Annual Groundwater Monitoring Report

DTE Electric Company
Monroe Power Plant Fly Ash Basin
Coal Combustion Residual Unit

7955 East Dunbar Road
Monroe, Michigan

January 2018

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Prepared For
DTE Electric Company

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Executive Summary

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

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

Potential SSIs over background limits were noted for pH in one or more downgradient wells for the September 2017 monitoring event. This is the initial detection monitoring event; therefore, it is the initial identification of a SSI over background levels. Based on the hydrogeology at the Site, with the presence of the clay-rich confining till beneath the MONPP FAB CCR unit, it is not possible for the uppermost aquifer to have been affected by CCR from operations. Due to limitations on CCR Rule implementation timelines, the background data sets are of relatively short duration for capturing the occurrence of natural temporal changes in the aquifer.

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 pH SSIs over background limits noted during the September 2017 monitoring event, DTE Electric plans to collect a resample for each of the potential SSIs and prepare an Alternative Source Demonstration (ASD) to evaluate the SSIs. The SSI is likely the result of temporal variability that was not captured in the background data set, given the short duration of time that the background data set was collected, but this will be further evaluated during the ASD process.

Section 1
Introduction

1.1 Program Summary

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

TRC Engineers Michigan, Inc., the engineering entity of TRC Environmental Corporation (TRC), prepared this Annual Groundwater Monitoring Report (Annual Report) for the MONPP FAB CCR unit on behalf of DTE Electric. This Annual Report was prepared in accordance with the requirements of §257.90(e) and presents the monitoring results and the statistical evaluation of the detection monitoring parameters (Appendix III to Part 257 of the CCR Rule) for the September 2017 semiannual groundwater monitoring event for the MONPP FAB CCR unit. This event is the initial detection monitoring event performed to comply with §257.94. The monitoring was performed in accordance with the *CCR Groundwater Monitoring and Quality Assurance Project Plan – DTE Electric Company Monroe Power Plant Coal Combustion Residual Fly Ash Basin* (QAPP) (TRC, August 2016; revised March 2017) and statistically evaluated per the *Groundwater Statistical Evaluation Plan – Monroe Power Plant Coal Combustion Residual Fly Ash Basin* (Stats Plan) (TRC, October 2017). As part of the statistical evaluation, the data collected during detection monitoring events are evaluated to identify statistically significant increases (SSIs) of detection monitoring parameters compared to background levels.

1.2 Site Overview

The MONPP is located in Section 16, Township 7 South, Range 9 East, at 7955 East Dunbar Road, Monroe in Monroe County, Michigan (Figure 1). The MONPP FAB is located about one mile southwest of the MONPP at latitude 41° 53' 03" North and longitude 83° 22' 31" West. The MONPP FAB is bounded by Dunbar Road and Plum Creek to the north and northeast, Interstate 75 to the northwest, a 200-acre peninsula into Lake Erie to the east and southeast, Lake Erie to the south and a large open field to the southwest (Figure 2).

The property has been used continuously for the operation of the MONPP FAB since approximately 1975 and is constructed over a natural clay-rich soil base. The MONPP FAB and landfill is a Type III solid waste disposal facility owned by DTE Electric, which currently accepts coal ash from DTE Electric's MONPP. The MONPP FAB is operated in accordance with Michigan Part 115 of the Natural Resources and Environmental Protection Act (NREPA), PA 451 of 1994, as amended, and the current operating license number 9393.

1.3 Geology/Hydrogeology

The MONPP FAB CCR unit is located within 200 feet southwest of Plum Creek and immediately north of Lake Erie. The MONPP FAB CCR unit uppermost aquifer consists of saturated limestone present beneath at least 37 feet and up to 53.5 feet of thick contiguous silty clay-rich soil that serves as a natural confining hydraulic barrier that isolates the underlying uppermost aquifer. The limestone bedrock aquifer is artesian in every location except MW-16-01, where the static water level was approximately 1 to 2 feet below ground surface (ft bgs).

Potentiometric groundwater elevation data collected in 2016 and 2017 suggest that there is horizontal groundwater flow potential within the upper aquifer unit generally to the northeast towards Plum Creek. The average hydraulic gradient to the northeast is on the order of 0.002 foot/foot along the eastern part of the MONPP FAB to 0.004 to 0.005 foot/foot in the center and northwestern part of the FAB, with an overall mean of 0.004 foot/foot.

The surface water elevation within the FAB raised surface impoundment is at least 5 to more than 30 feet above the potentiometric surface elevations in the uppermost aquifer limestone, and more than 60 feet above the base of the underlying clay-rich confining unit that isolates groundwater within the limestone aquifer. Therefore, flow potential from the CCR unit to the surrounding area would be radially outward from the FAB. However, there is no hydraulic communication between the uppermost aquifer and the FAB due to the continuous silty clay-rich confining unit beneath the MONPP FAB. Based on the artesian conditions, the low permeability of the underlying natural soils, and the calculated time of travel for groundwater to flow vertically from the FAB to the uppermost aquifer, it is not possible for the uppermost aquifer to have been affected by CCR from FAB operations that began in 1975.

The MONPP FAB CCR unit will use intrawell statistical methods because the saturated unit being monitored is isolated by a laterally contiguous silty clay unit which significantly impedes vertical groundwater flow thus preventing the monitored saturated zone from potentially being affected by CCR. In addition, the flow potential of liquid within the FAB is radially outward relative to the uppermost aquifer due to the elevation water is maintained within the FAB CCR unit. Based on these hydrogeologic conditions, intrawell statistical approaches are likely a more appropriate method to evaluate groundwater data statistically. Consequently, intrawell statistical tests will be used during detection monitoring as outlined in the Stats Plan.

Section 2
Groundwater Monitoring

2.1 Monitoring Well Network

A groundwater monitoring system has been established for the MONPP FAB CCR unit as detailed in the *Groundwater Monitoring System Summary Report – Monroe Power Plant Coal Combustion Residual Fly Ash Basin* (GWMS Report) (TRC, October 2017). The detection monitoring well network for the MONPP FAB CCR unit currently consists of seven monitoring wells that are screened in the uppermost aquifer. The monitoring well locations are shown on Figure 2.

