2019 Annual Groundwater Monitoring and Corrective Action Report

Former JR Whiting Power Plant
Pond 1&2 and Pond 6

Erie, Michigan

January 2020

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Prepared For
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Executive Summary

On April 17, 2015, the United States Environmental Protection Agency (USEPA) published the final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA) (the CCR Rule), as amended. Standards for groundwater monitoring and corrective action codified in the CCR Rule,(40 CFR 257.90-98), apply to the Consumers Energy Company (Consumers Energy) Pond 1&2 (existing surface impoundment) and Pond 6 (closed inactive surface impoundment) at the former JR Whiting (JRW) Power Plant Site (the Site). Pursuant to the CCR Rule, no later than January 31, 2018, and annually thereafter, the owner or operator of an existing 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), whereas the owner or operator of an inactive surface impoundment must prepare an annual groundwater monitoring and corrective action report no later than August 1, 2019 and annually thereafter. The initial *Annual Groundwater Monitoring Report* for Pond 6 was submitted in July 2019 (July 2019 Annual Report) (TRC, 2019). In order to align the Pond 6 reporting schedule with the existing schedule for Pond 1&2 (due no later than January 31 each year), this report is being submitted following the completion of one additional semiannual sampling event completed subsequent to the initial detection monitoring event.

TRC prepared this 2019 Annual Groundwater Monitoring Report for the JRW Pond 1&2 and Pond 6 on behalf of Consumers Energy to cover the period of January 1, 2019 to December 31, 2019. This 2019 Pond 1&2 and Pond 6 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 constituents (Appendix III to Part 257 of the CCR Rule) for the March and September 2019 semiannual groundwater monitoring events for Pond 1&2, and the September 2019 semiannual groundwater monitoring event for Pond 6. As part of the statistical evaluation, the data collected during detection monitoring events are evaluated to identify statistically significant increases (SSIs) in detection monitoring constituents to determine if concentrations in detection monitoring well samples exceed background levels.

For Pond 1&2, potential SSIs over background limits were noted for various Appendix III constituents in one or more downgradient wells during the March and September 2019 monitoring events. An Alternate Source Demonstration (ASD) was prepared by TRC to evaluate the March 2019 SSI and demonstrate that the SSI is attributed to natural variation within the uppermost aquifer that has not yet been captured in the background data set. Therefore, based on the information provided in the ASD, CEC continued detection monitoring as per 40 CFR 257.94 at Pond 1&2. In addition, verification resampling demonstrated that the potential SSIs observed in September 2019 were not statistically significant (i.e., verification resampling did not confirm the exceedance). Therefore, no SSIs were recorded for the 2019 monitoring period and detection monitoring will be continued at Pond 1&2 in conformance with §257.90 - §257.94. For Pond 6, all of the results are within the prediction limits for the analyzed constituents. Therefore, there are no SSIs in any of the downgradient wells for the September 2019 monitoring event. Since no SSIs over background limits were identified for any of the Appendix III constituents during the September 2019 monitoring event, Consumers Energy will continue with the detection monitoring program at the JRW Pond 6 in conformance with §257.90 - §257.94.

No corrective actions were performed in 2019. The next semiannual monitoring event for Pond 1&2 and Pond 6 is scheduled for the second and fourth calendar quarter of 2020. The next annual monitoring report will cover monitoring conducted in the 2020 calendar year and will be submitted no later than January 31, 2020.

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), as amended. Standards for groundwater monitoring and corrective action codified in the CCR Rule,(40 CFR 257.90-98), apply to the Consumers Energy Company (Consumers Energy) Pond 1&2 (existing surface impoundment) and Pond 6 (closed inactive surface impoundment) at the former JR Whiting (JRW) Power Plant Site (the Site). Pond 1&2 and Pond 6 are monitored using a multiunit groundwater monitoring system (in accordance with 40 CFR §257.91). Pursuant to the CCR Rule, , 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 prepared this 2019 Annual Groundwater Monitoring Report (2019 Annual Report) for the JRW Pond 1&2 and Pond 6 on behalf of Consumers Energy. This 2019 Pond 1&2 and Pond 6 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 constituents (Appendix III to Part 257 of the CCR Rule) for the March and September 2019 semiannual groundwater monitoring events for Pond 1&2. The monitoring was performed in accordance with the *JR Whiting Monitoring Program Sample Analysis Plan* (SAP) (ARCADIS, 2016) and the updated *JR Whiting Monitoring Program Sample and Analysis Plan* (TRC, May 2017), 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 constituents compared to background levels.

This report also presents the monitoring results and the statistical evaluation of the detection monitoring constituents (Appendix III to Part 257 of the CCR Rule) for the September 2019 semiannual groundwater monitoring event for the JRW Pond 6. This event is the second detection monitoring event performed to comply with §257.94. The monitoring was performed in accordance with the *JR Whiting Monitoring Program Sample and Analysis Plan* (SAP) (TRC, May 2017) and statistically evaluated per the *Groundwater Statistical Evaluation Plan* (Stats Plan) (TRC, April 2019). As part of the statistical evaluation, the data collected during detection monitoring events are evaluated to identify statistically significant increases (SSIs) of detection monitoring constituents compared to background levels.

1.2 Site Overview

The JR Whiting Plant was a coal-fired power generation facility located in Erie, Michigan, on the western shore of Lake Erie (Figure 1). The plant began producing electricity in 1952 from Units 1 and 2, with Unit 3 beginning operation in 1953. The plant ceased operation in April 2016. Figures 1 and 2 are a site location maps showing the facility and the surrounding area. Site features are shown on Figures 3 and 4.

The JR Whiting Ash Disposal Area is in three general locations of the JR Whiting site and is licensed under Michigan Part 115 of the Natural Resources and Environmental Protection Act (NREPA), PA 451 of 1994, as amended.

Pond 1&2 is located to the east of the plant, north of the discharge canal, south of Erie Road, and west of Lake Erie and constructed in native clay soil. It was historically used for wet ash sluicing. In 2019, it received its final cover system constructed pursuant to 40 CFR 257.102(a); the Ponds 1 and2 Closure Construction Quality Assurance (CQA) Plan dated August 31, 2017; the Part 115 Administrative Rules; and Pond 1&2 Closure Plan submitted to Michigan Department of Environmental, Great Lakes, and Energy (EGLE) on December 18, 2017.

Pond 6 is located to the north of the plant and was constructed in native clay soil. It was an inactive surface impoundment at the time the CCR Rule became effective on October 19, 2015 and was capped with final cover certified pursuant to the CCR Rule on December 5, 2017 and certified by the EGLE on August 24, 2018.

1.3 Geology/Hydrogeology

Pond 1&2 and Pond 6 are located adjacent to Lake Erie. The subsurface materials encountered at the JR Whiting site are predominately clay-rich till. The surficial CCR fill material is underlain by approximately 40 to 50 feet of laterally extensive clay-rich till that acts as a natural hydraulic barrier across the site. Limestone bedrock is present beneath the till and is considered the uppermost aquifer at the site.

Groundwater present within the uppermost aquifer is confined and protected from CCR constituents by the overlying clay-rich aquitard and is typically encountered around 50 feet below ground surface (ft bgs) in the limestone (beneath the till). Potentiometric surface elevation data from groundwater within the CCR monitoring wells exhibit an extremely low hydraulic gradient across the site with no consistent or discernible flow direction. There are minor differences in hydraulic head across the monitoring wells (ranging from zero up to 0.13 feet across Pond 1&2 and up to 0.24 feet across Pond 6 from event to event from November 2016 through September 2019), indicating that the potentiometric surface is flat the majority of the time. In the few instances since November 2016 where a slight gradient was observed and calculable, the direction of the flow potential was slightly to the northwest (two events) and to the east (one event) from Pond 1&2 and slightly to the south and west from Pond 6.

Given that the hydraulic gradient is often so low, groundwater flow across Pond 1&2 is frequently incalculable and often stagnant. The most pronounced groundwater gradient between November 2016 and September 2019 was observed in December 19, 2016, which showed a slight horizontal gradient of approximately 0.00016 to the northwest across Pond 1&2. For Pond 6, the most pronounced potentiometric head differential of 0.24 feet was observed on February 28, 2018 between JRW-MW-16001 on the north edge of Pond 6 and JRW-MW-16004 on the south edge of the Pond 6 CCR unit. Although, when considering the potentiometric surface elevation data from all of the Pond 6 CCR unit wells, the general groundwater flow direction inferred across the pond at that time is to the southwest, in order to be conservative, the maximum head difference was used to calculate the maximum groundwater flow velocity at the Pond 6 CCR unit throughout the background monitoring period. This results in a very slight horizontal gradient of approximately 0.000099 ft/ft to the south.

Section 2
Groundwater Monitoring

2.1 Monitoring Well Network

A groundwater monitoring system has been established for Pond 1&2 and Pond 6, which established the monitoring well locations for detection monitoring. The detection monitoring well network for Pond 1&2 and Pond 6 currently consists of six monitoring wells for each CCR unit that are screened in the uppermost aquifer. The monitoring well locations are shown on Figure 3 for Pond 1&2 and Figure 4 for Pond 6.

As discussed in the Stats Plan, intrawell statistical methods for JR Whiting were selected based on the geology and hydrogeology at the Site (primarily the presence of clay/hydraulic barrier, no apparent flow direction and lack of flow potential across the aquifer), in addition to other supporting lines of evidence that the aquifer is unaffected by the CCR unit (such as the consistency in concentrations of water quality data and similarities in concentrations in background and downgradient wells). An intrawell statistical approach requires that each of the downgradient wells doubles as the background and compliance well, where data from each individual well during a detection monitoring event is compared to a statistical limit developed using the background dataset from that same well. Monitoring wells JRW-MW-15001 through JRW-MW-15006 are located around the perimeter of Pond 1&2 and monitoring wells JRW-MW-16001 through JRW-MW-16006 are located around the perimeter of the JRW Pond 6. These monitoring wells provide data on both background and downgradient groundwater quality that has not been affected by the CCR unit (total of six background/downgradient monitoring wells for each pond).

As shown on Figure 2, monitoring wells JRW-MW-16007 through JRW-MW-16009 are used for water level measurements only. These wells were initially installed as potential background monitoring wells during the initial stages of characterizing the site. However, based on further hydrogeological characterization of the uppermost aquifer, an intrawell statistical approach was selected which does not rely on JRW-MW-16007 through JRW-MW-16009 for statistical evaluation.

During September 2019, the top of casing heights for several of the monitoring wells were modified to allow access to the wells subsequent to grading activities at Pond 1&2. In addition, monitoring well JRW-MW-15006 was not sampled during the September 2019 event due to damage sustained during construction activities related to capping and final cover placement. It has been repaired and redeveloped and was sampled in November 2019. Several monitoring wells at Pond 1&2 (JRW-MW-15001, JRW-MW-15003, JRW-MW-15004, and JRW-MW-15005) were also proactively redeveloped following construction activities. Top of casing elevation data are shown on Table 1 (original elevations) and Table 2 (updated elevations). No monitoring wells were installed or decommissioned in 2019.

2.2 Semiannual Groundwater Monitoring

The semiannual monitoring constituents 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 constituents 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.

2.2.1 Data Summary

For Pond 1&2, the first semiannual groundwater detection monitoring event for 2019 was performed on March 11 through March 13, 2019, by TRC personnel and samples were analyzed by Eurofins TestAmerica Laboratories, Inc. (TestAmerica) in accordance with the May 2017 SAP. Static water elevation data were collected at all nine monitoring well locations. Groundwater samples were collected from the six detection monitoring wells for the Appendix III constituents and field parameters. A summary of the groundwater data collected during the March 2019 event is provided on Table 1 (static groundwater elevation data), Table 4 (field data), and Table 6 (analytical results). For Pond 6, the first semiannual groundwater monitoring event for 2019 was previously reported in the July 2019 Annual Groundwater Monitoring Report for Pond 6.

The second semiannual groundwater detection monitoring event for 2019 was performed on September 16 through September 18, 2019, by TRC personnel and samples were analyzed by TestAmerica in accordance with the respective SAP. Static water elevation data were collected at all fifteen monitoring well locations. For Pond 1&2 groundwater samples were collected from five of the six detection monitoring wells during the September 2019 event for Appendix III constituents and field parameters. Monitoring well JRW-MW-15006 was sampled by FK Engineering on November 18, 2019, and analyzed by Brighton Analytical LLC, following well repair and redevelopment due to damage sustained during construction activities related to capping. At Pond 6, samples were collected from all six detection monitoring wells during the September 2019 event for Appendix III constituents and field parameters. A summary of the Pond 1&2 groundwater data collected during the September 2019 event is provided on Table 2 (static groundwater elevation data), Table 4 (field data), and Table 7 (analytical results). A summary of the Pond 6 groundwater data collected during the September 2019 event is provided on Table 3 (static groundwater elevation data), Table 5 (field data), and Table 8 (analytical results).

2.2.2 Data Quality Review

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

2.2.3 Groundwater Flow Rate and Direction

Groundwater elevation data collected during the background sampling events showed that the hydraulic gradient for groundwater within the uppermost aquifer is often so low, groundwater flow across Pond 1&2 and Pond 6 is frequently incalculable and often stagnant.

Pond 1&2

The average groundwater gradient observed on March 11, 2019, using well pairs JRW-MW-15005/JRW-MW-15001 and JRW-MW-15004/JRW-MW-15002, showed a very slight horizontal gradient of approximately 0.00012 ft/ft with minimal discernable overall flow direction across Pond 1&2 in the northwest direction. Using the highest hydraulic conductivity measured at the Pond 1&2 monitoring wells of 20 feet/day (ARCADIS, 2016), and an assumed effective porosity of 0.1, this results in a groundwater flow rate of approximately 0.023 feet/day (approximately 8.5 feet/year). Pond 1&2 groundwater elevations measured across the Site during the March 2019 sampling event are provided on Table 1 and are summarized in plan view on Figure 5.

The average groundwater gradient observed on September 16, 2019, using the same well pairs as the March 2019 event, showed a very slight horizontal gradient of approximately 0.000056 ft/ft with minimal discernable overall flow direction across the Pond 1&2 in the northwest direction. Using the aforementioned hydraulic conductivity and porosity assumptions, this results in a groundwater flow rate of approximately 0.011 feet/day (approximately 4.1 feet/year). Pond 1&2 groundwater elevations measured across the Site during the September 2019 sampling event are provided on Table 2 and are summarized in plan view on Figure 6.

The extremely low gradient and lack of general flow direction is similar to that identified in previous monitoring rounds (since the background sampling events commenced in December 2016) and continues to demonstrate that the downgradient compliance wells are appropriately positioned to detect the presence of Appendix III constituents that could potentially migrate from Pond 1&2.

Pond 6

The most pronounced groundwater gradient of 0.24 feet was observed on February 28, 2018, between JRW-MW-16001 on the north edge of Pond 6 and JRW-MW-16004 on the south edge of the Pond 6, showed a very slight horizontal gradient of approximately 0.000099 ft/ft towards the south. Using the highest hydraulic conductivity measured at the Pond 6 CCR unit monitoring wells (11.9 feet/day from the 2016 TRC well installation report) and an assumed effective porosity of 0.1, this results in a groundwater flow rate of approximately 0.012 feet/day (approximately 4.4 feet per year).

During the September 2019 event, the average hydraulic gradient of 0.000067 ft/ft was calculated using well pairs JRW-MW-16002/JRW-MW-16006, JRW-MW-16001/JRW-MW-16005, and JRW-MW-16003/JRW-MW-16004 toward the southwest. Using the aforementioned hydraulic conductivity and effective porosity assumptions, this results in an average groundwater flow rate of approximately 0.0079 feet/day (approximately 2.9 feet/year). Groundwater elevations measured across the Site during the September 2019 sampling event are provided on Table 3 and are summarized in plan view on Figure 7.

The extremely low gradient and/or lack of general flow direction is similar to that identified in previous monitoring rounds since the background sampling events commenced in November 2016 and continues to demonstrate that the downgradient compliance wells are appropriately positioned to detect the presence of Appendix III constituents that could potentially migrate from the JRW Pond 6.

Section 3
Statistical Evaluation

3.1 Establishing Background Limits

Pond 1&2

Per the Stats Plan, background limits were established for the Appendix III constituents following the ninth round of background monitoring using data collected from each of the six established detection monitoring wells (JRW-MW-15001 through JRW-MW-15006). The Appendix III background limits for each monitoring well will be used throughout the detection monitoring period to determine whether groundwater has been impacted from the JRW Pond 1&2 by comparing concentrations in the detection monitoring wells to their respective background limits for each Appendix III constituents. The statistical evaluation of the background data is presented in the *Annual Groundwater Monitoring Report* (TRC, January 2018) and was used to evaluate the data from the first semiannual event in 2019. It is recognized that due to lack of groundwater flow potential there is limited temporal independence in the background dataset, and, due to limitations on CCR Rule implementation timelines, the data sets are of relatively short duration for capturing natural temporal changes in the aquifer that may occur on a seasonal basis. As recommended in the alternate source demonstration discussed below in Section 3.3, in order to capture more natural temporal changes in the aquifer, an additional four rounds of data have been incorporated into the background dataset and the prediction limit calculations have been updated using data collected from November 2016 through March 2019. The updated statistical evaluation of the background data is presented in detail in Appendix B and was used to evaluate the data from the second semiannual monitoring event in 2019.

Pond 6

Per the Stats Plan, background limits were established for the Appendix III constituents following the twelfth round of background monitoring using data collected from each of the six established detection monitoring wells (JRW-MW-16001 through JRW-MW-16006). The statistical evaluation of the background data is presented in the Pond 6 July 2019 Annual Report. The Appendix III background limits for each monitoring well will be used throughout the detection monitoring period to determine whether groundwater has been impacted from the JRW Pond 6 by comparing concentrations in the detection monitoring wells to their respective background limits for each Appendix III constituent.

3.2 Data Comparison to Background Limits – Pond 1&2 First 2019 Semiannual Event (March 2019)

The concentrations of the constituents in each of the detection monitoring wells (JRW-MW-15001 through JRW-MW-15006) were compared to their respective statistical background limits calculated from the background data collected from each individual well (i.e., monitoring data from JRW-MW-15001 is compared to the background limit developed using the background dataset from JRW-MW-15001, and so forth). The comparisons are presented on Table 6.

The preliminary statistical evaluation of the March 2019 Appendix III constituents showed potential SSIs over background for:

- pH at JRW-MW-15001

The initial observation of a constituent concentration above the established background limits does not necessarily constitute an SSI. Per the Stats Plan, if there is an exceedance of a prediction limit for one or more of the constituents, 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 boron, calcium, chloride, fluoride, sulfate, or TDS.

3.3 Verification Sampling and Alternate Source Demonstration for the Pond 1&2 First 2019 Semiannual Event

Potential SSIs over background limits were noted for pH in one downgradient well for the March 2019 monitoring event. It is recognized that due to lack of groundwater flow potential at the Site there is limited temporal independence in the background dataset, and due to limitations on CCR Rule implementation timelines, the data sets are of relatively short duration for capturing natural temporal changes in the aquifer that may occur on a seasonal basis. In addition, although the statistical limits based on the initial eight-round background dataset were exceeded for pH, the calculated prediction limits and results respective to each of these potential SSIs are within the USEPA's established drinking water standards.

The Stats Plan allows for verification resampling within 30 days of the completion of the initial statistical analysis. However, verification sampling was not performed given the following:

- pH is a field measured parameter and steps were taken in the field at the time of sample collection to confirm the result. During the March 2019 sampling event, the purging procedures outlined in the SAP were followed, the pH meter calibration was checked against standard pH calibration solutions, and stabilization of the pH reading in addition to all other field parameters had been achieved at the time the pH result was recorded;
- pH was the only parameter outside of the statistical background limits (there were no other SSIs for any of the other Appendix III parameters);

- the pH value of 7.5 standard units (SU) is neutral and is in the middle of the USEPA's established range of pH drinking water standards (6.5 to 8.5 SU); and
- temporal independence in the background dataset used to calculate the prediction limits is limited.

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 SSI for pH below background limits noted during March 2019, an Alternate Source Demonstration (ASD) was prepared by TRC in the form of a technical memorandum dated May 21, 2019 with the subject: *Alternate Source Demonstration: March 2019 Detection Monitoring Event* (May 2019 ASD) to evaluate the SSI and demonstrate that the SSI is attributed to natural variation within the uppermost aquifer that has not yet been captured in the background data set. The May 2019 ASD is attached in Appendix C. Based on the multiple lines of evidence presented in the ASD, the SSI observed at JRW-MW-15005 in the March 2019 semiannual sampling event cannot be attributed to the JRW Pond 1&2 CCR unit. Therefore, based on the information provided in the ASD, CEC continued detection monitoring as per 40 CFR 257.94 at the Pond 1&2 CCR unit.

3.4 Data Comparison to Background Limits – Pond 1&2 Second 2019 Semiannual Event (September 2019)

The data comparisons of monitoring wells JRW-MW-15001 through JRW-MW-15005 for the September 2019 groundwater monitoring event and the November 2019 data for JRW-MW-15006 are presented on Table 7. The statistical evaluation of the September 2019 Appendix III constituents shows potential initial SSIs over background for:

- Boron at JRW-MW-15003;
- Calcium, chloride, and sulfate at JRW-MW-15005; and
- TDS at JRW-MW-15002 and JRW-MW-15005.

There were no SSIs compared to background for fluoride or pH.

3.5 Verification Sampling for the Pond 1&2 Second 2019 Semiannual Event

Verification resampling is recommended per the Stats Plan and the *USEPA's Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (Unified Guidance, USEPA,

2009) to achieve performance standards as specified by §257.93(g) in the CCR Rule. Per the Stats Plan, if there is an exceedance of a prediction limit for one or more of the constituents, the well(s) of concern will be resampled within 30 days of the completion of the initial statistical analysis. Only constituents that initially exceed their statistical limit (i.e., have no previously recorded SSIs) will be analyzed for verification purposes. As such, verification resampling for the September 2019 event was conducted on October 29 and 30, 2019 by TRC personnel. Groundwater samples were collected for TDS at JRW-MW-15002, boron at JRW-MW-15003, and calcium, chloride, sulfate, and TDS at JRW-MW-15005 A summary of the analytical results collected during the second semiannual verification resampling event is provided on Table 7. The associated data quality reviews are included in Appendix A.

The boron, calcium, chloride, sulfate, and TDS resample results are within the prediction limits; consequently, the initial potential SSIs from the September 2019 event are not confirmed. Therefore, in accordance with the stats plan and the Unified Guidance, the initial exceedances are not statistically significant, and no SSIs will be recorded for the September 2019 monitoring event.

3.6 Data Comparison to Background Limits – Pond 6 Second 2019 Semiannual Event (September 2019)

The concentrations of the constituents in each of the detection monitoring wells (JRW-MW-16001 through JRW-MW-16006) were compared to their respective statistical background limits calculated from the background data collected from each individual well (i.e., monitoring data from JRW-MW-16001 is compared to the background limit developed using the background dataset from JRW-MW-16001, and so forth). The comparisons are presented on Table 8.

All of the results are within the prediction limits for the analyzed constituents. Therefore, there are no SSIs.

Section 4
Corrective Action

There were no corrective actions needed or performed for either Pond 1&2 or Pond 6 within the calendar year 2019. No SSIs were recorded for the 2019 monitoring period; therefore, Consumers Energy will continue with the detection monitoring program at the JRW Pond 1&2 and Pond 6 CCR unit in conformance with §257.90 - §257.94.

Section 5
Conclusions and Recommendations

For Pond 1&2, potential SSIs over background limits were noted for various Appendix III constituents in one or more downgradient wells during the March and September 2019 monitoring events. Verification resampling demonstrated that these potential SSIs were not statistically significant (i.e., verification resampling did not confirm the exceedance). Therefore, no SSIs were recorded for the 2019 monitoring period and detection monitoring will be continued at Pond 1&2 in conformance with §257.90 - §257.94.

For Pond 6, no SSIs over background limits were identified for any of the Appendix III constituents during the September 2019 monitoring event; therefore, Consumers Energy will continue with the detection monitoring program at the JRW Pond 6 CCR unit in conformance with §257.90 - §257.94.

No corrective actions were needed or performed in 2019 for either Pond 1&2 or Pond 6. The semiannual monitoring events for these units are scheduled for the second and fourth calendar quarters of 2020. The next annual monitoring report will cover monitoring conducted in the 2020 calendar year and will be submitted no later than January 31, 2020.

Section 6
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Tables

Table 1

Summary of Groundwater Elevation Data – March 2019

JR Whiting Pond 1&2 – RCRA CCR Monitoring Program

Erie, Michigan

Well Location	Ground Surface Elevation (ft)	TOC Elevation (ft)	Geologic Unit of Screen Interval	Screen Interval Depth (ft BGS)			Screen Interval Elevation (ft)			March 11, 2019	
										Depth to Water (ft BTOC)	Groundwater Elevation (ft)
Static Water Level Monitoring Wells											
JRW-MW-16007	579.47	582.32	Limestone	68.0	to	78.0	511.5	to	501.5	6.64	575.68
JRW-MW-16008	579.95	582.84	Limestone	68.0	to	73.0	512.0	to	507.0	7.13	575.71
JRW-MW-16009	579.90	582.59	Limestone	69.0	to	79.0	510.9	to	500.9	6.85	575.74
Ponds 1 & 2											
JRW-MW-15001	589.6	590.71	Limestone	78.0	to	88.0	511.6	to	501.6	14.86	575.85
JRW-MW-15002	590.6	592.31	Limestone	81.0	to	91.0	509.6	to	499.6	16.43	575.88
JRW-MW-15003	589.6	591.36	Limestone	81.0	to	91.0	508.6	to	498.6	15.44	575.92
JRW-MW-15004	590.8	592.52	Limestone	86.0	to	96.0	504.8	to	494.8	16.56	575.96
JRW-MW-15005	592.7	594.25	Limestone	86.0	to	96.0	506.7	to	496.7	18.27	575.98
JRW-MW-15006	590.3	592.01	Limestone	81.0	to	91.0	509.3	to	499.3	16.11	575.90

Notes:

Survey conducted by Sheridan Surveying Co., November 2015 (2015 wells), and November 2016 (2016 wells)

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 Elevation Data – September 2019
JR Whiting Pond 1&2 – RCRA CCR Monitoring Program
Erie, Michigan

Well Location	Ground Surface Elevation (ft)	TOC Elevation (ft)	Geologic Unit of Screen Interval	Screen Interval Depth (ft BGS)			Screen Interval Elevation (ft)			September 16, 2019	
										Depth to Water (ft BTOC)	Groundwater Elevation (ft)
Static Water Level Monitoring Wells											
JRW-MW-16007	579.47	582.32	Limestone	68.0	to	78.0	511.5	to	501.5	6.26	576.06
JRW-MW-16008	579.95	582.84	Limestone	68.0	to	73.0	512.0	to	507.0	6.66	576.18
JRW-MW-16009	579.90	582.59	Limestone	69.0	to	79.0	510.9	to	500.9	6.43	576.16
Ponds 1 & 2											
JRW-MW-15001	NM	583.89	Limestone	NM	to	NM	511.6	to	501.6	7.34	576.55
JRW-MW-15002	NM	592.49	Limestone	NM	to	NM	509.6	to	499.6	15.92	576.57
JRW-MW-15003	NM	591.52	Limestone	NM	to	NM	508.6	to	498.6	14.93	576.59
JRW-MW-15004	NM	592.70	Limestone	NM	to	NM	504.8	to	494.8	16.09	576.61
JRW-MW-15005	NM	591.32	Limestone	NM	to	NM	506.7	to	496.7	14.71	576.61
JRW-MW-15006	NM	578.20	Limestone	NM	to	NM	509.3	to	499.3	1.69	576.51

Notes:

Top of casing elevation survey was conducted by Rowe Professional Services Company in October 2019.

Ground surface elevations not measured due to on-going regrading activities.

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

TOC: Top of well casing.

ft BTOC: Feet below top of well casing.

ft BGS: Feet below ground surface.

NM = Not measured

Table 3

Summary of Groundwater Elevation Data – September 2019

JR Whiting Pond 6 – RCRA CCR Monitoring Program

Erie, Michigan

Well Location	Ground Surface Elevation (ft)	TOC Elevation (ft)	Geologic Unit of Screen Interval	Screen Interval Depth (ft BGS)			Screen Interval Elevation (ft)			September 18, 2019	
										Depth to Water (ft BTOC)	Groundwater Elevation (ft)
Static Water Level Monitoring Wells											
JRW-MW-16007	579.47	582.32	Limestone	68.0	to	78.0	511.5	to	501.5	6.26	576.06
JRW-MW-16008	579.95	582.84	Limestone	68.0	to	73.0	512.0	to	507.0	6.66	576.18
JRW-MW-16009	579.90	582.59	Limestone	69.0	to	79.0	510.9	to	500.9	6.43	576.16
Pond 6											
JRW-MW-16001	589.19	592.32	Limestone	71.0	to	81.0	518.2	to	508.2	15.79	576.53
JRW-MW-16002	585.78	588.68	Limestone	81.0	to	91.0	504.8	to	494.8	12.18	576.50
JRW-MW-16003	586.19	589.02	Limestone	73.0	to	83.0	513.2	to	503.2	12.52	576.50
JRW-MW-16004	586.48	589.35	Limestone	75.0	to	85.0	511.5	to	501.5	12.90	576.45
JRW-MW-16005	589.29	592.13	Limestone	78.0	to	88.0	511.3	to	501.3	15.67	576.46
JRW-MW-16006	588.26	591.03	Limestone	79.0	to	89.0	509.3	to	499.26	14.60	576.43

Notes:

Survey conducted by Sheridan Surveying Co., November 2016 (2016 wells)

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

Static Water Level Monitoring Wells depth to water measured on September 16, 2019

TOC: Top of well casing.

ft BTOC: Feet below top of well casing.

ft BGS: Feet below ground surface.

Table 4
Summary of Field Parameter Results: March and September 2019
JR Whiting Pond 1&2 – RCRA CCR Monitoring Program
Erie, Michigan

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (SU)	Specific Conductivity (umhos/cm)	Temperature (°C)	Turbidity (NTU)
Ponds 1 & 2							
JRW-MW-15001	3/11/2019	0.25	-135.3	7.7	739	11.80	3.06
	9/17/2019	0.05	-131.4	7.7	1,077	14.30	5.51
JRW-MW-15002	3/11/2019	0.24	-83.7	7.7	810	11.15	1.36
	9/17/2019	0.15	-94.6	7.6	1,154	14.20	3.13
	10/29/2019(2)	0.41	-35.9	7.3	879	13.79	3.21
JRW-MW-15003	3/11/2019	2.09	-91.4	7.9	710	11.38	2.62
	9/17/2019	0.64	-100.3	7.7	1,016	14.50	5.30
	10/29/2019(2)	0.42	-90.8	7.6	762	13.02	2.50
JRW-MW-15004	3/12/2019	0.39	-72.5	7.5	1,042	12.71	2.01
	9/17/2019	0.01	-117.9	7.7	948	13.90	2.23
JRW-MW-15005	3/13/2019	0.87	-39.9	7.5	832	11.20	2.21
	9/14/2019	0.01	-123.0	7.8	893	14.20	2.32
	10/29/2019(2)	0.14	-105.2	7.5	700	14.15	1.56
JRW-MW-15006(1)	3/11/2019	0.31	-167.0	8.0	684	11.45	1.99
	11/18/2019	1.11	-17.0	7.8	1,180	12.12	NM

Notes:
mg/L - Milligrams per Liter.
mV - Millivolts.
SU - Standard units.
umhos/cm - Micromhos per centimeter.
°C - Degrees Celcius.
NM - Not measured
NTU - Nephelometric Turbidity Unit.
(1) Monitoring well JRW-MW-15006 was sampled by FK Engineering on November 18, 2019 following redevelopment due to damage from construction activities.
(2) - Results shown for verification sampling performed during October 2019.

