655	0.951
BCC-MW-15011	10	9	0.141	1.12	0.3777	0.29	0.3133	0.8296	1.588
BCC-MW-15012	10	9	0.153	0.693	0.3265	0.2495	0.1744	0.5342	1.018
BCC-MW-15013	10	7	0.173	0.731	0.3407	0.251	0.1953	0.5732	1.007
BCC-MW-15014	10	9	0.175	1.17	0.4251	0.216	0.3901	0.9176	1.299
BCC-MW-15015	10	10	0.133	0.832	0.3383	0.291	0.2149	0.6353	1.196
BCC-MW-15016	10	2	0.263	1.6	1.208	1.305	0.4147	0.3432	-1.238
BCC-MW-15017	10	0	1.56	2.5	2.01	1.955	0.3108	0.1546	0.07986
BCC-MW-15018	10	3	0.227	1.02	0.4826	0.412	0.2478	0.5134	1.053
BCC-MW-15019	10	4	0.279	0.717	0.4294	0.3465	0.1595	0.3715	0.7176
BCC-MW-15020	10	9	0.19	0.899	0.4304	0.292	0.2619	0.6086	0.881
BCC-MW-15021	10	4	0.215	0.768	0.533	0.5435	0.153	0.2871	-0.5248
BCC-MW-15022	10	8	0.15	0.708	0.3581	0.269	0.1931	0.5392	0.9254
BCC-MW-15023	10	6	0.226	0.958	0.4377	0.283	0.2804	0.6406	1.027
BCC-MW-17001	4	4	0.509	0.89	0.6952	0.691	0.1672	0.2405	0.06435
BCC-MW-17002	4	3	0.306	1.07	0.7908	0.8935	0.3518	0.4449	-0.6936
BCC-MW-17003	4	3	0.52	0.889	0.6895	0.6745	0.1653	0.2397	0.2115
BCC-MW-17004	4	4	0.441	0.945	0.657	0.621	0.2258	0.3437	0.3833
BCC-MW-17005	4	1	0.44	1.211	0.8001	0.7745	0.3234	0.4042	0.2483
BCC-MW-17006	4	4	0.582	0.93	0.785	0.814	0.1511	0.1925	-0.5427

Summary Report

Constituent: Radium-226/228 Analysis Run 11/16/2018 11:47 AM
Client: Consumers Energy Data: BCC_Sanitas

For observations made between 12/1/2015 and 8/8/2018, a summary of the selected data set:

Observations = 174
ND/Trace = 107
Wells = 21
Minimum Value = 0.354
Maximum Value = 5.89
Mean Value = 1.483
Median Value = 1.26
Standard Deviation = 1.211
Coefficient of Variation = 0.8164
Skewness = 1.799

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	10	9	0.451	3.85	1.332	0.565	1.396	1.048	1.221
BCC-MW-15010	10	7	0.363	1.75	0.8736	0.661	0.542	0.6204	0.5819
BCC-MW-15011	10	9	0.394	2.07	0.8713	0.5475	0.5943	0.6821	0.9697
BCC-MW-15012	10	9	0.416	2.28	0.9111	0.594	0.5985	0.6569	1.311
BCC-MW-15013	10	7	0.481	1.56	0.9148	0.749	0.4299	0.47	0.3906
BCC-MW-15014	10	8	0.423	3.02	1.168	0.809	0.8449	0.7231	1.153
BCC-MW-15015	10	9	0.408	1.63	0.7891	0.5775	0.4255	0.5392	0.8795
BCC-MW-15016	10	0	2.29	3.83	3.074	3.09	0.5807	0.1889	-0.09311
BCC-MW-15017	10	0	4.3	5.89	5.039	5.065	0.5725	0.1136	0.01966
BCC-MW-15018	10	2	0.586	1.97	1.297	1.291	0.3808	0.2937	0.06467
BCC-MW-15019	10	3	0.674	2.13	1.213	0.9855	0.497	0.4097	0.6156
BCC-MW-15020	10	4	0.467	2.32	0.9879	0.727	0.5881	0.5953	1.311
BCC-MW-15021	10	3	0.354	2	1.439	1.44	0.5059	0.3516	-0.8293
BCC-MW-15022	10	7	0.45	1.45	0.7921	0.663	0.3759	0.4746	0.6129
BCC-MW-15023	10	7	0.355	1.85	0.9031	0.572	0.5596	0.6197	0.5462
BCC-MW-17001	4	4	1.34	1.79	1.57	1.575	0.2143	0.1365	-0.038
BCC-MW-17002	4	3	1.56	4.84	2.885	2.57	1.456	0.5047	0.5652
BCC-MW-17003	4	4	1.42	1.55	1.48	1.475	0.05477	0.03701	0.2811
BCC-MW-17004	4	4	1.25	1.75	1.475	1.45	0.2063	0.1399	0.4102
BCC-MW-17005	4	4	1.15	1.8	1.512	1.55	0.2733	0.1807	-0.4328
BCC-MW-17006	4	4	1.34	1.76	1.583	1.615	0.2073	0.131	-0.2181

Summary Report

Constituent: Radium-228 Analysis Run 11/16/2018 11:47 AM
Client: Consumers Energy Data: BCC_Sanitas

For observations made between 12/1/2015 and 8/8/2018, a summary of the selected data set:

Observations = 174
ND/Trace = 111
Wells = 21
Minimum Value = 0.354
Maximum Value = 3.98
Mean Value = 0.9987
Median Value = 0.753
Standard Deviation = 0.7379
Coefficient of Variation = 0.7389
Skewness = 2.061

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	10	9	0.451	3.27	1.085	0.565	1.084	0.9987	1.446
BCC-MW-15010	10	7	0.363	0.978	0.65	0.615	0.2516	0.3871	0.1242
BCC-MW-15011	10	9	0.394	0.956	0.6478	0.5475	0.2473	0.3818	0.2906
BCC-MW-15012	10	9	0.416	2.08	0.7591	0.594	0.4833	0.6367	2.293
BCC-MW-15013	10	7	0.481	0.94	0.6869	0.6625	0.1883	0.2742	0.2086
BCC-MW-15014	10	8	0.423	1.85	0.8743	0.7725	0.4314	0.4934	1.136
BCC-MW-15015	10	9	0.408	0.85	0.6113	0.5775	0.1628	0.2663	0.1671
BCC-MW-15016	10	0	1.06	2.37	1.904	1.935	0.403	0.2117	-0.7056
BCC-MW-15017	10	0	2.5	3.98	3.029	2.95	0.4312	0.1424	1.092
BCC-MW-15018	10	2	0.586	1.39	0.8823	0.824	0.2342	0.2655	0.8883
BCC-MW-15019	10	6	0.484	1.8	0.8834	0.7405	0.4133	0.4679	1.214
BCC-MW-15020	10	4	0.467	1.61	0.7136	0.6125	0.333	0.4666	2.168
BCC-MW-15021	10	4	0.354	1.6	0.9736	0.8585	0.4276	0.4392	0.3379
BCC-MW-15022	10	8	0.45	0.799	0.6031	0.579	0.1366	0.2265	0.1735
BCC-MW-15023	10	8	0.355	0.963	0.5951	0.5375	0.2105	0.3537	0.6309
BCC-MW-17001	4	4	0.822	0.947	0.875	0.8655	0.0597	0.06823	0.2728
BCC-MW-17002	4	3	0.996	3.77	2.091	1.8	1.264	0.6043	0.5406
BCC-MW-17003	4	3	0.663	0.9015	0.7749	0.7675	0.1095	0.1413	0.1369
BCC-MW-17004	4	3	0.719	1.03	0.8408	0.807	0.1328	0.158	0.8038
BCC-MW-17005	4	4	0.722	0.945	0.8152	0.797	0.104	0.1276	0.348
BCC-MW-17006	4	4	0.716	0.888	0.7985	0.795	0.07687	0.09627	0.1059

Summary Report

Constituent: Selenium, Total Analysis Run 11/16/2018 11:47 AM
Client: Consumers Energy Data: BCC_Sanitas

For observations made between 12/1/2015 and 8/8/2018, a summary of the selected data set:

Observations = 174
ND/Trace = 121
Wells = 21
Minimum Value = 1
Maximum Value = 8
Mean Value = 1.392
Median Value = 1
Standard Deviation = 1.056
Coefficient of Variation = 0.7587
Skewness = 4.204

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	10	9	1	2	1.1	1	0.3162	0.2875	2.667
BCC-MW-15010	10	8	1	1	1	1	0	0	NaN
BCC-MW-15011	10	9	1	1	1	1	0	0	NaN
BCC-MW-15012	10	7	1	3.3	1.27	1	0.7181	0.5654	2.602
BCC-MW-15013	10	9	1	1	1	1	0	0	NaN
BCC-MW-15014	10	4	1	8	1.87	1	2.191	1.172	2.515
BCC-MW-15015	10	9	1	1	1	1	0	0	NaN
BCC-MW-15016	10	0	1	7	2.65	2	1.793	0.6767	1.555
BCC-MW-15017	10	0	1.7	8	3.185	2.85	1.818	0.5707	2.048
BCC-MW-15018	10	7	1	4	1.3	1	0.9487	0.7298	2.667
BCC-MW-15019	10	8	1	2	1.12	1	0.3155	0.2817	2.491
BCC-MW-15020	10	6	1	2	1.14	1	0.3273	0.2871	2.11
BCC-MW-15021	10	4	1	4	1.46	1	0.9571	0.6555	2.12
BCC-MW-15022	10	10	1	1	1	1	0	0	NaN
BCC-MW-15023	10	9	1	1	1	1	0	0	NaN
BCC-MW-17001	4	4	1	2	1.25	1	0.5	0.4	1.155
BCC-MW-17002	4	3	1	2	1.275	1.05	0.4856	0.3809	1.123
BCC-MW-17003	4	3	1	2.2	1.55	1.5	0.6403	0.4131	0.04838
BCC-MW-17004	4	4	1	2	1.25	1	0.5	0.4	1.155
BCC-MW-17005	4	4	1	2	1.25	1	0.5	0.4	1.155
BCC-MW-17006	4	4	1	2	1.25	1	0.5	0.4	1.155

Summary Report

Constituent: Thallium, Total Analysis Run 11/16/2018 11:47 AM
Client: Consumers Energy Data: BCC_Sanitas

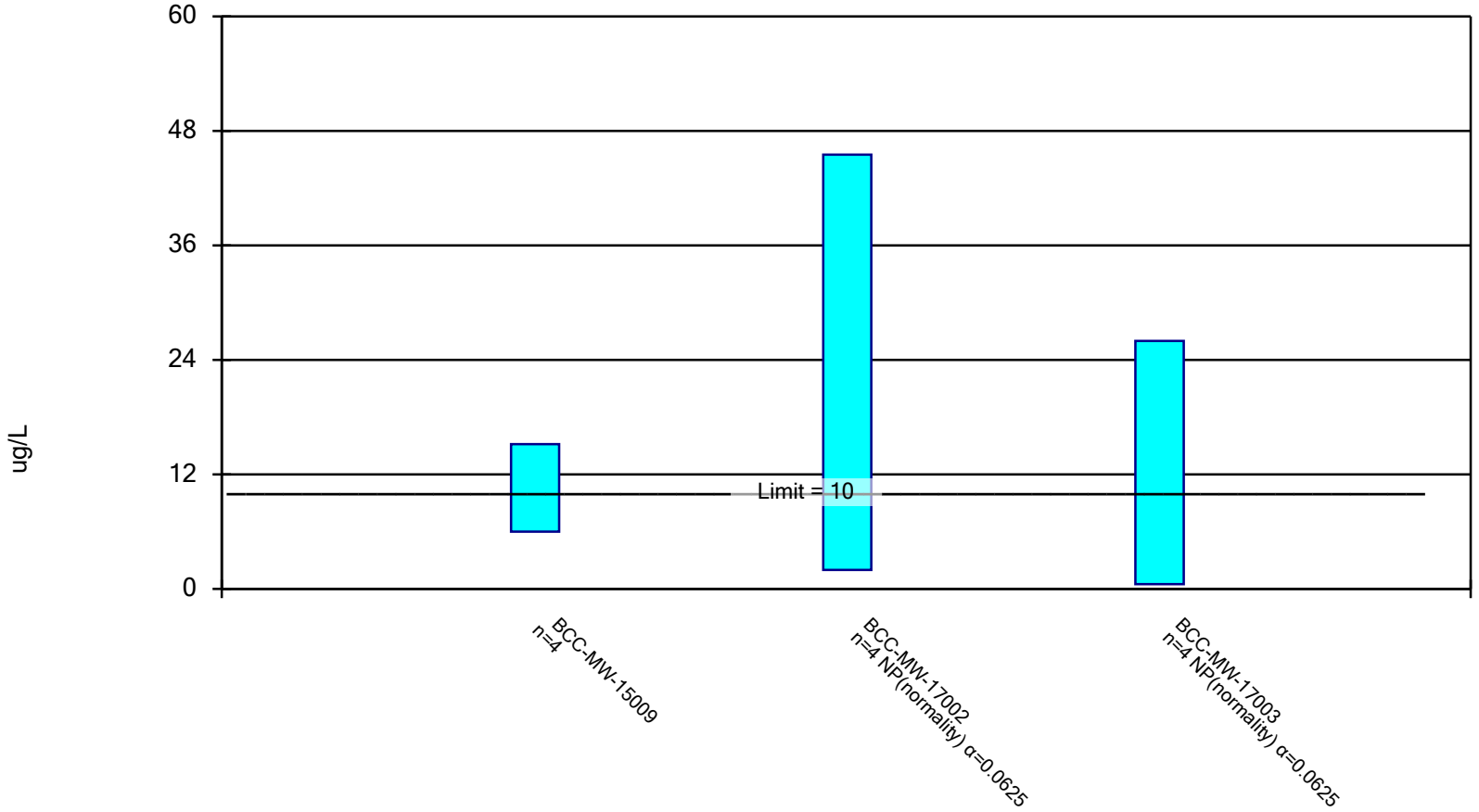
For observations made between 12/1/2015 and 8/8/2018, a summary of the selected data set:

Observations = 174
ND/Trace = 174
Wells = 21
Minimum Value = 2
Maximum Value = 2
Mean Value = 2
Median Value = 2
Standard Deviation = 0
Coefficient of Variation = 0
Skewness = NaN

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	10	10	2	2	2	2	0	0	NaN
BCC-MW-15010	10	10	2	2	2	2	0	0	NaN
BCC-MW-15011	10	10	2	2	2	2	0	0	NaN
BCC-MW-15012	10	10	2	2	2	2	0	0	NaN
BCC-MW-15013	10	10	2	2	2	2	0	0	NaN
BCC-MW-15014	10	10	2	2	2	2	0	0	NaN
BCC-MW-15015	10	10	2	2	2	2	0	0	NaN
BCC-MW-15016	10	10	2	2	2	2	0	0	NaN
BCC-MW-15017	10	10	2	2	2	2	0	0	NaN
BCC-MW-15018	10	10	2	2	2	2	0	0	NaN
BCC-MW-15019	10	10	2	2	2	2	0	0	NaN
BCC-MW-15020	10	10	2	2	2	2	0	0	NaN
BCC-MW-15021	10	10	2	2	2	2	0	0	NaN
BCC-MW-15022	10	10	2	2	2	2	0	0	NaN
BCC-MW-15023	10	10	2	2	2	2	0	0	NaN
BCC-MW-17001	4	4	2	2	2	2	0	0	NaN
BCC-MW-17002	4	4	2	2	2	2	0	0	NaN
BCC-MW-17003	4	4	2	2	2	2	0	0	NaN
BCC-MW-17004	4	4	2	2	2	2	0	0	NaN
BCC-MW-17005	4	4	2	2	2	2	0	0	NaN
BCC-MW-17006	4	4	2	2	2	2	0	0	NaN

Parametric and Non-Parametric (NP) Confidence Interval

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



Constituent: Arsenic, Total Analysis Run 11/27/2018 5:02 PM

Client: Consumers Energy Data: BCC_Sanitas

Confidence Interval

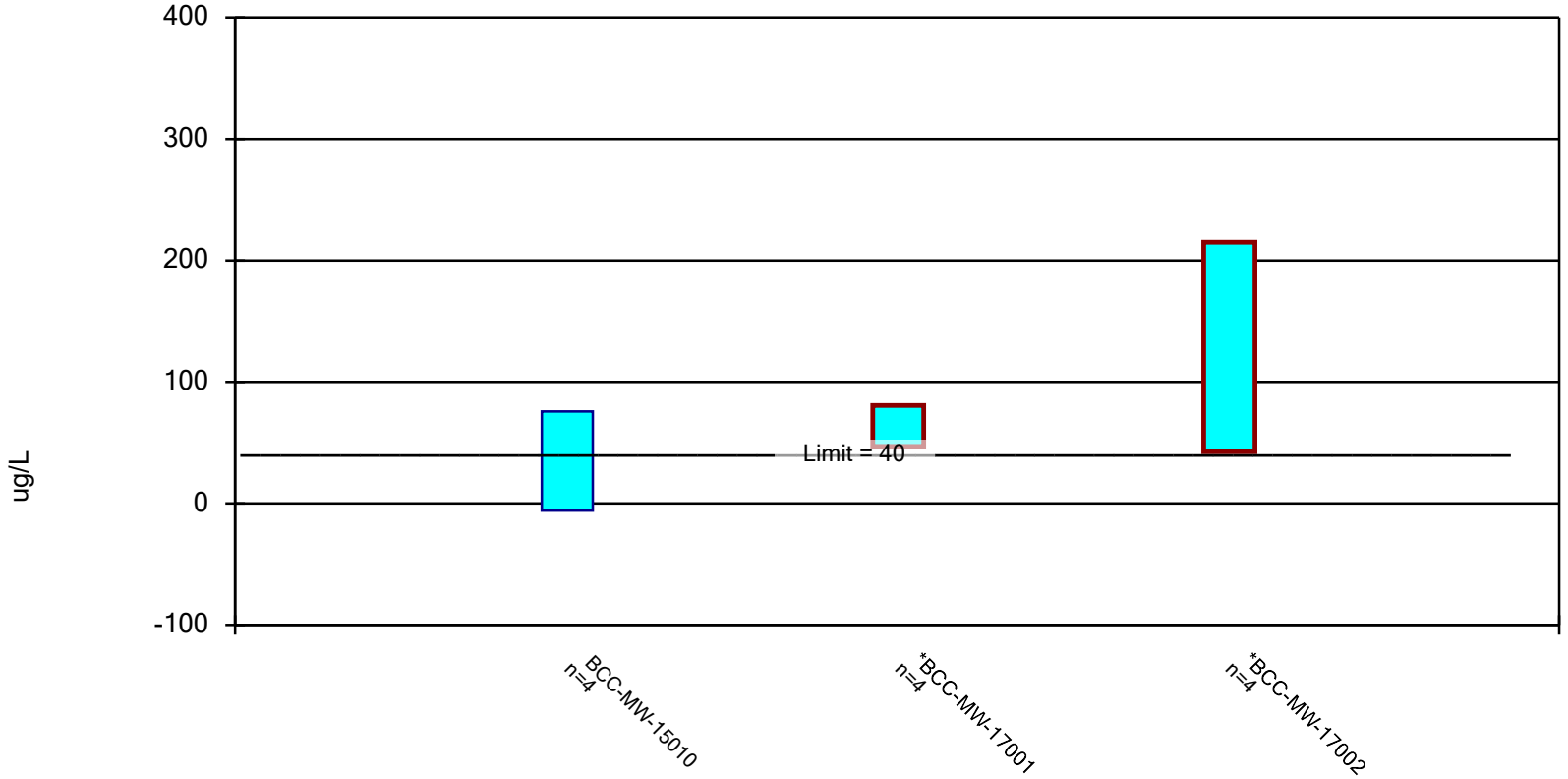
Constituent: Arsenic, Total (ug/L) Analysis Run 11/27/2018 5:03 PM

Client: Consumers Energy Data: BCC_Sanitas

	BCC-MW-15009	BCC-MW-17002	BCC-MW-17003
4/5/2017	13		
7/12/2017	11.4 (D)		
12/7/2017		45.5	26
2/20/2018		2	
2/21/2018			<1
4/17/2018	9.4		
6/14/2018	8.5		
6/16/2018		2.6	<1
8/7/2018		3.8	1.05 (D)
Mean	10.58	13.48	7.013
Std. Dev.	2.021	21.36	12.66
Upper Lim.	15.16	45.5	26
Lower Lim.	5.988	2	0.5

Parametric Confidence Interval

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



Constituent: Lithium, Total Analysis Run 11/27/2018 4:57 PM

Client: Consumers Energy Data: BCC_Sanitas

Confidence Interval

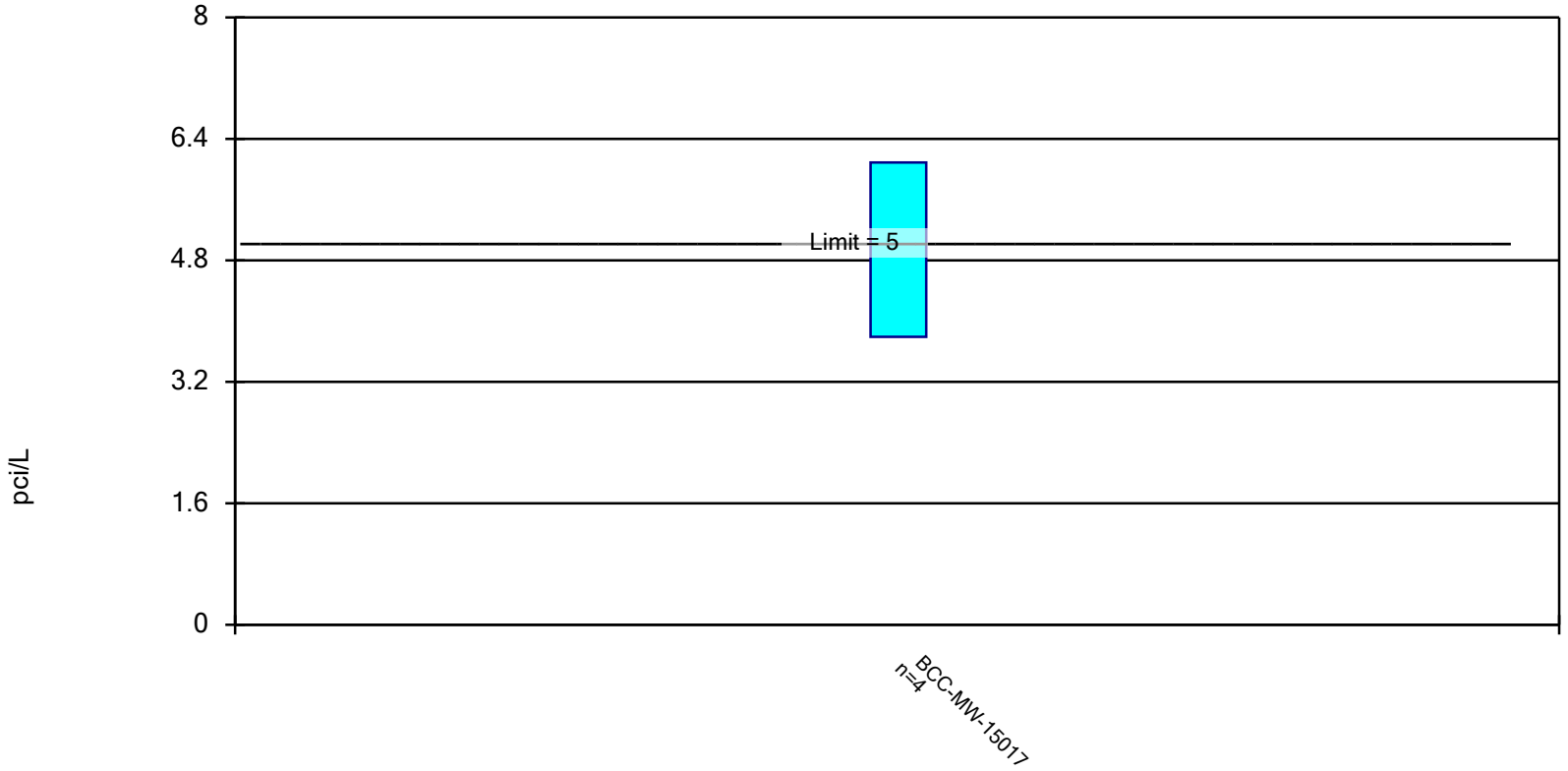
Constituent: Lithium, Total (ug/L) Analysis Run 11/27/2018 4:58 PM

Client: Consumers Energy Data: BCC_Sanitas

	BCC-MW-15010	BCC-MW-17001	BCC-MW-17002
4/5/2017	18		
7/12/2017	21		
12/7/2017		55	75
2/20/2018		73	160
4/17/2018	46		
6/14/2018	54		
6/16/2018		65	150
8/7/2018		62	130
Mean	34.75	63.75	128.8
Std. Dev.	17.95	7.455	37.94
Upper Lim.	75.51	80.68	214.9
Lower Lim.	-6.006	46.82	42.61

Parametric Confidence Interval

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



Constituent: Radium-226/228 Analysis Run 11/27/2018 5:00 PM

Client: Consumers Energy Data: BCC_Sanitas

Confidence Interval

Constituent: Radium-226/228 (pci/L) Analysis Run 11/27/2018 5:01 PM

Client: Consumers Energy Data: BCC_Sanitas

	BCC-MW-15017
4/6/2017	4.34
7/12/2017	4.75
4/18/2018	5.16
6/12/2018	5.51 (D)
Mean	4.94
Std. Dev.	0.5064
Upper Lim.	6.09
Lower Lim.	3.79

Appendix D
April 2019 Assessment Monitoring Statistical Evaluation

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Technical Memorandum

Date: July 19, 2019

To: Michelle Marion, CEC

From: Darby Litz, TRC
Sarah Holmstrom, TRC
Kristin Lowery, TRC

cc: Brad Runkel, CEC
JR Register, CEC
Bethany Swanberg, CEC

Project No.: 322176.0000 Phase 001, Task 003

Subject: Statistical Evaluation of April 2019 Assessment Monitoring Sampling Event
BC Cobb Bottom Ash Pond & Ponds 0-8 CCR Unit, Consumers Energy Company, Essexville, Michigan

During the statistical evaluation of the initial assessment monitoring event (June 2018), lithium was present in one or more downgradient monitoring wells at statistically significant levels exceeding the Groundwater Protection Standards (GWPSs). Therefore, Consumers Energy Company (CEC) initiated an Assessment of Corrective Measures (ACM) within 90 days from when the Appendix IV exceedance was determined. Currently, CEC is continuing semiannual assessment monitoring in accordance with §257.95 of the CCR Rule[1] at the BC Cobb Power Plant (BCC) Bottom Ash Pond and Ponds 0-8 (collectively the BCC Ponds). The first semiannual assessment monitoring event for 2019 was conducted on April 8 through April 12, 2019. In accordance with §257.95, the assessment monitoring data must be compared to GWPSs to determine whether or not Appendix IV constituents are detected at statistically significant levels above the GWPSs. GWPSs were established in accordance with §257.95(h), as detailed in the October 15, 2018 *Groundwater Protection Standards* technical memorandum, which was also included in the *2018 Annual Groundwater Monitoring Report* (TRC, January 2019). The following narrative describes the methods employed and the results obtained and the Sanitas™ output files are included as an attachment.

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

The statistical evaluation of the third semiannual assessment monitoring event data indicates that the following constituent is present at statistically significant levels exceeding the GWPS in downgradient monitoring wells at the BCC Ponds:

Constituent	GWPS	# Downgradient Wells Observed
Lithium	40 ug/L	2 of 21

These results are consistent with the results of the initial assessment monitoring data statistical evaluation and CEC will continue to initiate an assessment of corrective measures per §257.95(g). CEC will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

Assessment Monitoring Statistical Evaluation

The compliance monitoring wells BCC-MW-15009 through BCC-MW-15014 encircle the BAP, while BCC-MW-15015 through BCC-MW-15023 and BCC-MW-17001 through BCC-MW-17006 are located at the outer edge of the peninsula formed by the bottom ash pond system. Because the perimeter and interior berms within the ash management area were constructed in part with ash and bodies of water surround the ash management area, wells could not be installed entirely beyond the CCR material boundary.

Following the first semiannual assessment monitoring event for 2019, compliance well data for the BCC Ponds were evaluated in accordance with the *Groundwater Statistical Evaluation Plan* (Stats Plan) (TRC, October 2017). An assessment monitoring program was developed to evaluate concentrations of CCR constituents present in the uppermost aquifer relative to acceptable levels (i.e. GWPSs). In order to decide as to whether or not the GWPSs have been exceeded, the change in concentration observed at the downgradient wells during a given assessment monitoring event must be large enough, after accounting for variability in the sample data, that the result is unlikely to have occurred merely by chance. Consistent with the Unified Guidance[2], the preferred method for comparisons to a fixed standard are confidence limits. Based on the number of historical observations in the representative sample population, the population mean, the population standard deviation, and a selected confidence level (i.e. 99 percent), an upper and lower confidence limit is calculated. The true concentration, with 99 percent confidence, will fall between and lower and upper confidence limits.

The concentrations observed in the downgradient wells are deemed to be a statistically significant exceedance when the 99 percent lower confidence limit of the downgradient data exceeds the GWPS. If the confidence interval straddles the GWPS (i.e. the lower confidence level is below the GWPS but the upper confidence level is above), the statistical test results are inconclusive and there is not compelling evidence that the measured concentration is a result of a release from the CCR unit versus the inherent variability of the sample data. This statistical approach is consistent with the statistical

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

methods for assessment monitoring presented in §257.93(f) and (g). Statistical evaluation methodologies built into the CCR Rule, and numerous other federal rules, are key in determining whether or not individually measured data points represent a concentration increase over the baseline or a fixed standard (such as a GWPS in an assessment monitoring program).

For each detected Appendix IV constituent, the concentrations for each well were first compared directly to the GWPS, as shown on Table A1. Due to the significant operational changes that occurred within the ash management area and immediately adjacent to it during the CCR Rule baseline period, where groundwater flow rates and directions were changed drastically over relatively short periods of time, the data set used for statistical evaluation was limited to the five most recent events relative to the timeline of other factors that could be affecting observations of constituents in groundwater that are unrelated to releases from the ponds. Limiting the data set to the five most recent data points is appropriate for the BCC Ponds to allow for evaluation of groundwater quality that is representative of current conditions that excludes variability in the sample data set caused by the observed changes in site conditions that would not be indicative of a release from the BCC Ponds. Those observed changes are attributed to several possibilities including cessation of hydraulic loading in the BCC Ponds in April 2016, changes in the analytical laboratory being used, and pumping from Veteran's Memorial Pond (pumping influence observed from July 2017 through September 2017; construction completed in December 2017). These activities have the potential to influence the results of the statistical analysis by including data that may have different reporting limits or may have been biased low or high due to changing site conditions, introducing additional variability and uncertainty in the results that is inconsistent with the natural groundwater data distribution. Use of the five most recent data points relative to the timeline of other site factors is adequate in providing the minimum density of data for the statistical analysis as recommended per the Unified Guidance; therefore, no less than four data points are used to minimize bias from external influences.

For the BCC-MW-15000-series monitoring wells, the confidence interval tests included data collected between July 2017 and April 2019. For the BCC-MW-17000-series wells, the confidence interval tests included data collected between February 2018 and April 2019 (five out of the six data points accumulated since wells were installed in December 2017). Parameter-well combinations that included a direct exceedance of the GWPS during these timeframes were retained for further analysis. Arsenic in BCC-MW-15009, lithium in BCC-MW-15010, BCC-MW-17001, and BCC-MW-17002, molybdenum in BCC-MW-15014, and radium 226/228 in BCC-MW-15017 had individual results exceeding the GWPS.

Groundwater data were then evaluated utilizing Sanitas™ statistical software. Sanitas™ is a software tool that is commercially available for performing statistical evaluation consistent with procedures outlined in the Unified Guidance. Within the Sanitas™ statistical program, confidence limits were selected to perform the statistical comparison of compliance data to a fixed standard. Parametric and non-parametric confidence intervals were calculated, as appropriate, 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 Sanitas™ output files are included as an attachment.

The statistical data evaluation included the following steps:

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

The results of these evaluations are presented and discussed below.

Data from each round were evaluated for completeness, overall quality, and usability and were deemed appropriate for the purposes of the CCR assessment monitoring program. Initially, the recent baseline for the BCC-MW-15000-series monitoring wells (from July 2017 to April 2019) and for the BCC-MW-17000-series wells (February 2018 to April 2019) were observed visually for potential trends. No outliers or significant trends were identified.