As discussed in the Stats Plan, intrawell statistical methods for MONPP FAB were selected based on the geology and hydrogeology at the Site (primarily the presence of clay/hydraulic barrier and the hydraulic separation between the CCR unit and underlying uppermost 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). 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 MW-16-01 through MW-16-07 are located around the perimeter of the MONPP FAB and provide data on both background and downgradient groundwater quality that has not been affected by the CCR unit (total of seven background/downgradient monitoring wells).

2.2 Background Sampling

Background groundwater monitoring was conducted at the MONPP FAB CCR unit from August 2016 through July 2017 in accordance with the QAPP. Data collection included eight background data collection events of static water elevation measurements, analysis for parameters required in the CCR Rule's Appendix III and Appendix IV to Part 257, and field parameters (dissolved oxygen, oxidation reduction potential, pH, specific conductivity, temperature, and turbidity) from all seven monitoring wells installed for the MONPP FAB CCR unit. The groundwater samples were analyzed by TestAmerica Laboratories, Inc. (TestAmerica).

Background data are included in Appendix A Tables 1 through 3, where: Table 1 is a summary of static water elevation data; Table 2 is a summary of groundwater analytical data compared to potentially relevant criteria; and Table 3 is a summary of field data. In addition to the data tables, groundwater potentiometric elevation data are summarized for each background monitoring event in Appendix A Figures 1 through 8.

2.3 Semiannual Groundwater Monitoring

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

2.3.1 Data Summary

The initial semiannual groundwater detection monitoring event for 2017 was performed during September 18 and 19, 2017, by TRC personnel and samples were analyzed by TestAmerica in accordance with the QAPP. Static water elevation data were collected at all seven monitoring well locations. Groundwater samples were collected from the seven detection monitoring wells for the Appendix III indicator parameters and field parameters. A summary of the groundwater data collected during the September 2017 event is provided on Table 1 (static groundwater elevation data), Table 2 (analytical results), and Table 3 (field data).

2.3.2 Data Quality Review

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

2.3.3 Groundwater Flow Rate and Direction

Groundwater elevation data collected during the most recent background sampling events showed that groundwater within the uppermost aquifer generally flows to the northeast across the Site. Groundwater potentiometric surface elevations measured across the Site during the September 2017 sampling event are provided on Table 1 and were used to construct a groundwater potentiometric surface map (Figure 3).

The map indicates that current groundwater flow is consistent with previous monitoring events. The average hydraulic gradient throughout the Site during this event is estimated at 0.004 ft/ft. Resulting in an estimated average seepage velocity of approximately 0.18 ft/day or 66 ft/year for this event, using the average hydraulic conductivity of 5 ft/day (TRC, 2017) and an assumed effective porosity of 0.1.

The general flow direction is similar to that identified in previous monitoring rounds and continues to demonstrate that the downgradient wells are appropriately positioned to detect the presence of Appendix III parameters that could potentially migrate from the MONPP FAB CCR unit.

Section 3
Statistical Evaluation

3.1 Establishing Background Limits

Per the Stats Plan, background limits were established for the Appendix III indicator parameters following the collection of at least eight background monitoring events using data collected from each of the seven established detection monitoring wells (MW-16-01 through MW-16-07). The statistical evaluation of the background data is presented in detail in Appendix C. 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 MONPP FAB CCR unit by comparing concentrations in the detection monitoring wells to their respective background limits for each Appendix III indicator parameter.

3.2 Data Comparison to Background Limits

The concentrations of the indicator parameters in each of the detection monitoring wells (MW-16-01 through MW-16-07) were compared to their respective statistical background limits calculated from the background data collected from each individual well (i.e., monitoring data from MW-16-01 is compared to the background limit developed using the background dataset from MW-16-01, and so forth). The comparisons are presented on Table 4.

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

- pH at MW-16-06 and MW-16-07.

There were no SSIs compared to background for boron, calcium, chloride, fluoride, sulfate or TDS.

Section 4
Conclusions and Recommendations

Potential SSIs over background limits were noted for pH in one or more downgradient wells during the September 2017 monitoring event. This is the initial detection monitoring event; therefore, it is the initial identification of a potential SSI over background levels. As discussed above, and in the GWMS Report, based on the artesian conditions, the low permeability of the underlying natural soils, and the calculated time of travel for groundwater to flow vertically from the MONPP FAB to the uppermost aquifer, it is not possible for the uppermost aquifer to have been affected by CCR from FAB operations that began in 1975. Due to limitations on CCR Rule implementation timelines, the background data sets are of relatively short duration for capturing the occurrence of natural temporal changes in the aquifer. 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 maximum contaminant level (MCL) pH range of 6.5 to 8.5 standard units (SU) for drinking water (USEPA, 2012).

According to §257.94(e), in the event that the facility determines, pursuant to §257.93(h), that there is a SSI over background levels for one or more of the Appendix III constituents, the facility will, within 90 days of detecting a SSI, establish an assessment monitoring program **<or>** demonstrate that:

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

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

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

In response to the potential SSIs over background limits noted for the September 2017 monitoring event, DTE Electric plans to collect a resample for each of the potential SSIs and prepare an ASD

within 90-days to evaluate the SSIs. The SSI is likely the result of temporal variability that was not captured in the background data set, given the short duration of time that the background data set was collected, but this will be further evaluated during the ASD process.

No corrective actions were performed in 2017. The next semiannual monitoring event at the MONPP FAB is scheduled for the second calendar quarter of 2018.