Table 5

Summary of Field Parameter Results: September 2019
JR Whiting Pond 6 – RCRA CCR Monitoring Program
Erie, Michigan

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (SU)	Specific Conductivity (umhos/cm)	Temperature (°C)	Turbidity (NTU)
Pond 6							
JRW-MW-16001	9/18/2019	0.13	-70.4	7.8	780	12.70	2.49
JRW-MW-16002	9/18/2019	0.23	-127.7	7.8	1,001	14.30	14.4
JRW-MW-16003	9/18/2019	0.11	-154.3	7.7	975	13.80	4.34
JRW-MW-16004	9/18/2019	0.17	-72.4	7.6	1,209	12.70	3.67
JRW-MW-16005	9/18/2019	0.12	-99.1	7.7	868	12.80	5.27
JRW-MW-16006	9/18/2019	4.01	-100.1	7.9	831	12.90	3.25

Notes:

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

Table 6
Comparison of Appendix III Parameter Results to Background Limits – March 2019
JR Whiting Pond 1&2 – RCRA CCR Monitoring Program
Erie, Michigan

Sample Location:		JRW-MW-15001			JRW-MW-15002		JRW-MW-15003		JRW-MW-15004		JRW-MW-15005		JRW-MW-15006	
Sample Date:		3/11/2019			3/11/2019		3/11/2019		3/12/2019		3/13/2019		3/11/2019	
Constituent	Unit	Data		PL	Data	PL	Data	PL	Data	PL	Data	PL	Data	PL
Appendix III		Primary	Duplicate											
Boron	ug/L	200	190	251	190	229	210	219	230	271	210	256	210	240
Calcium	mg/L	130	130	182	140	185	110	162	110	143	97	127	110	144
Chloride	mg/L	45	45	54.4	46	54.5	43.0	55.5	46	54.7	43	44.0	44	52.1
Fluoride	ug/L	1,300	1,300	1,560	1,400	1,870	1,400	1,810	1,300	1,860	1,400	1,730	1,300	1,710
pH, Field	SU	7.7	7.7	7.4 - 8.1	7.7	7.3 - 7.8	7.9	7.4 - 8.2	7.5	7.4 - 7.9	**7.5 (1)**	7.7 - 8.4	8.0	7.1 - 9.0
Sulfate	mg/L	410	400	469	430	495	380	454	360	389	300	347	370	404
Total Dissolved Solids	mg/L	840	820	974	870	1,020	760	969	730	900	670	844	720	922

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.

Bold font indicates an exceedance of the Prediction Limit (PL) using the number of significant figures in the PL.

RESULT Shading and bold font indicates an exceedance of the PL.

(1) Exceedance addressed through alternate source demonstration.

Table 7

Comparison of Appendix III Parameter Results to Background Limits – September 2019

JR Whiting Pond 1&2 – RCRA CCR Monitoring Program

Erie, Michigan

Sample Location:		JRW-MW-15001		JRW-MW-15002			JRW-MW-15003			JRW-MW-15004		JRW-MW-15005			JRW-MW-15006	
Sample Date:		9/17/2019	PL	9/17/2019	10/29/2019(1)	PL	9/17/2019	10/29/2019(1)	PL	9/17/2019	PL	9/17/2019	10/29/2019(1)	PL	11/18/2019(2)	PL
Constituent	Unit	Data		Data	Data		Data	Data		Data		Data	Data		Data	
Appendix III																
Boron	ug/L	230	240	220	--	220	**240**	220	230	250	270	220	--	270	190	250
Calcium	mg/L	150	180	150	--	180	130	--	160	110	140	**150**	96	120	97	140
Chloride	mg/L	48	55	48	--	56	45	--	55	46	56.0	**48**	42	46.0	48	53
Fluoride	ug/L	1,300	1,600	1,500	--	1,900	1,500	--	1,800	1,400	1,800	1,500	--	1,700	1,400	1,700
Sulfate	mg/L	410	470	450	--	500	380	--	440	350	390	**470**	310	350	340	410
Total Dissolved Solids	mg/L	810	1,000	**1,200**	840	1,100	770	--	940	730	880	**870**	610	840	660	920
pH, Field	SU	7.7	6.8 - 8.2	7.6	--	7.2 - 7.9	7.7	--	7.3 - 8.3	7.7	7.2 - 8.0	7.8	--	7.3 - 8.6	7.8	7.0 - 9.0

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

-- - not analyzed

All metals were analyzed as total unless otherwise specified.

Prediction limits updated October 31, 2019.

Bold font indicates an exceedance of the Prediction Limit (PL) using the number of significant figures in the PL.

RESULT Shading and bold font indicates a confirmed exceedance of the PL.

(1) Results shown for verification sampling performed on October 29, 2019.

(2) Monitoring well JRW-MW-15006 was sampled by FK Engineering on November 18, 2019 following redevelopment due to damage from construction activities.

Table 8

Comparison of Appendix III Parameter Results to Background Limits – September 2019
JR Whiting Pond 6 – RCRA CCR Monitoring Program
Erie, Michigan

Sample Location:		JRW-MW-16001		JRW-MW-16002		JRW-MW-16003		JRW-MW-16004		JRW-MW-16005		JRW-MW-16006	
Sample Date:		9/18/2019	PL	9/18/2019	PL	9/18/2019	PL	9/18/2019	PL	9/18/2019	PL	9/18/2019	PL
Constituent	Unit	Data		Data		Data		Data		Data		Data	
Appendix III													
Boron	ug/L	160	203	180	209	210	257	210	262	190	244	180	226
Calcium	mg/L	79	111	130	149	120	156	150	181	96	182	93	117
Chloride	mg/L	20	23.6	22	25.4	29	32.4	39	43.7	25	29.4	25	38.6
Fluoride	ug/L	1,600	2,300	1,100	1,400	1,300	1,600	1,300	1,700	1,500	1,800	1,500	2,200
Sulfate	mg/L	270	278	420	426	440	470	500	507	330	498	320	399
Total Dissolved Solids	mg/L	550	770	740	832	790	1,040	920	1,110	660	1,030	600	904
pH, Field	SU	7.8	7.5 - 8.9	7.8	7.5 - 8.3	7.7	7.4 - 7.9	7.6	7.4 - 8.2	7.7	7.3 - 8.0	7.9	7.5 - 8.2

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

-- = not analyzed

All metals were analyzed as total unless otherwise specified.

Bold font indicates an exceedance of the Prediction Limit (PL) using the number of significant figures in the PL.

Figures

BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

N

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

0 3,000 6,000 FEET

TRC

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Ann Arbor, MI 48108-3284
Phone: 734.971.7080
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TRC - GIS

PROJECT:

CONSUMERS ENERGY COMPANY
JR WHITING POWER PLANT
ERIE, MICHIGAN

TITLE:

SITE LOCATION MAP
POND 1 & 2

DRAWN BY:	M. VAPHIADIS
CHECKED BY:	B. YELEN
APPROVED BY:	S. HOLMSTROM
DATE:	JANUARY 2020
PROJ. NO.:	332751
FILE:	332751-001-0015slm.mxd

FIGURE 1

BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

N

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

0 3,000 6,000
FEET

1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trccompanies.com TRC - GIS	PROJECT: **CONSUMERS ENERGY COMPANY JR WHITING POWER PLANT ERIE, MICHIGAN**	DRAWN BY:	M. VAPHIADIS
		CHECKED BY:	B. YELEN
		APPROVED BY:	S. HOLMSTROM
	TITLE: **SITE LOCATION MAP POND 6**	DATE:	JANUARY 2020
		PROJ. NO.:	332751
		FILE:	332751-001-0016cslm.mxd
		FIGURE 2	

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LEGEND

- MONITORING WELL (STATIC WATER LEVEL ONLY)
- CCR UNIT MONITORING WELL

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO,2019.
2. STATIC WATER ONLY WELL LOCATIONS SURVEYED BY SHERIDAN SURVEYING CO. ON 11/19/2015.
3. PONDS 1 & 2 WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES CO. ON 10/19/2019.

PROJECT:
CONSUMERS ENERGY COMPANY
JR WHITING POWER PLANT
ERIE, MICHIGAN

TITLE:
SITE PLAN
WITH CCR MONITORING WELL LOCATIONS
FOR POND 1 & 2

DRAWN BY:	M. VAPHIADIS	PROJ NO.:	332751
CHECKED BY:	B. YELEN		
APPROVED BY:	S. HOLMSTROM		**FIGURE 3**
DATE:	JANUARY 2020		

TRC
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FILE NO.: 332751-001-0017.mxd

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

Plot Date: 1/16/2020, 12:19:28 PM by MVAPHIADIS -- LAYOUT: ANSI B(11"x17")
Path: E:\ConsumersEnergy\CCR_GW\2017_269767\332751-001-0017.mxd

TRC - GIS

LEGEND

- MONITORING WELL (STATIC WATER LEVEL ONLY)
- CCR UNIT MONITORING WELL

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 4/28/2018.
2. WELL LOCATIONS SURVEYED BY SHERIDAN SURVEYING CO. ON 11/19/2015.

N

0 500 1,000 Feet

1 " = 500 '

1:6,000

PROJECT: CONSUMERS ENERGY COMPANY
JR WHITING POWER PLANT
ERIE, MICHIGAN

TITLE: SITE PLAN
WITH CCR MONITORING WELL LOCATIONS
FOR POND 6

DRAWN BY:	M. VAPHIADIS	PROJ NO.:	332751
CHECKED BY:	B. YELEN	FIGURE 4	
APPROVED BY:	S. HOLMSTROM		
DATE:	JANUARY 2020		

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FILE NO.: 332751-001-018.mxd

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

Plot Date: 1/16/2020, 12:26:50 PM by MVAPHIADIS -- LAYOUT: ANSI B(11"x17")
Path: E:\ConsumersEnergy\CCR_GW\2017_269767\332751-001-018.mxd

LEGEND

MONITORING WELL (STATIC WATER LEVEL ONLY)

CCR UNIT MONITORING WELL

LABEL FORMAT

MONITORING WELL ID
GROUNDWATER ELEVATION FT MSL (MEASUREMENT DATE)
GROUNDWATER ELEVATION FT MSL (MEASUREMENT DATE)
etc...

NOTES

1. BASE MAP IMAGERY FROM NEARMAP, 4/12/2017.
2. STATIC WATER ONLY WELL LOCATIONS SURVEYED BY SHERIDAN SURVEYING CO. ON 11/19/2015 AND 11/30/2016.
3. PONDS 1 & 2 WELL LOCATION SURVEYED BY ROWE PROFESSIONAL SERVICES CO. ON 10/19/2019.

N

0 500 1,000 Feet

1 " = 500 '
1:6,000

PROJECT:
CONSUMERS ENERGY COMPANY
JR WHITING POWER PLANT
ERIE, MICHIGAN

TITLE:
GROUNDWATER
POTENTIOMETRIC ELEVATION SUMMARY
POND 1 & 2 MARCH 2019

DRAWN BY:	M. VAPHIADIS	PROJ NO.:	332751
CHECKED BY:	B. YELEN	**FIGURE 5**	
APPROVED BY:	S. HOLMSTROM		
DATE:	JANUARY 2020		

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FILE NO.: 332751-001-019.mxd

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

Plot Date: 1/16/2020, 12:26:10 PM by MVAPHIADIS -- LAYOUT: ANSI B(11"x17")
Path: E:\ConsumersEnergy\CCR_GW\2017_269767\332751-001-019.mxd

TRC - GIS

LEGEND

- MONITORING WELL (STATIC WATER LEVEL ONLY)
- CCR UNIT MONITORING WELL

LABEL FORMAT

MONITORING WELL ID
GROUNDWATER ELEVATION FT MSL (MEASUREMENT DATE)
GROUNDWATER ELEVATION FT MSL (MEASUREMENT DATE)
etc...

NOTES

1. BASE MAP IMAGERY FROM NEARMAP, 4/28/2018.
2. STATIC WATER ONLY WELL LOCATIONS SURVEYED BY SHERIDAN SURVEYING CO. ON 11/19/2015 AND 11/30/2016.
3. PONDS 1 & 2 WELL LOCATION SURVEYED BY ROWE PROFESSIONAL SERVICES CO. ON 10/19/2019.

N

0 500 1,000 Feet

1 " = 500 '
1:6,000

PROJECT:
CONSUMERS ENERGY COMPANY
JR WHITING POWER PLANT
ERIE, MICHIGAN

TITLE:
GROUNDWATER
POTENTIOMETRIC ELEVATION SUMMARY
POND 1 & 2 SEPTEMBER 2019

DRAWN BY:	M. VAPHIADIS	PROJ NO.:	332751
CHECKED BY:	B. YELEN	FIGURE 6	
APPROVED BY:	S. HOLMSTROM		
DATE:	JANUARY2019		

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FILE NO.: 332751-001-020.mxd

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

Plot Date: 1/16/2020, 12:42:32 PM by MVAPHIADIS -- LAYOUT: ANSI B(11"x17")
Path: E:\ConsumersEnergy\CCR_GW\2017_269767\332751-001-020.mxd

LEGEND

MONITORING WELL (STATIC WATER LEVEL ONLY)

CCR UNIT MONITORING WELL

LABEL FORMAT

MONITORING WELL ID
GROUNDWATER ELEVATION FT MSL (MEASUREMENT DATE)

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 4/28/2018.
2. WELL LOCATIONS SURVEYED BY SHERIDAN SURVEYING CO. ON 11/19/2015.

0 500 1,000 Feet

1 " = 500 '
1:6,000

PROJECT:
CONSUMERS ENERGY COMPANY
JR WHITING POWER PLANT
ERIE, MICHIGAN

TITLE:
GROUNDWATER
POTENTIOMETRIC ELEVATION SUMMARY
POND 6 SEPTEMBER 2019

DRAWN BY:	M. VAPHIADIS	PROJ NO.:	332751
CHECKED BY:	B. YELEN	**FIGURE 7**	
APPROVED BY:	S. HOLMSTROM		
DATE:	JANUARY 2020		

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FILE NO.: 332751-001-021.mxd

TRC - GIS

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

Plot Date: 1/16/2020, 12:37:47 PM by MVAPHIADIS -- LAYOUT: ANSI B(11"x17")
Path: E:\ConsumersEnergy\CCR_GW\2017_269767\332751-001-021.mxd

Appendix A
Data Quality Reviews

Pond 1 & 2

Laboratory Data Quality Review
Groundwater Sampling Event March 2019
Consumers Energy JR Whiting Ponds 1 and 2

Groundwater samples were collected by TRC for the March 2019 JR Whiting Ponds 1 and 2 sampling event. Samples were analyzed for anions, total metals, and total dissolved solids by Test America Laboratories, Inc. (Test America), located in Irvine, California. The laboratory analytical results are reported in laboratory report 240-109541-1.

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

- JRW-MW-15001
- JRW-MW-15002
- JRW-MW-15003
- JRW-MW-15004
- JRW-MW-15005
- JRW-MW-15006

Each sample was analyzed for the following constituents:

Analyte Group	Method
Anions (Chloride, Fluoride, Sulfate)	EPA 300.0
Boron, Calcium	EPA 6010B
Total Dissolved Solids	SM 2540C-11

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

Data Quality Review Procedure

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

- Sample receipt, as noted in the cover page or case narrative;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;
- Data for method blanks, field blanks, and equipment blanks, if applicable. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Field and equipment blanks are used to assess potential contamination arising from field procedures;
- Data for laboratory control samples (LCSs). The LCSs are used to assess the accuracy of the analytical method using a clean matrix;

- Data for matrix spike and matrix spike duplicate samples (MS/MSDs), if applicable. The MS/MSDs are used to assess the accuracy and precision of the analytical method using a sample from the dataset;
- Data for laboratory duplicates, if applicable. The laboratory duplicates are used to assess the precision of the analytical method using a sample from the dataset;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

This data usability report addresses the following items:

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

Review Summary

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

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

QA/QC Sample Summary:

- The holding time for total dissolved solids (TDS) for samples JRW-MW-15001, JRW-MW-15002, JRW-MW-15003, JRW-MW-15006, DUP-1, EB-1, and FB-1 exceeded the 7-day holding time criteria by approximately 11 days. The positive and nondetect results for TDS in these samples are estimated and may be biased low (see attached table). However, TDS concentrations are within the range of historical results.
- Target analytes were not detected in the equipment blank (EB-1_20190311) and field blank (FB-1_20190311).
- Target analytes were not detected in the method blanks.
- LCS recoveries for all target analytes were within laboratory control limits.
- The field duplicate pair samples were DUP-1 and JRW-MW-15001. The relative percent differences (RPDs) between the parent and duplicate sample were within the acceptance limits.

- MS/MSD analyses were performed on sample JRW-MW-15006 for anions, boron, and calcium; the percent recoveries (%Rs) and RPDs were within the acceptance limits with the following exception:
  - The recovery of calcium in the MSD was below the acceptance criteria. However, the calcium concentration in the parent sample JRW-MW-15006 was >4x the spike concentration; therefore, the laboratory control limits are not applicable. Data usability was not affected.
- Laboratory duplicate analysis was performed on sample JRW-MW-15006 for TDS; the %R was within the acceptance limit.

Attachment A

Summary of Data Non-Conformances for Groundwater Analytical Data

JR Whiting Ponds 1 and 2 - RCRA CCR Monitoring Program

Erie, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
JRW-MW-15001_20190311	3/11/2019	TDS	Holding time exceeded; results may be biased low.
JRW-MW-15002_20190311	3/11/2019		
JRW-MW-15003_20190311	3/11/2019		
JRW-MW-15006_20190311	3/11/2019		
DUP-1_20190311	3/11/2019		
EB-1_20190311	3/11/2019		
FB-1_20190311	3/11/2019		

Laboratory Data Quality Review
Groundwater Sampling Event September 2019
Consumers Energy JR Whiting Ponds 1 and 2

Groundwater samples were collected by TRC for the September 2019 detection monitoring sampling event. Samples were analyzed for anions and total dissolved solids by Eurofins TA in North Canton, Ohio (Eurofins TA – Canton). The boron and calcium analyses were subcontracted to Eurofins TA in Irvine, California (Eurofins TA - Irvine). The laboratory analytical results were reported in laboratory sample delivery groups (SDGs) 240-119089-1 and 240-119185-1.

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

- JRW-MW-15001
- JRW-MW-15002
- JRW-MW-15003
- JRW-MW-15004
- JRW-MW-15005

Each sample was analyzed for the following constituents:

Analyte Group	Method
Anions (Chloride, Fluoride, Sulfate)	EPA 300.0
Boron, Calcium	SW846 6010B
Total Dissolved Solids	SM 2540C-11

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

Data Quality Review Procedure

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

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

analytical procedures. Field and equipment blanks are used to assess potential contamination arising from field procedures.

- Data for laboratory control samples (LCSs). The LCSs are used to assess the accuracy of the analytical method using a clean matrix.
- Percent recoveries for matrix spike (MS) and matrix spike duplicates (MSD), where applicable. Percent recoveries are calculated for each analyte spiked and used to assess bias due to sample matrix effects.
- Data for laboratory duplicates, where applicable. The laboratory duplicates are replicate analyses of one sample and are used to assess the precision of the analytical method.
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes.
- Overall usability of the data which addressed 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, with the exceptions noted below. The discussion that follows describes the QA/QC results and evaluation.

Review Summary

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

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

QA/QC Sample Summary:

- No target analytes were detected in the method blanks.
- One equipment blank (EB-01) and one field blank (FB-01) were collected. No target analytes were detected in these blank samples.
- LCS recoveries were within laboratory control limits for all analytes.

- MS/MSD analyses were performed on sample JRW-MW-15005 for anions, calcium, and boron. All recoveries and relative percent differences (RPDs) were within the acceptance limits except for calcium. However, since the concentration of calcium in sample JRW-MW-15005 was greater than 4x the spike amount, the MS/MSD results for calcium were not evaluated.
- Laboratory duplicate analysis was performed on sample JRW-MW-15005 for total dissolved solids; RPDs were within the acceptance limits.
- Samples were DUP-01 and JRW-MW-15001 were submitted as the field duplicate pair with this data set. The RPDs were within the acceptance criteria.

Laboratory Data Quality Review
Groundwater Sampling Event Verification Resample October 2019
Consumers Energy JR Whiting Ponds 1 and 2

Groundwater samples were collected by TRC for the October 2019 detection monitoring verification resampling event. Samples were analyzed for anions and total dissolved solids by Eurofins TestAmerica in North Canton, Ohio (Eurofins TA – Canton). Samples were analyzed for total metals by Eurofins TestAmerica, located in Irvine, California (Eurofins TA - Irvine). The laboratory analytical results were reported in laboratory sample delivery group (SDG) 240-121442-1.

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

- JRW-MW-15002
- JRW-MW-15003
- JRW-MW-15005

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

Analyte Group	Method
Anions (Chloride, Sulfate)	SW-846 300.0
Total Dissolved Solids	SM 2540C-11
Total Metals	SW-846 6010B

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

Data Quality Review Procedure

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

- Sample receipt, as noted in the cover page or case narrative
- Technical holding times for analyses
- Reporting limits (RLs) compared to project-required RLs.
- Data for method blanks, equipment blanks, and field blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Field and equipment blanks are used to assess potential contamination arising from field procedures.
- Data for laboratory control samples (LCSs). The LCSs are used to assess the accuracy of the analytical method using a clean matrix.

- Percent recoveries for matrix spike (MS) and matrix spike duplicates (MSD). Percent recoveries are calculated for each analyte spiked and used to assess bias due to sample matrix effects.
- 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
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes.
- Overall usability of the data which addressed 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, with the exceptions noted below. The discussion that follows describes the QA/QC results and evaluation.

Review Summary

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

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

QA/QC Sample Summary:

- A method blank was analyzed with each analytical batch. No target analytes were detected in the method blanks.
- One equipment blank (EB-01) and one field blank (FB-01) were collected. No target analytes were detected in samples EB-01 and FB-01.
- LCS recoveries were within laboratory control limits for all analytes.
- MS/MSD analyses were not performed at a frequency of 1/20 samples per the Sampling and Analysis Plan (SAP) for anions. MS/MSD analyses were performed on sample JRW-MW-16009 for metals. The RPDs were within the QC limits.

- The recoveries of calcium in the MS and/or MSD performed on sample JRW-MW-16009 were outside of the acceptance criteria. However, the concentration of calcium in the parent sample was >4x the spike concentration; therefore, the laboratory control limits were not applicable. Data usability was not affected.

- Laboratory duplicate analyses were not performed with this data set.
- The field duplicate samples were Dup-01 and JRW-MW-15005 and Dup-02 and JRW-MW-15003; all criteria were met.

Laboratory Data Quality Review
Groundwater Well Redevelopment Event November 2019
Consumers Energy JR Whiting Pond 1&2

A groundwater samples was collected by FK Engineering during the November 2019 JR Whiting Pond 1&2 well redevelopment event. The sample was analyzed for anions, total metals, and total dissolved solids by Brighton Analytical, LLC (BA), located in Brighton, Michigan. The laboratory analytical results are reported in laboratory report 62365.

During the November 2019 sampling event, a groundwater sample was collected from the following well:

- JRW-MW-15006

The sample was analyzed for the following constituents:

Analyte Group	Method
Anions (Chloride, Fluoride, Sulfate)	EPA 300.0
Boron	EPA 200.7
Calcium	EPA 200.8
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 Quality Review Procedure

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

- Sample receipt, as noted in the cover page or case narrative;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;
- Data for method blanks, field blanks, and equipment blanks, if applicable. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Field and equipment blanks are used to assess potential contamination arising from field procedures;
- Data for laboratory control samples (LCSs). The LCSs are used to assess the accuracy of the analytical method using a clean matrix;

- Data for matrix spike and matrix spike duplicate samples (MS/MSDs), if applicable. The MS/MSDs are used to assess the accuracy and precision of the analytical method using a sample from the dataset;
- Data for laboratory duplicates, if applicable. The laboratory duplicates are used to assess the precision of the analytical method using a sample from the dataset;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

This data usability report addresses the following items:

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

Review Summary

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

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

QA/QC Sample Summary:

- No analytes exceeded applicable holding times for the sample.
- Field blank and equipment blank analyses were held pending sample analysis and therefore not analyzed.
- LCS recoveries for all target analytes were within laboratory control limits.
- The field duplicate pair samples were S2 (duplicate) and S1 (sample). The duplicate was held pending sample analysis and therefore not analyzed.
- MS/MSD analyses were performed on sample S1 for anions, boron, and calcium; the percent recoveries (%Rs) and relative percent difference (RPD) were within the acceptance limits.
- Laboratory duplicate analysis was performed on sample S1 for TDS; the RPD was within the acceptance limit.

Pond 6

Laboratory Data Quality Review
Groundwater Sampling Event September 2019
CEC JR Whiting Pond 6

Groundwater samples were collected by TRC for the September 2019 JR Whiting Pond 6 sampling event. Samples were analyzed for anions and total dissolved solids by Eurofins TestAmerica (TA) in North Canton, Ohio (Eurofins TA – Canton). The boron and calcium analyses were subcontracted to Eurofins TA in Irvine, California (Eurofins TA - Irvine). The laboratory analytical results are reported in laboratory reports 240-119207-1 and 240-119210-1.

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

- JRW-MW-16001
- JRW-MW-16002
- JRW-MW-16003
- JRW-MW-16004
- JRW-MW-16005
- JRW-MW-16006

Each sample was analyzed for the following constituents:

Analyte Group	Method
Anions (Chloride, Fluoride, Sulfate)	EPA 300.0
Total Metals (Boron and Calcium)	SW-846 6010B
Total Dissolved Solids (TDS)	SM 2540C-11

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

Data Quality Review Procedure

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

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

- Data for laboratory control samples (LCSs). The LCSs are used to assess the accuracy of the analytical method using a clean matrix.
- Percent recoveries for matrix spike (MS) and matrix spike duplicates (MSD), where applicable. Percent recoveries are calculated for each analyte spiked and used to assess bias due to sample matrix effects.
- Data for laboratory duplicates, where applicable. The laboratory duplicates are replicate analyses of one sample and are used to assess the precision of the analytical method.
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes.
- Overall usability of the data which addressed 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, with the exceptions noted below. The discussion that follows describes the QA/QC results and evaluation.

Review Summary

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

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

QA/QC Sample Summary:

- A method blank was analyzed with each analytical batch. No target analytes were detected in the method blanks.
- One equipment blank (EB-02) and one field blank (FB-02) were collected. No target analytes were detected in the blanks.
- LCS recoveries were within laboratory control limits for all analytes.
- MS/MSD analyses were performed on sample JRW-MW-16003 for anions and metals; the recoveries and relative percent differences (RPDs) were within QC limits except for

calcium. However, since the concentration of calcium was >4x the spike amount in sample JRW-MW-16003, MS/MSD results for calcium were not evaluated.

- Laboratory duplicate analysis was performed on sample JRW-MW-16003 for TDS; the RPD was within QC limits.
- The field duplicate pair samples were Dup-02 and JRW-MW-16006. The RPDs between the parent and duplicate sample were within QC limits.

Appendix B
Statistical Background Limits

TRC

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Technical Memorandum

Date: October 31, 2019

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

From: Sarah Holmstrom, TRC
Darby Litz, TRC
Meredith Brehob, TRC

Project No.: 332751.0000 Phase 001, Task 003

Subject: Appendix III Prediction Limit Update – Consumers Energy, JR Whiting Ponds 1 and 2

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, as amended, the owner or operator of a CCR Unit must implement a detection monitoring program and evaluate statistically significant increases above background (40 CFR §257.94). Statistical background limits for the JR Whiting (JRW) Power Plant Pond 1 and Pond 2 (Ponds 1 and 2) were established in the January 15, 2018 Technical Memorandum titled "Background Statistical Evaluation (R1-R9)". As described in the initial statistical limit calculation, background samples were collected one to two months apart in order to collect a minimum of eight samples prior to October 17, 2017. Based on this frequency and the lack of groundwater flow at this site, it is likely that the background data set does not fully capture the natural temporal trends in groundwater quality. As such, Consumers Energy is updating the background statistical limits for the JRW site to include the additional four rounds of semiannual monitoring data collected and incorporate additional temporal variability observed subsequent to the initial statistical limit calculation. This memorandum presents the updated background statistical limits derived for Ponds 1 and 2.

The JRW Ponds 1 and 2 CCR unit is located adjacent to Lake Erie. Groundwater present within the uppermost aquifer at the CCR unit is confined and protected from CCR constituents by the overlying clay-rich aquitard and is typically encountered around 50 feet below ground surface (bgs) in the limestone (beneath the till). Potentiometric surface elevation data from groundwater within the CCR monitoring wells exhibit an extremely low hydraulic gradient across the site with no apparent flow direction. Based on the hydrogeology at the Site, particularly the extremely low to non-existent gradient or lack of flow direction at the JRW site in addition to the presence of 40 to 50 feet of laterally extensive clay-rich till that acts as a natural hydraulic barrier across the site, an intrawell statistical approach is being implemented for detection monitoring. A series of six monitoring wells surrounds the two adjacent ponds and makes up the detection monitoring well network for the Ponds 1 and 2 CCR unit. Potentiometric surface elevation data from groundwater within the CCR monitoring wells exhibit an extremely low hydraulic gradient across the Site with no apparent flow direction. There are minor differences in hydraulic head across the monitoring wells (ranging from zero up to 0.13 feet across Ponds 1 and 2 from event to event from November 2016 through July 2017), indicating that the potentiometric surface is flat the majority of the time. In the few instances since November 2016 where a slight gradient was observed and calculable, the direction of the flow potential was slightly to the northwest (2 events) and to the east (one event). Given that the hydraulic gradient is often so low, groundwater flow across Ponds 1 and 2 is frequently incalculable and often stagnant. The most pronounced groundwater gradient between November 2016 and November 2018 was observed in December 19, 2016, which showed a slight horizontal gradient of approximately 0.00016 to the northwest across Ponds 1 and 2. Based on potentiometric data, horizontal travel times within the aquifer are low, on the order of 5 ft/year or less, and it is likely that groundwater proximal to the monitoring wells is stagnant or slightly moving back and forth across the borehole, potentially extending the residence time of groundwater in the vicinity of each monitoring well and resulting in limited temporal variability in the dataset.

This limited temporal variability can only be corrected with the collection of additional groundwater data, and the inclusion of the additional data in the background data set updated in the future, as long as data continue to show no impacts from the CCR unit. As a result of site-specific geologic and hydrogeologic conditions, downward migration of CCR leachate is not expected, and groundwater data continue to show no impacts from the CCR unit. This is supported by the information presented in the 2017 and 2018 Annual Reports (TRC, January 2018 and January 2019) and the May 21, 2019 Technical Memorandum prepared by TRC titled "Alternate Source Demonstration: March 2019 Detection Monitoring Event" which provide further details regarding site-specific hydrogeology and groundwater analytical results.

Therefore, the additional four rounds of data have been incorporated into the background dataset and the prediction limit calculations have been updated using data collected from November 2016 through March 2019 as detailed below.

The background data for JRW Ponds 1 and 2 CCR unit were evaluated in accordance with the Groundwater Statistical Evaluation Plan (Stats Plan) (TRC, October 2017). The JRW 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), intrawell prediction limits were selected to perform the statistical calculation for background/baseline limits. Use of prediction limits is recommended by the UG to provide high statistical power and is an acceptable approach for intrawell detection monitoring under the CCR rule. Upper prediction limits (UPLs) were calculated for each of the CCR Appendix III parameters based on a single future value. The following narrative describes the methods employed and the results obtained and the Sanitas™ output files are included as an attachment.

The set of downgradient monitoring wells utilized for compliance in the JRW Ponds 1 and 2 CCR unit detection monitoring program includes JRW-MW-15001 through JRW-MW-15006. An intrawell statistical approach requires that each of the downgradient wells doubles as the background and compliance well, where data from each individual well during a detection monitoring event is compared to a statistical limit developed using the background/baseline dataset from that same well. The baseline 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;
- Outlier testing of individual data points that appear from the graphical representations as potential outliers;
- Evaluation of percentage of non-detects for each baseline/background well-constituent (w/c) pair;
- Distribution of the data; and
- Calculation of the intrawell UPL for each monitoring well for each Appendix III constituent data set (upper and lower prediction 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, and laboratory duplicates.

The data were found to be complete and usable for the purposes of the CCR monitoring program, with the exception of sulfate at JRW-MW-15001 collected on May 1, 2018, where the relative percent difference between the primary sample and the duplicate results was outside of the acceptance criteria. The JRW-MW-15001 resample on June 13, 2018 met all quality criteria for the sulfate data and was used in place of the May 1, 2018 sulfate data.

Time versus Concentration Graphs

The time versus concentration (T v. C) graphs (Sanitas™ Output Files) do not show potential or suspect outliers for the seven Appendix III parameters.

While variations in results are present, the graphs show consistent baseline data and do not suggest that data sets, as a whole, likely have overall trending or seasonality. However, as discussed above, due to lack of groundwater flow potential there is limited temporal independence in the background dataset and, although the dataset has been expanded to include the additional four rounds of data and incorporate any additional temporal variability, due to limitations on CCR Rule implementation timelines, the data sets are of relatively short duration for making such observations regarding overall trending or seasonality.

Outlier Testing

Because the baseline T v. C graphs (Sanitas™ Output Files) did not show potential outliers, outlier testing was not performed for the JRW baseline data sets. Had candidate values been present, the Dixon's Outlier Test in Sanitas™ would have been used to evaluate potential outlier removal.

Percentage of Non-detects

The baseline data sets for the Appendix III parameters for the six compliance monitoring wells at the JRW site did not include any non-detect values.

Distribution of the Data Sets

The distribution of the data sets is determined by the Sanitas™ software during calculation of the upper prediction limit. The Shapiro-Wilk test is used for samples sizes fewer than 50. Non-detect/censored data were not present in the data sets. 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 1 summarizes the distributions determined by the Sanitas™ software.