The Sanitas™ software was then used to test compliance at the downgradient monitoring wells using the confidence interval method for the most recent five sampling events. The software outputs are included in Attachment 1 along with data reports showing the values used for the evaluation. The percentage of non-detect observations are also included in Attachment 1. Non-detect data was handled in accordance with the Stats Plan for the purposes of calculating the confidence intervals. The tests were run with a per-well significance of $\alpha = 0.01$. The Sanitas™ software generates an output that includes graphs of the parametric or non-parametric confidence intervals for each well along with notes on data transformations, as appropriate. The data sets with direct exceedances of the GWPS were found to be normally distributed. The confidence interval test compares the lower confidence limit to the GWPS.

The statistical evaluation of the Appendix IV parameters shows exceedances for lithium at BCC-MW-17001 and BCC-MW-17002. The lower confidence limits for the other Appendix IV constituents statistically evaluated at BCC-MW-15009, BCC-MW-15010, BCC-MW-15014, and BCC-MW-15017 were below their respective GWPSs. These results are consistent with the results of the initial assessment monitoring data statistical evaluation and CEC will continue the assessment of corrective measures per §257.95(g). CEC will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

Attachments

Table A1 Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to April 2019

Attachment 1 Sanitas™ Output Files

Table

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to April 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15009												
						Sample Date:	12/1/2015	2/17/2016	4/18/2016	7/12/2016	9/28/2016	2/14/2017	4/5/2017	7/11/2017	7/11/2017	9/13/2017	4/16/2018	6/13/2018	11/28/2018	4/9/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient								Field Dup					
Appendix III																				
Boron	ug/L	NC	NA	1,320	NA		2,380	2,520	2,170	2,070	2,190	2,110	2,190	2,210	1,690	2,120	--	1,670	1,690	1,600
Calcium	mg/L	NC	NA	259	NA		42.7	44.1	40.1	44.1	46.7	37.7	38.2	37.6	36.5	34.9	--	42.4	27.9	33
Chloride	mg/L	250*	NA	5,980	NA		24	24.0	27.1	26.9	24.3	22.8	24.9	26.3	26.3	26	--	95.7	51.1	32
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		63	39.3	49.5	55.2	49.1	31.6	39.8	43.0	47.2	41.7	--	< 2.0	19.2	49
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		240	230	220	220	230	200	190	216	246	188	--	456	454	300
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		10.6	10.8	10.3	10.0	10.0	10.2	10.1	9.6	--	10.2	9.8	9.8	9.8	9.4
Appendix IV																				
Antimony	ug/L	6	NA	1	6		1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		**45**	**31**	**24**	**24**	**20**	**14**	**13**	**12.0**	**10.8**	--	9.4	8.5	4.1	3.9
Barium	ug/L	2,000	NA	340	2,000		16	12	11	11	11	9	10	13.2	10.8	--	16.5	13.8	10.2	16
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	< 1	1	2	< 1	< 1	< 1	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		15.6	14.6	15	14	14	13	14	19	19	--	24	21	20	21
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		57	60	50	49	49	40	38	43.7	41.8	--	16.0	11.6	5.2	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		< 0.166	< 0.157	< 0.209	< 0.158	< 0.269	< 0.159	< 0.347	< 0.756	< 0.887	--	< 0.934	< 0.580	< 0.567	< 0.153
Radium-228	pCi/L	NC	NA	NA	NA		< 0.451	< 0.475	< 0.467	< 0.461	< 0.628	0.678	< 0.502	< 1.96	< 2.96	--	< 0.957	< 3.27	< 0.903	< 0.583
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.451	< 0.475	< 0.467	< 0.461	< 0.628	0.747	< 0.502	< 2.72	< 3.85	--	< 1.89	< 3.85	< 1.47	< 0.583
Selenium	ug/L	50	NA	3	50		< 1	< 1	2	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to April 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15010												
						Sample Date:	12/1/2015	2/17/2016	4/13/2016	7/13/2016	9/28/2016	2/14/2017	4/5/2017	7/11/2017	9/13/2017	9/13/2017	4/16/2018	6/14/2018	11/28/2018	4/9/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient									Field Dup				
Appendix III																				
Boron	ug/L	NC	NA	1,320	NA		1,970	1,510	1,340	1,270	1,570	1,440	1,760	1,340	1,770	1,770	--	2,100	1,850	1,700
Calcium	mg/L	NC	NA	259	NA		71.2	51.9	37.4	58.2	66.4	49.8	80.5	40.7	129	133	--	133	115	110
Chloride	mg/L	250*	NA	5,980	NA		23	22.5	21.5	22.7	25.1	22.3	24.2	25.5	24.5	24.4	--	29.3	39.6	22
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		120	52.6	31.0	50.7	69.7	24.2	53.5	24.8	143	143	--	73.7	48.3	49
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		410	270	220	260	320	250	360	288	570	618	--	636	590	490
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.7	7.8	7.8	7.8	8.0	8.0	7.8	7.8	7.8	--	7.8	7.4	7.5	7.6
Appendix IV																				
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		49	34	28	42	45	31	51	29.2	--	--	63.4	64.8	68.1	78
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	< 1	2	< 1	< 1	1	< 1	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	--	< 15.0	< 15.0	< 6.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		36.1	22.7	18	15	22	14	18	21	--	--	**46**	**54**	**51**	**41**
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		33	29	27	15	20	9	7	16.2	--	--	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		< 0.302	< 0.217	< 0.244	< 0.145	< 0.297	< 0.179	< 0.216	< 0.642	--	--	< 0.869	0.661	< 0.820	< 0.185
Radium-228	pCi/L	NC	NA	NA	NA		0.849	< 0.502	< 0.447	0.420	0.728	< 0.363	< 0.380	< 0.956	--	--	< 0.877	< 0.978	< 0.805	< 0.516
Radium-226/228	pCi/L	5	NA	2.42	**5**		0.973	< 0.502	< 0.447	0.451	0.82	< 0.363	< 0.38	< 1.60	--	--	< 1.75	< 1.45	< 1.63	< 0.516
Selenium	ug/L	50	NA	3	50		< 1	< 1	1	1	< 1	< 1	< 1	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	--	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.

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

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

All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to April 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15011											
						Sample Date:	12/1/2015	2/17/2016	4/13/2016	7/12/2016	9/28/2016	2/14/2017	4/5/2017	7/11/2017	9/13/2017	4/16/2018	6/13/2018	11/28/2018	4/10/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient												
Appendix III																			
Boron	ug/L	NC	NA	1,320	NA		1,680	1,420	1,340	1,210	1,180	1,280	1,340	1,060	1,490	--	1,630	1,650	1,600
Calcium	mg/L	NC	NA	259	NA		53	47.6	36.9	47.3	48.0	47.9	52.0	42.2	23.9	--	22.6	29.5	41
Chloride	mg/L	250*	NA	5,980	NA		22	20.7	22.1	24.8	21.0	19.5	22.2	22.9	24.0	--	23.2	26.3	38
Fluoride	ug/L	4,000	NA	1,000	NA		1,200	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		50	30.8	35.8	43.8	38.5	37.2	42.8	29.1	6.4	--	12.3	21.9	38
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		270	230	210	240	230	230	240	224	140	--	244	182	260
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		8.7	8.5	8.2	8.5	8.7	9.2	9.0	8.2	8.5	9.1	8.5	8.9	8.8
Appendix IV																			
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		5	3	3	4	6	7	8	< 1.0	--	6.4	1.5	7.3	9.3
Barium	ug/L	2,000	NA	340	2,000		36	29	25	30	31	31	32	30.7	--	15.2	16.6	18.5	31
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		1	< 1	2	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		1,200	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		17.2	16	14	15	16	17	17	20	--	21	11	18	18
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		20	29	35	26	27	25	22	21.4	--	8.9	5.8	13.9	15
Radium-226	pCi/L	NC	NA	NA	NA		< 0.199	< 0.141	< 0.319	< 0.166	< 0.284	< 0.160	< 0.296	< 1.12	--	< 0.742	0.350	< 0.771	0.226
Radium-228	pCi/L	NC	NA	NA	NA		0.956	< 0.447	< 0.435	< 0.402	< 0.496	< 0.394	< 0.599	< 0.954	--	< 0.872	< 0.923	< 0.747	< 0.532
Radium-226/228	pCi/L	5	NA	2.42	**5**		1.01	< 0.447	< 0.435	< 0.402	< 0.496	< 0.394	< 0.599	< 2.07	--	< 1.61	< 1.25	< 1.52	< 0.532
Selenium	ug/L	50	NA	3	50		< 1	< 1	< 1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to April 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15012												
						Sample Date:	12/1/2015	2/17/2016	4/13/2016	7/13/2016	9/29/2016	2/14/2017	4/5/2017	7/12/2017	9/13/2017	4/17/2018	6/13/2018	11/28/2018	4/10/2019	4/10/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient													
Appendix III																				Field Dup
Boron	ug/L	NC	NA	1,320	NA		961	1,390	1,830	1,450	1,470	1,380	1,500	1,340	1,140	--	1,450	1,280	1,300	1,300
Calcium	mg/L	NC	NA	259	NA		49.5	82.1	65.5	44.5	43.5	32.0	34.9	24.6	48.7	--	95.1	55.7	61	60
Chloride	mg/L	250*	NA	5,980	NA		20	20.4	23.7	23.0	22.6	19.7	22.7	24.1	23.3	--	22.7	21.5	20	20
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,200	1,100	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		69	111	106	65.6	50.9	55.7	57.2	21.8	59.6	--	355	137	190	180
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		300	370	340	250	210	190	200	168	318	--	902	302	380	380
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		8.0	8.1	8.1	8.9	9.2	8.6	8.5	9.9	11.4	9.7	10.2	9.8	9.4	--
Appendix IV																				
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		< 1	2	8	**12**	9	2	3	6.1	--	1.8	3.4	1.3	1.4	1.4
Barium	ug/L	2,000	NA	340	2,000		40	63	68	34	22	25	28	14.3	--	109	105	51.7	79	79
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	< 1	1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,200	1,100	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		15.6	20.8	19	18	15	11	12	12	--	13	11	10	12	12
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		29	9	35	37	44	35	27	94.5	--	50.8	71.3	28.3	26	26
Radium-226	pCi/L	NC	NA	NA	NA		< 0.164	< 0.243	< 0.256	< 0.216	< 0.335	< 0.153	< 0.243	0.436	--	< 0.693	< 0.526	0.700	< 0.142	0.219
Radium-228	pCi/L	NC	NA	NA	NA		< 0.471	< 0.634	0.827	< 0.539	< 0.548	< 0.416	< 0.554	< 2.08	--	< 0.733	< 0.789	< 0.992	< 0.485	< 0.481
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.471	< 0.634	0.919	< 0.539	< 0.548	< 0.416	< 0.554	< 2.28	--	< 1.43	< 1.32	1.27	< 0.485	0.514
Selenium	ug/L	50	NA	3	50		< 1	< 1	< 1	< 1	< 1	< 1	< 1	1.2	--	1.2	3.3	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.

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

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

All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to April 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15013													
						Sample Date:	12/1/2015	2/18/2016	4/13/2016	7/13/2016	9/29/2016	2/14/2017	4/5/2017	7/12/2017	9/13/2017	4/17/2018	4/17/2018	6/13/2018	6/13/2018	11/29/2018	4/11/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient										Field Dup		Field Dup		
Appendix III																					
Boron	ug/L	NC	NA	1,320	NA		1,140	1,290	1,180	1,080	1,090	1,050	1,120	916	1,270	--	--	1,130	1,100	1,070	1,200
Calcium	mg/L	NC	NA	259	NA		65.2	58.3	47.5	48.4	59.7	52.5	50.9	43.9	34.4	--	--	47.3	48.9	50.8	50
Chloride	mg/L	250*	NA	5,980	NA		21	20.9	21.5	21.0	22.9	19.8	19.9	23.4	21.2	--	--	21.5	21.6	21.3	21
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		89	44.3	34.3	27.5	31.3	23.1	15.1	8.7	59.9	--	--	8.7	7.9	5.9	4.8
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		330	290	260	250	250	260	250	240	192	--	--	324	268	210	260
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.6	7.2	7.4	7.3	7.4	7.7	7.4	7.4	7.9	7.6	--	7.7	--	7.0	7.3
Appendix IV																					
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		71	58	49	47	51	52	48	41.9	--	43.3	44.7	43.9	41.1	39.5	45
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	< 1	2	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		17.5	19.9	18	17	18	18	17	23	--	27	28	24	24	23	17
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		17	20	21	12	11	10	9	7.7	--	< 5.0	< 5.0	< 5.0	< 5.0	5.0	5.7
Radium-226	pCi/L	NC	NA	NA	NA		0.272	< 0.299	0.173	< 0.181	< 0.215	< 0.230	< 0.215	0.731	--	< 0.505	< 0.506	< 0.546	< 0.585	< 0.696	< 0.232
Radium-228	pCi/L	NC	NA	NA	NA		0.914	< 0.527	0.727	0.483	< 0.598	< 0.481	< 0.516	< 0.940	--	< 0.633	< 0.780	< 0.754	< 0.903	< 0.728	< 0.450
Radium-226/228	pCi/L	5	NA	2.42	**5**		1.19	< 0.527	0.9	0.596	< 0.598	< 0.481	< 0.516	< 1.56	--	< 1.14	< 1.29	< 1.30	< 1.49	< 1.42	< 0.450
Selenium	ug/L	50	NA	3	50		< 1	< 1	< 1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to April 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15014												
						Sample Date:	12/1/2015	2/18/2016	4/18/2016	7/13/2016	9/29/2016	2/14/2017	4/5/2017	7/12/2017	9/13/2017	4/17/2018	6/13/2018	11/29/2018	4/11/2019	4/11/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient												Field Dup
Appendix III																			
Boron	ug/L	NC	NA	1,320	NA		2,560	2,230	1,840	1,630	1,690	1,530	1,560	1,300	1,410	--	1,370	1,400	1,500	1,600
Calcium	mg/L	NC	NA	259	NA		75.6	75.3	63.9	73.5	64.7	66.3	65.3	61.8	57.8	--	50.8	51.1	49	53
Chloride	mg/L	250*	NA	5,980	NA		21	21.9	21.9	22.0	22.7	18.6	22.1	22.4	22.5	--	21.3	20.5	20	22
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		43	34.7	31.4	35.6	23.7	27.8	23.9	24.9	19.2	--	2.4	12.4	12	14
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		350	310	270	290	250	280	270	292	282	--	338	224	260	290
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		11.5	11.6	11.2	11.0	11.1	11.5	11.3	11.5	12.0	11.6	11.4	11.5	11.3	--
Appendix IV																			
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	1.7	--	1.1	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		**15**	**11**	**11**	8	9	7	7	8.4	--	6.2	5.5	4.0	3.8	4.0
Barium	ug/L	2,000	NA	340	2,000		329	376	257	508	357	571	546	732	--	779	607	604	620	630
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	2	1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	1.4
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		< 10	< 10	< 10	< 10	< 10	< 10	< 10	19	--	27	16	21	12	11
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		**119**	76	58	69	81	80	77	70.9	--	94.7	100	**106**	**120**	**110**
Radium-226	pCi/L	NC	NA	NA	NA		< 0.176	< 0.175	< 0.177	0.214	< 0.218	< 0.211	< 0.289	< 0.511	--	< 1.11	< 1.17	< 1.52	< 0.192	< 0.182
Radium-228	pCi/L	NC	NA	NA	NA		1.23	< 0.735	< 0.562	< 0.606	< 0.485	0.810	< 0.423	< 1.07	--	< 0.972	< 1.85	< 1.73	< 0.538	< 0.379
Radium-226/228	pCi/L	5	NA	2.42	**5**		1.31	< 0.735	< 0.562	< 0.606	< 0.485	0.883	< 0.423	< 1.58	--	< 2.08	< 3.02	< 3.25	< 0.538	< 0.379
Selenium	ug/L	50	NA	3	50		< 1	1	< 1	< 1	< 1	1	8	2.3	--	1.2	1.2	2.6	5.2	2.6
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.

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

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

All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to April 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15015													
						Sample Date:	12/1/2015	2/18/2016	4/13/2016	7/13/2016	9/29/2016	2/14/2017	4/5/2017	7/12/2017	7/12/2017	9/13/2017	9/13/2017	4/17/2018	6/13/2018	11/29/2018	4/11/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient								Field Dup		Field Dup				
Appendix III																					
Boron	ug/L	NC	NA	1,320	NA		1,190	1,170	963	614	656	662	599	489	678	433	374	--	398	505	630
Calcium	mg/L	NC	NA	259	NA		32.8	33.0	30.6	36.2	40.1	38.4	37.6	29.4	32.3	36.9	38.8	--	45.0	50.8	68
Chloride	mg/L	250*	NA	5,980	NA		21	22.0	21.6	20.4	19.5	19.2	22.7	20.1	20.0	20.3	20.3	--	19.5	17.8	20
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		7.8	6.56	8.34	13.9	9.26	10.4	13.8	18.8	17.9	16.1	15.6	--	12.6	13.2	88
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		220	200	190	180	180	200	190	166	190	192	274	--	316	238	360
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.6	7.4	7.4	7.4	7.8	7.7	7.6	8.4	--	8.7	--	8.3	7.9	7.8	7.6
Appendix IV																					
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		2	2	2	6	5	5	6	6.4	7.6	--	--	4.7	5.5	4.3	4.3
Barium	ug/L	2,000	NA	340	2,000		23	22	21	25	28	30	28	30.1	33.6	--	--	39.9	37.9	41.0	63
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	< 1	1	1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	< 15.0	--	--	< 15.0	< 15.0	< 6.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		< 10	< 10	< 10	< 10	< 10	< 10	< 10	12	11	--	--	16	13	14	11
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		17	14	17	11	10	9	11	11.9	13.0	--	--	9.4	7.0	7.2	11
Radium-226	pCi/L	NC	NA	NA	NA		< 0.193	< 0.157	< 0.242	< 0.133	< 0.378	< 0.166	< 0.340	< 0.832	< 0.698	--	--	< 0.467	< 0.475	< 0.677	< 0.224
Radium-228	pCi/L	NC	NA	NA	NA		< 0.578	< 0.577	< 0.521	< 0.467	0.850	< 0.408	< 0.420	< 0.799	< 0.748	--	--	< 0.730	< 0.763	< 1.07	< 0.518
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.578	< 0.577	< 0.521	< 0.467	0.85	< 0.408	< 0.42	< 1.63	< 1.45	--	--	< 1.20	< 1.24	< 1.75	< 0.518
Selenium	ug/L	50	NA	3	50		< 1	< 1	< 1	1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	--	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to April 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15016											
						Sample Date:	12/1/2015	2/18/2016	4/13/2016	7/13/2016	9/29/2016	2/14/2017	4/5/2017	7/12/2017	9/13/2017	4/17/2018	6/12/2018	11/29/2018	4/11/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient												
Appendix III																			
Boron	ug/L	NC	NA	1,320	NA		108	119	86	100	88	92	83	85.9	83	--	76.6	80.8	110
Calcium	mg/L	NC	NA	259	NA		172	184	164	172	181	176	172	170	182	--	168	169	170
Chloride	mg/L	250*	NA	5,980	NA		200	204	203	165	204	196	200	10.4	226	--	197	201	190
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	< 2.0	< 2.0	< 2.0
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		980	1,000	980	920	930	990	1,000	1,050	995	--	986	968	1,000
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		6.6	6.5	6.4	6.3	6.4	6.4	6.6	6.4	6.6	6.8	6.5	6.6	6.4
Appendix IV																			
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		2	2	3	3	2	2	2	1.5	--	1.5	1.3	1.3	1.6
Barium	ug/L	2,000	NA	340	2,000		656	647	614	619	621	666	613	596	--	649	652	548	700
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		2	3	3	4	3	3	3	1.9	--	2.1	2.0	2.3	2.3
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	--	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5.0	--	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		< 0.263	1.51	1.31	1.50	1.06	1.17	1.60	1.30	--	1.56	< 0.810	1.75	1.18
Radium-228	pCi/L	NC	NA	NA	NA		2.29	2.32	1.69	1.68	1.68	2.37	2.06	1.06	--	2.08	1.81	2.20	1.76
Radium-226/228	pCi/L	5	NA	2.42	**5**		2.29	3.83	3	3.18	2.74	3.54	3.66	2.36	--	3.64	2.50	3.95	2.94
Selenium	ug/L	50	NA	3	50		2	4	2	7	1	2	2	3.6	--	1.5	1.4	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.

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

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

All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to April 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15017												
						Sample Date:	12/1/2015	2/18/2016	4/18/2016	7/13/2016	9/29/2016	2/14/2017	4/5/2017	7/12/2017	9/13/2017	4/17/2018	6/12/2018	6/12/2018	11/29/2018	4/11/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient													
Appendix III																		Field Dup		
Boron	ug/L	NC	NA	1,320	NA		59	90	66	76	78	76	75	75	82.8	--	83.8	79.0	73.2	100
Calcium	mg/L	NC	NA	259	NA		225	247	220	232	252	232	232	203	245	--	243	232	242	220
Chloride	mg/L	250*	NA	5,980	NA		200	201	184	204	182	192	187	199	224	--	224	224	193	210
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		850	1,100	1,200	1,100	1,100	1,200	1,100	1,230	1,130	--	1,120	1,170	1,110	1,200
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		6.5	6.4	6.4	6.4	6.4	6.6	6.5	6.4	6.5	6.8	6.5	--	6.7	6.4
Appendix IV																				
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		**13**	7	5	**12**	**12**	5	4	3	--	2.3	2.1	2.1	1.8	1.9
Barium	ug/L	2,000	NA	340	2,000		1,030	981	924	985	955	968	876	772	--	955	936	953	824	960
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		4	4	4	9	11	5	5	5.3	--	3.4	3.4	3.3	3.1	2.9
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	--	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5.0	--	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		1.61	2.38	2.18	1.91	1.94	1.82	1.56	1.97	--	2.23	2.13	2.87	1.93	1.52
Radium-228	pCi/L	NC	NA	NA	NA		2.69	2.97	3.50	3.98	2.50	3.15	2.78	2.78	--	2.93	3.30	2.72	3.19	3.93
Radium-226/228	pCi/L	5	NA	2.42	**5**		4.3	**5.35**	**5.68**	**5.89**	4.44	4.97	4.34	4.75	--	**5.16**	**5.43**	**5.59**	**5.12**	**5.46**
Selenium	ug/L	50	NA	3	50		3	4	3	8	2	2	3	2.7	--	1.7	2.4	2.5	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to April 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15018													
						Sample Date:	12/2/2015	2/18/2016	4/14/2016	7/14/2016	9/29/2016	2/14/2017	4/5/2017	7/11/2017	7/11/2017	9/13/2017	9/13/2017	4/18/2018	4/18/2018	6/12/2018	11/29/2018	4/11/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient															
Appendix III															Field Dup		Field Dup		Field Dup			
Boron	ug/L	NC	NA	1,320	NA		487	526	478	399	438	479	493	538	446	492	502	--	--	559	488	640
Calcium	mg/L	NC	NA	259	NA		88.6	100	87.9	86.8	98.5	100	92.1	84.8	81.1	90.7	89.1	--	--	87.6	101	96
Chloride	mg/L	250*	NA	5,980	NA		38.0	38.0	40.8	39.3	37.5	43.6	44.4	53.4	52.6	49.1	50.2	--	--	48.9	49.1	59
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	< 2.0	< 2.0	--	--	< 2.0	< 2.0	< 2.0
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		290	400	430	390	410	450	410	420	438	392	380	--	--	598	426	480
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.0	6.9	6.8	6.5	6.5	6.7	6.8	6.8	--	6.8	--	6.9	--	6.8	6.9	6.8
Appendix IV																						
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		1	< 1	< 1	2	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		155	149	139	133	143	171	149	153	143	--	--	139	141	156	127	150
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	1	1	1	1	< 1	1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	< 15.0	--	--	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		21.4	23.1	24	12	14	21	21	26	26	--	--	29	27	26	22	24
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5.0	< 5.0	--	--	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		0.227	0.394	0.430	0.234	0.522	0.363	< 0.314	< 0.479	< 1.02	--	--	< 0.843	0.290	< 0.756	< 0.842	0.316
Radium-228	pCi/L	NC	NA	NA	NA		< 0.586	0.778	0.649	0.845	0.803	0.996	1.08	< 0.767	< 0.950	--	--	0.869	0.622	1.39	< 0.997	0.598
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.586	1.17	1.08	1.08	1.33	1.36	1.37	< 1.25	< 1.97	--	--	1.59	0.912	1.77	< 1.84	0.915
Selenium	ug/L	50	NA	3	50		< 1	< 1	1	4	< 1	< 1	< 1	< 1.0	1	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to April 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15019												
						Sample Date:	12/2/2015	2/18/2016	4/14/2016	7/13/2016	9/30/2016	2/15/2017	4/5/2017	7/11/2017	9/13/2017	4/18/2018	6/12/2018	11/30/2018	4/12/2019	4/12/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient													
Appendix III																				Field Dup
Boron	ug/L	NC	NA	1,320	NA		1,530	1,590	1,440	1,320	1,260	1,370	1,410	1,430	1,010	--	1,170	1,540	1,600	1,500
Calcium	mg/L	NC	NA	259	NA		84.6	93.6	83.0	90.0	92.6	91.8	92.8	90.1	107	--	97.7	98.2	97	94
Chloride	mg/L	250*	NA	5,980	NA		34	32.4	33.7	37.7	35.6	34.5	33.6	52.5	73.9	--	67.7	42.6	39	39
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		340	390	440	410	370	410	420	470	618	--	524	556	430	440
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.0	6.8	6.9	6.7	6.4	6.8	6.9	6.8	6.7	7.0	6.7	6.9	6.7	--
Appendix IV																				
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		91	94	88	88	96	93	90	109	--	161	187	114	110	120
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	< 1	1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		23.7	27.9	26	24	22	23	22	27	--	25	23	26	22	22
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5.0	--	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		0.333	0.279	0.465	0.282	0.315	0.329	< 0.36	< 0.620	--	< 0.717	< 0.594	< 0.880	0.246	< 0.197
Radium-228	pCi/L	NC	NA	NA	NA		< 0.484	< 0.567	0.532	< 0.718	< 0.739	1.80	0.872	< 1.02	--	< 0.742	1.36	1.16	0.548	< 0.513
Radium-226/228	pCi/L	5	NA	2.42	**5**		0.674	0.798	0.997	0.969	< 0.739	2.13	0.974	< 1.64	--	< 1.46	1.75	< 1.77	0.794	0.669
Selenium	ug/L	50	NA	3	50		< 1	< 1	< 1	2	< 1	< 1	< 1	1.2	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.

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

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

All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to April 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15020													
						Sample Date:	12/2/2015	2/18/2016	4/14/2016	7/14/2016	9/30/2016	2/15/2017	4/5/2017	7/11/2017	9/13/2017	4/18/2018	6/12/2018	6/12/2018	11/30/2018	11/30/2018	4/12/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient											Field Dup		Field Dup	
Appendix III																				
Boron	ug/L	NC	NA	1,320	NA		630	738	638	603	608	621	667	618	745	--	708	699	721	930	700
Calcium	mg/L	NC	NA	259	NA		61	67.6	59.1	60.7	66.5	67.0	66.6	68.1	107	--	96.3	91.6	81.5	81.7	76
Chloride	mg/L	250*	NA	5,980	NA		39	35.4	34.3	69.6	33.5	33.3	33.9	45.7	87.8	--	92.1	92.0	49.6	49.6	45
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		2.2	2.34	< 2	< 2	< 2	< 2	< 2	< 2.0	3	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		320	310	320	310	310	330	320	388	608	--	622	508	428	382	400
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.3	7.2	7.0	6.9	6.9	7.0	7.1	7.0	6.8	7.0	6.7	--	6.9	--	6.8
Appendix IV																				
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		48	52	51	47	54	53	52	60.4	--	148	197	196	119	115	120
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	2	< 1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		15.1	17.8	16	14	14	14	14	18	--	16	16	16	20	20	15
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5.0	--	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		< 0.269	< 0.240	< 0.341	< 0.190	< 0.276	< 0.294	< 0.290	< 0.761	--	0.744	< 0.899	< 0.774	1.14	< 1.06	0.226
Radium-228	pCi/L	NC	NA	NA	NA		< 0.467	0.731	0.474	< 0.598	0.682	< 0.591	0.543	< 0.627	--	0.813	1.75	1.47	0.925	1.30	< 0.558
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.467	0.847	0.73	< 0.598	0.724	< 0.591	0.652	< 1.39	--	1.56	2.64	2.00	2.07	1.79	< 0.558
Selenium	ug/L	50	NA	3	50		< 1	1	< 1	2	< 1	< 1	< 1	1.4	--	< 1.0	< 1.0	1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to April 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15021											
						Sample Date:	12/2/2015	2/18/2016	4/14/2016	7/13/2016	10/5/2016	2/15/2017	4/6/2017	7/12/2017	9/13/2017	4/18/2018	6/12/2018	11/30/2018	4/12/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient												
Appendix III																			
Boron	ug/L	NC	NA	1,320	NA		362	489	400	425	491	465	519	519	602	--	809	798	940
Calcium	mg/L	NC	NA	259	NA		86.4	98.5	89.6	97.4	96.9	97.9	96.3	86.8	91.3	--	89.4	96.6	93
Chloride	mg/L	250*	NA	5,980	NA		88	82.7	87.2	98.3	98.9	94.6	93.9	97.0	108	--	112	120	110
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	< 2.0	< 2.0	< 2.0
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		610	540	570	590	620	570	560	548	490	--	576	534	590
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		6.8	6.8	6.8	6.7	6.8	6.9	6.9	6.8	6.8	7.1	6.8	6.7	6.7
Appendix IV																			
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		3	1	1	2	2	2	2	1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		274	244	236	233	252	240	228	211	--	236	238	224	250
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	2	2	2	1	2	2	< 1.0	--	< 1.0	1.1	< 1.0	1.2
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	--	< 10	< 10	< 10	< 8.0
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5.0	--	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		0.569	0.629	0.563	0.429	0.483	0.524	< 0.215	< 0.768	--	< 0.461	< 0.689	1.49	0.531
Radium-228	pCi/L	NC	NA	NA	NA		0.984	0.782	0.846	0.871	1.52	< 0.582	< 0.354	< 0.697	--	< 1.50	1.60	1.12	0.783
Radium-226/228	pCi/L	5	NA	2.42	**5**		1.55	1.41	1.41	1.3	2	0.966	< 0.354	< 1.47	--	< 1.96	1.97	2.61	1.31
Selenium	ug/L	50	NA	3	50		1	2	1	4	< 1	< 1	1	1.6	--	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to April 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15022											
						Sample Date:	12/2/2015	2/18/2016	4/14/2016	7/14/2016	10/5/2016	2/15/2017	4/6/2017	7/12/2017	9/13/2017	4/18/2018	6/11/2018	11/27/2018	4/12/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient												
Appendix III																			
Boron	ug/L	NC	NA	1,320	NA		250	388	387	362	391	394	434	478	833	--	1,170	3,840	6,800
Calcium	mg/L	NC	NA	259	NA		46.7	46.4	47.8	43.0	43.7	54.1	49.3	51.8	35.2	--	38.2	265	310
Chloride	mg/L	250*	NA	5,980	NA		25	18.7	17.6	16.8	17.1	18.2	18.6	22.1	23.3	--	21.5	23.1	19
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		39	38.3	29.9	34.3	32.8	34.1	32.8	45.9	44.1	--	24.1	953	1,100
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		270	210	250	250	210	250	230	254	266	--	210	1,670	1,900
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		8.3	8.5	8.2	8.2	8.1	7.8	8.1	8.4	7.6	7.8	8.3	7.8	7.7
Appendix IV																			
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	1.9	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		6	7	8	8	6	4	4	5.8	--	< 1.0	1.1	< 1.0	1.4
Barium	ug/L	2,000	NA	340	2,000		139	119	155	116	119	137	129	138	--	102	104	242	190
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	1	2	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	--	13	11	25	23
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		22	16	11	17	19	12	14	13.6	--	< 5.0	< 5.0	47.6	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		0.246	< 0.242	< 0.247	< 0.150	< 0.346	< 0.217	< 0.291	< 0.468	--	0.666	< 0.708	< 0.596	< 0.182
Radium-228	pCi/L	NC	NA	NA	NA		< 0.484	< 0.450	0.740	< 0.472	< 0.514	< 0.477	0.709	< 0.799	--	< 0.644	< 0.742	< 0.807	< 0.470
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.484	< 0.45	0.812	< 0.472	< 0.514	< 0.477	0.862	< 1.27	--	1.13	< 1.45	< 1.40	< 0.470
Selenium	ug/L	50	NA	3	50		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to April 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15023											
						Sample Date:	12/2/2015	2/18/2016	4/14/2016	7/14/2016	10/5/2016	2/15/2017	4/5/2017	7/11/2017	9/13/2017	4/18/2018	6/11/2018	11/29/2018	4/12/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient												
Appendix III																			
Boron	ug/L	NC	NA	1,320	NA		414	284	267	308	526	484	1,590	701	504	--	1,650	1,350	2,600
Calcium	mg/L	NC	NA	259	NA		59.7	59.4	53.3	54.1	64.0	59.9	74.5	50.8	60.9	--	98.9	116	120
Chloride	mg/L	250*	NA	5,980	NA		30	26.9	24.6	28.7	24.8	23.8	24.6	26.8	25.5	--	19.4	17.0	16
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		20	26.5	28.9	25.0	24.3	21.0	22.5	22.6	36.2	--	139	156	140
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		240	270	270	290	290	280	300	290	408	--	474	530	600
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.4	7.5	7.5	7.5	7.4	7.6	7.6	7.6	7.6	7.6	7.4	7.5	7.0
Appendix IV																			
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		2	2	1	3	2	2	< 1	1.9	--	< 1.0	< 1.0	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		57	48	43	40	47	42	46	38.0	--	97.1	87.8	90.4	100
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1	< 1	2	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		12.1	10.6	< 10	< 10	< 10	< 10	11	< 10	--	19	18	20	31
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		8	6	< 5	7	6	6	< 5	6.0	--	< 5.0	7.1	6.6	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		0.232	< 0.237	< 0.242	0.226	< 0.309	0.257	0.455	< 0.889	--	< 0.572	< 0.958	< 0.537	0.181
Radium-228	pCi/L	NC	NA	NA	NA		< 0.530	0.426	< 0.456	< 0.545	< 0.355	< 0.400	0.963	< 0.636	--	< 0.749	< 0.891	< 1.18	0.771
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.53	0.599	< 0.456	< 0.545	< 0.355	0.426	1.42	< 1.53	--	< 1.32	< 1.85	< 1.72	0.952
Selenium	ug/L	50	NA	3	50		< 1	< 1	< 1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.