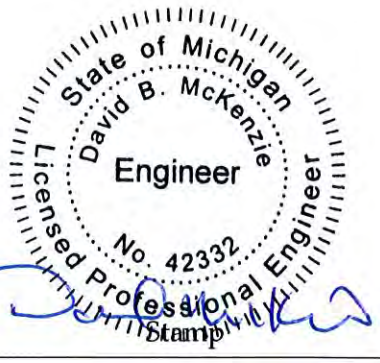
Section 5
Groundwater Monitoring Report Certification

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

Annual Groundwater Monitoring Report Certification
Monroe Power Plant Fly Ash Basin
Monroe, Michigan

CERTIFICATION

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

Name: David B. McKenzie, P.E.	Expiration Date: October 31, 2019	
Company: TRC Engineers Michigan, Inc.	Date: 1/30/18	

Section 6
References

TRC Environmental Corporation. August 2016; Revised March 2017. CCR Groundwater Monitoring and Quality Assurance Project Plan – DTE Electric Company Monroe Power Plant Coal Combustion Residual Fly Ash Basin, 7955 East Dunbar Road, Monroe, Michigan. Prepared for DTE Electric Company.

TRC Environmental Corporation. October 2017. Groundwater Monitoring System Summary Report – Monroe Power Plant Coal Combustion Residual Fly Ash Basin, 7955 East Dunbar Road, Monroe, Michigan. Prepared for DTE Electric Company.

TRC Environmental Corporation. October 2017. Groundwater Statistical Evaluation Plan – Monroe Power Plant Coal Combustion Residual Fly Ash Basin, 7955 East Dunbar Road, Monroe, Michigan. Prepared for DTE Electric 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.

Tables

Table 1
Groundwater Elevation Summary – September 2017
Monroe Fly Ash Basin – RCRA CCR Monitoring Program
Monroe, Michigan

Well ID	MW-16-01		MW-16-02		MW-16-03		MW-16-04		MW-16-05		MW-16-06		MW-16-07	
Date Installed	2/17/2016		2/18/2016		2/16/2016		2/15/2016		4/13/2016		4/13/2016		4/14/2016	
TOC Elevation	581.74		581.81		579.95		585.54		583.25		581.94		578.40	
Geologic Unit of Screened Interval	Silt/Limestone Interface		Silt/Limestone Interface		Sand & Silty Clay Limestone Interface		Silty Sand and Gravel		Limestone		Gravel and Cobbles		Silt/Limestone Interface	
Screened Interval Elevation	530.9 to 525.9		526.4 to 521.4		540.3 to 535.3		541.6 to 536.6		540.5 to 535.5		534.2 to 529.2		540.4 to 535.4	
Unit	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft
Measurement Date	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation
9/19/2017	5.07	576.67	-1.35	583.16	-8.93	588.88	-11.40	596.94	-10.60	593.85	0.83	581.11	-5.45	583.85

Notes:

Negative depth to water measurement indicates artesian conditions, actual measured water level is above the top of casing.

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

ft BTOC - feet below top of casing

Table 2
Summary of Groundwater Analytical Data – September 2017
Monroe Power Plant Fly Ash Basin – RCRA CCR Monitoring Program
Monroe, Michigan

Sample Location:		MW-16-01	MW-16-02	MW-16-03	MW-16-04	MW-16-05	MW-16-06	MW-16-07
Sample Date:		9/18/2017	9/18/2017	9/19/2017	9/19/2017	9/19/2017	9/18/2017	9/19/2017
Constituent	Unit							
Appendix III								
Boron	ug/L	270	420	460	170	250	340	200
Calcium	ug/L	380,000	390,000	400,000	530,000	390,000	380,000	370,000
Chloride	mg/L	11	13	18	34	11	11	7.8
Fluoride	mg/L	1.8	1.6	1.5	1.0	1.5	1.6	1.5
pH	SU	6.9	7.0	6.9	7.0	6.9	6.9	6.8
Sulfate	mg/L	1,500	1,500	1,500	1,300	1,400	1,500	1,400
Total Dissolved Solids	mg/L	2,200	2,300	2,300	2,100	2,100	2,300	2,100

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.

Table 3
Summary of Field Parameters – September 2017
Monroe Power Plant Fly Ash Basin – RCRA CCR Monitoring Program
Monroe, Michigan

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (SU)	Specific Conductivity (umhos/cm)	Temperature (deg C)	Turbidity (NTU)
MW-16-01	9/18/2017	0.41	-4.6	6.9	2,343	13.76	2.27
MW-16-02	9/18/2017	0.06	6.4	7.0	2,410	12.36	3.69
MW-16-03	9/19/2017	0.07	-11.9	6.9	2,476	12.74	11.1
MW-16-04	9/19/2017	0.15	-109.6	7.0	2,361	11.79	1.04
MW-16-05	9/19/2017	0.09	-20.0	6.9	2,319	12.16	4.01
MW-16-06	9/18/2017	0.46	-11.0	6.9	2,367	14.08	11.5
MW-16-07	9/19/2017	0.06	-21.0	6.8	2,317	12.71	1.79

Notes:

mg/L - milligrams per liter.

mV - milliVolt.

SU - standard unit.

umhos/cm - micro-mhos per centimeter.

deg C - degrees celcius.

NTU - nephelometric turbidity units.

Table 4
Comparison of Appendix III Parameter Results to Background Limits – September 2017
Monroe Power Plant Fly Ash Basin – RCRA CCR Monitoring Program
Monroe, Michigan

Sample Location:		MW-16-01		MW-16-02		MW-16-03		MW-16-04		MW-16-05		MW-16-06		MW-16-07	
Sample Date:		9/18/2017		9/18/2017		9/19/2017		9/19/2017		9/19/2017		9/18/2017		9/19/2017	
Constituent	Unit	Data	PL	Data	PL	Data	PL	Data	PL	Data	PL	Data	PL	Data	PL
Appendix III															
Boron	ug/L	270	310	420	470	460	510	170	210	250	280	340	400	200	280
Calcium	ug/L	380,000	450,000	390,000	430,000	400,000	490,000	530,000	610,000	390,000	440,000	380,000	420,000	370,000	440,000
Chloride	mg/L	11	14	13	15	18	20	34	39	11	12	11	12	7.8	13
Fluoride	mg/L	1.8	2.1	1.6	1.8	1.5	1.8	1.0	1.1	1.5	1.7	1.6	1.8	1.5	1.8
pH, Field	SU	6.9	6.3 - 9.0	7.0	6.9 - 7.3	6.9	6.7 - 7.3	7.0	7.0 - 7.5	6.9	6.6 - 7.7	**6.9**	7.0 - 7.3	**6.8**	6.9 - 7.4
Sulfate	mg/L	1,500	1,500	1,500	1,700	1,500	1,700	1,300	1,500	1,400	1,600	1,500	1,600	1,400	1,600
Total Dissolved Solids	mg/L	2,200	2,200	2,300	2,300	2,300	2,300	2,100	2,200	2,100	2,200	2,300	2,300	2,100	2,200

Notes:

ug/L - micrograms per liter.

