



Annual Groundwater Monitoring Report

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

January 2018



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*Prepared For
Consumers Energy Company*

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Executive Summary

On April 17, 2015, the United States Environmental Protection Agency (USEPA) published the final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA) (the CCR Rule). The CCR Rule, which became effective on October 19, 2015, applies to the Consumers Energy Company (CEC) Bottom Ash Pond and Ponds 0-8 (BCC Ponds) at the former BC Cobb Power Plant Site (the Site). The BCC Ponds are monitored using a multiunit groundwater monitoring system (in accordance with 40 CFR §257.91). 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).

TRC Environmental Corporation (TRC) prepared this Annual Groundwater Monitoring Report for the BCC Ponds CCR unit on behalf of CEC. This Annual Report was prepared in accordance with the requirements of §257.90(e) and presents the monitoring results and the statistical evaluation of the detection monitoring parameters (Appendix III to Part 257 of the CCR Rule) for the September 2017 semiannual groundwater monitoring event for the BCC Ponds CCR unit. This event is the initial detection monitoring event performed to comply with §257.94. As part of the statistical evaluation, the data collected during detection monitoring events are evaluated to identify statistically significant increases (SSIs) in detection monitoring parameters to determine if concentrations in detection monitoring well samples exceed background levels.

Potential SSIs over background limits were noted for boron, fluoride and pH in one or more downgradient wells for the September 2017 monitoring event. This is the initial detection monitoring event; therefore, it is the initial identification of a SSI over background levels. According to §257.94(e), if the facility determines, pursuant to §257.93(h), that there is a SSI over background levels for one or more of the Appendix III constituents, the facility will, within 90 days of detecting a SSI, establish an assessment monitoring program ~~or~~ demonstrate that:

- A source other than the CCR unit caused the SSI, or
- The SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality.

In response to the potential SSIs over background limits noted during September 2017, CEC plans to prepare an Alternative Source Demonstration (ASD) to evaluate whether a source other than the CCR unit caused the SSIs prior to initiating assessment monitoring.

Section 1

Introduction

1.1 Program Summary

On April 17, 2015, the United States Environmental Protection Agency (USEPA) published the final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA) (the CCR Rule). The CCR Rule, which became effective on October 19, 2015, applies to the Consumers Energy Company (CEC) Bottom Ash Pond and Ponds 0-8 (BCC Ponds) at the former BC Cobb Power Plant Site (the Site). The BCC Ponds are monitored using a multiunit groundwater monitoring system (in accordance with 40 CFR §257.91). 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).

TRC Environmental Corporation (TRC) prepared this Annual Groundwater Monitoring Report (Annual Report) for the BCC Ponds CCR unit on behalf of CEC. This Annual Report was prepared in accordance with the requirements of §257.90(e) and presents the monitoring results and the statistical evaluation of the detection monitoring parameters (Appendix III to Part 257 of the CCR Rule) for the September 2017 semiannual groundwater monitoring event for the BCC Ponds CCR unit. This event is the initial detection monitoring event performed to comply with §257.94. The monitoring was performed in accordance with the *BC Cobb Monitoring Program Sample Analysis Plan (SAP)* (ARCADIS, 2016) and statistically evaluated per the *Groundwater Statistical Evaluation Plan (Stats Plan)* (TRC, October 2017). As part of the statistical evaluation, the data collected during detection monitoring events are evaluated to identify statistically significant increases (SSIs) of detection monitoring parameters compared to background levels.

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. There are two RCRA CCR units associated with the plant—the Bottom Ash Pond and Ponds 0-8, both of which are wet ash dewatering areas. From 1984 through plant closure in 2016, CCR have been deposited in the ash ponds by utilizing sluicing methods. Some of the CCR was periodically removed from the ponds and transported by truck to the JH Campbell Type III landfill (West Olive, Michigan) for disposal or were commercially marketed for beneficial reuse to the extent possible. Site features are shown on Figure 2.

1.3 Geology/Hydrogeology

The majority of the BCC Ponds CCR unit is 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 20 to 30 ft bgs, beneath the fine-grained sand, ranging in thickness from approximately 1 to 13 feet. 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 site is located in the central area of the County.

The BCC Ponds CCR unit is bound by several surface water features (Figure 2): the North Channel Muskegon River and former plant-associated discharge channel adjoin the northwestern and southernmost boundaries of the pond area, and Veterans Memorial Pond (at the time of the September 2017 monitoring event, Veteran Memorial Pond was separated from the River by a weir, drained, and undergoing construction, but as of the report completion date, is no longer drained and construction appears to be mostly complete) is located northeast of the pond area, approximately 100 feet northeast of Michigan Highway 120.

Groundwater flow within the uppermost aquifer varies between early CCR monitoring at the Site before plant operations ceased in April 2016 and the post-shutdown period when sluicing operations had ended. In general, groundwater is typically encountered at a similar or slightly higher elevation relative to the surrounding surface water features, flowing outward toward the bounding surface water features. While the ponds were actively receiving CCR and non-CCR wastewater, groundwater in the pond area was several feet higher than surrounding surface water and upgradient groundwater, creating a mound in the BCC Ponds CCR unit.

Based on the hydrogeology at the Site, particularly the conductive properties of the sandy aquifer, the proximity of the BCC Ponds CCR unit to the surrounding surface water bodies, and consistent groundwater flow direction toward the adjacent surface water bodies, an inter-well statistical approach is recommended for detection monitoring as outlined in the Stats Plan.

Section 2

Groundwater Monitoring

2.1 Monitoring Well Network

A groundwater monitoring system has been established for the BCC Ponds CCR unit, which established the monitoring well locations for detection monitoring. The detection monitoring well network for the BCC Ponds CCR unit currently consists of 22 monitoring wells that are screened in the uppermost aquifer. The monitoring well locations are shown on Figure 2. Monitoring wells BCC-MW-15002 through BCC-MW-15008 are located southwest of the BCC Ponds and provide data on background groundwater quality that has not been affected by the CCR unit (total of 7 background wells). Monitoring wells BCC-MW-15009 through BCC-MW-15023 are located downgradient of the BCC Ponds CCR unit (total of 15 downgradient wells). As shown on Figure 2, monitoring well BCC-MW-15001 is used for water level measurements only. Monitoring well BCC-MW-15001 was excluded from the background data set due to the presence of significant amounts of surficial CCR recorded in the boring log at that location.

2.2 Background Sampling

Background groundwater monitoring was conducted at the BCC Ponds CCR unit from November 2015 through July 2017 in accordance with the SAP. Data collection included eight rounds (Rounds 1 through 8) of static water elevation measurements, analysis for parameters required in the CCR Rule's Appendix III and Appendix IV to Part 257, and field parameters (dissolved oxygen, oxidation reduction potential, pH, specific conductivity, temperature, and turbidity) from all 23 monitoring wells installed at the site. The Rounds 1 through 7 groundwater samples were collected and analyzed by CEC's Laboratory Services, Jackson, Michigan. Round 8 groundwater sampling was conducted by TRC the week of July 11, 2017, and analyzed by Pace Analytical Services, LLC (Pace). Background data are included in Appendix A Tables 1 through 3, where: Table 1 is a summary of static water elevation data; Table 2 is a summary of groundwater analytical data compared to potentially relevant criteria; and Table 3 is a summary of field data.

In addition to the data tables, groundwater contour maps were developed for each of the background events to evaluate groundwater flow directions. The contour maps for each background monitoring event are also included in Appendix A as Figures 1 through 8.

2.3 Semiannual Groundwater Monitoring

The semiannual monitoring parameters for the detection groundwater monitoring program were selected per the CCR Rule's Appendix III to Part 257 – Constituents for Detection Monitoring. The Appendix III indicator parameters consist of boron, calcium, chloride, fluoride, pH (field reading), sulfate, and total dissolved solids (TDS) and were analyzed in accordance with the SAP. In addition to pH, the collected field parameters included dissolved oxygen, oxidation reduction potential, specific conductivity, temperature, and turbidity.

2.3.1 Data Summary

The initial semiannual groundwater detection monitoring event for 2017 was performed during September 12 through 14, 2017, by TRC personnel and samples were analyzed by Pace in accordance with the SAP. Static water elevation data were collected at all monitoring well locations. Groundwater samples were collected from the seven background monitoring wells and 15 downgradient monitoring wells for the Appendix III indicator parameters and field parameters. A summary of the groundwater data collected during the September 2017 event is provided on Table 1 (static groundwater elevation data), Table 2 (analytical results), and Table 3 (field data).

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. Particular data non-conformances are summarized in Appendix B.

2.3.3 Groundwater Flow Rate and Direction

Groundwater elevation data collected during the most recent background sampling events (post-April 2016) showed that groundwater is 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 elevations measured during the September 2017 sampling event are provided on Table 1 and were used to construct a groundwater contour map (Figure 3).

The map indicates that current groundwater flow continues to radiate outward non-uniformly toward the surface water. The direction of the highest gradient (towards the northeast) appears to be influenced by dewatering activities that were taking place at the Veteran's Pond relative to previous monitoring events. The average hydraulic gradient throughout the BCC Ponds CCR unit area during this event is estimated at 0.004 ft/ft. The

gradient was calculated using the following well pairs: BCC-MW-15007/BCC-MW-15001 and BCC-MW-15012/BCC-MW-15022 (Figure 3). Using the mean hydraulic conductivity of 58 ft/day (ARCADIS, 2016) and an assumed effective porosity of 0.3, the estimated average seepage velocity is approximately 0.78 ft/day or 280 ft/year for this event.

Although the gradient toward the northeast has increased since the background sampling events commenced in November 2015, the general flow direction is similar to that identified in previous monitoring rounds and continues to demonstrate that the downgradient wells are appropriately positioned to detect the presence of Appendix III parameters that could potentially migrate from the BCC Ponds CCR unit.

Section 3

Statistical Evaluation

3.1 Establishing Background Limits

Per the Stats Plan, background limits were established for the Appendix III indicator parameters following the eighth round of background monitoring using data collected from the seven established background monitoring wells (BCC-MW-15002 through BCC-MW-15008). The statistical evaluation of the background data is presented in detail in Appendix C. The Appendix III background limits will be used throughout the detection monitoring period to determine whether groundwater has been impacted from the BCC Ponds CCR unit by comparing concentrations in the downgradient wells to the background limits for each Appendix III indicator parameter.

3.2 Data Comparison to Background Limits

The concentrations of the indicator parameters in the downgradient wells were compared to the statistical background limits calculated from the background data collected from MW-15002 through MW-15008. The comparisons are presented on Table 4.

The statistical evaluation of the September 2017 Appendix III indicator parameters shows potential SSIs over background for:

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

The initial observation of an indicator parameter concentration above the established background limits does not necessarily constitute a SSI. Per the Stats Plan, if there is an exceedance of a prediction limit for one or more of the parameters, the well(s) of concern can be resampled within 30 days of the completion of the initial statistical analysis for verification purposes. There were no SSIs compared to background for calcium, chloride, sulfate or TDS at any of the downgradient wells.

Section 4

Conclusions and Recommendations

Potential SSIs over background limits were noted for boron, fluoride and pH in one or more downgradient wells during September 2017. This is the initial detection monitoring event; therefore, it is the initial identification of a SSI over background levels. According to §257.94(e), if the facility determines, pursuant to §257.93(h), that there is a SSI over background levels for one or more of the Appendix III constituents, the facility will, within 90 days of detecting a SSI, establish an assessment monitoring program ~~or~~ demonstrate that:

- A source other than the CCR unit caused the SSI, or
- The SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality.

The owner or operator must complete a written demonstration (i.e., Alternative Source Demonstration, ASD), of the above within 90 days of confirming the SSI. Based on the outcome of the ASD the following steps will be taken:

- If a successful ASD is completed, a certification from a qualified professional engineer is required, and the CCR unit may continue with detection monitoring.
- If a successful ASD is not completed within the 90-day period, the owner or operator of the CCR unit must initiate an assessment monitoring program as required under §257.95. The facility must also include the ASD in the annual groundwater monitoring and corrective action report required by §257.90(e), in addition to the certification by a qualified professional engineer.

During the 90-day period after triggering assessment monitoring, the groundwater monitoring system wells will have groundwater samples collected and analyzed for Appendix IV constituents pursuant to §257.95(b). Within 90 days of obtaining the results from the first assessment monitoring event, the groundwater monitoring system wells will have groundwater samples collected and analyzed for Appendix III parameters and the detected Appendix IV parameters in the initial assessment monitoring event.

In response to the potential SSIs over background limits noted during September 2017, CEC plans to prepare an ASD to evaluate whether a source other than the BCC Ponds CCR unit caused the SSIs prior to initiating assessment monitoring. Based on the results from the ASD, CEC will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

Section 5

References

ARCADIS. May 13, 2016. Summary of Monitoring Well Design, Installation, and Development. BC Cobb Electric Generation Facility – Muskegon, Michigan. Prepared for Consumers Energy Company.

ARCADIS. May 18, 2016. Electric Generation Facilities RCRA CCR Detection Monitoring Program. BC Cobb Monitoring Program Sample Analysis Plan, Muskegon, Michigan. Prepared for Consumers Energy Company.

TRC Environmental Corporation. October 2017. Groundwater Statistical Evaluation Plan – Former BC Cobb Power Plant, Bottom Ash Pond & Ponds 0-8, Muskegon, Michigan. Prepared for Consumers Energy Company.

Tables

Table 1
 Summary of Groundwater Elevation Data – September 2017
 BC Cobb – RCRA CCR Monitoring Program
 Muskegon, Michigan

Well Location	Ground Surface Elevation (ft)	TOC Elevation (ft)	Geologic Unit of Screen Interval	Screen Interval Depth (ft BGS)	Screen Interval Elevation (ft)	Borehole Terminus Depth (ft BGS)	Borehole Terminus Elevation (ft)	September 13, 2017	
								Depth to Water (ft BTOC)	Groundwater Elevation (ft)
Background									
BCC-MW-15001	583.6	586.52	Sand w/ organic seam at 18.8 ft bgs	10.0 to 20.0	573.6 to 563.6	20.0	563.6	7.42	579.10
BCC-MW-15002	583.8	586.87	Sand	15.0 to 20.0	568.8 to 563.8	20.0	563.8	7.32	579.55
BCC-MW-15003	584.1	587.12	Sand	13.0 to 18.0	571.1 to 566.1	20.0	564.1	6.96	580.16
BCC-MW-15004	587.7	590.57	Sand	5.0 to 15.0	582.7 to 572.7	20.0	567.7	10.11	580.46
BCC-MW-15005	584.8	587.77	Sand	5.0 to 15.0	579.8 to 569.8	20.0	564.8	6.90	580.87
BCC-MW-15006	584.9	587.81	Sand	5.0 to 15.0	579.9 to 569.9	20.0	564.9	7.10	580.71
BCC-MW-15007	584.5	587.43	Sand	4.0 to 10.0	580.5 to 574.5	20.0	564.5	7.05	580.38
BCC-MW-15008	584.8	587.76	Sand	4.0 to 9.0	580.8 to 575.8	20.0	564.8	6.80	580.96
Downgradient									
BCC-MW-15009	586.3	589.27	Sand (14 - 17.2 ft bgs) and Clay/silt (17.2 - 24 ft bgs)	14.0 to 24.0	572.3 to 562.3	24.0	562.3	8.85	580.42
BCC-MW-15010	585.2	588.11	Sand w/ little silt and organic matter	12.0 to 22.0	573.2 to 563.2	24.0	561.2	8.44	579.67
BCC-MW-15011	592.3	595.22	Sand w/ some silt	21.0 to 31.0	571.3 to 561.3	32.0	560.3	15.44	579.78
BCC-MW-15012	594.5	597.39	Sand	21.0 to 31.0	573.5 to 563.5	35.0	559.5	17.54	579.85
BCC-MW-15013	595.9	598.50	Sand with clay/silt and organic material from 36.5 - 37.5 ft bgs	30.0 to 40.0	565.9 to 555.9	40.0	555.9	17.77	580.73
BCC-MW-15014	596.2	599.04	Sand/silty sand	23.0 to 31.0	573.2 to 565.2	40.0	556.2	18.64	580.40
BCC-MW-15015	593.9	596.75	Sand with clay/silt and organic material from 29 - 29.5 ft bgs	20.0 to 30.0	573.9 to 563.9	30.0	563.9	15.80	580.95
BCC-MW-15016	586.2	589.05	Sand	35.0 to 40.0	551.2 to 546.2	45.0	541.2	8.16	580.89
BCC-MW-15017	585.7	588.61	Sand	35.0 to 40.0	550.7 to 545.7	40.0	545.7	7.68	580.93
BCC-MW-15018	589.4	592.43	Sand	37.5 to 42.5	551.9 to 546.9	45.0	544.4	11.48	580.95
BCC-MW-15019	589.4	592.42	Sand	37.0 to 42.0	552.4 to 547.4	45.0	544.4	11.70	580.72
BCC-MW-15020	589.5	592.23	Sand	35.0 to 40.0	554.5 to 549.5	45.0	544.5	12.00	580.23
BCC-MW-15021	590.7	593.73	Sand	39.5 to 42.5	551.2 to 548.2	50.0	540.7	13.71	580.02
BCC-MW-15022	592.6	595.82	Sand	24.0 to 30.0	568.6 to 562.6	45.0	547.6	17.60	578.22
BCC-MW-15023	585.4	588.08	Sand/silty sand	12.0 to 19.5	573.4 to 565.9	20.0	565.4	11.85	576.23

Notes:

Survey conducted by Williams & Works, November 2015.
 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.

Table 2
 Summary of Groundwater Sampling Results (Analytical) – September 2017
 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	BCC-MW-15009	BCC-MW-15010	BCC-MW-15011	BCC-MW-15012
Sample Date:						9/14/2017	9/14/2017	9/14/2017	9/14/2017	9/14/2017	9/14/2017	9/14/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	background						downgradient				
Appendix III																
Boron	ug/L	NC	500	500	7,200	1,130	361	325	36.8	45.1	141	401	2,120	1,770	1,490	1,140
Calcium	mg/L	NC	NC	NC	500	132	145	115	64.2	79.6	133	51.8	34.9	129	23.9	48.7
Chloride	mg/L	250**	250	250	500	152	493	382	7.0	16.1	1,940	68.9	26.0	24.5	24.0	23.3
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	1,100
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	7.2	7.1	6.8	7.3	7.2	6.7	7.7	10.2	7.8	8.5	11.4
Sulfate	mg/L	250**	250	250	500	13.8	<2.0	5.8	2.9	11.6	8.3	3.0	41.7	143	6.4	59.6
Total Dissolved Solids	mg/L	500**	500	500	500	772	1,370	934	240	322	2,690	448	188	570	140	318

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

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

NC - no criteria.

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

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

^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion.

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

RED value indicates an exceedance of the MCL.

All metals were analyzed as total unless otherwise specified.

Table 2
 Summary of Groundwater Sampling Results (Analytical) – September 2017
 BC Cobb – RCRA CCR Monitoring Program
 Muskegon, Michigan

Sample Location:						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
Sample Date:						9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	downgradient										
Appendix III																
Boron	ug/L	NC	500	500	7,200	1,270	1,410	433	83.0	82.8	492	1,010	745	602	833	504
Calcium	mg/L	NC	NC	NC	500	34.4	57.8	36.9	182	245	90.7	107	107	91.3	35.2	60.9
Chloride	mg/L	250**	250	250	500	21.2	22.5	20.3	226	224	49.1	73.9	87.8	108	23.3	25.5
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
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	7.9	12.0	8.7	6.6	6.5	6.8	6.7	6.8	6.8	7.6	7.6
Sulfate	mg/L	250**	250	250	500	59.9	19.2	16.1	<2.0	<2.0	<2.0	<2.0	3.0	<2.0	44.1	36.2
Total Dissolved Solids	mg/L	500**	500	500	500	192	282	192	995	1,130	392	618	608	490	266	408

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

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

NC - no criteria.

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

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

^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion.

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 3
 Summary of Field Parameter Results – September 2017
 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	9/14/2017	0.21	56.4	7.2	1,338	14.73	2.33
BCC-MW-15003	9/14/2017	0.21	69.1	7.1	2,151	14.13	<1
BCC-MW-15004	9/14/2017	0.25	77.4	6.8	1,740	15.57	1.76
BCC-MW-15005	9/14/2017	0.19	-117.9	7.3	424	17.26	4.20
BCC-MW-15006	9/14/2017	0.39	-25.0	7.2	545	20.60	2.28
BCC-MW-15007	9/14/2017	0.13	-67.7	6.7	4,965	19.70	2.19
BCC-MW-15008	9/14/2017	0.13	-108.0	7.7	743	19.03	1.49
Downgradient							
BCC-MW-15009	9/13/2017	0.03	-363.9	10.2	307	16.14	2.88
BCC-MW-15010	9/13/2017	0.11	-126.9	7.8	875	14.98	1.43
BCC-MW-15011	9/13/2017	0.11	-127.8	8.5	247	15.07	<1
BCC-MW-15012	9/13/2017	0.12	-172.3	11.4	441	15.91	<1
BCC-MW-15013	9/13/2017	0.12	-122.3	7.9	320	15.46	<1
BCC-MW-15014	9/13/2017	0.09	-185.6	12.0	679	15.11	1.65
BCC-MW-15015	9/13/2017	0.07	-183.4	8.7	340	15.06	<1
BCC-MW-15016	9/13/2017	0.11	-87.9	6.6	2,018	15.55	3.11
BCC-MW-15017	9/13/2017	0.17	-71.2	6.5	2,420	14.49	2.68
BCC-MW-15018	9/13/2017	0.19	-55.3	6.8	839	14.52	4.65
BCC-MW-15019	9/13/2017	0.16	-70.2	6.7	1,058	13.81	2.94
BCC-MW-15020	9/13/2017	0.22	-59.7	6.8	985	14.40	4.62
BCC-MW-15021	9/13/2017	0.24	-81.7	6.8	1,123	13.87	2.32
BCC-MW-15022	9/13/2017	0.30	-71.3	7.6	376	15.43	2.84
BCC-MW-15023	9/13/2017	0.22	-33.4	7.6	519	14.16	1.28

Notes:

mg/L - Milligrams per Liter.
 mV - Millivolts.
 SU - Standard units
 umhos/cm - Micromhos per centimeter.
 NTU - Nephelometric Turbidity Unit.