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

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

All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to April 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-17001						BCC-MW-17002					
						Sample Date:	12/7/2017	2/20/2018	6/15/2018	8/6/2018	11/29/2018	11/29/2018	4/11/2019	12/7/2017	2/20/2018	6/15/2018	8/6/2018	11/29/2018	4/11/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		Shallow 2017 Wells												
Appendix III												Field Dup							
Boron	ug/L	NC	NA	1,320	NA		991	827	1,100	1,220	1,480	1,550	1,700	8,280	12,800	13,300	9,440	9,030	9,200
Calcium	mg/L	NC	NA	259	NA		118	118	124	117	135	134	130	178	201	224	194	197	220
Chloride	mg/L	250*	NA	5,980	NA		27.3	28.5	29.1	29.1	29.0	29.2	31	15.3	14.2	13.2	15.4	16.8	15
Fluoride	ug/L	4,000	NA	1,000	NA		<1,000	<1,000	<1,000	<1,000	< 1,000	< 1,000	< 1,000	<1,000	<1,000	<1,000	<1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		156	135	90.8	18.7	148	140	64	330	325	332	226	402	690
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		558	552	566	476	568	554	570	726	892	936	740	800	1,000
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.1	7.0	7.2	6.9	7.3	--	6.9	7.0	7.1	7.2	7.1	7.0	6.6
Appendix IV																			
Antimony	ug/L	6	NA	1	6		< 1.0	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0	< 1.0	1.5	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		5.2	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	**45.5**	2.0	2.6	3.8	2.0	1.6
Barium	ug/L	2,000	NA	340	2,000		85.6	71.3	65.8	73.8	74.4	70.6	82	148	76.7	62.8	57.6	97.7	130
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.3	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 15.0	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		<1,000	<1,000	<1,000	<1,000	< 1,000	< 1,000	< 1,000	<1,000	<1,000	<1,000	<1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		**55**	**73**	**65**	**62**	**64**	**63**	**43**	**75**	**160**	**150**	**130**	**120**	**100**
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	30.1	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		< 0.509	< 0.890	< 0.766	< 0.616	< 0.942	< 0.754	0.314	< 1.03	< 1.07	< 0.757	0.306	< 0.968	0.233
Radium-228	pCi/L	NC	NA	NA	NA		< 0.830	< 0.901	< 0.947	< 0.822	0.989	1.20	< 0.413	< 0.996	< 3.77	< 2.35	1.25	2.01	< 0.598
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 1.34	< 1.79	< 1.71	< 1.44	< 1.69	< 1.45	0.721	< 2.03	< 4.84	< 3.11	1.56	2.29	0.688
Selenium	ug/L	50	NA	3	50		< 1.0	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0	< 1.0	1.1	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.

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

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

All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to April 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-17003							BCC-MW-17004						
						Sample Date:	12/7/2017	2/20/2018	6/15/2018	8/7/2018	8/7/2018	11/29/2018	4/12/2019	12/6/2017	2/20/2018	6/15/2018	8/7/2018	11/30/2018	4/12/2019	4/12/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		Shallow 2017 Wells													
Appendix III											Field Dup									Field Dup
Boron	ug/L	NC	NA	1,320	NA		413	394	369	383	377	410	380	367	429	525	425	601	440	450
Calcium	mg/L	NC	NA	259	NA		74.3	55.7	63.2	74.6	76.9	88.7	78	53.7	48.1	73.1	68.9	116	67	71
Chloride	mg/L	250*	NA	5,980	NA		18.3	21.5	22.7	21.9	21.8	19.1	17	21.3	21.3	21.4	21.2	18.7	19	20
Fluoride	ug/L	4,000	NA	1,000	NA		<1,000	<1,000	<1,000	<1,000	<1,000	< 1,000	< 1,000	<1,000	<1,000	<1,000	<1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		48.4	< 2.0	< 2.0	17.7	25.9	49.6	12	< 2.0	< 2.0	8.3	< 2.0	166	7.8	7.5
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		324	330	412	326	324	362	360	228	238	410	320	500	330	340
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.0	7.2	7.4	7.3	--	7.3	7.1	7.2	7.3	7.4	7.3	7.3	7.5	--
Appendix IV																				
Antimony	ug/L	6	NA	1	6		1.1	< 1.0	< 1.0	< 2.0	< 2.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		**26**	< 1.0	< 1.0	1.0	1.1	< 1.0	3.8	2.5	1.8	1.1	< 1.0	2.1	1.7	1.7
Barium	ug/L	2,000	NA	340	2,000		128	78.1	66.5	77.9	83.3	92.7	83	145	116	175	148	252	150	150
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.2	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	< 15.0	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		<1,000	<1,000	<1,000	<1,000	<1,000	< 1,000	< 1,000	<1,000	<1,000	<1,000	<1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		19	17	13	18	18	19	15	< 10	< 10	< 10	< 10	14	< 8.0	8.0
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		48.8	6.3	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	9.9	5.9	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		< 0.889	< 0.755	< 0.594	< 0.687	0.353	< 0.685	0.205	< 0.945	< 0.723	< 0.441	< 0.519	< 0.766	0.182	< 0.203
Radium-228	pCi/L	NC	NA	NA	NA		< 0.663	< 0.707	< 0.828	0.932	< 0.871	< 0.695	< 0.483	< 0.804	< 0.719	< 0.810	1.03	< 0.790	0.539	< 0.623
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 1.55	< 1.46	< 1.42	< 1.49	< 1.03	< 1.38	0.539	< 1.75	< 1.44	< 1.25	< 1.46	< 1.56	0.721	0.638
Selenium	ug/L	50	NA	3	50		< 1.0	2.2	< 1.0	< 2.0	< 2.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.

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

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

All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to April 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-17005									BCC-MW-17006					
						Sample Date:	12/6/2017	12/6/2017	2/20/2018	2/20/2018	6/15/2018	6/15/2018	8/7/2018	11/30/2018	4/12/2019	12/6/2017	2/20/2018	6/15/2018	8/7/2018	11/30/2018	4/12/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		Shallow 2017 Wells														
Appendix III								Field Dup		Field Dup		Field Dup									
Boron	ug/L	NC	NA	1,320	NA		191	208	238	228	377	353	342	350	400	669	594	653	765	630	650
Calcium	mg/L	NC	NA	259	NA		51.9	54.0	54.2	53.1	71.2	71.1	68.1	68.1	69	106	95.0	97.5	90.4	99.8	150
Chloride	mg/L	250*	NA	5,980	NA		19.4	19.4	21.6	21.3	20.5	20.5	19.6	18.5	15	19.0	20.3	20.9	21.5	20.4	19
Fluoride	ug/L	4,000	NA	1,000	NA		<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	< 1,000	< 1,000	<1,000	<1,000	<1,000	<1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		11.5	11.00	< 2.0	< 2.0	9.6	9.0	4.3	42.1	120	129	93.1	69.8	46.2	102	290
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		262	220	310	266	358	416	318	318	380	474	472	478	438	432	800
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.3	--	7.3	--	7.4	--	7.3	7.6	7.5	7.7	7.3	7.5	7.5	7.7	7.5
Appendix IV																					
Antimony	ug/L	6	NA	1	6		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	**10**		2.9	2.8	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	4.9	2.4	4.6	< 1.0	6.6	5.9
Barium	ug/L	2,000	NA	340	2,000		168	167	123	128	161	149	179	131	84	83.3	79.0	70.3	73	68.6	120
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	3	100		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	< 15.0	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0
Fluoride	ug/L	4,000	NA	1,000	4,000		<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	< 1,000	< 1,000	<1,000	<1,000	<1,000	<1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	28	**40**		10	12	11	11	< 10	< 10	13	11	< 8.0	38	37	31	36	32	35
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	9	**100**		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		< 0.863	1.56	< 0.804	0.910	< 0.692	< 0.610	0.440	< 0.592	0.270	< 0.930	< 0.766	< 0.862	< 0.582	1.13	< 0.225
Radium-228	pCi/L	NC	NA	NA	NA		< 0.722	< 0.649	< 0.904	< 0.945	< 0.796	< 0.853	< 0.741	< 0.656	< 0.479	< 0.833	< 0.716	< 0.888	< 0.757	1.06	< 0.556
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 1.59	< 1.61	< 1.71	< 1.80	< 1.49	< 1.46	< 1.15	< 1.25	0.700	< 1.76	< 1.48	< 1.75	< 1.34	2.19	< 0.556
Selenium	ug/L	50	NA	3	50		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Technical Memorandum

Sanitas™ Output Files

Summary Report

Constituent: Antimony, Total Analysis Run 7/12/2019 8:29 AM
Client: Consumers Energy Data: BCC_Sanitas_19.07.11

For observations made between 12/1/2015 and 4/12/2019, a summary of the selected data set:

Observations = 216
ND/Trace = 210
Wells = 21
Minimum Value = 1
Maximum Value = 2
Mean Value = 1.038
Median Value = 1
Standard Deviation = 0.1836
Coefficient of Variation = 0.1769
Skewness = 4.78

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	12	11	1	1	1	1	0	0	NaN
BCC-MW-15010	12	12	1	1	1	1	0	0	NaN
BCC-MW-15011	12	12	1	1	1	1	0	0	NaN
BCC-MW-15012	12	12	1	1	1	1	0	0	NaN
BCC-MW-15013	12	12	1	1	1	1	0	0	NaN
BCC-MW-15014	12	10	1	1.7	1.067	1	0.2015	0.1889	2.914
BCC-MW-15015	12	12	1	1	1	1	0	0	NaN
BCC-MW-15016	12	12	1	1	1	1	0	0	NaN
BCC-MW-15017	12	12	1	1	1	1	0	0	NaN
BCC-MW-15018	12	12	1	1	1	1	0	0	NaN
BCC-MW-15019	12	12	1	1	1	1	0	0	NaN
BCC-MW-15020	12	12	1	1	1	1	0	0	NaN
BCC-MW-15021	12	12	1	1	1	1	0	0	NaN
BCC-MW-15022	12	11	1	1.9	1.075	1	0.2598	0.2417	3.015
BCC-MW-15023	12	12	1	1	1	1	0	0	NaN
BCC-MW-17001	6	6	1	2	1.167	1	0.4082	0.3499	1.789
BCC-MW-17002	6	5	1	2	1.25	1	0.4183	0.3347	1.122
BCC-MW-17003	6	5	1	2	1.183	1	0.4021	0.3398	1.751
BCC-MW-17004	6	6	1	2	1.167	1	0.4082	0.3499	1.789
BCC-MW-17005	6	6	1	2	1.167	1	0.4082	0.3499	1.789
BCC-MW-17006	6	6	1	2	1.167	1	0.4082	0.3499	1.789

Summary Report

Constituent: Arsenic, Total Analysis Run 7/12/2019 8:29 AM
Client: Consumers Energy Data: BCC_Sanitas_19.07.11

For observations made between 12/1/2015 and 4/12/2019, a summary of the selected data set:

Observations = 216
ND/Trace = 86
Wells = 21
Minimum Value = 1
Maximum Value = 45.5
Mean Value = 3.977
Median Value = 1.85
Standard Deviation = 6.024
Coefficient of Variation = 1.515
Skewness = 4.183

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	12	0	3.9	45	17.36	13.5	12.1	0.6969	0.9634
BCC-MW-15010	12	12	1	1	1	1	0	0	NaN
BCC-MW-15011	12	1	1	9.3	5.125	5.5	2.642	0.5156	-0.1147
BCC-MW-15012	12	1	1	12	4.25	2.5	3.642	0.857	0.9995
BCC-MW-15013	12	12	1	1	1	1	0	0	NaN
BCC-MW-15014	12	0	3.9	15	8	7.5	3.197	0.3997	0.702
BCC-MW-15015	12	0	2	7	4.483	4.85	1.682	0.3751	-0.4331
BCC-MW-15016	12	0	1.3	3	1.933	2	0.571	0.2954	0.8776
BCC-MW-15017	12	0	1.8	13	5.758	4.5	4.26	0.7398	0.7748
BCC-MW-15018	12	10	1	2	1.083	1	0.2887	0.2665	3.015
BCC-MW-15019	12	12	1	1	1	1	0	0	NaN
BCC-MW-15020	12	12	1	1	1	1	0	0	NaN
BCC-MW-15021	12	4	1	3	1.5	1	0.6742	0.4495	0.9295
BCC-MW-15022	12	2	1	8	4.442	4.9	2.748	0.6187	-0.1383
BCC-MW-15023	12	5	1	3	1.575	1.45	0.6635	0.4213	0.6808
BCC-MW-17001	6	5	1	5.2	1.7	1	1.715	1.009	1.789
BCC-MW-17002	6	0	1.6	45.5	9.583	2.3	17.61	1.838	1.781
BCC-MW-17003	6	3	1	26	5.642	1.025	10.04	1.779	1.742
BCC-MW-17004	6	1	1	2.5	1.7	1.75	0.5762	0.3389	0.02062
BCC-MW-17005	6	5	1	2.85	1.308	1	0.7553	0.5773	1.789
BCC-MW-17006	6	1	1	6.6	4.233	4.75	2.134	0.5041	-0.4899

Summary Report

Constituent: Barium, Total Analysis Run 7/12/2019 8:29 AM
Client: Consumers Energy Data: BCC_Sanitas_19.07.11

For observations made between 12/1/2015 and 4/12/2019, a summary of the selected data set:

Observations = 216
ND/Trace = 0
Wells = 21
Minimum Value = 9
Maximum Value = 1030
Mean Value = 189.7
Median Value = 89
Standard Deviation = 248
Coefficient of Variation = 1.308
Skewness = 1.971

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	12	0	9	16.5	12.38	11.5	2.577	0.2082	0.5456
BCC-MW-15010	12	0	28	78	48.63	47	16.82	0.3459	0.3025
BCC-MW-15011	12	0	15.2	36	27.17	30.35	6.769	0.2492	-0.7686
BCC-MW-15012	12	0	14.3	109	53.25	45.85	31.97	0.6003	0.5679
BCC-MW-15013	12	0	39.5	71	49.08	47.5	8.564	0.1745	1.442
BCC-MW-15014	12	0	257	779	524.3	558.5	163.4	0.3118	-0.1471
BCC-MW-15015	12	0	21	63	32.55	29	11.76	0.3614	1.466
BCC-MW-15016	12	0	548	700	631.8	634	38.84	0.06148	-0.4201
BCC-MW-15017	12	0	772	1030	931.2	955	72.97	0.07836	-0.9997
BCC-MW-15018	12	0	127	171	146.7	148.5	11.53	0.07862	0.304
BCC-MW-15019	12	0	88	187	110.5	95	31.68	0.2867	1.568
BCC-MW-15020	12	0	47	196.5	83.24	53.5	49.86	0.599	1.196
BCC-MW-15021	12	0	211	274	238.8	237	15.74	0.06591	0.5103
BCC-MW-15022	12	0	102	242	140.8	133	39.83	0.2828	1.518
BCC-MW-15023	12	0	38	100	61.36	47.5	24.62	0.4012	0.6451
BCC-MW-17001	6	0	65.8	85.6	75.17	73.15	7.31	0.09726	0.3105
BCC-MW-17002	6	0	57.6	148	95.47	87.2	36.91	0.3866	0.394
BCC-MW-17003	6	0	66.5	128	88.15	81.8	21.27	0.2413	1.176
BCC-MW-17004	6	0	116	252	164.3	149	46.86	0.2852	1.165
BCC-MW-17005	6	0	84	179	140.3	143	34.43	0.2454	-0.5464
BCC-MW-17006	6	0	68.6	120	82.37	76	19.24	0.2336	1.478

Summary Report

Constituent: Beryllium, Total Analysis Run 7/12/2019 8:29 AM
Client: Consumers Energy Data: BCC_Sanitas_19.07.11

For observations made between 12/1/2015 and 4/12/2019, a summary of the selected data set:

Observations = 216
ND/Trace = 216
Wells = 21
Minimum Value = 1
Maximum Value = 1
Mean Value = 1
Median Value = 1
Standard Deviation = 0
Coefficient of Variation = 0
Skewness = NaN

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	12	12	1	1	1	1	0	0	NaN
BCC-MW-15010	12	12	1	1	1	1	0	0	NaN
BCC-MW-15011	12	12	1	1	1	1	0	0	NaN
BCC-MW-15012	12	12	1	1	1	1	0	0	NaN
BCC-MW-15013	12	12	1	1	1	1	0	0	NaN
BCC-MW-15014	12	12	1	1	1	1	0	0	NaN
BCC-MW-15015	12	12	1	1	1	1	0	0	NaN
BCC-MW-15016	12	12	1	1	1	1	0	0	NaN
BCC-MW-15017	12	12	1	1	1	1	0	0	NaN
BCC-MW-15018	12	12	1	1	1	1	0	0	NaN
BCC-MW-15019	12	12	1	1	1	1	0	0	NaN
BCC-MW-15020	12	12	1	1	1	1	0	0	NaN
BCC-MW-15021	12	12	1	1	1	1	0	0	NaN
BCC-MW-15022	12	12	1	1	1	1	0	0	NaN
BCC-MW-15023	12	12	1	1	1	1	0	0	NaN
BCC-MW-17001	6	6	1	1	1	1	0	0	NaN
BCC-MW-17002	6	6	1	1	1	1	0	0	NaN
BCC-MW-17003	6	6	1	1	1	1	0	0	NaN
BCC-MW-17004	6	6	1	1	1	1	0	0	NaN
BCC-MW-17005	6	6	1	1	1	1	0	0	NaN
BCC-MW-17006	6	6	1	1	1	1	0	0	NaN

Summary Report

Constituent: Cadmium, Total Analysis Run 7/12/2019 8:29 AM
Client: Consumers Energy Data: BCC_Sanitas_19.07.11

For observations made between 12/1/2015 and 4/12/2019, a summary of the selected data set:

Observations = 216
ND/Trace = 216
Wells = 21
Minimum Value = 0.2
Maximum Value = 0.2
Mean Value = 0.2
Median Value = 0.2
Standard Deviation = 0
Coefficient of Variation = 0
Skewness = NaN

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15010	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15011	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15012	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15013	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15014	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15015	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15016	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15017	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15018	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15019	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15020	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15021	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15022	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15023	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17001	6	6	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17002	6	6	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17003	6	6	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17004	6	6	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17005	6	6	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17006	6	6	0.2	0.2	0.2	0.2	0	0	NaN

Summary Report

Constituent: Chromium, Total Analysis Run 7/12/2019 8:29 AM
Client: Consumers Energy Data: BCC_Sanitas_19.07.11

For observations made between 12/1/2015 and 4/12/2019, a summary of the selected data set:

Observations = 216
ND/Trace = 151
Wells = 21
Minimum Value = 1
Maximum Value = 11
Mean Value = 1.378
Median Value = 1
Standard Deviation = 1.14
Coefficient of Variation = 0.8275
Skewness = 5.041

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	12	10	1	2	1.083	1	0.2887	0.2665	3.015
BCC-MW-15010	12	10	1	2	1.083	1	0.2887	0.2665	3.015
BCC-MW-15011	12	9	1	2	1.083	1	0.2887	0.2665	3.015
BCC-MW-15012	12	10	1	1	1	1	0	0	NaN
BCC-MW-15013	12	10	1	2	1.083	1	0.2887	0.2665	3.015
BCC-MW-15014	12	8	1	2	1.1	1	0.2892	0.2629	2.826
BCC-MW-15015	12	10	1	1	1	1	0	0	NaN
BCC-MW-15016	12	0	1.9	4	2.633	2.65	0.6315	0.2398	0.63
BCC-MW-15017	12	0	2.9	11	5.004	4	2.493	0.4983	1.54
BCC-MW-15018	12	7	1	1	1	1	0	0	NaN
BCC-MW-15019	12	10	1	1	1	1	0	0	NaN
BCC-MW-15020	12	10	1	2	1.083	1	0.2887	0.2665	3.015
BCC-MW-15021	12	4	1	2	1.442	1.15	0.4963	0.3442	0.2995
BCC-MW-15022	12	9	1	2	1.083	1	0.2887	0.2665	3.015
BCC-MW-15023	12	10	1	2	1.083	1	0.2887	0.2665	3.015
BCC-MW-17001	6	5	1	1.3	1.05	1	0.1225	0.1166	1.789
BCC-MW-17002	6	6	1	1	1	1	0	0	NaN
BCC-MW-17003	6	6	1	1	1	1	0	0	NaN
BCC-MW-17004	6	5	1	1.2	1.033	1	0.08165	0.07902	1.789
BCC-MW-17005	6	6	1	1	1	1	0	0	NaN
BCC-MW-17006	6	6	1	1	1	1	0	0	NaN

Summary Report

Constituent: Cobalt, Total Analysis Run 7/12/2019 8:29 AM
Client: Consumers Energy Data: BCC_Sanitas_19.07.11

For observations made between 12/1/2015 and 4/12/2019, a summary of the selected data set:

Observations = 216
ND/Trace = 216
Wells = 21
Minimum Value = 6
Maximum Value = 15
Mean Value = 13.25
Median Value = 15
Standard Deviation = 3.57
Coefficient of Variation = 0.2695
Skewness = -1.544

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	12	12	6	15	13.5	15	3.503	0.2595	-1.789
BCC-MW-15010	12	12	6	15	13.5	15	3.503	0.2595	-1.789
BCC-MW-15011	12	12	6	15	13.5	15	3.503	0.2595	-1.789
BCC-MW-15012	12	12	6	15	13.5	15	3.503	0.2595	-1.789
BCC-MW-15013	12	12	6	15	13.5	15	3.503	0.2595	-1.789
BCC-MW-15014	12	12	6	15	13.5	15	3.503	0.2595	-1.789
BCC-MW-15015	12	12	6	15	13.5	15	3.503	0.2595	-1.789
BCC-MW-15016	12	12	6	15	13.5	15	3.503	0.2595	-1.789
BCC-MW-15017	12	12	6	15	13.5	15	3.503	0.2595	-1.789
BCC-MW-15018	12	12	6	15	13.5	15	3.503	0.2595	-1.789
BCC-MW-15019	12	12	6	15	13.5	15	3.503	0.2595	-1.789
BCC-MW-15020	12	12	6	15	13.5	15	3.503	0.2595	-1.789
BCC-MW-15021	12	12	6	15	13.5	15	3.503	0.2595	-1.789
BCC-MW-15022	12	12	6	15	13.5	15	3.503	0.2595	-1.789
BCC-MW-15023	12	12	6	15	13.5	15	3.503	0.2595	-1.789
BCC-MW-17001	6	6	6	15	12	15	4.648	0.3873	-0.7071
BCC-MW-17002	6	6	6	15	12	15	4.648	0.3873	-0.7071
BCC-MW-17003	6	6	6	15	12	15	4.648	0.3873	-0.7071
BCC-MW-17004	6	6	6	15	12	15	4.648	0.3873	-0.7071
BCC-MW-17005	6	6	6	15	12	15	4.648	0.3873	-0.7071
BCC-MW-17006	6	6	6	15	12	15	4.648	0.3873	-0.7071

Summary Report

Constituent: Fluoride Analysis Run 7/12/2019 8:29 AM
Client: Consumers Energy Data: BCC_Sanitas_19.07.11

For observations made between 12/1/2015 and 4/12/2019, a summary of the selected data set:

Observations = 231
ND/Trace = 227
Wells = 21
Minimum Value = 1000
Maximum Value = 1200
Mean Value = 1002
Median Value = 1000
Standard Deviation = 19.66
Coefficient of Variation = 0.01962
Skewness = 9.412

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	13	13	1000	1000	1000	1000	0	0	NaN
BCC-MW-15010	13	13	1000	1000	1000	1000	0	0	NaN
BCC-MW-15011	13	11	1000	1200	1015	1000	55.47	0.05463	3.175
BCC-MW-15012	13	11	1000	1200	1023	1000	59.91	0.05856	2.362
BCC-MW-15013	13	13	1000	1000	1000	1000	0	0	NaN
BCC-MW-15014	13	13	1000	1000	1000	1000	0	0	NaN
BCC-MW-15015	13	13	1000	1000	1000	1000	0	0	NaN
BCC-MW-15016	13	13	1000	1000	1000	1000	0	0	NaN
BCC-MW-15017	13	13	1000	1000	1000	1000	0	0	NaN
BCC-MW-15018	13	13	1000	1000	1000	1000	0	0	NaN
BCC-MW-15019	13	13	1000	1000	1000	1000	0	0	NaN
BCC-MW-15020	13	13	1000	1000	1000	1000	0	0	NaN
BCC-MW-15021	13	13	1000	1000	1000	1000	0	0	NaN
BCC-MW-15022	13	13	1000	1000	1000	1000	0	0	NaN
BCC-MW-15023	13	13	1000	1000	1000	1000	0	0	NaN
BCC-MW-17001	6	6	1000	1000	1000	1000	0	0	NaN
BCC-MW-17002	6	6	1000	1000	1000	1000	0	0	NaN
BCC-MW-17003	6	6	1000	1000	1000	1000	0	0	NaN
BCC-MW-17004	6	6	1000	1000	1000	1000	0	0	NaN
BCC-MW-17005	6	6	1000	1000	1000	1000	0	0	NaN
BCC-MW-17006	6	6	1000	1000	1000	1000	0	0	NaN

Summary Report

Constituent: Lead, Total Analysis Run 7/12/2019 8:29 AM
Client: Consumers Energy Data: BCC_Sanitas_19.07.11

For observations made between 12/1/2015 and 4/12/2019, a summary of the selected data set:

Observations = 216
ND/Trace = 216
Wells = 21
Minimum Value = 1
Maximum Value = 1
Mean Value = 1
Median Value = 1
Standard Deviation = 0
Coefficient of Variation = 0
Skewness = NaN

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	12	12	1	1	1	1	0	0	NaN
BCC-MW-15010	12	12	1	1	1	1	0	0	NaN
BCC-MW-15011	12	12	1	1	1	1	0	0	NaN
BCC-MW-15012	12	12	1	1	1	1	0	0	NaN
BCC-MW-15013	12	12	1	1	1	1	0	0	NaN
BCC-MW-15014	12	12	1	1	1	1	0	0	NaN
BCC-MW-15015	12	12	1	1	1	1	0	0	NaN
BCC-MW-15016	12	12	1	1	1	1	0	0	NaN
BCC-MW-15017	12	12	1	1	1	1	0	0	NaN
BCC-MW-15018	12	12	1	1	1	1	0	0	NaN
BCC-MW-15019	12	12	1	1	1	1	0	0	NaN
BCC-MW-15020	12	12	1	1	1	1	0	0	NaN
BCC-MW-15021	12	12	1	1	1	1	0	0	NaN
BCC-MW-15022	12	12	1	1	1	1	0	0	NaN
BCC-MW-15023	12	12	1	1	1	1	0	0	NaN
BCC-MW-17001	6	6	1	1	1	1	0	0	NaN
BCC-MW-17002	6	6	1	1	1	1	0	0	NaN
BCC-MW-17003	6	6	1	1	1	1	0	0	NaN
BCC-MW-17004	6	6	1	1	1	1	0	0	NaN
BCC-MW-17005	6	6	1	1	1	1	0	0	NaN
BCC-MW-17006	6	6	1	1	1	1	0	0	NaN

Summary Report

Constituent: Lithium, Total Analysis Run 7/12/2019 8:29 AM
Client: Consumers Energy Data: BCC_Sanitas_19.07.11

For observations made between 12/1/2015 and 4/12/2019, a summary of the selected data set:

Observations = 216
ND/Trace = 69
Wells = 21
Minimum Value = 8
Maximum Value = 160
Mean Value = 20.52
Median Value = 15
Standard Deviation = 20.86
Coefficient of Variation = 1.017
Skewness = 4.259

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	12	0	13	24	17.1	15.3	3.675	0.2149	0.5581
BCC-MW-15010	12	0	14	54	29.9	22.35	14.77	0.4938	0.4985
BCC-MW-15011	12	0	11	21	16.68	17	2.643	0.1584	-0.4455
BCC-MW-15012	12	0	10	20.8	14.12	12.5	3.537	0.2506	0.6808
BCC-MW-15013	12	0	17	27.5	19.99	18	3.51	0.1756	0.9281
BCC-MW-15014	12	7	10	27	13.71	10	5.754	0.4198	1.26
BCC-MW-15015	12	7	10	16	11.29	10	2.005	0.1776	1.344
BCC-MW-15016	12	12	10	10	10	10	0	0	NaN
BCC-MW-15017	12	12	10	10	10	10	0	0	NaN
BCC-MW-15018	12	0	12	28	21.88	22.55	4.704	0.215	-0.9685
BCC-MW-15019	12	0	22	27.9	24.3	23.85	2.05	0.08436	0.3899
BCC-MW-15020	12	0	14	20	15.83	15.55	1.923	0.1215	0.8748
BCC-MW-15021	12	12	8	10	9.833	10	0.5774	0.05871	-3.015
BCC-MW-15022	12	8	10	25	12.67	10	5.382	0.4249	1.719
BCC-MW-15023	12	5	10	31	14.31	10.8	6.53	0.4564	1.531
BCC-MW-17001	6	0	43	73	60.25	62.75	10.24	0.1699	-0.6247
BCC-MW-17002	6	0	75	160	122.5	125	31.58	0.2578	-0.3103
BCC-MW-17003	6	0	13	19	16.83	17.5	2.401	0.1427	-0.6416
BCC-MW-17004	6	4	8	14	10.33	10	1.966	0.1903	1.05
BCC-MW-17005	6	2	8	13	10.67	11	1.633	0.1531	-0.3242
BCC-MW-17006	6	0	31	38	34.83	35.5	2.787	0.08001	-0.3599

Summary Report

Constituent: Mercury, Total Analysis Run 7/12/2019 8:29 AM
Client: Consumers Energy Data: BCC_Sanitas_19.07.11

For observations made between 12/1/2015 and 4/12/2019, a summary of the selected data set:

Observations = 216
ND/Trace = 216
Wells = 21
Minimum Value = 0.2
Maximum Value = 0.2
Mean Value = 0.2
Median Value = 0.2
Standard Deviation = 0
Coefficient of Variation = 0
Skewness = NaN

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15010	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15011	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15012	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15013	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15014	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15015	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15016	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15017	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15018	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15019	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15020	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15021	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15022	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-15023	12	12	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17001	6	6	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17002	6	6	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17003	6	6	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17004	6	6	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17005	6	6	0.2	0.2	0.2	0.2	0	0	NaN
BCC-MW-17006	6	6	0.2	0.2	0.2	0.2	0	0	NaN