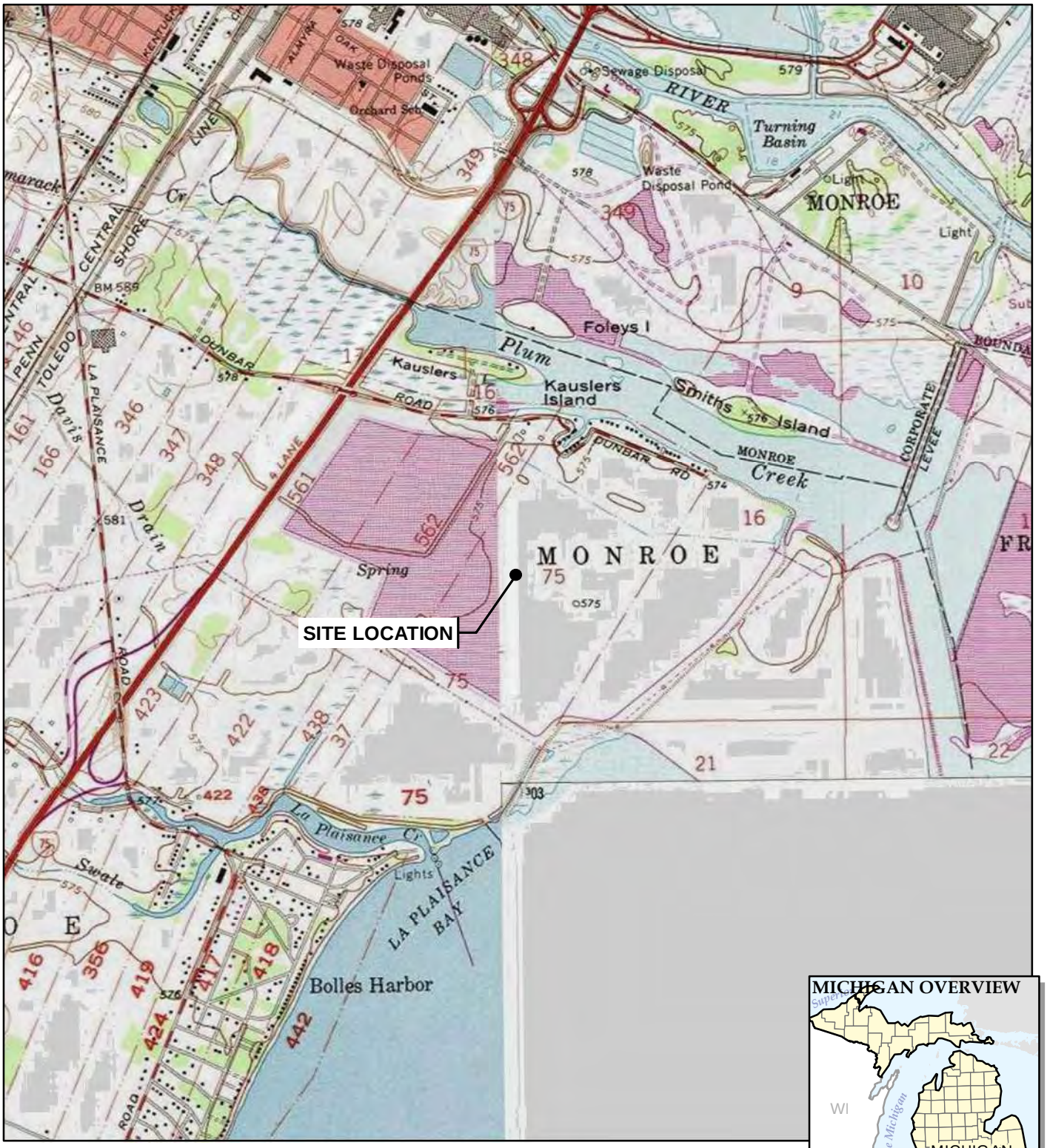
mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

All metals were analyzed as total unless otherwise specified.

RESULT Shading and bold font indicates an exceedance of the Prediction Limit (PL).

Figures



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

N

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

0 2,000 4,000
FEET

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

PROJECT:
DTE ELECTRIC COMPANY
MONROE POWER PLANT
7955 EAST DUNBAR ROAD
MONROE, MICHIGAN

TITLE:
SITE LOCATION MAP

DRAWN BY:	J. PAPEZ
CHECKED BY:	S HOLMSTROM
APPROVED BY:	V. BUENING
DATE:	OCTOBER 2017
PROJ. NO.:	265996.0001
FILE:	265996-SLMMB.mxd

FIGURE 1

E:\DTE\CCR_Sites\2017_265996\265996-SLMMB.mxd -- Saved By: BDEEGAN on 10/9/2017, 14:49:39 PM

LEGEND

- MONITORING WELLS
- APPROXIMATE BOUNDARY OF FLY ASH BASIN

NOTES

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

0 600 1,200 Feet

1 " = 600 '

1:7,200

PROJECT:

DTE ELECTRIC COMPANY
MONROE POWER PLANT FLY ASH BASIN
7955 EAST DUNBAR ROAD
MONROE, MICHIGAN

TITLE:

MONITORING NETWORK AND SITE PLAN

DRAWN BY:	J. PAPEZ	PROJ NO.:	265996.0001
CHECKED BY:	S. HOLMSTROM		
APPROVED BY:	V. BUENING		**FIGURE 2**
DATE:	JANUARY 2018		

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Ann Arbor, MI 48108-3284
Phone: 734.971.7080
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FILE NO.: 265996-0001-000.mxd

TRC - GIS
Coordinate System: NAD 1983 UTM Zone 17N (Meter)
Map Rotation: 0
Plot Date: 1/29/2018, 09:45:57 AM by SMAJOR – LAYOUT: ANSI B (11"x17")
Path: E:\DTE\CCR_Sites\2017_265996\265996-0001-000.mxd

LEGEND

- MONITORING WELL
- APPROXIMATE BOUNDARY OF FLY ASH BASIN
- INFERRED GROUNDWATER FLOW DIRECTION
- POTENTIOMETRIC SURFACE CONTOUR LINE (5-FT INTERVAL,DASHED WHERE INFERRED)
- (582.69) STATIC WATER ELEVATION IN FEET (NAVD, 1988)

NOTES

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

0 600 1,200 Feet

1 " = 600 '

1:7,200

PROJECT:
DTE ELECTRIC COMPANY
MONROE POWER PLANT FLY ASH BASIN
7955 EAST DUNBAR ROAD
MONROE, MICHIGAN

TITLE:
POTENTIOMETRIC SURFACE MAP
SEPTEMBER 2017

DRAWN BY:	S MAJOR	PROJ NO.:	265996.0001
CHECKED BY:	C. SCIESZKA		
APPROVED BY:	V. BUENING		FIGURE 3
DATE:	JANUARY 2018		

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

FILE NO.: 265996-0001-011a.mxd

TRC - GIS
Coordinate System: NAD 1983 UTM Zone 17N (Meter)
Map Rotation: 0
Plot Date: 1/12/2018, 08:54:41 AM by SMAJOR -- LAYOUT: ANSI B(11"x17")
Path: E:\DTE\CCR_Sites\2017_265996\265996-0001-011a.mxd

Appendix A
Background Data

Table 1
Groundwater Elevation Summary
Monroe Fly Ash Basin – RCRA CCR Monitoring Program
Monroe, Michigan

Well ID	MW-16-01		MW-16-02		MW-16-03		MW-16-04		MW-16-05		MW-16-06		MW-16-07	
Date Installed	2/17/2016		2/18/2016		2/16/2016		2/15/2016		4/13/2016		4/13/2016		4/14/2016	
TOC Elevation	581.74		581.81		579.95		585.54		583.25		581.94		578.40	
Geologic Unit of Screened Interval	Silt/Limestone Interface		Silt/Limestone Interface		Sand & Silty Clay Limestone Interface		Silty Sand and Gravel		Limestone		Gravel and Cobbles		Silt/Limestone Interface	
Screened Interval Elevation	530.9 to 525.9		526.4 to 521.4		540.3 to 535.3		541.6 to 536.6		540.5 to 535.5		534.2 to 529.2		540.4 to 535.4	
Unit	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft
Measurement Date	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation
8/8/2016	5.62	576.12	-0.68	582.49	-7.40	587.35	-10.50	596.04	-8.18	591.43	1.50	580.44	-4.90	583.30
9/26/2016	5.45	576.29	-1.26	583.07	-7.97	587.92	-11.50	597.04	-9.90	593.15	1.13	580.81	-5.85	584.25
11/14/2016	4.92	576.82	-2.00	583.81	-10.60	590.55	-15.00	600.54	-11.80	595.05	0.17	581.77	-6.80	585.20
1/17/2017	4.74	577.00	-3.10	584.91	-11.30	591.25	-16.20	601.74	-13.15	596.40	-0.60	582.54	-7.40	585.80
3/6/2017	4.76	576.98	-3.35	585.16	-11.10	591.05	-16.85	602.39	-13.60	596.85	-0.85	582.79	-8.20	586.60
4/25/2017	4.63	577.11	-3.72	585.53	-11.90	591.85	-17.72	603.26	-13.95	597.20	-1.05	582.99	-8.10	586.50
6/12/2017	4.90	576.84	-2.70	584.51	-10.80	590.75	-15.50	601.04	-12.50	595.75	-0.35	582.29	-13.00	591.40
7/17/2017	4.94	576.80	-2.30	584.11	-10.40	590.35	-15.10	600.64	-12.40	595.65	0.00	581.94	-8.10	586.50

Notes:

Negative depth to water measurement indicates artesian conditions, actual measured water level is above the top of casing.

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

ft BTOC - feet below top of casing

Table 2
Summary of Groundwater Analytical Data
Monroe Power Plant Fly Ash Basin – RCRA CCR Monitoring Program
Monroe, Michigan

Sample Location:		MW-16-01										
Sample Date:		8/8/2016	8/8/2016	9/27/2016	11/14/2016	1/17/2017	3/6/2017	3/6/2017	4/26/2017	6/13/2017	6/13/2017	7/17/2017
Constituent	Unit		Field Dup					Field Dup			Field Dup	
Appendix III												
Boron	ug/L	240	250	240	280	240	300	250	270	260	260	290
Calcium	ug/L	320,000	330,000	340,000	410,000	350,000	360,000	370,000	390,000	410,000	400,000	410,000
Chloride	mg/L	9.9	12	8.8	< 10	10	10	10	11	12	11	11
Fluoride	mg/L	1.1	0.86	1.4	1.4	1.2	1.7	1.7	1.8	1.8	1.7	1.7
pH	SU	8.3	8.2	7.8	7.7	7.5	7.8	7.5	7.3	7.3	7.3	7.3
Sulfate	mg/L	1,400	1,500	1,500	1,500	1,400	1,300	1,300	1,400	1,400	1,400	1,400
Total Dissolved Solids	mg/L	2,100	2,100	2,000	2,000	2,200	2,100	2,100	2,100	2,100	2,100	2,100
Appendix IV												
Antimony	ug/L	< 2.0	< 2.0	< 2.0	2.1	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Arsenic	ug/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Barium	ug/L	20	23	19	16	16	15	15	15	14	15	15
Beryllium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium	ug/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Cobalt	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Fluoride	mg/L	1.1	0.86	1.4	1.4	1.2	1.7	1.7	1.8	1.8	1.7	1.7
Lead	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	76	77	77	77	65	63	66	78	67	65	64
Mercury	ug/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Radium-226	pCi/L	0.359	0.236	0.251	< 0.365	0.430	0.334	0.328	0.325	0.328	0.268	0.372
Radium-226/228	pCi/L	< 0.391	0.465	0.497	0.852	0.668	0.649	0.634	< 0.367	0.722	0.511	0.852
Radium-228	pCi/L	< 0.391	< 0.371	< 0.478	< 0.569	< 0.392	< 0.406	< 0.368	< 0.367	0.395	< 0.295	0.480
Selenium	ug/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Thallium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units.
pCi/L - picocuries per liter.
All metals were analyzed as total unless otherwise specified.