Upper Prediction Limits

Table 1 presents the calculated UPLs (with one future event) for the baseline data sets. The UPL is calculated based on the distribution listed on the table. For nonnormal background datasets, a nonparametric prediction limit is utilized, resulting in the highest value from the background dataset as the UPL. Results from verification resampling were averaged with the associated original data points to present one value for each event for the purpose of UPL calculation. The achieved confidence and/or coverage rates depend entirely on the number of background data points, and coverage rates for various confidence levels are shown in the Sanitas™ outputs for nonparametric prediction limits. Verification resampling (1 of 2) is recommended per the Stats Plan and UG to achieve the performance standards specified in the CCR rules.

Table 1
Summary of Baseline Data Distributions and Intrawell Upper Prediction Limits

WELL	CONSTITUENT	DISTRIBUTION	UPPER PREDICTION LIMIT – FROM SANITAS™
JRW-MW-15001	Boron	Normal	240
	Calcium	Normal	180
	Chloride	Normal	55
	Fluoride	Normal	1,600
	Field pH	Normal	6.8 – 8.2
	Sulfate	Normal	470
	Total Dissolved Solids	Normal	1,000
JRW-MW-15002	Boron	Normal	220
	Calcium	Normal	180
	Chloride	Normal	56
	Fluoride	Normal	1,900
	Field pH	Normal	7.2 – 7.9
	Sulfate	Normal	500
	Total Dissolved Solids	Normal	1,100
JRW-MW-15003	Boron	Normal	230
	Calcium	Normal	160
	Chloride	Normal	55
	Fluoride	Normal	1,800
	Field pH	Normal	7.3 – 8.3
	Sulfate	Normal	440
	Total Dissolved Solids	Normal	940
JRW-MW-15004	Boron	Normal	270
	Calcium	Normal	140
	Chloride	Normal	56
	Fluoride	Normal	1,800
	Field pH	Normal	7.2 – 8.0
	Sulfate	Normal	390
	Total Dissolved Solids	Normal	880

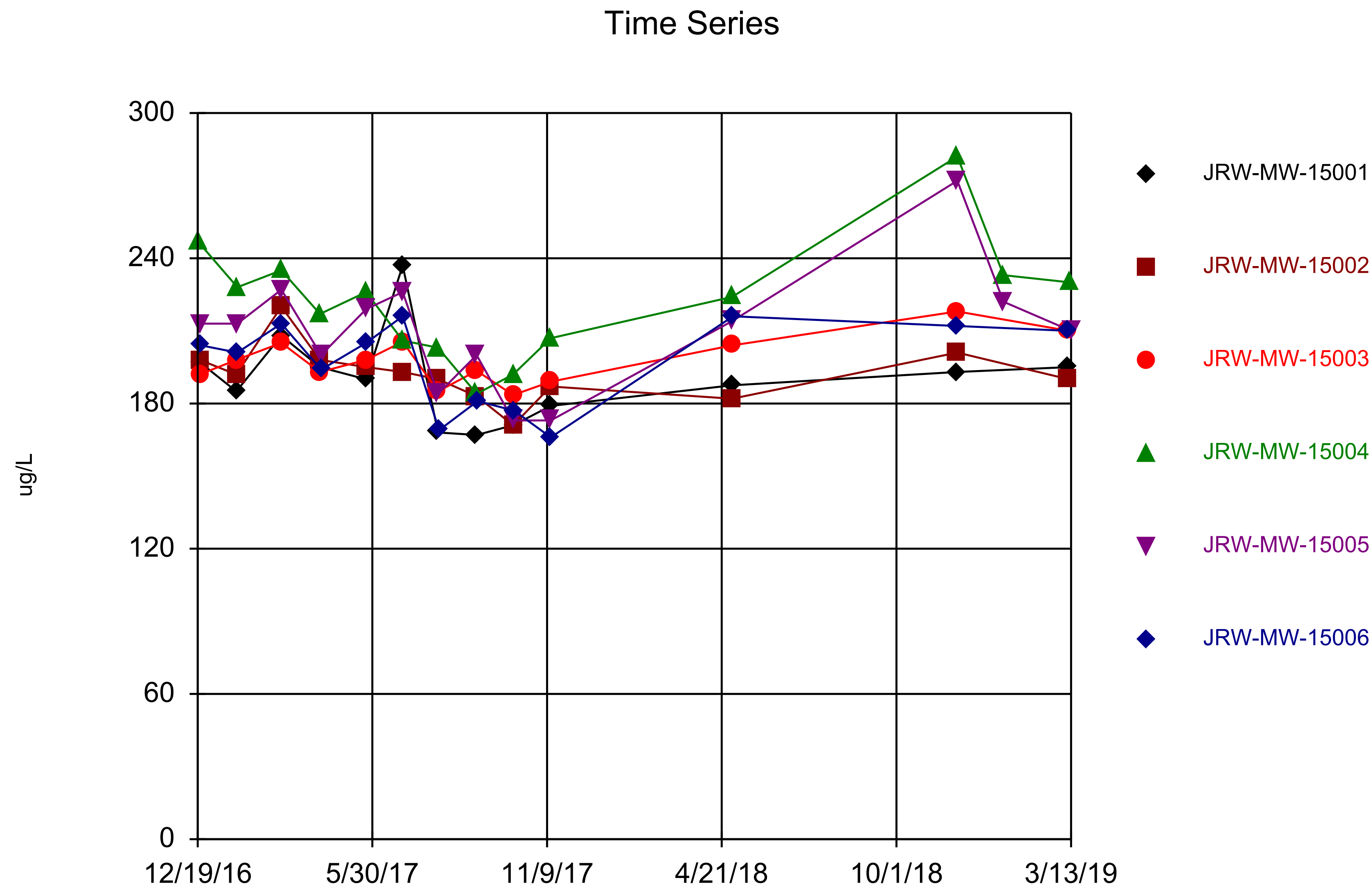
WELL	CONSTITUENT	DISTRIBUTION	UPPER PREDICTION LIMIT – FROM SANITAS™
JRW-MW-15005	Boron	Normal	270
	Calcium	Normal	120
	Chloride	Normal	46
	Fluoride	Normal	1,700
	Field pH	Normal	7.3 – 8.6
	Sulfate	Normal	350
	Total Dissolved Solids	Nonnormal	840*
JRW-MW-15006	Boron	Normal	250
	Calcium	Normal	140
	Chloride	Normal	53
	Fluoride	Normal	1,700
	Field pH	Normal	7.0 – 9.0
	Sulfate	Normal	410
	Total Dissolved Solids	Nonnormal	920*

Attachments

Sanitas™ Output Files

Sanitas™ Output Files

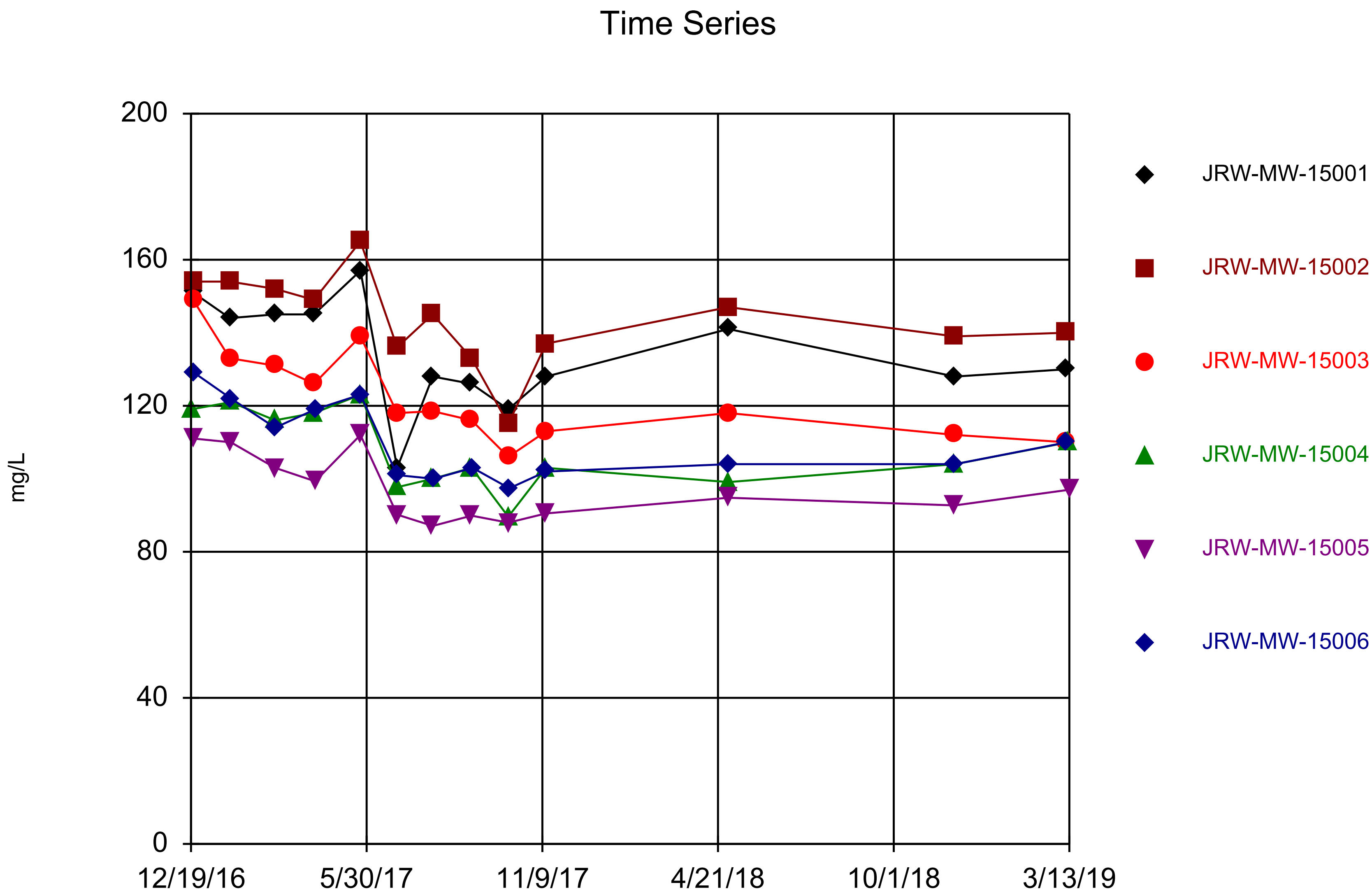
Sanitas™ v.9.6.18 Sanitas software licensed to Consumers Energy. EPA



Constituent: Boron, Total Analysis Run 8/2/2019 2:31 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

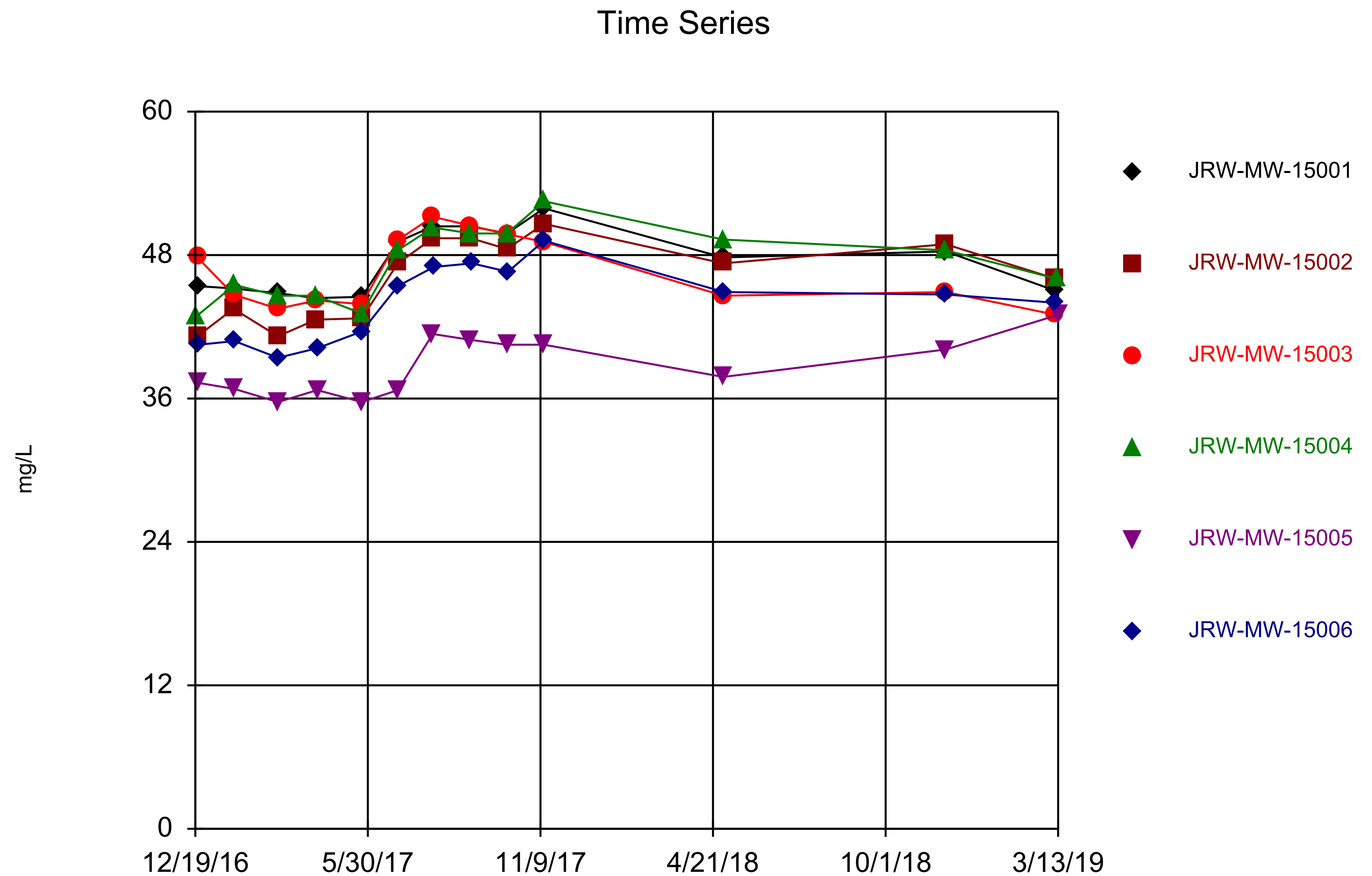
Sanitas™ v.9.6.18 Sanitas software licensed to Consumers Energy. EPA



Constituent: Calcium, Total   Analysis Run 8/2/2019 2:31 PM

Client: Consumers Energy   Data: JRW_Ponds 1_2_Sanitas 19.05.02

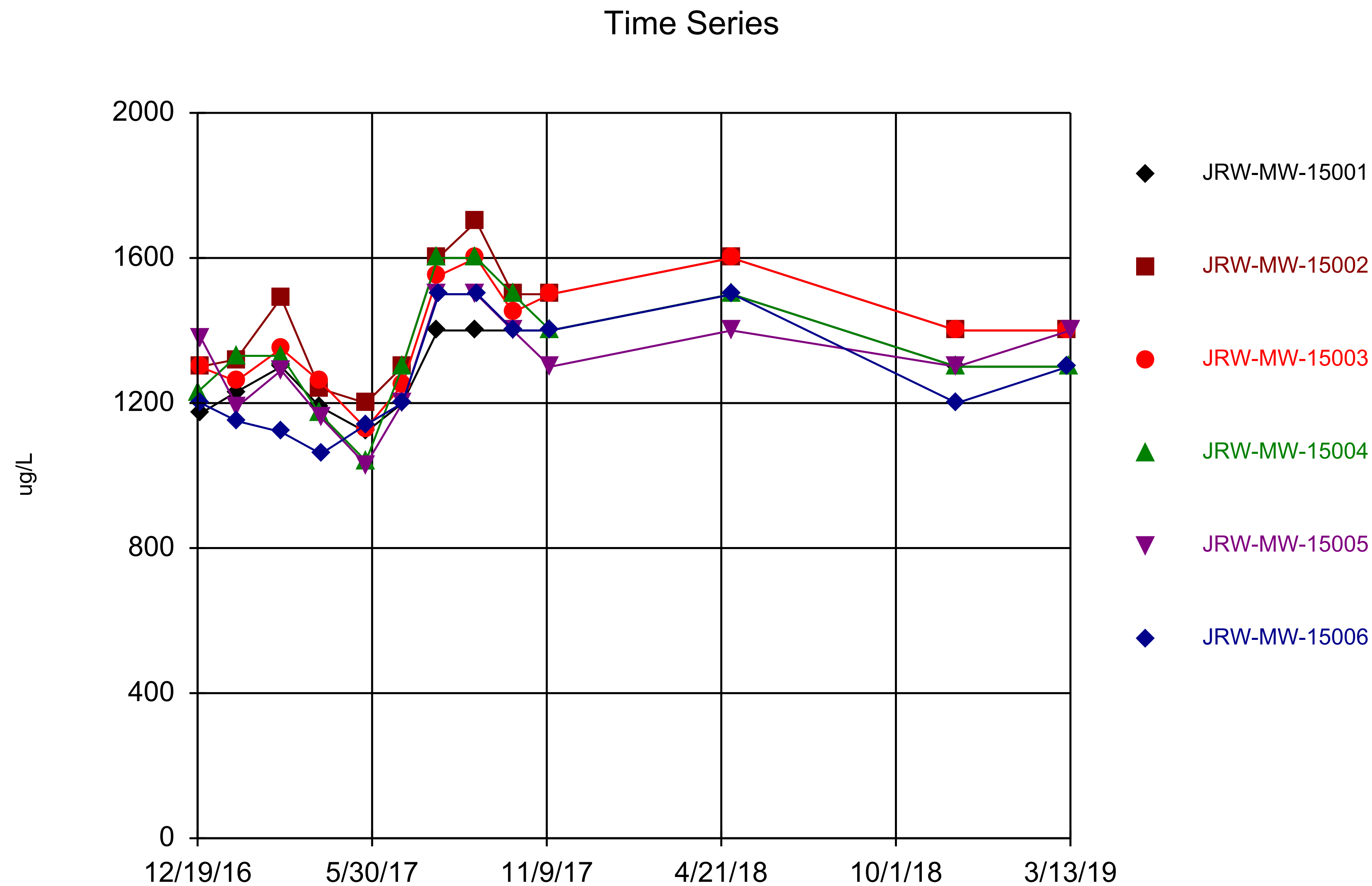
Sanitas™ v.9.6.18 Sanitas software licensed to Consumers Energy. EPA



Constituent: Chloride Analysis Run 8/2/2019 2:31 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

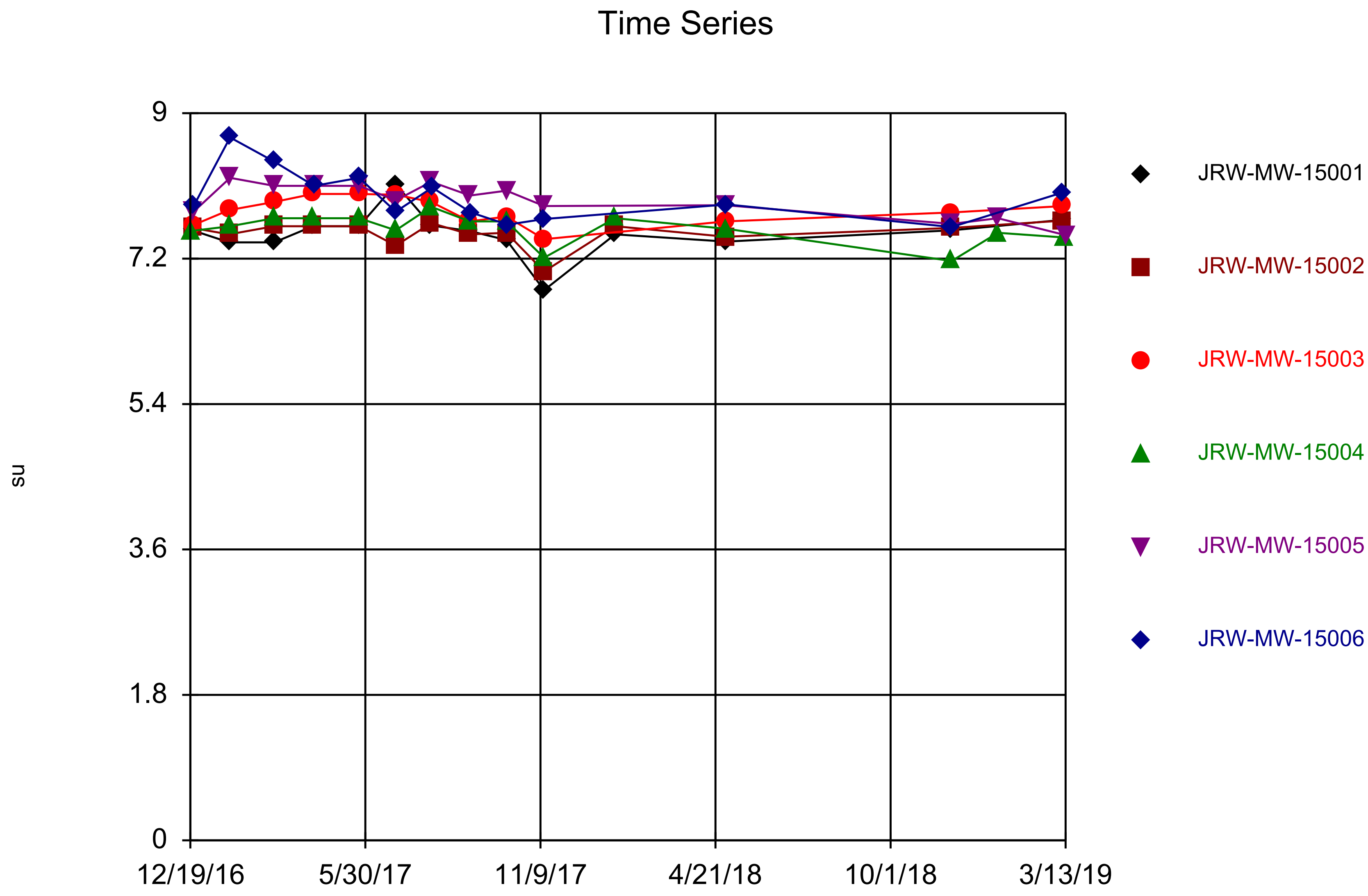
Sanitas™ v.9.6.18 Sanitas software licensed to Consumers Energy. EPA



Constituent: Fluoride Analysis Run 8/2/2019 2:31 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

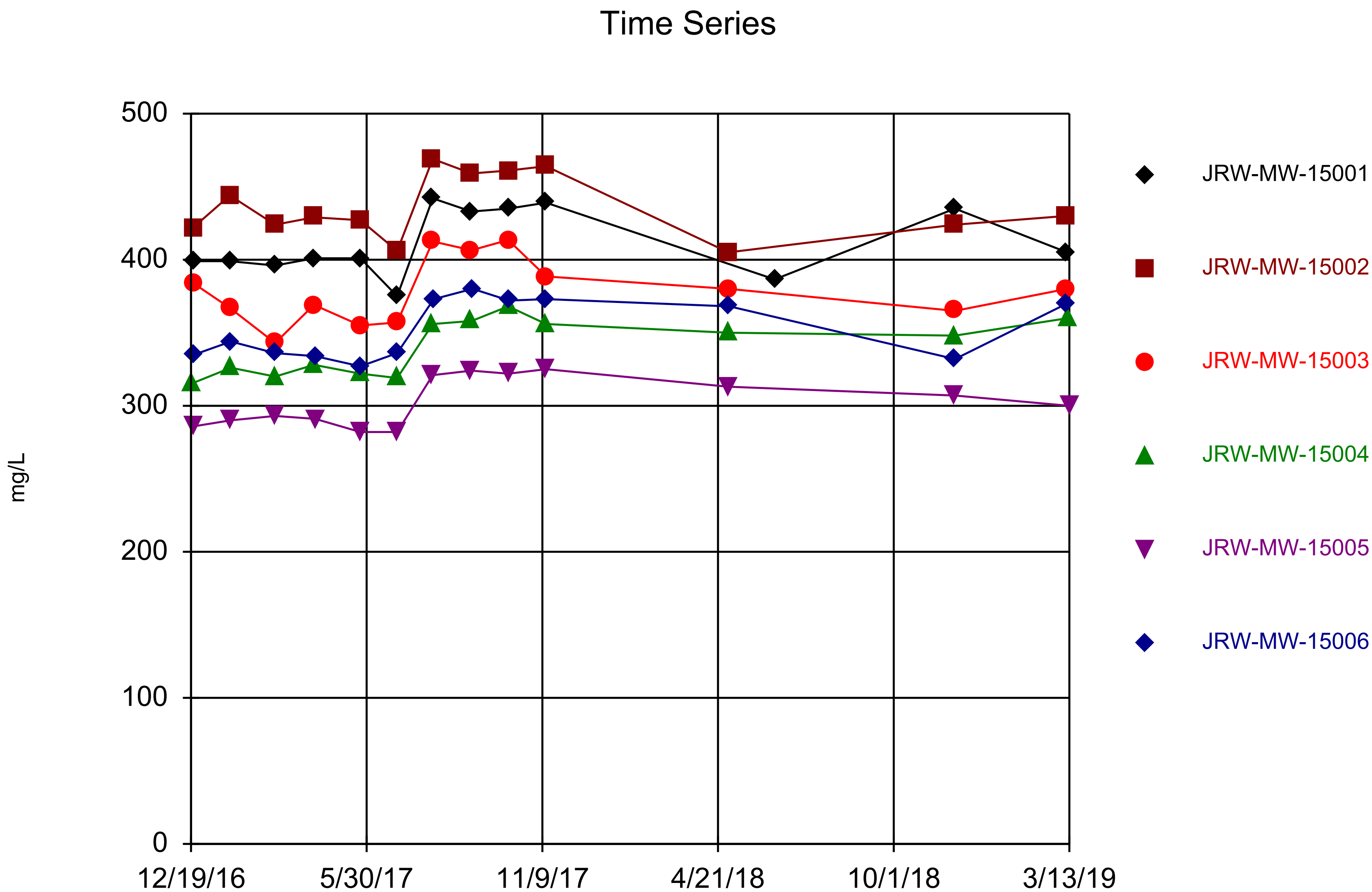
Sanitas™ v.9.6.18 Sanitas software licensed to Consumers Energy. EPA



Constituent: pH, Field   Analysis Run 8/2/2019 2:31 PM

Client: Consumers Energy   Data: JRW_Ponds 1_2_Sanitas 19.05.02

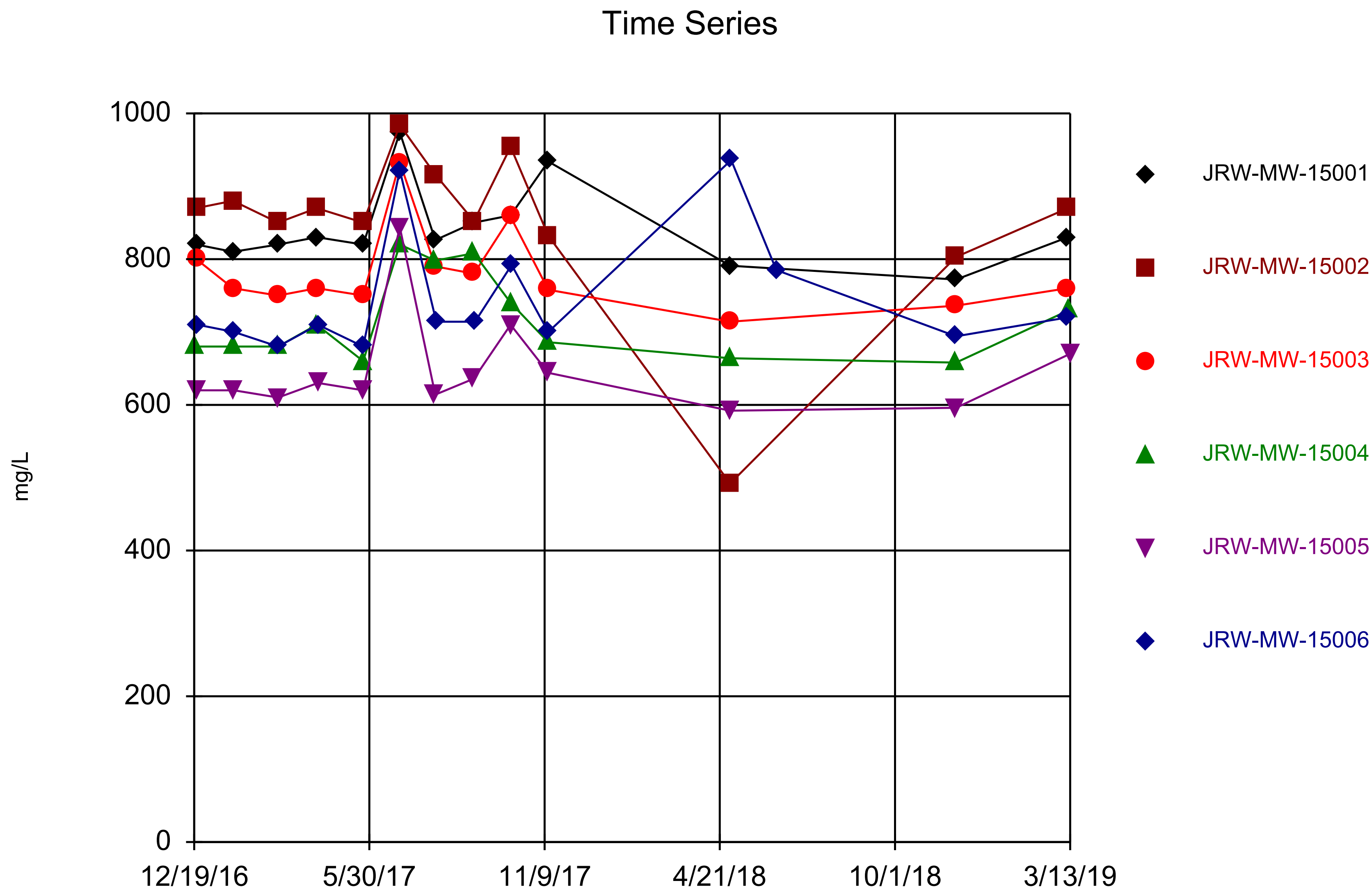
Sanitas™ v.9.6.18 Sanitas software licensed to Consumers Energy. EPA



Constituent: Sulfate   Analysis Run 8/2/2019 2:32 PM

Client: Consumers Energy   Data: JRW_Ponds 1_2_Sanitas 19.05.02

Sanitas™ v.9.6.18 Sanitas software licensed to Consumers Energy. EPA

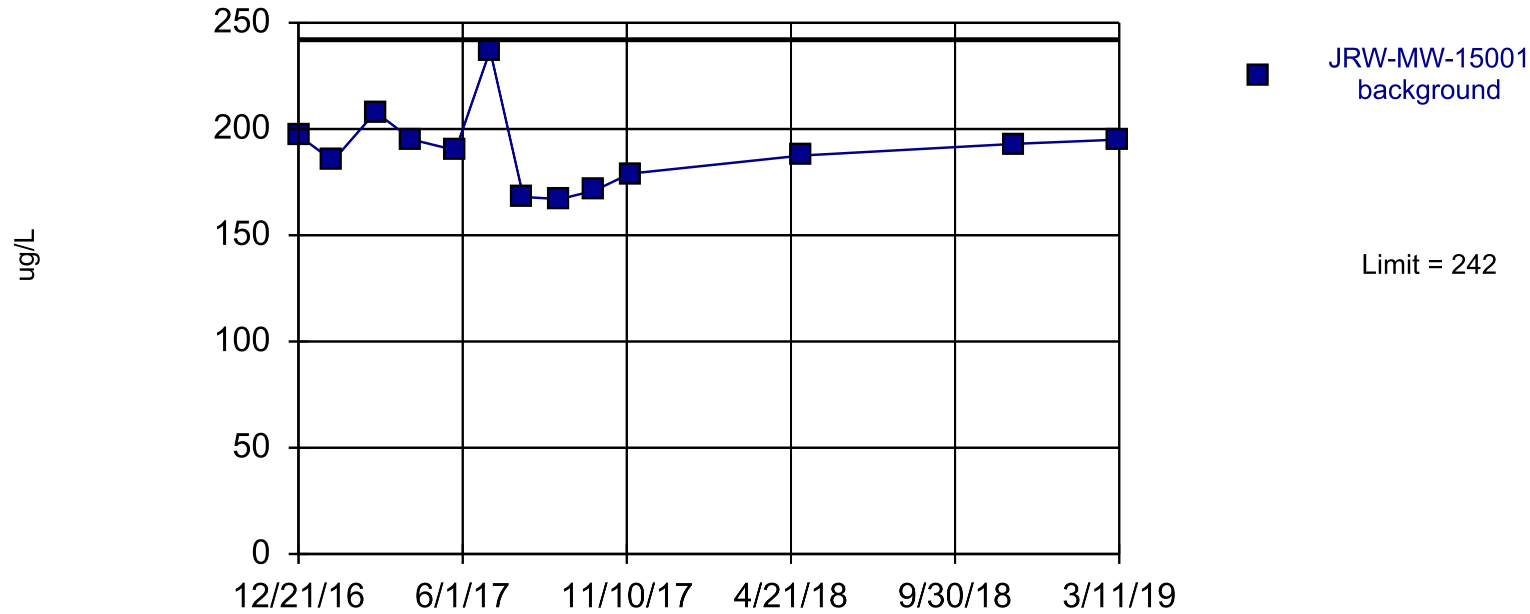


Constituent: Total Dissolved Solids, Total   Analysis Run 8/2/2019 2:32 PM

Client: Consumers Energy   Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15001