Summary Report

Constituent: Molybdenum, Total Analysis Run 7/12/2019 8:30 AM
Client: Consumers Energy Data: BCC_Sanitas_19.07.11

For observations made between 12/1/2015 and 4/12/2019, a summary of the selected data set:

Observations = 216
ND/Trace = 117
Wells = 21
Minimum Value = 5
Maximum Value = 119
Mean Value = 16.31
Median Value = 5
Standard Deviation = 22.3
Coefficient of Variation = 1.367
Skewness = 2.57

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	12	1	5	60	35.3	41.38	20.26	0.574	-0.4725
BCC-MW-15010	12	4	5	33	14.68	12	10.4	0.7081	0.5772
BCC-MW-15011	12	0	5.8	35	20.75	21.7	8.54	0.4116	-0.243
BCC-MW-15012	12	0	9	94.5	40.58	35	22.81	0.5621	1.169
BCC-MW-15013	12	2	5	21	10.7	9.5	5.791	0.5412	0.7023
BCC-MW-15014	12	0	58	119	87.22	80.5	19.37	0.2221	0.3171
BCC-MW-15015	12	0	7	17	11.34	11	3.299	0.291	0.551
BCC-MW-15016	12	12	5	5	5	5	0	0	NaN
BCC-MW-15017	12	12	5	5	5	5	0	0	NaN
BCC-MW-15018	12	12	5	5	5	5	0	0	NaN
BCC-MW-15019	12	12	5	5	5	5	0	0	NaN
BCC-MW-15020	12	12	5	5	5	5	0	0	NaN
BCC-MW-15021	12	12	5	5	5	5	0	0	NaN
BCC-MW-15022	12	3	5	47.6	15.6	13.8	11.51	0.7376	1.829
BCC-MW-15023	12	4	5	8	6.058	6	0.9784	0.1615	0.4767
BCC-MW-17001	6	6	5	5	5	5	0	0	NaN
BCC-MW-17002	6	5	5	30.1	9.183	5	10.25	1.116	1.789
BCC-MW-17003	6	4	5	48.8	12.52	5	17.78	1.421	1.785
BCC-MW-17004	6	4	5	9.9	5.967	5	1.96	0.3285	1.665
BCC-MW-17005	6	6	5	5	5	5	0	0	NaN
BCC-MW-17006	6	6	5	5	5	5	0	0	NaN

Summary Report

Constituent: Radium-226 Analysis Run 7/12/2019 8:30 AM
Client: Consumers Energy Data: BCC_Sanitas_19.07.11

For observations made between 12/1/2015 and 4/12/2019, a summary of the selected data set:

Observations = 216
ND/Trace = 140
Wells = 21
Minimum Value = 0.133
Maximum Value = 2.5
Mean Value = 0.5992
Median Value = 0.458
Standard Deviation = 0.4823
Coefficient of Variation = 0.8049
Skewness = 1.625

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	12	12	0.153	0.934	0.3822	0.239	0.2903	0.7595	0.9636
BCC-MW-15010	12	11	0.145	0.869	0.3981	0.2705	0.2688	0.6753	0.7735
BCC-MW-15011	12	10	0.141	1.12	0.3978	0.29	0.3099	0.779	1.309
BCC-MW-15012	12	9	0.153	0.7	0.3455	0.2495	0.1978	0.5725	0.8656
BCC-MW-15013	12	9	0.173	0.731	0.3612	0.252	0.2081	0.576	0.8235
BCC-MW-15014	12	11	0.175	1.52	0.4969	0.216	0.4825	0.9709	1.185
BCC-MW-15015	12	12	0.133	0.832	0.357	0.291	0.2214	0.6202	0.9485
BCC-MW-15016	12	2	0.263	1.75	1.251	1.305	0.4068	0.3251	-1.17
BCC-MW-15017	12	0	1.52	2.5	1.963	1.935	0.3146	0.1603	0.1791
BCC-MW-15018	12	4	0.227	1.02	0.4987	0.412	0.2534	0.5081	0.843
BCC-MW-15019	12	5	0.2215	0.88	0.4496	0.3465	0.2068	0.4599	0.8455
BCC-MW-15020	12	9	0.19	1.1	0.4692	0.292	0.3147	0.6708	0.912
BCC-MW-15021	12	4	0.215	1.49	0.6126	0.547	0.309	0.5045	1.942
BCC-MW-15022	12	10	0.15	0.708	0.3632	0.269	0.1961	0.5397	0.7352
BCC-MW-15023	12	7	0.181	0.958	0.4246	0.283	0.2665	0.6277	1.044
BCC-MW-17001	6	5	0.314	0.942	0.6728	0.691	0.2396	0.3562	-0.3221
BCC-MW-17002	6	4	0.233	1.07	0.7273	0.8625	0.3714	0.5106	-0.4861
BCC-MW-17003	6	4	0.205	0.889	0.608	0.6395	0.2353	0.387	-0.6779
BCC-MW-17004	6	5	0.1925	0.945	0.5977	0.621	0.2682	0.4486	-0.2533
BCC-MW-17005	6	2	0.27	1.211	0.6771	0.642	0.3309	0.4887	0.4661
BCC-MW-17006	6	5	0.225	1.13	0.7492	0.814	0.3141	0.4193	-0.6084

Summary Report

Constituent: Radium-226/228 Analysis Run 7/12/2019 8:30 AM
Client: Consumers Energy Data: BCC_Sanitas_19.07.11

For observations made between 12/1/2015 and 4/12/2019, a summary of the selected data set:

Observations = 216
ND/Trace = 130
Wells = 21
Minimum Value = 0.354
Maximum Value = 5.89
Mean Value = 1.49
Median Value = 1.28
Standard Deviation = 1.203
Coefficient of Variation = 0.8069
Skewness = 1.793

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	12	11	0.451	3.85	1.281	0.6055	1.282	1.001	1.383
BCC-MW-15010	12	9	0.363	1.75	0.9068	0.668	0.5502	0.6068	0.4819
BCC-MW-15011	12	11	0.394	2.07	0.8971	0.5655	0.5805	0.6471	0.8179
BCC-MW-15012	12	9	0.416	2.28	0.9067	0.594	0.5658	0.624	1.27
BCC-MW-15013	12	9	0.45	1.56	0.9182	0.749	0.4405	0.4798	0.3021
BCC-MW-15014	12	10	0.423	3.25	1.289	0.809	0.9991	0.7749	1.019
BCC-MW-15015	12	11	0.408	1.75	0.8466	0.5775	0.4849	0.5728	0.8306
BCC-MW-15016	12	0	2.29	3.95	3.136	3.09	0.5857	0.1868	-0.08919
BCC-MW-15017	12	0	4.3	5.89	5.081	5.14	0.532	0.1047	-0.1797
BCC-MW-15018	12	3	0.586	1.97	1.31	1.291	0.3981	0.3039	0.09745
BCC-MW-15019	12	4	0.674	2.13	1.219	0.9855	0.5014	0.4112	0.493
BCC-MW-15020	12	5	0.467	2.32	1.031	0.727	0.6152	0.597	1.019
BCC-MW-15021	12	3	0.354	2.61	1.526	1.44	0.5721	0.375	-0.1313
BCC-MW-15022	12	9	0.45	1.45	0.8159	0.663	0.3975	0.4872	0.5212
BCC-MW-15023	12	8	0.355	1.85	0.9753	0.7755	0.5581	0.5722	0.3369
BCC-MW-17001	6	5	0.721	1.79	1.449	1.565	0.3961	0.2734	-1.109
BCC-MW-17002	6	3	0.688	4.84	2.42	2.16	1.431	0.5915	0.6441
BCC-MW-17003	6	5	0.539	1.55	1.306	1.44	0.3805	0.2912	-1.694
BCC-MW-17004	6	5	0.6795	1.75	1.357	1.45	0.3698	0.2726	-1.043
BCC-MW-17005	6	5	0.7	1.8	1.333	1.37	0.39	0.2925	-0.4953
BCC-MW-17006	6	5	0.556	2.19	1.513	1.615	0.5518	0.3648	-0.7061

Summary Report

Constituent: Radium-228 Analysis Run 7/12/2019 8:30 AM
Client: Consumers Energy Data: BCC_Sanitas_19.07.11

For observations made between 12/1/2015 and 4/12/2019, a summary of the selected data set:

Observations = 216
ND/Trace = 138
Wells = 21
Minimum Value = 0.354
Maximum Value = 3.98
Mean Value = 0.9951
Median Value = 0.753
Standard Deviation = 0.7337
Coefficient of Variation = 0.7373
Skewness = 2.14

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	12	11	0.451	3.27	1.028	0.6055	0.9914	0.9645	1.697
BCC-MW-15010	12	9	0.363	0.978	0.6517	0.622	0.2358	0.3618	0.1086
BCC-MW-15011	12	11	0.394	0.956	0.6464	0.5655	0.2284	0.3533	0.3136
BCC-MW-15012	12	11	0.416	2.08	0.7557	0.594	0.4504	0.5961	2.312
BCC-MW-15013	12	9	0.45	0.94	0.6706	0.6625	0.1844	0.2749	0.258
BCC-MW-15014	12	10	0.423	1.85	0.9176	0.7725	0.4765	0.5193	0.9144
BCC-MW-15015	12	11	0.408	1.07	0.6418	0.5775	0.2015	0.3139	0.7052
BCC-MW-15016	12	0	1.06	2.37	1.917	1.935	0.3776	0.197	-0.7603
BCC-MW-15017	12	0	2.5	3.98	3.118	2.99	0.4688	0.1504	0.7678
BCC-MW-15018	12	3	0.586	1.39	0.8681	0.824	0.2307	0.2657	0.7801
BCC-MW-15019	12	6	0.484	1.8	0.877	0.7405	0.3975	0.4532	1.122
BCC-MW-15020	12	5	0.467	1.61	0.7339	0.6125	0.327	0.4456	1.823
BCC-MW-15021	12	4	0.354	1.6	0.9699	0.8585	0.3935	0.4057	0.3749
BCC-MW-15022	12	10	0.45	0.807	0.609	0.579	0.1436	0.2358	0.1885
BCC-MW-15023	12	9	0.355	1.18	0.6585	0.5905	0.2565	0.3895	0.6479
BCC-MW-17001	6	5	0.413	1.095	0.8346	0.8655	0.2291	0.2746	-1.014
BCC-MW-17002	6	4	0.598	3.77	1.829	1.63	1.15	0.6289	0.6941
BCC-MW-17003	6	5	0.483	0.9015	0.7129	0.701	0.1446	0.2028	-0.2938
BCC-MW-17004	6	4	0.581	1.03	0.789	0.797	0.1462	0.1853	0.3271
BCC-MW-17005	6	6	0.479	0.945	0.7327	0.7315	0.1612	0.2201	-0.2853
BCC-MW-17006	6	5	0.556	1.06	0.8017	0.795	0.1702	0.2123	0.1053

Summary Report

Constituent: Selenium, Total Analysis Run 7/12/2019 8:30 AM
Client: Consumers Energy Data: BCC_Sanitas_19.07.11

For observations made between 12/1/2015 and 4/12/2019, a summary of the selected data set:

Observations = 216
ND/Trace = 161
Wells = 21
Minimum Value = 1
Maximum Value = 8
Mean Value = 1.337
Median Value = 1
Standard Deviation = 0.9795
Coefficient of Variation = 0.7327
Skewness = 4.486

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	12	11	1	2	1.083	1	0.2887	0.2665	3.015
BCC-MW-15010	12	10	1	1	1	1	0	0	NaN
BCC-MW-15011	12	11	1	1	1	1	0	0	NaN
BCC-MW-15012	12	9	1	3.3	1.225	1	0.658	0.5371	2.944
BCC-MW-15013	12	11	1	1	1	1	0	0	NaN
BCC-MW-15014	12	4	1	8	2.1	1.1	2.072	0.9866	2.155
BCC-MW-15015	12	11	1	1	1	1	0	0	NaN
BCC-MW-15016	12	2	1	7	2.375	2	1.745	0.7346	1.707
BCC-MW-15017	12	2	1	8	2.821	2.575	1.851	0.6563	1.885
BCC-MW-15018	12	9	1	4	1.25	1	0.866	0.6928	3.015
BCC-MW-15019	12	10	1	2	1.1	1	0.2892	0.2629	2.826
BCC-MW-15020	12	8	1	2	1.117	1	0.301	0.2696	2.424
BCC-MW-15021	12	6	1	4	1.383	1	0.884	0.6391	2.426
BCC-MW-15022	12	12	1	1	1	1	0	0	NaN
BCC-MW-15023	12	11	1	1	1	1	0	0	NaN
BCC-MW-17001	6	6	1	2	1.167	1	0.4082	0.3499	1.789
BCC-MW-17002	6	5	1	2	1.183	1	0.4021	0.3398	1.751
BCC-MW-17003	6	5	1	2.2	1.367	1	0.5715	0.4182	0.7458
BCC-MW-17004	6	6	1	2	1.167	1	0.4082	0.3499	1.789
BCC-MW-17005	6	6	1	2	1.167	1	0.4082	0.3499	1.789
BCC-MW-17006	6	6	1	2	1.167	1	0.4082	0.3499	1.789

Summary Report

Constituent: Thallium, Total Analysis Run 7/12/2019 8:30 AM
Client: Consumers Energy Data: BCC_Sanitas_19.07.11

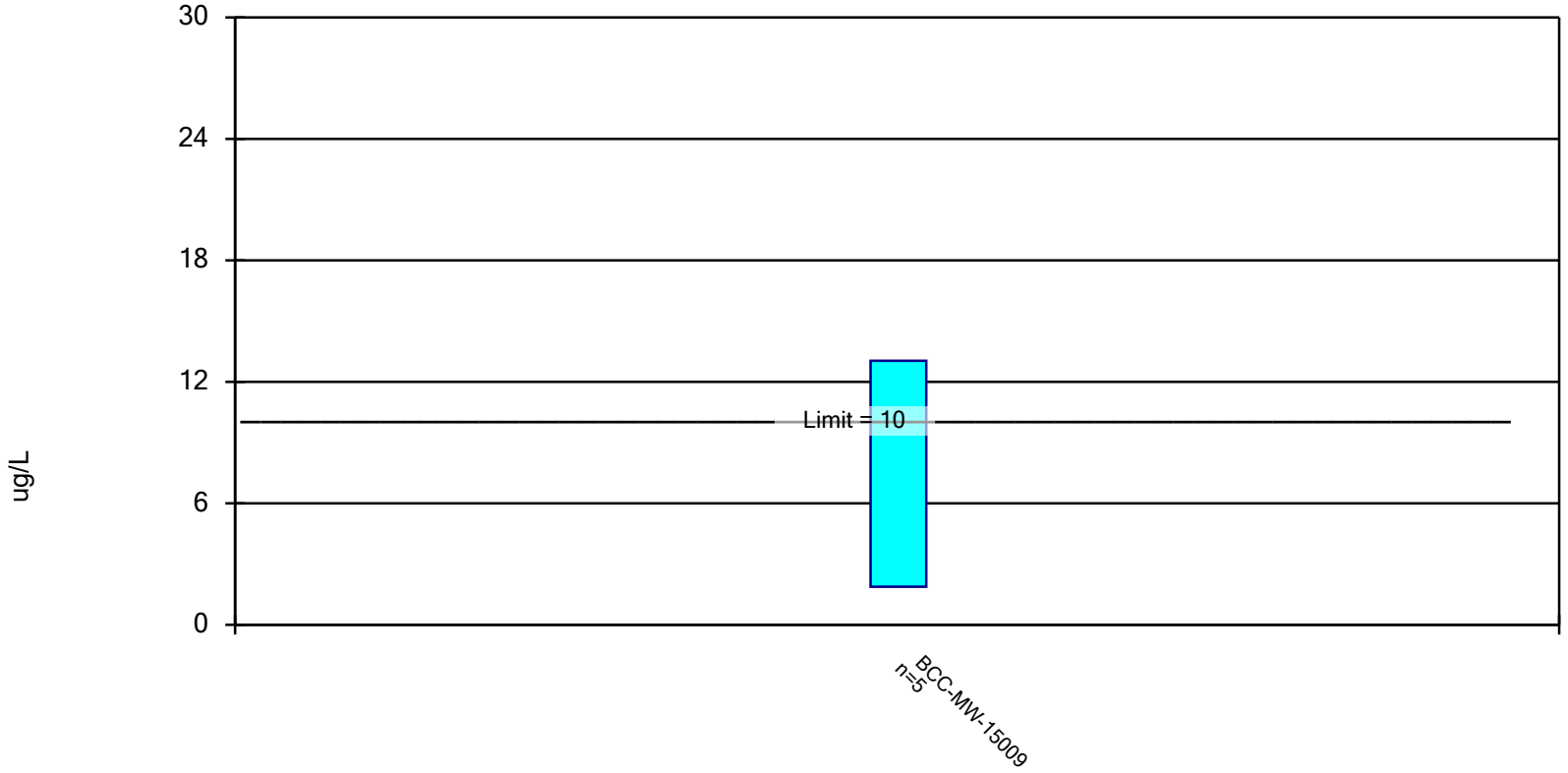
For observations made between 12/1/2015 and 4/12/2019, a summary of the selected data set:

Observations = 216
ND/Trace = 216
Wells = 21
Minimum Value = 2
Maximum Value = 2
Mean Value = 2
Median Value = 2
Standard Deviation = 0
Coefficient of Variation = 0
Skewness = NaN

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	12	12	2	2	2	2	0	0	NaN
BCC-MW-15010	12	12	2	2	2	2	0	0	NaN
BCC-MW-15011	12	12	2	2	2	2	0	0	NaN
BCC-MW-15012	12	12	2	2	2	2	0	0	NaN
BCC-MW-15013	12	12	2	2	2	2	0	0	NaN
BCC-MW-15014	12	12	2	2	2	2	0	0	NaN
BCC-MW-15015	12	12	2	2	2	2	0	0	NaN
BCC-MW-15016	12	12	2	2	2	2	0	0	NaN
BCC-MW-15017	12	12	2	2	2	2	0	0	NaN
BCC-MW-15018	12	12	2	2	2	2	0	0	NaN
BCC-MW-15019	12	12	2	2	2	2	0	0	NaN
BCC-MW-15020	12	12	2	2	2	2	0	0	NaN
BCC-MW-15021	12	12	2	2	2	2	0	0	NaN
BCC-MW-15022	12	12	2	2	2	2	0	0	NaN
BCC-MW-15023	12	12	2	2	2	2	0	0	NaN
BCC-MW-17001	6	6	2	2	2	2	0	0	NaN
BCC-MW-17002	6	6	2	2	2	2	0	0	NaN
BCC-MW-17003	6	6	2	2	2	2	0	0	NaN
BCC-MW-17004	6	6	2	2	2	2	0	0	NaN
BCC-MW-17005	6	6	2	2	2	2	0	0	NaN
BCC-MW-17006	6	6	2	2	2	2	0	0	NaN

Parametric Confidence Interval

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



Constituent: Arsenic, Total Analysis Run 6/7/2019 3:14 PM

Client: Consumers Energy Data: BCC_Sanitas_19.06.06

Confidence Interval

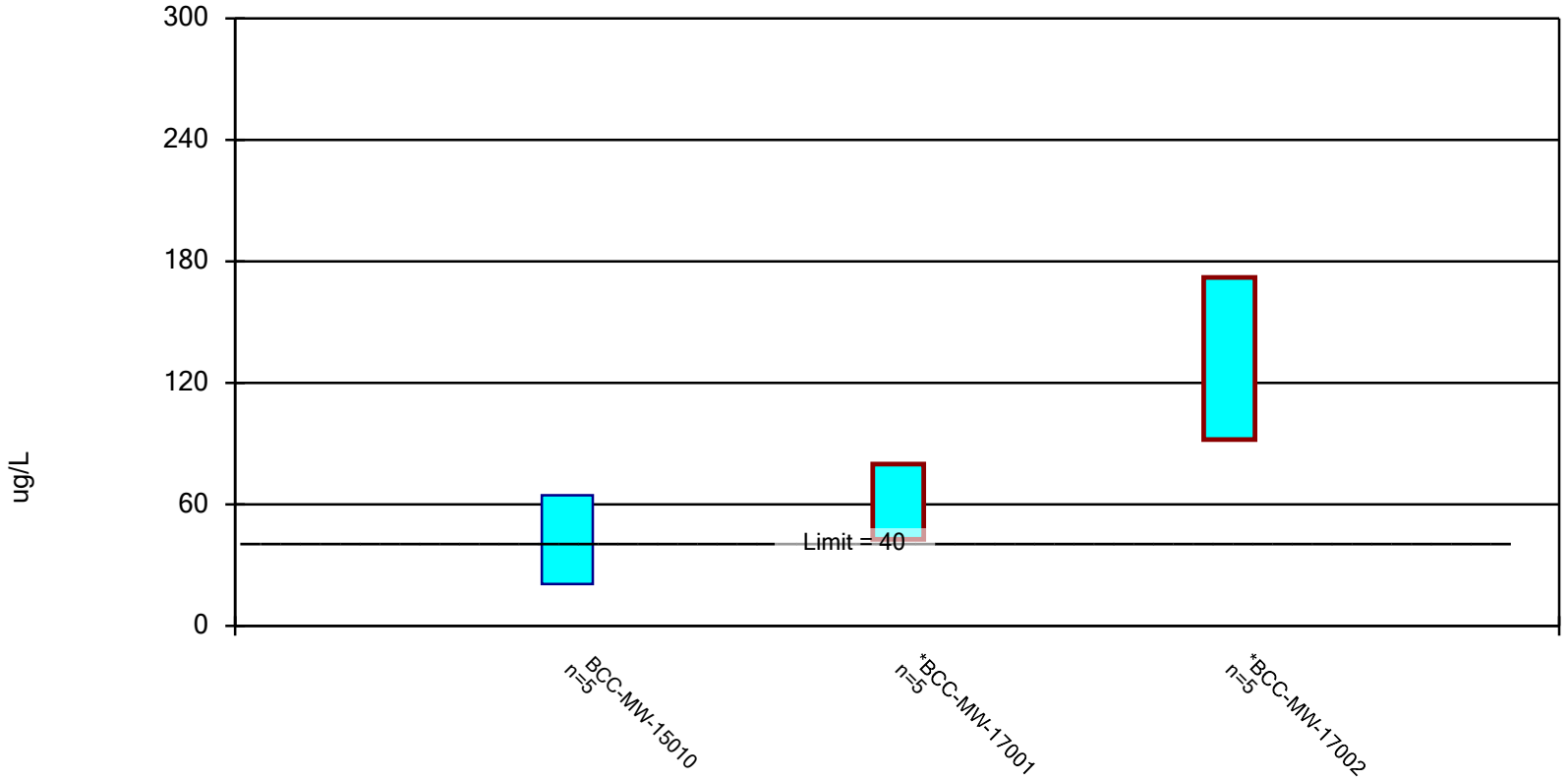
Constituent: Arsenic, Total (ug/L) Analysis Run 6/7/2019 3:15 PM

Client: Consumers Energy Data: BCC_Sanitas_19.06.06

	BCC-MW-15009
7/11/2017	11.4 (D)
4/16/2018	9.4
6/13/2018	8.5
11/28/2018	4.1
4/9/2019	3.9
Mean	7.46
Std. Dev.	3.329
Upper Lim.	13.04
Lower Lim.	1.881

Parametric Confidence Interval

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



Constituent: Lithium, Total Analysis Run 6/7/2019 3:15 PM

Client: Consumers Energy Data: BCC_Sanitas_19.06.06

Confidence Interval

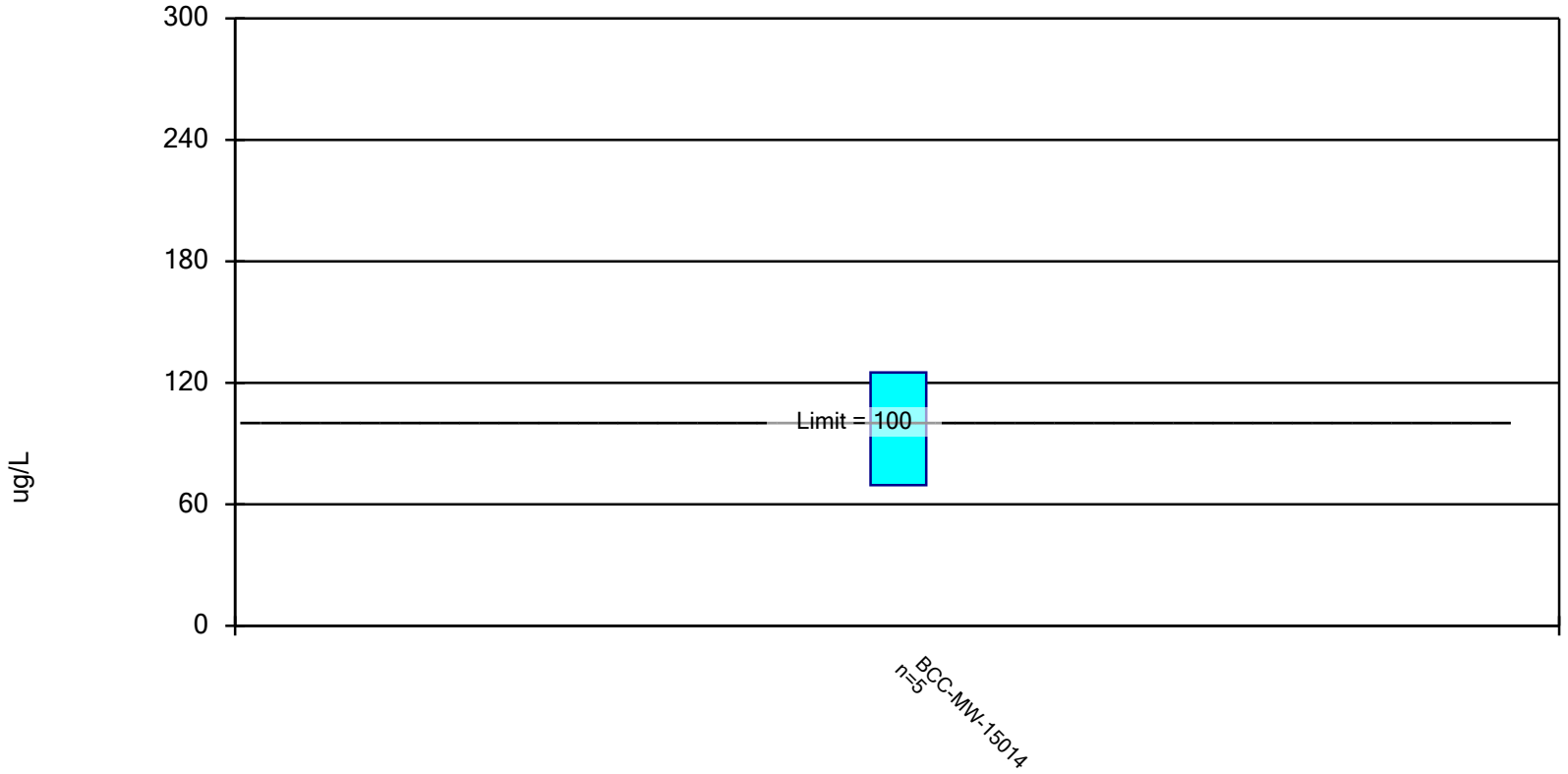
Constituent: Lithium, Total (ug/L) Analysis Run 6/7/2019 3:15 PM

Client: Consumers Energy Data: BCC_Sanitas_19.06.06

	BCC-MW-15010	BCC-MW-17001	BCC-MW-17002
7/11/2017	21		
2/20/2018		73	160
4/16/2018	46		
6/14/2018	54		
6/15/2018		65	150
8/6/2018		62	130
11/28/2018	51		
11/29/2018		63.5 (D)	120
4/9/2019	41		
4/11/2019		43	100
Mean	42.6	61.3	132
Std. Dev.	13.05	11.08	23.87
Upper Lim.	64.47	79.86	172
Lower Lim.	20.73	42.74	91.99

Parametric Confidence Interval

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



Constituent: Molybdenum, Total Analysis Run 6/7/2019 3:16 PM

Client: Consumers Energy Data: BCC_Sanitas_19.06.06

Confidence Interval

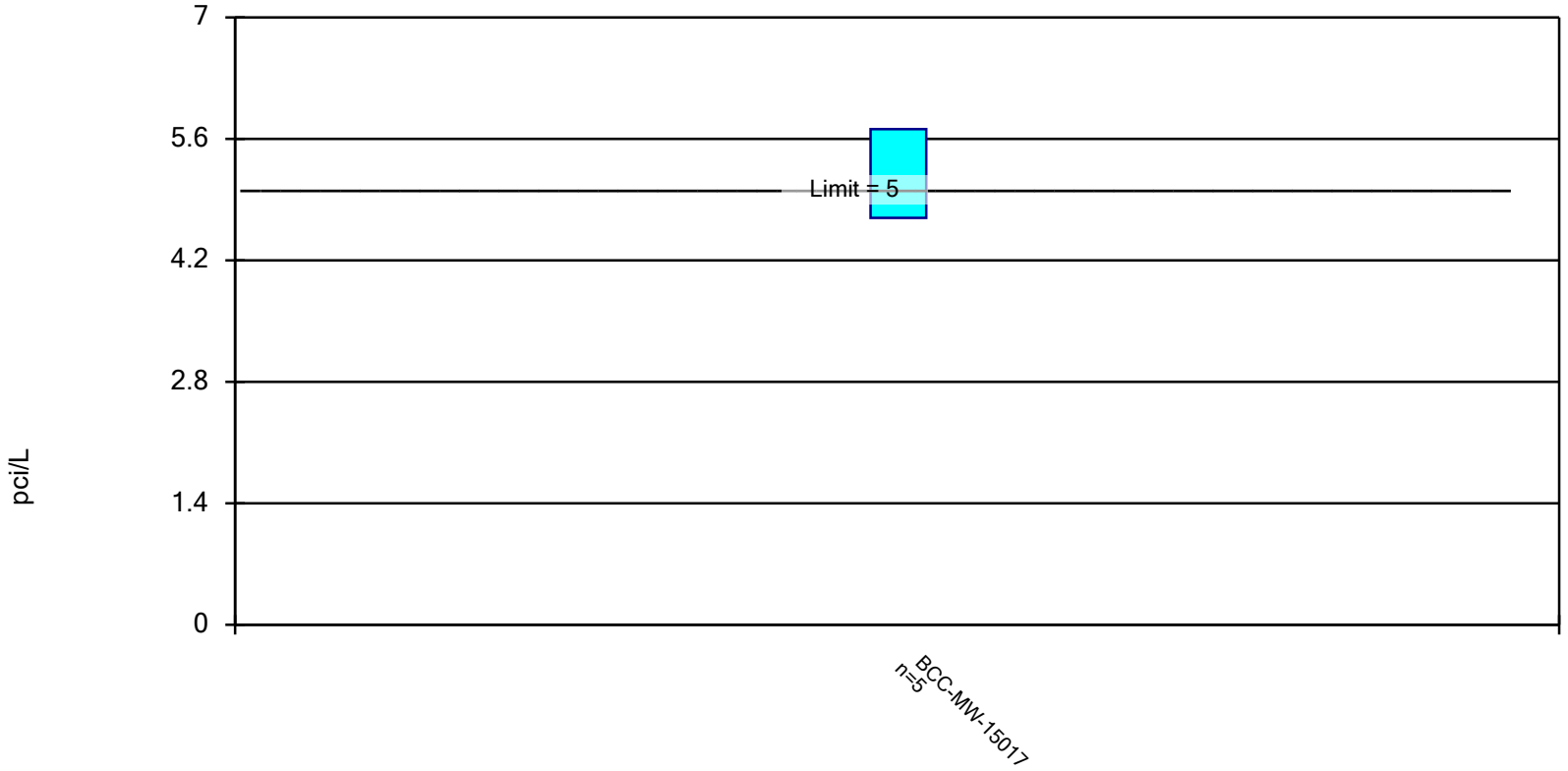
Constituent: Molybdenum, Total (ug/L) Analysis Run 6/7/2019 3:16 PM

Client: Consumers Energy Data: BCC_Sanitas_19.06.06

	BCC-MW-15014
7/12/2017	70.9
4/17/2018	94.7
6/13/2018	100
11/29/2018	106
4/11/2019	115 (D)
Mean	97.32
Std. Dev.	16.58
Upper Lim.	125.1
Lower Lim.	69.53

Parametric Confidence Interval

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



Constituent: Radium-226/228 Analysis Run 7/12/2019 8:27 AM

Client: Consumers Energy Data: BCC_Sanitas_19.07.11

Confidence Interval

Constituent: Radium-226/228 (pci/L) Analysis Run 7/12/2019 8:27 AM

Client: Consumers Energy Data: BCC_Sanitas_19.07.11

	BCC-MW-15017
7/12/2017	4.75
4/17/2018	5.16
6/12/2018	5.51 (D)
11/29/2018	5.12
4/11/2019	5.46
Mean	5.2
Std. Dev.	0.3059
Upper Lim.	5.713
Lower Lim.	4.687

Appendix E
September 2019 Assessment Monitoring Statistical Evaluation

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Technical Memorandum

Date: December 13, 2019

To: Michelle Marion, Consumers Energy

From: Darby Litz, TRC
Sarah Holmstrom, TRC
Kristin Lowery, TRC

cc: Brad Runkel, Consumers Energy
JR Register, Consumers Energy
Bethany Swanberg, Consumers Energy

Project No.: 322176.0000 Phase 001, Task 003

Subject: Statistical Evaluation of September 2019 Assessment Monitoring Sampling Event
BC Cobb Bottom Ash Pond & Ponds 0-8 CCR Unit, Consumers Energy Company, Essexville, Michigan

During the statistical evaluation of the initial assessment monitoring event (June 2018), lithium was present in one or more downgradient monitoring wells at statistically significant levels exceeding the Groundwater Protection Standards (GWPSs). Therefore, Consumers Energy Company (Consumers Energy) initiated an Assessment of Corrective Measures (ACM) within 90 days from when the Appendix IV exceedance was determined. The ACM was completed on September 11, 2019. Consumers Energy is continuing semiannual assessment monitoring in accordance with §257.95 of the CCR Rule[1] at the BC Cobb Power Plant Bottom Ash Pond and Ponds 0-8 (collectively the BCC Ponds). The second semiannual assessment monitoring event for 2019 was conducted on September 24 through September 27, 2019. In accordance with §257.95, the assessment monitoring data must be compared to GWPSs to determine whether or not Appendix IV constituents are detected at statistically significant levels above the GWPSs. GWPSs were established in accordance with §257.95(h), as detailed in the October 15, 2018 *Groundwater Protection Standards* technical memorandum, which was also included in the *2018 Annual Groundwater Monitoring Report* (TRC, January 2019). The following narrative describes the methods employed and the results obtained and the Sanitas™ output files are included as an attachment.