Table 2
Summary of Groundwater Analytical Data
Monroe Power Plant Fly Ash Basin – RCRA CCR Monitoring Program
Monroe, Michigan

Sample Location:		MW-16-02									
Sample Date:		8/9/2016	9/27/2016	11/15/2016	11/15/2016	1/17/2017	3/7/2017	4/25/2017	4/25/2017	6/12/2017	7/18/2017
Constituent	Unit				Field Dup				Field Dup		
Appendix III											
Boron	ug/L	360	370	460	450	400	410	410	400	410	420
Calcium	ug/L	400,000	410,000	410,000	400,000	390,000	390,000	420,000	410,000	430,000	400,000
Chloride	mg/L	13	11	12	12	13	13	14	14	14	13
Fluoride	mg/L	1.5	1.5	1.4	1.4	1.4	1.7	1.7	1.7	1.6	1.6
pH	SU	7.2	7.1	7.2	7.5	7.1	7.4	7.2	7.1	7.2	7.1
Sulfate	mg/L	1,600	1,600	1,600	1,600	1,500	1,400	1,600	1,500	1,500	1,500
Total Dissolved Solids	mg/L	2,200	2,200	2,200	2,200	2,300	2,200	2,200	2,200	2,200	2,300
Appendix IV											
Antimony	ug/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Arsenic	ug/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Barium	ug/L	6.7	7.7	8.4	8.7	9.0	7.3	6.9	6.9	7.4	8.4
Beryllium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium	ug/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Cobalt	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Fluoride	mg/L	1.5	1.5	1.4	1.4	1.4	1.7	1.7	1.7	1.6	1.6
Lead	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	93	110	93	100	85	89	110	100	100	87
Mercury	ug/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Radium-226	pCi/L	2.45	2.58	2.35	2.45	2.16	2.75	2.28	2.15	2.16	1.98
Radium-226/228	pCi/L	2.88	3.30	2.82	2.92	2.54	3.16	2.47	2.28	2.24	2.41
Radium-228	pCi/L	< 0.432	0.727	0.464	0.475	< 0.383	0.415	< 0.395	< 0.306	< 0.351	0.431
Selenium	ug/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Thallium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units.
pCi/L - picocuries per liter.
All metals were analyzed as total unless otherwise specified.

Table 2
Summary of Groundwater Analytical Data
Monroe Power Plant Fly Ash Basin – RCRA CCR Monitoring Program
Monroe, Michigan

Sample Location:		MW-16-03							
Sample Date:		8/8/2016	9/27/2016	11/15/2016	1/17/2017	3/7/2017	4/25/2017	6/12/2017	7/18/2017
Constituent	Unit								
Appendix III									
Boron	ug/L	390	400	500	460	430	450	460	450
Calcium	ug/L	480,000	430,000	470,000	420,000	450,000	430,000	440,000	410,000
Chloride	mg/L	18	15	18	19	19	19	19	20
Fluoride	mg/L	1.4	1.5	1.4	1.4	1.6	1.7	1.6	1.6
pH	SU	7.2	7.2	7.1	7.2	7.3	7.1	7.1	7.1
Sulfate	mg/L	1,600	1,600	1,600	1,600	1,500	1,500	1,500	1,500
Total Dissolved Solids	mg/L	2,300	2,200	2,300	2,300	2,200	2,300	2,300	2,300
Appendix IV									
Antimony	ug/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Arsenic	ug/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Barium	ug/L	21	8.5	11	8.6	13	9.1	7.8	9.1
Beryllium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium	ug/L	3.1	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Cobalt	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Fluoride	mg/L	1.4	1.5	1.4	1.4	1.6	1.7	1.6	1.6
Lead	ug/L	2.5	< 1.0	< 1.0	< 1.0	1.3	< 1.0	< 1.0	< 1.0
Lithium	ug/L	100	110	110	97	98	120	110	92
Mercury	ug/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Radium-226	pCi/L	2.44	1.90	2.25	1.86	1.88	1.75	1.70	1.73
Radium-226/228	pCi/L	2.51	2.36	2.51	2.45	2.51	2.13	1.93	2.27
Radium-228	pCi/L	< 0.803	0.462	< 0.420	0.583	0.638	0.385	< 0.416	0.533
Selenium	ug/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Thallium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units.
pCi/L - picocuries per liter.
All metals were analyzed as total unless otherwise specified.