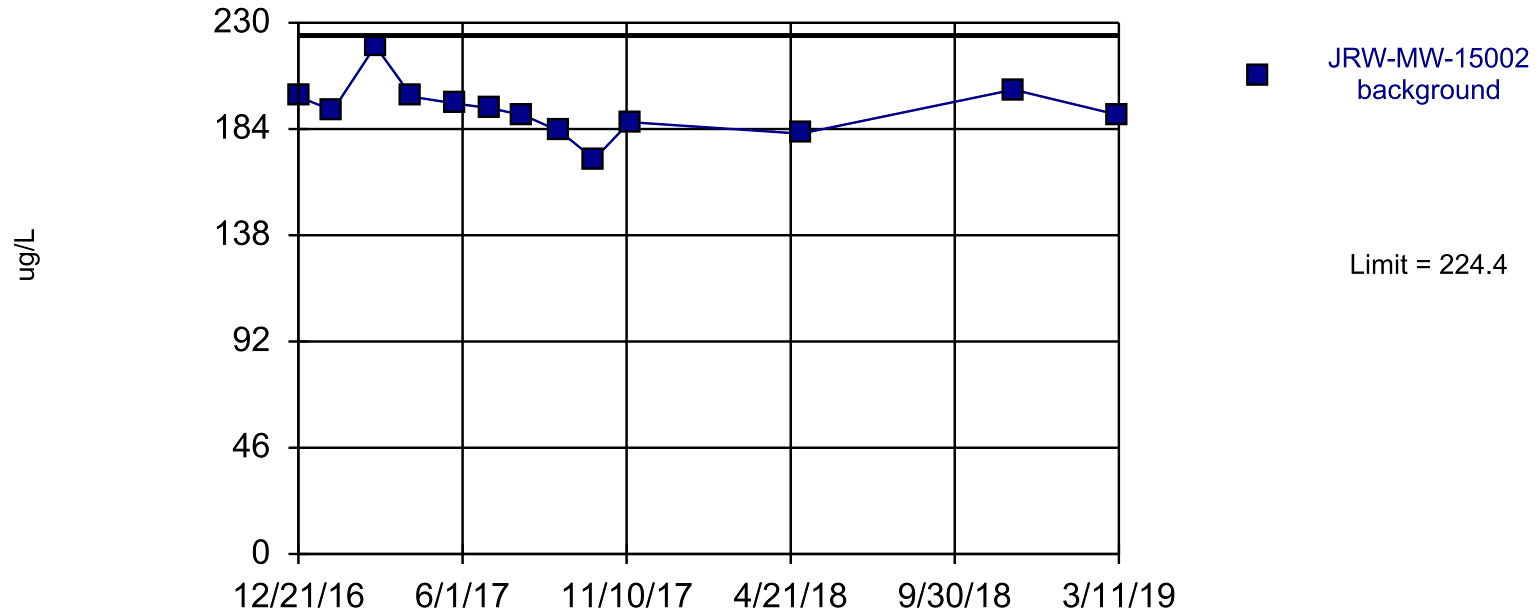
Background Data Summary: Mean=190.2, Std. Dev.=18.63, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8992, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Boron, Total Analysis Run 8/2/2019 2:38 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15002



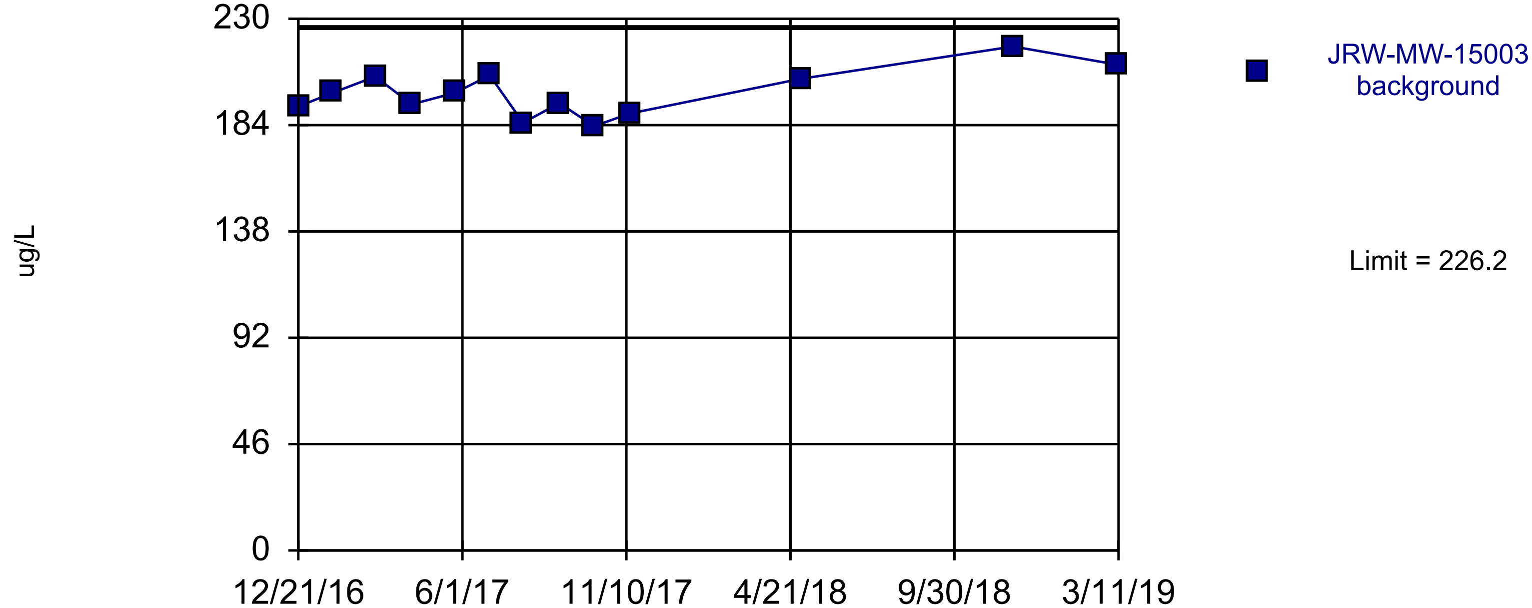
Background Data Summary: Mean=192.3, Std. Dev.=11.55, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9396, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Boron, Total Analysis Run 8/2/2019 2:38 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15003



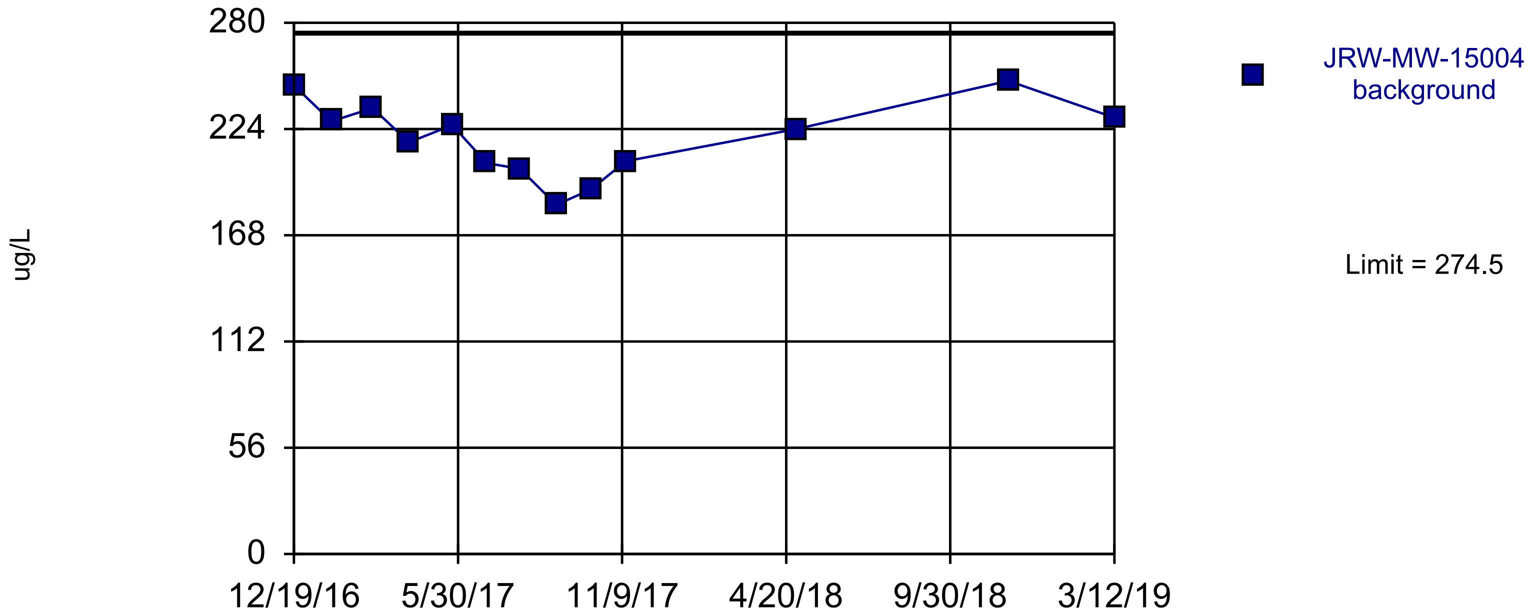
Background Data Summary: Mean=198, Std. Dev.=10.11, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9675, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Boron, Total Analysis Run 8/2/2019 2:38 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15004



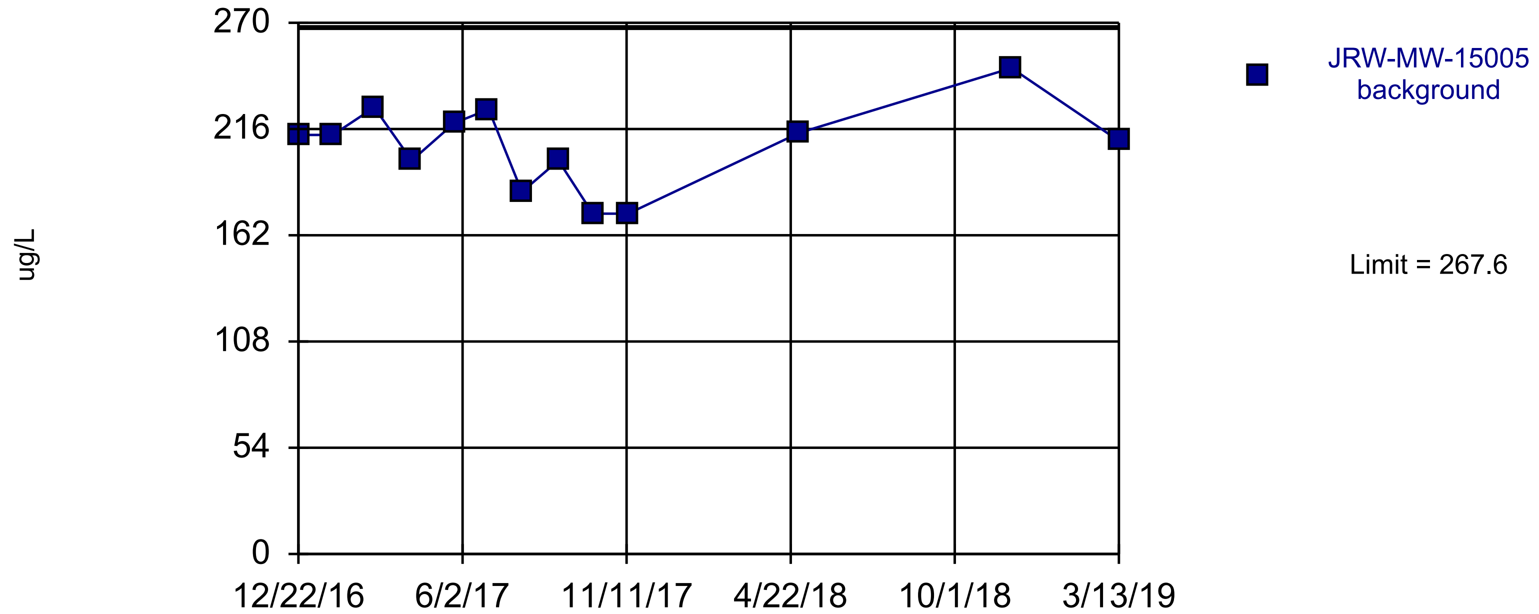
Background Data Summary: Mean=219.1, Std. Dev.=19.92, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9682, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Boron, Total Analysis Run 8/22/2019 3:10 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15005



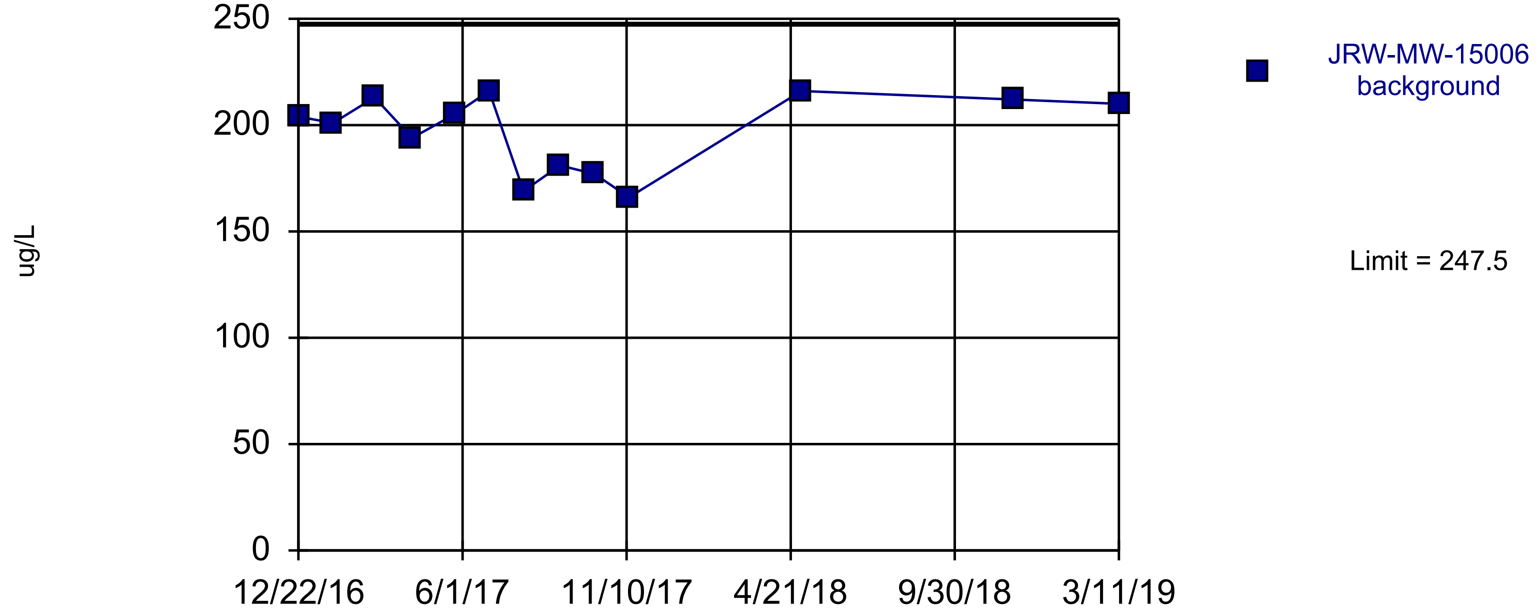
Background Data Summary: Mean=207.6, Std. Dev.=21.54, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9487, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Boron, Total Analysis Run 8/22/2019 3:10 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15006



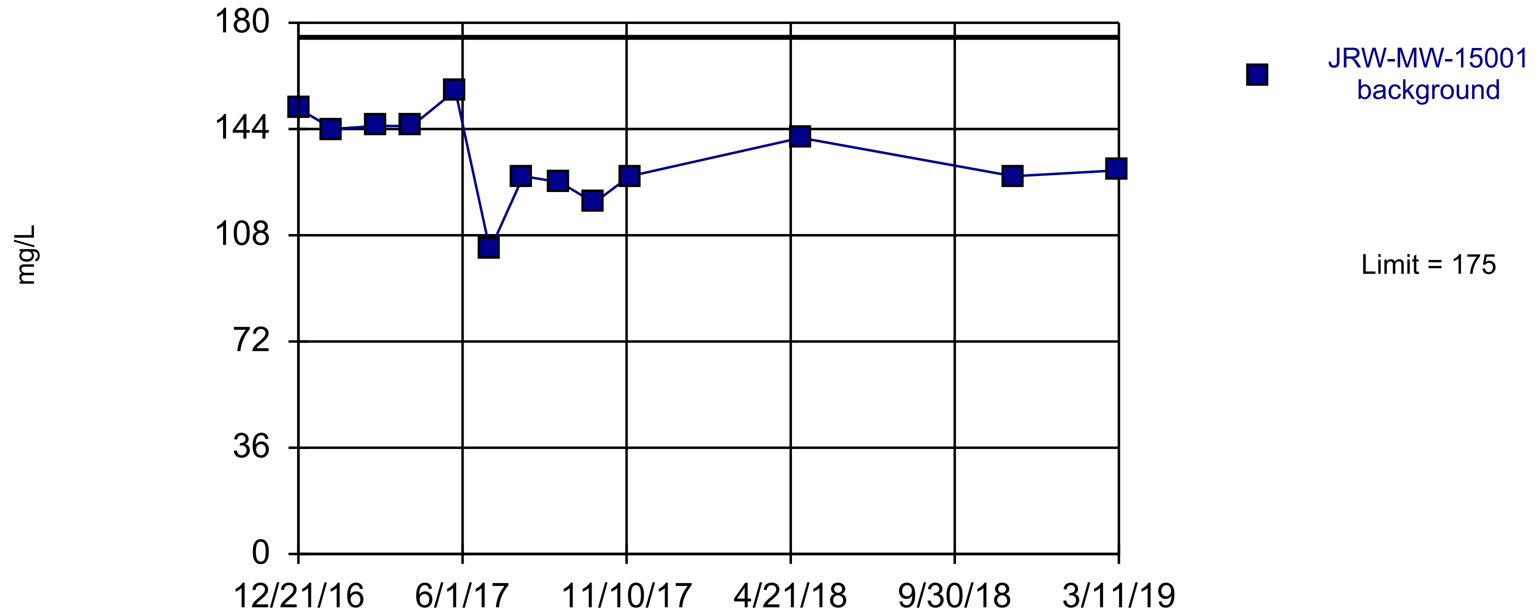
Background Data Summary: Mean=197.2, Std. Dev.=18.05, n=13. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8713, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Boron, Total Analysis Run 8/2/2019 2:38 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15001



Background Data Summary: Mean=134.2, Std. Dev.=14.67, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9497, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Calcium, Total Analysis Run 8/2/2019 2:38 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

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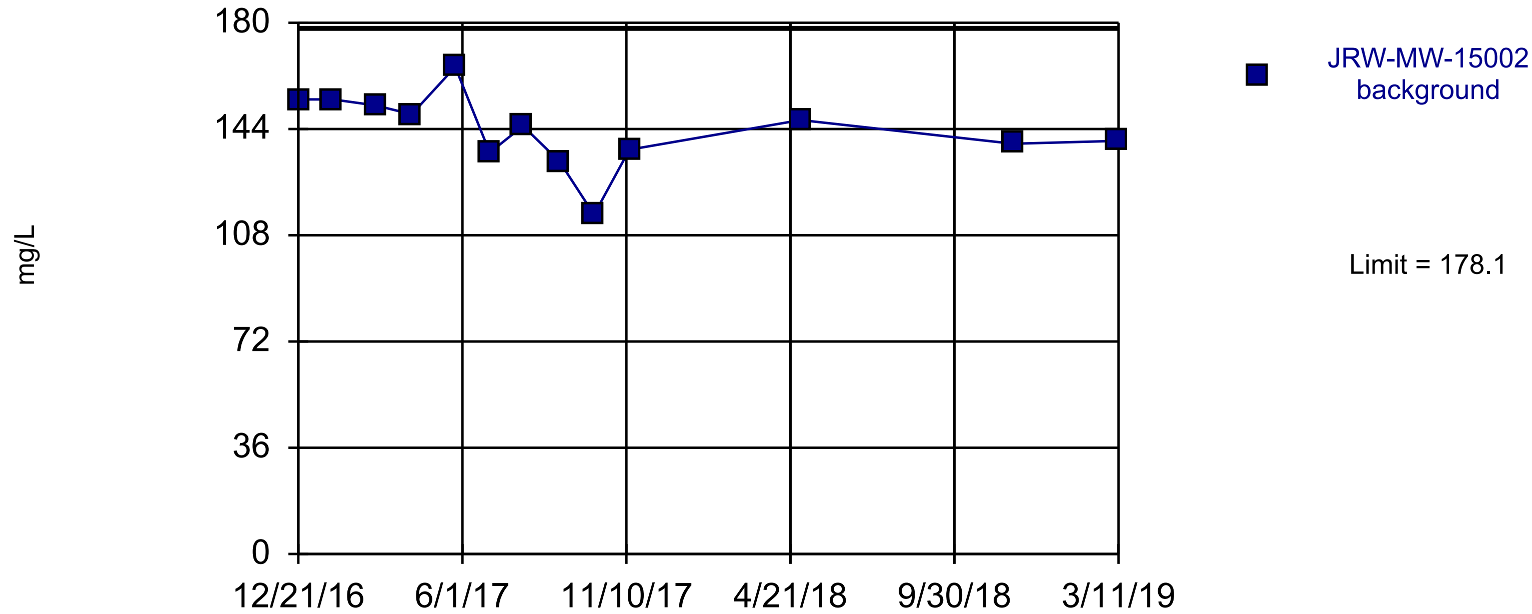
Prediction Limit

Intrawell Parametric, JRW-MW-15002



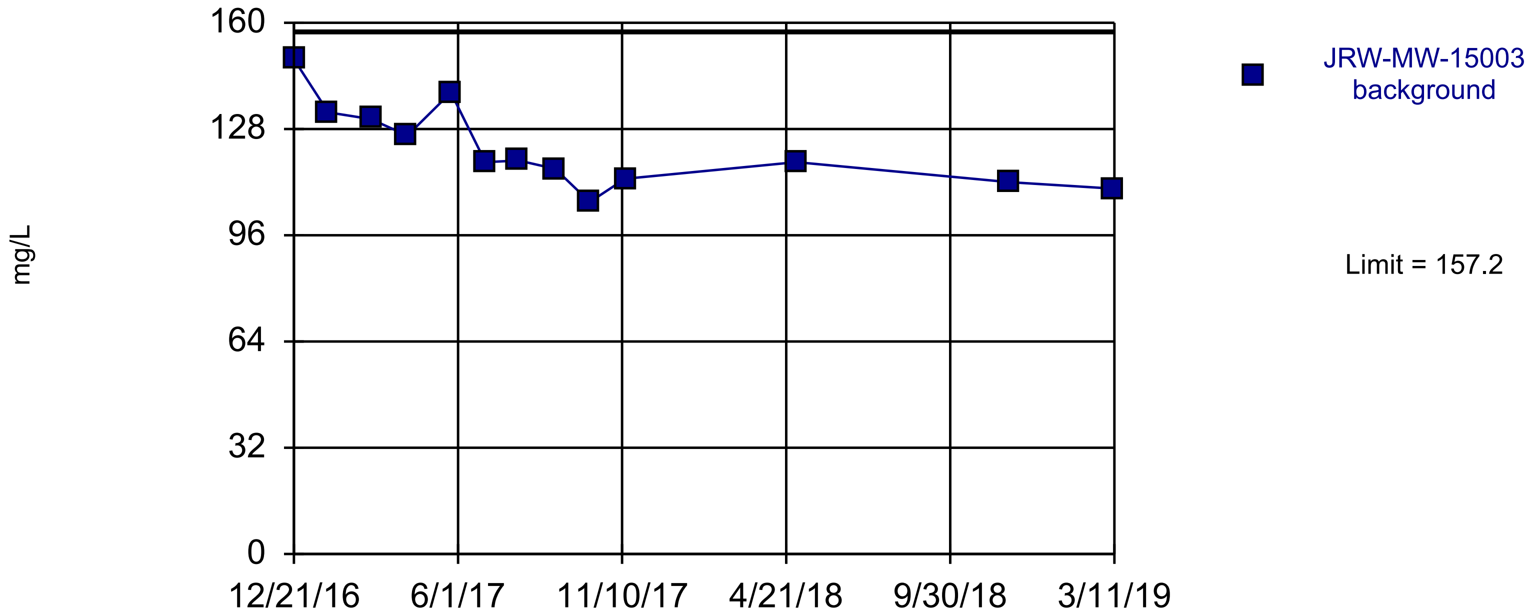
Background Data Summary: Mean=143.5, Std. Dev.=12.43, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9589, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Calcium, Total   Analysis Run 8/2/2019 2:38 PM

Client: Consumers Energy   Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15003



Background Data Summary: Mean=122.3, Std. Dev.=12.57, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.928, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

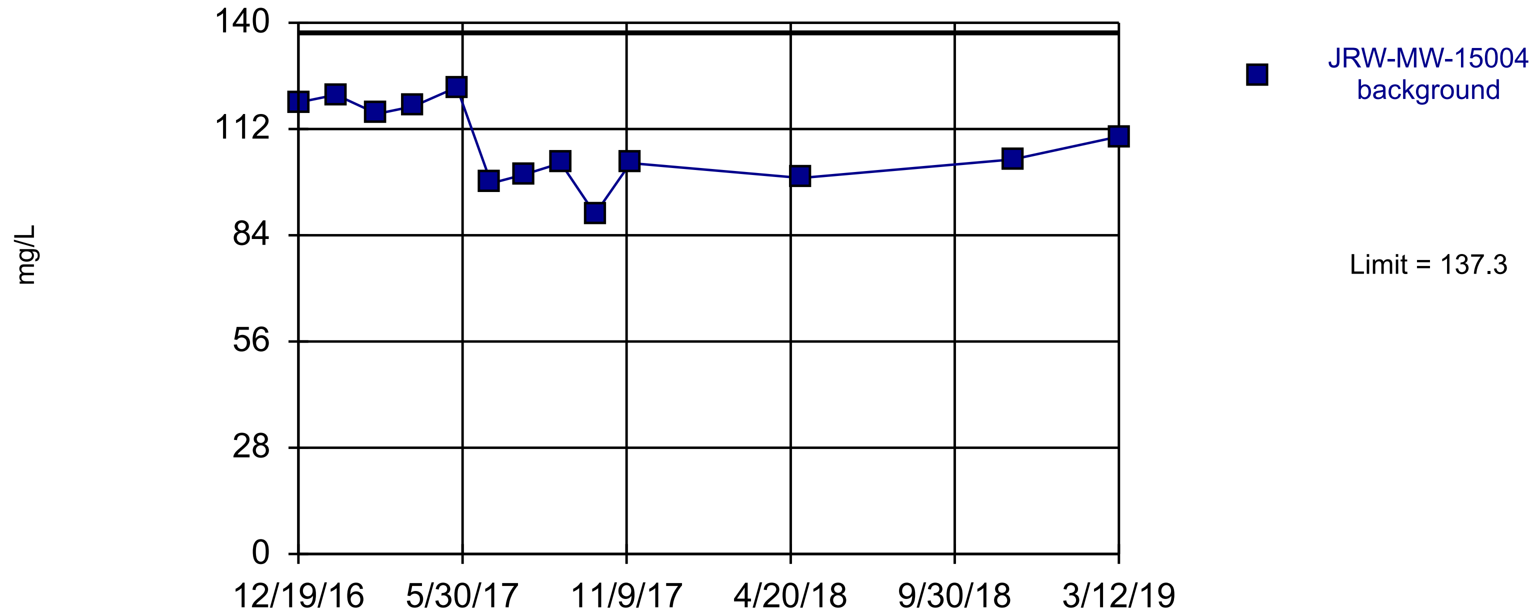
Constituent: Calcium, Total Analysis Run 8/2/2019 2:38 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Sanitas™ v.9.6.18 Sanitas software licensed to Consumers Energy. EPA

Prediction Limit

Intrawell Parametric, JRW-MW-15004



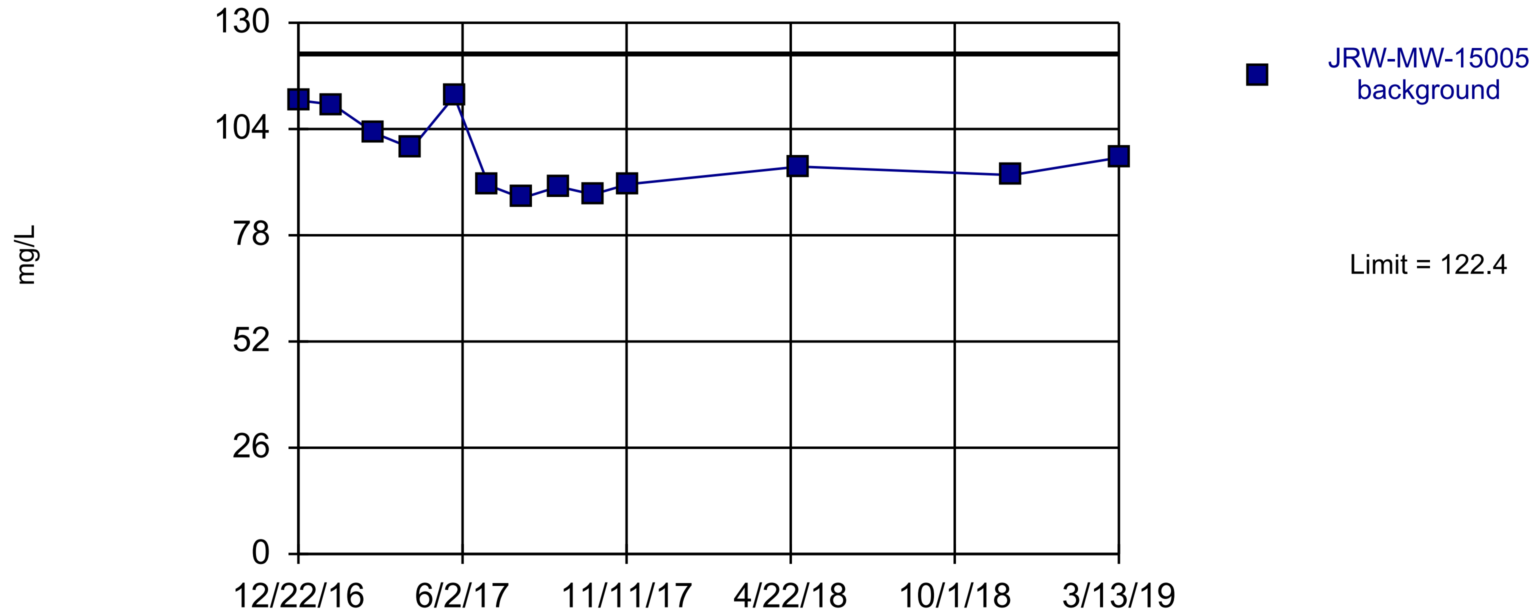
Background Data Summary: Mean=108, Std. Dev.=10.55, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9334, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Calcium, Total   Analysis Run 8/2/2019 2:38 PM

Client: Consumers Energy   Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15005