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

The statistical evaluation of the fourth semiannual assessment monitoring event data indicates that the following constituent is present at statistically significant levels exceeding the GWPS in downgradient monitoring wells at the BCC Ponds:

Constituent	GWPS	# Downgradient Wells Observed
Lithium	40 ug/L	2 of 21

These results are consistent with the results of the initial assessment monitoring data statistical evaluation and Consumers Energy will continue to evaluate corrective measures per §257.96 and §257.97. Consumers Energy will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

Assessment Monitoring Statistical Evaluation

The compliance monitoring wells BCC-MW-15009 through BCC-MW-15014 encircle the Bottom Ash Pond, while BCC-MW-15015 through BCC-MW-15023 and BCC-MW-17001 through BCC-MW-17006 are located at the outer edge of the peninsula formed by Ponds 0-8. Because the perimeter and interior berms within the ash management area were constructed in part with ash and bodies of water surround the ash management area, wells could not be installed entirely beyond the CCR material boundary.

Following the second semiannual assessment monitoring event for 2019, compliance well data for the BCC Ponds were evaluated in accordance with the *Groundwater Statistical Evaluation Plan* (Stats Plan) (TRC, October 2017). An assessment monitoring program was developed to evaluate concentrations of CCR constituents present in the uppermost aquifer relative to acceptable levels (i.e. GWPSs). To evaluate whether or not a GWPS exceedance is statistically significant, the difference in concentration observed at the downgradient wells during a given assessment monitoring event compared to the GWPS must be large enough, after accounting for variability in the sample data, that the result is unlikely to have occurred merely by chance. Consistent with the Unified Guidance [2], the preferred method for comparisons to a fixed standard are confidence limits. Based on the number of historical observations in the representative sample population, the population mean, the population standard deviation, and a selected confidence level (i.e. 99 percent), an upper and lower confidence limit is calculated. The true concentration, with 99 percent confidence, will fall between and lower and upper confidence limits.

The concentrations observed in the downgradient wells are deemed to be a statistically significant exceedance when the 99 percent lower confidence limit of the downgradient data exceeds the GWPS. If the confidence interval straddles the GWPS (i.e. the lower confidence level is below the GWPS but the upper confidence level is above), the statistical test result indicates that there is insufficient confidence that the measured concentrations are different from the GWPS and thus no compelling

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

evidence that the measured concentration is a result of a release from the CCR unit versus the inherent variability of the sample data. This statistical approach is consistent with the statistical methods for assessment monitoring presented in §257.93(f) and (g). Statistical evaluation methodologies built into the CCR Rule, and numerous other federal rules, are key in determining whether or not individually measured data points represent a concentration increase over the baseline or a fixed standard (such as a GWPS in an assessment monitoring program).

For each detected Appendix IV constituent, the concentrations for each well were first compared directly to the GWPS, as shown on Table A1. Due to the significant operational changes that occurred within the ash management area and immediately adjacent to it during the CCR Rule baseline period, where groundwater flow rates and directions were changed drastically over relatively short periods of time, the data set used for statistical evaluation was limited to the six most recent events relative to the timeline of other factors that could be affecting observations of constituents in groundwater that are unrelated to releases from the ponds. Limiting the data set to the six most recent data points is appropriate for the BCC Ponds to allow for evaluation of groundwater quality that is representative of current conditions that excludes variability in the sample data set caused by the observed changes in site conditions that would not be indicative of a release from the BCC Ponds. Those observed changes are attributed to several possible reasons including cessation of hydraulic loading in the BCC Ponds in April 2016, changes in the analytical laboratory being used, and pumping from Veterans Memorial Pond (pumping influence observed from July 2017 through September 2017; construction completed in December 2017). These activities have the potential to influence the results of the statistical analysis by including data that may have different reporting limits or may have been biased low or high due to changing site conditions, introducing additional variability and uncertainty in the results that are unrelated to the natural groundwater data distribution. Use of the six most recent data points relative to the timeline of other site factors is adequate in providing the minimum density of data for the statistical analysis as recommended per the Unified Guidance; no fewer than four data points are used.

For the BCC-MW-15000-series monitoring wells, the confidence interval tests included data collected between July 2017 and September 2019. For the BCC-MW-17000-series wells, the confidence interval tests included data collected between February 2018 and September 2019 (six out of the seven data points accumulated since wells were installed in December 2017). Parameter-well combinations that included a direct exceedance of the GWPS during these timeframes were retained for further analysis. Arsenic in BCC-MW-15009, lithium in BCC-MW-15010, BCC-MW-17001, and BCC-MW-17002, molybdenum in BCC-MW-15014, and radium 226/228 in BCC-MW-15017 had individual results exceeding the GWPS.

Groundwater data were then evaluated utilizing Sanitas™ statistical software. Sanitas™ is a software tool that is commercially available for performing statistical evaluation consistent with procedures outlined in the Unified Guidance. Within the Sanitas™ statistical program, confidence limits were selected to perform the statistical comparison of compliance data to a fixed standard. Parametric and non-parametric confidence intervals were calculated, as appropriate, for each of the CCR Appendix IV

parameters using a per test[3] 99 percent confidence level, i.e., a significance level (α) of 0.01. The following narrative describes the methods employed, the results obtained and the Sanitas™ output files are included as an attachment.

The statistical data evaluation included the following steps:

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

The results of these evaluations are presented and discussed below.

Data from each round were evaluated for completeness, overall quality, and usability and were deemed appropriate for the purposes of the CCR assessment monitoring program. Initially, the recent baseline for the BCC-MW-15000-series monitoring wells (from July 2017 to September 2019) and for the BCC-MW-17000-series wells (February 2018 to September 2019) were observed visually for potential trends. No outliers were identified. Arsenic in BCC-MW-15009 exhibits a downward trend. The trend charts show that arsenic concentrations are generally decreasing with time, as evidenced by the negative Sen's Slope, and that the downward trend of arsenic at BCC-MW-15009 is statistically significant (Attachment 1). The decreases in arsenic concentrations are causing the confidence intervals to widen for BCC-MW-15009. Calculating a confidence interval around a trending data set incorporates not only variability present naturally in the underlying dataset, but also incorporates variability due to the trend itself. However, it is a decreasing trend for arsenic which suggests improvement in groundwater quality where the arsenic concentration has been below the GWPS for five consecutive monitoring events. In addition, assessment monitoring has already been triggered at the site by other constituents (i.e. lithium), and corrective measures are currently being assessed; therefore, no change in statistical methods were applied at this time but will be considered in the future based on additional data collected and status of corrective measures implementation.

The Sanitas™ software was then used to test compliance at the downgradient monitoring wells using the confidence interval method for the most recent five sampling events. The software outputs are included in Attachment 1 along with data reports showing the values used for the evaluation. The percentage of non-detect observations for well/constituent pairs with a direct GWPS exceedance are

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

also included in Attachment 1. Non-detect data were handled in accordance with the Stats Plan for the purposes of calculating the confidence intervals. The tests were run with a per-test significance of α = 0.01. The Sanitas™ software generates an output that includes graphs of the parametric or non-parametric confidence intervals for each well along with notes on data transformations, as appropriate. The data sets with direct exceedances of the GWPS were found to be normally distributed. The confidence interval test compares the lower confidence limit to the GWPS.

The statistical evaluation of the Appendix IV parameters shows exceedances for lithium at BCC-MW-17001 and BCC-MW-17002. The lower confidence limits for the other Appendix IV constituents statistically evaluated at BCC-MW-15009, BCC-MW-15010, BCC-MW-15014, and BCC-MW-15017 were below their respective GWPSs. These results are consistent with the results of the initial assessment monitoring data statistical evaluation and Consumers Energy will continue to evaluate corrective measures per §257.96 and §257.97. Consumers Energy will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

Attachments

Table A1 Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to September 2019

Attachment 1 Sanitas™ Output Files

Table

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to September 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15009													
						Sample Date:	12/1/2015	2/17/2016	4/18/2016	7/12/2016	9/28/2016	2/14/2017	4/5/2017	7/11/2017	7/11/2017	9/13/2017	4/16/2018	6/13/2018	11/28/2018	4/9/2019	9/25/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient								Field Dup						
Appendix III																					
Boron	ug/L	NC	NA	1,320	NA		2,380	2,520	2,170	2,070	2,190	2,110	2,190	2,210	1,690	2,120	--	1,670	1,690	1,600	1,500
Calcium	mg/L	NC	NA	259	NA		42.7	44.1	40.1	44.1	46.7	37.7	38.2	37.6	36.5	34.9	--	42.4	27.9	33	51
Chloride	mg/L	250*	NA	5,980	NA		24	24.0	27.1	26.9	24.3	22.8	24.9	26.3	26.3	26	--	95.7	51.1	32	41
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		63	39.3	49.5	55.2	49.1	31.6	39.8	43.0	47.2	41.7	--	< 2.0	19.2	49	30
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		240	230	220	220	230	200	190	216	246	188	--	456	454	300	290
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		10.6	10.8	10.3	10.0	10.0	10.2	10.1	9.6	--	10.2	9.8	9.8	9.8	9.4	8.7
Appendix IV																					
Antimony	ug/L	6	NA	1	6		1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--
Arsenic	ug/L	10	NA	10	**10**		**45**	**31**	**24**	**24**	**20**	**14**	**13**	**12.0**	**10.8**	--	9.4	8.5	4.1	3.9	2.3
Barium	ug/L	2,000	NA	340	2,000		16	12	11	11	11	9	10	13.2	10.8	--	16.5	13.8	10.2	16	27
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	--
Chromium	ug/L	100	NA	3	100		< 1	< 1	1	2	< 1	< 1	< 1	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	--
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--
Lithium	ug/L	NC	40	28	**40**		15.6	14.6	15	14	14	13	14	19	19	--	24	21	20	21	32
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	--
Molybdenum	ug/L	NC	100	9	**100**		57	60	50	49	49	40	38	43.7	41.8	--	16.0	11.6	5.2	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		< 0.166	< 0.157	< 0.209	< 0.158	< 0.269	< 0.159	< 0.347	< 0.756	< 0.887	--	< 0.934	< 0.580	< 0.567	< 0.153	0.370
Radium-228	pCi/L	NC	NA	NA	NA		< 0.451	< 0.475	< 0.467	< 0.461	< 0.628	0.678	< 0.502	< 1.96	< 2.96	--	< 0.957	< 3.27	< 0.903	< 0.583	< 0.551
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.451	< 0.475	< 0.467	< 0.461	< 0.628	0.747	< 0.502	< 2.72	< 3.85	--	< 1.89	< 3.85	< 1.47	< 0.583	0.807
Selenium	ug/L	50	NA	3	50		< 1	< 1	2	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	--

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to September 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15010												
						Sample Date:	12/1/2015	2/17/2016	4/13/2016	7/13/2016	9/28/2016	2/14/2017	4/5/2017	7/11/2017	9/13/2017	9/13/2017	4/16/2018	6/14/2018	11/28/2018	4/9/2019	9/24/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient														
Appendix III																Field Dup					
Boron	ug/L	NC	NA	1,320	NA		1,970	1,510	1,340	1,270	1,570	1,440	1,760	1,340	1,770	1,770	--	2,100	1,850	1,700	1,100
Calcium	mg/L	NC	NA	259	NA		71.2	51.9	37.4	58.2	66.4	49.8	80.5	40.7	129	133	--	133	115	110	130
Chloride	mg/L	250*	NA	5,980	NA		23	22.5	21.5	22.7	25.1	22.3	24.2	25.5	24.5	24.4	--	29.3	39.6	22	42
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		120	52.6	31.0	50.7	69.7	24.2	53.5	24.8	143	143	--	73.7	48.3	49	2.9
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		410	270	220	260	320	250	360	288	570	618	--	636	590	490	450
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.7	7.8	7.8	7.8	8.0	8.0	7.8	7.8	7.8	--	7.8	7.4	7.5	7.6	7.4
Appendix IV																					
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	--
Arsenic	ug/L	10	NA	10	**10**		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		49	34	28	42	45	31	51	29.2	--	--	63.4	64.8	68.1	78	61
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	--
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20	--
Chromium	ug/L	100	NA	3	100		< 1	< 1	2	< 1	< 1	1	< 1	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	--	< 15.0	< 15.0	< 6.0	< 6.0	--
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	--
Lithium	ug/L	NC	40	28	**40**		36.1	22.7	18	15	22	14	18	21	--	--	**46**	**54**	**51**	**41**	**43**
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20	--
Molybdenum	ug/L	NC	100	9	**100**		33	29	27	15	20	9	7	16.2	--	--	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		< 0.302	< 0.217	< 0.244	< 0.145	< 0.297	< 0.179	< 0.216	< 0.642	--	--	< 0.869	0.661	< 0.820	< 0.185	< 0.140
Radium-228	pCi/L	NC	NA	NA	NA		0.849	< 0.502	< 0.447	0.420	0.728	< 0.363	< 0.380	< 0.956	--	--	< 0.877	< 0.978	< 0.805	< 0.516	< 0.578
Radium-226/228	pCi/L	5	NA	2.42	**5**		0.973	< 0.502	< 0.447	0.451	0.82	< 0.363	< 0.38	< 1.60	--	--	< 1.75	< 1.45	< 1.63	< 0.516	< 0.578
Selenium	ug/L	50	NA	3	50		< 1	< 1	1	1	< 1	< 1	< 1	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	--	< 2.0	< 2.0	< 2.0	< 2.0	--

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to September 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15011												
						Sample Date:	12/1/2015	2/17/2016	4/13/2016	7/12/2016	9/28/2016	2/14/2017	4/5/2017	7/11/2017	9/13/2017	4/16/2018	6/13/2018	11/28/2018	4/10/2019	9/25/2019	9/25/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient														
Appendix III																					Field Dup
Boron	ug/L	NC	NA	1,320	NA		1,680	1,420	1,340	1,210	1,180	1,280	1,340	1,060	1,490	--	1,630	1,650	1,600	1,600	1,600
Calcium	mg/L	NC	NA	259	NA		53	47.6	36.9	47.3	48.0	47.9	52.0	42.2	23.9	--	22.6	29.5	41	63	63
Chloride	mg/L	250*	NA	5,980	NA		22	20.7	22.1	24.8	21.0	19.5	22.2	22.9	24.0	--	23.2	26.3	38	37	37
Fluoride	ug/L	4,000	NA	1,000	NA		1,200	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		50	30.8	35.8	43.8	38.5	37.2	42.8	29.1	6.4	--	12.3	21.9	38	97	99
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		270	230	210	240	230	230	240	224	140	--	244	182	260	380	400
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		8.7	8.5	8.2	8.5	8.7	9.2	9.0	8.2	8.5	9.1	8.5	8.9	8.8	8.4	--
Appendix IV																					
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--	--
Arsenic	ug/L	10	NA	10	**10**		5	3	3	4	6	7	8	< 1.0	--	6.4	1.5	7.3	9.3	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		36	29	25	30	31	31	32	30.7	--	15.2	16.6	18.5	31	39	39
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--	--
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	--	--
Chromium	ug/L	100	NA	3	100		1	< 1	2	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	--	--
Fluoride	ug/L	4,000	NA	1,000	4,000		1,200	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--	--
Lithium	ug/L	NC	40	28	**40**		17.2	16	14	15	16	17	17	20	--	21	11	18	18	13	13
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	--	--
Molybdenum	ug/L	NC	100	9	**100**		20	29	35	26	27	25	22	21.4	--	8.9	5.8	13.9	15	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		< 0.199	< 0.141	< 0.319	< 0.166	< 0.284	< 0.160	< 0.296	< 1.12	--	< 0.742	0.350	< 0.771	0.226	0.272	< 0.192
Radium-228	pCi/L	NC	NA	NA	NA		0.956	< 0.447	< 0.435	< 0.402	< 0.496	< 0.394	< 0.599	< 0.954	--	< 0.872	< 0.923	< 0.747	< 0.532	0.454	< 0.519
Radium-226/228	pCi/L	5	NA	2.42	**5**		1.01	< 0.447	< 0.435	< 0.402	< 0.496	< 0.394	< 0.599	< 2.07	--	< 1.61	< 1.25	< 1.52	< 0.532	0.726	0.622
Selenium	ug/L	50	NA	3	50		< 1	< 1	< 1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	--	--

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to September 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15012												
						Sample Date:	12/1/2015	2/17/2016	4/13/2016	7/13/2016	9/29/2016	2/14/2017	4/5/2017	7/12/2017	9/13/2017	4/17/2018	6/13/2018	11/28/2018	4/10/2019	4/10/2019	9/25/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient													Field Dup	
Appendix III																					
Boron	ug/L	NC	NA	1,320	NA		961	1,390	1,830	1,450	1,470	1,380	1,500	1,340	1,140	--	1,450	1,280	1,300	1,300	1,300
Calcium	mg/L	NC	NA	259	NA		49.5	82.1	65.5	44.5	43.5	32.0	34.9	24.6	48.7	--	95.1	55.7	61	60	140
Chloride	mg/L	250*	NA	5,980	NA		20	20.4	23.7	23.0	22.6	19.7	22.7	24.1	23.3	--	22.7	21.5	20	20	22
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,200	1,100	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		69	111	106	65.6	50.9	55.7	57.2	21.8	59.6	--	355	137	190	180	540
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		300	370	340	250	210	190	200	168	318	--	902	302	380	380	850
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		8.0	8.1	8.1	8.9	9.2	8.6	8.5	9.9	11.4	9.7	10.2	9.8	9.4	--	10.1
Appendix IV																					
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--
Arsenic	ug/L	10	NA	10	**10**		< 1	2	8	**12**	9	2	3	6.1	--	1.8	3.4	1.3	1.4	1.4	2.3
Barium	ug/L	2,000	NA	340	2,000		40	63	68	34	22	25	28	14.3	--	109	105	51.7	79	79	190
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--
Chromium	ug/L	100	NA	3	100		< 1	< 1	1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	--
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,200	1,100	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--
Lithium	ug/L	NC	40	28	**40**		15.6	20.8	19	18	15	11	12	12	--	13	11	10	12	12	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--
Molybdenum	ug/L	NC	100	9	**100**		29	9	35	37	44	35	27	94.5	--	50.8	71.3	28.3	26	26	75
Radium-226	pCi/L	NC	NA	NA	NA		< 0.164	< 0.243	< 0.256	< 0.216	< 0.335	< 0.153	< 0.243	0.436	--	< 0.693	< 0.526	0.700	< 0.142	0.219	0.241
Radium-228	pCi/L	NC	NA	NA	NA		< 0.471	< 0.634	0.827	< 0.539	< 0.548	< 0.416	< 0.554	< 2.08	--	< 0.733	< 0.789	< 0.992	< 0.485	< 0.481	< 0.551
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.471	< 0.634	0.919	< 0.539	< 0.548	< 0.416	< 0.554	< 2.28	--	< 1.43	< 1.32	1.27	< 0.485	0.514	0.776
Selenium	ug/L	50	NA	3	50		< 1	< 1	< 1	< 1	< 1	< 1	< 1	1.2	--	1.2	3.3	< 1.0	< 1.0	< 1.0	2.2
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	--

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to September 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15013													
						Sample Date:	12/1/2015	2/18/2016	4/13/2016	7/13/2016	9/29/2016	2/14/2017	4/5/2017	7/12/2017	9/13/2017	4/17/2018	4/17/2018	6/13/2018	6/13/2018	11/29/2018	4/11/2019	9/25/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient										Field Dup		Field Dup			
Appendix III																						
Boron	ug/L	NC	NA	1,320	NA		1,140	1,290	1,180	1,080	1,090	1,050	1,120	916	1,270	--	--	1,130	1,100	1,070	1,200	1,300
Calcium	mg/L	NC	NA	259	NA		65.2	58.3	47.5	48.4	59.7	52.5	50.9	43.9	34.4	--	--	47.3	48.9	50.8	50	45
Chloride	mg/L	250*	NA	5,980	NA		21	20.9	21.5	21.0	22.9	19.8	19.9	23.4	21.2	--	--	21.5	21.6	21.3	21	24
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		89	44.3	34.3	27.5	31.3	23.1	15.1	8.7	59.9	--	--	8.7	7.9	5.9	4.8	53
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		330	290	260	250	250	260	250	240	192	--	--	324	268	210	260	250
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.6	7.2	7.4	7.3	7.4	7.7	7.4	7.4	7.9	7.6	--	7.7	--	7.0	7.3	8.0
Appendix IV																						
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--
Arsenic	ug/L	10	NA	10	**10**		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		71	58	49	47	51	52	48	41.9	--	43.3	44.7	43.9	41.1	39.5	45	31
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--
Chromium	ug/L	100	NA	3	100		< 1	< 1	2	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	--
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--
Lithium	ug/L	NC	40	28	**40**		17.5	19.9	18	17	18	18	17	23	--	27	28	24	24	23	17	13
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--
Molybdenum	ug/L	NC	100	9	**100**		17	20	21	12	11	10	9	7.7	--	< 5.0	< 5.0	< 5.0	< 5.0	5.0	5.7	9.9
Radium-226	pCi/L	NC	NA	NA	NA		0.272	< 0.299	0.173	< 0.181	< 0.215	< 0.230	< 0.215	0.731	--	< 0.505	< 0.506	< 0.546	< 0.585	< 0.696	< 0.232	< 0.201
Radium-228	pCi/L	NC	NA	NA	NA		0.914	< 0.527	0.727	0.483	< 0.598	< 0.481	< 0.516	< 0.940	--	< 0.633	< 0.780	< 0.754	< 0.903	< 0.728	< 0.450	< 0.482
Radium-226/228	pCi/L	5	NA	2.42	**5**		1.19	< 0.527	0.9	0.596	< 0.598	< 0.481	< 0.516	< 1.56	--	< 1.14	< 1.29	< 1.30	< 1.49	< 1.42	< 0.450	0.508
Selenium	ug/L	50	NA	3	50		< 1	< 1	< 1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	--

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to September 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15014												
						Sample Date:	12/1/2015	2/18/2016	4/18/2016	7/13/2016	9/29/2016	2/14/2017	4/5/2017	7/12/2017	9/13/2017	4/17/2018	6/13/2018	11/29/2018	4/11/2019	4/11/2019	9/25/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient													Field Dup	
Appendix III																					
Boron	ug/L	NC	NA	1,320	NA		2,560	2,230	1,840	1,630	1,690	1,530	1,560	1,300	1,410	--	1,370	1,400	1,500	1,600	1,400
Calcium	mg/L	NC	NA	259	NA		75.6	75.3	63.9	73.5	64.7	66.3	65.3	61.8	57.8	--	50.8	51.1	49	53	50
Chloride	mg/L	250*	NA	5,980	NA		21	21.9	21.9	22.0	22.7	18.6	22.1	22.4	22.5	--	21.3	20.5	20	22	23
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		43	34.7	31.4	35.6	23.7	27.8	23.9	24.9	19.2	--	2.4	12.4	12	14	25
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		350	310	270	290	250	280	270	292	282	--	338	224	260	290	250
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		11.5	11.6	11.2	11.0	11.1	11.5	11.3	11.5	12.0	11.6	11.4	11.5	11.3	--	11.3
Appendix IV																					
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	1.7	--	1.1	< 1.0	< 1.0	< 1.0	< 1.0	--
Arsenic	ug/L	10	NA	10	**10**		**15**	**11**	**11**	8	9	7	7	8.4	--	6.2	5.5	4.0	3.8	4.0	2.6
Barium	ug/L	2,000	NA	340	2,000		329	376	257	508	357	571	546	732	--	779	607	604	620	630	560
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--
Chromium	ug/L	100	NA	3	100		< 1	2	1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	1.4	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	--
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--
Lithium	ug/L	NC	40	28	**40**		< 10	< 10	< 10	< 10	< 10	< 10	< 10	19	--	27	16	21	12	11	23
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--
Molybdenum	ug/L	NC	100	9	**100**		**119**	76	58	69	81	80	77	70.9	--	94.7	100	**106**	**120**	**110**	99
Radium-226	pCi/L	NC	NA	NA	NA		< 0.176	< 0.175	< 0.177	0.214	< 0.218	< 0.211	< 0.289	< 0.511	--	< 1.11	< 1.17	< 1.52	< 0.192	< 0.182	< 0.185
Radium-228	pCi/L	NC	NA	NA	NA		1.23	< 0.735	< 0.562	< 0.606	< 0.485	0.810	< 0.423	< 1.07	--	< 0.972	< 1.85	< 1.73	< 0.538	< 0.379	< 0.513
Radium-226/228	pCi/L	5	NA	2.42	**5**		1.31	< 0.735	< 0.562	< 0.606	< 0.485	0.883	< 0.423	< 1.58	--	< 2.08	< 3.02	< 3.25	< 0.538	< 0.379	< 0.513
Selenium	ug/L	50	NA	3	50		< 1	1	< 1	< 1	< 1	1	8	2.3	--	1.2	1.2	2.6	5.2	2.6	4.7
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	--

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to September 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

Sample Location:						BCC-MW-15015													
Sample Date:						12/1/2015	2/18/2016	4/13/2016	7/13/2016	9/29/2016	2/14/2017	4/5/2017	7/12/2017	7/12/2017	9/13/2017	9/13/2017	4/17/2018	6/13/2018	11/29/2018	4/11/2019	9/26/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS	downgradient															
														Field Dup		Field Dup					
Appendix III																					
Boron	ug/L	NC	NA	1,320	NA	1,190	1,170	963	614	656	662	599	489	678	433	374	--	398	505	630	510
Calcium	mg/L	NC	NA	259	NA	32.8	33.0	30.6	36.2	40.1	38.4	37.6	29.4	32.3	36.9	38.8	--	45.0	50.8	68	46
Chloride	mg/L	250*	NA	5,980	NA	21	22.0	21.6	20.4	19.5	19.2	22.7	20.1	20.0	20.3	20.3	--	19.5	17.8	20	17
Fluoride	ug/L	4,000	NA	1,000	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA	7.8	6.56	8.34	13.9	9.26	10.4	13.8	18.8	17.9	16.1	15.6	--	12.6	13.2	88	69
Total Dissolved Solids	mg/L	500*	NA	5,170	NA	220	200	190	180	180	200	190	166	190	192	274	--	316	238	360	250
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA	7.6	7.4	7.4	7.4	7.8	7.7	7.6	8.4	--	8.7	--	8.3	7.9	7.8	7.6	8.4
Appendix IV																					
Antimony	ug/L	6	NA	1	6	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	--
Arsenic	ug/L	10	NA	10	**10**	2	2	2	6	5	5	6	6.4	7.6	--	--	4.7	5.5	4.3	4.3	5.7
Barium	ug/L	2,000	NA	340	2,000	23	22	21	25	28	30	28	30.1	33.6	--	--	39.9	37.9	41.0	63	44
Beryllium	ug/L	4	NA	1	4	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	--
Cadmium	ug/L	5	NA	0.2	5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20	--
Chromium	ug/L	100	NA	3	100	< 1	< 1	1	1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0
Cobalt	ug/L	NC	6	15	15	< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	< 15.0	--	--	< 15.0	< 15.0	< 6.0	< 6.0	--
Fluoride	ug/L	4,000	NA	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	--
Lithium	ug/L	NC	40	28	**40**	< 10	< 10	< 10	< 10	< 10	< 10	< 10	12	11	--	--	16	13	14	11	< 10
Mercury	ug/L	2	NA	0.2	2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20	--
Molybdenum	ug/L	NC	100	9	**100**	17	14	17	11	10	9	11	11.9	13.0	--	--	9.4	7.0	7.2	11	< 10
Radium-226	pCi/L	NC	NA	NA	NA	< 0.193	< 0.157	< 0.242	< 0.133	< 0.378	< 0.166	< 0.340	< 0.832	< 0.698	--	--	< 0.467	< 0.475	< 0.677	< 0.224	< 0.165
Radium-228	pCi/L	NC	NA	NA	NA	< 0.578	< 0.577	< 0.521	< 0.467	0.850	< 0.408	< 0.420	< 0.799	< 0.748	--	--	< 0.730	< 0.763	< 1.07	< 0.518	< 0.491
Radium-226/228	pCi/L	5	NA	2.42	**5**	< 0.578	< 0.577	< 0.521	< 0.467	0.85	< 0.408	< 0.42	< 1.63	< 1.45	--	--	< 1.20	< 1.24	< 1.75	< 0.518	< 0.491
Selenium	ug/L	50	NA	3	50	< 1	< 1	< 1	1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0
Thallium	ug/L	2	NA	2	2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	--	< 2.0	< 2.0	< 2.0	< 2.0	--

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to September 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15016												
						Sample Date:	12/1/2015	2/18/2016	4/13/2016	7/13/2016	9/29/2016	2/14/2017	4/5/2017	7/12/2017	9/13/2017	4/17/2018	6/12/2018	11/29/2018	4/11/2019	9/26/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient												
Appendix III																			
Boron	ug/L	NC	NA	1,320	NA		108	119	86	100	88	92	83	85.9	83	--	76.6	80.8	110	100
Calcium	mg/L	NC	NA	259	NA		172	184	164	172	181	176	172	170	182	--	168	169	170	160
Chloride	mg/L	250*	NA	5,980	NA		200	204	203	165	204	196	200	10.4	226	--	197	201	190	230
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	< 2.0	< 2.0	< 2.0	< 20
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		980	1,000	980	920	930	990	1,000	1,050	995	--	986	968	1,000	980
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		6.6	6.5	6.4	6.3	6.4	6.4	6.6	6.4	6.6	6.8	6.5	6.6	6.4	6.6
Appendix IV																			
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--
Arsenic	ug/L	10	NA	10	**10**		2	2	3	3	2	2	2	1.5	--	1.5	1.3	1.3	1.6	1.4
Barium	ug/L	2,000	NA	340	2,000		656	647	614	619	621	666	613	596	--	649	652	548	700	630
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	--
Chromium	ug/L	100	NA	3	100		2	3	3	4	3	3	3	1.9	--	2.1	2.0	2.3	2.3	2.4
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	--
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--
Lithium	ug/L	NC	40	28	**40**		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	--	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	--
Molybdenum	ug/L	NC	100	9	**100**		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5.0	--	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		< 0.263	1.51	1.31	1.50	1.06	1.17	1.60	1.30	--	1.56	< 0.810	1.75	1.18	1.31
Radium-228	pCi/L	NC	NA	NA	NA		2.29	2.32	1.69	1.68	1.68	2.37	2.06	1.06	--	2.08	1.81	2.20	1.76	1.97
Radium-226/228	pCi/L	5	NA	2.42	**5**		2.29	3.83	3	3.18	2.74	3.54	3.66	2.36	--	3.64	2.50	3.95	2.94	3.27
Selenium	ug/L	50	NA	3	50		2	4	2	7	1	2	2	3.6	--	1.5	1.4	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	--