Table 4
 Comparison of Appendix III Parameter Results to Background Limits – September 2017
 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:	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017
Constituent	Unit	UTL	downgradient							
Appendix III										
Boron	ug/L	1,320	2,120	1,770	1,490	1,140	1,270	1,410	433	83.0
Calcium	mg/L	259	34.9	129	23.9	48.7	34.4	57.8	36.9	182
Chloride	mg/L	5,980	26.0	24.5	24.0	23.3	21.2	22.5	20.3	226
Fluoride	ug/L	1,000	<1,000	<1,000	1,000	1,100	<1,000	<1,000	<1,000	<1,000
pH, Field	SU	6.6 - 8.3	10.2	7.8	8.5	11.4	7.9	12.0	8.7	6.6
Sulfate	mg/L	200	41.7	143	6.4	59.6	59.9	19.2	16.1	<2.0
Total Dissolved Solids	mg/L	5,170	188	570	140	318	192	282	192	995

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

All metals were analyzed as total unless otherwise specified.

RESULT

Shading and bold font indicates an exceedance of the Upper Tolerance Limit (UTL) using the number of significant figures in the UTL.

Table 4
 Comparison of Appendix III Parameter Results to Background Limits – September 2017
 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:			9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017
Constituent	Unit	UTL	downgradient						
Appendix III									
Boron	ug/L	1,320	82.8	492	1,010	745	602	833	504
Calcium	mg/L	259	245	90.7	107	107	91.3	35.2	60.9
Chloride	mg/L	5,980	224	49.1	73.9	87.8	108	23.3	25.5
Fluoride	ug/L	1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
pH, Field	SU	6.6 - 8.3	6.5	6.8	6.7	6.8	6.8	7.6	7.6
Sulfate	mg/L	200	<2.0	<2.0	<2.0	3.0	<2.0	44.1	36.2
Total Dissolved Solids	mg/L	5,170	1,130	392	618	608	490	266	408

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

All metals were analyzed as total unless otherwise specified.

RESULT

Shading and bold font indicates an exceedance of the Upper Tolerance Limit (UTL) using the number of significant figures in the UTL.

Figures



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.



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

PROJECT:

**CONSUMERS ENERGY COMPANY
BC COBB POWER PLANT
MUSKEGON, MICHIGAN**

TITLE:

SITE LOCATION MAP

DRAWN BY:

J. PAPEZ

CHECKED BY:

S. HOLMSTROM

APPROVED BY:

G. CROCKFORD

DATE:

OCTOBER 2017

PROJ. NO.:

269767-001

FILE:

269767-001-010slm.mxd

FIGURE 1



LEGEND

- BACKGROUND MONITORING WELL
- DOWNGRAIDENT 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.

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: J. PAPEZ	PROJ NO: 269767-001
CHECKED BY: S HOLMSTROM	
APPROVED BY: G. CROCKFORD	FIGURE 2
DATE: JANUARY 2018	

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

FILE NO: 269767-001-002X.mxd



LEGEND

- BACKGROUND MONITORING WELL
- DOWNGRADE MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- APPROXIMATE POND BOUNDARY
- (580.85) GROUNDWATER ELEVATION (FEET, MSL)
- GROUNDWATER ELEVATION CONTOUR (1' 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. NU= NOT USED. WELL SCREENED AT DEEPER INTERVAL RELATIVE TO ADJACENT WELLS, 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:	
GROUNDWATER CONTOUR MAP SEPTEMBER 13, 2017	
DRAWN BY: S. MAJOR	PROJ NO.: 269767-001
CHECKED BY: S. HOLMSTROM	FIGURE 3
APPROVED BY: G. CROCKFORD	
DATE: JANUARY 2018	
1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com	
FILE NO.: 269767-001-016A.mxd	

Appendix A

Background Data

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 Depth (ft BGS)		Screen Interval Elevation (ft)		Borehole Terminus Depth (ft BGS)	Borehole Terminus Elevation (ft)	Round 1		Round 2		Round 3		Round 4			
										November 30, 2015		February 16, 2016		April 12, 2016		July 11, 2016			
										Depth to Water (ft BTOC)	Groundwater Elevation (ft)	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 w/ organic seam at 18.8 ft bgs	10.0	to	20.0	573.6	to	563.6	20.0	563.6	5.68	580.84	5.89	580.63	5.34	581.18	5.76	580.76
BCC-MW-15002	583.8	586.87	Sand	15.0	to	20.0	568.8	to	563.8	20.0	563.8	6.01	580.86	6.23	580.64	5.66	581.21	6.13	580.74
BCC-MW-15003	584.1	587.12	Sand	13.0	to	18.0	571.1	to	566.1	20.0	564.1	6.28	580.84	6.48	580.64	5.89	581.23	6.39	580.73
BCC-MW-15004	587.7	590.57	Sand	5.0	to	15.0	582.7	to	572.7	20.0	567.7	9.75	580.82	9.90	580.67	9.29	581.28	9.84	580.73
BCC-MW-15005	584.8	587.77	Sand	5.0	to	15.0	579.8	to	569.8	20.0	564.8	7.23	580.54	7.37	580.40	6.77	581.00	6.94	580.83
BCC-MW-15006	584.9	587.81	Sand	5.0	to	15.0	579.9	to	569.9	20.0	564.9	6.67	581.14	6.90	580.91	6.23	581.58	6.89	580.92
BCC-MW-15007	584.5	587.43	Sand	4.0	to	10.0	580.5	to	574.5	20.0	564.5	6.30	581.13	6.58	580.85	5.88	581.55	6.61	580.82
BCC-MW-15008	584.8	587.76	Sand	4.0	to	9.0	580.8	to	575.8	20.0	564.8	6.77	580.99	7.17	580.59	5.79	581.97	6.99	580.77
Downgradient																			
BCC-MW-15009	586.3	589.27	Sand (14 - 17.2 ft bgs) and Clay/silt (17.2 - 24 ft bgs)	14.0	to	24.0	572.3	to	562.3	24.0	562.3	7.39	581.88	7.64	581.63	6.99	582.28	8.40	580.87
BCC-MW-15010	585.2	588.11	Sand w/ little silt and organic matter	12.0	to	22.0	573.2	to	563.2	24.0	561.2	6.69	581.42	6.96	581.15	6.38	581.73	7.31	580.80
BCC-MW-15011	592.3	595.22	Sand w/ some silt	21.0	to	31.0	571.3	to	561.3	32.0	560.3	13.09	582.13	13.30	581.92	12.76	582.46	14.37	580.85
BCC-MW-15012	594.5	597.39	Sand	21.0	to	31.0	573.5	to	563.5	35.0	559.5	13.93	583.46	14.11	583.28	13.60	583.79	16.48	580.91
BCC-MW-15013	595.9	598.50	Sand with clay/silt and organic material from 36.5 - 37.5 ft bgs	30.0	to	40.0	565.9	to	555.9	40.0	555.9	16.71	581.79	16.81	581.69	16.22	582.28	17.65	580.85
BCC-MW-15014	596.2	599.04	Sand/silty sand	23.0	to	31.0	573.2	to	565.2	40.0	556.2	15.85	583.19	16.02	583.02	15.53	583.51	18.18	580.86
BCC-MW-15015	593.9	596.75	Sand with clay/silt and organic material from 29 - 29.5 ft bgs	20.0	to	30.0	573.9	to	563.9	30.0	563.9	15.94	580.81	15.95	580.80	15.50	581.25	15.97	580.78
BCC-MW-15016	586.2	589.05	Sand	35.0	to	40.0	551.2	to	546.2	45.0	541.2	8.97	580.08	8.77	580.28	8.65	580.40	8.40	580.65
BCC-MW-15017	585.7	588.61	Sand	35.0	to	40.0	550.7	to	545.7	40.0	545.7	8.62	579.99	8.47	580.14	8.26	580.35	7.94	580.67
BCC-MW-15018	589.4	592.43	Sand	37.5	to	42.5	551.9	to	546.9	45.0	544.4	12.35	580.08	12.26	580.17	11.90	580.53	11.70	580.73
BCC-MW-15019	589.4	592.42	Sand	37.0	to	42.0	552.4	to	547.4	45.0	544.4	12.31	580.11	12.25	580.17	12.88	579.54	11.71	580.71
BCC-MW-15020	589.5	592.23	Sand	35.0	to	40.0	554.5	to	549.5	45.0	544.5	12.09	580.14	12.06	580.17	11.66	580.57	11.50	580.73
BCC-MW-15021	590.7	593.73	Sand	39.5	to	42.5	551.2	to	548.2	50.0	540.7	13.63	580.10	13.45	580.28	13.38	580.35	13.12	580.61
BCC-MW-15022	592.6	595.82	Sand	24.0	to	30.0	568.6	to	562.6	45.0	547.6	12.40	583.42	12.31	583.51	12.14	583.68	15.00	580.82
BCC-MW-15023	585.4	588.08	Sand/silty sand	12.0	to	19.5	573.4	to	565.9	20.0	565.4	4.02	584.06	4.20	583.88	3.80	584.28	7.41	580.67

Notes:
 Survey conducted by Williams & Works, November 2015.
 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.

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 Depth (ft BGS)	Screen Interval Elevation (ft)	Round 5		Round 6		Round 7		Round 8	
						September 27, 2016		February 13, 2017		April 4, 2017		July 11, 2017	
						Depth to Water (ft BTOC)	Groundwater Elevation (ft)	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 w/ organic seam at 18.8 ft bgs	10.0 to 20.0	573.6 to 563.6	5.63	580.89	6.52	580.00	5.75	580.77	6.10	580.42
BCC-MW-15002	583.8	586.87	Sand	15.0 to 20.0	568.8 to 563.8	5.77	581.10	6.75	580.12	5.91	580.96	6.18	580.69
BCC-MW-15003	584.1	587.12	Sand	13.0 to 18.0	571.1 to 566.1	6.02	581.10	6.96	580.16	6.34	580.78	6.09	581.03
BCC-MW-15004	587.7	590.57	Sand	5.0 to 15.0	582.7 to 572.7	9.47	581.10	10.35	580.22	9.75	580.82	9.39	581.18
BCC-MW-15005	584.8	587.77	Sand	5.0 to 15.0	579.8 to 569.8	6.86	580.91	7.83	579.94	7.11	580.66	6.46	581.31
BCC-MW-15006	584.9	587.81	Sand	5.0 to 15.0	579.9 to 569.9	6.31	581.50	7.46	580.35	6.63	581.18	6.36	581.45
BCC-MW-15007	584.5	587.43	Sand	4.0 to 10.0	580.5 to 574.5	6.24	581.19	7.32	580.11	6.45	580.98	6.22	581.21
BCC-MW-15008	584.8	587.76	Sand	4.0 to 9.0	580.8 to 575.8	6.91	580.85	8.02	579.74	7.08	580.68	6.50	581.26
Downgradient													
BCC-MW-15009	586.3	589.27	Sand (14 - 17.2 ft bgs) and Clay/silt (17.2 - 24 ft bgs)	14.0 to 24.0	572.3 to 562.3	8.48	580.79	9.49	579.78	8.66	580.61	8.15	581.12
BCC-MW-15010	585.2	588.11	Sand w/ little silt and organic matter	12.0 to 22.0	573.2 to 563.2	7.17	580.94	8.14	579.97	7.35	580.76	7.34	580.77
BCC-MW-15011	592.3	595.22	Sand w/ some silt	21.0 to 31.0	571.3 to 561.3	14.35	580.87	15.29	579.93	14.53	580.69	14.38	580.84
BCC-MW-15012	594.5	597.39	Sand	21.0 to 31.0	573.5 to 563.5	16.56	580.83	17.43	579.96	16.70	580.69	16.50	580.89
BCC-MW-15013	595.9	598.50	Sand with clay/silt and organic material from 36.5 - 37.5 ft bgs	30.0 to 40.0	565.9 to 555.9	18.00	580.50	18.95	579.55	18.04	580.46	17.40	581.10
BCC-MW-15014	596.2	599.04	Sand/silty sand	23.0 to 31.0	573.2 to 565.2	18.46	580.58	19.29	579.75	18.51	580.53	18.03	581.01
BCC-MW-15015	593.9	596.75	Sand with clay/silt and organic material from 29 - 29.5 ft bgs	20.0 to 30.0	573.9 to 563.9	16.45	580.30	17.36	579.39	16.42	580.33	15.64	581.11
BCC-MW-15016	586.2	589.05	Sand	35.0 to 40.0	551.2 to 546.2	8.61	580.44	9.61	579.44	8.75	580.30	8.03	581.02
BCC-MW-15017	585.7	588.61	Sand	35.0 to 40.0	550.7 to 545.7	8.20	580.41	9.28	579.33	8.53	580.08	7.55	581.06
BCC-MW-15018	589.4	592.43	Sand	37.5 to 42.5	551.9 to 546.9	12.14	580.29	13.13	579.30	12.18	580.25	11.33	581.10
BCC-MW-15019	589.4	592.42	Sand	37.0 to 42.0	552.4 to 547.4	12.12	580.30	13.11	579.31	12.16	580.26	11.41	581.01
BCC-MW-15020	589.5	592.23	Sand	35.0 to 40.0	554.5 to 549.5	11.92	580.31	12.87	579.36	11.91	580.32	11.33	580.90
BCC-MW-15021	590.7	593.73	Sand	39.5 to 42.5	551.2 to 548.2	13.05	580.68	14.13	579.60	13.33	580.40	13.06	580.67
BCC-MW-15022	592.6	595.82	Sand	24.0 to 30.0	568.6 to 562.6	14.94	580.88	15.66	580.16	15.08	580.74	15.65	580.17
BCC-MW-15023	585.4	588.08	Sand/silty sand	12.0 to 19.5	573.4 to 565.9	7.35	580.73	8.00	580.08	7.13	580.95	8.44	579.64

Notes:
 Survey conducted by Williams & Works, November 2015.
 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.

Table 2
 Summary of Analytical Results for Groundwater Samples
 BC Cobb – RCRA CCR Monitoring Program
 Muskegon, Michigan

Sample Location:						BCC-MW-15001							
Sample Date:						11/30/2015	2/17/2016	4/12/2016	7/12/2016	9/27/2016	2/13/2017	4/4/2017	7/11/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	background							
Appendix III													
Boron	ug/L	NC	500	500	7,200	1,120	1,290	1,310	1,290	1,010	1,060	1,080	1,100
Calcium	mg/L	NC	NC	NC	500	118	129	105	113	130	105	107	91.1
Chloride	mg/L	250**	250	250	500	35.0	22.4	21.3	19.7	19.9	23.2	22.3	27.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	6.96	7.0	7.1	7.1	6.7	6.9	7.0	6.92
Sulfate	mg/L	250**	250	250	500	67.0	46.2	33.8	33.5	35.6	41.9	37.0	44.8
Total Dissolved Solids	mg/L	500**	500	500	500	580	520	460	470	520	470	470	526
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1	<1.0
Arsenic	ug/L	10	10	10	10	<1	<1	<1	<1	<1	<1	<1	<1.0
Barium	ug/L	2,000	2,000	2,000	670	127	118	114	98	116	102	105	109
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Chromium	ug/L	100	100	100	11	<1	1	3	2	<1	1	1	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1	<1.0
Lithium	ug/L	NC	170	350	440	32.2	32.2	31	30	30	28	27	32
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Molybdenum	ug/L	NC	73	210	3,200	<5	<5	<5	<5	<5	<5	<5	<5.0
Radium-226	pCi/L	5	NC	NC	NC	0.366	0.387	0.312	0.255	0.311	0.297	<0.276	<0.948
Radium-226/228	pCi/L	5	NC	NC	NC	1.54	0.963	1.23	1.39	<1.11	1.55	0.885	<1.80
Radium-228	pCi/L	5	NC	NC	NC	1.17	<0.812	0.921	1.13	<1.11	1.25	0.610	<0.855
Selenium	ug/L	50	50	50	5	<1	<1	<1	1	<1	<1	<1	<1.0
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2	<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 default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. 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 2
 Summary of Analytical Results for Groundwater Samples
 BC Cobb – RCRA CCR Monitoring Program
 Muskegon, Michigan

Sample Location:						BCC-MW-15002							
Sample Date:						11/30/2015	2/17/2016	4/12/2016	7/12/2016	9/27/2016	2/13/2017	4/4/2017	7/11/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	background							
Appendix III													
Boron	ug/L	NC	500	500	7,200	1,320	1,200	1,050	834	979	1,110	1,170	988
Calcium	mg/L	NC	NC	NC	500	214	259	197	169	165	184	167	185
Chloride	mg/L	250**	250	250	500	720	519	681	577	328	226	354	472
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	6.74	7.1	7.0	7.0	7.0	7.2	7.2	7.11
Sulfate	mg/L	250**	250	250	500	250	327	300	202	127	116	85.6	113
Total Dissolved Solids	mg/L	500**	500	500	500	1,900	1,900	1,900	1,800	1,100	1,100	1,200	1,500
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1	<1.0
Arsenic	ug/L	10	10	10	10	10	4	2	2	1	1	<1	<1.0
Barium	ug/L	2,000	2,000	2,000	670	274	257	252	232	148	134	146	186
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Chromium	ug/L	100	100	100	11	1	2	3	2	<1	2	2	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1	<1.0
Lithium	ug/L	NC	170	350	440	<10	<10	<10	<10	<10	<10	<10	11
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Molybdenum	ug/L	NC	73	210	3,200	<5	<5	<5	<5	<5	<5	<5	<5.0
Radium-226	pCi/L	5	NC	NC	NC	0.816	0.600	0.893	0.641	<0.254	0.419	0.387	<0.912
Radium-226/228	pCi/L	5	NC	NC	NC	3.03	2.03	2.32	1.88	<0.927	1.41	1.79	2.20
Radium-228	pCi/L	5	NC	NC	NC	2.21	1.43	1.43	1.24	<0.927	0.995	1.40	1.49
Selenium	ug/L	50	50	50	5	1	<1	<1	1	<1	<1	1	<1.0
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2	<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 default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. 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 2
 Summary of Analytical Results for Groundwater Samples
 BC Cobb – RCRA CCR Monitoring Program
 Muskegon, Michigan

Sample Location:						BCC-MW-15003							
Sample Date:						11/30/2015	2/17/2016	4/12/2016	7/12/2016	9/27/2016	2/13/2017	4/4/2017	7/12/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI [^]	background							
Appendix III													
Boron	ug/L	NC	500	500	7,200	542	574	2,370	528	494	608	679	695
Calcium	mg/L	NC	NC	NC	500	216	233	180	177	179	163	167	154
Chloride	mg/L	250**	250	250	500	700	682	640	581	512	456	363	293
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	7.24	7.1	7.2	7.1	7.1	7.4	7.3	7.07
Sulfate	mg/L	250**	250	250	500	46.0	48.7	41.2	28.3	27.2	20.1	16.7	6.8
Total Dissolved Solids	mg/L	500**	500	500	500	1,900	1,900	1,700	1,600	1,500	1,400	1,200	1,110
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1	<1.0
Arsenic	ug/L	10	10	10	10	2	<1	<1	1	<1	<1	<1	<1.0
Barium	ug/L	2,000	2,000	2,000	670	236	219	189	170	159	137	138	112
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Chromium	ug/L	100	100	100	11	<1	2	2	2	1	1	1	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1	<1.0
Lithium	ug/L	NC	170	350	440	<10	<10	<10	<10	<10	<10	<10	11
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Molybdenum	ug/L	NC	73	210	3,200	<5	<5	<5	<5	<5	<5	<5	<5.0
Radium-226	pCi/L	5	NC	NC	NC	0.667	0.633	0.522	0.387	0.284	0.350	0.442	0.442
Radium-226/228	pCi/L	5	NC	NC	NC	2.40	1.30	1.39	1.66	1.53	1.58	1.25	<1.03
Radium-228	pCi/L	5	NC	NC	NC	1.73	0.664	0.870	1.27	1.25	1.23	0.807	<0.858
Selenium	ug/L	50	50	50	5	2	<1	<1	1	<1	<1	1	<1.0
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2	<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 default hardness of 150 mg CaCO₃/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. 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 2
 Summary of Analytical Results for Groundwater Samples
 BC Cobb – RCRA CCR Monitoring Program
 Muskegon, Michigan

Sample Location:						BCC-MW-15004							
Sample Date:						11/30/2015	2/17/2016	4/12/2016	7/12/2016	9/27/2016	2/13/2017	4/4/2017	7/12/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI [^]	background							
Appendix III													
Boron	ug/L	NC	500	500	7,200	198	124	166	338	279	193	376	302
Calcium	mg/L	NC	NC	NC	500	94.6	80.9	70.7	87.0	81.9	75.1	73.4	67.2
Chloride	mg/L	250**	250	250	500	27.0	18.1	22.0	30.9	22.1	28.2	35.2	45.7
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	7.28	7.2	6.9	6.7	6.9	7.1	7.1	6.95
Sulfate	mg/L	250**	250	250	500	33.0	17.8	13.6	<2	8.06	7.20	<2	2.9
Total Dissolved Solids	mg/L	500**	500	500	500	440	340	350	420	380	340	380	450
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1	<1.0
Arsenic	ug/L	10	10	10	10	2	1	1	2	7	2	2	3.2
Barium	ug/L	2,000	2,000	2,000	670	33	18	29	43	42	29	33	38.4
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Chromium	ug/L	100	100	100	11	<1	1	2	2	1	1	3	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1	<1.0
Lithium	ug/L	NC	170	350	440	<10	<10	<10	<10	<10	<10	<10	<10
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Molybdenum	ug/L	NC	73	210	3,200	<5	<5	7	<5	<5	<5	<5	<5.0
Radium-226	pCi/L	5	NC	NC	NC	<0.203	<0.216	<0.370	<0.157	<0.292	<0.181	<0.308	<0.654
Radium-226/228	pCi/L	5	NC	NC	NC	1.02	<0.565	0.518	0.808	1.08	1.18	1.02	<1.45
Radium-228	pCi/L	5	NC	NC	NC	0.879	<0.565	0.518	0.768	0.986	1.10	1.02	<0.796
Selenium	ug/L	50	50	50	5	<1	2	2	<1	<1	<1	1	<1.0
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2	<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 default hardness of 150 mg CaCO₃/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. 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 2
 Summary of Analytical Results for Groundwater Samples
 BC Cobb – RCRA CCR Monitoring Program
 Muskegon, Michigan