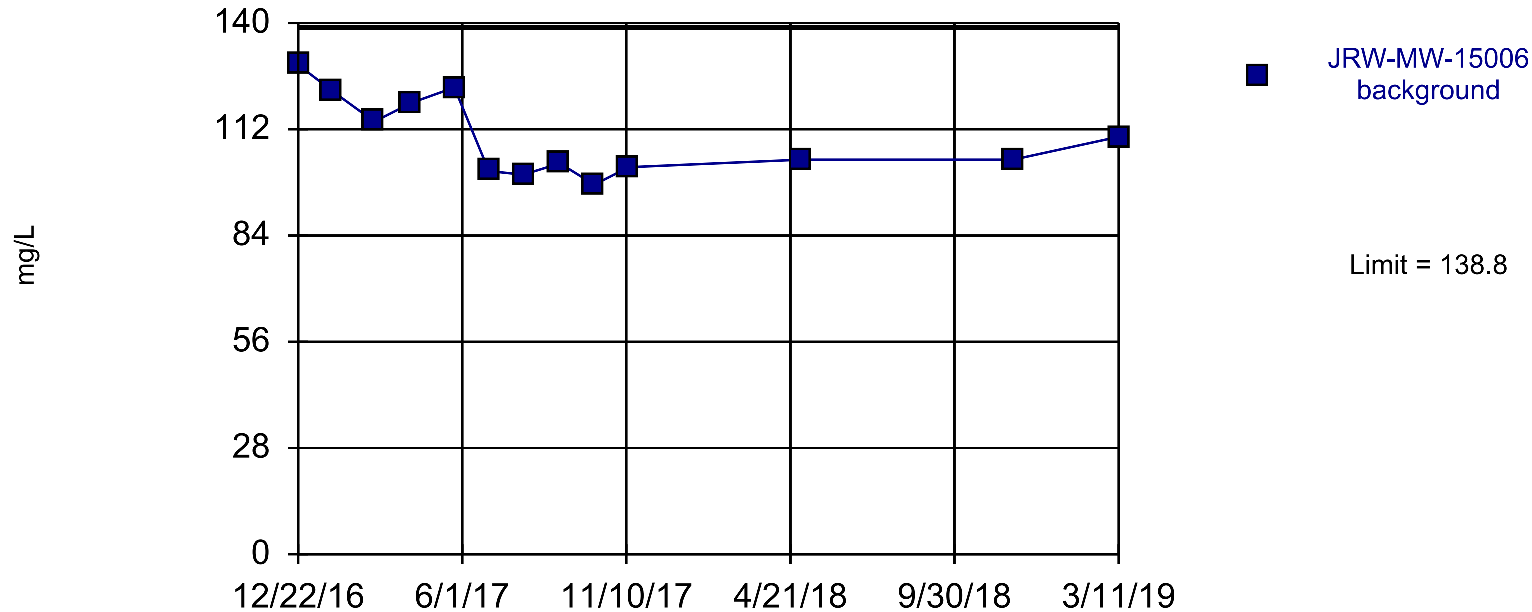
Background Data Summary: Mean=97.35, Std. Dev.=8.995, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8795, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Calcium, Total Analysis Run 8/2/2019 2:38 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15006



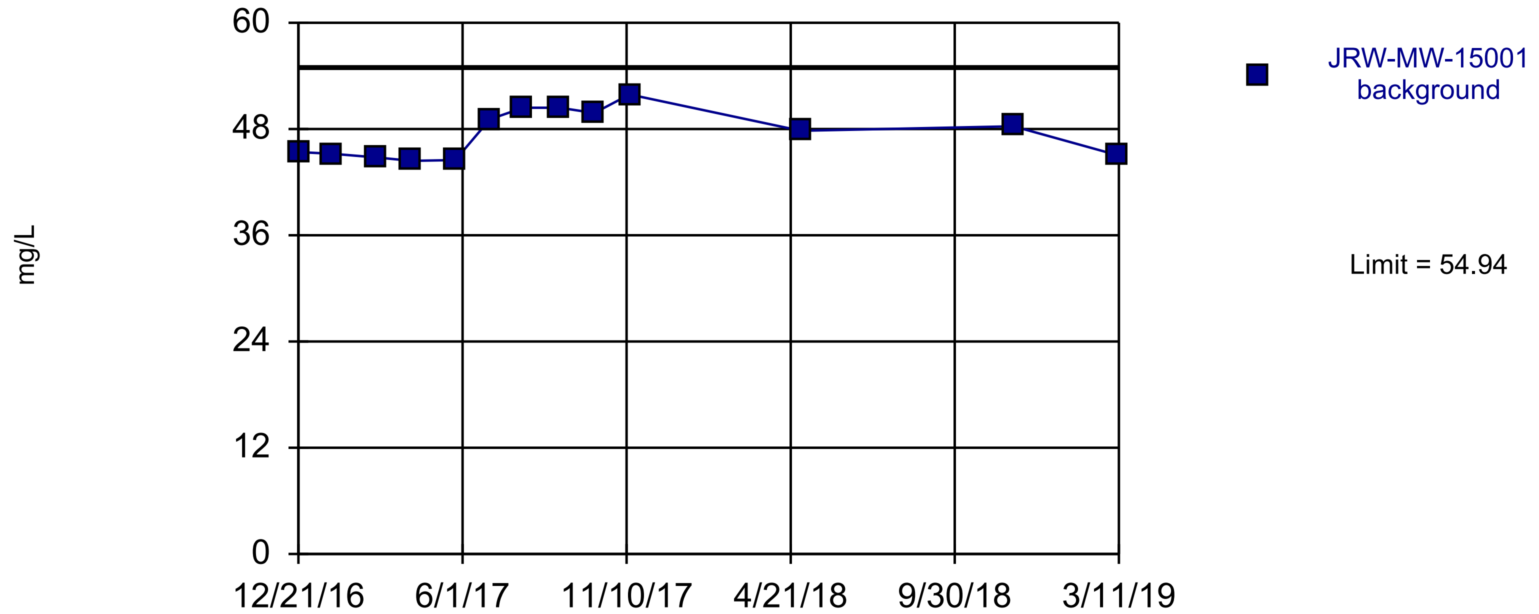
Background Data Summary: Mean=109.9, Std. Dev.=10.39, n=13. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8966, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Calcium, Total Analysis Run 8/2/2019 2:38 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15001



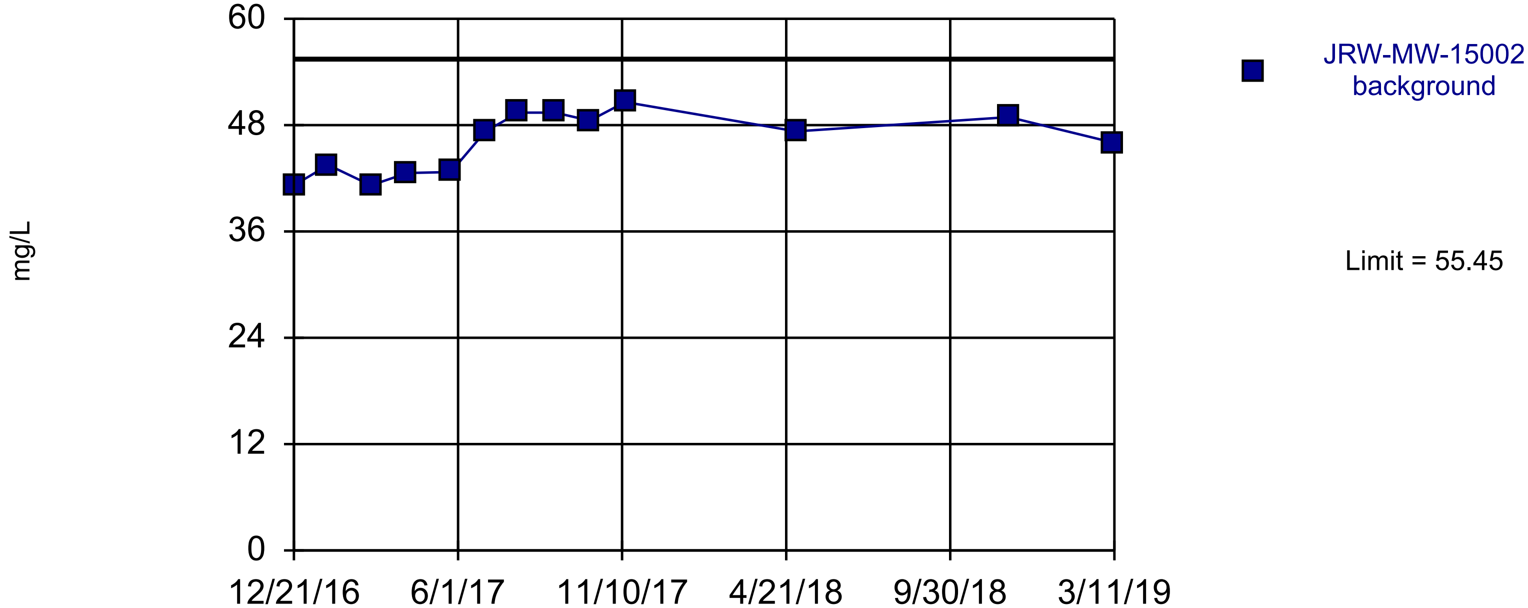
Background Data Summary: Mean=47.46, Std. Dev.=2.686, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8814, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Chloride Analysis Run 8/2/2019 2:38 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15002



Background Data Summary: Mean=46.05, Std. Dev.=3.38, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.896, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Chloride Analysis Run 8/2/2019 2:38 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

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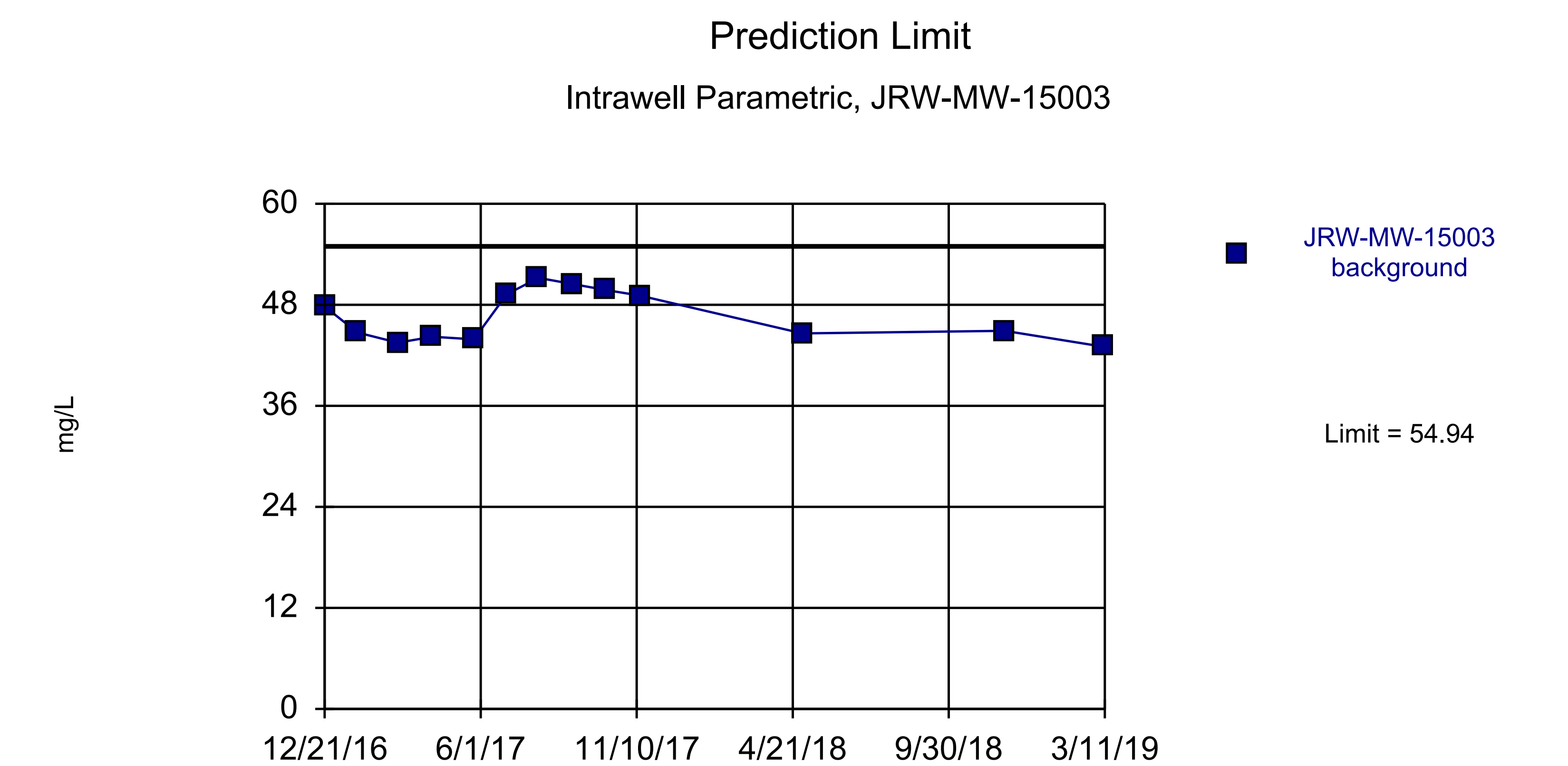


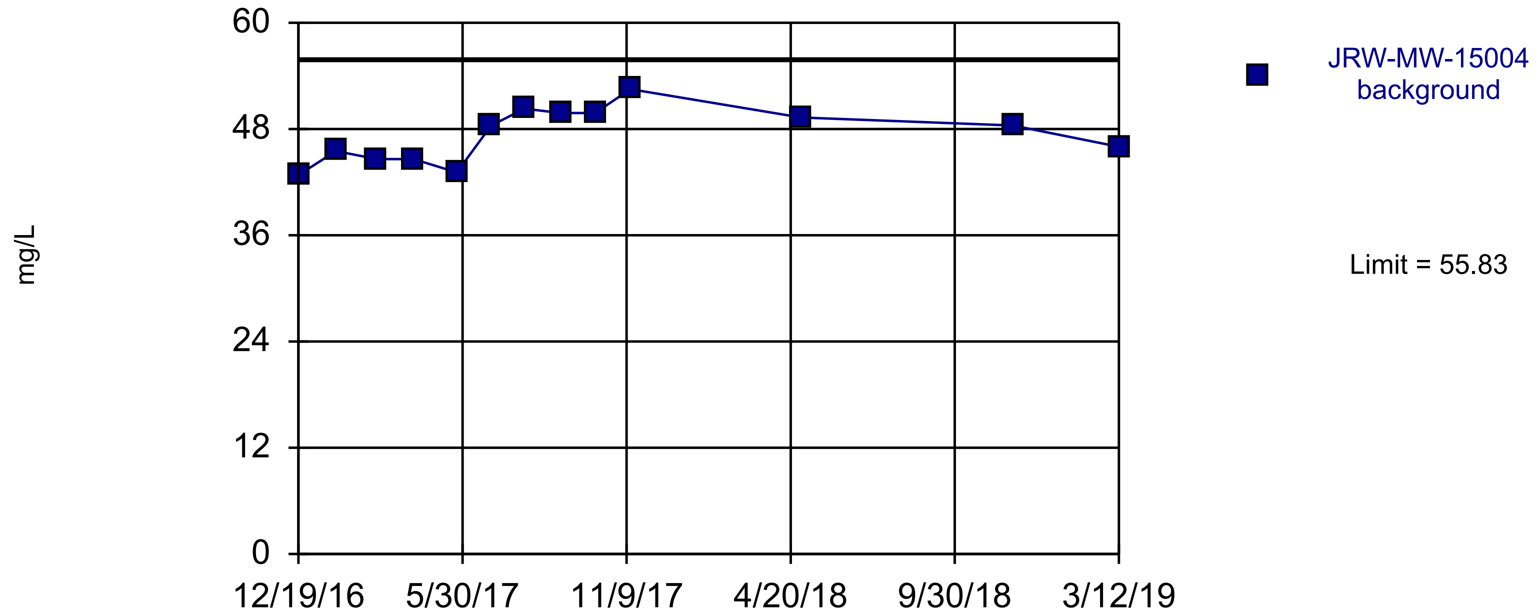
Background Data Summary: Mean=46.64, Std. Dev.=2.982, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8708, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Chloride Analysis Run 8/2/2019 2:38 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15004



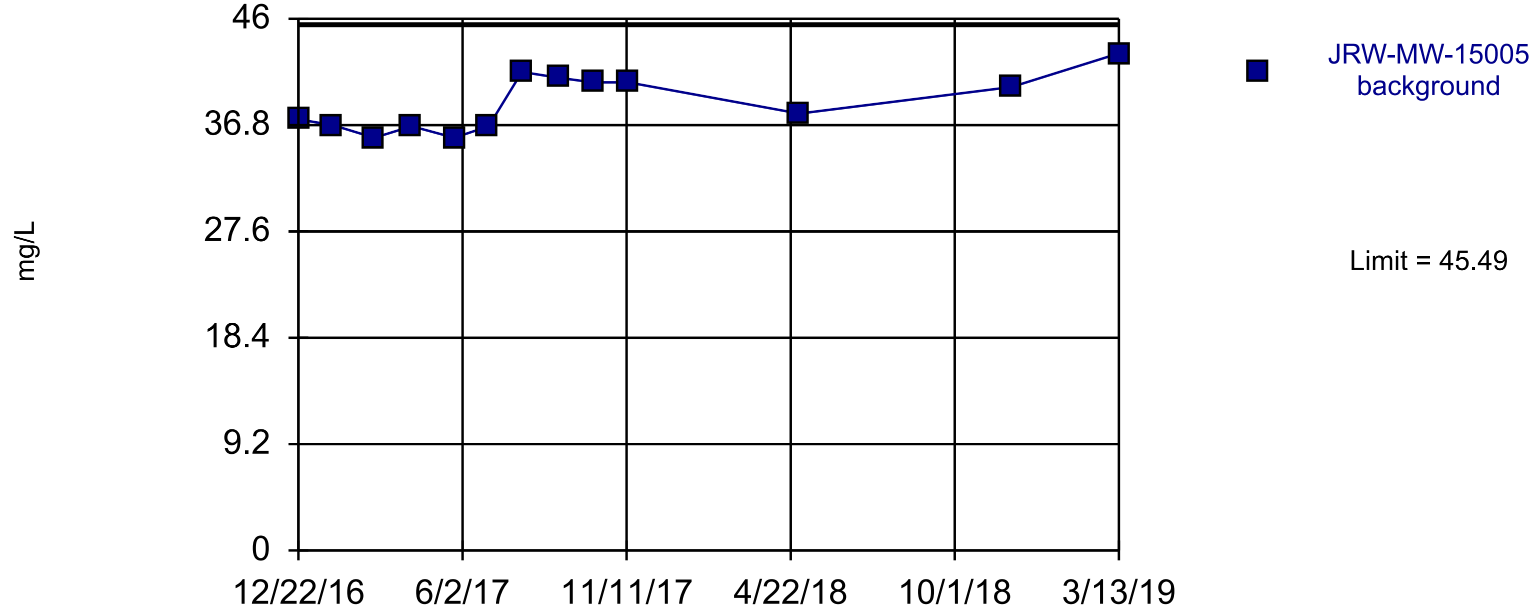
Background Data Summary: Mean=47.32, Std. Dev.=3.06, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9408, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Chloride Analysis Run 8/2/2019 2:38 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15005



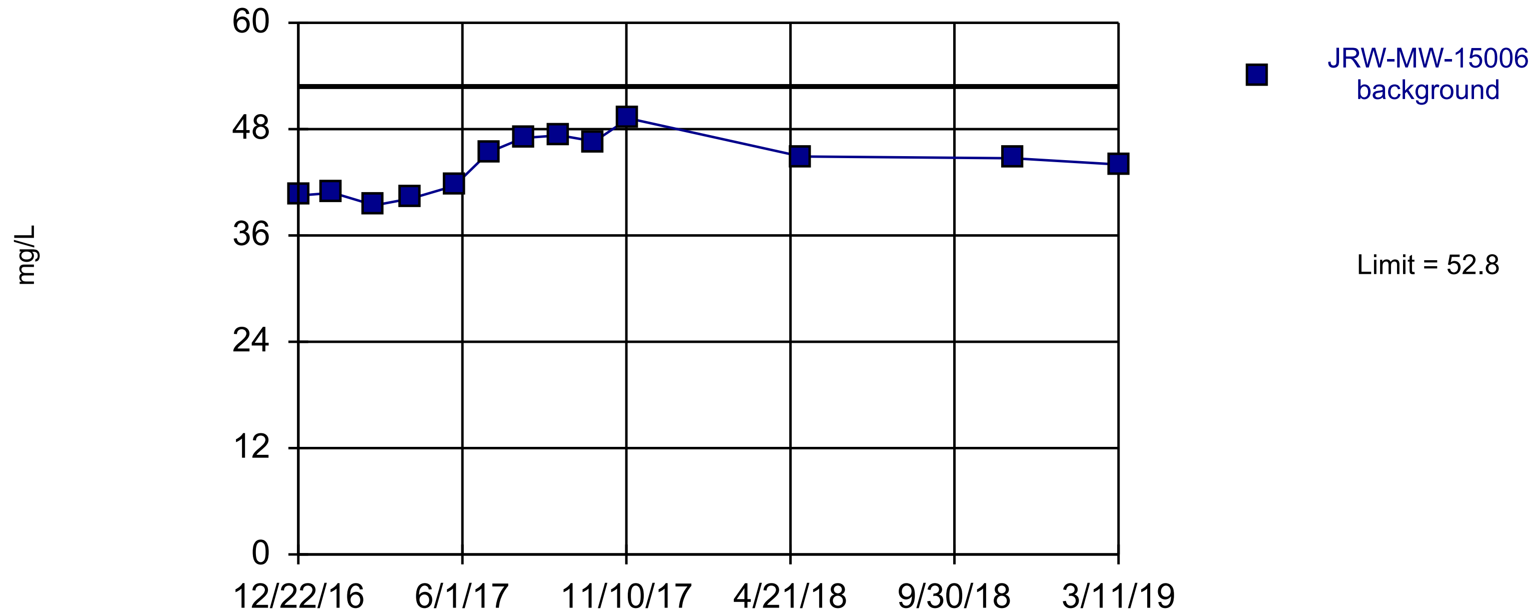
Background Data Summary: Mean=38.7, Std. Dev.=2.44, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9018, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Chloride Analysis Run 8/2/2019 2:38 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15006



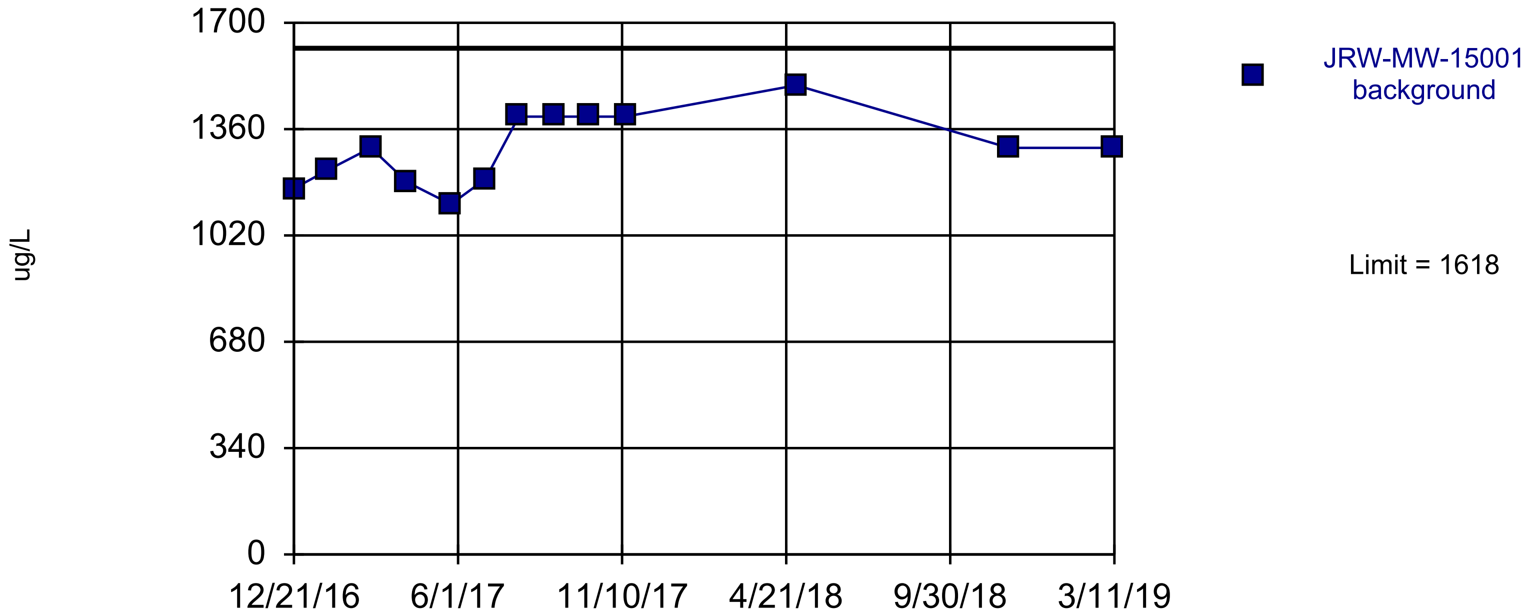
Background Data Summary: Mean=43.97, Std. Dev.=3.173, n=13. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9367, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Chloride Analysis Run 8/2/2019 2:38 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15001



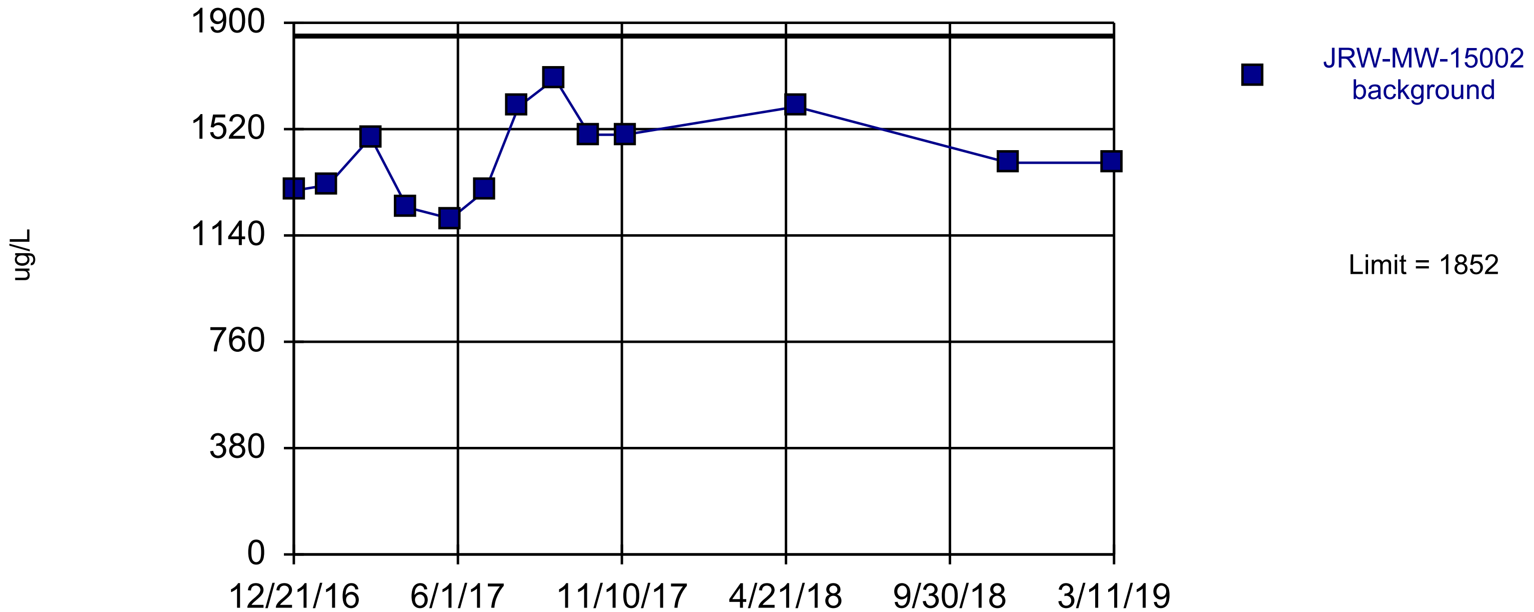
Background Data Summary: Mean=1301, Std. Dev.=114.1, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9415, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Fluoride Analysis Run 8/2/2019 2:38 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15002



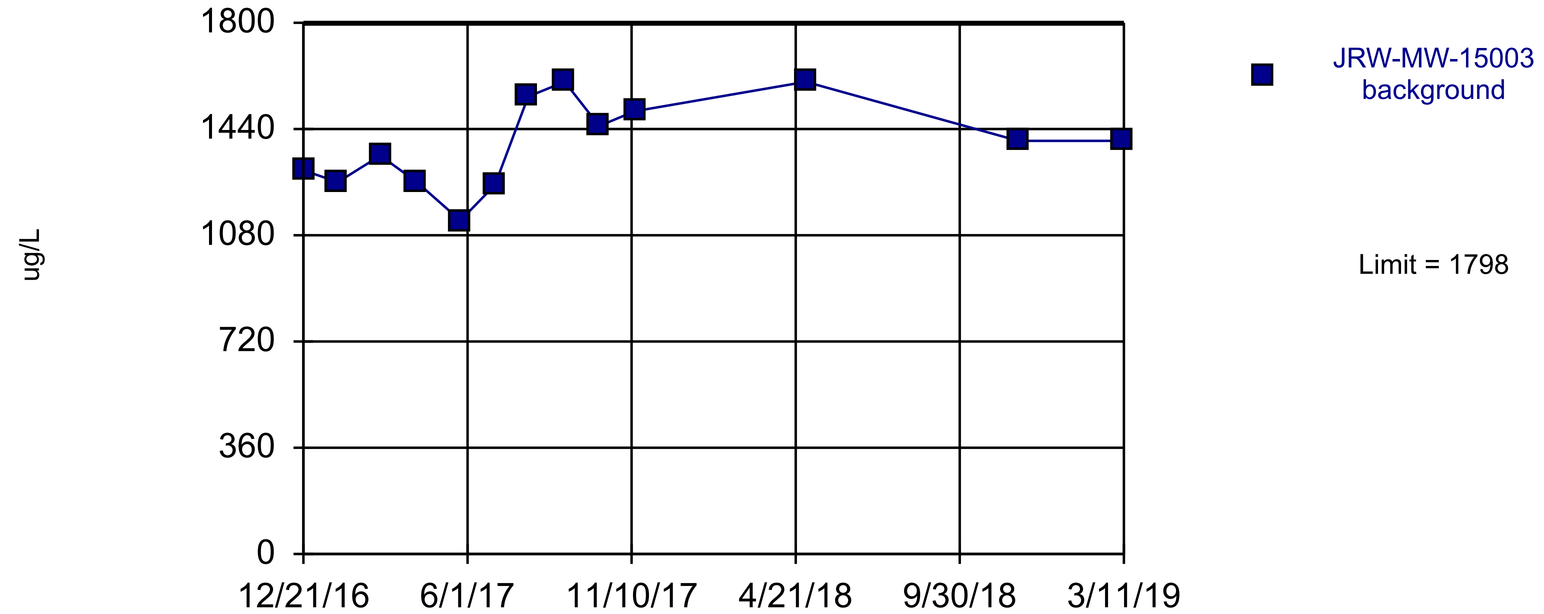
Background Data Summary: Mean=1427, Std. Dev.=152.9, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9589, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Fluoride Analysis Run 8/2/2019 2:38 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15003



Background Data Summary: Mean=1388, Std. Dev.=147.3, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9538, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Fluoride Analysis Run 8/2/2019 2:38 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

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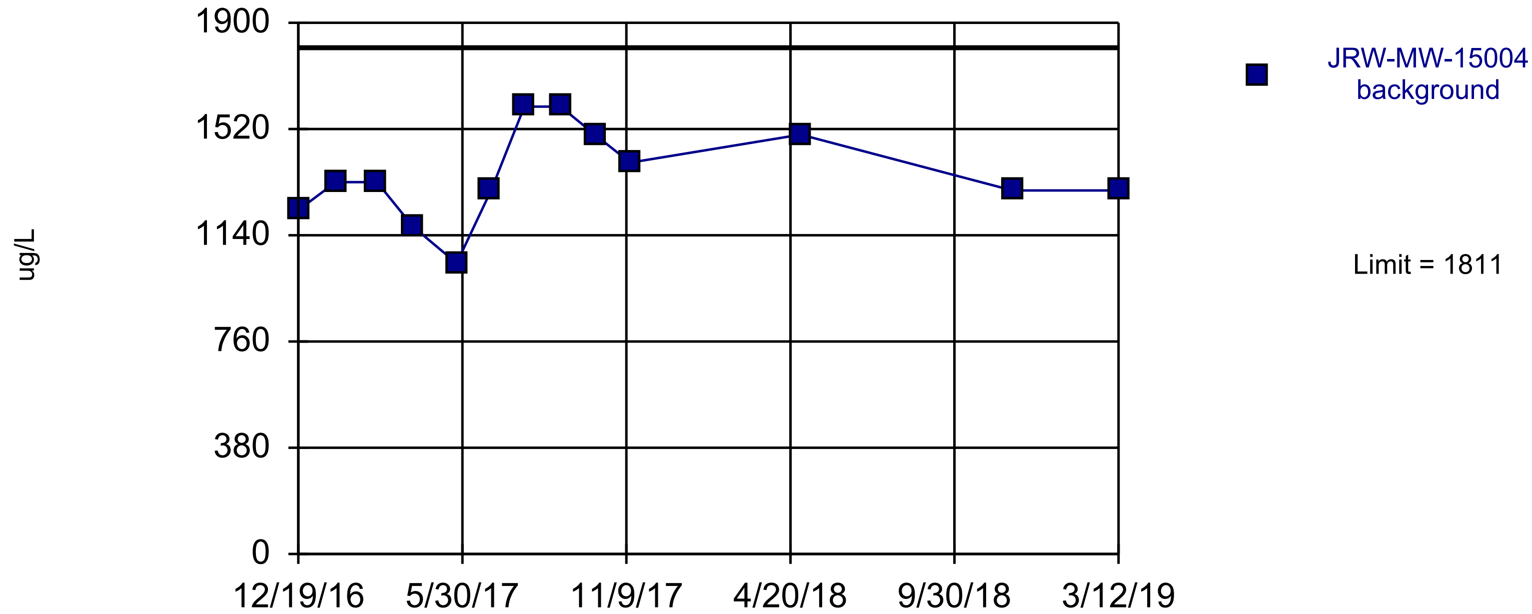
Prediction Limit