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to September 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15017													
						Sample Date:	12/1/2015	2/18/2016	4/18/2016	7/13/2016	9/29/2016	2/14/2017	4/5/2017	7/12/2017	9/13/2017	4/17/2018	6/12/2018	6/12/2018	11/29/2018	4/11/2019	9/26/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient											Field Dup			
Appendix III																					
Boron	ug/L	NC	NA	1,320	NA		59	90	66	76	78	76	75	75	82.8	--	83.8	79.0	73.2	100	93
Calcium	mg/L	NC	NA	259	NA		225	247	220	232	252	232	232	203	245	--	243	232	242	220	220
Chloride	mg/L	250*	NA	5,980	NA		200	201	184	204	182	192	187	199	224	--	224	224	193	210	250
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 20
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		850	1,100	1,200	1,100	1,100	1,200	1,100	1,230	1,130	--	1,120	1,170	1,110	1,200	1,200
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		6.5	6.4	6.4	6.4	6.4	6.6	6.5	6.4	6.5	6.8	6.5	--	6.7	6.4	6.6
Appendix IV																					
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--
Arsenic	ug/L	10	NA	10	**10**		**13**	7	5	**12**	**12**	5	4	3	--	2.3	2.1	2.1	1.8	1.9	1.8
Barium	ug/L	2,000	NA	340	2,000		1,030	981	924	985	955	968	876	772	--	955	936	953	824	960	900
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--
Chromium	ug/L	100	NA	3	100		4	4	4	9	11	5	5	5.3	--	3.4	3.4	3.3	3.1	2.9	3.4
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	--
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--
Lithium	ug/L	NC	40	28	**40**		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	--	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--
Molybdenum	ug/L	NC	100	9	**100**		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5.0	--	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		1.61	2.38	2.18	1.91	1.94	1.82	1.56	1.97	--	2.23	2.13	2.87	1.93	1.52	1.42
Radium-228	pCi/L	NC	NA	NA	NA		2.69	2.97	3.50	3.98	2.50	3.15	2.78	2.78	--	2.93	3.30	2.72	3.19	3.93	2.75
Radium-226/228	pCi/L	5	NA	2.42	**5**		4.3	**5.35**	**5.68**	**5.89**	4.44	4.97	4.34	4.75	--	**5.16**	**5.43**	**5.59**	**5.12**	**5.46**	4.16
Selenium	ug/L	50	NA	3	50		3	4	3	8	2	2	3	2.7	--	1.7	2.4	2.5	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	--

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to September 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15018															
						Sample Date:	12/2/2015	2/18/2016	4/14/2016	7/14/2016	9/29/2016	2/14/2017	4/5/2017	7/11/2017	7/11/2017	9/13/2017	9/13/2017	4/18/2018	4/18/2018	6/12/2018	11/29/2018	4/11/2019	9/26/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient																
Appendix III															Field Dup		Field Dup		Field Dup				
Boron	ug/L	NC	NA	1,320	NA		487	526	478	399	438	479	493	538	446	492	502	--	--	559	488	640	550
Calcium	mg/L	NC	NA	259	NA		88.6	100	87.9	86.8	98.5	100	92.1	84.8	81.1	90.7	89.1	--	--	87.6	101	96	94
Chloride	mg/L	250*	NA	5,980	NA		38.0	38.0	40.8	39.3	37.5	43.6	44.4	53.4	52.6	49.1	50.2	--	--	48.9	49.1	59	55
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	< 2.0	< 2.0	--	--	< 2.0	< 2.0	< 2.0	< 20
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		290	400	430	390	410	450	410	420	438	392	380	--	--	598	426	480	430
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.0	6.9	6.8	6.5	6.5	6.7	6.8	6.8	--	6.8	--	6.9	--	6.8	6.9	6.8	6.9
Appendix IV																							
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--
Arsenic	ug/L	10	NA	10	**10**		1	< 1	< 1	2	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		155	149	139	133	143	171	149	153	143	--	--	139	141	156	127	150	140
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--
Chromium	ug/L	100	NA	3	100		< 1	1	1	1	1	< 1	1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	< 15.0	--	--	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	--
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--
Lithium	ug/L	NC	40	28	**40**		21.4	23.1	24	12	14	21	21	26	26	--	--	29	27	26	22	24	20
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--
Molybdenum	ug/L	NC	100	9	**100**		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5.0	< 5.0	--	--	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		0.227	0.394	0.430	0.234	0.522	0.363	< 0.314	< 0.479	< 1.02	--	--	< 0.843	0.290	< 0.756	< 0.842	0.316	0.511
Radium-228	pCi/L	NC	NA	NA	NA		< 0.586	0.778	0.649	0.845	0.803	0.996	1.08	< 0.767	< 0.950	--	--	0.869	0.622	1.39	< 0.997	0.598	0.846
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.586	1.17	1.08	1.08	1.33	1.36	1.37	< 1.25	< 1.97	--	--	1.59	0.912	1.77	< 1.84	0.915	1.36
Selenium	ug/L	50	NA	3	50		< 1	< 1	1	4	< 1	< 1	< 1	< 1.0	1	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	--

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to September 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15019												
						Sample Date:	12/2/2015	2/18/2016	4/14/2016	7/13/2016	9/30/2016	2/15/2017	4/5/2017	7/11/2017	9/13/2017	4/18/2018	6/12/2018	11/30/2018	4/12/2019	4/12/2019	9/26/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient													Field Dup	
Appendix III																					
Boron	ug/L	NC	NA	1,320	NA		1,530	1,590	1,440	1,320	1,260	1,370	1,410	1,430	1,010	--	1,170	1,540	1,600	1,500	1,000
Calcium	mg/L	NC	NA	259	NA		84.6	93.6	83.0	90.0	92.6	91.8	92.8	90.1	107	--	97.7	98.2	97	94	100
Chloride	mg/L	250*	NA	5,980	NA		34	32.4	33.7	37.7	35.6	34.5	33.6	52.5	73.9	--	67.7	42.6	39	39	68
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 20
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		340	390	440	410	370	410	420	470	618	--	524	556	430	440	530
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.0	6.8	6.9	6.7	6.4	6.8	6.9	6.8	6.7	7.0	6.7	6.9	6.7	--	6.9
Appendix IV																					
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--
Arsenic	ug/L	10	NA	10	**10**		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		91	94	88	88	96	93	90	109	--	161	187	114	110	120	150
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--
Chromium	ug/L	100	NA	3	100		< 1	< 1	1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	--
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--
Lithium	ug/L	NC	40	28	**40**		23.7	27.9	26	24	22	23	22	27	--	25	23	26	22	22	20
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--
Molybdenum	ug/L	NC	100	9	**100**		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5.0	--	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		0.333	0.279	0.465	0.282	0.315	0.329	< 0.36	< 0.620	--	< 0.717	< 0.594	< 0.880	0.246	< 0.197	0.443
Radium-228	pCi/L	NC	NA	NA	NA		< 0.484	< 0.567	0.532	< 0.718	< 0.739	1.80	0.872	< 1.02	--	< 0.742	1.36	1.16	0.548	< 0.513	0.651
Radium-226/228	pCi/L	5	NA	2.42	**5**		0.674	0.798	0.997	0.969	< 0.739	2.13	0.974	< 1.64	--	< 1.46	1.75	< 1.77	0.794	0.669	1.09
Selenium	ug/L	50	NA	3	50		< 1	< 1	< 1	2	< 1	< 1	< 1	1.2	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	--

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to September 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15020													
						Sample Date:	12/2/2015	2/18/2016	4/14/2016	7/14/2016	9/30/2016	2/15/2017	4/5/2017	7/11/2017	9/13/2017	4/18/2018	6/12/2018	6/12/2018	11/30/2018	11/30/2018	4/12/2019	9/26/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient															
Appendix III																		Field Dup		Field Dup		
Boron	ug/L	NC	NA	1,320	NA		630	738	638	603	608	621	667	618	745	--	708	699	721	930	700	830
Calcium	mg/L	NC	NA	259	NA		61	67.6	59.1	60.7	66.5	67.0	66.6	68.1	107	--	96.3	91.6	81.5	81.7	76	110
Chloride	mg/L	250*	NA	5,980	NA		39	35.4	34.3	69.6	33.5	33.3	33.9	45.7	87.8	--	92.1	92.0	49.6	49.6	45	130
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		2.2	2.34	< 2	< 2	< 2	< 2	< 2	< 2.0	3	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	2.9
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		320	310	320	310	310	330	320	388	608	--	622	508	428	382	400	660
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.3	7.2	7.0	6.9	6.9	7.0	7.1	7.0	6.8	7.0	6.7	--	6.9	--	6.8	6.8
Appendix IV																						
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--
Arsenic	ug/L	10	NA	10	**10**		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		48	52	51	47	54	53	52	60.4	--	148	197	196	119	115	120	330
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--
Chromium	ug/L	100	NA	3	100		< 1	2	< 1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.1
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	--
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--
Lithium	ug/L	NC	40	28	**40**		15.1	17.8	16	14	14	14	14	18	--	16	16	16	20	20	15	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--
Molybdenum	ug/L	NC	100	9	**100**		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5.0	--	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		< 0.269	< 0.240	< 0.341	< 0.190	< 0.276	< 0.294	< 0.290	< 0.761	--	0.744	< 0.899	< 0.774	1.14	< 1.06	0.226	0.672
Radium-228	pCi/L	NC	NA	NA	NA		< 0.467	0.731	0.474	< 0.598	0.682	< 0.591	0.543	< 0.627	--	0.813	1.75	1.47	0.925	1.30	< 0.558	1.26
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.467	0.847	0.73	< 0.598	0.724	< 0.591	0.652	< 1.39	--	1.56	2.64	2.00	2.07	1.79	< 0.558	1.94
Selenium	ug/L	50	NA	3	50		< 1	1	< 1	2	< 1	< 1	< 1	1.4	--	< 1.0	< 1.0	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	--

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to September 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15021												
						Sample Date:	12/2/2015	2/18/2016	4/14/2016	7/13/2016	10/5/2016	2/15/2017	4/6/2017	7/12/2017	9/13/2017	4/18/2018	6/12/2018	11/30/2018	4/12/2019	9/26/2019	9/26/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient														
Appendix III																					Field Dup
Boron	ug/L	NC	NA	1,320	NA		362	489	400	425	491	465	519	519	602	--	809	798	940	930	960
Calcium	mg/L	NC	NA	259	NA		86.4	98.5	89.6	97.4	96.9	97.9	96.3	86.8	91.3	--	89.4	96.6	93	92	95
Chloride	mg/L	250*	NA	5,980	NA		88	82.7	87.2	98.3	98.9	94.6	93.9	97.0	108	--	112	120	110	110	110
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	< 2.0	--	< 2.0	< 2.0	< 2.0	< 20	< 20
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		610	540	570	590	620	570	560	548	490	--	576	534	590	570	570
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		6.8	6.8	6.8	6.7	6.8	6.9	6.9	6.8	6.8	7.1	6.8	6.7	6.7	6.9	--
Appendix IV																					
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--	--
Arsenic	ug/L	10	NA	10	**10**		3	1	1	2	2	2	2	1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		274	244	236	233	252	240	228	211	--	236	238	224	250	240	230
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--	--
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	--	--
Chromium	ug/L	100	NA	3	100		< 1	2	2	2	1	2	2	< 1.0	--	< 1.0	1.1	< 1.0	1.2	1.2	1.1
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	--	--
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--	--
Lithium	ug/L	NC	40	28	**40**		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	--	< 10	< 10	< 10	< 8.0	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	--	--
Molybdenum	ug/L	NC	100	9	**100**		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5.0	--	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		0.569	0.629	0.563	0.429	0.483	0.524	< 0.215	< 0.768	--	< 0.461	< 0.689	1.49	0.531	0.794	0.460
Radium-228	pCi/L	NC	NA	NA	NA		0.984	0.782	0.846	0.871	1.52	< 0.582	< 0.354	< 0.697	--	< 1.50	1.60	1.12	0.783	0.738	0.587
Radium-226/228	pCi/L	5	NA	2.42	**5**		1.55	1.41	1.41	1.3	2	0.966	< 0.354	< 1.47	--	< 1.96	1.97	2.61	1.31	1.53	1.05
Selenium	ug/L	50	NA	3	50		1	2	1	4	< 1	< 1	1	1.6	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	--	--

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to September 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15022												
						Sample Date:	12/2/2015	2/18/2016	4/14/2016	7/14/2016	10/5/2016	2/15/2017	4/6/2017	7/12/2017	9/13/2017	4/18/2018	6/11/2018	11/27/2018	4/12/2019	9/25/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient													
Appendix III																				
Boron	ug/L	NC	NA	1,320	NA		250	388	387	362	391	394	434	478	833	--	1,170	3,840	6,800	10,000
Calcium	mg/L	NC	NA	259	NA		46.7	46.4	47.8	43.0	43.7	54.1	49.3	51.8	35.2	--	38.2	265	310	300
Chloride	mg/L	250*	NA	5,980	NA		25	18.7	17.6	16.8	17.1	18.2	18.6	22.1	23.3	--	21.5	23.1	19	24
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		39	38.3	29.9	34.3	32.8	34.1	32.8	45.9	44.1	--	24.1	953	1,100	1,200
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		270	210	250	250	210	250	230	254	266	--	210	1,670	1,900	1,900
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		8.3	8.5	8.2	8.2	8.1	7.8	8.1	8.4	7.6	7.8	8.3	7.8	7.7	7.5
Appendix IV																				
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	1.9	< 1.0	< 1.0	< 1.0	--
Arsenic	ug/L	10	NA	10	**10**		6	7	8	8	6	4	4	5.8	--	< 1.0	1.1	< 1.0	1.4	4.0
Barium	ug/L	2,000	NA	340	2,000		139	119	155	116	119	137	129	138	--	102	104	242	190	130
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	--
Chromium	ug/L	100	NA	3	100		< 1	1	2	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	--
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--
Lithium	ug/L	NC	40	28	**40**		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	--	13	11	25	23	22
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	--
Molybdenum	ug/L	NC	100	9	**100**		22	16	11	17	19	12	14	13.6	--	< 5.0	< 5.0	47.6	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		0.246	< 0.242	< 0.247	< 0.150	< 0.346	< 0.217	< 0.291	< 0.468	--	0.666	< 0.708	< 0.596	< 0.182	0.261
Radium-228	pCi/L	NC	NA	NA	NA		< 0.484	< 0.450	0.740	< 0.472	< 0.514	< 0.477	0.709	< 0.799	--	< 0.644	< 0.742	< 0.807	< 0.470	0.617
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.484	< 0.45	0.812	< 0.472	< 0.514	< 0.477	0.862	< 1.27	--	1.13	< 1.45	< 1.40	< 0.470	0.877
Selenium	ug/L	50	NA	3	50		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	--

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to September 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-15023												
						Sample Date:	12/2/2015	2/18/2016	4/14/2016	7/14/2016	10/5/2016	2/15/2017	4/5/2017	7/11/2017	9/13/2017	4/18/2018	6/11/2018	11/29/2018	4/12/2019	9/26/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		downgradient													
Appendix III																				
Boron	ug/L	NC	NA	1,320	NA		414	284	267	308	526	484	1,590	701	504	--	1,650	1,350	2,600	1,000
Calcium	mg/L	NC	NA	259	NA		59.7	59.4	53.3	54.1	64.0	59.9	74.5	50.8	60.9	--	98.9	116	120	100
Chloride	mg/L	250*	NA	5,980	NA		30	26.9	24.6	28.7	24.8	23.8	24.6	26.8	25.5	--	19.4	17.0	16	16
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		20	26.5	28.9	25.0	24.3	21.0	22.5	22.6	36.2	--	139	156	140	130
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		240	270	270	290	290	280	300	290	408	--	474	530	600	490
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.4	7.5	7.5	7.5	7.4	7.6	7.6	7.6	7.6	7.6	7.4	7.5	7.0	7.5
Appendix IV																				
Antimony	ug/L	6	NA	1	6		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--
Arsenic	ug/L	10	NA	10	**10**		2	2	1	3	2	2	< 1	1.9	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Barium	ug/L	2,000	NA	340	2,000		57	48	43	40	47	42	46	38.0	--	97.1	87.8	90.4	100	92
Beryllium	ug/L	4	NA	1	4		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--
Cadmium	ug/L	5	NA	0.2	5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	--
Chromium	ug/L	100	NA	3	100		< 1	< 1	2	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15	< 15	< 15	< 15	< 15	< 15	< 15	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	--
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--
Lithium	ug/L	NC	40	28	**40**		12.1	10.6	< 10	< 10	< 10	< 10	11	< 10	--	19	18	20	31	13
Mercury	ug/L	2	NA	0.2	2		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	--
Molybdenum	ug/L	NC	100	9	**100**		8	6	< 5	7	6	6	< 5	6.0	--	< 5.0	7.1	6.6	< 5.0	5.1
Radium-226	pCi/L	NC	NA	NA	NA		0.232	< 0.237	< 0.242	0.226	< 0.309	0.257	0.455	< 0.889	--	< 0.572	< 0.958	< 0.537	0.181	0.209
Radium-228	pCi/L	NC	NA	NA	NA		< 0.530	0.426	< 0.456	< 0.545	< 0.355	< 0.400	0.963	< 0.636	--	< 0.749	< 0.891	< 1.18	0.771	< 0.400
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 0.53	0.599	< 0.456	< 0.545	< 0.355	0.426	1.42	< 1.53	--	< 1.32	< 1.85	< 1.72	0.952	0.527
Selenium	ug/L	50	NA	3	50		< 1	< 1	< 1	1	< 1	< 1	< 1	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	--

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to September 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-17001								BCC-MW-17002						
						Sample Date:	12/7/2017	2/20/2018	6/15/2018	8/6/2018	11/29/2018	11/29/2018	4/11/2019	9/26/2019	12/7/2017	2/20/2018	6/15/2018	8/6/2018	11/29/2018	4/11/2019	9/26/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		Shallow 2017 Wells														
Appendix III												Field Dup									
Boron	ug/L	NC	NA	1,320	NA		991	827	1,100	1,220	1,480	1,550	1,700	1,800	8,280	12,800	13,300	9,440	9,030	9,200	13,000
Calcium	mg/L	NC	NA	259	NA		118	118	124	117	135	134	130	120	178	201	224	194	197	220	200
Chloride	mg/L	250*	NA	5,980	NA		27.3	28.5	29.1	29.1	29.0	29.2	31	28	15.3	14.2	13.2	15.4	16.8	15	12
Fluoride	ug/L	4,000	NA	1,000	NA		<1,000	<1,000	<1,000	<1,000	< 1,000	< 1,000	< 1,000	< 1,000	<1,000	<1,000	<1,000	<1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		156	135	90.8	18.7	148	140	64	17	330	325	332	226	402	690	540
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		558	552	566	476	568	554	570	490	726	892	936	740	800	1,000	860
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.1	7.0	7.2	6.9	7.3	--	6.9	7.0	7.0	7.1	7.2	7.1	7.0	6.6	7.3
Appendix IV																					
Antimony	ug/L	6	NA	1	6		< 1.0	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0	< 1.0	--	1.5	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0	--
Arsenic	ug/L	10	NA	10	**10**		5.2	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	**45.5**	2.0	2.6	3.8	2.0	1.6	1.8
Barium	ug/L	2,000	NA	340	2,000		85.6	71.3	65.8	73.8	74.4	70.6	82	81	148	76.7	62.8	57.6	97.7	130	75
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--
Chromium	ug/L	100	NA	3	100		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.3	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	--	< 15.0	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	--
Fluoride	ug/L	4,000	NA	1,000	4,000		<1,000	<1,000	<1,000	<1,000	< 1,000	< 1,000	< 1,000	< 1,000	<1,000	<1,000	<1,000	<1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--
Lithium	ug/L	NC	40	28	**40**		**55**	**73**	**65**	**62**	**64**	**63**	**43**	**60**	**75**	**160**	**150**	**130**	**120**	**100**	**140**
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--
Molybdenum	ug/L	NC	100	9	**100**		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	30.1	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		< 0.509	< 0.890	< 0.766	< 0.616	< 0.942	< 0.754	0.314	0.260	< 1.03	< 1.07	< 0.757	0.306	< 0.968	0.233	0.501
Radium-228	pCi/L	NC	NA	NA	NA		< 0.830	< 0.901	< 0.947	< 0.822	0.989	1.20	< 0.413	0.821	< 0.996	< 3.77	< 2.35	1.25	2.01	< 0.598	< 0.527
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 1.34	< 1.79	< 1.71	< 1.44	< 1.69	< 1.45	0.721	1.08	< 2.03	< 4.84	< 3.11	1.56	2.29	0.688	0.702
Selenium	ug/L	50	NA	3	50		< 1.0	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0	< 1.0	< 1.0	1.1	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	--

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to September 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-17003								BCC-MW-17004							
						Sample Date:	12/7/2017	2/20/2018	6/15/2018	8/7/2018	8/7/2018	11/29/2018	4/12/2019	9/26/2019	12/6/2017	2/20/2018	6/15/2018	8/7/2018	11/30/2018	4/12/2019	4/12/2019	9/26/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		Shallow 2017 Wells															
Appendix III											Field Dup										Field Dup	
Boron	ug/L	NC	NA	1,320	NA		413	394	369	383	377	410	380	350	367	429	525	425	601	440	450	570
Calcium	mg/L	NC	NA	259	NA		74.3	55.7	63.2	74.6	76.9	88.7	78	82	53.7	48.1	73.1	68.9	116	67	71	66
Chloride	mg/L	250*	NA	5,980	NA		18.3	21.5	22.7	21.9	21.8	19.1	17	23	21.3	21.3	21.4	21.2	18.7	19	20	16
Fluoride	ug/L	4,000	NA	1,000	NA		<1,000	<1,000	<1,000	<1,000	<1,000	< 1,000	< 1,000	< 1,000	<1,000	<1,000	<1,000	<1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		48.4	< 2.0	< 2.0	17.7	25.9	49.6	12	37	< 2.0	< 2.0	8.3	< 2.0	166	7.8	7.5	3.1
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		324	330	412	326	324	362	360	380	228	238	410	320	500	330	340	300
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.0	7.2	7.4	7.3	--	7.3	7.1	7.5	7.2	7.3	7.4	7.3	7.3	7.5	--	7.6
Appendix IV																						
Antimony	ug/L	6	NA	1	6		1.1	< 1.0	< 1.0	< 2.0	< 2.0	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0	< 1.0	--
Arsenic	ug/L	10	NA	10	**10**		**26**	< 1.0	< 1.0	1.0	1.1	< 1.0	3.8	9.4	2.5	1.8	1.1	< 1.0	2.1	1.7	1.7	< 1.0
Barium	ug/L	2,000	NA	340	2,000		128	78.1	66.5	77.9	83.3	92.7	83	93	145	116	175	148	252	150	150	140
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--
Chromium	ug/L	100	NA	3	100		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.2	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	--	< 15.0	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	--
Fluoride	ug/L	4,000	NA	1,000	4,000		<1,000	<1,000	<1,000	<1,000	<1,000	< 1,000	< 1,000	< 1,000	<1,000	<1,000	<1,000	<1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--
Lithium	ug/L	NC	40	28	**40**		19	17	13	18	18	19	15	14	< 10	< 10	< 10	< 10	14	< 8.0	8.0	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--
Molybdenum	ug/L	NC	100	9	**100**		48.8	6.3	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	9.9	5.9	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		< 0.889	< 0.755	< 0.594	< 0.687	0.353	< 0.685	0.205	0.347	< 0.945	< 0.723	< 0.441	< 0.519	< 0.766	0.182	< 0.203	0.271
Radium-228	pCi/L	NC	NA	NA	NA		< 0.663	< 0.707	< 0.828	0.932	< 0.871	< 0.695	< 0.483	< 0.521	< 0.804	< 0.719	< 0.810	1.03	< 0.790	0.539	< 0.623	< 0.546
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 1.55	< 1.46	< 1.42	< 1.49	< 1.03	< 1.38	0.539	0.676	< 1.75	< 1.44	< 1.25	< 1.46	< 1.56	0.721	0.638	< 0.546
Selenium	ug/L	50	NA	3	50		< 1.0	2.2	< 1.0	< 2.0	< 2.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	--

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 as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.

Table A1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – December 2015 to September 2019
BC Cobb – RCRA CCR Monitoring Program
Muskegon, Michigan

						Sample Location:	BCC-MW-17005											BCC-MW-17006						
						Sample Date:	12/6/2017	12/6/2017	2/20/2018	2/20/2018	6/15/2018	6/15/2018	8/7/2018	11/30/2018	4/12/2019	9/26/2019	9/26/2019	12/6/2017	2/20/2018	6/15/2018	8/7/2018	11/30/2018	4/12/2019	9/26/2019
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS		Shallow 2017 Wells																	
Appendix III								Field Dup		Field Dup		Field Dup					Field Dup							
Boron	ug/L	NC	NA	1,320	NA		191	208	238	228	377	353	342	350	400	490	520	669	594	653	765	630	650	600
Calcium	mg/L	NC	NA	259	NA		51.9	54.0	54.2	53.1	71.2	71.1	68.1	68.1	69	120	120	106	95.0	97.5	90.4	99.8	150	130
Chloride	mg/L	250*	NA	5,980	NA		19.4	19.4	21.6	21.3	20.5	20.5	19.6	18.5	15	17	17	19.0	20.3	20.9	21.5	20.4	19	18
Fluoride	ug/L	4,000	NA	1,000	NA		<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	< 1,000	< 1,000	< 1,000	< 1,000	<1,000	<1,000	<1,000	<1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	200	NA		11.5	11.00	< 2.0	< 2.0	9.6	9.0	4.3	42.1	120	65	64	129	93.1	69.8	46.2	102	290	220
Total Dissolved Solids	mg/L	500*	NA	5,170	NA		262	220	310	266	358	416	318	318	380	550	520	474	472	478	438	432	800	680
pH, Field	SU	6.5 - 8.5*	NA	6.6 - 8.3	NA		7.3	--	7.3	--	7.4	--	7.3	7.6	7.5	7.3	--	7.7	7.3	7.5	7.5	7.7	7.5	7.8
Appendix IV																								
Antimony	ug/L	6	NA	1	6		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0	--
Arsenic	ug/L	10	NA	10	**10**		2.9	2.8	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	4.9	2.4	4.6	< 1.0	6.6	5.9	4.3
Barium	ug/L	2,000	NA	340	2,000		168	167	123	128	161	149	179	131	84	340	350	83.3	79.0	70.3	73	68.6	120	98
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--
Chromium	ug/L	100	NA	3	100		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.1	3.8	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.2
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	--	--	< 15.0	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	--
Fluoride	ug/L	4,000	NA	1,000	4,000		<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	< 1,000	< 1,000	< 1,000	< 1,000	<1,000	<1,000	<1,000	<1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	2	15		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--
Lithium	ug/L	NC	40	28	**40**		10	12	11	11	< 10	< 10	13	11	< 8.0	14	14	38	37	31	36	32	35	28
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--
Molybdenum	ug/L	NC	100	9	**100**		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Radium-226	pCi/L	NC	NA	NA	NA		< 0.863	1.56	< 0.804	0.910	< 0.692	< 0.610	0.440	< 0.592	0.270	0.497	0.481	< 0.930	< 0.766	< 0.862	< 0.582	1.13	< 0.225	0.497
Radium-228	pCi/L	NC	NA	NA	NA		< 0.722	< 0.649	< 0.904	< 0.945	< 0.796	< 0.853	< 0.741	< 0.656	< 0.479	< 0.564	0.596	< 0.833	< 0.716	< 0.888	< 0.757	1.06	< 0.556	< 0.437
Radium-226/228	pCi/L	5	NA	2.42	**5**		< 1.59	< 1.61	< 1.71	< 1.80	< 1.49	< 1.46	< 1.15	< 1.25	0.700	0.739	1.08	< 1.76	< 1.48	< 1.75	< 1.34	2.19	< 0.556	0.819
Selenium	ug/L	50	NA	3	50		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0	< 1.0	< 1.0
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	--	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	--

Notes:

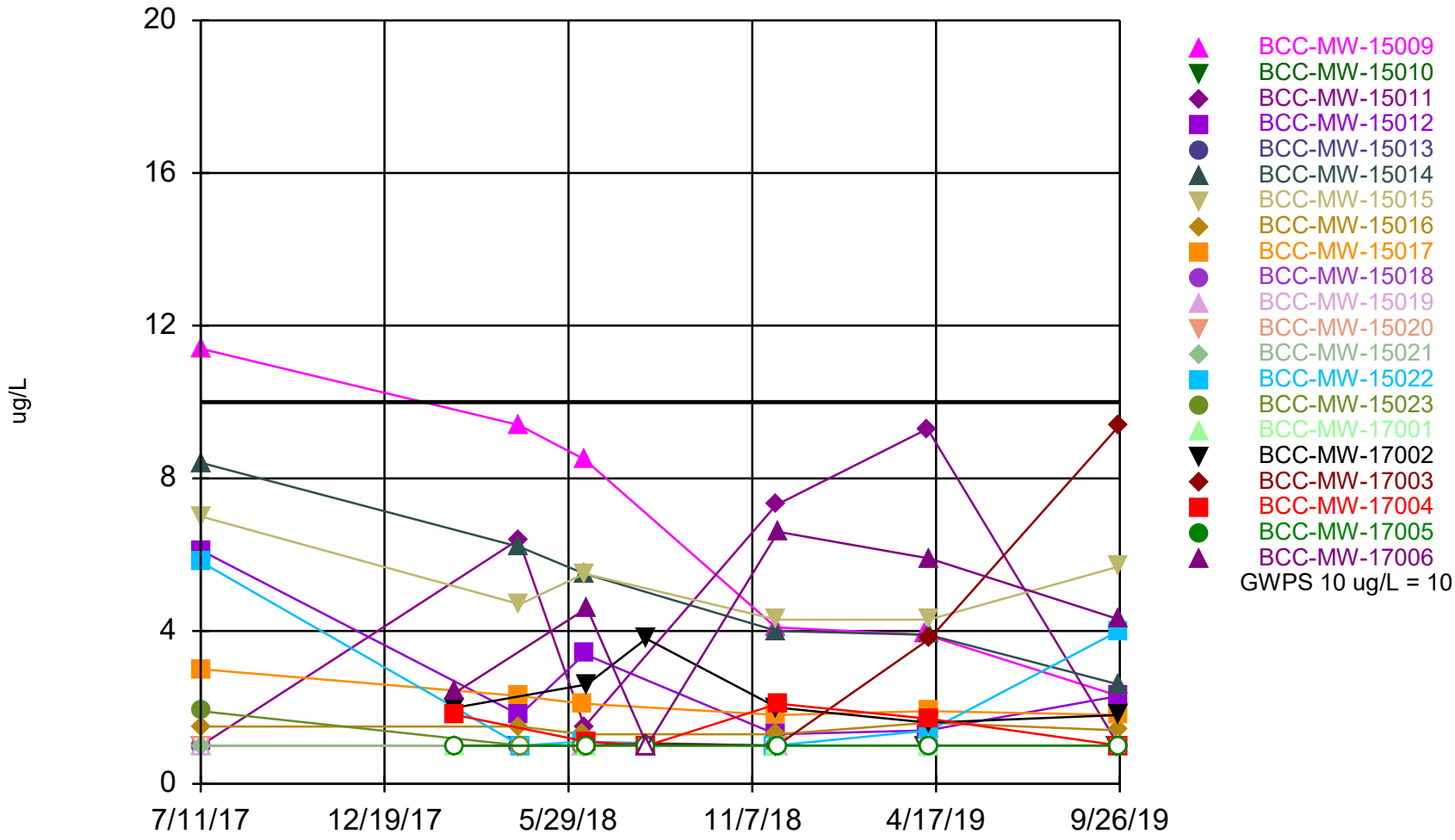
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional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

Technical Memorandum

Sanitas™ Output Files

Hollow symbols indicate censored values.