Sample Location:						BCC-MW-15005							
Sample Date:						12/1/2015	2/17/2016	4/13/2016	7/12/2016	9/27/2016	2/13/2017	4/4/2017	7/12/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	background							
Appendix III													
Boron	ug/L	NC	500	500	7,200	<20	51	35	46	43	39	25	31.3
Calcium	mg/L	NC	NC	NC	500	57.2	93.3	60.6	75.4	67.3	99.2	43.9	60.2
Chloride	mg/L	250**	250	250	500	9.50	137	66.6	13.1	1.23	181	20.1	3.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	7.18	7.2	7.3	7.2	7.1	7.3	7.6	7.33
Sulfate	mg/L	250**	250	250	500	10.0	5.27	4.69	5.39	<2	5.57	7.88	4.4
Total Dissolved Solids	mg/L	500**	500	500	500	230	480	340	590	230	570	200	204
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1	<1.0
Arsenic	ug/L	10	10	10	10	1	1	<1	2	2	<1	<1	1.1
Barium	ug/L	2,000	2,000	2,000	670	83	125	97	151	147	173	82	116
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Chromium	ug/L	100	100	100	11	<1	<1	2	1	<1	<1	<1	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	1	<1	<1	<1	<1.0
Lithium	ug/L	NC	170	350	440	<10	<10	<10	<10	<10	<10	<10	<10
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Molybdenum	ug/L	NC	73	210	3,200	<5	<5	<5	<5	<5	<5	<5	<5.0
Radium-226	pCi/L	5	NC	NC	NC	0.180	<0.336	<0.244	0.221	<0.332	<0.192	<0.279	<0.675
Radium-226/228	pCi/L	5	NC	NC	NC	0.882	<0.494	<0.378	0.662	0.545	1.02	0.447	<1.41
Radium-228	pCi/L	5	NC	NC	NC	0.702	<0.494	<0.378	0.441	0.471	1.02	0.447	<0.739
Selenium	ug/L	50	50	50	5	<1	<1	<1	<1	<1	<1	<1	<1.0
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2	<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 default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. 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 2
 Summary of Analytical Results for Groundwater Samples
 BC Cobb – RCRA CCR Monitoring Program
 Muskegon, Michigan

Sample Location:						BCC-MW-15006							
Sample Date:						11/30/2015	2/17/2016	4/13/2016	7/12/2016	9/28/2016	2/13/2017	4/4/2017	7/12/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	background							
Appendix III													
Boron	ug/L	NC	500	500	7,200	48	39	33	43	55	32	35	42.3
Calcium	mg/L	NC	NC	NC	500	84.5	73.9	60.0	60.6	86.2	70.5	67.9	68.8
Chloride	mg/L	250**	250	250	500	50.0	12.8	32.5	63.1	19.6	48.0	23.5	69.8
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	7.03	7.3	7.2	6.9	6.9	7.3	7.4	7.15
Sulfate	mg/L	250**	250	250	500	17.0	17.1	12.7	8.54	12.2	7.34	6.88	9.4
Total Dissolved Solids	mg/L	500**	500	500	500	380	290	300	380	320	330	260	346
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	1	<1	<1	1	<1	<1	<1.0
Arsenic	ug/L	10	10	10	10	1	1	<1	2	3	3	2	4.3
Barium	ug/L	2,000	2,000	2,000	670	26	16	17	20	26	17	17	27.8
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Chromium	ug/L	100	100	100	11	<1	1	2	1	<1	1	1	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1	<1.0
Lithium	ug/L	NC	170	350	440	<10	<10	<10	<10	<10	<10	<10	<10
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Molybdenum	ug/L	NC	73	210	3,200	5	6	7	7	7	8	8	8.5
Radium-226	pCi/L	5	NC	NC	NC	<0.301	<0.268	<0.205	<0.225	<0.416	<0.240	<0.198	<0.701
Radium-226/228	pCi/L	5	NC	NC	NC	0.629	<0.623	<0.479	<0.522	<0.571	<0.483	0.652	<1.41
Radium-228	pCi/L	5	NC	NC	NC	0.584	<0.623	<0.479	<0.522	<0.571	<0.483	0.459	<0.708
Selenium	ug/L	50	50	50	5	3	3	2	1	1	<1	1	1.2
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2	<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 default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. 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 2
 Summary of Analytical Results for Groundwater Samples
 BC Cobb – RCRA CCR Monitoring Program
 Muskegon, Michigan

Sample Location:						BCC-MW-15007							
Sample Date:						12/1/2015	2/17/2016	4/13/2016	7/12/2016	9/28/2016	2/14/2017	4/4/2017	7/12/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	background							
Appendix III													
Boron	ug/L	NC	500	500	7,200	79	74	65	89	135	76	83	130
Calcium	mg/L	NC	NC	NC	500	165	222	226	234	250	181	169	170
Chloride	mg/L	250**	250	250	500	1,900	2,300	2,480	2,280	2,390	1,850	1,670	1,900
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	6.74	6.6	6.6	6.6	6.6	6.7	6.7	6.74
Sulfate	mg/L	250**	250	250	500	21.0	15.7	11.0	9.87	9.38	3.19	4.25	9.1
Total Dissolved Solids	mg/L	500**	500	500	500	3,700	2,000	3,900	4,500	4,800	3,700	3,100	3,700
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	1	<1.0
Arsenic	ug/L	10	10	10	10	5	1	1	5	3	1	2	5.8
Barium	ug/L	2,000	2,000	2,000	670	285	267	236	294	377	227	167	229
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Chromium	ug/L	100	100	100	11	<1	2	2	2	1	2	2	1.1
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1	<1.0
Lithium	ug/L	NC	170	350	440	<10	<10	<10	<10	<10	<10	<10	<10
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Molybdenum	ug/L	NC	73	210	3,200	8	<5	<5	<5	<5	<5	<5	<5.0
Radium-226	pCi/L	5	NC	NC	NC	0.686	0.659	0.289	0.554	1.15	0.629	0.492	<0.711
Radium-226/228	pCi/L	5	NC	NC	NC	2.19	1.69	1.56	1.65	2.75	2.02	1.29	<1.45
Radium-228	pCi/L	5	NC	NC	NC	1.50	1.03	1.27	1.10	1.60	1.39	0.796	0.850
Selenium	ug/L	50	50	50	5	1	<1	<1	<1	<1	<1	2	<1.0
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2	<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 default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. 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 2
 Summary of Analytical Results for Groundwater Samples
 BC Cobb – RCRA CCR Monitoring Program
 Muskegon, Michigan

Sample Location:						BCC-MW-15008							
Sample Date:						12/1/2015	2/17/2016	4/13/2016	7/12/2016	9/28/2016	2/14/2017	4/4/2017	7/12/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	background							
Appendix III													
Boron	ug/L	NC	500	500	7,200	1,060	897	794	866	1,160	489	416	396
Calcium	mg/L	NC	NC	NC	500	39.6	39.5	48.4	77.2	109	63.4	63.0	54.4
Chloride	mg/L	250**	250	250	500	160	157	193	546	423	129	95.9	70.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	8.15	8.3	8.1	8.1	7.8	7.8	7.6	7.62
Sulfate	mg/L	250**	250	250	500	45.0	3.05	5.13	22.3	12.0	8.70	4.60	3.9
Total Dissolved Solids	mg/L	500**	500	500	500	540	530	590	1,300	1,100	650	510	414
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1	<1.0
Arsenic	ug/L	10	10	10	10	1	<1	<1	4	<1	<1	<1	2.3
Barium	ug/L	2,000	2,000	2,000	670	39	42	49	61	100	63	59	54.6
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Chromium	ug/L	100	100	100	11	<1	<1	1	2	<1	<1	1	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1	<1.0
Lithium	ug/L	NC	170	350	440	12.9	13.5	16	19	28	17	18	23
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Molybdenum	ug/L	NC	73	210	3,200	<5	<5	<5	<5	<5	<5	<5	<5.0
Radium-226	pCi/L	5	NC	NC	NC	<0.188	<0.215	<0.199	0.174	<0.217	<0.173	<0.284	<0.592
Radium-226/228	pCi/L	5	NC	NC	NC	0.620	<0.457	0.646	<0.405	1.03	0.843	<0.346	1.66
Radium-228	pCi/L	5	NC	NC	NC	0.521	<0.457	0.516	<0.405	0.893	0.672	<0.346	1.47
Selenium	ug/L	50	50	50	5	<1	<1	<1	1	<1	<1	1	<1.0
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2	<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 default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. 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 2
 Summary of Analytical Results for Groundwater Samples
 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
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	downgradient							
Appendix III													
Boron	ug/L	NC	500	500	7,200	2,380	2,520	2,170	2,070	2,190	2,110	2,190	2,210
Calcium	mg/L	NC	NC	NC	500	42.7	44.1	40.1	44.1	46.7	37.7	38.2	37.6
Chloride	mg/L	250**	250	250	500	24.0	24.0	27.1	26.9	24.3	22.8	24.9	26.3
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	10.62	10.8	10.3	10	10	10.2	10.1	9.6
Sulfate	mg/L	250**	250	250	500	63.0	39.3	49.5	55.2	49.1	31.6	39.8	43.0
Total Dissolved Solids	mg/L	500**	500	500	500	240	230	220	220	230	200	190	216
Appendix IV													
Antimony	ug/L	6	6	6	130	1	<1	<1	<1	<1	<1	<1	<1.0
Arsenic	ug/L	10	10	10	10	45	31	24	24	20	14	13	12.0
Barium	ug/L	2,000	2,000	2,000	670	16	12	11	11	11	9	10	13.2
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Chromium	ug/L	100	100	100	11	<1	<1	1	2	<1	<1	<1	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1	<1.0
Lithium	ug/L	NC	170	350	440	15.6	14.6	15	14	14	13	14	19
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Molybdenum	ug/L	NC	73	210	3,200	57	60	50	49	49	40	38	43.7
Radium-226	pCi/L	5	NC	NC	NC	<0.166	<0.157	<0.209	<0.158	<0.269	<0.159	<0.347	<0.756
Radium-226/228	pCi/L	5	NC	NC	NC	<0.451	<0.475	<0.467	<0.461	<0.628	0.747	<0.502	<2.72
Radium-228	pCi/L	5	NC	NC	NC	<0.451	<0.475	<0.467	<0.461	<0.628	0.678	<0.502	<1.96
Selenium	ug/L	50	50	50	5	<1	<1	2	<1	<1	<1	<1	<1.0
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2	<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 default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. 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 2
 Summary of Analytical Results for Groundwater Samples
 BC Cobb – RCRA CCR Monitoring Program
 Muskegon, Michigan