Table 2
Summary of Groundwater Analytical Data
Monroe Power Plant Fly Ash Basin – RCRA CCR Monitoring Program
Monroe, Michigan

Sample Location:		MW-16-04								
Sample Date:		8/9/2016	9/26/2016	9/26/2016	11/15/2016	1/17/2017	3/7/2017	4/25/2017	6/12/2017	7/17/2017
Constituent	Unit			Field Dup						
Appendix III										
Boron	ug/L	130	130	120	210	170	160	170	170	190
Calcium	ug/L	570,000	510,000	500,000	570,000	570,000	550,000	550,000	580,000	590,000
Chloride	mg/L	29	28	28	33	35	35	33	36	35
Fluoride	mg/L	0.88	0.88	0.89	0.87	0.86	1.1	1.0	1.0	1.0
pH	SU	7.2	7.1	7.2	7.1	7.2	7.3	7.2	7.2	7.2
Sulfate	mg/L	1,400	1,400	1,400	1,500	1,400	1,300	1,300	1,400	1,400
Total Dissolved Solids	mg/L	2,100	2,100	2,000	1,700	2,100	2,200	2,100	2,100	2,100
Appendix IV										
Antimony	ug/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Arsenic	ug/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Barium	ug/L	8.9	9.5	9.0	10	9.6	11	10	11	11
Beryllium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium	ug/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Cobalt	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Fluoride	mg/L	0.88	0.88	0.89	0.87	0.86	1.1	1.0	1.0	1.0
Lead	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	18	20	19	20	17	17	21	18	17
Mercury	ug/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Radium-226	pCi/L	0.354	0.503	0.714	0.453	0.424	0.530	0.358	0.411	0.517
Radium-226/228	pCi/L	0.775	0.869	0.947	0.574	0.974	0.723	0.650	0.578	0.639
Radium-228	pCi/L	0.421	< 0.439	< 0.469	< 0.363	0.550	< 0.352	< 0.343	< 0.373	< 0.329
Selenium	ug/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Thallium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units.
pCi/L - picocuries per liter.
All metals were analyzed as total
unless otherwise specified.

Table 2
Summary of Groundwater Analytical Data
Monroe Power Plant Fly Ash Basin – RCRA CCR Monitoring Program
Monroe, Michigan

Sample Location:		MW-16-05							
Sample Date:		8/8/2016	9/26/2016	11/15/2016	1/17/2017	3/7/2017	4/25/2017	6/12/2017	7/17/2017
Constituent	Unit								
Appendix III									
Boron	ug/L	200	190	270	220	220	230	230	250
Calcium	ug/L	410,000	390,000	420,000	400,000	410,000	420,000	430,000	400,000
Chloride	mg/L	12	9.0	< 10	11	11	11	12	12
Fluoride	mg/L	1.3	1.4	1.3	1.4	1.6	1.6	1.5	1.6
pH	SU	7.1	7.1	7.1	7.2	7.2	7.1	7.1	7.1
Sulfate	mg/L	1,500	1,500	1,500	1,400	1,400	1,400	1,500	1,500
Total Dissolved Solids	mg/L	2,100	2,000	2,100	2,100	2,200	2,100	2,200	2,100
Appendix IV									
Antimony	ug/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Arsenic	ug/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Barium	ug/L	8.7	7.2	11	12	12	14	9.7	8.7
Beryllium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium	ug/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Cobalt	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Fluoride	mg/L	1.3	1.4	1.3	1.4	1.6	1.6	1.5	1.6
Lead	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	40	43	41	39	40	47	42	39
Mercury	ug/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Radium-226	pCi/L	1.61	1.63	1.52	1.41	1.77	1.37	1.38	1.41
Radium-226/228	pCi/L	2.11	2.26	1.56	1.46	1.78	1.41	1.44	1.68
Radium-228	pCi/L	0.496	0.632	< 0.446	< 0.452	< 0.344	< 0.348	< 0.386	< 0.303
Selenium	ug/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Thallium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units.
pCi/L - picocuries per liter.
All metals were analyzed as total unless otherwise specified.

Table 2
Summary of Groundwater Analytical Data
Monroe Power Plant Fly Ash Basin – RCRA CCR Monitoring Program
Monroe, Michigan

Sample Location:		MW-16-06							
Sample Date:		8/9/2016	9/27/2016	11/15/2016	1/17/2017	3/6/2017	4/25/2017	6/13/2017	7/17/2017
Constituent	Unit								
Appendix III									
Boron	ug/L	270	270	380	330	340	330	320	350
Calcium	ug/L	370,000	380,000	400,000	390,000	400,000	410,000	410,000	390,000
Chloride	mg/L	12	9.8	11	11	12	12	12	12
Fluoride	mg/L	1.5	1.5	1.4	1.5	1.7	1.7	1.6	1.7
pH	SU	7.1	7.2	7.2	7.2	7.2	7.1	7.1	7.2
Sulfate	mg/L	1,500	1,500	1,600	1,500	1,400	1,400	1,400	1,500
Total Dissolved Solids	mg/L	2,200	2,100	2,200	2,200	2,100	2,100	2,200	2,200
Appendix IV									
Antimony	ug/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Arsenic	ug/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Barium	ug/L	34	14	13	12	15	9.9	14	13
Beryllium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium	ug/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Cobalt	ug/L	1.6	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Fluoride	mg/L	1.5	1.5	1.4	1.5	1.7	1.7	1.6	1.7
Lead	ug/L	1.1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	68	85	76	75	80	94	79	74
Mercury	ug/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Radium-226	pCi/L	0.346	0.633	0.638	0.492	0.536	0.491	0.525	0.477
Radium-226/228	pCi/L	0.575	0.751	0.918	0.732	0.700	0.648	0.623	0.650
Radium-228	pCi/L	< 0.346	< 0.376	< 0.881	< 0.397	< 0.377	< 0.322	< 0.330	< 0.333
Selenium	ug/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Thallium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units.
pCi/L - picocuries per liter.
All metals were analyzed as total unless otherwise specified.