Time Series

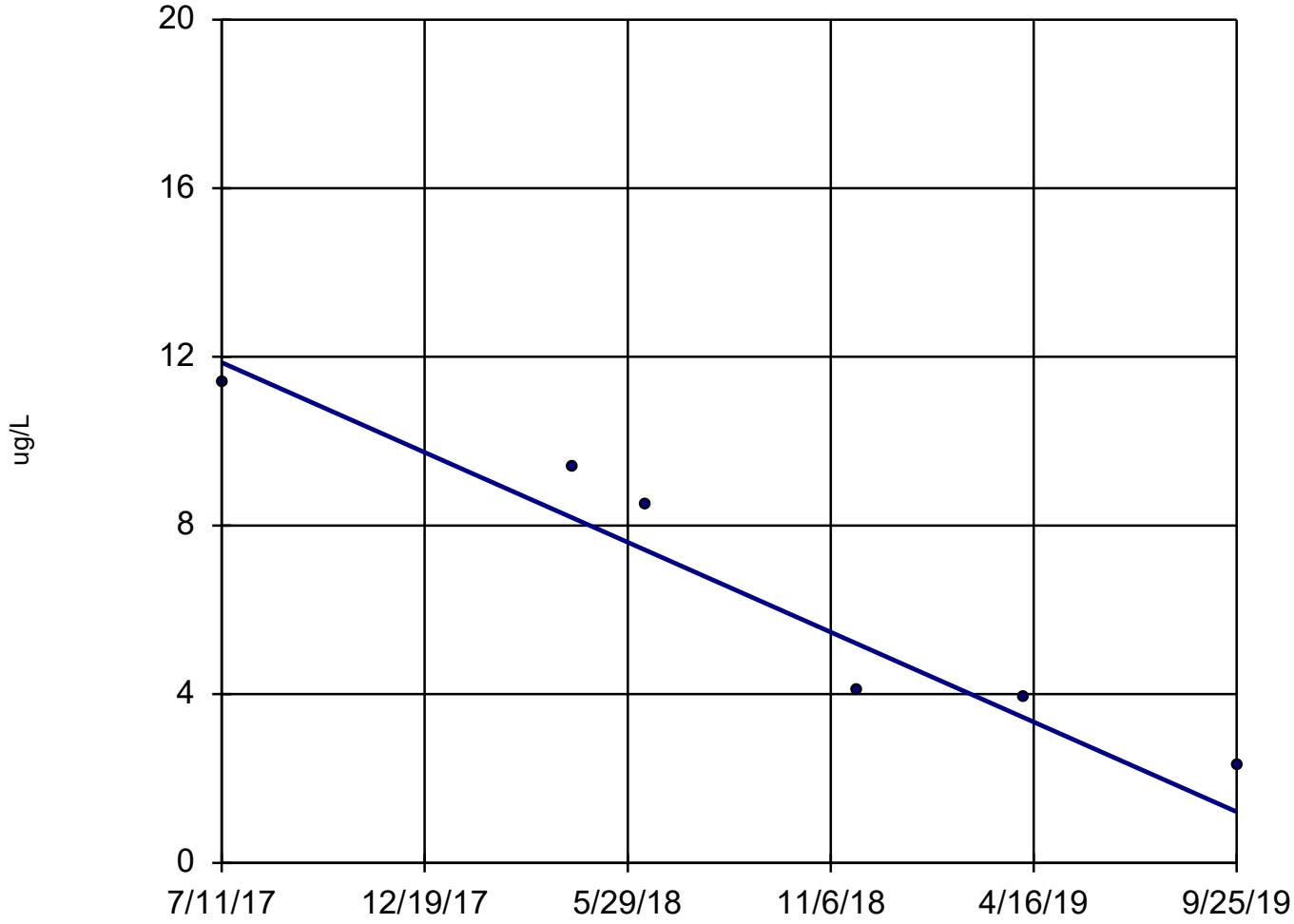


Constituent: Arsenic, Total Analysis Run 12/9/2019 8:05 AM

Client: Consumers Energy Data: BCC_Sanitas_19.11.06

Sen's Slope Estimator

BCC-MW-15009



n = 6

Slope = -4.825 units per year.

Mann-Kendall statistic = -15
critical = -13

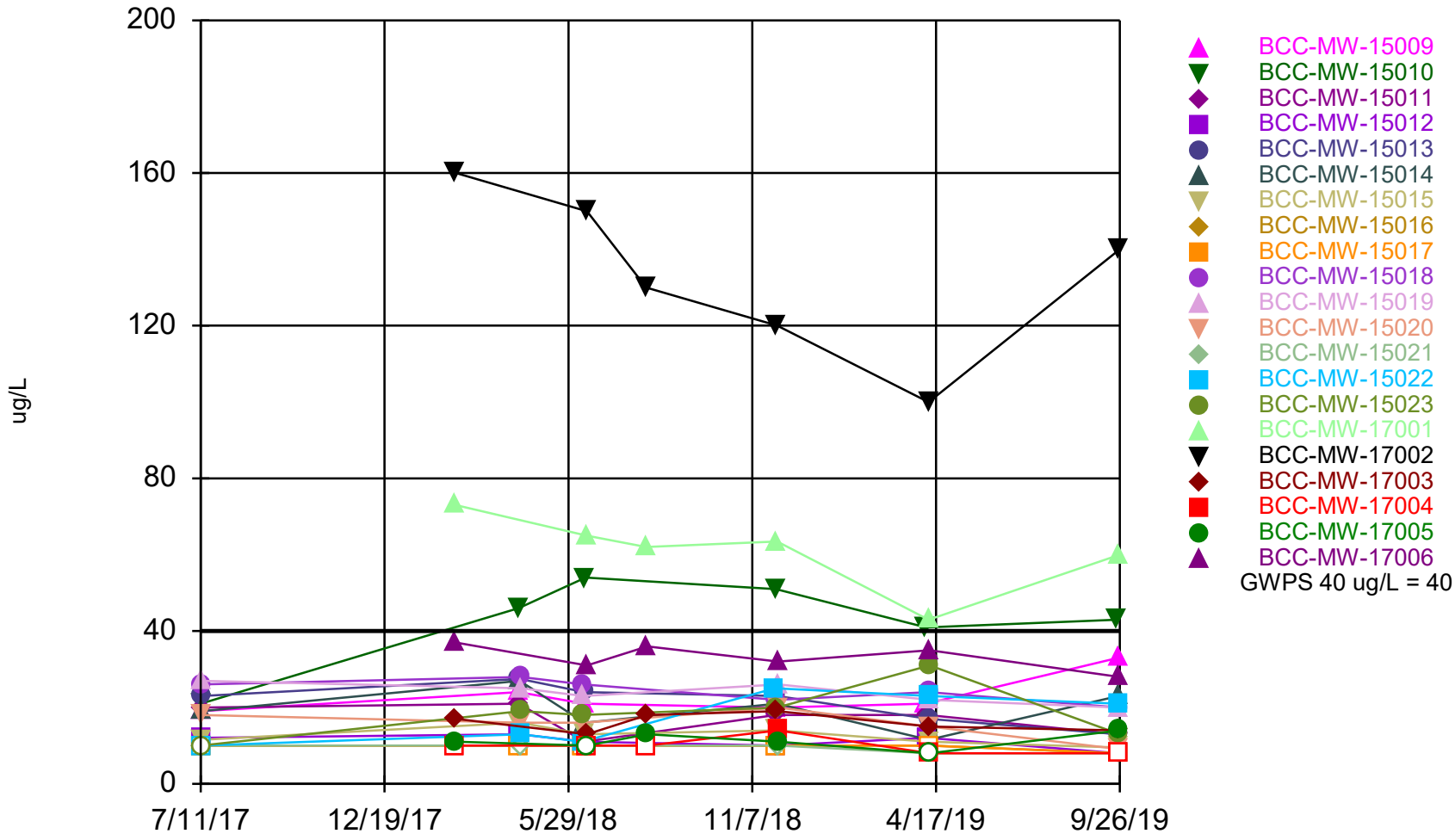
Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

Constituent: Arsenic, Total Analysis Run 11/7/2019 10:22 AM

Client: Consumers Energy Data: BCC_Sanitas_19.11.06

Hollow symbols indicate censored values.

Time Series

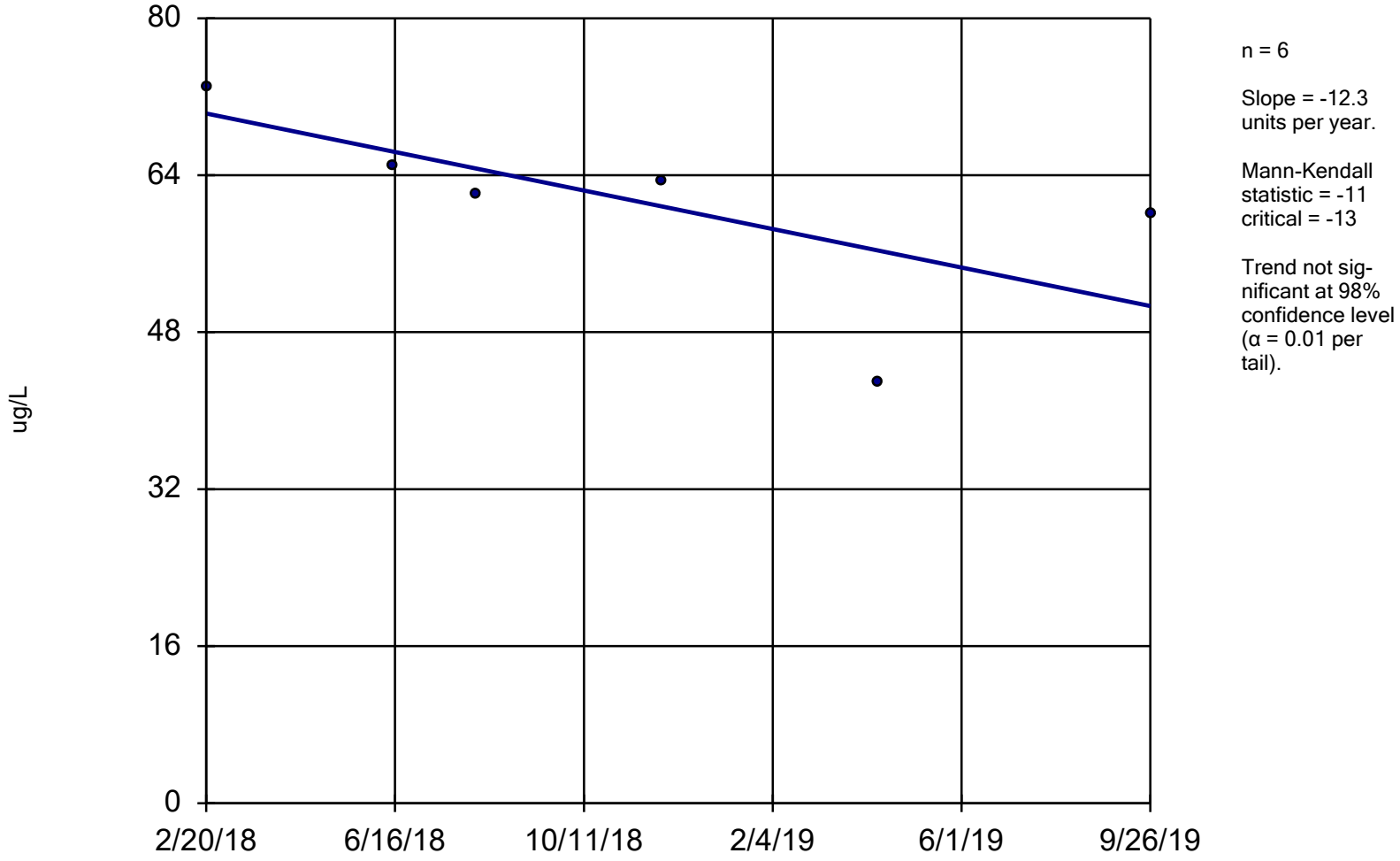


Constituent: Lithium, Total Analysis Run 12/9/2019 8:06 AM

Client: Consumers Energy Data: BCC_Sanitas_19.11.06

Sen's Slope Estimator

BCC-MW-17001



n = 6

Slope = -12.3 units per year.

Mann-Kendall statistic = -11
critical = -13

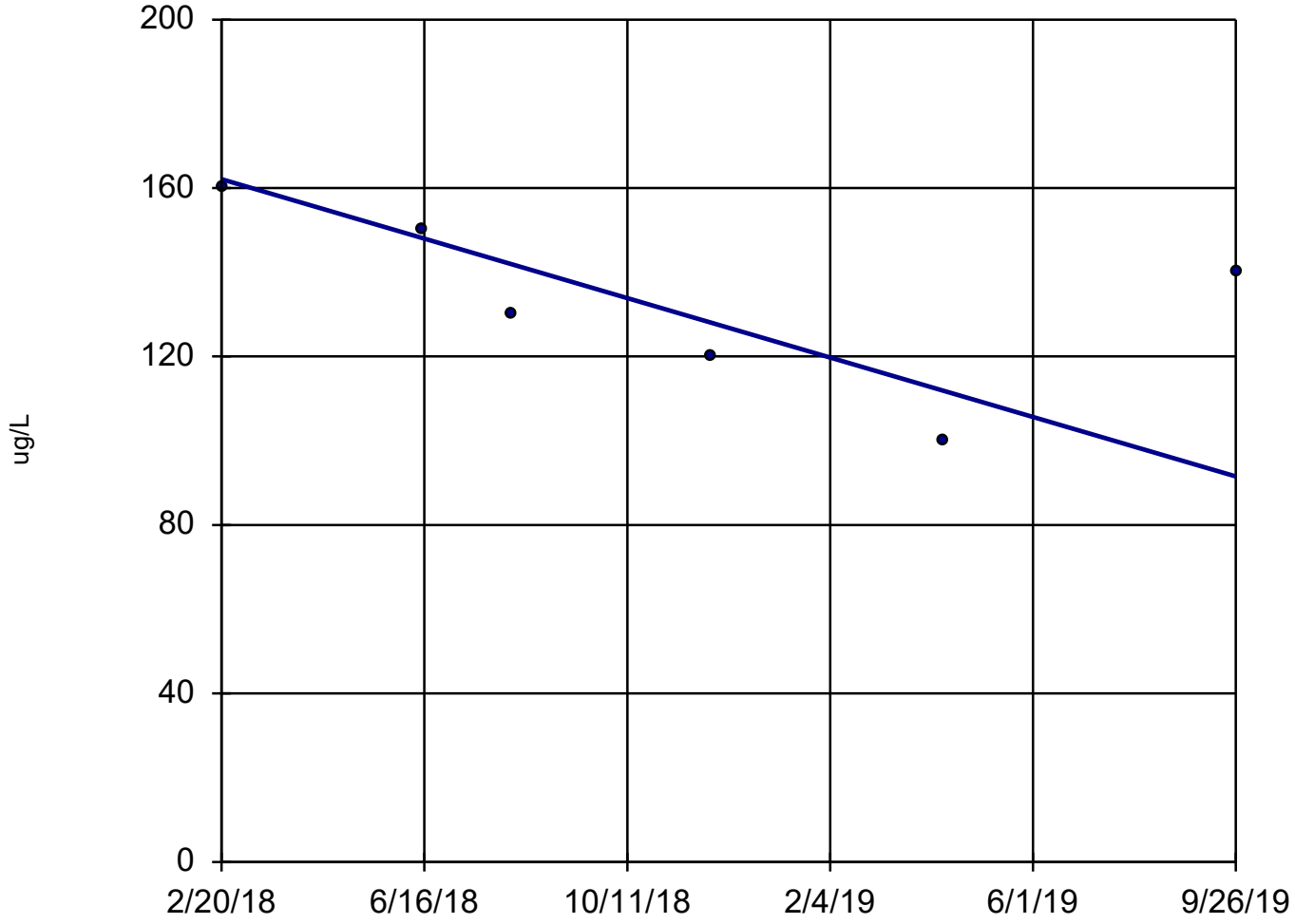
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Lithium, Total Analysis Run 11/7/2019 10:25 AM

Client: Consumers Energy Data: BCC_Sanitas_19.11.06

Sen's Slope Estimator

BCC-MW-17002



n = 6

Slope = -44.15 units per year.

Mann-Kendall statistic = -9
critical = -13

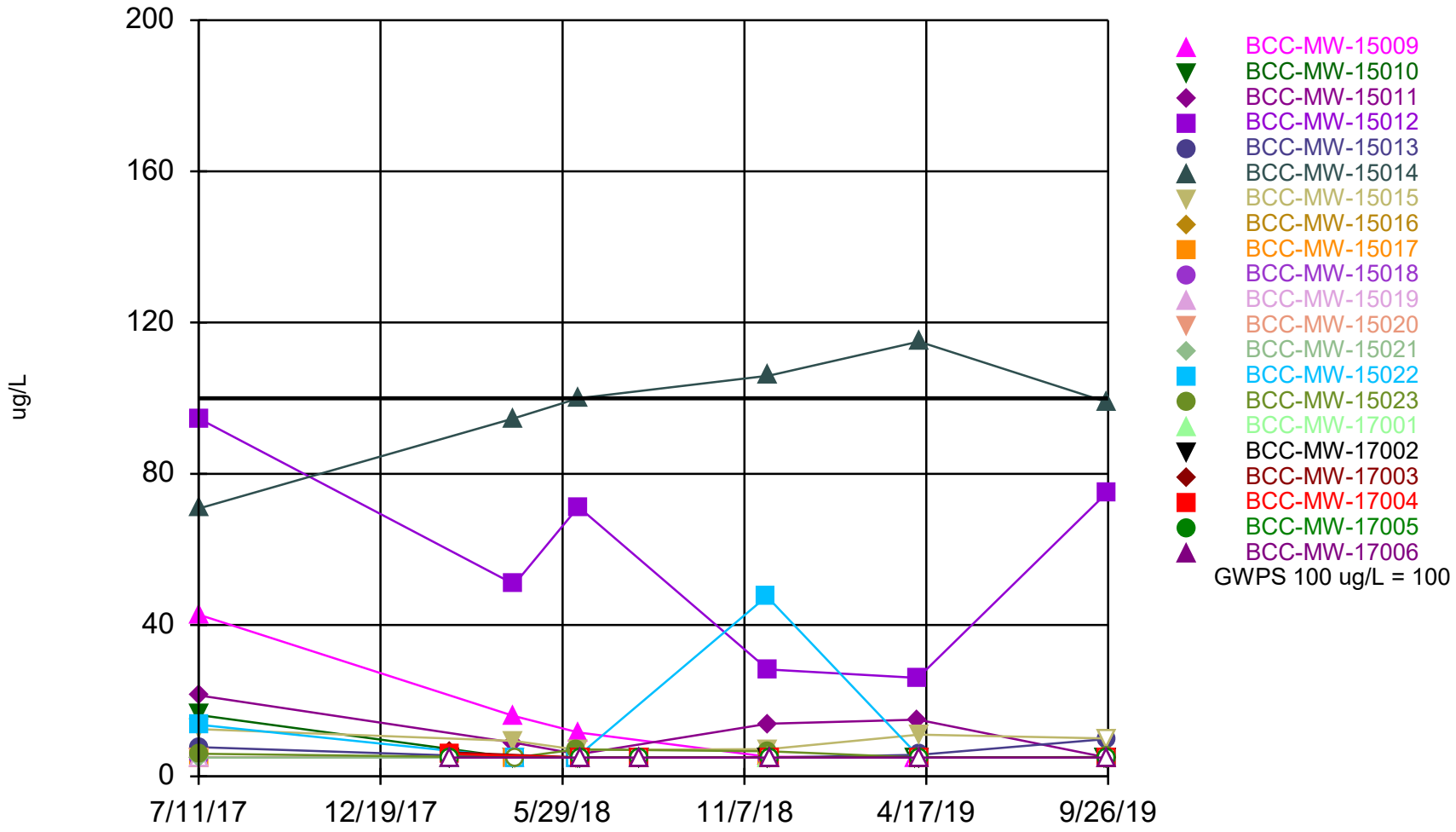
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Lithium, Total Analysis Run 11/7/2019 10:24 AM

Client: Consumers Energy Data: BCC_Sanitas_19.11.06

Hollow symbols indicate censored values.

Time Series

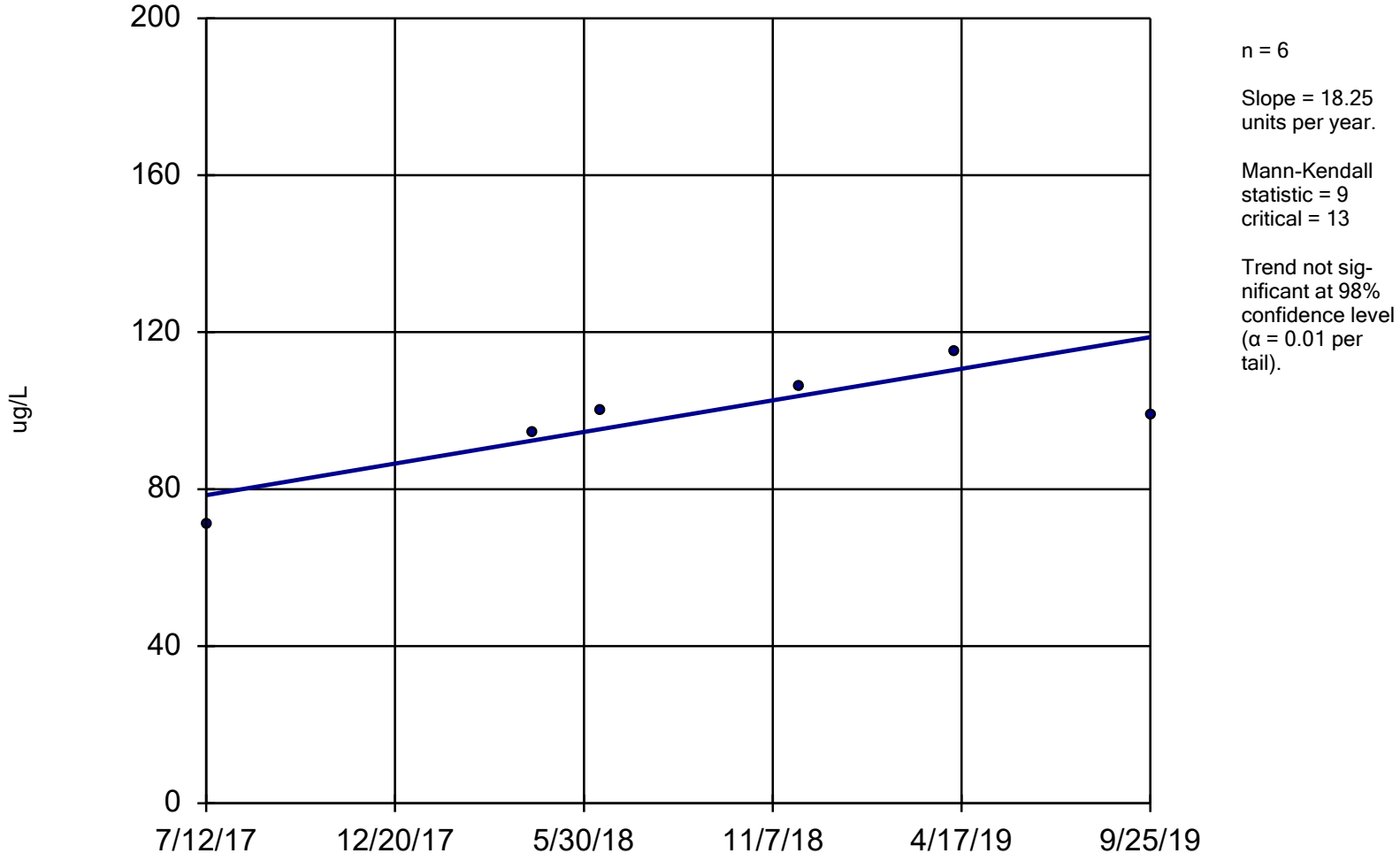


Constituent: Molybdenum, Total Analysis Run 12/9/2019 8:07 AM

Client: Consumers Energy Data: BCC_Sanitas_19.11.06

Sen's Slope Estimator

BCC-MW-15014



n = 6

Slope = 18.25 units per year.

Mann-Kendall statistic = 9
critical = 13

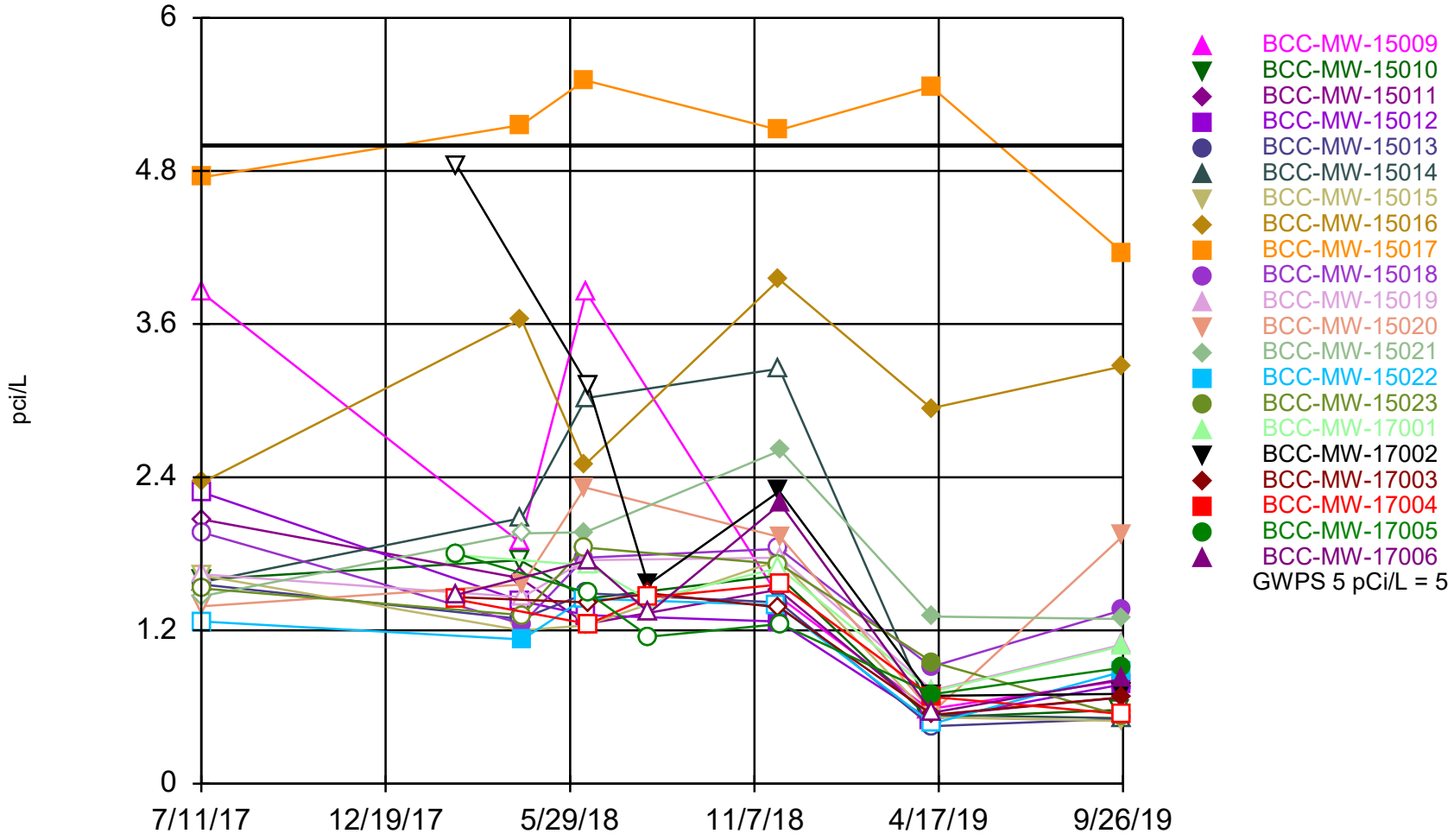
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Molybdenum, Total Analysis Run 11/7/2019 10:25 AM

Client: Consumers Energy Data: BCC_Sanitas_19.11.06

Hollow symbols indicate censored values.