Sample Location:						BCC-MW-15010							
Sample Date:						12/1/2015	2/17/2016	4/13/2016	7/12/2016	9/28/2016	2/14/2017	4/5/2017	7/11/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	downgradient							
Appendix III													
Boron	ug/L	NC	500	500	7,200	1,970	1,510	1,340	1,270	1,570	1,440	1,760	1,340
Calcium	mg/L	NC	NC	NC	500	71.2	51.9	37.4	58.2	66.4	49.8	80.5	40.7
Chloride	mg/L	250**	250	250	500	23.0	22.5	21.5	22.7	25.1	22.3	24.2	25.5
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	7.74	7.8	7.8	7.8	8.0	8.0	7.8	7.8
Sulfate	mg/L	250**	250	250	500	120	52.6	31.0	50.7	69.7	24.2	53.5	24.8
Total Dissolved Solids	mg/L	500**	500	500	500	410	270	220	260	320	250	360	288
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1	<1.0
Arsenic	ug/L	10	10	10	10	<1	<1	<1	<1	<1	<1	<1	<1.0
Barium	ug/L	2,000	2,000	2,000	670	49	34	28	42	45	31	51	29.2
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Chromium	ug/L	100	100	100	11	<1	<1	2	<1	<1	1	<1	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1	<1.0
Lithium	ug/L	NC	170	350	440	36.1	22.7	18	15	22	14	18	21
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Molybdenum	ug/L	NC	73	210	3,200	33	29	27	15	20	9	7	16.2
Radium-226	pCi/L	5	NC	NC	NC	<0.302	<0.217	<0.244	<0.145	<0.297	<0.179	<0.216	<0.642
Radium-226/228	pCi/L	5	NC	NC	NC	0.973	<0.502	<0.447	0.451	0.820	<0.363	<0.380	<1.60
Radium-228	pCi/L	5	NC	NC	NC	0.849	<0.502	<0.447	0.420	0.728	<0.363	<0.380	<0.956
Selenium	ug/L	50	50	50	5	<1	<1	1	1	<1	<1	<1	<1.0
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2	<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 default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. 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 2
 Summary of Analytical Results for Groundwater Samples
 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
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	downgradient							
Appendix III													
Boron	ug/L	NC	500	500	7,200	1,680	1,420	1,340	1,210	1,180	1,280	1,340	1,060
Calcium	mg/L	NC	NC	NC	500	53.0	47.6	36.9	47.3	48.0	47.9	52.0	42.2
Chloride	mg/L	250**	250	250	500	22.0	20.7	22.1	24.8	21.0	19.5	22.2	22.9
Fluoride	ug/L	4,000	NC	NC	NC	1,200	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	8.68	8.5	8.2	8.5	8.7	9.2	9.0	8.2
Sulfate	mg/L	250**	250	250	500	50.0	30.8	35.8	43.8	38.5	37.2	42.8	29.1
Total Dissolved Solids	mg/L	500**	500	500	500	270	230	210	240	230	230	240	224
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1	<1.0
Arsenic	ug/L	10	10	10	10	5	3	3	4	6	7	8	<1.0
Barium	ug/L	2,000	2,000	2,000	670	36	29	25	30	31	31	32	30.7
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Chromium	ug/L	100	100	100	11	1	<1	2	1	<1	<1	<1	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	1,200	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1	<1.0
Lithium	ug/L	NC	170	350	440	17.2	16	14	15	16	17	17	20
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Molybdenum	ug/L	NC	73	210	3,200	20	29	35	26	27	25	22	21.4
Radium-226	pCi/L	5	NC	NC	NC	<0.199	<0.141	<0.319	<0.166	<0.284	<0.160	<0.296	<1.12
Radium-226/228	pCi/L	5	NC	NC	NC	1.01	<0.447	<0.435	<0.402	<0.496	<0.394	<0.599	<2.07
Radium-228	pCi/L	5	NC	NC	NC	0.956	<0.447	<0.435	<0.402	<0.496	<0.394	<0.599	<0.954
Selenium	ug/L	50	50	50	5	<1	<1	<1	1	<1	<1	<1	<1.0
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2	<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 default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. 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 2
 Summary of Analytical Results for Groundwater Samples
 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
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	downgradient							
Appendix III													
Boron	ug/L	NC	500	500	7,200	961	1,390	1,830	1,450	1,470	1,380	1,500	1,340
Calcium	mg/L	NC	NC	NC	500	49.5	82.1	65.5	44.5	43.5	32.0	34.9	24.6
Chloride	mg/L	250**	250	250	500	20.0	20.4	23.7	23.0	22.6	19.7	22.7	24.1
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	1,200
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	7.98	8.1	8.1	8.9	9.2	8.6	8.5	9.89
Sulfate	mg/L	250**	250	250	500	69.0	111	106	65.6	50.9	55.7	57.2	21.8
Total Dissolved Solids	mg/L	500**	500	500	500	300	370	340	250	210	190	200	168
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1	<1.0
Arsenic	ug/L	10	10	10	10	<1	2	8	12	9	2	3	6.1
Barium	ug/L	2,000	2,000	2,000	670	40	63	68	34	22	25	28	14.3
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Chromium	ug/L	100	100	100	11	<1	<1	1	1	<1	<1	<1	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	1,200
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1	<1.0
Lithium	ug/L	NC	170	350	440	15.6	20.8	19	18	15	11	12	12
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Molybdenum	ug/L	NC	73	210	3,200	29	9	35	37	44	35	27	94.5
Radium-226	pCi/L	5	NC	NC	NC	<0.164	<0.243	<0.256	<0.216	<0.335	<0.153	<0.243	0.436
Radium-226/228	pCi/L	5	NC	NC	NC	<0.471	<0.634	0.919	<0.539	<0.548	<0.416	<0.554	<2.28
Radium-228	pCi/L	5	NC	NC	NC	<0.471	<0.634	0.827	<0.539	<0.548	<0.416	<0.554	<2.08
Selenium	ug/L	50	50	50	5	<1	<1	<1	<1	<1	<1	<1	1.2
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2	<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 default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. 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 2
 Summary of Analytical Results for Groundwater Samples
 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
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	downgradient							
Appendix III													
Boron	ug/L	NC	500	500	7,200	1,140	1,290	1,180	1,080	1,090	1,050	1,120	916
Calcium	mg/L	NC	NC	NC	500	65.2	58.3	47.5	48.4	59.7	52.5	50.9	43.9
Chloride	mg/L	250**	250	250	500	21.0	20.9	21.5	21.0	22.9	19.8	19.9	23.4
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	7.61	7.2	7.4	7.3	7.4	7.7	7.4	7.36
Sulfate	mg/L	250**	250	250	500	89.0	44.3	34.3	27.5	31.3	23.1	15.1	8.7
Total Dissolved Solids	mg/L	500**	500	500	500	330	290	260	250	250	260	250	240
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1	<1.0
Arsenic	ug/L	10	10	10	10	<1	<1	<1	<1	<1	<1	<1	<1.0
Barium	ug/L	2,000	2,000	2,000	670	71	58	49	47	51	52	48	41.9
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Chromium	ug/L	100	100	100	11	<1	<1	2	1	<1	<1	<1	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1	<1.0
Lithium	ug/L	NC	170	350	440	17.5	19.9	18	17	18	18	17	23
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Molybdenum	ug/L	NC	73	210	3,200	17	20	21	12	11	10	9	7.7
Radium-226	pCi/L	5	NC	NC	NC	0.272	<0.299	0.173	<0.181	<0.215	<0.230	<0.215	0.731
Radium-226/228	pCi/L	5	NC	NC	NC	1.19	<0.527	0.900	0.596	<0.598	<0.481	<0.516	<1.56
Radium-228	pCi/L	5	NC	NC	NC	0.914	<0.527	0.727	0.483	<0.598	<0.481	<0.516	<0.940
Selenium	ug/L	50	50	50	5	<1	<1	<1	1	<1	<1	<1	<1.0
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2	<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 default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. 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 2
 Summary of Analytical Results for Groundwater Samples
 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
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	downgradient							
Appendix III													
Boron	ug/L	NC	500	500	7,200	2,560	2,230	1,840	1,630	1,690	1,530	1,560	1,300
Calcium	mg/L	NC	NC	NC	500	75.6	75.3	63.9	73.5	64.7	66.3	65.3	61.8
Chloride	mg/L	250**	250	250	500	21.0	21.9	21.9	22.0	22.7	18.6	22.1	22.4
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	11.53	11.6	11.2	11	11.1	11.5	11.3	11.5
Sulfate	mg/L	250**	250	250	500	43.0	34.7	31.4	35.6	23.7	27.8	23.9	24.9
Total Dissolved Solids	mg/L	500**	500	500	500	350	310	270	290	250	280	270	292
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1	1.7
Arsenic	ug/L	10	10	10	10	15	11	11	8	9	7	7	8.4
Barium	ug/L	2,000	2,000	2,000	670	329	376	257	508	357	571	546	732
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Chromium	ug/L	100	100	100	11	<1	2	1	1	<1	<1	<1	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1	<1.0
Lithium	ug/L	NC	170	350	440	<10	<10	<10	<10	<10	<10	<10	19
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Molybdenum	ug/L	NC	73	210	3,200	119	76	58	69	81	80	77	70.9
Radium-226	pCi/L	5	NC	NC	NC	<0.176	<0.175	<0.177	0.214	<0.218	<0.211	<0.289	<0.511
Radium-226/228	pCi/L	5	NC	NC	NC	1.31	<0.735	<0.562	<0.606	<0.485	0.883	<0.423	<1.58
Radium-228	pCi/L	5	NC	NC	NC	1.23	<0.735	<0.562	<0.606	<0.485	0.810	<0.423	<1.07
Selenium	ug/L	50	50	50	5	<1	1	<1	<1	<1	1	8	2.3
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2	<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 default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. 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 2
 Summary of Analytical Results for Groundwater Samples
 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
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	downgradient							
Appendix III													
Boron	ug/L	NC	500	500	7,200	1,190	1,170	963	614	656	662	599	489
Calcium	mg/L	NC	NC	NC	500	32.8	33.0	30.6	36.2	40.1	38.4	37.6	29.4
Chloride	mg/L	250**	250	250	500	21.0	22.0	21.6	20.4	19.5	19.2	22.7	20.1
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	7.56	7.4	7.4	7.4	7.8	7.7	7.6	8.35
Sulfate	mg/L	250**	250	250	500	7.80	6.56	8.34	13.9	9.26	10.4	13.8	18.8
Total Dissolved Solids	mg/L	500**	500	500	500	220	200	190	180	180	200	190	166
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1	<1.0
Arsenic	ug/L	10	10	10	10	2	2	2	6	5	5	6	6.4
Barium	ug/L	2,000	2,000	2,000	670	23	22	21	25	28	30	28	30.1
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Chromium	ug/L	100	100	100	11	<1	<1	1	1	<1	<1	<1	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1	<1.0
Lithium	ug/L	NC	170	350	440	<10	<10	<10	<10	<10	<10	<10	12
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Molybdenum	ug/L	NC	73	210	3,200	17	14	17	11	10	9	11	11.9
Radium-226	pCi/L	5	NC	NC	NC	<0.193	<0.157	<0.242	<0.133	<0.378	<0.166	<0.340	<0.832
Radium-226/228	pCi/L	5	NC	NC	NC	<0.578	<0.577	<0.521	<0.467	0.850	<0.408	<0.420	<1.63
Radium-228	pCi/L	5	NC	NC	NC	<0.578	<0.577	<0.521	<0.467	0.850	<0.408	<0.420	<0.799
Selenium	ug/L	50	50	50	5	<1	<1	<1	1	<1	<1	<1	<1.0
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2	<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 default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. 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 2
 Summary of Analytical Results for Groundwater Samples
 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
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	downgradient							
Appendix III													
Boron	ug/L	NC	500	500	7,200	108	119	86	100	88	92	83	85.9
Calcium	mg/L	NC	NC	NC	500	172	184	164	172	181	176	172	170
Chloride	mg/L	250**	250	250	500	200	204	203	165	204	196	200	10.4
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	6.55	6.5	6.4	6.3	6.4	6.4	6.6	6.44
Sulfate	mg/L	250**	250	250	500	<2	<2	<2	<2	<2	<2	<2	<2.0
Total Dissolved Solids	mg/L	500**	500	500	500	980	1,000	980	920	930	990	1,000	1,050
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1	<1.0
Arsenic	ug/L	10	10	10	10	2	2	3	3	2	2	2	1.5
Barium	ug/L	2,000	2,000	2,000	670	656	647	614	619	621	666	613	596
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Chromium	ug/L	100	100	100	11	2	3	3	4	3	3	3	1.9
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1	<1.0
Lithium	ug/L	NC	170	350	440	<10	<10	<10	<10	<10	<10	<10	<10
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Molybdenum	ug/L	NC	73	210	3,200	<5	<5	<5	<5	<5	<5	<5	<5.0
Radium-226	pCi/L	5	NC	NC	NC	<0.263	1.51	1.31	1.50	1.06	1.17	1.60	1.30
Radium-226/228	pCi/L	5	NC	NC	NC	2.29	3.83	3.00	3.18	2.74	3.54	3.66	2.36
Radium-228	pCi/L	5	NC	NC	NC	2.29	2.32	1.69	1.68	1.68	2.37	2.06	1.06
Selenium	ug/L	50	50	50	5	2	4	2	7	1	2	2	3.6
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2	<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 default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. 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 2
 Summary of Analytical Results for Groundwater Samples
 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
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	downgradient							
Appendix III													
Boron	ug/L	NC	500	500	7,200	59	90	66	76	78	76	75	75.0
Calcium	mg/L	NC	NC	NC	500	225	247	220	232	252	232	232	203
Chloride	mg/L	250**	250	250	500	200	201	184	204	182	192	187	199
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	6.46	6.4	6.4	6.4	6.4	6.6	6.5	6.41
Sulfate	mg/L	250**	250	250	500	<2	<2	<2	<2	<2	<2	<2	<2.0
Total Dissolved Solids	mg/L	500**	500	500	500	850	1,100	1,200	1,100	1,100	1,200	1,100	1,230
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1	<1.0
Arsenic	ug/L	10	10	10	10	13	7	5	12	12	5	4	3.0
Barium	ug/L	2,000	2,000	2,000	670	1,030	981	924	985	955	968	876	772
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Chromium	ug/L	100	100	100	11	4	4	4	9	11	5	5	5.3
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1	<1.0
Lithium	ug/L	NC	170	350	440	<10	<10	<10	<10	<10	<10	<10	<10
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Molybdenum	ug/L	NC	73	210	3,200	<5	<5	<5	<5	<5	<5	<5	<5.0
Radium-226	pCi/L	5	NC	NC	NC	1.61	2.38	2.18	1.91	1.94	1.82	1.56	1.97
Radium-226/228	pCi/L	5	NC	NC	NC	4.30	5.35	5.68	5.89	4.44	4.97	4.34	4.75
Radium-228	pCi/L	5	NC	NC	NC	2.69	2.97	3.50	3.98	2.50	3.15	2.78	2.78
Selenium	ug/L	50	50	50	5	3	4	3	8	2	2	3	2.7
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2	<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 default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. 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 2
 Summary of Analytical Results for Groundwater Samples
 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
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	downgradient							
Appendix III													
Boron	ug/L	NC	500	500	7,200	487	526	478	399	438	479	493	538
Calcium	mg/L	NC	NC	NC	500	88.6	100	87.9	86.8	98.5	100	92.1	84.8
Chloride	mg/L	250**	250	250	500	38.0	38.0	40.8	39.3	37.5	43.6	44.4	53.4
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	7.0	6.9	6.8	6.5	6.5	6.7	6.8	6.78
Sulfate	mg/L	250**	250	250	500	<2	<2	<2	<2	<2	<2	<2	<2.0
Total Dissolved Solids	mg/L	500**	500	500	500	290	400	430	390	410	450	410	420
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1	<1.0
Arsenic	ug/L	10	10	10	10	1	<1	<1	2	<1	<1	<1	<1.0
Barium	ug/L	2,000	2,000	2,000	670	155	149	139	133	143	171	149	153
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Chromium	ug/L	100	100	100	11	<1	1	1	1	1	<1	1	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1	<1.0
Lithium	ug/L	NC	170	350	440	21.4	23.1	24	12	14	21	21	26
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Molybdenum	ug/L	NC	73	210	3,200	<5	<5	<5	<5	<5	<5	<5	<5.0
Radium-226	pCi/L	5	NC	NC	NC	0.227	0.394	0.430	0.234	0.522	0.363	<0.314	<0.479
Radium-226/228	pCi/L	5	NC	NC	NC	<0.586	1.17	1.08	1.08	1.33	1.36	1.37	<1.25
Radium-228	pCi/L	5	NC	NC	NC	<0.586	0.778	0.649	0.845	0.803	0.996	1.08	<0.767
Selenium	ug/L	50	50	50	5	<1	<1	1	4	<1	<1	<1	<1.0
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2	<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 default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. 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 2
 Summary of Analytical Results for Groundwater Samples
 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
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	downgradient							
Appendix III													
Boron	ug/L	NC	500	500	7,200	1,530	1,590	1,440	1,320	1,260	1,370	1,410	1,430
Calcium	mg/L	NC	NC	NC	500	84.6	93.6	83.0	90.0	92.6	91.8	92.8	90.1
Chloride	mg/L	250**	250	250	500	34.0	32.4	33.7	37.7	35.6	34.5	33.6	52.5
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	7.0	6.8	6.9	6.7	6.4	6.8	6.9	6.79
Sulfate	mg/L	250**	250	250	500	<2	<2	<2	<2	<2	<2	<2	<2.0
Total Dissolved Solids	mg/L	500**	500	500	500	340	390	440	410	370	410	420	470
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1	<1.0
Arsenic	ug/L	10	10	10	10	<1	<1	<1	<1	<1	<1	<1	<1.0
Barium	ug/L	2,000	2,000	2,000	670	91	94	88	88	96	93	90	109
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Chromium	ug/L	100	100	100	11	<1	<1	1	1	<1	<1	<1	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1	<1.0
Lithium	ug/L	NC	170	350	440	23.7	27.9	26	24	22	23	22	27
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Molybdenum	ug/L	NC	73	210	3,200	<5	<5	<5	<5	<5	<5	<5	<5.0
Radium-226	pCi/L	5	NC	NC	NC	0.333	0.279	0.465	0.282	0.315	0.329	<0.360	<0.620
Radium-226/228	pCi/L	5	NC	NC	NC	0.674	0.798	0.997	0.969	<0.739	2.13	0.974	<1.64
Radium-228	pCi/L	5	NC	NC	NC	<0.484	<0.567	0.532	<0.718	<0.739	1.80	0.872	<1.02
Selenium	ug/L	50	50	50	5	<1	<1	<1	2	<1	<1	<1	1.2
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2	<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 default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. 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 2
 Summary of Analytical Results for Groundwater Samples
 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
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	downgradient							
Appendix III													
Boron	ug/L	NC	500	500	7,200	630	738	638	603	608	621	667	618
Calcium	mg/L	NC	NC	NC	500	61.0	67.6	59.1	60.7	66.5	67.0	66.6	68.1
Chloride	mg/L	250**	250	250	500	39.0	35.4	34.3	69.6	33.5	33.3	33.9	45.7
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	7.27	7.2	7.0	6.9	6.9	7.0	7.1	7.01
Sulfate	mg/L	250**	250	250	500	2.20	2.34	<2	<2	<2	<2	<2	<2.0
Total Dissolved Solids	mg/L	500**	500	500	500	320	310	320	310	310	330	320	388
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1	<1.0
Arsenic	ug/L	10	10	10	10	<1	<1	<1	<1	<1	<1	<1	<1.0
Barium	ug/L	2,000	2,000	2,000	670	48	52	51	47	54	53	52	60.4
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Chromium	ug/L	100	100	100	11	<1	2	<1	1	<1	<1	<1	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1	<1.0
Lithium	ug/L	NC	170	350	440	15.1	17.8	16	14	14	14	14	18
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Molybdenum	ug/L	NC	73	210	3,200	<5	<5	<5	<5	<5	<5	<5	<5.0
Radium-226	pCi/L	5	NC	NC	NC	<0.269	<0.240	<0.341	<0.190	<0.276	<0.294	<0.290	<0.761
Radium-226/228	pCi/L	5	NC	NC	NC	<0.467	0.847	0.730	<0.598	0.724	<0.591	0.652	<1.39
Radium-228	pCi/L	5	NC	NC	NC	<0.467	0.731	0.474	<0.598	0.682	<0.591	0.543	<0.627
Selenium	ug/L	50	50	50	5	<1	1	<1	2	<1	<1	<1	1.4
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2	<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 default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. 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 2
 Summary of Analytical Results for Groundwater Samples
 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	4/5/2017	7/12/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	downgradient							
Appendix III													
Boron	ug/L	NC	500	500	7,200	362	489	400	425	491	465	519	519
Calcium	mg/L	NC	NC	NC	500	86.4	98.5	89.6	97.4	96.9	97.9	96.3	86.8
Chloride	mg/L	250**	250	250	500	88.0	82.7	87.2	98.3	98.9	94.6	93.9	97.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	6.83	6.8	6.8	6.7	6.8	6.9	6.9	6.81
Sulfate	mg/L	250**	250	250	500	<2	<2	<2	<2	<2	<2	<2	<2.0
Total Dissolved Solids	mg/L	500**	500	500	500	610	540	570	590	620	570	560	548
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1	<1.0
Arsenic	ug/L	10	10	10	10	3	1	1	2	2	2	2	1.0
Barium	ug/L	2,000	2,000	2,000	670	274	244	236	233	252	240	228	211
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Chromium	ug/L	100	100	100	11	<1	2	2	2	1	2	2	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1	<1.0
Lithium	ug/L	NC	170	350	440	<10	<10	<10	<10	<10	<10	<10	<10
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Molybdenum	ug/L	NC	73	210	3,200	<5	<5	<5	<5	<5	<5	<5	<5.0
Radium-226	pCi/L	5	NC	NC	NC	0.569	0.629	0.563	0.429	0.483	0.524	<0.215	<0.768
Radium-226/228	pCi/L	5	NC	NC	NC	1.55	1.41	1.41	1.30	2.00	0.966	<0.354	<1.47
Radium-228	pCi/L	5	NC	NC	NC	0.984	0.782	0.846	0.871	1.52	<0.582	<0.354	<0.697
Selenium	ug/L	50	50	50	5	1	2	1	4	<1	<1	1	1.6
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2	<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 default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. 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 2
 Summary of Analytical Results for Groundwater Samples
 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
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	downgradient							
Appendix III													
Boron	ug/L	NC	500	500	7,200	250	388	387	362	391	394	434	478
Calcium	mg/L	NC	NC	NC	500	46.7	46.4	47.8	43.0	43.7	54.1	49.3	51.8
Chloride	mg/L	250**	250	250	500	25.0	18.7	17.6	16.8	17.1	18.2	18.6	22.1
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	8.29	8.5	8.2	8.2	8.1	7.8	8.1	8.36
Sulfate	mg/L	250**	250	250	500	39.0	38.3	29.9	34.3	32.8	34.1	32.8	45.9
Total Dissolved Solids	mg/L	500**	500	500	500	270	210	250	250	210	250	230	254
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1	<1.0
Arsenic	ug/L	10	10	10	10	6	7	8	8	6	4	4	5.8
Barium	ug/L	2,000	2,000	2,000	670	139	119	155	116	119	137	129	138
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Chromium	ug/L	100	100	100	11	<1	1	2	1	<1	<1	<1	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1	<1.0
Lithium	ug/L	NC	170	350	440	<10	<10	<10	<10	<10	<10	<10	<10
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Molybdenum	ug/L	NC	73	210	3,200	22	16	11	17	19	12	14	13.6
Radium-226	pCi/L	5	NC	NC	NC	0.246	<0.242	<0.247	<0.150	<0.346	<0.217	<0.291	<0.468
Radium-226/228	pCi/L	5	NC	NC	NC	<0.484	<0.450	0.812	<0.472	<0.514	<0.477	0.862	<1.27
Radium-228	pCi/L	5	NC	NC	NC	<0.484	<0.450	0.740	<0.472	<0.514	<0.477	0.709	<0.799
Selenium	ug/L	50	50	50	5	<1	<1	<1	<1	<1	<1	<1	<1.0
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2	<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 default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. 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 2
 Summary of Analytical Results for Groundwater Samples
 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	4/6/2017	7/11/2017
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	downgradient							
Appendix III													
Boron	ug/L	NC	500	500	7,200	414	284	267	308	526	484	1,590	701
Calcium	mg/L	NC	NC	NC	500	59.7	59.4	53.3	54.1	64.0	59.9	74.5	50.8
Chloride	mg/L	250**	250	250	500	30.0	26.9	24.6	28.7	24.8	23.8	24.6	26.8
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
pH, Field	SU	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	7.43	7.5	7.5	7.5	7.4	7.6	7.6	7.63
Sulfate	mg/L	250**	250	250	500	20.0	26.5	28.9	25.0	24.3	21.0	22.5	22.6
Total Dissolved Solids	mg/L	500**	500	500	500	240	270	270	290	290	280	300	290
Appendix IV													
Antimony	ug/L	6	6	6	130	<1	<1	<1	<1	<1	<1	<1	<1.0
Arsenic	ug/L	10	10	10	10	2	2	1	3	2	2	<1	1.9
Barium	ug/L	2,000	2,000	2,000	670	57	48	43	40	47	42	46	38.0
Beryllium	ug/L	4	4	4	6.7	<1	<1	<1	<1	<1	<1	<1	<1.0
Cadmium	ug/L	5	5	5	3.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Chromium	ug/L	100	100	100	11	<1	<1	2	1	<1	<1	<1	<1.0
Cobalt	ug/L	NC	40	100	100	<15	<15	<15	<15	<15	<15	<15	<15.0
Fluoride	ug/L	4,000	NC	NC	NC	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Lead	ug/L	NC	4	4	29	<1	<1	<1	<1	<1	<1	<1	<1.0
Lithium	ug/L	NC	170	350	440	12.1	10.6	<10	<10	<10	<10	11	<10
Mercury	ug/L	2	2	2	0.20#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20
Molybdenum	ug/L	NC	73	210	3,200	8	6	<5	7	6	6	<5	6.0
Radium-226	pCi/L	5	NC	NC	NC	0.232	<0.237	<0.242	0.226	<0.309	0.257	0.455	<0.889
Radium-226/228	pCi/L	5	NC	NC	NC	<0.530	0.599	<0.456	<0.545	<0.355	0.426	1.42	<1.53
Radium-228	pCi/L	5	NC	NC	NC	<0.530	0.426	<0.456	<0.545	<0.355	<0.400	0.963	<0.636
Selenium	ug/L	50	50	50	5	<1	<1	<1	1	<1	<1	<1	<1.0
Thallium	ug/L	2	2	2	3.7	<2	<2	<2	<2	<2	<2	<2	<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 default hardness of 150 mg CaCO3/L per MDEQ RRD Op Memo 5, Sept. 30, 2004. Generic GSI criterion for calcium, chloride, and sulfate is the total dissolved solids criterion. 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 3
 Summary of Field Parameters
 BC Cobb – RCRA CCR Monitoring Program
 Muskegon, Michigan

Sample Location	Sample Date	Dissolved Oxygen	Oxidation Reduction Potential	Specific Conductivity	Temperature	Turbidity
		mg/L	mV	umhos/cm	°C	NTU
BCC-MW-15001	11/30/15	0.09	-139.3	884	13.12	0.94
	02/17/16	0.8	-92.3	859	8.4	2.4
	04/12/16	0.5	-66.1	802	9.3	5.6
	07/12/16	0.4	-162.2	766	15.4	4.5
	09/27/16	0.4	-83.1	880	12.7	<1
	02/13/17	0.5	-93.6	780	11.2	5.5
	04/04/17	0.1	-94.8	848	10.7	<1
	07/11/17	0.11	-110.8	721.0	14.60	3.94
BCC-MW-15002	11/30/15	0.14	-129.4	3,401	12.52	1.72
	02/17/16	0.2	-82.0	3,114	9.6	<1
	04/12/16	0.3	-82.9	3,693	10.5	<1
	07/12/16	0.4	-43.4	3,087	17.0	<1
	09/27/16	0.4	-50.5	2,003	14.1	<1
	02/13/17	0.5	-77.4	1,784	11.4	<1
	04/04/17	0.6	-59.8	2,072	10.2	<1
	07/11/17	0.10	-11.0	2,479.2	14.21	<1
BCC-MW-15003	11/30/15	2.32	34.1	2,957	11.24	5.1
	02/17/16	0.3	-76.2	3,291	7.5	<1
	04/12/16	0.3	-51.2	2,991	9.8	<1
	07/12/16	0.3	-119.9	2,796	15.5	<1
	09/27/16	0.4	-67.8	2,749	14.3	<1
	02/13/17	0.4	-82.6	2,438	9.9	2.1
	04/04/17	0.0	-107.0	2,349	9.2	1.6
	07/12/17	0.15	-87.2	1,803.0	14.60	5.79
BCC-MW-15004	11/30/15	1.64	-7.3	655	11.07	3.09
	02/17/16	1.0	41.1	556	7.0	2.3
	04/12/16	0.5	-14.0	616	7.6	<1
	07/12/16	0.3	-120.7	741	15.9	<1
	09/27/16	0.4	-69.5	688	16.9	<1
	02/13/17	0.6	-11.2	570	9.0	<1
	04/04/17	0.6	-67.3	615	8.7	<1
	07/12/17	0.14	-39.2	647.9	15.02	3.08
BCC-MW-15005	12/01/15	0.67	-100.7	345	9.19	1.23
	02/17/16	0.3	-65.7	731	5.4	<1
	04/13/16	0.7	-37.1	573	6.7	1.1
	07/12/16	0.3	-141.1	482	17.3	2.3
	09/27/16	0.5	-79.1	387	19.0	2.3
	02/13/17	0.9	-35.7	921	7.1	4.5
	04/04/17	3.2	-66.6	424	7.4	8.0
	07/12/17	0.20	-90.8	374.9	18.31	2.68

Notes:

mg/L - Milligrams per Liter.
 mV - Millivolts.
 umhos/cm - Micromhos per centimeter.
 NTU - Nephelometric Turbidity Unit.