Intrawell Parametric, JRW-MW-15004



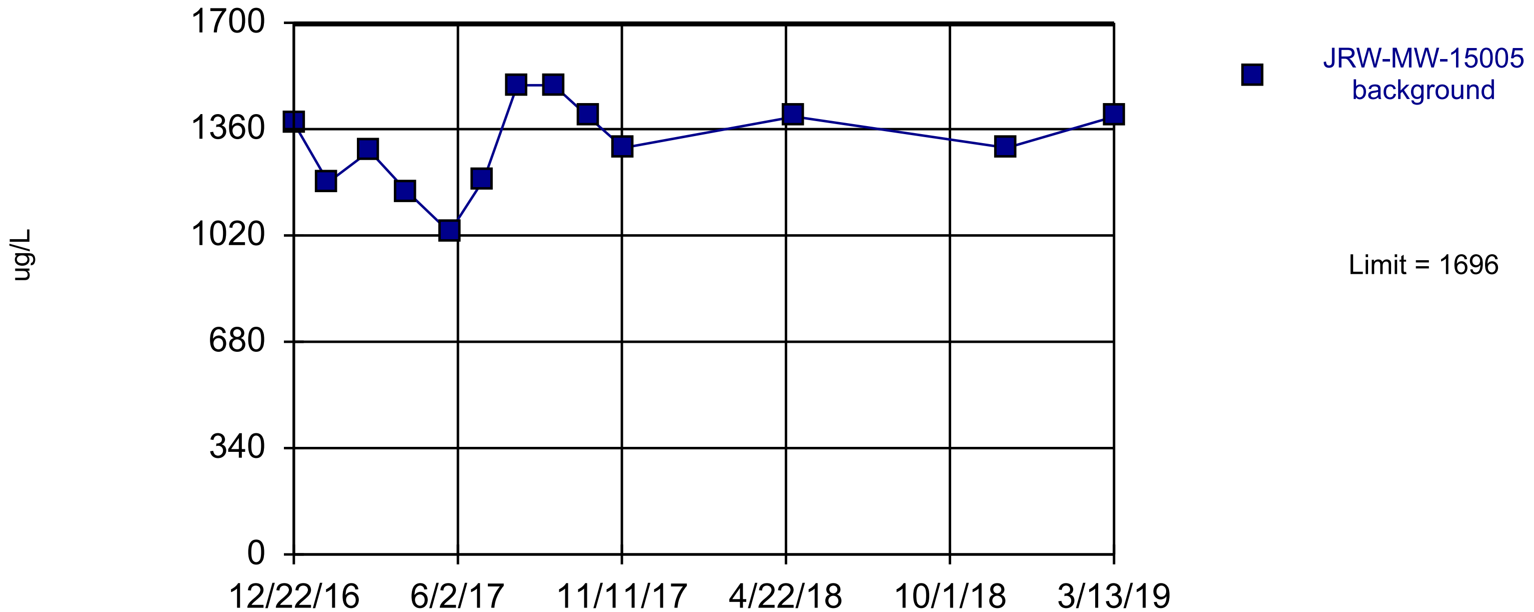
Background Data Summary: Mean=1354, Std. Dev.=164.2, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.952, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Fluoride Analysis Run 8/2/2019 2:38 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15005



Background Data Summary: Mean=1312, Std. Dev.=138.3, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9472, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Fluoride Analysis Run 8/2/2019 2:38 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

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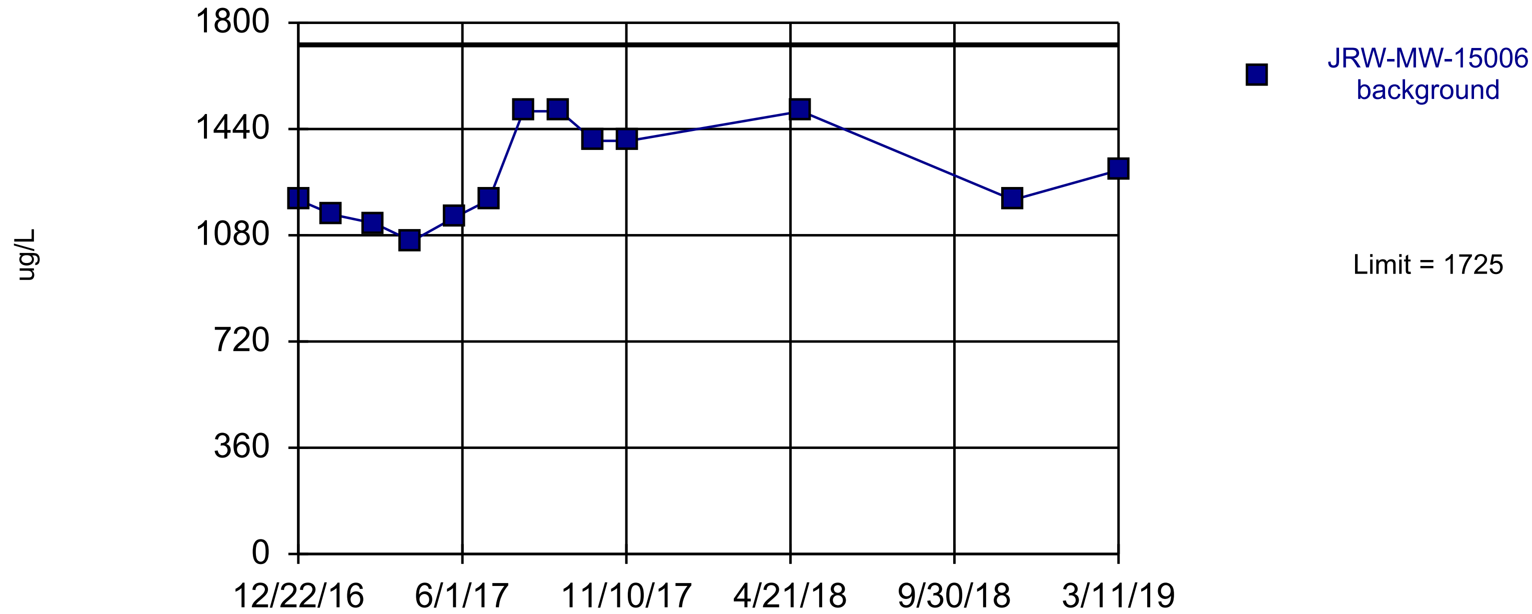
Prediction Limit

Intrawell Parametric, JRW-MW-15006



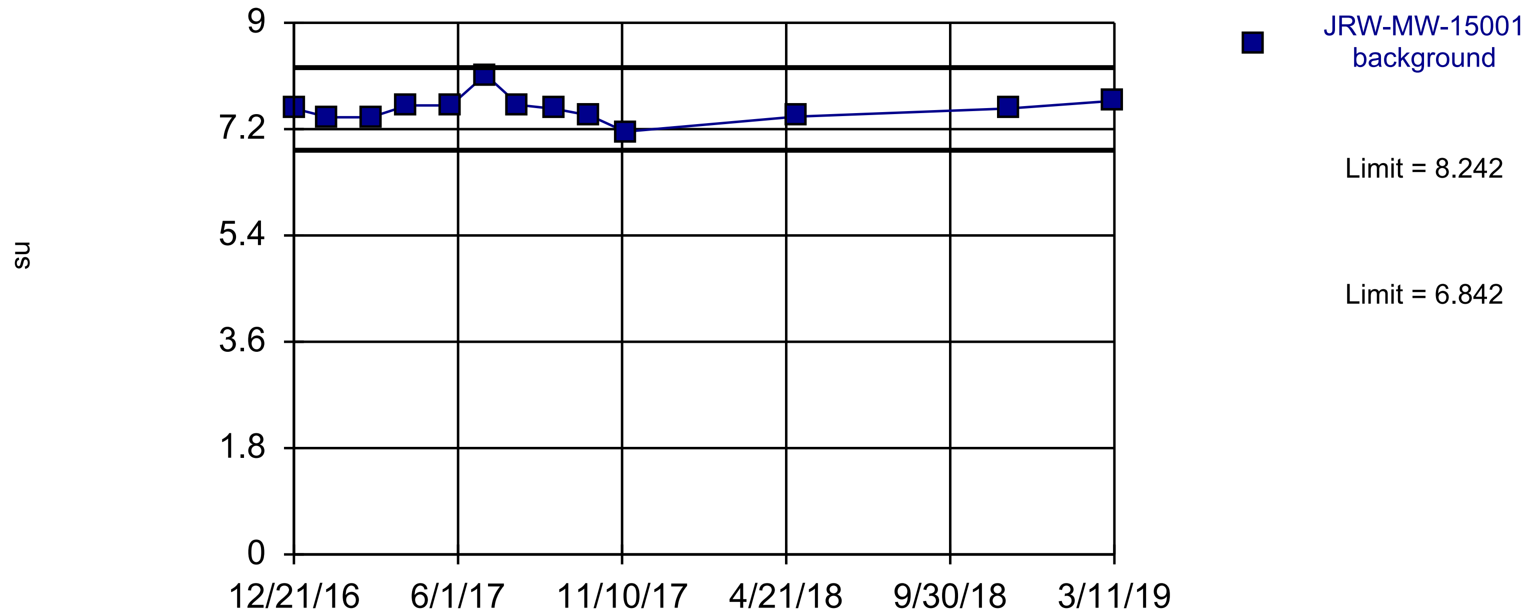
Background Data Summary: Mean=1282, Std. Dev.=159.2, n=13. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.886, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Fluoride Analysis Run 8/2/2019 2:38 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15001



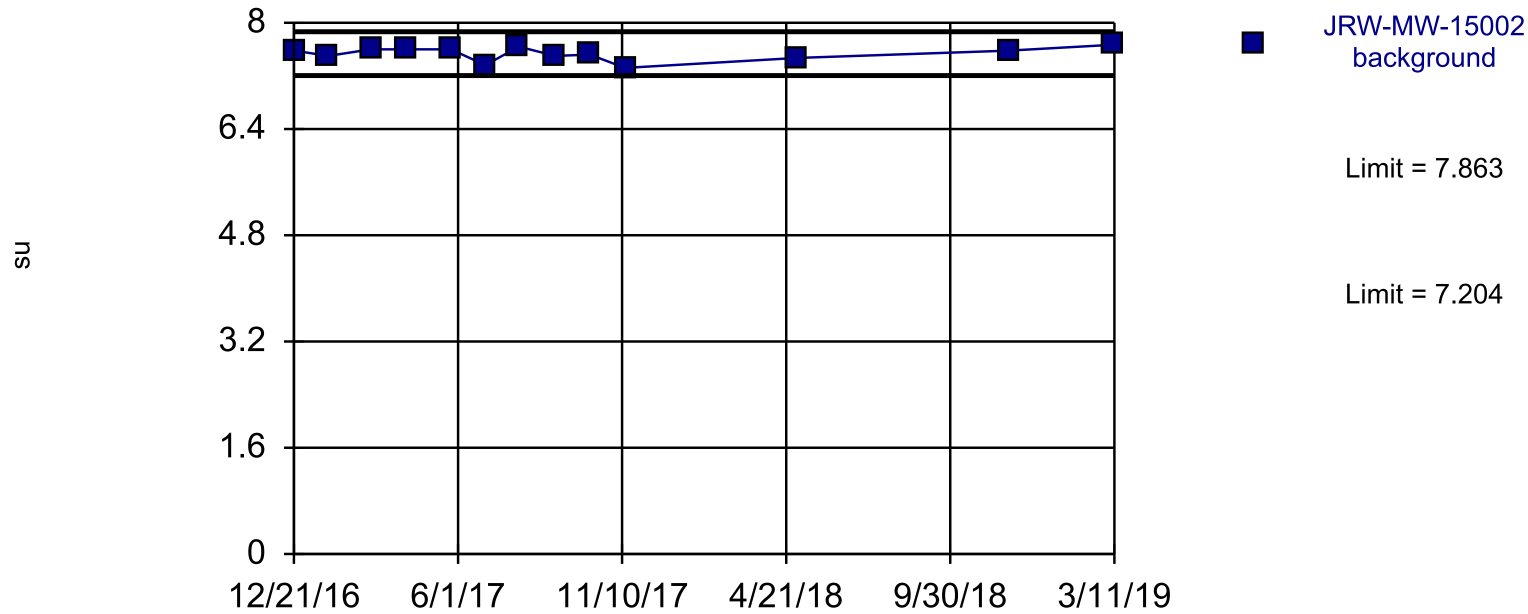
Background Data Summary: Mean=7.542, Std. Dev.=0.2207, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8684, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: pH, Field Analysis Run 9/19/2019 1:52 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15002



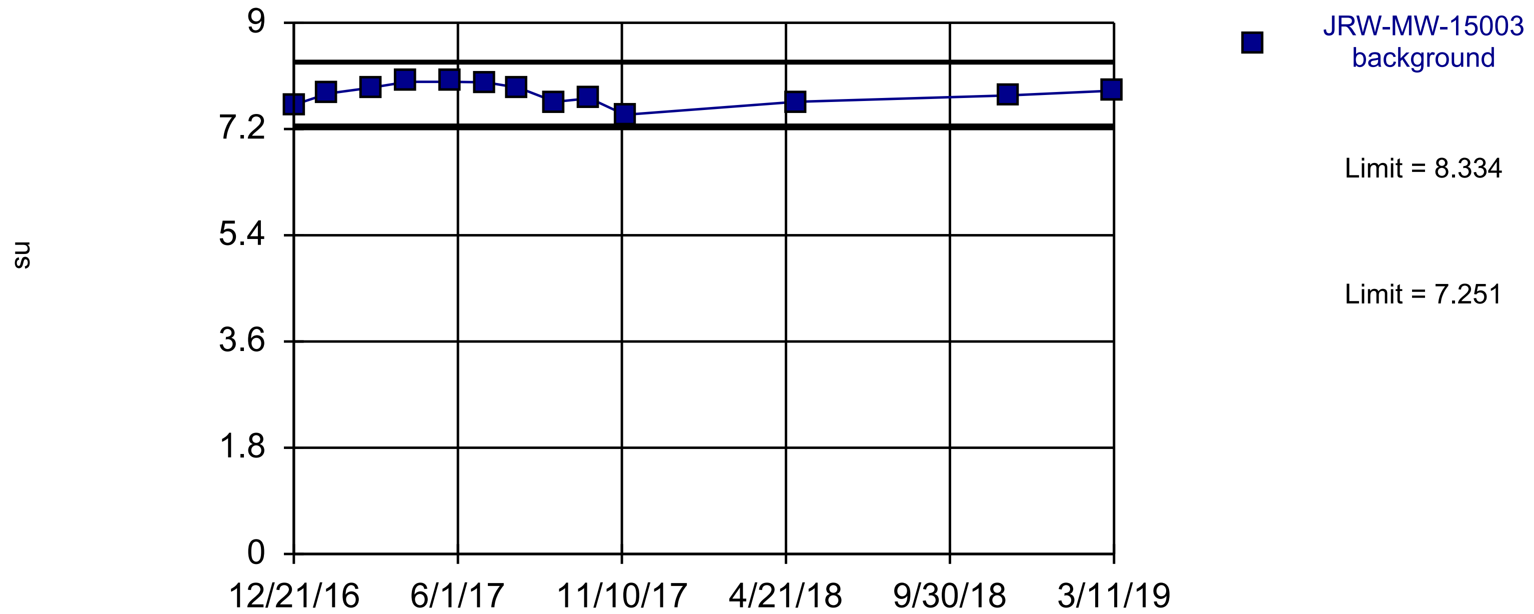
Background Data Summary: Mean=7.534, Std. Dev.=0.104, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9087, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: pH, Field Analysis Run 9/19/2019 1:54 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15003



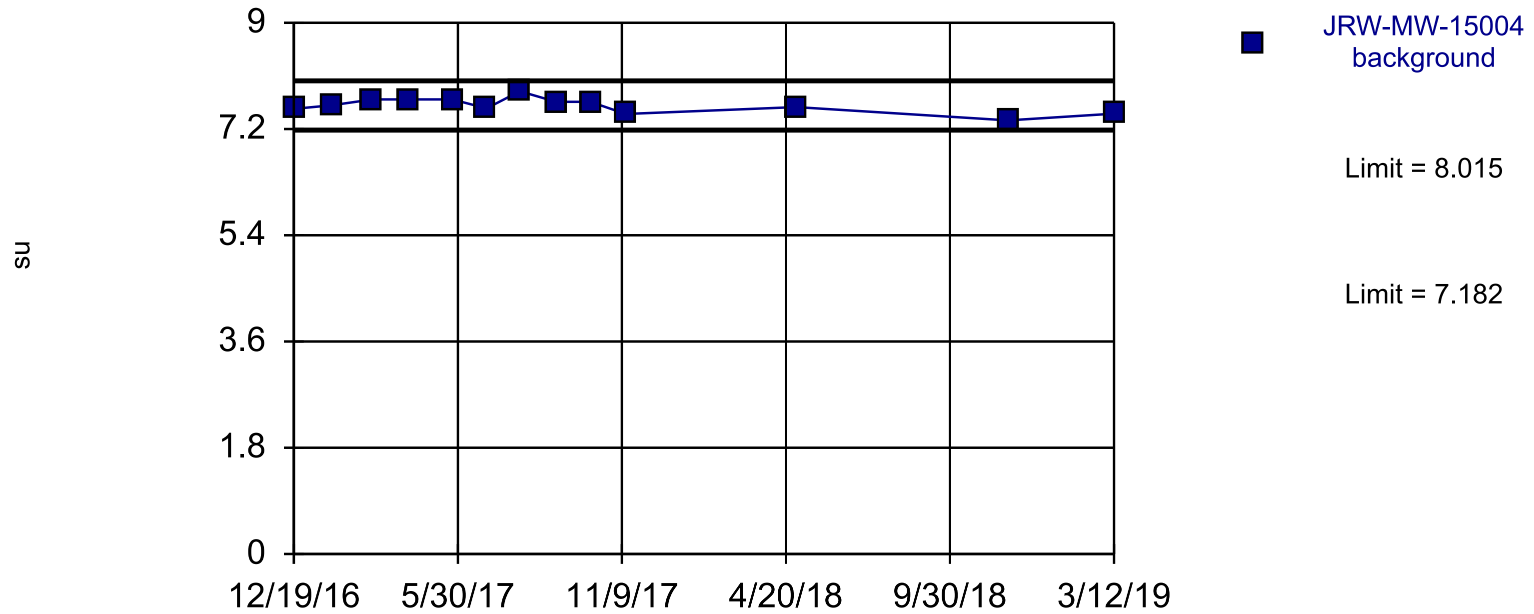
Background Data Summary: Mean=7.792, Std. Dev.=0.1708, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9427, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: pH, Field Analysis Run 8/2/2019 2:39 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15004



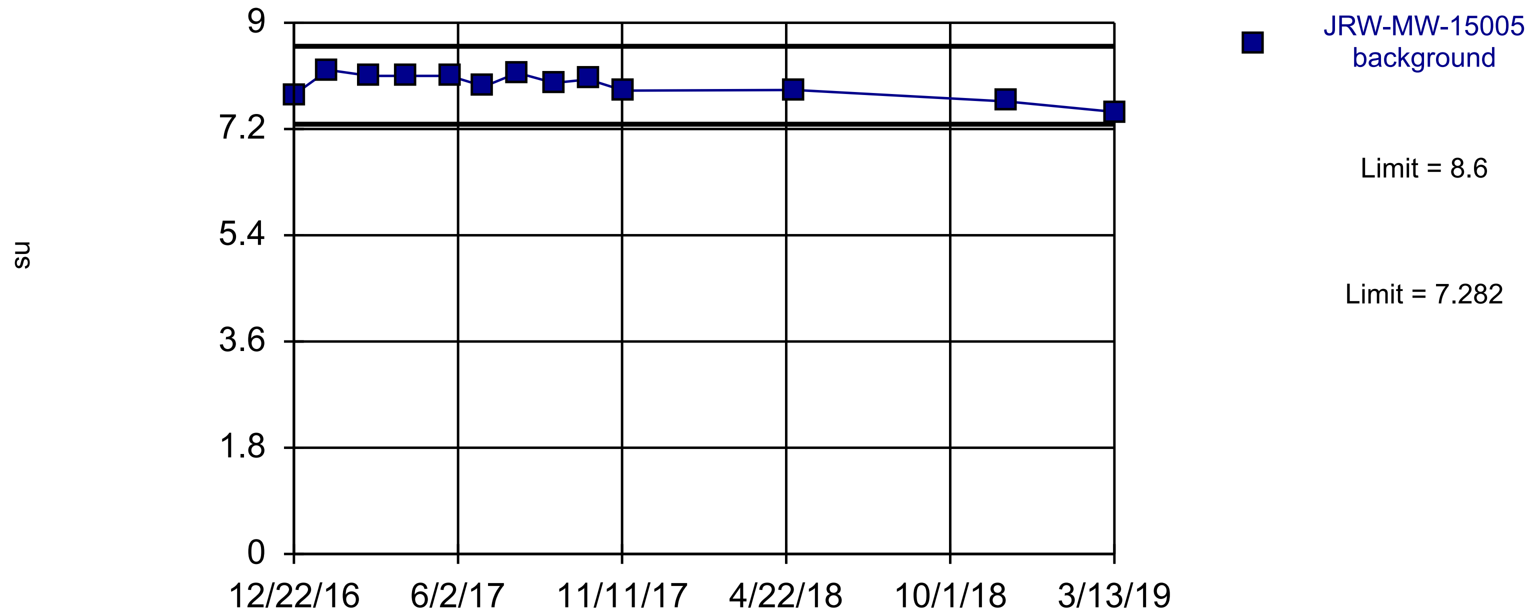
Background Data Summary: Mean=7.598, Std. Dev.=0.1315, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9714, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: pH, Field Analysis Run 9/19/2019 1:58 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15005



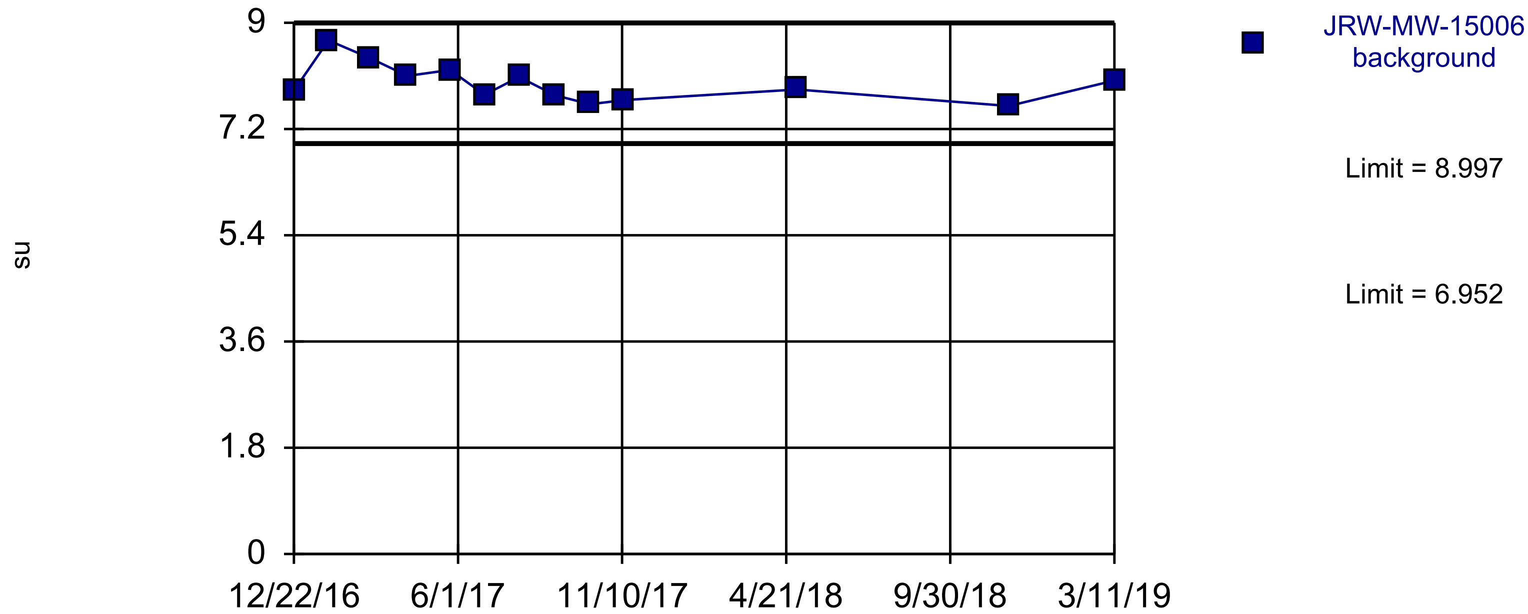
Background Data Summary: Mean=7.941, Std. Dev.=0.2079, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9297, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: pH, Field Analysis Run 8/22/2019 3:12 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15006



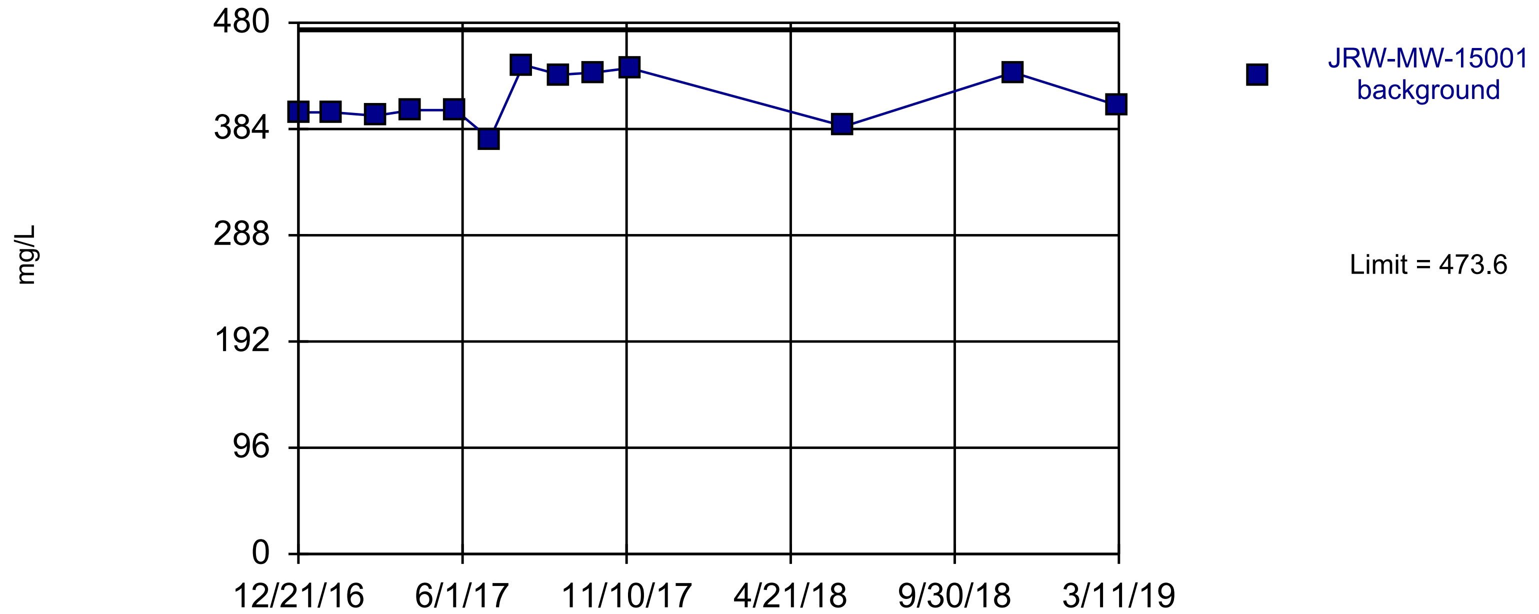
Background Data Summary: Mean=7.975, Std. Dev.=0.3225, n=13. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9274, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: pH, Field Analysis Run 8/2/2019 2:39 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15001



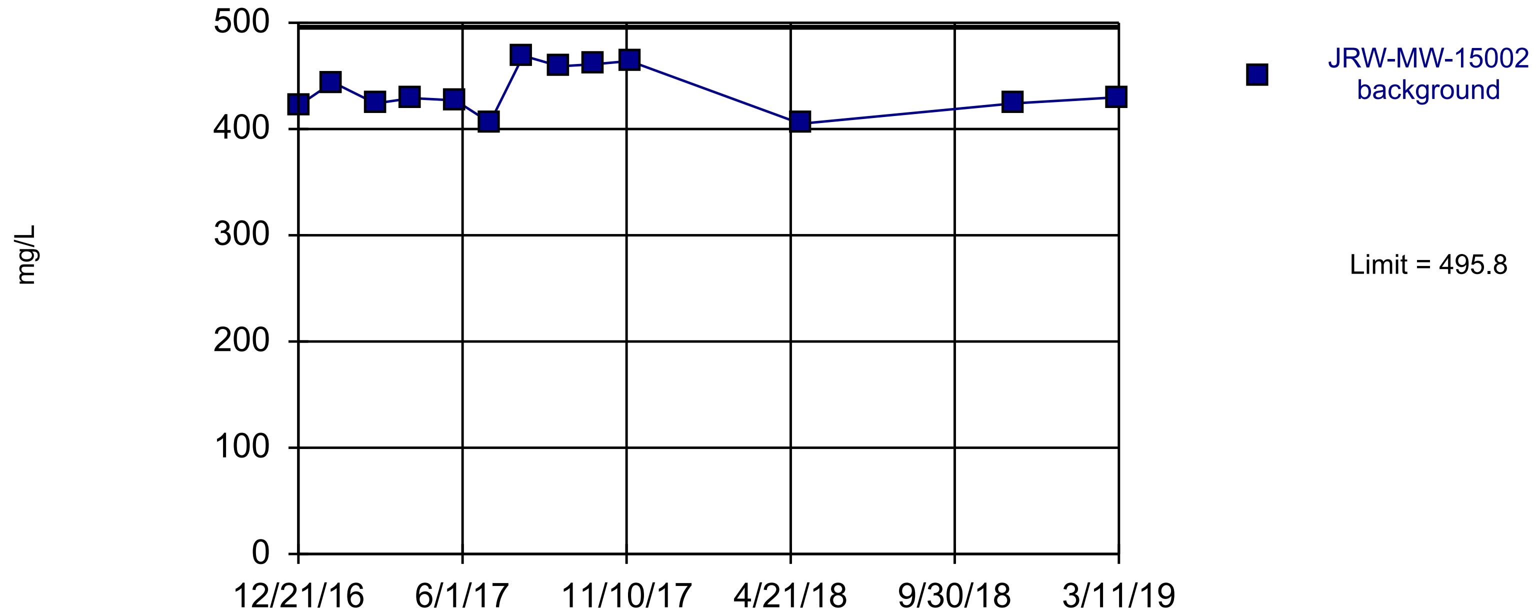
Background Data Summary: Mean=411.3, Std. Dev.=22.41, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8812, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Sulfate Analysis Run 8/2/2019 2:39 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15002