Time Series



Constituent: Radium-226/228 Analysis Run 12/9/2019 8:07 AM

Client: Consumers Energy Data: BCC_Sanitas_19.11.06

Summary Report

Constituent: Arsenic, Total Analysis Run 12/9/2019 8:08 AM
Client: Consumers Energy Data: BCC_Sanitas_19.11.06

For observations made between 7/11/2017 and 9/26/2019, a summary of the selected data set:

Observations = 126
ND/Trace = 62
Wells = 21
Minimum Value = 1
Maximum Value = 11.4
Mean Value = 2.379
Median Value = 1.025
Standard Deviation = 2.266
Coefficient of Variation = 0.9525
Skewness = 1.893

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	6	0	2.3	11.4	6.6	6.3	3.647	0.5526	0.111
BCC-MW-15010	6	6	1	1	1	1	0	0	NaN
BCC-MW-15011	6	2	1	9.3	4.417	3.95	3.686	0.8347	0.1909
BCC-MW-15012	6	0	1.3	6.1	2.717	2.05	1.826	0.6721	1.191
BCC-MW-15013	6	6	1	1	1	1	0	0	NaN
BCC-MW-15014	6	0	2.6	8.4	5.1	4.75	2.057	0.4034	0.4693
BCC-MW-15015	6	0	4.3	7	5.25	5.1	1.043	0.1986	0.6931
BCC-MW-15016	6	0	1.3	1.6	1.433	1.45	0.1211	0.08449	0.05482
BCC-MW-15017	6	0	1.8	3	2.15	2	0.4593	0.2136	1.166
BCC-MW-15018	6	6	1	1	1	1	0	0	NaN
BCC-MW-15019	6	6	1	1	1	1	0	0	NaN
BCC-MW-15020	6	6	1	1	1	1	0	0	NaN
BCC-MW-15021	6	5	1	1	1	1	0	0	NaN
BCC-MW-15022	6	2	1	5.8	2.383	1.25	2.036	0.8543	0.9279
BCC-MW-15023	6	5	1	1.9	1.15	1	0.3674	0.3195	1.789
BCC-MW-17001	6	6	1	1	1	1	0	0	NaN
BCC-MW-17002	6	0	1.6	3.8	2.3	2	0.8075	0.3511	1.199
BCC-MW-17003	6	3	1	9.4	2.875	1.025	3.386	1.178	1.427
BCC-MW-17004	6	2	1	2.1	1.45	1.4	0.4764	0.3286	0.2188
BCC-MW-17005	6	6	1	1	1	1	0	0	NaN
BCC-MW-17006	6	1	1	6.6	4.133	4.45	2.111	0.5106	-0.3575

Summary Report

Constituent: Lithium, Total Analysis Run 12/9/2019 8:08 AM
Client: Consumers Energy Data: BCC_Sanitas_19.11.06

For observations made between 7/11/2017 and 9/26/2019, a summary of the selected data set:

Observations = 126
ND/Trace = 27
Wells = 21
Minimum Value = 8
Maximum Value = 160
Mean Value = 25.7
Median Value = 18
Standard Deviation = 27.78
Coefficient of Variation = 1.081
Skewness = 3.143

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	6	0	19	33	23	21	5.177	0.2251	1.412
BCC-MW-15010	6	0	21	54	42.67	44.5	11.67	0.2736	-1.116
BCC-MW-15011	6	0	11	21	16.83	18	3.971	0.2359	-0.5164
BCC-MW-15012	6	1	8	13	11	11.5	1.789	0.1626	-0.6889
BCC-MW-15013	6	0	13	27.5	21.25	23	5.27	0.248	-0.5427
BCC-MW-15014	6	0	11.5	27	19.58	20	5.426	0.2771	-0.1696
BCC-MW-15015	6	0	9.5	16	12.5	12.25	2.324	0.1859	0.2619
BCC-MW-15016	6	6	8	10	9.667	10	0.8165	0.08447	-1.789
BCC-MW-15017	6	6	8	10	9.667	10	0.8165	0.08447	-1.789
BCC-MW-15018	6	0	20	28	24.33	25	2.944	0.121	-0.3053
BCC-MW-15019	6	0	20	27	23.83	24	2.639	0.1107	-0.233
BCC-MW-15020	6	0	9.1	20	15.68	16	3.688	0.2352	-0.8417
BCC-MW-15021	6	6	8	10	9.333	10	1.033	0.1107	-0.7071
BCC-MW-15022	6	1	10	25	17.17	17	6.585	0.3836	0.04646
BCC-MW-15023	6	1	10	31	18.5	18.5	7.232	0.3909	0.6812
BCC-MW-17001	6	0	43	73	61.08	62.75	9.922	0.1624	-0.9303
BCC-MW-17002	6	0	100	160	133.3	135	21.6	0.162	-0.3381
BCC-MW-17003	6	0	13	19	16	16	2.366	0.1479	0
BCC-MW-17004	6	4	8	14	10	10	2.191	0.2191	1
BCC-MW-17005	6	2	8	14	11.17	11	2.137	0.1914	-0.09978
BCC-MW-17006	6	0	28	37	33.17	33.5	3.43	0.1034	-0.3498

Summary Report

Constituent: Molybdenum, Total Analysis Run 12/9/2019 8:08 AM
Client: Consumers Energy Data: BCC_Sanitas_19.11.06

For observations made between 7/11/2017 and 9/26/2019, a summary of the selected data set:

Observations = 126
ND/Trace = 87
Wells = 21
Minimum Value = 5
Maximum Value = 115
Mean Value = 13.51
Median Value = 5
Standard Deviation = 23.34
Coefficient of Variation = 1.728
Skewness = 3.067

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	6	2	5	42.75	14.26	8.4	14.67	1.029	1.444
BCC-MW-15010	6	5	5	16.2	6.867	5	4.572	0.6659	1.789
BCC-MW-15011	6	1	5	21.4	11.67	11.4	6.283	0.5385	0.3984
BCC-MW-15012	6	0	26	94.5	57.65	61.05	27.41	0.4754	0.005288
BCC-MW-15013	6	2	5	9.9	6.383	5.35	2.015	0.3157	1.004
BCC-MW-15014	6	0	70.9	115	97.6	99.5	14.85	0.1521	-0.8822
BCC-MW-15015	6	1	7	12.45	9.508	9.7	2.133	0.2243	0.0183
BCC-MW-15016	6	6	5	5	5	5	0	0	NaN
BCC-MW-15017	6	6	5	5	5	5	0	0	NaN
BCC-MW-15018	6	6	5	5	5	5	0	0	NaN
BCC-MW-15019	6	6	5	5	5	5	0	0	NaN
BCC-MW-15020	6	6	5	5	5	5	0	0	NaN
BCC-MW-15021	6	6	5	5	5	5	0	0	NaN
BCC-MW-15022	6	4	5	47.6	13.53	5	17.04	1.259	1.641
BCC-MW-15023	6	2	5	7.1	5.8	5.55	0.9099	0.1569	0.3926
BCC-MW-17001	6	6	5	5	5	5	0	0	NaN
BCC-MW-17002	6	6	5	5	5	5	0	0	NaN
BCC-MW-17003	6	5	5	6.3	5.217	5	0.5307	0.1017	1.789
BCC-MW-17004	6	5	5	5.9	5.15	5	0.3674	0.07134	1.789
BCC-MW-17005	6	6	5	5	5	5	0	0	NaN
BCC-MW-17006	6	6	5	5	5	5	0	0	NaN

Summary Report

Constituent: Radium-226/228 Analysis Run 12/9/2019 8:08 AM
Client: Consumers Energy Data: BCC_Sanitas_19.11.06

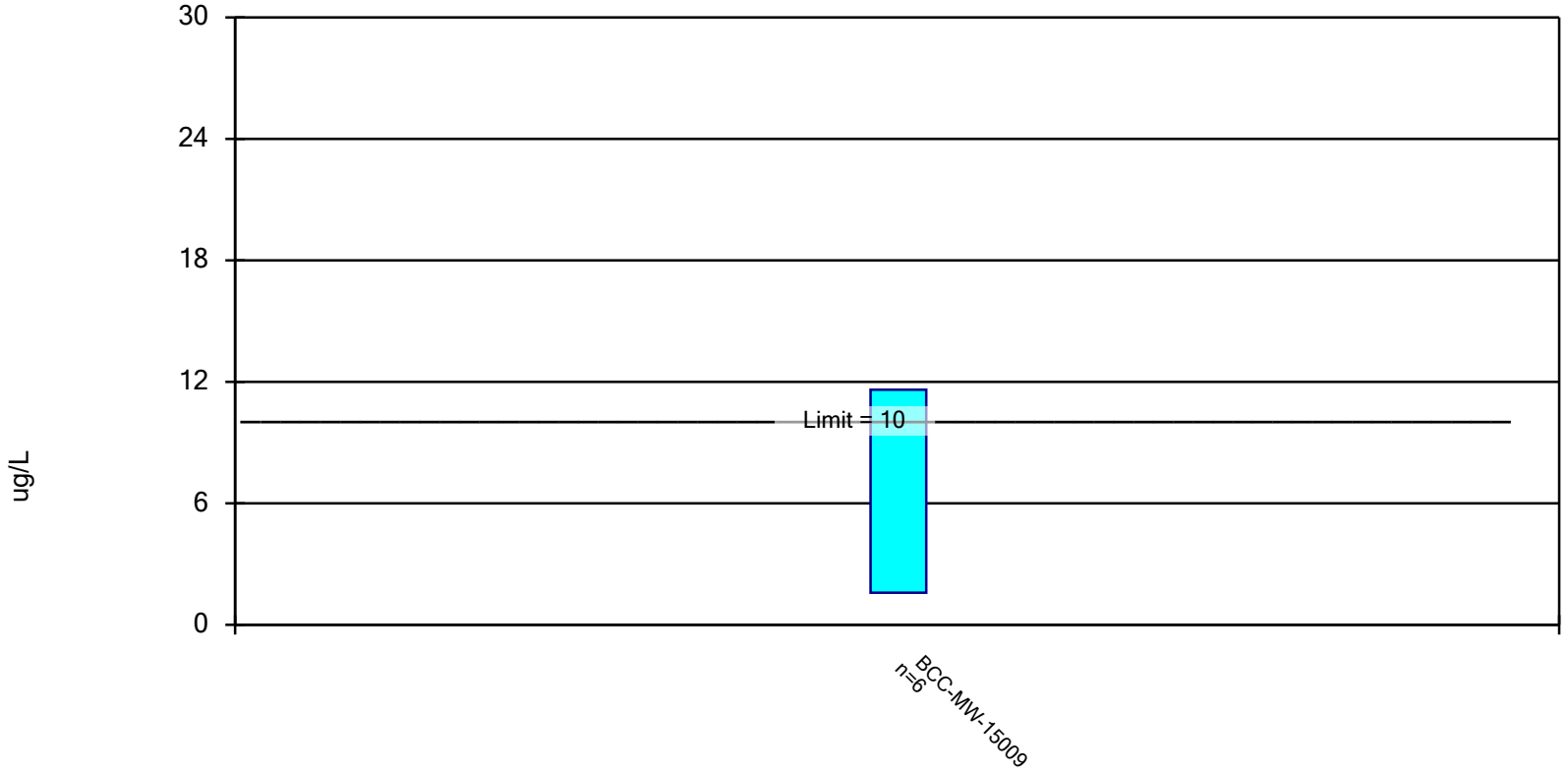
For observations made between 7/11/2017 and 9/26/2019, a summary of the selected data set:

Observations = 126
ND/Trace = 76
Wells = 21
Minimum Value = 0.45
Maximum Value = 5.51
Mean Value = 1.681
Median Value = 1.46
Standard Deviation = 1.101
Coefficient of Variation = 0.6549
Skewness = 1.721

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
BCC-MW-15009	6	5	0.583	3.85	2.075	1.68	1.452	0.6996	0.4009
BCC-MW-15010	6	6	0.516	1.75	1.254	1.525	0.5563	0.4436	-0.6195
BCC-MW-15011	6	5	0.532	2.07	1.276	1.385	0.5862	0.4594	-0.08447
BCC-MW-15012	6	3	0.4995	2.28	1.263	1.295	0.6141	0.4864	0.4716
BCC-MW-15013	6	5	0.45	1.56	1.12	1.355	0.5045	0.4506	-0.6157
BCC-MW-15014	6	6	0.513	3.25	1.83	1.83	1.18	0.6447	0.01386
BCC-MW-15015	6	6	0.491	1.75	1.138	1.22	0.5355	0.4705	-0.2286
BCC-MW-15016	6	0	2.36	3.95	3.11	3.105	0.6286	0.2021	0.08107
BCC-MW-15017	6	0	4.16	5.51	5.027	5.14	0.5051	0.1005	-0.8071
BCC-MW-15018	6	2	0.915	1.97	1.518	1.565	0.4078	0.2687	-0.3221
BCC-MW-15019	6	3	0.7315	1.77	1.407	1.55	0.4155	0.2953	-0.7295
BCC-MW-15020	6	2	0.558	2.32	1.616	1.745	0.612	0.3786	-0.7493
BCC-MW-15021	6	2	1.29	2.61	1.768	1.715	0.5126	0.2899	0.6169
BCC-MW-15022	6	4	0.47	1.45	1.1	1.2	0.3712	0.3376	-0.7937
BCC-MW-15023	6	4	0.527	1.85	1.317	1.425	0.4998	0.3797	-0.5496
BCC-MW-17001	6	4	0.721	1.79	1.405	1.565	0.4236	0.3015	-0.7095
BCC-MW-17002	6	2	0.688	4.84	2.198	1.925	1.597	0.7263	0.6534
BCC-MW-17003	6	4	0.539	1.49	1.161	1.4	0.4324	0.3725	-0.7156
BCC-MW-17004	6	5	0.546	1.56	1.156	1.345	0.4346	0.376	-0.5797
BCC-MW-17005	6	4	0.7	1.8	1.217	1.2	0.3954	0.325	0.1841
BCC-MW-17006	6	4	0.556	2.19	1.356	1.41	0.5991	0.4419	-0.02322

Parametric Confidence Interval

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



Constituent: Arsenic, Total Analysis Run 12/11/2019 3:01 PM

Client: Consumers Energy Data: BCC_Sanitas_19.11.06

Confidence Interval

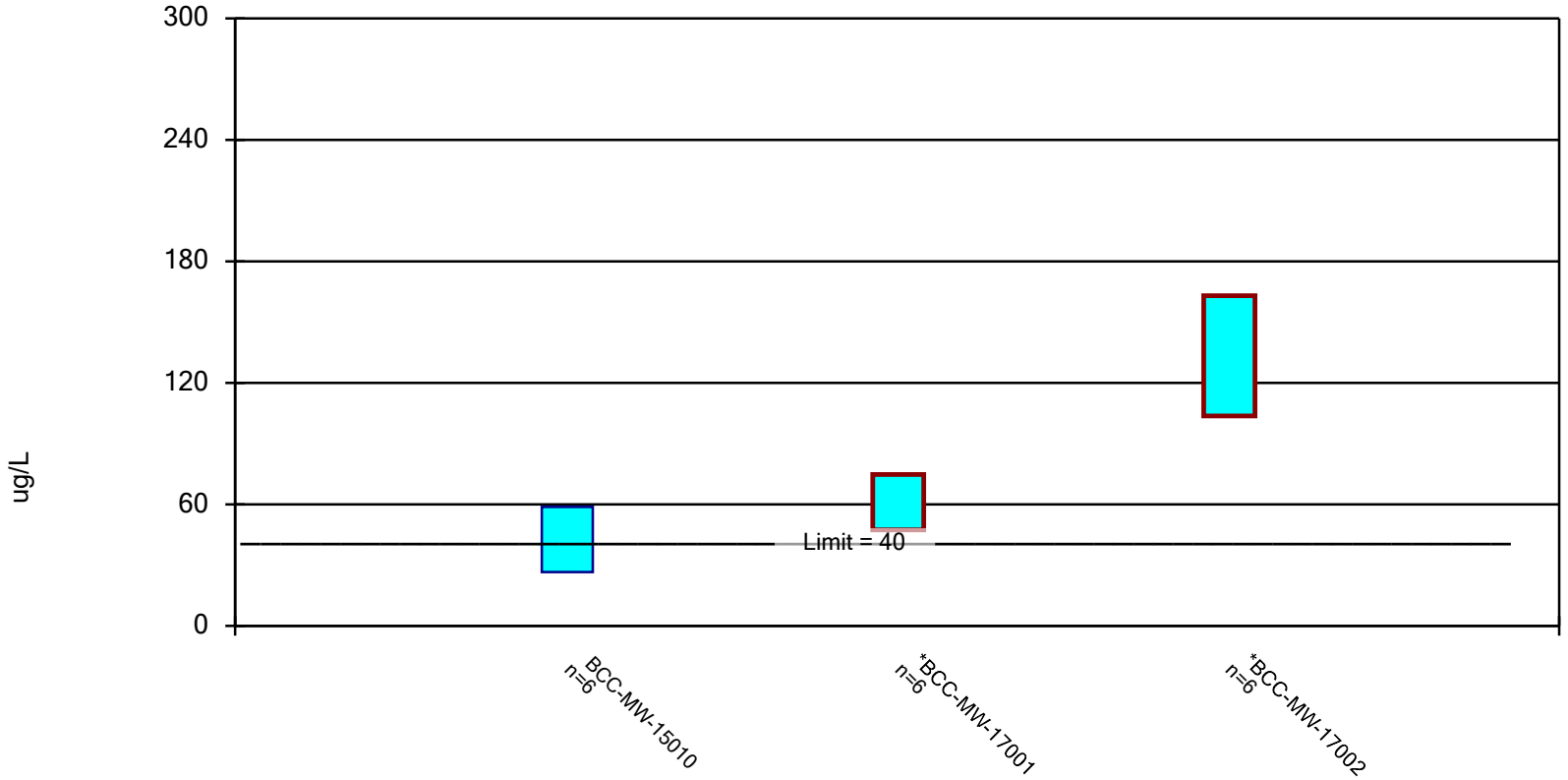
Constituent: Arsenic, Total (ug/L) Analysis Run 12/11/2019 3:02 PM

Client: Consumers Energy Data: BCC_Sanitas_19.11.06

	BCC-MW-15009
7/11/2017	11.4 (D)
4/16/2018	9.4
6/13/2018	8.5
11/28/2018	4.1
4/9/2019	3.9
9/25/2019	2.3
Mean	6.6
Std. Dev.	3.647
Upper Lim.	11.61
Lower Lim.	1.589

Parametric Confidence Interval

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



Constituent: Lithium, Total Analysis Run 11/7/2019 12:48 PM

Client: Consumers Energy Data: BCC_Sanitas_19.11.06

Confidence Interval

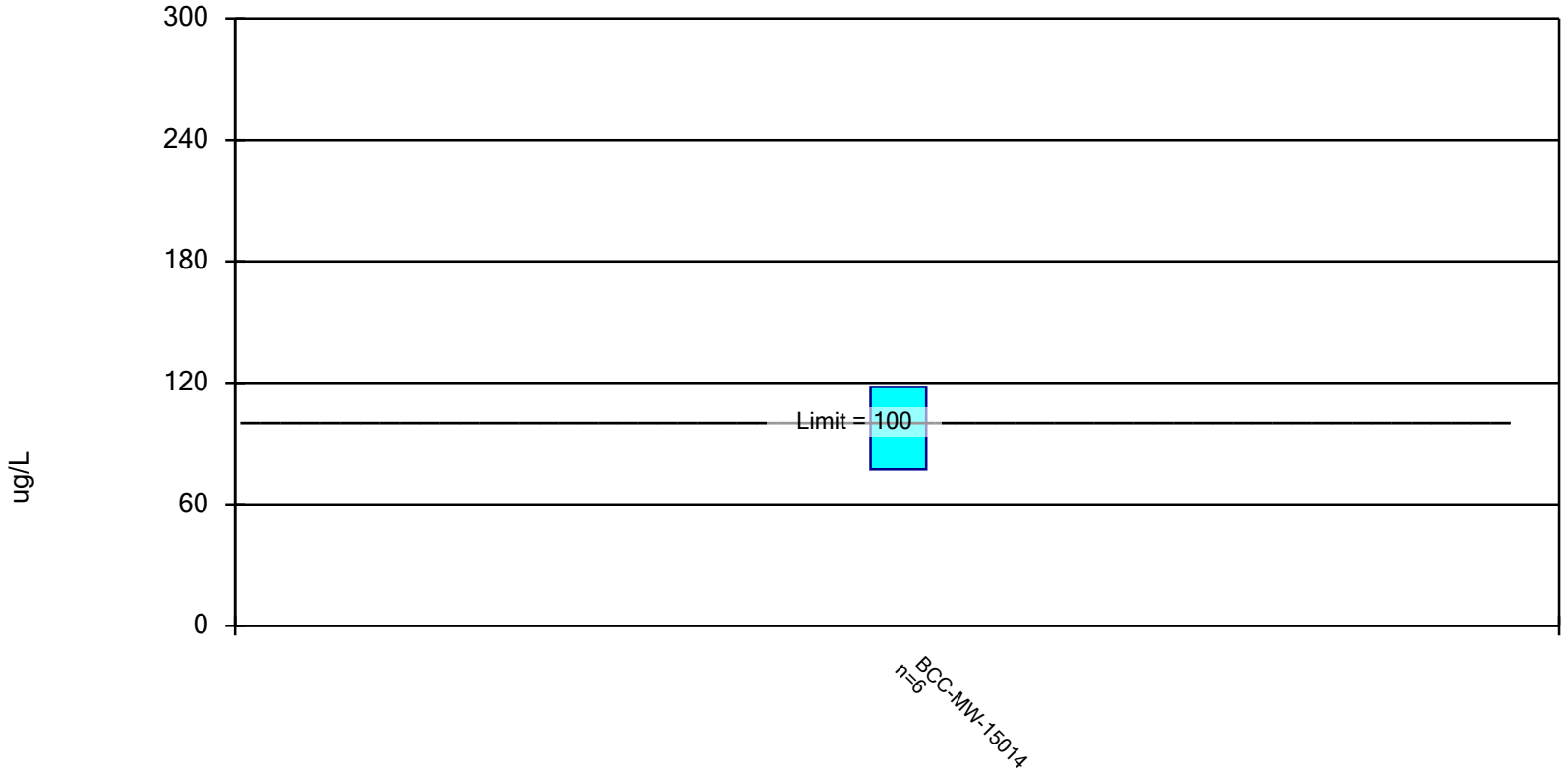
Constituent: Lithium, Total (ug/L) Analysis Run 11/7/2019 12:48 PM

Client: Consumers Energy Data: BCC_Sanitas_19.11.06

	BCC-MW-15010	BCC-MW-17001	BCC-MW-17002
7/11/2017	21		
2/20/2018		73	160
4/16/2018	46		
6/14/2018	54		
6/15/2018		65	150
8/6/2018		62	130
11/28/2018	51		
11/29/2018		63.5 (D)	120
4/9/2019	41		
4/11/2019		43	100
9/24/2019	43		
9/26/2019		60	140
Mean	42.67	61.08	133.3
Std. Dev.	11.67	9.922	21.6
Upper Lim.	58.7	74.71	163
Lower Lim.	26.63	47.45	103.7

Parametric Confidence Interval

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



Constituent: Molybdenum, Total Analysis Run 11/7/2019 12:50 PM

Client: Consumers Energy Data: BCC_Sanitas_19.11.06

Confidence Interval

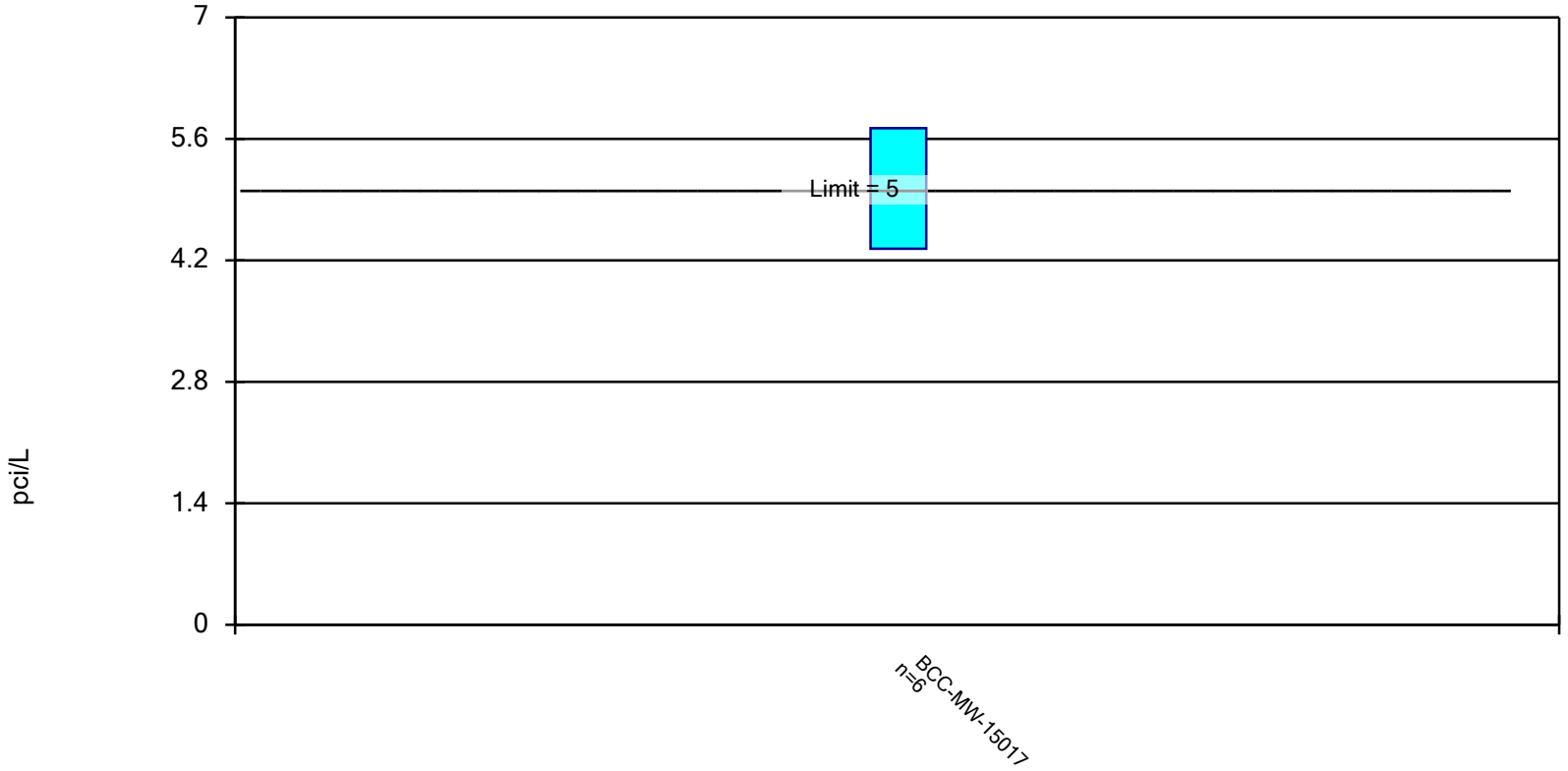
Constituent: Molybdenum, Total (ug/L) Analysis Run 11/7/2019 12:50 PM

Client: Consumers Energy Data: BCC_Sanitas_19.11.06

	BCC-MW-15014
7/12/2017	70.9
4/17/2018	94.7
6/13/2018	100
11/29/2018	106
4/11/2019	115 (D)
9/25/2019	99
Mean	97.6
Std. Dev.	14.85
Upper Lim.	118
Lower Lim.	77.2

Parametric Confidence Interval

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



Constituent: Radium-226/228 Analysis Run 11/7/2019 12:49 PM

Client: Consumers Energy Data: BCC_Sanitas_19.11.06

Confidence Interval

Constituent: Radium-226/228 (pci/L) Analysis Run 11/7/2019 12:49 PM

Client: Consumers Energy Data: BCC_Sanitas_19.11.06

	BCC-MW-15017
7/12/2017	4.75
4/17/2018	5.16
6/12/2018	5.51 (D)
11/29/2018	5.12
4/11/2019	5.46
9/26/2019	4.16
Mean	5.027
Std. Dev.	0.5051
Upper Lim.	5.721
Lower Lim.	4.333

Appendix F
ACM Extension Certification

Consumers Energy
Count on Us®

A CMS Energy Company

Date: July 12, 2019

To: Operating Record

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

RE: Demonstration for 60-Day Extension for Assessment of Corrective Measures
Professional Engineer Certification
BC Cobb Bottom Ash Pond and BC Cobb Ponds 0-8

Professional Engineer Certification Statement [§257.96(a)]

Consumers Energy has determined that the analysis of the effectiveness of potential corrective measures in meeting all of the requirements and objectives of a selected remedy described in §257.97 cannot be achieved within the 90-day timeline to complete the Assessment of Corrective Measures for BC Cobb Bottom Ash Pond and BC Cobb Ponds 0-8 due to site-specific conditions that are changing based on initiating closure activities. Notification was made on March 30, 2018 that closure activities had been initiated. Groundwater monitoring data collected to date indicates changing conditions that can influence factors that must be considered in the assessment, including source evaluation, plume delineation, groundwater assessment, and source control. The final published rule allows for a single 60 day extension based on site-specific conditions or circumstances.

I hereby attest that, having reviewed the detection and assessment monitoring documentation and being familiar with the provisions of Title 40 of the Code of Federal Regulations §257.96, that the demonstration justifying a 60-day time extension to the 90-day completion period of the Assessment of Corrective Measures is accurate for BC Cobb Bottom Ash Pond and BC Cobb Ponds 0-8 in accordance with the requirements of §257.96(a). This will now set the deadline for completing the Assessment of Corrective Measures for September 11, 2019.

Harold D. Register, Jr.

Signature

STATE OF MICHIGAN
HAROLD D. REGISTER, JR.
ENGINEER
No. 6201056266
LICENSED PROFESSIONAL ENGINEER

July 12, 2019

Date of Certification

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

Name

07/12/2019

6201056266

Professional Engineer Certification Number

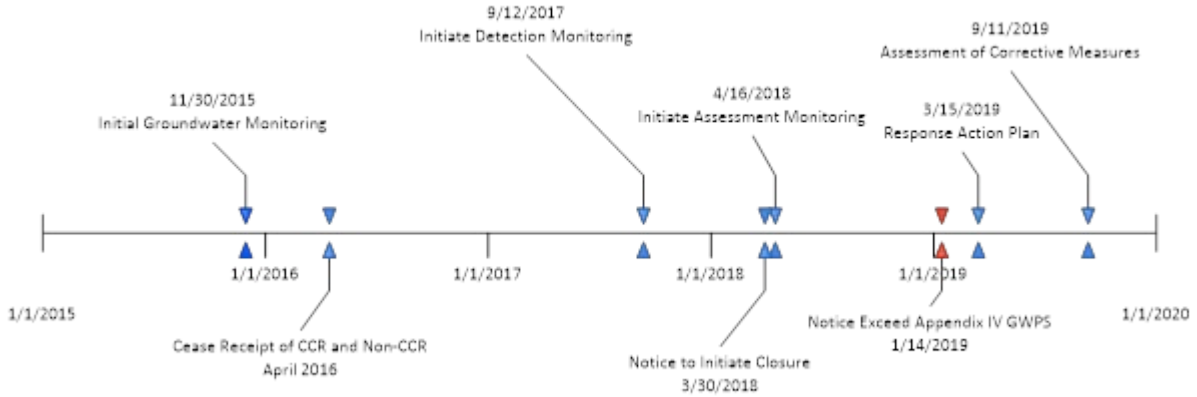
Appendix G
Semiannual Progress Report

Initial Semiannual Progress Report - Selection of Final Remedy

BC Cobb Bottom Ash Pond and Ponds 0-8 CCR Units
Michelle Marion, Consumers Energy
January 30, 2020

This Semi-annual Progress Report, prepared as a requirement of §257.97(a) of the federal Coal Combustion Residual (CCR Rule), describes progress toward selecting and designing the final remedy for CCR units that triggered Assessment of Corrective Measures (ACM) under the CCR Rule: the BC Cobb Bottom Ash Pond and Ponds 0-8 (BCC Ponds). A progress report is required to be prepared semiannually upon completion of the Assessment of Corrective Measures Report until the final remedy is selected.

As presented in the key milestones timeline below, a groundwater monitoring system was installed for the BCC Ponds and background monitoring commenced in December 2015. Consumers Energy Company (CEC) first reported the potential for statistically significant increases (SSIs) for Appendix IV constituents in the *"Notification of Appendix IV Constituent Exceeding Groundwater Protection Standard per §257.95(g)"* (CEC, January 2019). Subsequently, the Assessment of Corrective Measures Report (TRC, September 2019) was completed on September 11, 2019.



Source Control Measures Undertaken

In 2018, CEC placed the February 2018 Closure Plan, prepared and certified by Golder Associates, Inc. in the Operating record and provided formal Notification of Intent to Initiate Closure on March 30, 2018 confirming that CEC plans to close the BCC Ponds under the CCR Rule's closure by removal provision in §257.102(c). Consumers Energy also submitted a closure work plan to the Michigan Department of Environmental Quality, now the Department of Environment, Great Lakes, and Energy, who approved it on October 16, 2018 and clarified the workplan on August 13, 2018 and September 20, 2019. Excavation of CCR removal is planned to commence in 2020; with elements of construction such as design, permitting, and procurement having already commenced. Removal activities are planned to be completed and documented in an excavation completion report by 2023.

Results of 2019 Semi-Annual Sampling Events

The statistical assessments from both 2019 semiannual groundwater monitoring events have confirmed that lithium is the only Appendix IV constituent present at statistically significant levels above the Groundwater Protection Standard (GWPS). Although lithium concentrations exceed the site-specific GWPS in on-site groundwater, the property containing the site is owned and operated by Consumers Energy and on-site groundwater is not used for drinking water. Additionally, concentrations of lithium are below applicable State of Michigan unrestricted cleanup criteria. The nearest off-site drinking water well is more than 2,000 feet away on the other side of the North Branch of the Muskegon River. Groundwater chemistry already appears to be improving as a result of discontinuing the hydraulic loading to BCC Ponds and is expected to further improve following the completed source removal of CCR.

Progress Towards Remedy Selection

Consumers Energy first provided the Michigan Department of Environment, Great Lakes, and Energy (EGLE) a Response Action Plan prepared in accordance with Part 115 on March 15, 2019 after calculating a potential SSI for lithium at BCC Ponds. This report documents identified potential sources of contamination, interim response activities taken to control possible sources of contamination, and a schedule for terminating receipt of waste and initiating closure of the BCC Ponds. This report was approved by EGLE on May 14, 2019. CEC also committed to initiate an Assessment of Corrective Measures (ACM) which was submitted to EGLE on September 11, 2019. This ACM stated that Consumers Energy plans to use an adaptive management strategy that includes measures to remove source material, reduce infiltration, and/or minimize the potential future migration.

Source removal is schedule to begin in 2020 and will consist of dewatering to allow for excavation of the vertical and lateral extent of waste CCR. The reduction of hydraulic loading and recharge of the aquifer are expected to have changed groundwater redox conditions (e.g. from aerobic to anaerobic) and the physical removal of CCR is expected to further improve groundwater quality. It is anticipated that the remedy selection process for addressing affected groundwater will proceed following the implementation of the CCR source material

management strategies. Additionally, CEC will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98, which includes semiannual assessment monitoring in accordance with §257.95 to monitor groundwater conditions and inform the remedy selection. The final remedy will be formally selected per §257.97 once the selected option is reviewed and commented on by EGLE and a public meeting is conducted at least 30-days prior to the final selection as required under §257.96(e).

References

Consumer Energy Company. March 30, 2018. Notification of Intent to Close Two CCR Units. B.C. Cobb Generating Facility Bottom Ash Pond and Ponds 0-8 Closure Plan, Muskegon, Michigan. Prepared for Consumers Energy Company.

Consumer Energy Company. January 15, 2019. Notification of Appendix IV Constituent Exceeding Groundwater Protection Standard per §257.95(g). B.C. Cobb Generating Facility Bottom Ash Pond and Ponds 0-8, Muskegon, Michigan. Prepared for Consumers Energy Company.

Golder Associates Inc. February 2018. BC Cobb Generating Facility Bottom Ash Pond and Ponds 0-8 Closure Plan, Muskegon, Michigan. Prepared for Consumers Energy Company.

Golder Associates Inc. 2018, May 30, 2018 clarified October 16, 2018 and September 20, 2019. BC Cobb Ponds 0-8 and Bottom Ash Closure Work Plan, Muskegon, Michigan. Prepared for Consumers Energy Company.

TRC Environmental Corporation. September 11, 2019. Assessment of Corrective Measures, Consumers Energy, Former BC Cobb Power Plant, Bottom Ash Pond & Ponds 0-8, Muskegon, Michigan. Prepared for Consumers Energy Company.