Table 3
 Summary of Field Parameters
 BC Cobb – RCRA CCR Monitoring Program
 Muskegon, Michigan

Sample Location	Sample Date	Dissolved Oxygen	Oxidation Reduction Potential	Specific Conductivity	Temperature	Turbidity
		mg/L	mV	umhos/cm	°C	NTU
BCC-MW-15006	11/30/15	2.71	-55.1	683	9.71	2.81
	02/17/16	2.7	73.4	471	4.6	8.7
	04/13/16	2.6	60.5	518	6.8	<1
	07/12/16	1.4	-18.5	678	23.9	<1
	09/28/16	1.2	-5.5	557	19.4	<1
	02/13/17	2.0	-49.7	503	5.5	<1
	04/04/17	3.5	-10.0	414	8.0	<1
	07/12/17	1.49	33.2	598.8	21.51	<1
BCC-MW-15007	12/01/15	0.23	-134.8	6,286	10.56	2.03
	02/17/16	1.4	-72.5	7,506	5.3	1
	04/13/16	0.3	-48.7	7,861	7.1	<1
	07/12/16	0.3	-109.9	7,314	19.1	<1
	09/28/16	0.4	-94.8	8,664	20.3	<1
	02/14/17	0.5	-90.8	6,474	6.1	1.3
	04/04/17	0.1	-72.9	6,047	7.6	<1
	07/12/17	0.13	-118.7	4,980.0	19.60	2.12
BCC-MW-15008	12/01/15	0.00	-308.4	938	12.78	1.18
	02/17/16	0.1	-219.5	956	6.2	<1
	04/13/16	0.2	-230.2	1,133	6.7	<1
	07/12/16	0.2	-239.0	2,443	21.8	<1
	09/28/16	0.4	-250.7	2,149	19.9	<1
	02/14/17	0.6	-117.9	1,078	6.5	<1
	04/04/17	0.5	-88.3	864	7.8	<1
	07/12/17	0.11	-114.3	710.6	18.29	3.79
BCC-MW-15009	12/01/15	0.41	-236.7	335	13.50	1.93
	02/17/16	0.2	-280.2	352	12.7	<1
	04/18/16	0.4	-195.5	346	17.7	<1
	07/12/16	0.2	-367.1	356	19.7	<1
	09/28/16	0.4	-365.3	358	16.8	<1
	02/14/17	0.4	-361.2	329	13.6	1.2
	04/05/17	0.0	-292.0	338	13.5	2.5
	07/11/17	0.05	-319.6	295.7	17.00	6.99
BCC-MW-15010	12/01/15	0.01	-246.0	587	12.97	2.51
	02/17/16	0.1	-197.3	402	11.4	2.8
	04/13/16	0.2	-182.6	344	10.9	<1
	07/13/16	0.3	-174.7	449	16.0	3.1
	09/28/16	0.4	-104.8	547	18.5	<1
	02/14/17	0.5	-192.3	390	12.0	<1
	04/05/17	0.5	-52.9	556	11.3	<1
	07/11/17	0.08	-193.4	345.0	15.50	4.71

Notes:

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Table 3
 Summary of Field Parameters
 BC Cobb – RCRA CCR Monitoring Program
 Muskegon, Michigan

Sample Location	Sample Date	Dissolved Oxygen	Oxidation Reduction Potential	Specific Conductivity	Temperature	Turbidity
		mg/L	mV	umhos/cm	°C	NTU
BCC-MW-15011	12/01/15	0.00	-322.4	391	13.76	3.54
	02/17/16	0.2	-180.3	346	10.4	<1
	04/13/16	0.3	-145.7	323	14.1	<1
	07/12/16	0.2	-208.0	371	19.2	<1
	09/28/16	0.4	-100.0	390	15.2	<1
	02/14/17	0.5	-221.3	389	12.2	<1
	04/05/17	0.1	-198.5	427	13.0	<1
	07/11/17	0.10	-198.1	345.5	16.00	2.65
BCC-MW-15012	12/01/15	0.49	0.8	374	14.33	2.25
	02/17/16	0.2	-201.2	569	12.6	<1
	04/13/16	0.2	-217.3	570	14.2	1.8
	07/13/16	0.4	-179.0	406	19.9	<1
	09/29/16	0.5	-174.9	354	14.7	<1
	02/14/17	0.6	-186.8	318	12.2	<1
	04/05/17	0.4	-208.8	340	12.6	<1
	07/12/17	0.12	-297.0	264.7	15.20	4.41
BCC-MW-15013	12/01/15	0.07	-262.9	528	14.25	1.59
	02/18/16	0.4	-119.7	436	8.7	<1
	04/13/16	0.3	-130.3	400	13.5	<1
	07/13/16	0.4	-117.9	392	15.8	<1
	09/29/16	0.5	-118.8	449	14.4	<1
	02/14/17	0.4	-161.6	444	12.4	1.2
	04/05/17	0.1	-137.0	435	13.0	<1
	07/12/17	0.13	-169.9	416.8	14.80	3.97
BCC-MW-15014	12/01/15	0.17	-308.7	605	15.87	3.47
	02/18/16	0.1	-215.0	642	10.8	<1
	04/18/16	0.2	-221.3	654	13.6	1
	07/13/16	0.3	-205.9	676	14.8	1.6
	09/29/16	0.4	-242.5	590	12.4	<1
	02/14/17	0.4	-226.2	576	10.9	<1
	04/05/17	0.3	-237.2	568	10.5	<1
	07/12/17	0.14	-315.6	761.0	14.00	4.76
BCC-MW-15015	12/01/15	0.02	-299.8	313	14.51	1.84
	02/18/16	0.2	-230.1	298	9.4	<1
	04/13/16	0.2	-222.5	296	12.5	<1
	07/13/16	0.3	-140.4	318	15.8	<1
	09/29/16	0.4	-152.8	349	13.6	<1
	02/14/17	0.4	-201.7	354	10.8	<1
	04/05/17	0.1	-170.2	369	11.1	1.2
	07/12/17	0.14	-222.6	328.7	14.10	1.77

Notes:

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Table 3
 Summary of Field Parameters
 BC Cobb – RCRA CCR Monitoring Program
 Muskegon, Michigan

Sample Location	Sample Date	Dissolved Oxygen	Oxidation Reduction Potential	Specific Conductivity	Temperature	Turbidity
		mg/L	mV	umhos/cm	°C	NTU
BCC-MW-15016	12/01/15	0.84	-109.7	1,902	10.85	2.92
	02/18/16	0.1	-61.8	2,061	11.0	2.8
	04/13/16	0.1	-92.2	2,170	12.1	<1
	07/13/16	0.3	-126.3	2,171	16.7	5
	09/29/16	0.3	-90.1	2,161	15.0	<1
	02/14/17	0.5	-97.3	2,061	11.4	1.3
	04/05/17	0.4	-96.3	1,929	10.6	<1
	07/12/17	0.09	-63.7	2,005.4	14.21	3.58
BCC-MW-15017	12/01/15	0.04	-204.9	1,963	11.22	1.39
	02/18/16	0.2	-132.6	2,237	10.1	<1
	04/18/16	0.3	-95.2	2,159	14.8	<1
	07/13/16	0.2	-101.2	2,211	16.1	<1
	09/29/16	0.5	-83.1	2,242	13.9	3.2
	02/14/17	0.5	-86.8	1,988	11.1	5.4
	04/05/17	0.0	-99.8	2,410	10.0	3.5
	07/12/17	0.07	-79.5	2,182.4	13.75	3.52
BCC-MW-15018	12/02/15	0.20	-138.5	710	12.77	5.46
	02/18/16	0.2	-76.6	753	9.8	<1
	04/14/16	0.3	-80.8	772	10.1	<1
	07/14/16	0.4	-83.7	819	14.9	<1
	09/29/16	0.5	-53.5	824	13.0	<1
	02/14/17	0.5	-71.1	793	10.5	<1
	04/05/17	0.5	-55.3	680	9.5	7
	07/11/17	0.11	-36.7	762.1	14.54	1.71
BCC-MW-15019	12/02/15	1.46	-88.0	646	12.09	8
	02/18/16	0.2	-122.7	727	6.6	<1
	04/14/16	0.5	-105.9	707	9.5	<1
	07/13/16	0.2	-106.7	733	17.5	<1
	09/30/16	0.6	-70.7	762	13.0	<1
	02/15/17	0.6	-119.2	692	9.7	<1
	04/05/17	0.0	-125.9	821	9.0	<1
	07/11/17	0.09	-78.9	843.2	14.50	1.56
BCC-MW-15020	12/02/15	0.77	-97.2	475	12.61	2.1
	02/18/16	0.1	-112.5	526	9.8	<1
	04/14/16	2.7	-79.8	555	11.3	<1
	07/14/16	0.4	-95.3	549	15.7	<1
	09/30/16	0.6	-65.9	560	13.7	<1
	02/15/17	0.5	-96.7	540	9.8	<1
	04/05/17	0.5	-79.3	507	10.0	<1
	07/11/17	0.12	-76.7	604.3	15.57	3.42

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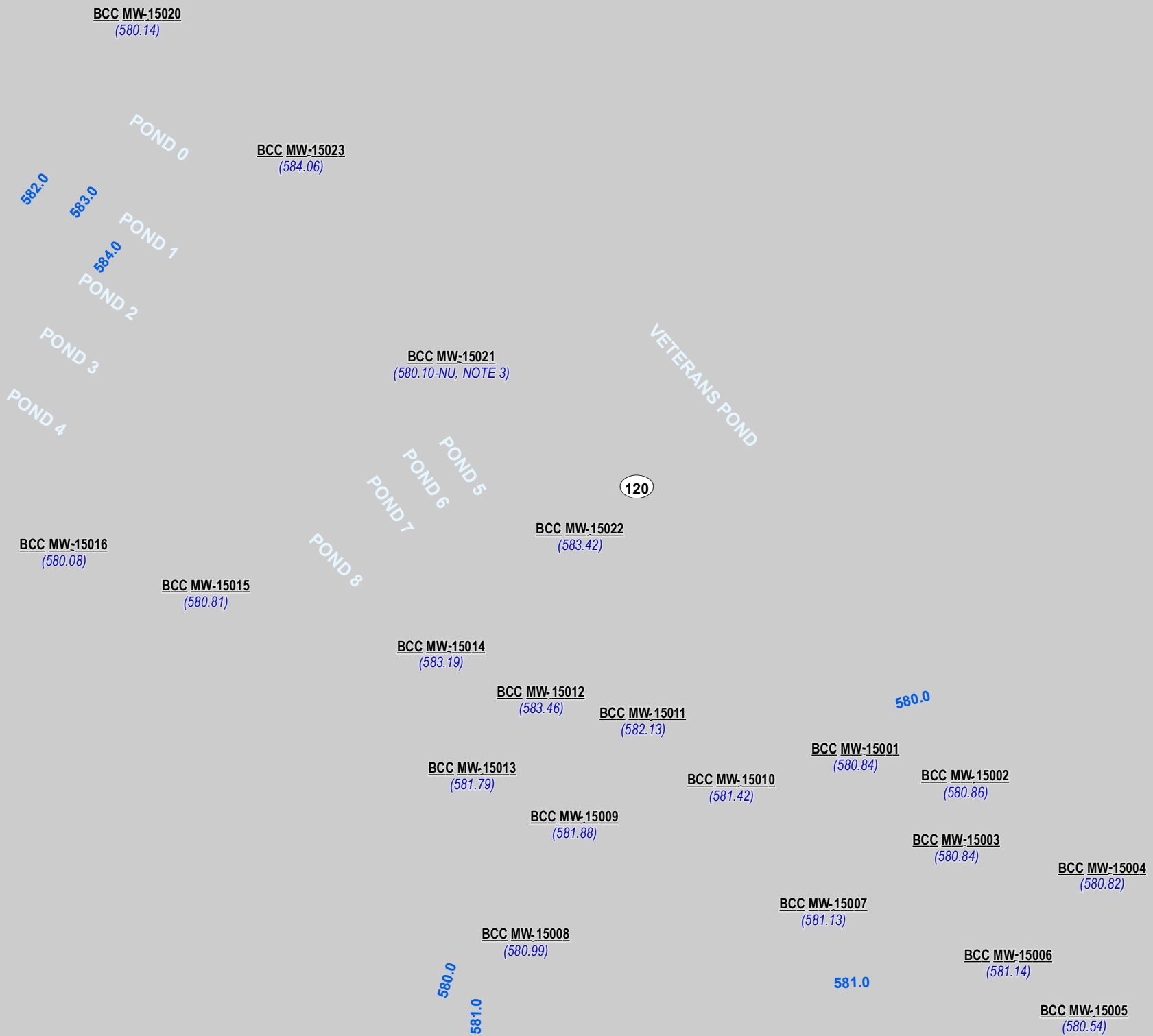
Table 3
 Summary of Field Parameters
 BC Cobb – RCRA CCR Monitoring Program
 Muskegon, Michigan

Sample Location	Sample Date	Dissolved Oxygen	Oxidation Reduction Potential	Specific Conductivity	Temperature	Turbidity
		mg/L	mV	umhos/cm	°C	NTU
BCC-MW-15021	12/02/15	0.33	-144.3	1,019	13.17	2.29
	02/18/16	0.2	-111.7	1,032	9.1	<1
	04/14/16	0.3	-101.2	1,018	12.6	<1
	07/13/16	0.2	-97.6	1,040	17.3	<1
	10/05/16	0.6	-15.8	1,114	14.8	1
	02/15/17	0.5	-108.6	962	10.9	<1
	04/06/17	0.1	-122.1	1,189	7.3	<1
	07/12/17	0.11	-83.0	1,038.8	13.76	1.05
BCC-MW-15022	12/02/15	0.53	-72.3	383	10.47	0.34
	02/18/16	0.2	-91.2	377	5.0	<1
	04/14/16	0.4	-64.5	422	11.6	<1
	07/14/16	0.3	-74.4	356	14.6	<1
	10/05/16	0.3	-172.3	365	13.9	<1
	02/15/17	0.5	-121.4	421	9.6	<1
	04/06/17	0.5	-163.8	380	10.1	<1
	07/12/17	0.10	-271.2	413.5	15.20	1.30
BCC-MW-15023	12/02/15	0.27	-139.1	493	13.49	0.89
	02/18/16	0.2	-82.7	456	6.8	<1
	04/14/16	0.3	-79.0	436	10.7	<1
	07/14/16	0.5	-72.7	447	16.9	<1
	10/05/16	0.5	-75.0	480	14.8	<1
	02/15/17	0.6	-53.4	446	7.3	<1
	04/05/17	0.1	-83.6	600	8.1	2
	07/11/17	0.13	-46.3	451.7	12.84	0.56

Notes:

mg/L - Milligrams per Liter.
 mV - Millivolts.
 umhos/cm - Micromhos per centimeter.
 NTU - Nephelometric Turbidity Unit.

North Channel Muskegon River

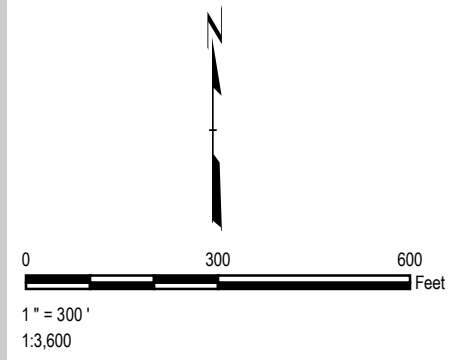


LEGEND

- BACKGROUND MONITORING WELL
- DOWNGRADIENT MONITORING WELL
- APPROXIMATE POND BOUNDARY
- GROUNDWATER ELEVATION (FEET, MSL)
- GROUNDWATER ELEVATION CONTOUR (1' INTERVAL, DASHED WHERE INFERRED)

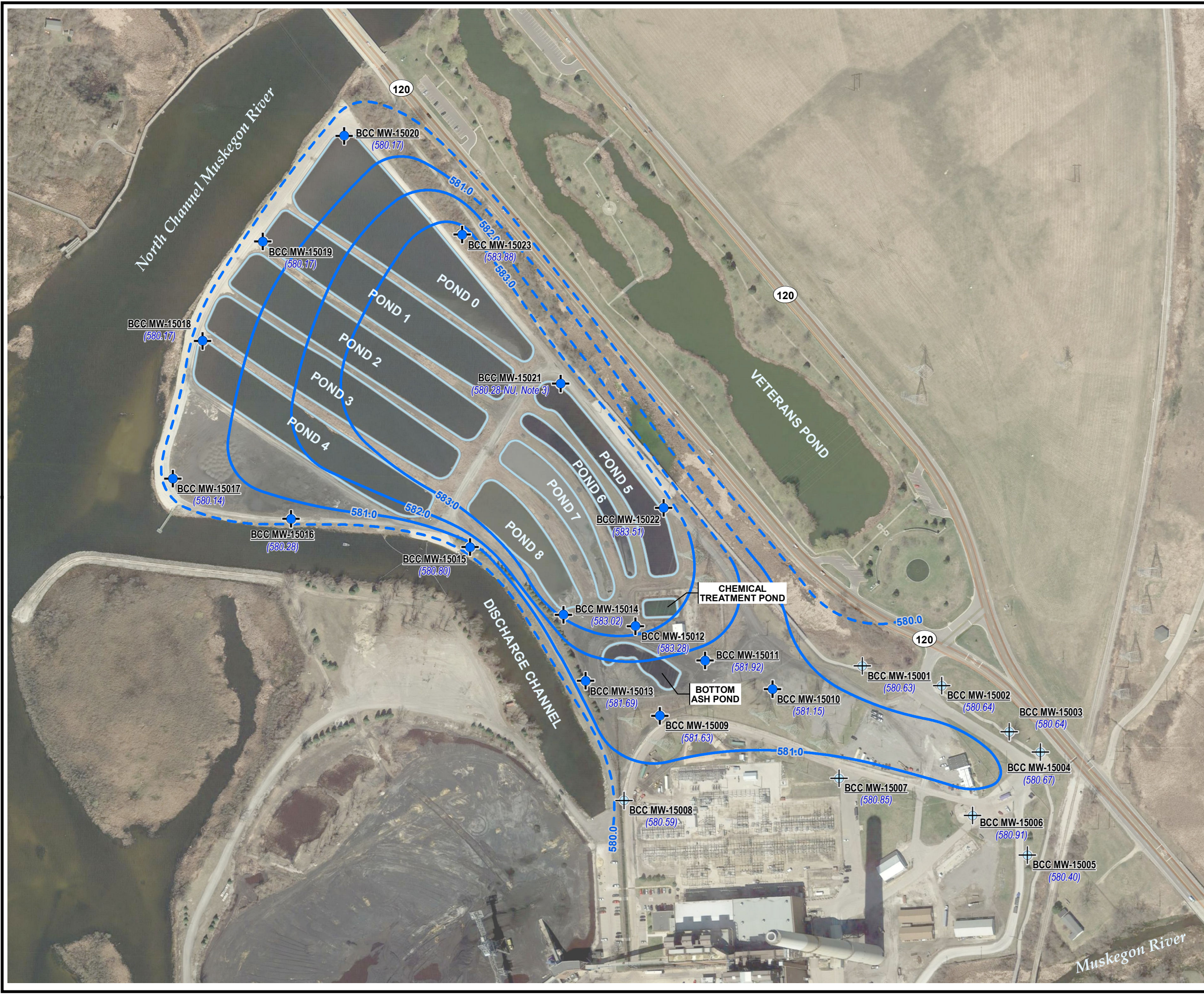
NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO & PARTNERS, 04/04/2016.
2. WELL LOCATIONS SURVEYED BY WILLIAMS & WORKS ON 11/23/2015.
3. NU= NOT USED. WELL SCREENED AT DEEPER INTERVAL RELATIVE TO ADJACENT WELLS, NOT USED TO CONSTRUCT CONTOUR MAP.








PROJECT: CONSUMERS ENERGY COMPANY BC COBB POWER PLANT MUSKEGON, MICHIGAN	
TITLE: GROUNDWATER CONTOUR MAP NOVEMBER 30, 2015	
DRAWN BY: B DEEGAN	PROJ NO.: 269767-001
CHECKED BY: S HOLMSTROM	FIGURE 1
APPROVED BY: G. CROCKFORD	
DATE: JANUARY 2018	
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FILE NO.: 269767-001-005.mxd	

Muskegon River

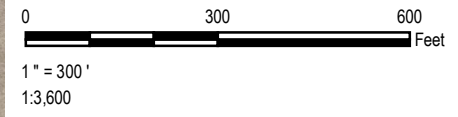



LEGEND

-  BACKGROUND MONITORING WELL
-  DOWNGRADIENT MONITORING WELL
-  APPROXIMATE POND BOUNDARY
-  (580.85) GROUNDWATER ELEVATION (FEET, MSL)
-  GROUNDWATER ELEVATION CONTOUR (1' INTERVAL, DASHED WHERE INFERRED)

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH & PARTNERS, 04/04/2016.
2. WELL LOCATIONS SURVEYED BY WILLIAMS & WORKS ON 11/23/2015.
3. NU = NOT USED. WELL SCREENED AT DEEPER INTERVAL RELATIVE TO ADJACENT WELLS, NOT USED TO CONSTRUCT CONTOUR MAP.



PROJECT:	
CONSUMERS ENERGY COMPANY BC COBB POWER PLANT MUSKEGON, MICHIGAN	
TITLE:	
GROUNDWATER CONTOUR MAP FEBRUARY 16, 2016	
DRAWN BY: J. PAPEZ	PROJ NO.: 269767-001
CHECKED BY: S HOLMSTROM	FIGURE 2
APPROVED BY: G. CROCKFORD	
DATE: JANUARY 2018	
	
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FILE NO.: 269767-001-003.mxd	



LEGEND

- BACKGROUND MONITORING WELL
- DOWNGRADIENT MONITORING WELL
- APPROXIMATE POND BOUNDARY
- GROUNDWATER ELEVATION (FEET, MSL)
- GROUNDWATER ELEVATION CONTOUR (1' INTERVAL, DASHED WHERE INFERRED)

- NOTES**
1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO & PARTNERS, 04/04/2016.
 2. WELL LOCATIONS SURVEYED BY WILLIAMS & WORKS ON 11/23/2015.
 3. NU= NOT USED. WELL SCREENED AT DEEPER INTERVAL RELATIVE TO ADJACENT WELLS, NOT USED TO CONSTRUCT CONTOUR MAP.

0 300 600
Feet

1" = 300'
1:3,600

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

TITLE: **GROUNDWATER CONTOUR MAP
APRIL 12, 2016**

DRAWN BY: B DEEGAN	PROJ NO: 269767-001
CHECKED BY: S HOLMSTROM	
APPROVED BY: G. CROCKFORD	
DATE: JANUARY 2018	

FIGURE 3

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FILE NO: 269767-001-006.mxd



LEGEND

- BACKGROUND MONITORING WELL
- DOWNGRADIENT MONITORING WELL
- APPROXIMATE POND BOUNDARY
- 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.

N

0 300 600
Feet

1" = 300'
1:3,600

PROJECT:	
CONSUMERS ENERGY COMPANY BC COBB POWER PLANT MUSKEGON, MICHIGAN	
TITLE:	
GROUNDWATER CONTOUR MAP JULY 11, 2016	
DRAWN BY: B DEEGAN	PROJ NO.: 269767-001
CHECKED BY: S HOLMSTROM	FIGURE 4
APPROVED BY: G. CROCKRFORD	
DATE: JANUARY 2018	
1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com	
FILE NO.: 269767-001-007.mxd	



LEGEND

- BACKGROUND MONITORING WELL
- DOWNGRADIENT MONITORING WELL
- APPROXIMATE POND BOUNDARY
- 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.

N

0 300 600
Feet

1" = 300'
1:3,600

PROJECT:		CONSUMERS ENERGY COMPANY BC COBB POWER PLANT MUSKEGON, MICHIGAN	
TITLE:		GROUNDWATER CONTOUR MAP SEPTEMBER 27, 2016	
DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-001
CHECKED BY:	S HOLMSTROM	FIGURE 5	
APPROVED BY:	G. CROCKFORD		
DATE:	JANUARY 2018		
		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com	
FILE NO.:	269767-001-004.mxd		



LEGEND

- BACKGROUND MONITORING WELL
- DOWNGRADIENT MONITORING WELL
- APPROXIMATE POND BOUNDARY
- 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.