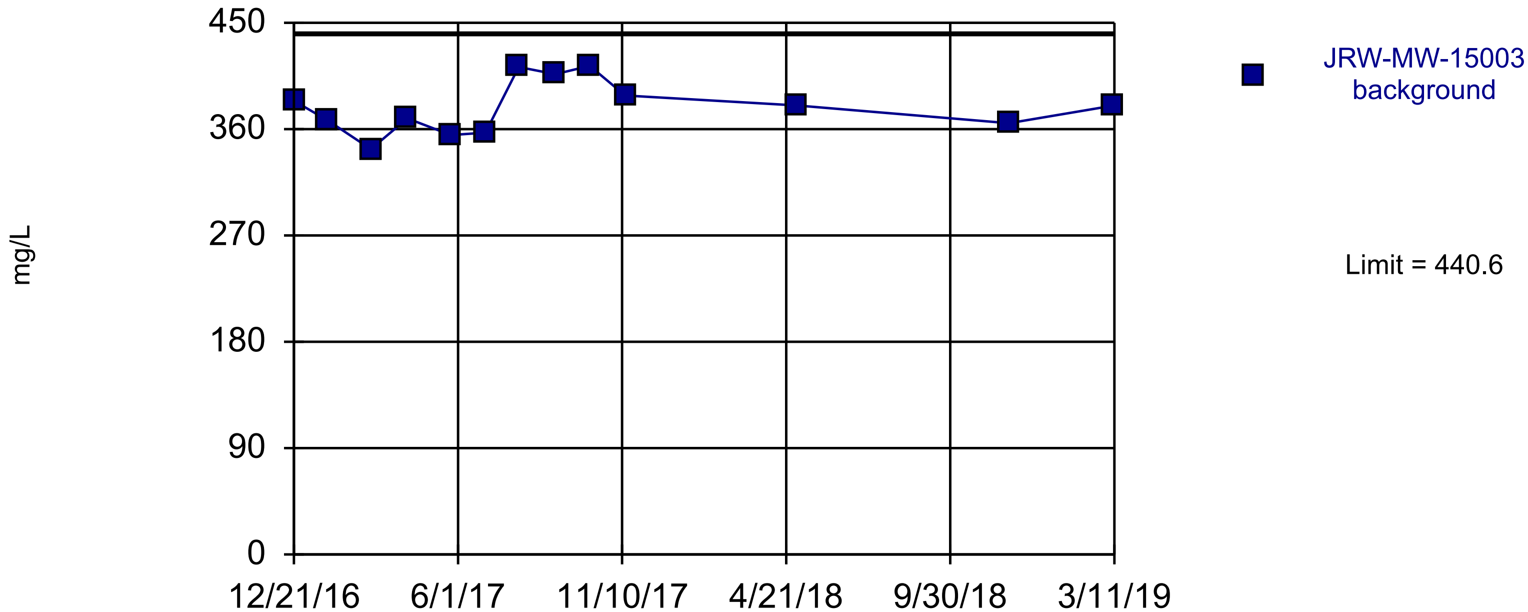
Background Data Summary: Mean=435.7, Std. Dev.=21.6, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9083, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Sulfate Analysis Run 8/2/2019 2:39 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15003



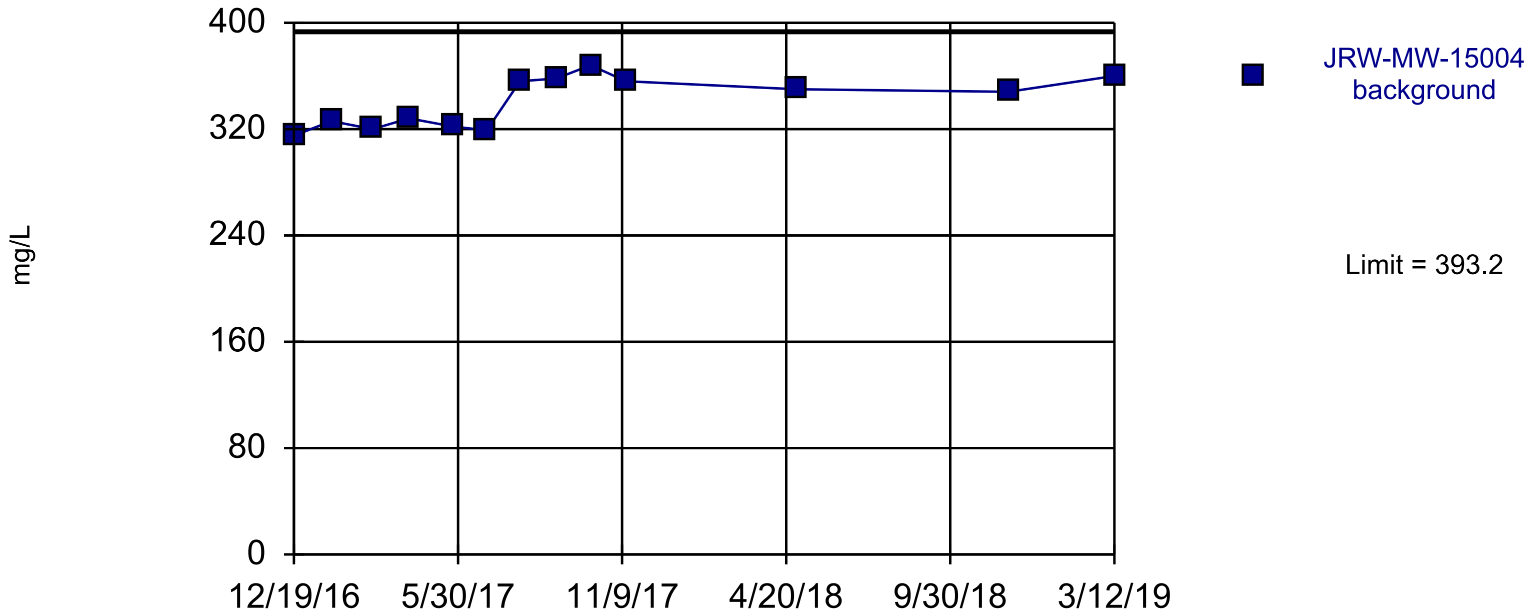
Background Data Summary: Mean=378.5, Std. Dev.=22.32, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9486, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Sulfate Analysis Run 8/2/2019 2:39 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15004



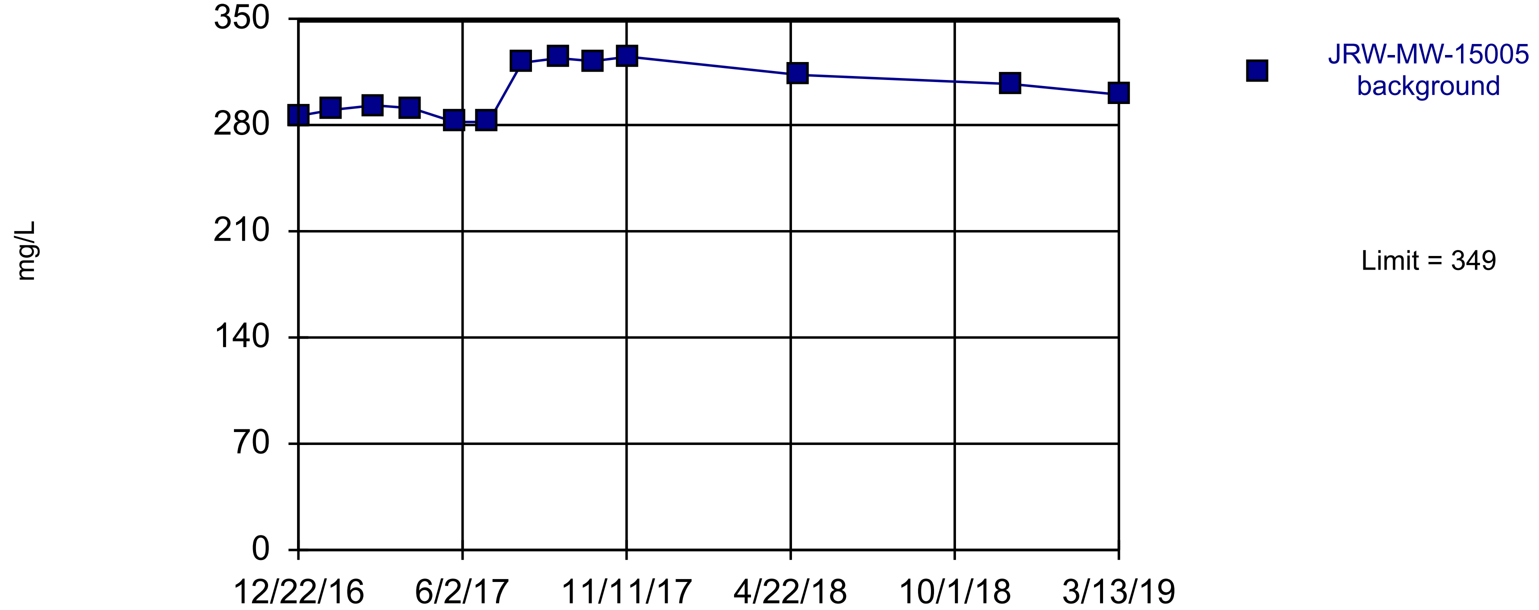
Background Data Summary: Mean=340.5, Std. Dev.=18.95, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8769, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Sulfate Analysis Run 8/2/2019 2:39 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15005



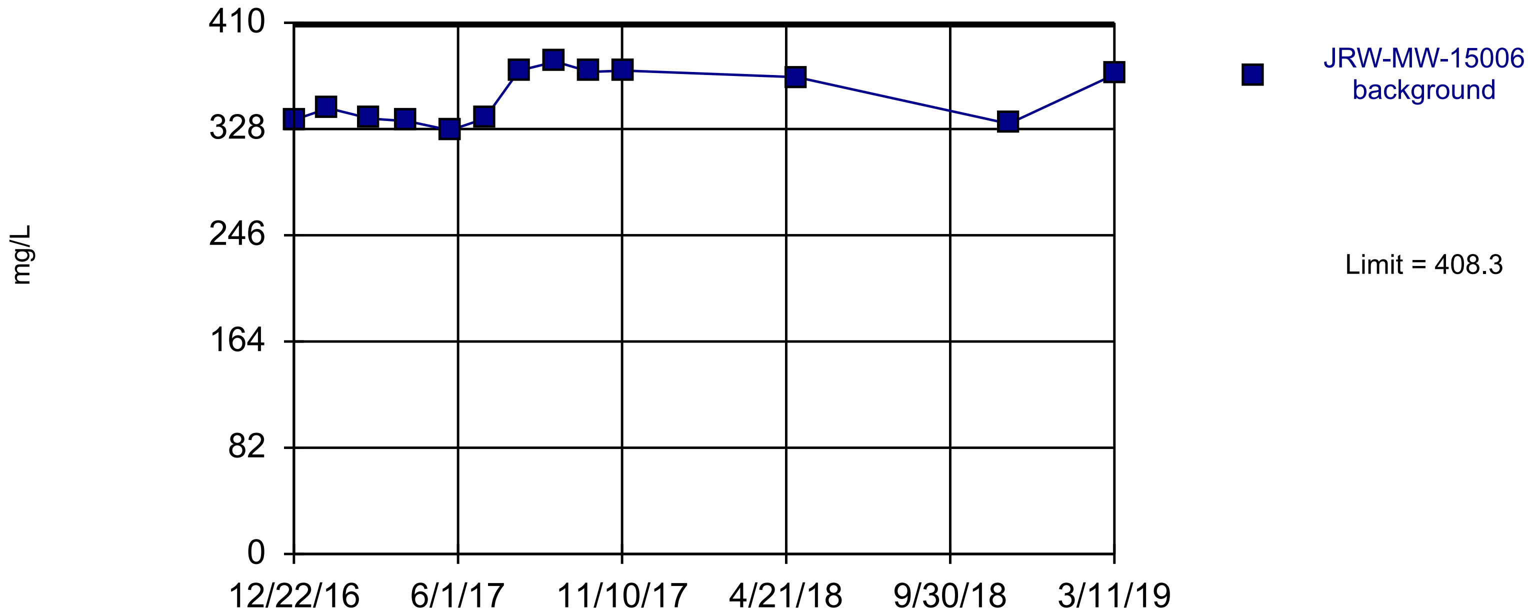
Background Data Summary: Mean=302.8, Std. Dev.=16.63, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8838, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Sulfate Analysis Run 8/2/2019 2:39 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15006



Background Data Summary: Mean=352.3, Std. Dev.=20.12, n=13. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8226, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Sulfate Analysis Run 8/2/2019 2:39 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

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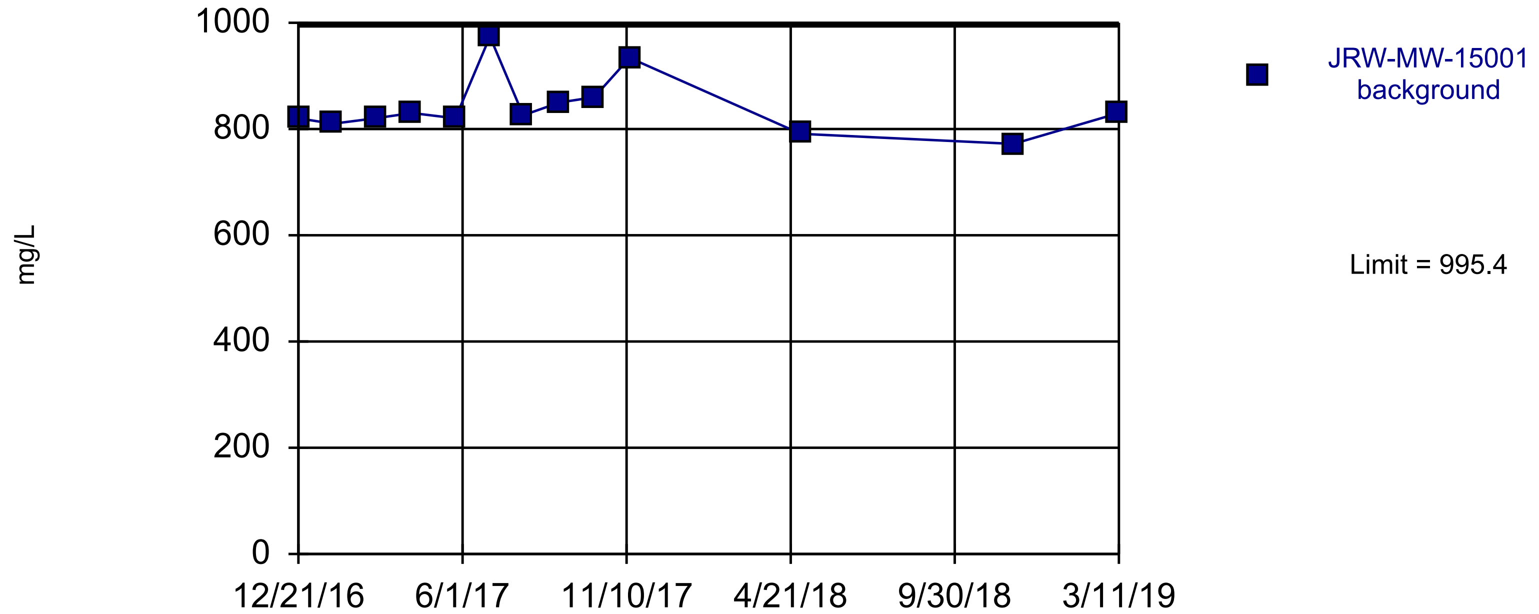
Prediction Limit

Intrawell Parametric, JRW-MW-15001



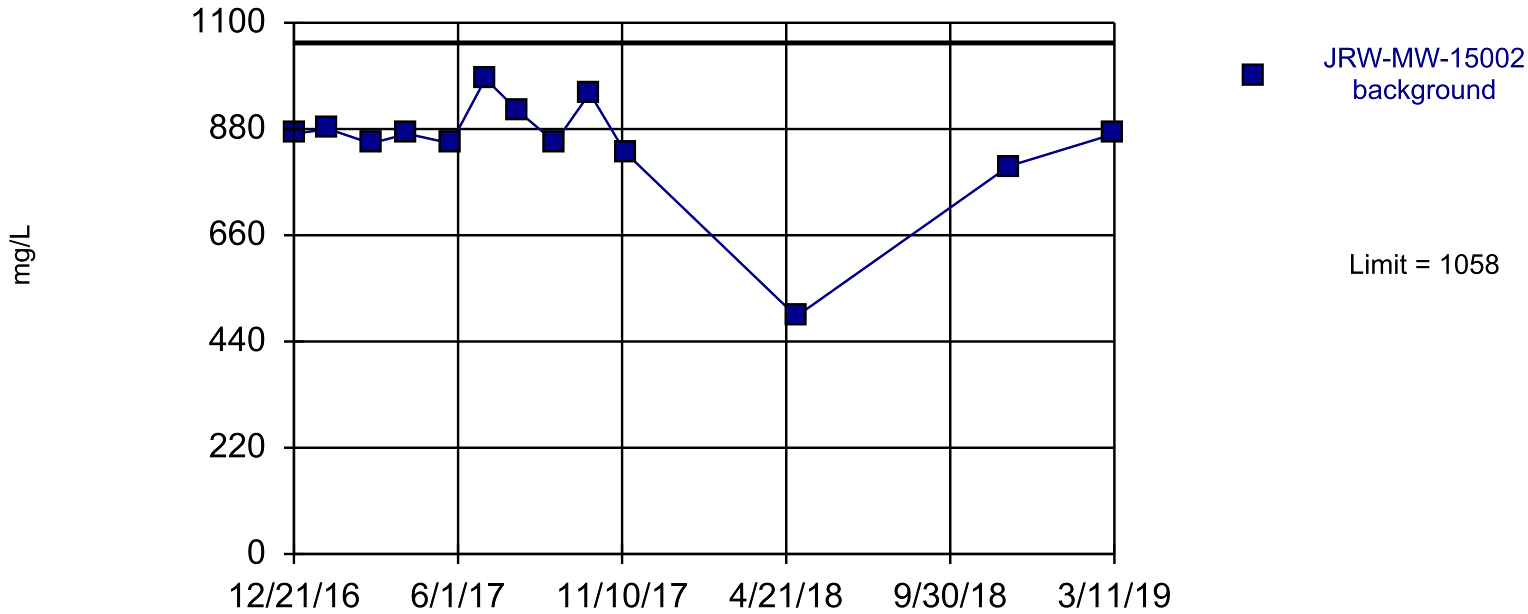
Background Data Summary: Mean=841.3, Std. Dev.=55.37, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8288, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Total Dissolved Solids, Total Analysis Run 8/2/2019 2:39 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15002



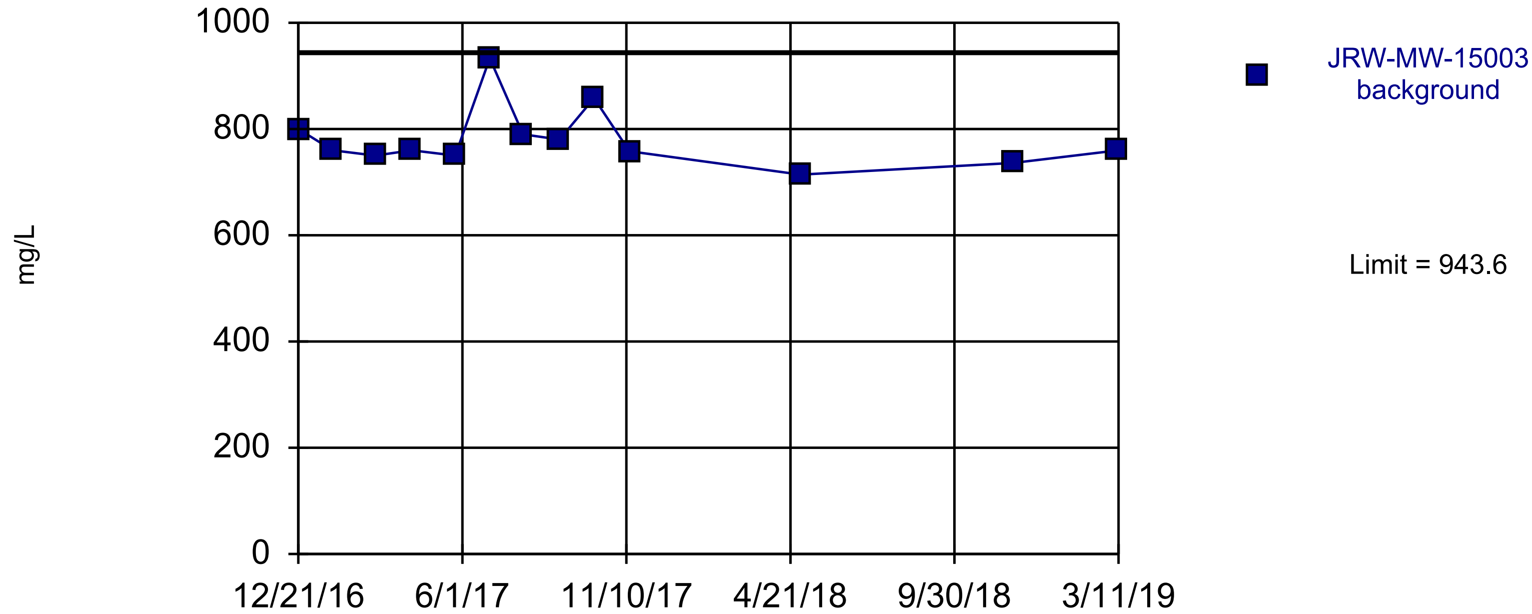
Background Data Summary (based on cube transformation): Mean=6.4e8, Std. Dev.=2.0e8, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8556, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Total Dissolved Solids, Total Analysis Run 8/2/2019 2:39 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15003



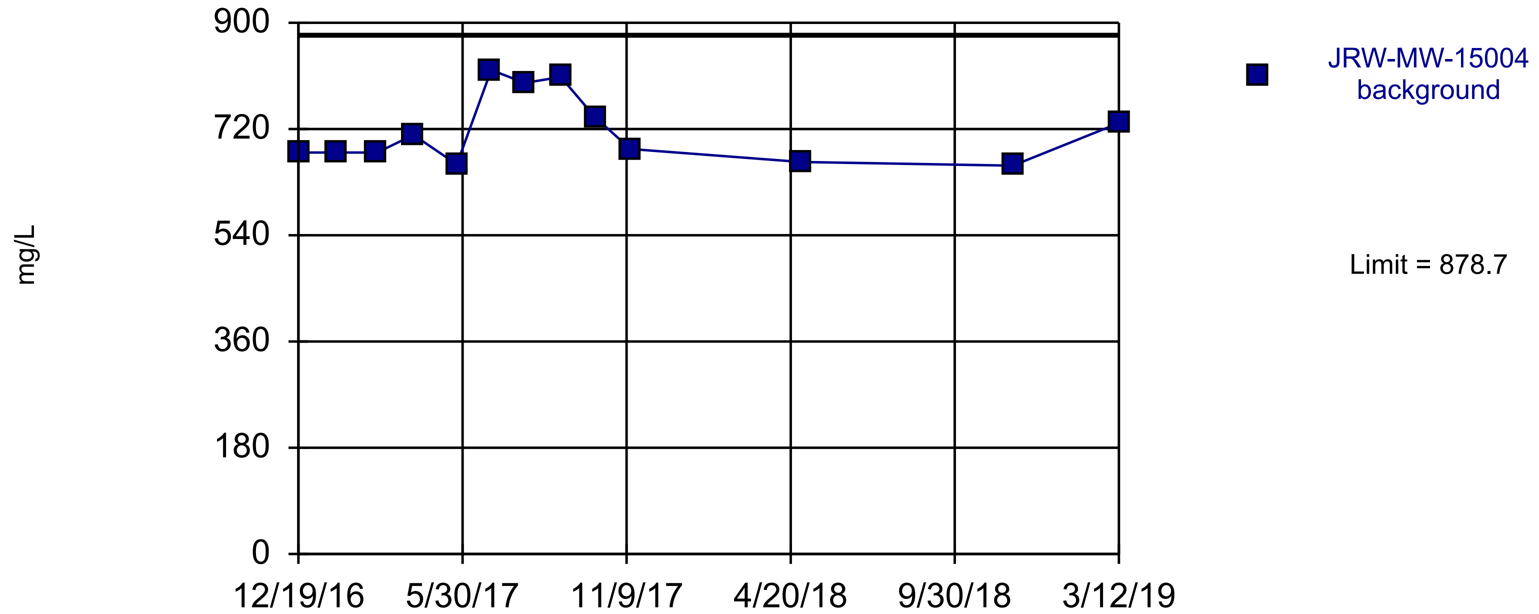
Background Data Summary (based on square root transformation): Mean=27.92, Std. Dev.=1.004, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8212, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Total Dissolved Solids, Total Analysis Run 8/2/2019 2:39 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

Prediction Limit

Intrawell Parametric, JRW-MW-15004



Background Data Summary: Mean=716.5, Std. Dev.=58.31, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8452, critical = 0.814. Report alpha = 0.01. Assumes 1 future value.

Constituent: Total Dissolved Solids, Total Analysis Run 8/2/2019 2:39 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

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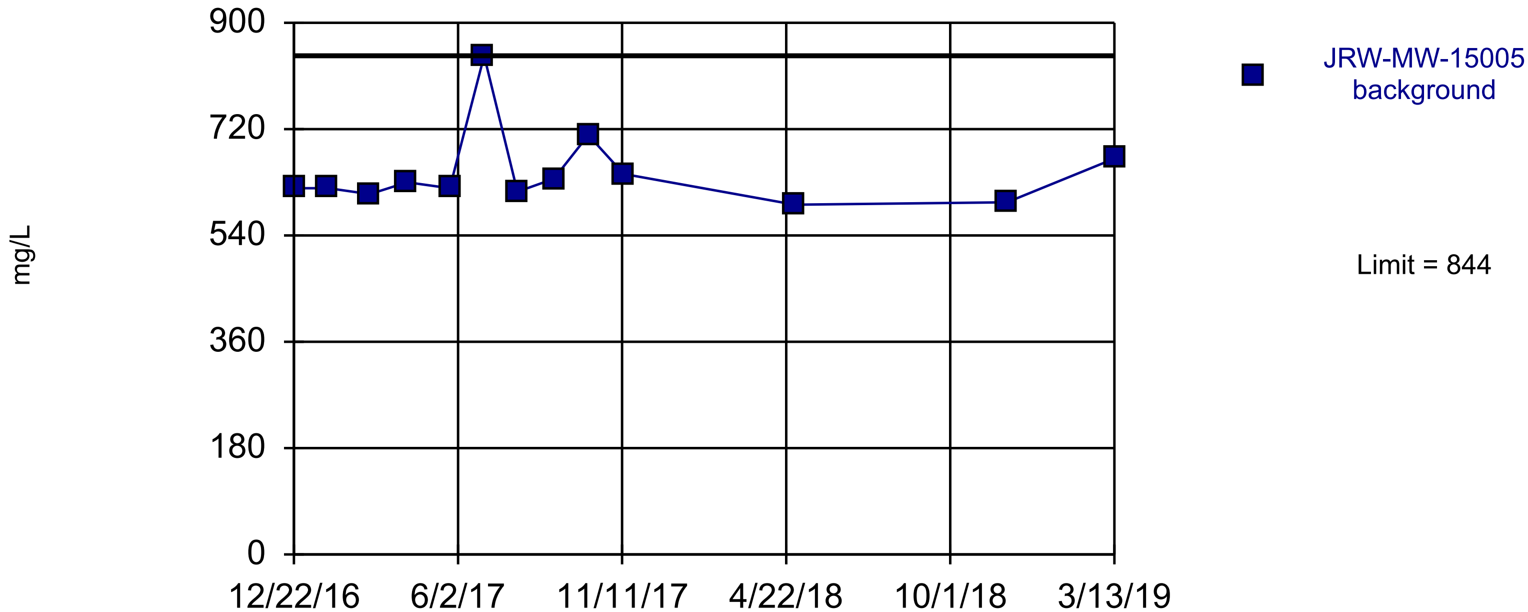
Prediction Limit

Intrawell Non-parametric, JRW-MW-15005



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 13 background values. Report alpha = 0.07143. Assumes 1 future value. Insufficient data to test for seasonality: data were not deseasonalized.

Constituent: Total Dissolved Solids, Total Analysis Run 8/2/2019 2:39 PM

Client: Consumers Energy Data: JRW_Ponds 1_2_Sanitas 19.05.02

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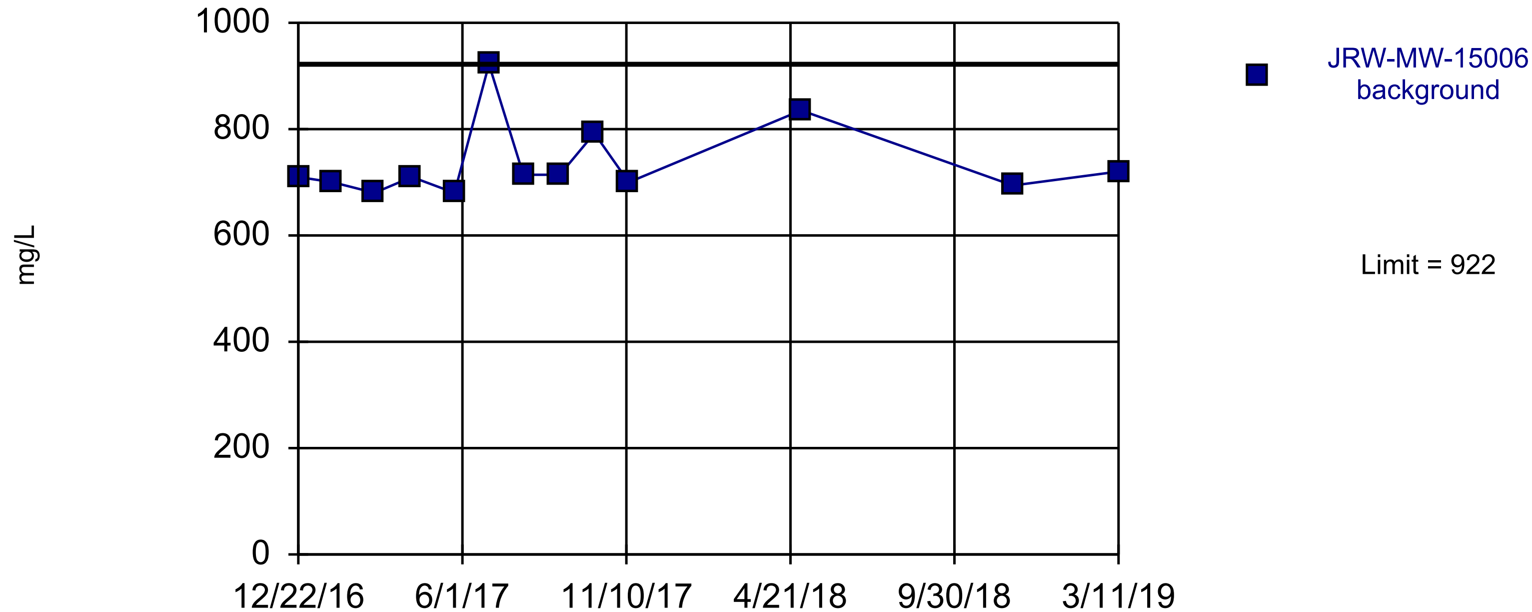
Prediction Limit

Intrawell Non-parametric, JRW-MW-15006



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 13 background values. Report alpha = 0.07143. Assumes 1 future value. Seasonality was not detected with 95% confidence.

Constituent: Total Dissolved Solids, Total   Analysis Run 8/22/2019 3:10 PM

Client: Consumers Energy   Data: JRW_Ponds 1_2_Sanitas 19.05.02

Appendix C
Alternate Source Demonstration

Consumers Energy
Count on Us®

A CMS Energy Company

Date: June 3, 2019

To: Operating Record

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

RE: Alternate Source Demonstration Professional Engineer Certification, §257.94(e)(2)
Former JR Whiting Power Plant, Ponds 1 and 2

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

I hereby certify that the alternative source demonstration presented within this document for the JR Whiting Ponds 1 and 2 CCR unit has been prepared to meet the requirements of Title 40 CFR §257.94(e)(2) of the Federal CCR Rule. This document is accurate and has been prepared in accordance with good engineering practices, including the consideration of applicable industry standards, and with the requirements of Title 40 CFR §257.94(e)(2).

Harold D. Register Jr.

Signature

June 3, 2019

Date of Certification

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

6201056266
Professional Engineer Certification Number

STATE OF MICHIGAN
HAROLD D.
REGISTER, JR.
ENGINEER
No.
6201056266
LICENSED PROFESSIONAL ENGINEER

06/03/2019

ENCLOSURES

TRC (May 2019). "*Alternate Source Demonstration: March 2019 Detection Monitoring Event, Former JR Whiting Power Plant Ponds 1 and 2, Erie, Michigan*"

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Technical Memorandum

Date:	May 21, 2019
To:	Michelle Marion, Consumers Energy Company Harold D. Register, Jr., P.E., Consumers Energy Company
From:	Sarah Holmstrom, TRC Brian Yelen, TRC Vincent Buening, TRC
Cc:	Graham Crockford, TRC
Project No.:	332751.0000 Phase 001, Task 003
Subject:	Alternate Source Demonstration: March 2019 Detection Monitoring Event Former JR Whiting Power Plant Ponds 1 and 2, Erie, Michigan

Introduction

On April 17, 2015, the United States Environmental Protection Agency (USEPA) published the final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA) (the CCR Rule). The CCR Rule, which became effective on October 19, 2015, applies to the Consumers Energy Company (CEC) Ponds 1 and 2 at the JR Whiting Power Plant (the Site).