0 300 600
Feet

1" = 300'
1:3,600

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

TITLE: **GROUNDWATER CONTOUR MAP
FEBRUARY 13, 2017**

DRAWN BY: B DEEGAN PROJ NO: 269767-001
CHECKED BY: S HOLMSTROM
APPROVED BY: G. CROCKFORD
DATE: JANUARY 2018

FIGURE 6

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FILE NO: 269767-001-008.mxd



LEGEND

- BACKGROUND MONITORING WELL
- DOWNGRADE MONITORING WELL
- APPROXIMATE POND BOUNDARY
- GROUNDWATER ELEVATION (FEET, MSL)
(580.85)
- 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.

0 300 600
Feet

1" = 300'
1:3,600

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

TITLE: **GROUNDWATER CONTOUR MAP
APRIL 04, 2017**

DRAWN BY: B DEEGAN	PROJ NO.: 269767-001
CHECKED BY: S HOLMSTROM	
APPROVED BY: G. CROCKFORD	
DATE: JANUARY 2018	

FIGURE 7

TRC

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FILE NO.: 269767-001-009.mxd



LEGEND

- BACKGROUND MONITORING WELL
- DOWNGRADE MONITORING WELL
- 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.

N

0 300 600
Feet

1" = 300'
1:3,600

PROJECT: CONSUMERS ENERGY COMPANY BC COBB POWER PLANT MUSKEGON, MICHIGAN	
TITLE: GROUNDWATER CONTOUR MAP JULY 11, 2017	
DRAWN BY: J. PAPEZ	PROJ NO.: 269767-001
CHECKED BY: S. HOLMSTROM	FIGURE 8
APPROVED BY: G. CROCKFORD	
DATE: JANUARY 2018	
FILE NO.: 269767-001-014.mxd	

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Appendix B

Data Quality Review

Laboratory Data Quality Review

Groundwater Monitoring Event September 2017

CEC BC Cobb

Groundwater samples were collected by TRC for the September 2017 sampling event. Samples were analyzed for anions, total metals, and total dissolved solids by Pace Analytical Services, LLC (Pace), located in Grand Rapids, Michigan. The laboratory analytical results are reported in laboratory report 462581.

During the September 2017 sampling event, a groundwater sample was collected from each of the following wells:

- BCC-MW-15001
- BCC-MW-15009
- BCC-MW-15017
- BCC-MW-15002
- BCC-MW-15010
- BCC-MW-15018
- BCC-MW-15003
- BCC-MW-15011
- BCC-MW-15019
- BCC-MW-15004
- BCC-MW-15012
- BCC-MW-15020
- BCC-MW-15005
- BCC-MW-15013
- BCC-MW-15021
- BCC-MW-15006
- BCC-MW-15014
- BCC-MW-15022
- BCC-MW-15007
- BCC-MW-15015
- BCC-MW-15023
- BCC-MW-15008
- BCC-MW-15016

Each sample was analyzed for the following constituents:

Analyte Group	Method
Anions (Chloride, Fluoride, Sulfate)	EPA 300.0
Total Metals	EPA 6020A, EPA 6010C
Total Dissolved Solids	SM 2540C

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). The following items were included in the evaluation of the data:

- Sample receipt, as noted in the cover page or case narrative;
- Technical holding times for analyses;

- Data for method blanks, equipment blanks, and field blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Field and equipment blanks are used to assess potential contamination arising from field procedures;
- Percent recoveries for matrix spike (MS) and matrix spike duplicates (MSD). Percent recoveries are calculated for each analyte spiked and used to assess bias due to sample matrix effects;
- Reporting limits (RLs) compared to project-required RLs;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes;
- Data for laboratory control samples (LCSs). The LCSs are used to assess the accuracy of the analytical method using a clean matrix;
- Data for laboratory duplicates, when available. The laboratory duplicates are replicate analyses of one sample and are used to assess the precision of the analytical method; 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.

Findings

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

- Appendix III constituents will be utilized for the purposes of developing a detection monitoring program.
- Data are usable for the purposes of this episodic report.
- When the data are evaluated for preparing a detection monitoring statistical program, findings below may be used to support the removal of outliers.

QA/QC Sample Summary:

- Three equipment blanks (EB-01, EB-01, and EB-03) and two field blanks (FB-01 and FB-02) were collected.
- Dup-01 corresponds to BCC-MW-15010, Dup-02 corresponds to BCC-MW-15015, and Dup-03 corresponds to BCC-MW-15018.

- MS/MSDs were performed on samples BCC-MW-15002, BCC-MW-15003, BCC-MW-15008, BCC-MW-15010, and BCC-MW-15014.

Pace Analytical:

- MS/MSD recoveries
 - MS/MSDs were performed on BCC-MW-15003 and BCC-MW-15002 for batch 5122. The recoveries for chloride in the MS/MSD performed on BCC-MW-15003 were below the lower laboratory control limit. The recoveries for sulfate in the MS/MSD performed on BCC-MW-15002 were below the lower laboratory control limit. The chloride and sulfate results for samples analyzed in the same batch may be biased low.
 - MS/MSDs were performed on BCC-MW-15010 and BCC-MW-15014 for batch 5123. The MS/MSD performed on BCC-MW-15010 had chloride and sulfate recoveries that were below the lower laboratory control limits. Chloride and sulfate results for samples analyzed in the same batch may be biased low.
 - MS/MSD was performed on BCC-MW-15003 for batch 5047. The calcium recoveries in the MS/MSD were above the upper laboratory control limit; however, the calcium concentration in the parent sample was >4x the spike concentration, therefore, the laboratory control limits are not applicable.
 - MS/MSD was performed on BCC-MW-15014 for batch 5113. The boron recovery in the MS was below the lower laboratory control limit and the recovery in the MSD was above the upper laboratory control limit. The boron concentration in the parent sample was >4x the spike concentration, therefore, the laboratory control limits are not applicable.
- The RPD for TDS for the sample duplicate pair (BCC-MW-15015/Dup-02) exceeded the 20% acceptance limit. Potential uncertainty exists for TDS results in samples BCC-MW-15015 and Dup-02 due to field duplicate variability.

Appendix C

Statistical Background Limits

Technical Memorandum

Date: January 15, 2018

To: Michelle Marion, CEC
J.R. Register, CEC
Brad Runkel, CEC

From: Sarah Holmstrom, TRC
Darby Litz, TRC
Joyce Peterson, TRC

Project No.: 269767.0000 Phase 001, Task 003

Subject: Background Statistical Evaluation (R1-R8) – Consumers Energy, BC Cobb

Pursuant to the United States Environmental Protection Agency’s (U.S. EPA’s) Resource Conservation and Recovery Act (RCRA) Coal Combustion Residual rule (“CCR Rule”) promulgated on April 17, 2015, the owner or operator of a CCR Unit must collect a minimum of eight rounds of background groundwater data to initiate a detection monitoring program and evaluate statistically significant increases above background (40 CFR §257.94). This memorandum presents the background statistical limits derived for the Consumers Energy Company (CEC) former BC Cobb Power Plant (BC Cobb site) in Muskegon, Michigan.

There are two RCRA CCR units associated with the plant—the Bottom Ash Pond and Ponds 0-8, both of which are wet ash dewatering areas. From 1984 through plant closure in 2016, CCR has been deposited in the ash ponds by utilizing sluicing methods. In response to the CCR Rule, CEC had 23 groundwater monitoring wells installed at the Bottom Ash Pond and Ponds 0-8 to serve as a multiunit groundwater monitoring system (in accordance with 40 CFR §257.91).

Following the baseline data collection period (November 2015 through July 2017), the background data for the BC Cobb site were evaluated in accordance with the Groundwater Statistical Evaluation Plan (Stats Plan) (TRC, October 2017). The BC Cobb site groundwater data are maintained within a database accessible through Sanitas™ statistical software. Sanitas™ is a software tool that is commercially available for performing statistical evaluation consistent with procedures outlined in U.S.EPA’s Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (Unified Guidance; UG). Within the Sanitas™ statistical program (and the UG), tolerance limits were selected to perform the statistical calculation for background limits. Use of tolerance limits is a streamlined approach that offers adequate statistical power under the current, initial stage of establishing

Technical Memorandum

background and developing the monitoring program and is an acceptable approach for detection monitoring under the CCR rule. Upper tolerance limits (UTLs) were calculated for each of the CCR Appendix III parameters. The following narrative describes the methods employed and the results obtained and the Sanitas™ output files are included as an attachment.

The set of background wells utilized for the two CCR units at the BC Cobb site includes BCC-MW-15002 through BCC-MW-15008. The background evaluation included the following steps:

- Review of data quality reports for the baseline/background data sets for CCR Appendix III constituents;
- Graphical representation of the baseline data as time versus concentration (T v. C) by well/constituent pair;
- Graphical representation of cumulative baseline background data sorted from lowest to highest concentration for each constituent;
- Outlier testing of individual data points that appear from the graphical representations as potential outliers;
- Evaluation of percentage of nondetects for each baseline/background well-constituent (w/c) pair;
- Distribution of the data; and
- Calculation of the UTL for each cumulative baseline/background data set (upper and lower tolerance limits were calculated for field pH).

The results of these evaluations are presented and discussed below.

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 matrix spike and matrix spike duplicates (MS/MSDs) recoveries, 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.

Time versus Concentration Graphs

The T v. C graphs show a potential outlier for boron (high value for BCC-MW-15003 in April 2016) (Figure 1). This data set will be tested by the Sanitas™ software to assess whether the potential outlier is statistically significant.

While variations in results are present, the graphs do not suggest that data sets as a whole, likely have overall trending or seasonality. The data sets are of relatively short duration for making such observations.

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Cumulative Baseline Data Sets

Ideally, the background data sets provide a continuous concentration distribution. The ideal is rarely achieved by multiple background wells representing a relatively large geographic area, such as in the case at the BC Cobb site. When sorted by concentration, the data generally group by smaller subsets of the overall background well network (Figure 2). Some of the parameters have a relatively consistent distribution, but chloride, sulfate, and TDS clearly have some wells with higher values than the other background wells. These results need to be taken into consideration as they represent potential non-CCR upgradient contributions to downgradient wells.

Outlier Testing

The Dixon's Outlier Test in Sanitas™ was used to test the potential outlier graphs in the boron data set for BCC-MW-15003 that was identified in the T v. C graphs (Figure 1) and in the cumulative concentration distribution (Figure 2). The suspect data point was found to be an outlier at the 0.05 significance level (see attached Sanitas™ output file). With the outlier removed, Sanitas found that the boron data set at BCC-MW-15003 was normally distributed at the 0.01 significance level. The outlier data point will be excluded from the background/baseline UTL calculations.

Percentage of Nondetects

Table 1 summarizes the percentage of results below the reporting limit for each w/c pair.

Table 1
Summary of Percentage of Baseline Results Below Reporting Limit

WELL	CONSTITUENT	PERCENT NON-DETECT
BCC-MW-15002	Boron	0
	Calcium	0
	Chloride	0
	Fluoride	100
	Field pH	0
	Sulfate	0
	Total Dissolved Solids	0
BCC-MW-15003	Boron	0
	Calcium	0
	Chloride	0
	Fluoride	100
	Field pH	0
	Sulfate	0
	Total Dissolved Solids	0

Technical Memorandum

Table 1
Summary of Percentage of Baseline Results Below Reporting Limit

WELL	CONSTITUENT	PERCENT NON-DETECT
BCC-MW-15004	Boron	0
	Calcium	0
	Chloride	0
	Fluoride	100
	Field pH	0
	Sulfate	25
	Total Dissolved Solids	0
BCC-MW-15005	Boron	12.5
	Calcium	0
	Chloride	0
	Fluoride	100
	Field pH	0
	Sulfate	12.5
	Total Dissolved Solids	0
BCC-MW-15006	Boron	0
	Calcium	0
	Chloride	0
	Fluoride	100
	Field pH	0
	Sulfate	0
	Total Dissolved Solids	0
BCC-MW-15007	Boron	0
	Calcium	0
	Chloride	0
	Fluoride	100
	Field pH	0
	Sulfate	0
	Total Dissolved Solids	0
BCC-MW-15008	Boron	0
	Calcium	0
	Chloride	0
	Fluoride	100
	Field pH	0
	Sulfate	0
	Total Dissolved Solids	0

Technical Memorandum

Table 1
Summary of Percentage of Baseline Results Below Reporting Limit

WELL	CONSTITUENT	PERCENT NON-DETECT
COMBINED	Boron	1.8
	Calcium	0
	Chloride	0
	Fluoride	100
	Field pH	0
	Sulfate	5.4
	Total Dissolved Solids	0

Distribution of the Data Sets

The distribution of the data sets is determined by the Sanitas™ software during calculation of the upper tolerance limit. The Shapiro-Francia test is used for samples sizes greater than 50. Non-detect/censored data were handled in accordance with the Stats Plan. If the data appear to be non-normal, mathematical transformations of the data may be utilized such that the transformed data follow a normal distribution (e.g., lognormal distributions). Alternatively, non-parametric tests may be utilized when data cannot be normalized. Table 2 summarizes the distributions determined by the Sanitas™ software. The distribution is based on the combined baseline results for all seven background monitoring wells.

Table 2
Summary of Background/Baseline Data Distributions

CONSTITUENT	DISTRIBUTION
Boron (outlier removed)	Nonnormal
Calcium	Nonnormal
Chloride	Normalized by natural log transformation
Fluoride	All ND – use highest RL
Field pH	Nonnormal
Sulfate	Normalized by natural log transformation
Total Dissolved Solids	Normalized by natural log transformation

Upper Tolerance Limits

Table 3 presents the calculated upper tolerance limits for the background/baseline data sets. The UTL for the data set with an observed outlier was calculated with the outlier removed. The UTL is calculated based on the distribution listed above. UTLs are calculated for 95 percent coverage and 95 percent confidence. Verification resampling (1 of 2) is recommended per the Stats Plan and UG to achieve a site-wide false positive rate within the range specified in the CCR rules.

Technical Memorandum

Table 3
Summary of Baseline Upper Tolerance Limits

CONSTITUENT	UPPER TOLERANCE LIMIT – FROM SANITAS™
Boron (outlier removed)	1,320 µg/L
Calcium	259 mg/L
Chloride	5,980 mg/L
Fluoride	1,000 µg/L
Field pH	6.6 – 8.3 s.u.
Sulfate	200 mg/L
Total Dissolved Solids	5,170 mg/L

Attachments

Figure 1 – Background Concentration Time-Series Charts

Figure 2 – Combined Background Distribution

Sanitas™ Output Files

Technical Memorandum

Figures

Figure 1
Background Concentration Time-Series Charts
BC Cobb - RCRA CCR Monitoring Program

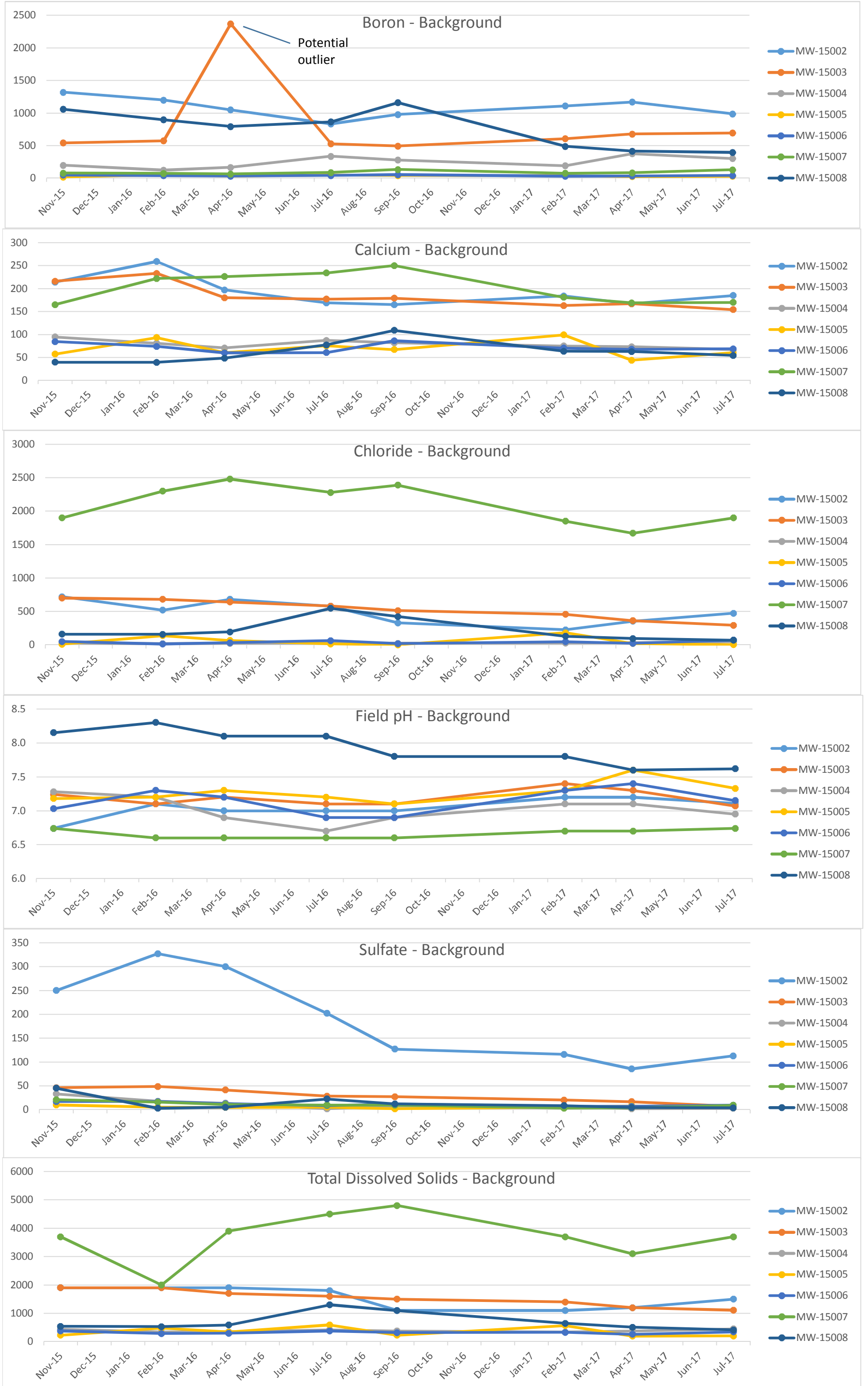
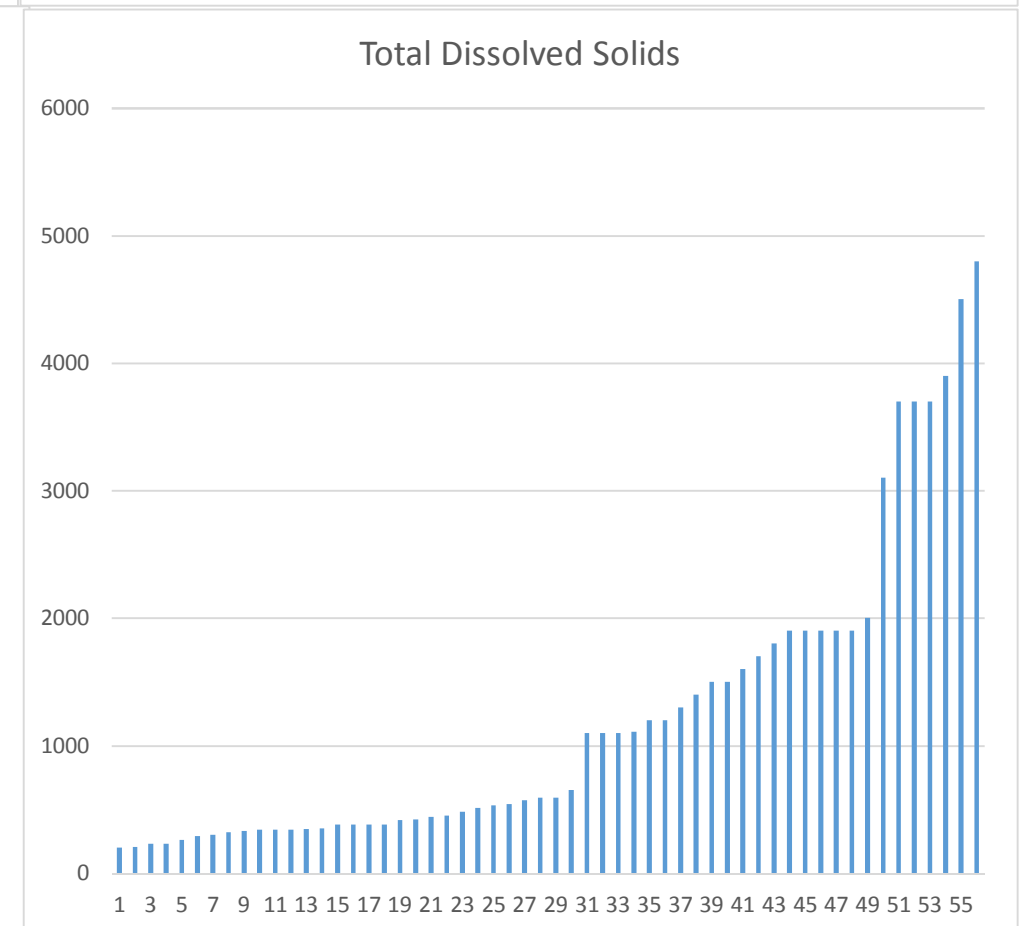
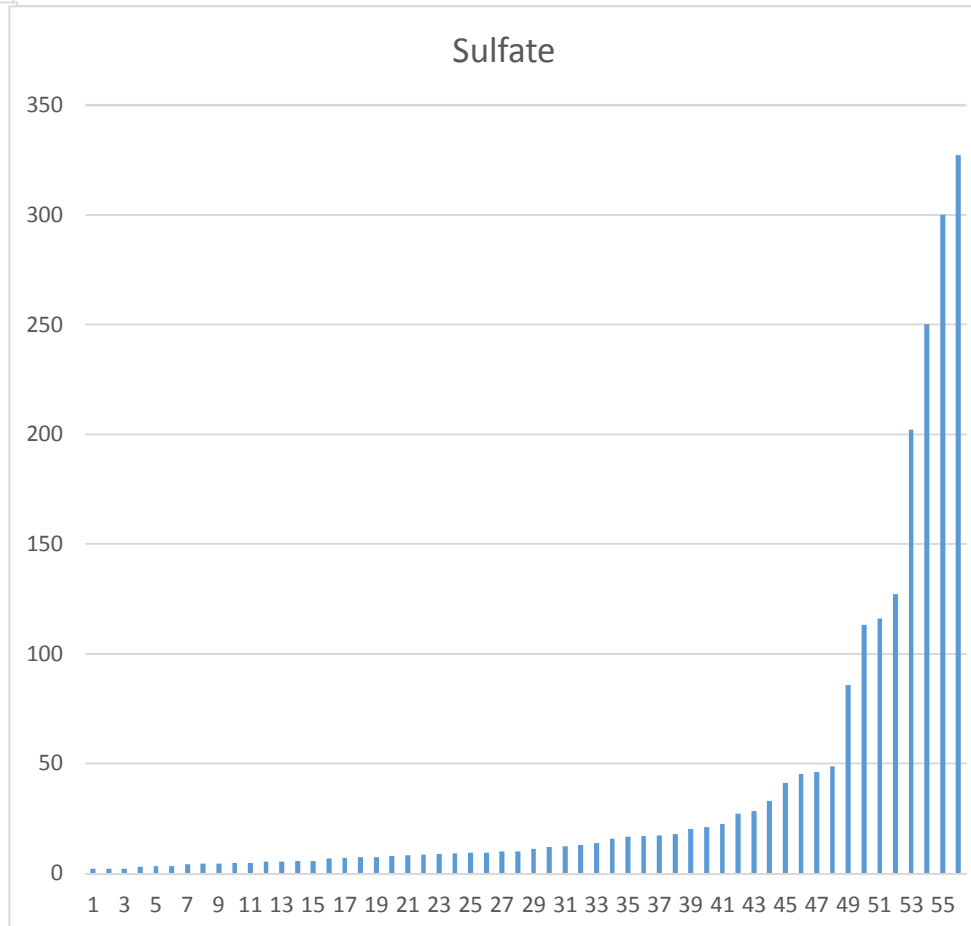
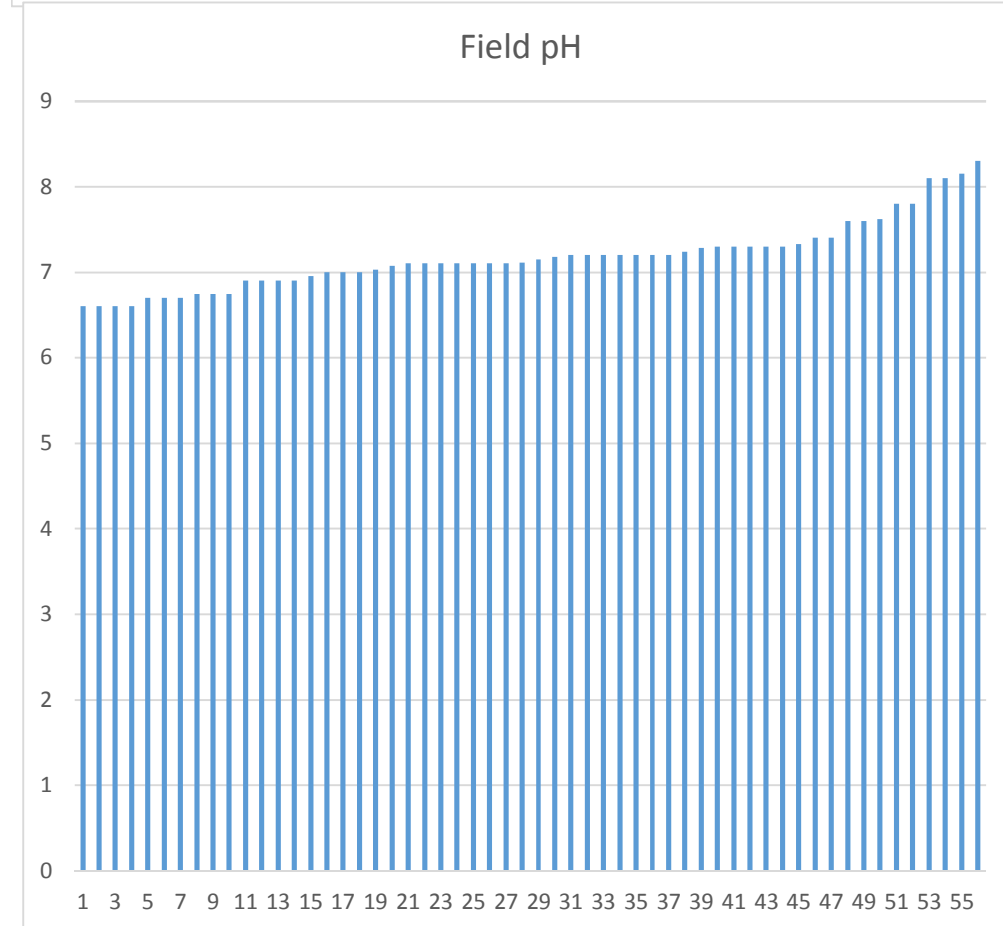
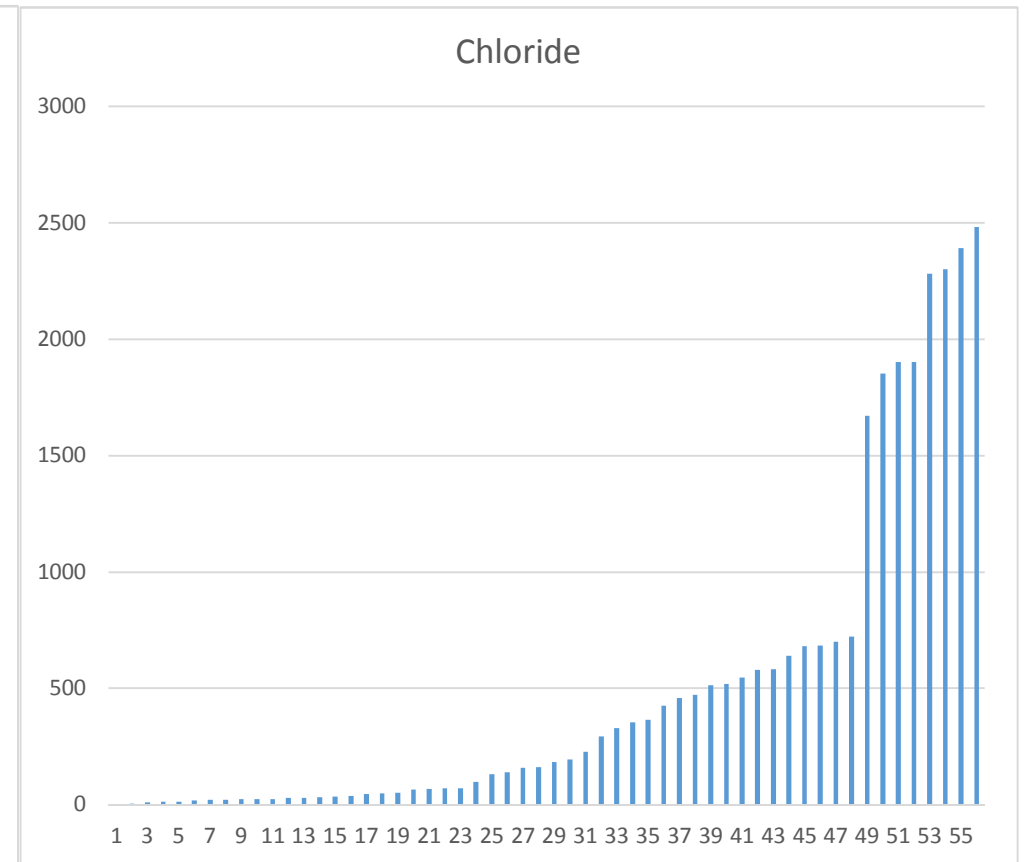
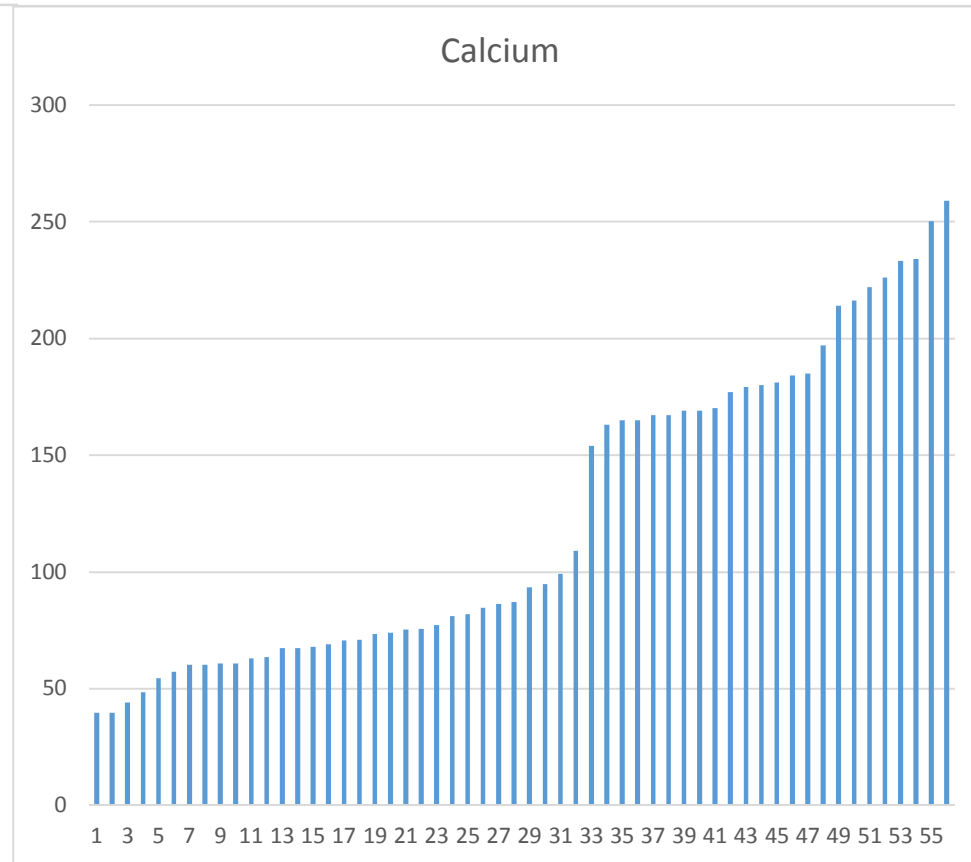
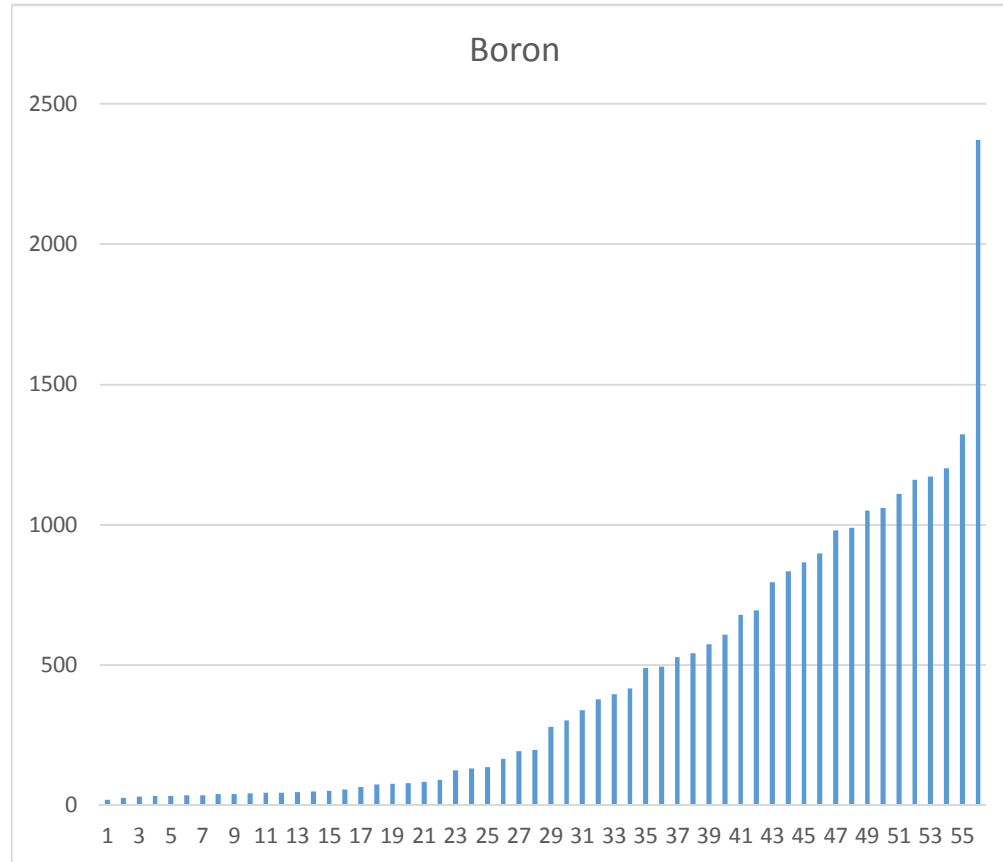


Figure 2
Combined Background Distribution
BC Cobb - RCRA CCR Monitoring Program

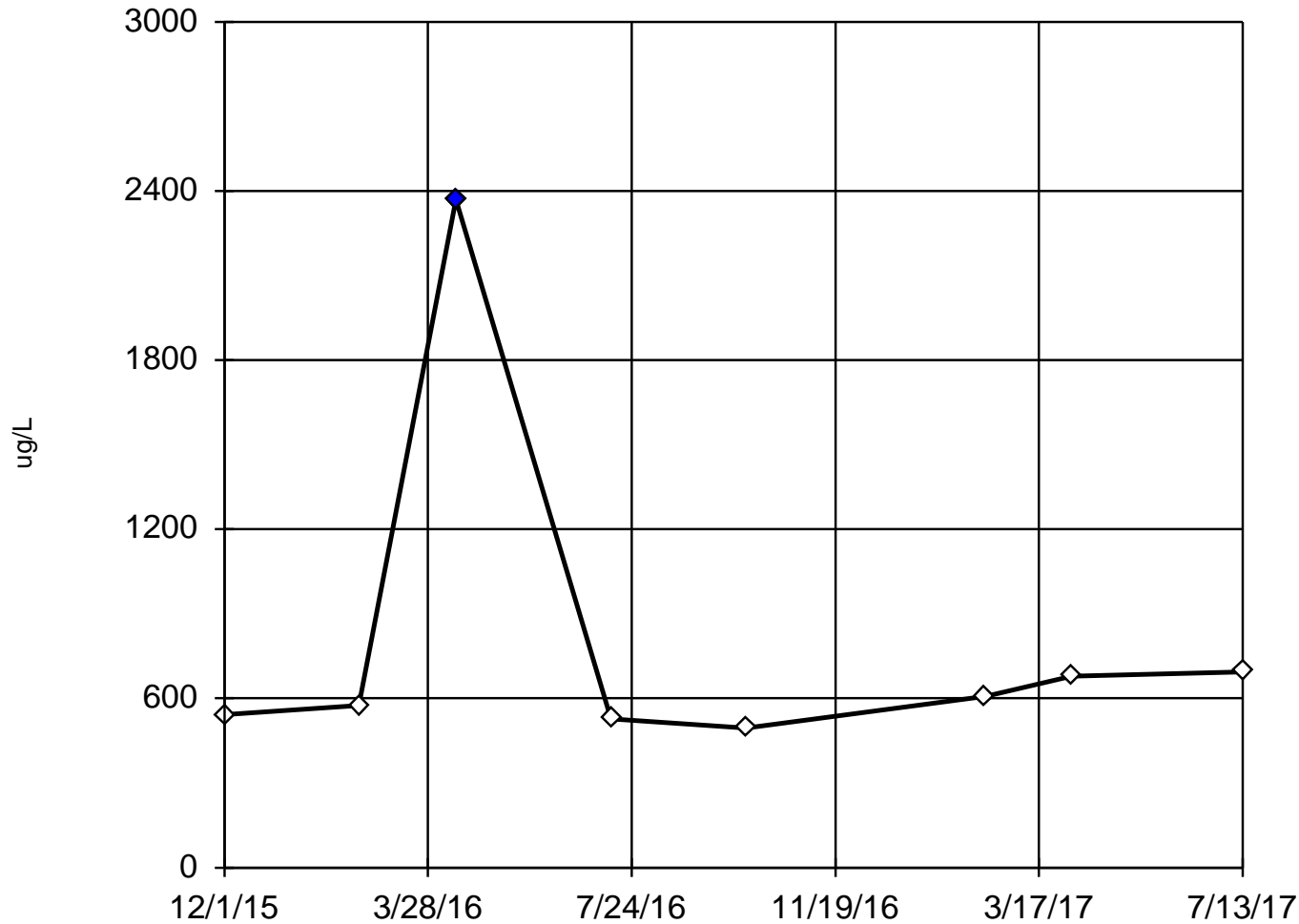


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Sanitas™ Output Files

Dixon's Outlier Test

BCC-MW-15003 (bg)



n = 8

Statistical outlier is drawn as solid.
Testing for 1 high outlier.
Mean = 811.3.
Std. Dev. = 633.8.
2370: c = 0.9093
tab1 = 0.554.
Alpha = 0.05.

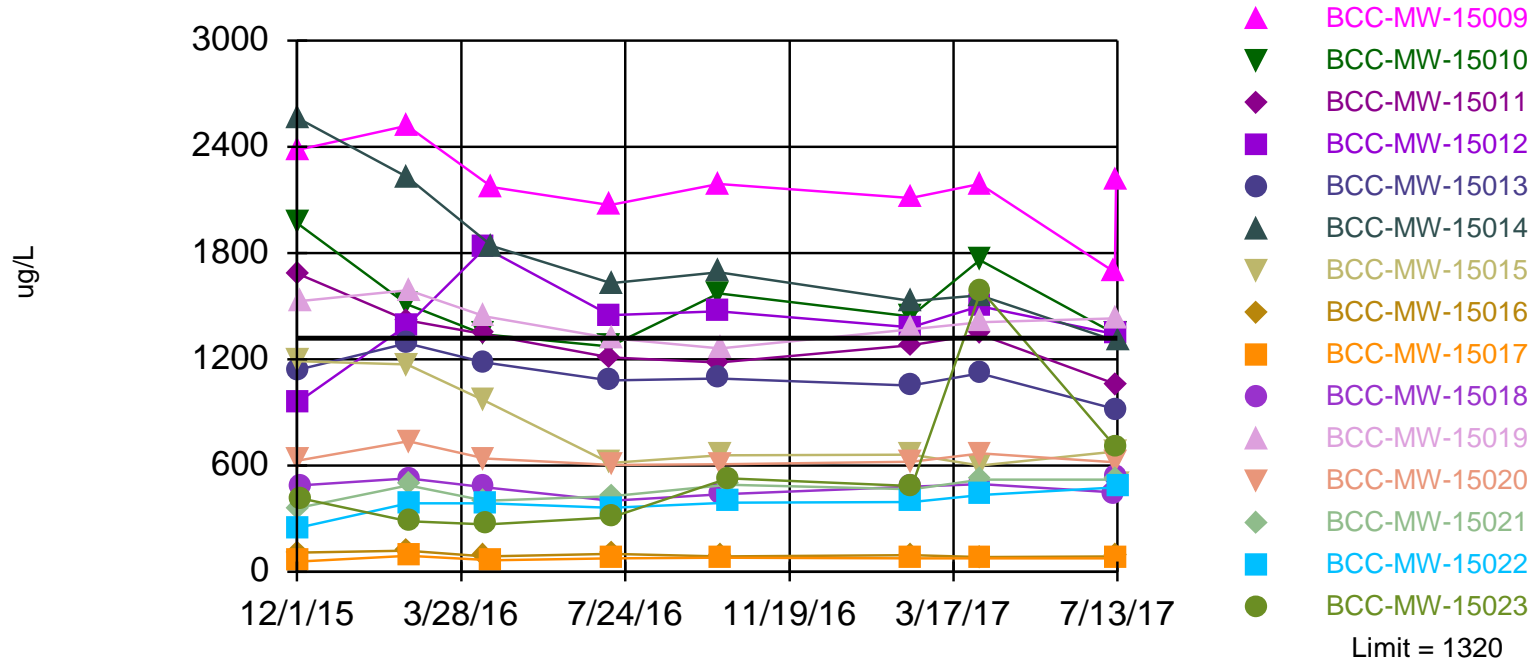
Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.9321
Critical = 0.838
The distribution, after removal of suspect value, was found to be normally distributed.