On March 11 through March 13, 2019, TRC conducted the semiannual detection monitoring event at the JR Whiting (JRW) Ponds 1 and 2 on behalf of CEC in accordance with the requirements of §257.90(e). This event is the fourth semiannual detection monitoring event performed to comply with §257.94. The data collected during detection monitoring events are evaluated to identify statistically significant increases (SSIs) in detection monitoring parameters (Appendix III Part 257 of the CCR Rule) to determine if groundwater concentrations in the detection monitoring well network exceed background levels. Subsequent to the completion of the sampling event, the statistical analysis was performed pursuant to §257.93(f) and (g), and in accordance with the Groundwater Statistical Evaluation Plan (Stats Plan) (TRC, 2017).

The statistical evaluation of the March 2019 Appendix III constituents showed a potential SSI outside the background range for:

- pH at JRW-MW-15005

All other Appendix III constituents were below their respective statistical background limits.

The Stats Plan allows for verification resampling within 30 days of the completion of the initial statistical analysis. However, verification sampling was not performed given the following:

- pH is a field measured parameter and steps were taken in the field at the time of sample collection to confirm the result. During the March 2019 sampling event, the purging procedures outlined in the SAP were followed, the pH meter calibration was double checked, and stabilization of the pH reading and all other field parameters had been achieved at the time the pH result was recorded;
- Temporal independence in the background dataset used to calculate the prediction limits is limited. It is recognized that due to lack of groundwater flow potential at the Site there is limited temporal independence in the background dataset, and due to limitations on CCR Rule implementation timelines, the data sets are of relatively short duration for capturing natural temporal changes in the aquifer that may occur on a seasonal basis;
- pH was the only parameter outside of the statistical background limits (there were no other SSIs for any of the other Appendix III parameters); and
- The pH value of 7.5 standard units (S.U.) is neutral and within the USEPA's established drinking water standards.

In accordance with §257.94(e)(2), CEC may demonstrate that a source other than the CCR unit caused the SSI or that the SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. This Alternate Source Demonstration (ASD) has been prepared to address the potential SSI identified in the March 2019 detection monitoring event and shows, based on the multiple lines of evidence presented below, that the SSI observed in the March 2019 semiannual sampling event cannot be attributed to the JRW Ponds 1 and 2 CCR unit.

Background

The JR Whiting Plant was a coal-fired power generation facility located in Erie, Michigan, on the western shore of Lake Erie (Figure 1). The plant began producing electricity in 1952 from Units 1 and 2, with Unit 3 beginning operation in 1953. The plant ceased operation in April 2016. Figure 1 is a site location map showing the facility and the surrounding area. Site features are shown on Figure 2.

The JR Whiting Ash Disposal Area is in three general locations of the Site and is regulated/licensed under Michigan Part 115 of the Natural Resources and Environmental Protection Act (NREPA), PA 451 of 1994, as amended. Ponds 1 and 2 are located to the east of the plant, north of the discharge canal, south of Erie Road, and west of Lake Erie. Ponds 1 and 2 was constructed in native clay soil and used historically for wet ash sluicing until April 2016.

The subsurface materials encountered at the JR Whiting site are predominately clay-rich till. The surficial CCR fill material is underlain by approximately 40 to 50 feet of laterally extensive clay-rich till that acts as a natural hydraulic barrier across the Site. Limestone bedrock is present beneath the till and is considered the uppermost aquifer at the Site. Groundwater present within the uppermost aquifer is confined and hydraulically isolated from CCR constituents in Ponds 1 and 2 by the overlying clay-rich aquitard. The uppermost aquifer is typically encountered around 50 feet below ground surface (ft bgs) in the limestone (beneath the till).

Potentiometric surface elevation data from groundwater within the CCR monitoring wells exhibit an extremely low hydraulic gradient across the Site with no apparent flow direction. There are minor differences in hydraulic head across the monitoring wells (ranging from zero up to 0.13 feet across Ponds 1 and 2 from event to event from November 2016 through July 2017), indicating that the potentiometric surface is flat the majority of the time. In the few instances since November 2016 where a slight gradient was observed and calculable, the direction of the flow potential was slightly to the northwest (2 events) and to the east (one event).

Given that the hydraulic gradient is often so low, groundwater flow across Ponds 1 and 2 is frequently incalculable and often stagnant. The most pronounced groundwater gradient between November 2016 and November 2018 was observed in December 19, 2016, which showed a slight horizontal gradient of approximately 0.00016 to the northwest across Ponds 1 and 2.

As a result of site-specific geologic and hydrogeologic conditions, downward migration of CCR leachate is not expected. Please refer to the 2017 and 2018 Annual Reports for further details regarding site-specific hydrogeology and groundwater analytical results (TRC, January 2018 and January 2019).

The detection monitoring well network for JRW Ponds 1 and 2 currently consists of six monitoring wells that are screened in the uppermost aquifer as documented in the October 17, 2017, Groundwater Monitoring System Certification, 257.91(f) (CEC, 2017). The monitoring well locations are shown in Figure 2.

Alternate Source Demonstration

The JRW Ponds 1 and 2 data were evaluated and show that the pH SSI value outside of the prediction limit range is not related to the CCR containment ponds but rather is attributed to the natural variability in groundwater quality within the aquifer. Multiple lines of evidence are provided in support of this conclusion and are as follows:

- **Limited background sampling timeline to capture natural variability** – As mentioned above, potentiometric data show that groundwater flow is very low and often stagnant with no apparent groundwater flow direction. Due to the limitations on CCR Rule implementation timelines, the background data collection monitoring events for JR Whiting were timed at a frequency of one to two months apart to ensure the collection of the eight background samples prior to October 17, 2017. Background data are included in the 2017 Annual Groundwater Monitoring Report (TRC, January 2018). Based on this frequency and the general lack of groundwater flow at the Site, it is likely that limited temporal independence is represented in the background data set at this Site. The short duration of the background sampling events limits the ability of the statistical analysis to capture the natural temporal trends in the groundwater quality at JRW. This limited temporal variability can only be corrected with the collection of additional groundwater data, and the inclusion of the additional data in the background data set updated in the future, as long as data continue to show no impacts from the CCR unit.

- **Hydraulic isolation and time of travel analysis** – The clay formation immediately beneath the JRW Ponds 1 and 2 CCR unit provides a natural hydraulic barrier that prevents vertical migration of CCR constituents to the underlying limestone aquifer. Permeameter tests completed on eight samples of the Site clay produced hydraulic conductivity values ranging from 5.5×10^{-9} cm/s to 2.23×10^{-8} cm/s (TRC, December 2018). The vertical extent of the clay layer beneath the CCR unit is shown in cross sections A-A′ and C-C′ respectively (Figures 3 through 5). As presented in detail in the Natural Clay Liner Equivalency Evaluation Report prepared by TRC, the conservatively calculated time of travel for water from the base of the JRW Ponds 1 and 2 to migrate through approximately 35 feet of clay to the underlying uppermost aquifer, is approximately 1,900 years (TRC, December 2018). The JRW Power Plant operated for 64 years between 1952 and ended in 2016. Based on the calculated travel time of 1,900 years, leachate could not have migrated to the upper aquifer within the operational period.

- **pH values are neutral and within the expected range** – Values for pH at JRW-MW-15005 are similar to pH values measured throughout the other Ponds 1 and 2 monitoring wells, other wells onsite located outside of the Ponds 1 and 2 well network, and an off-site US Geological Survey monitoring well, as discussed in detail below. The JRW-MW-15005 pH is also neutral and in the middle of the USEPA's established range of pH drinking water standards (6.5 to 8.5 S.U.) (USEPA, April 2012). The following lines of evidence demonstrate that the pH at JRW-MW-15005 is neutral and within the expected range:

  - The prediction limit calculated for pH at JRW-MW-15005, and the other Ponds 1 and 2 monitoring wells, are based on 8 background sampling events conducted between November 2016 and October 2017. The lower and upper pH prediction limit for JRW-MW-15005 is 7.7 S.U. and 8.4 S.U., respectively, and the minimum lower and maximum upper prediction limit based on the limits calculated for all of the six monitoring wells range from 7.1 S.U. to 9.0 S.U. across the Ponds 1 and 2 well network. The pH values measured at the Ponds 1 and 2 monitoring wells range from a minimum of 7.4 S.U. (measured at JRW-MW-15002 in June 2017) to a maximum of 8.7 S.U. (measured at JRW-MW-15006 in January 2017) based on confirmed data collected at the Ponds 1 and 2 monitoring well network through May 2019. It should be noted that there were additional results from November 2017 and November 2018 that suggest pH values may be even lower in the Ponds 1 and 2 monitoring wells; however, those results were not confirmed through verification sampling conducted subsequent to those sampling events. The pH of 7.5 S.U. at monitoring well JRW-MW-15005 is within the overall Ponds 1 and 2 upper and lower prediction limit range and minimum/maximum pH values as shown on Chart 1.
  - Monitoring wells JRW-MW-16007 through JRW-MW-16008 are located west of Ponds 1 and 2 are currently used for static water level data collection and also provide additional onsite groundwater quality data away from the CCR unit (Figure 2). The pH values from

these wells have similar pH values compared to data from Ponds 1 and 2 wells and fall within the overall Ponds 1 and 2 upper and lower prediction limit range and aforementioned minimum/maximum pH values as shown on Chart 1. This demonstrates that the pH at JRW-MW-15005 is consistent with pH in groundwater across the Site.

  – Previous studies of U.S. Geological Survey well G-32 located in Monroe County show a field pH measurement of 7.1 S.U. and a laboratory measured pH of 7.2 S.U. (USGS, NWIS 2019). This well is located approximately 3 miles west of the Site and is screened in the same geologic unit at a similar depth as the Ponds 1 and 2 monitoring wells. This data further demonstrates that groundwater pH in the upper aquifer is neutral, and the occurrence of a pH of 7.5 S.U. at JRW-MW-15005 is within the expected range of values.

- **No other SSIs identified** – All other Appendix III constituents in groundwater at JRW-MW-15005, and the other remaining Ponds 1 and 2 wells, were below or within their respective prediction limits (Table 1). The lack of SSIs observed for other Appendix III constituents further demonstrates that the March 2019 pH value for JRW-MW-15005 is not related to the CCR unit and the aquifer is unaffected from Ponds 1 and 2 leachate.

Conclusions and Recommendations

Based on the multiple lines of evidence presented above, the SSI observed at JRW-MW-15005 in the March 2019 semiannual sampling event cannot be attributed to the JRW Ponds 1 and 2 CCR unit. The information provided in this report serves as the ASD for the JRW Ponds 1 and 2, was prepared in accordance with 40 CFR 257.94(e)(2) of the CCR Rule, and demonstrates that the pH SSI determined based on the semiannual detection monitoring event performed in March 2019 is not due to a release of CCR leachate into the groundwater. Therefore, based on the information provided in this ASD, CEC will continue detection monitoring as per 40 CFR 257.94 at the Ponds 1 and 2 CCR unit.

In addition, it is recommended that the statistical limits for the Appendix III parameters at the JRW Ponds 1 and 2 monitoring well network be updated to include the additional four rounds of semiannual monitoring data collected and incorporate the additional temporal variability observed subsequent to the initial statistical limit calculations.

References

Consumers Energy Company. October 2017. Groundwater Monitoring System Certification, §257.91(f) JR Whiting Power Plant, Ponds 1&2.

TRC Environmental Corporation. October 2017. Groundwater Statistical Evaluation Plan – Former JR Whiting Power Plant, Ponds 1 and 2, Erie, Michigan. Prepared for Consumers Energy Company.

TRC Environmental Corporation. January 2018. Annual Groundwater Monitoring Report – Former JR Whiting Power Plant, Ponds 1 and 2, Erie, Michigan. Prepared for Consumers Energy Company.

TRC Environmental Corporation. January 2019. 2018 Annual Groundwater Monitoring Report – Former JR Whiting Power Plant, Ponds 1 and 2, Erie, Michigan. Prepared for Consumers Energy Company.

TRC Environmental Corporation. December 2018. Natural Clay Liner Equivalency Report – Six Southeast Michigan Coal Combustion Residual Units. Prepared for DTE Electric Company and Consumers Energy Company.

U.S. Environmental Protection Agency. April 2012. 2012 Edition of the Drinking Water Standards and Health Advisories. EPA 822-S-12-001. Office of Water, U.S. Environmental Protection Agency, Washington, DC. Spring 2012; Date of update: April 2012.

U.S. Geological Survey, 2019, National Water Information System data accessed May 10, 2019, at http://waterdata.usgs.gov/nwis/. April 28, 1992, Monroe County, Michigan, Well G-32.

Attachments

Table 1. Comparison of Appendix III Parameter Results to Background Limits – March 2019

Figure 1. Site Location Map
Figure 2. Site Plan with CCR Monitoring Well Locations
Figure 3. Site Plan with Monitoring Well Locations
Figure 4. Generalized Geologic Cross Section A-A′
Figure 5. Generalized Geologic Cross Sections B-B′ and C-C′

Chart 1. Time Series – Ponds 1 and 2 and Other Onsite Monitoring Wells

Table 1

Table 1

Comparison of Appendix III Parameter Results to Background Limits – March 2019

JR Whiting Ponds 1 & 2 – RCRA CCR Monitoring Program

Erie, Michigan

Sample Location:		JRW-MW-15001			JRW-MW-15002		JRW-MW-15003		JRW-MW-15004		JRW-MW-15005		JRW-MW-15006	
Sample Date:		3/11/2019			3/11/2019		3/11/2019		3/12/2019		3/13/2019		3/11/2019	
Constituent	Unit	Data		PL	Data	PL	Data	PL	Data	PL	Data	PL	Data	PL
Appendix III		Primary	Duplicate											
Boron	ug/L	200	190	251	190	229	210	219	230	271	210	256	210	240
Calcium	mg/L	130	130	182	140	185	110	162	110	143	97	127	110	144
Chloride	mg/L	45	45	54.4	46	54.5	43.0	55.5	46	54.7	43	44.0	44	52.1
Fluoride	ug/L	1,300	1,300	1,560	1,400	1,870	1,400	1,810	1,300	1,860	1,400	1,730	1,300	1,710
pH, Field	SU	7.7	7.7	7.4 - 8.1	7.7	7.3 - 7.8	7.9	7.4 - 8.2	7.5	7.4 - 7.9	**7.5**	7.7 - 8.4	8.0	7.1 - 9.0
Sulfate	mg/L	410	400	469	430	495	380	454	360	389	300	347	370	404
Total Dissolved Solids	mg/L	840	820	974	870	1,020	760	969	730	900	670	844	720	922

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.

Bold font indicates an exceedance of the Prediction Limit (PL) using the number of significant figures in the PL.

RESULT Shading and bold font indicates an exceedance of the PL.

Figures

BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

N

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

0 3,000 6,000 FEET

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

TRC - GIS

PROJECT:

CONSUMERS ENERGY COMPANY
JR WHITING POWER PLANT
ERIE, MICHIGAN

TITLE:

SITE LOCATION MAP

DRAWN BY:	S. MAJOR
CHECKED BY:	B. YELEN
APPROVED BY:	S. HOLMSTROM
DATE:	MAY 2019
PROJ. NO.:	332751
FILE:	332751-001-001slm.mxd

FIGURE 1

LEGEND

MONITORING WELL (STATIC WATER LEVEL ONLY)

CCR UNIT MONITORING WELL

NOTES

1. BASE MAP IMAGERY FROM NEARMAP, 4/12/2017.
2. WELL LOCATIONS SURVEYED BY SHERIDAN SURVEYING CO. ON 11/19/2015.

PROJECT:

CONSUMERS ENERGY COMPANY
JR WHITING POWER PLANT
ERIE, MICHIGAN

TITLE:

SITE PLAN
WITH CCR MONITORING WELL LOCATIONS

DRAWN BY:	S. MAJOR	PROJ NO.:	332751
CHECKED BY:	B. YELEN		
APPROVED BY:	S. HOLMSTROM	FIGURE 2	
DATE:	MAY 2019		

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FILE NO.: 332751-001-002.mxd

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

Plot Date: 5/17/2019, 16:11:24 PM by SMAJOR -- LAYOUT: ANSI B(11"x17")
Path: E:\ConsumersEnergy\CCR_GW\2017_269767\332751-001-002.mxd

LEGEND

MONITORING WELL (STATIC WATER LEVEL ONLY)

CCR UNIT MONITORING WELL

CROSS SECTION LOCATION

NOTES

1. BASE MAP IMAGERY FROM NEARMAP, 4/12/2017.
2. WELL LOCATIONS SURVEYED BY SHERIDAN SURVEYING CO. ON 11/19/2015 AND 11/30/2016.

0 500 1,000 Feet

1 " = 500 '

1:6,000

PROJECT:

CONSUMERS ENERGY COMPANY
JR WHITING POWER PLANT
ERIE, MICHIGAN

TITLE:

SITE PLAN
WITH MONITORING WELL LOCATIONS

DRAWN BY:	S. MAJOR	PROJ NO.:	332751-001
CHECKED BY:	S. HOLMSTROM	FIGURE 3	
APPROVED BY:	V. BUENING		
DATE:	MAY 2019		

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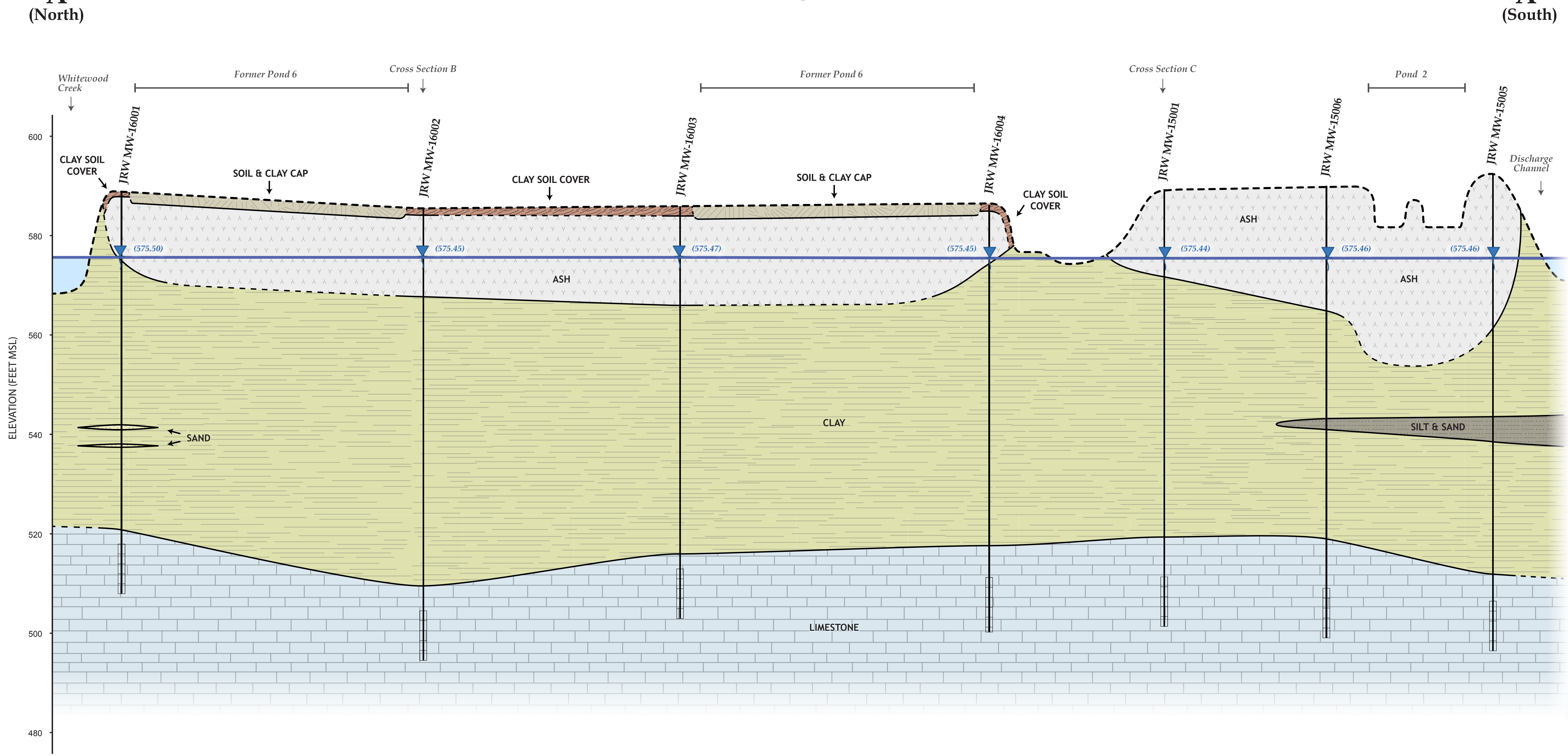
FILE NO.: 332751-001-005.mxd

TRC - GIS

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

Plot Date: 5/21/2019, 11:39:04 AM by SMAJOR -- LAYOUT: ANSI B(11"x17")
Path: E:\ConsumersEnergy\CCR_GW\2017_269767\332751-001-005.mxd

Generalized Geologic Cross Section



LEGEND

GROUND SURFACE PROFILE, DASHED WHERE INFERRED

STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED

APPROXIMATE CONFINED GROUNDWATER POTENTIOMETRIC ELEVATION (JULY 31, 2017)

SOIL UNIT LITHOLOGY

SOIL & CLAY CAP
CLAY SOIL COVER
ASH
CLAY
LIMESTONE
SILT & SAND
SAND

WELL BOREHOLE
WELL SCREEN

Horizontal Scale: 1" = 300'
Vertical Scale: 1" = 20'
15x Vertical Exaggeration
(Scale is Approximate)

20 10 0
0 150 300

NOTES

1. FEATURE LOCATIONS AND SCALE ARE APPROXIMATE.
2. CROSS SECTION BASED UPON INFORMATION FROM ASH POND MATERIAL CHARACTERIZATION (GOLDER, 2016), SUMMARY OF MONITORING WELL DESIGN, INSTALLATION, AND DEVELOPMENT (ARCADIS, 2016), AND 2016 MONITORING WELL DESIGN, INSTALLATION, DEVELOPMENT, AND DECOMISSIONING (TRC, 2016).

PROJECT:
CONSUMERS ENERGY COMPANY
JR WHITING POWER PLANT
ERIE, MICHIGAN

TITLE:
GENERALIZED GEOLOGIC CROSS SECTION A-A'

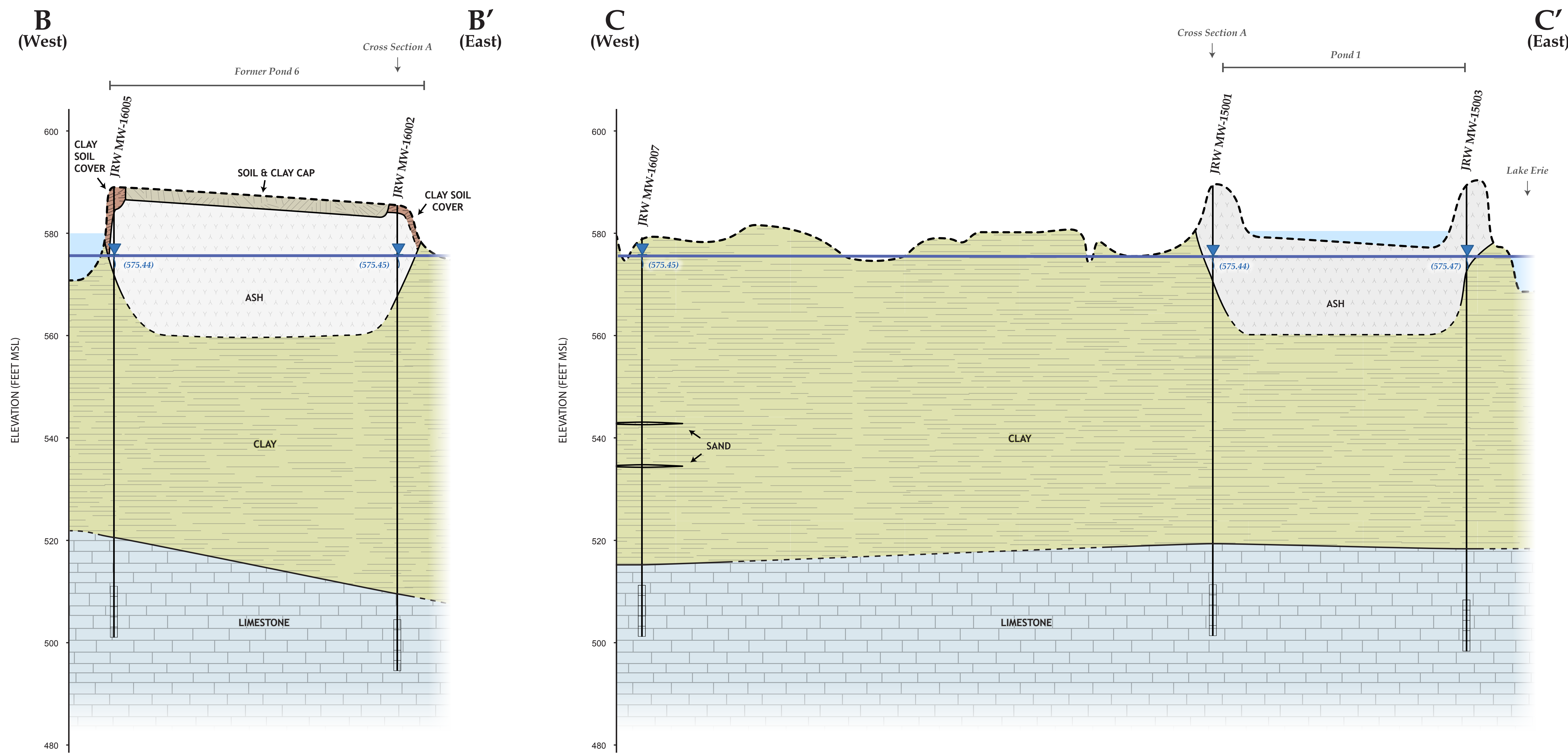
DRAWN BY:	S.MAJOR	PROJ NO.:	332751
CHECKED BY:	S. HOLMSTROM	FIGURE 4	
APPROVED BY:	V. BUENING		
DATE:	MAY 2019		

TRC
1540 Eisenhower Place
Ann Arbor, MI 48108
Phone: 734.971.7080

FILE NO.: 332751-001-ai01

File Path: E:\WI_DOT\2015_229576\AI\269767-004-ai01.ai

Generalized Geologic Cross Sections



LEGEND

GROUND SURFACE PROFILE, DASHED WHERE INFERRED

STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED

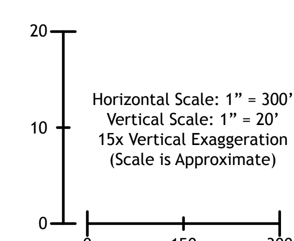
APPROXIMATE CONFINED GROUNDWATER POTENTIOMETRIC ELEVATION (JULY 31, 2017)

SOIL UNIT LITHOLOGY

- SOIL & CLAY CAP
- CLAY SOIL COVER
- ASH
- CLAY
- LIMESTONE
- SAND

WELL BOREHOLE

WELL SCREEN



Horizontal Scale: 1" = 300'
Vertical Scale: 1" = 20'
15x Vertical Exaggeration
(Scale is Approximate)

NOTES

1. FEATURE LOCATIONS AND SCALE ARE APPROXIMATE.
2. CROSS SECTION BASED UPON INFORMATION FROM ASH POND MATERIAL CHARACTERIZATION (GOLDER, 2016), SUMMARY OF MONITORING WELL DESIGN, INSTALLATION, AND DEVELOPMENT (ARCADIS, 2016), AND 2016 MONITORING WELL DESIGN, INSTALLATION, DEVELOPMENT, AND DECOMISSIONING (TRC, 2016).

PROJECT:
CONSUMERS ENERGY COMPANY
JR WHITING POWER PLANT
ERIE, MICHIGAN

TITLE:
GENERALIZED GEOLOGIC CROSS SECTIONS B-B' AND C-C'

DRAWN BY:	S.MAJOR	PROJ NO.:	332751
CHECKED BY:	S. HOLMSTROM	FIGURE 5	
APPROVED BY:	V. BUENING		
DATE:	MAY 2019		

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Phone: 734.971.7080

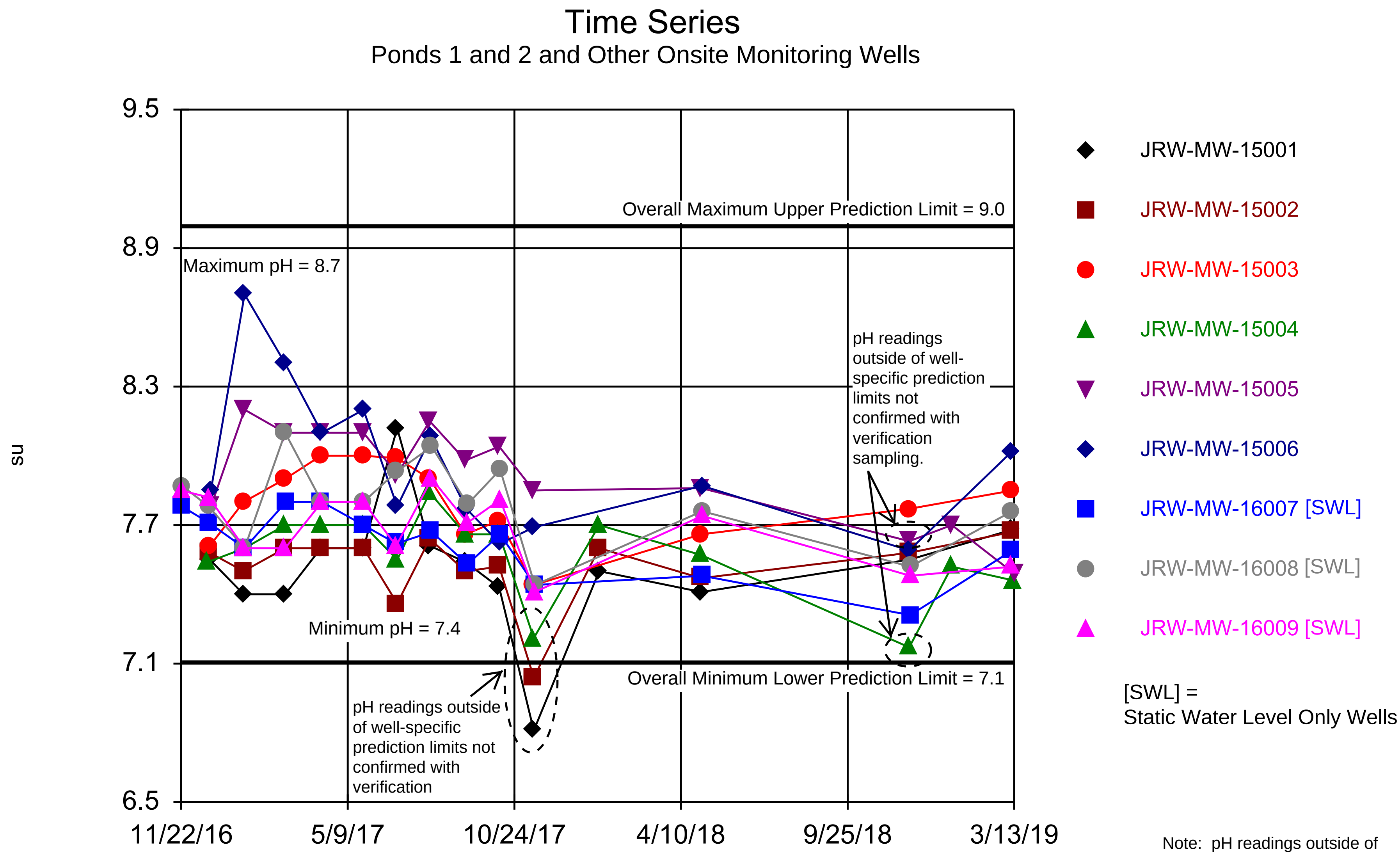
FILE NO.: 322751-001-ai02.ai

File Path: E:\WI_DOT\2015_229576\AI\322751-001-ai02.ai

Chart 1

CHART 1

Sanitas™ v.9.6.14 Sanitas software licensed to Consumers Energy.



Note: pH readings outside of established prediction limits that were not confirmed with verification sampling will be re-evaluated during the next statistical limit update.

Constituent: pH, Field   Analysis Run 5/21/2019 2:29 PM

Client: Consumers Energy   Data: JRW_Ponds 1_2_Sanitas 19.05.02