Constituent: Boron, Total Analysis Run 11/13/2017 3:03 PM

Client: Consumers Energy Data: BCC_Sanitas

Exceeds Limit: BCC-MW-15009, BCC-MW-15010, BCC-MW-15012, BCC-MW-15019

Tolerance Limit Interwell Non-parametric



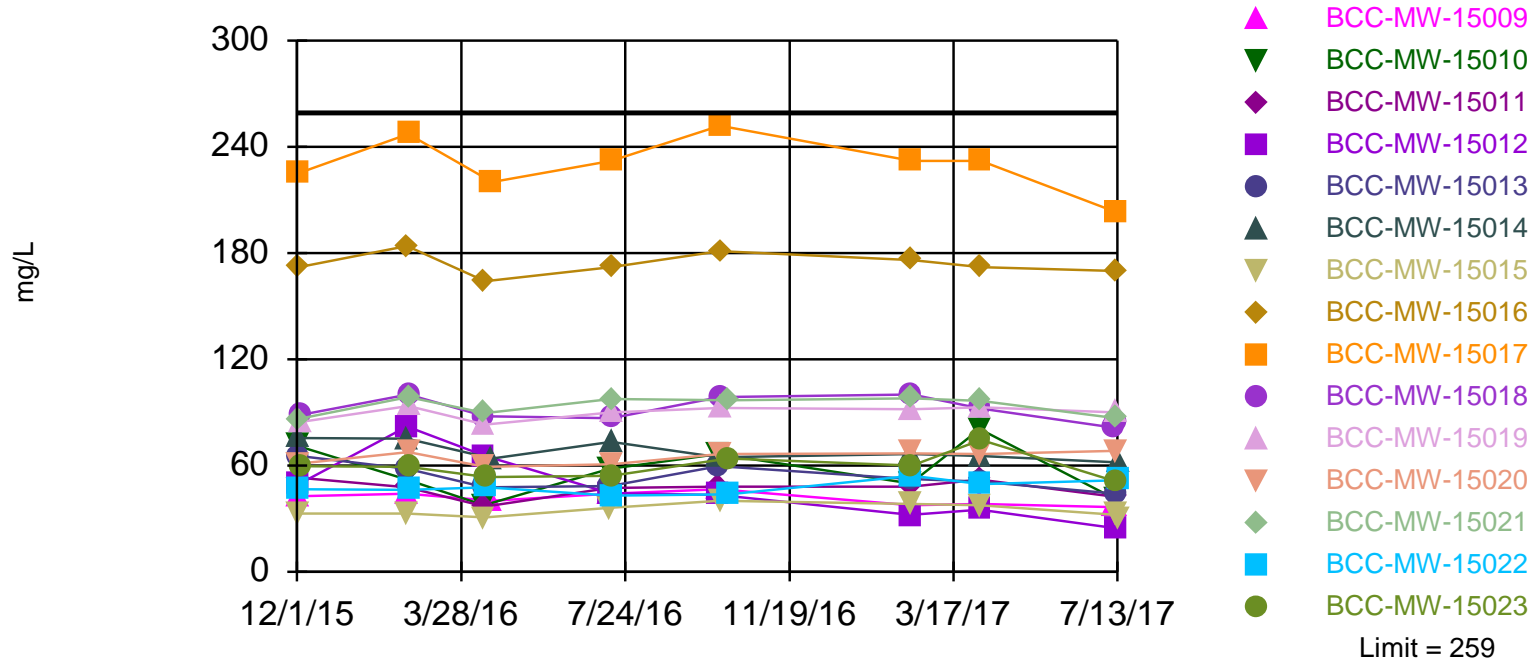
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Most recent observation is compared with limit. Limit is highest of 55 background values. 1.818% NDs. 91.99% coverage at alpha=0.01; 94.73% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.05954.

Constituent: Boron, Total Analysis Run 11/14/2017 9:18 AM

Client: Consumers Energy Data: BCC_Sanitas

Within Limit

Tolerance Limit Interwell Non-parametric



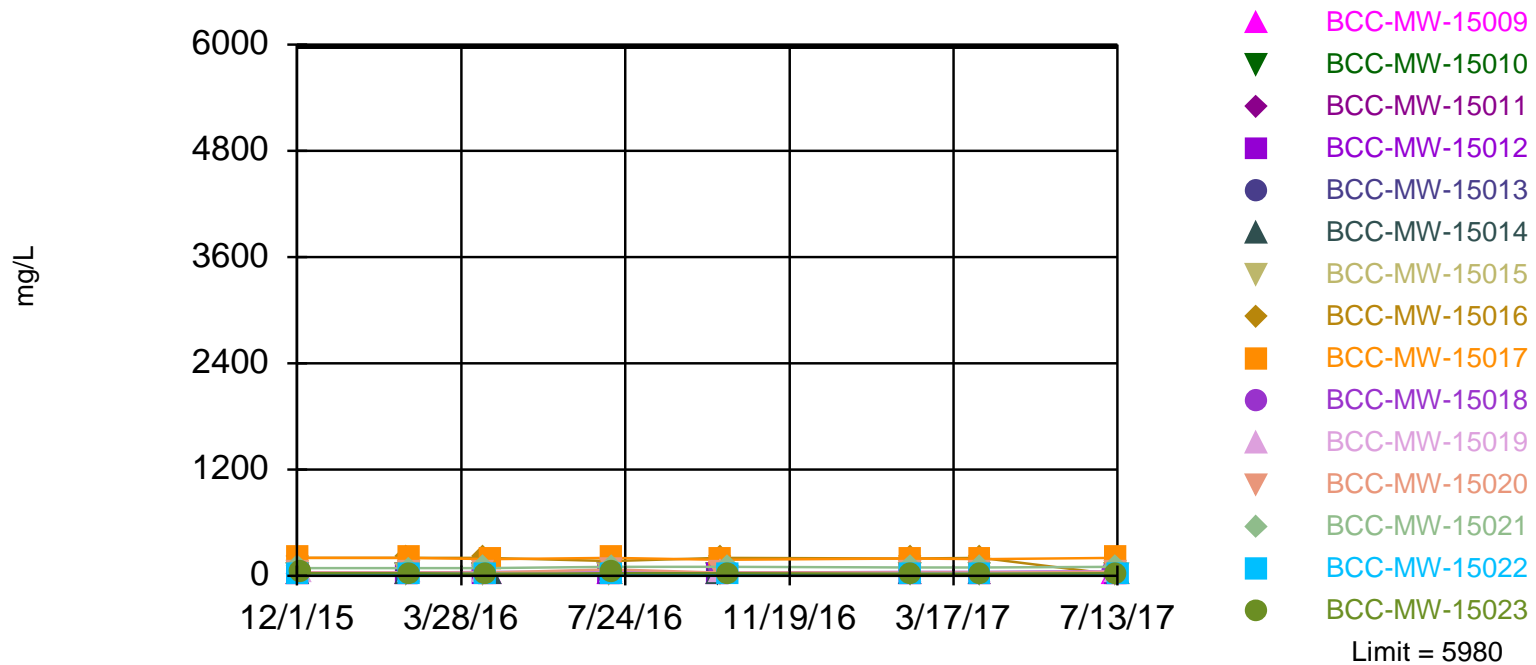
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Most recent observation is compared with limit. Limit is highest of 56 background values. 91.99% coverage at alpha=0.01; 94.73% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.05656.

Constituent: Calcium, Total Analysis Run 11/14/2017 9:18 AM

Client: Consumers Energy Data: BCC_Sanitas

Within Limit

Tolerance Limit Interwell Parametric



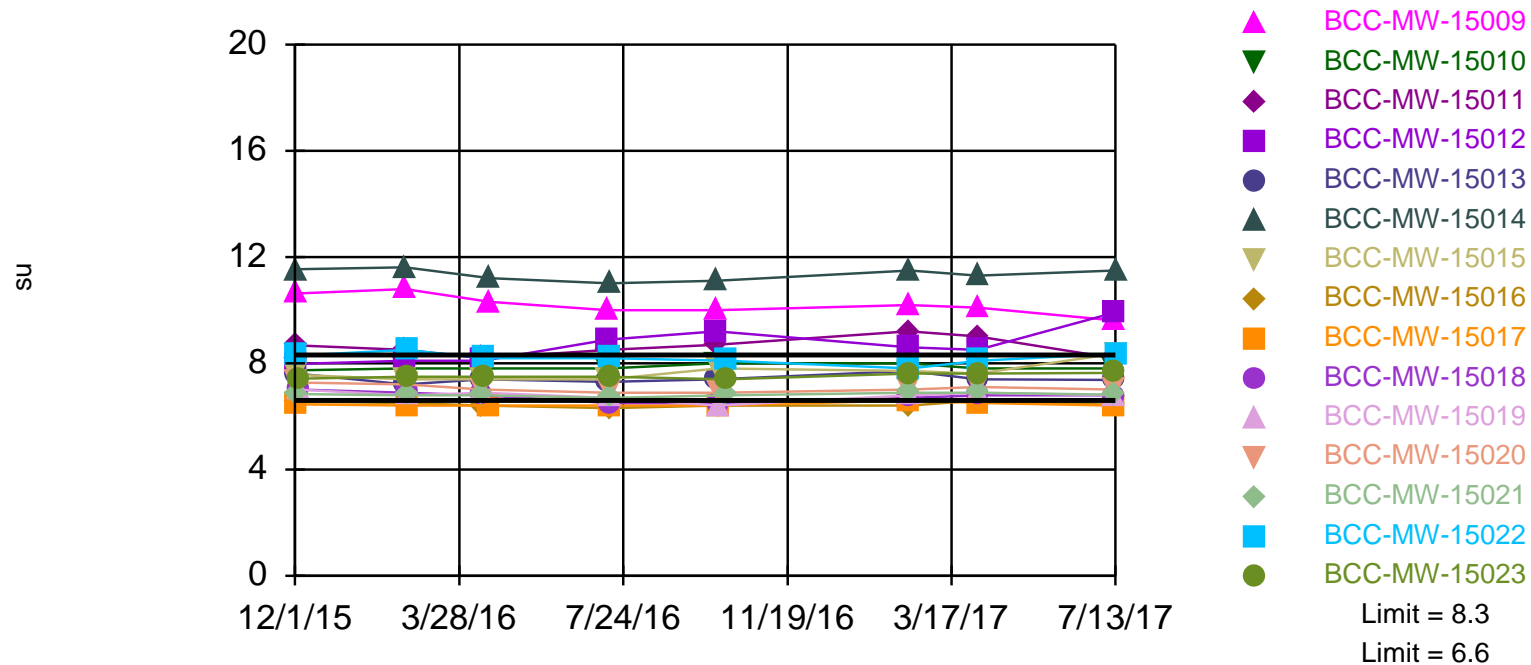
95% coverage. Most recent observation is compared with limit. Background Data Summary (based on natural log transformation): Mean=4.993, Std. Dev.=1.822, n=56. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9681, critical = 0.942. Report alpha = 0.05.

Constituent: Chloride Analysis Run 11/14/2017 9:18 AM

Client: Consumers Energy Data: BCC_Sanitas

Exceeds Limits: BCC-MW-15009, BCC-MW-15012, BCC-MW-15014, BCC-MW-15015...

Tolerance Limit Interwell Non-parametric



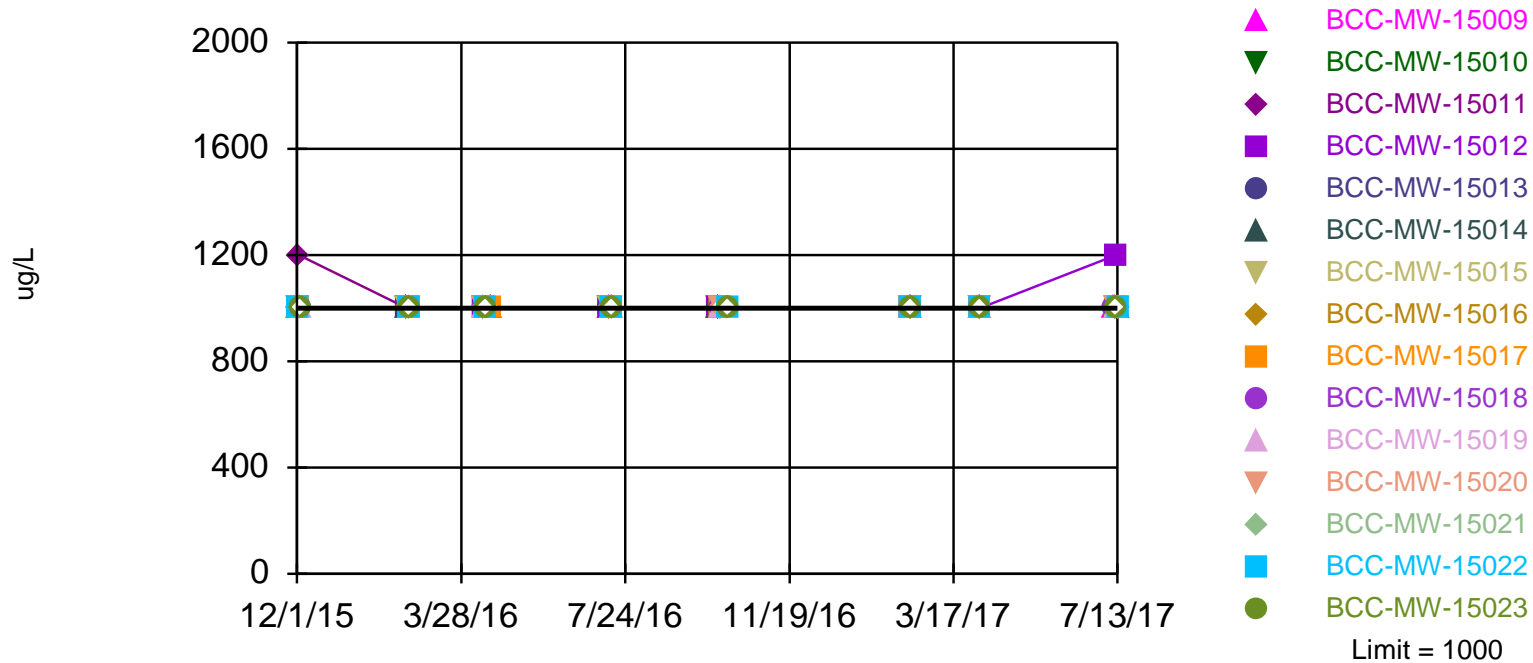
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Most recent observation is compared with limit. Limits are highest and lowest of 56 background values. 88.87% coverage at alpha=0.01; 91.99% coverage at alpha=0.05; 97.07% coverage at alpha=0.5. Report alpha = 0.2233 (0.1116 per tail).

Constituent: pH, Field Analysis Run 11/14/2017 9:19 AM

Client: Consumers Energy Data: BCC_Sanitas

Exceeds Limit: BCC-MW-15012

Tolerance Limit Interwell Non-parametric



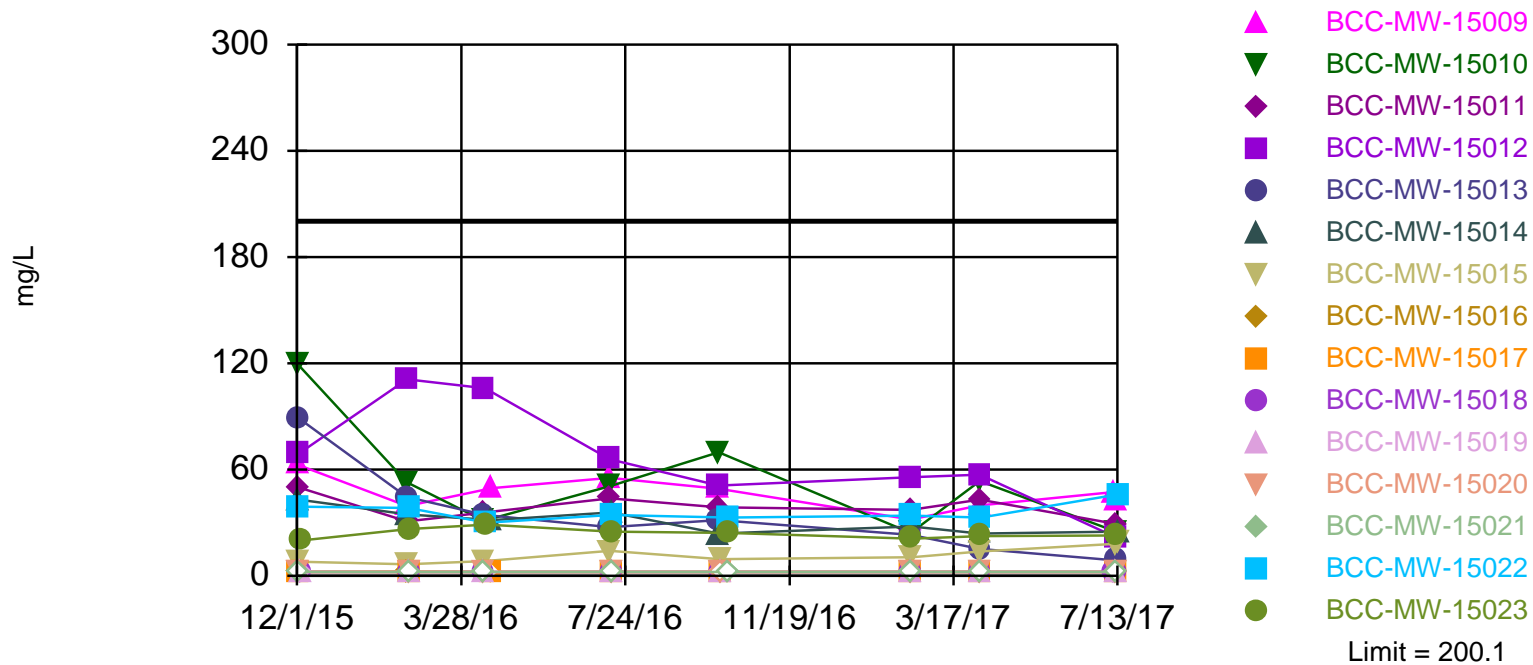
Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 50%. Most recent observation is compared with limit. All background values were censored; limit is most recent reporting limit. 91.99% coverage at alpha=0.01; 94.73% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.05656.

Constituent: Fluoride Analysis Run 11/14/2017 9:19 AM

Client: Consumers Energy Data: BCC_Sanitas

Within Limit

Tolerance Limit Interwell Parametric



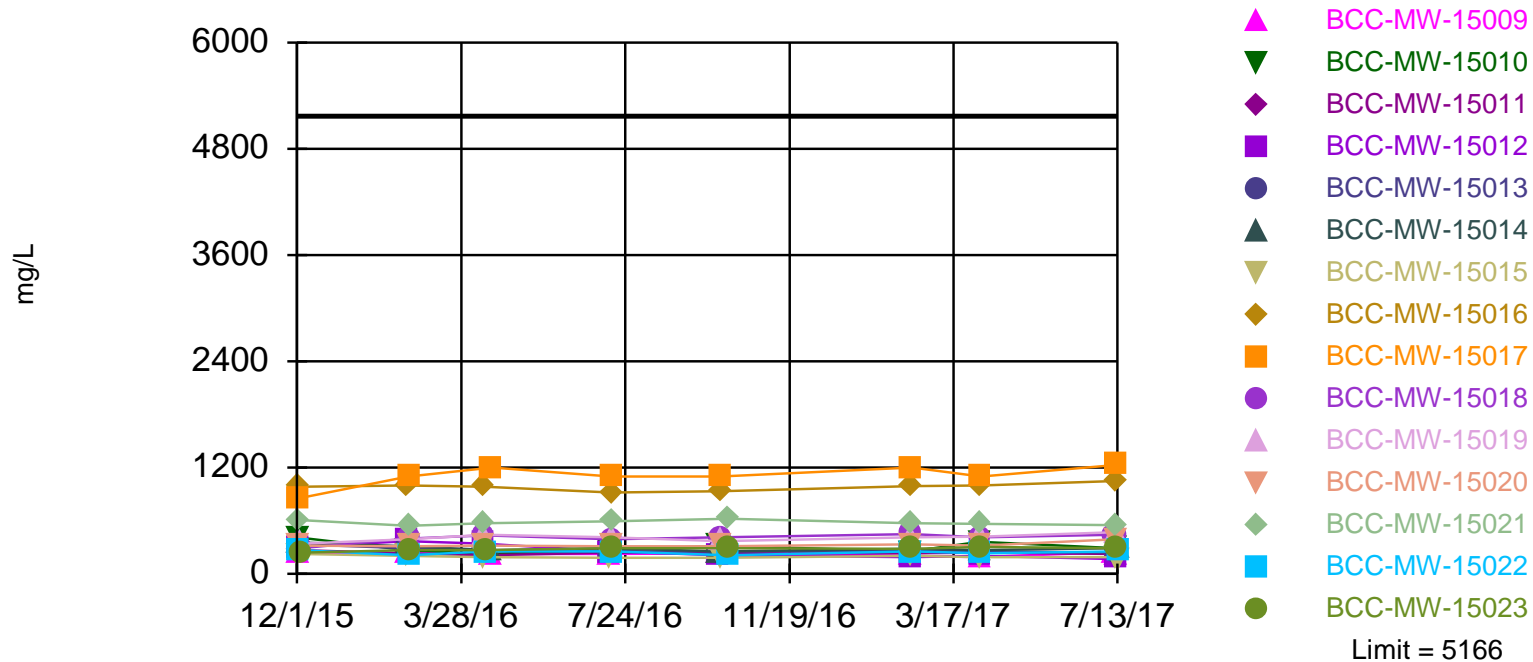
95% coverage. Most recent observation is compared with limit. Background Data Summary (based on natural log transformation): Mean=2.666, Std. Dev.=1.295, n=56, 5.357% NDs. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9429, critical = 0.942. Report alpha = 0.05.

Constituent: Sulfate Analysis Run 11/14/2017 9:19 AM

Client: Consumers Energy Data: BCC_Sanitas

Within Limit

Tolerance Limit Interwell Parametric



95% coverage. Most recent observation is compared with limit. Background Data Summary (based on natural log transformation): Mean=6.688, Std. Dev.=0.9164, n=56. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9447, critical = 0.942. Report alpha = 0.05.

Constituent: Total Dissolved Solids, Dissolved Analysis Run 11/14/2017 9:20 AM

Client: Consumers Energy Data: BCC_Sanitas