Table 2
Summary of Groundwater Analytical Data
Monroe Power Plant Fly Ash Basin – RCRA CCR Monitoring Program
Monroe, Michigan

Sample Location:		MW-16-07									
Sample Date:		8/8/2016	9/26/2016	11/15/2016	1/17/2017	1/17/2017	3/6/2017	4/25/2017	6/12/2017	7/17/2017	7/17/2017
Constituent	Unit					Field Dup					Field Dup
Appendix III											
Boron	ug/L	160	160	240	200	200	190	210	210	230	230
Calcium	ug/L	390,000	390,000	410,000	390,000	390,000	390,000	420,000	430,000	420,000	410,000
Chloride	mg/L	7.7	6.8	< 10	7.3	7.4	< 10	8.0	< 10	10	< 10
Fluoride	mg/L	1.4	1.4	1.3	1.4	1.4	1.6	1.6	1.6	1.7	1.7
pH	SU	7.1	7.1	7.1	7.2	7.1	7.2	7.1	7.1	7.2	7.1
Sulfate	mg/L	1,500	1,500	1,500	1,400	1,500	1,400	1,400	1,400	1,500	1,500
Total Dissolved Solids	mg/L	2,100	2,000	2,100	2,100	2,100	2,100	2,100	2,200	2,100	2,100
Appendix IV											
Antimony	ug/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Arsenic	ug/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Barium	ug/L	9.0	8.2	9.4	9.2	8.3	8.3	8.3	8.2	7.7	7.9
Beryllium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium	ug/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Cobalt	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Fluoride	mg/L	1.4	1.4	1.3	1.4	1.4	1.6	1.6	1.6	1.7	1.7
Lead	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	32	36	34	34	33	33	39	38	32	33
Mercury	ug/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Radium-226	pCi/L	0.512	0.609	0.548	0.567	0.565	0.566	0.384	0.481	0.465	0.526
Radium-226/228	pCi/L	0.595	1.11	0.654	0.763	0.717	0.751	0.558	0.585	0.759	0.699
Radium-228	pCi/L	< 0.450	0.505	< 0.464	< 0.418	< 0.379	< 0.364	< 0.321	< 0.343	< 0.301	< 0.325
Selenium	ug/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Thallium	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units.
pCi/L - picocuries per liter.
All metals were analyzed as total unless otherwise specified.

Table 3
Summary of Field Parameters
Monroe Fly Ash Basin – RCRA CCR Monitoring Program
Monroe, Michigan

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (SU)	Specific Conductivity (umhos/cm)	Temperature (deg C)	Turbidity (NTU)
MW-16-01	8/8/2016	0.25	7.5	8.63	1,808	13.59	3.08
	9/27/2016	0.58	3.2	8.29	1,945	13.72	7.09
	11/14/2016	3.47	115.4	7.74	1,732	13.68	5.65
	1/17/2017	1.09	46.3	7.46	1,712	11.25	3.10
	3/6/2017	0.47	41.6	7.34	1,706	11.56	2.50
	4/26/2017	0.40	8.8	7.23	2,211	12.21	2.23
	6/13/2017	0.58	19.0	7.20	2,271	15.92	2.53
	7/17/2017	0.77	36.5	7.23	2,197	16.36	2.18
MW-16-02	8/9/2016	0.49	35.9	7.07	2,014	11.77	0.00
	9/27/2016	0.61	33.4	7.30	2,045	13.01	2.66
	11/15/2016	0.92	29.9	7.06	1,672	11.13	4.74
	1/17/2017	0.21	-39.0	7.09	2,620	10.64	102
	3/7/2017	0.13	49.2	7.15	1,800	10.80	2.58
	4/25/2017	0.06	13.0	6.99	2,289	11.14	1.71
	6/12/2017	0.07	21.9	7.04	2,235	11.96	5.80
	7/18/2017	0.08	37.0	7.02	2,308	11.75	2.22
MW-16-03	8/8/2016	0.21	19.6	6.93	1,905	12.48	129
	9/27/2016	0.36	32.1	7.17	2,047	12.22	55.2
	11/15/2016	0.73	-3.2	7.04	1,733	11.74	31.6
	1/17/2017	0.47	-3.0	6.72	2,650	11.65	55.3
	3/7/2017	0.13	37.9	7.13	1,872	11.51	54.5
	4/25/2017	0.07	2.7	6.98	2,342	12.04	38.1
	6/12/2017	0.06	-7.4	7.02	2,282	12.89	14.9
	7/18/2017	0.05	10.7	6.97	2,351	13.03	25.6
MW-16-04	8/9/2016	0.50	-1.8	7.02	1,978	11.86	1.29
	9/26/2016	0.98	13.8	7.53	1,945	11.09	2.54
	11/15/2016	0.41	-77.4	7.11	1,625	10.98	3.98
	1/17/2017	0.47	2.6	7.02	1,756	10.83	3.07
	3/7/2017	0.13	-48.1	7.19	1,703	11.19	2.88
	4/25/2017	0.23	-133.1	7.04	2,239	11.42	3.88
	6/12/2017	0.17	-73.6	7.10	2,172	12.20	4.15
	7/17/2017	0.15	-42.2	7.22	1,653	12.03	2.45
MW-16-05	8/8/2016	0.35	10.3	7.30	1,834	12.51	8.28
	9/26/2016	1.12	12.3	7.67	1,927	11.44	16.7
	11/15/2016	1.36	-9.7	7.12	1,618	11.47	21.4
	1/17/2017	1.20	0.20	6.95	1,747	11.32	24.3
	3/7/2017	0.08	21.6	7.15	1,752	11.61	31.7
	4/25/2017	0.07	-20.1	7.00	2,194	12.00	29.2
	6/12/2017	0.09	-29.8	7.05	2,139	12.44	17.4
	7/17/2017	0.05	8.9	7.12	1,629	12.02	12.2

Notes:

mg/L - milligrams per liter.

mV - milliVolt.

SU - standard unit.

umhos/cm - micro-mhos per centimeter.

deg C - degrees celcius.

NTU - nephelometric Turbidity Units.

Table 3
Summary of Field Parameters
Monroe Fly Ash Basin – RCRA CCR Monitoring Program
Monroe, Michigan

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (SU)	Specific Conductivity (umhos/cm)	Temperature (deg C)	Turbidity (NTU)
MW-16-06	8/9/2016	0.46	25.4	7.06	2,171	15.44	72.5
	9/27/2016	1.37	-3.6	7.33	2,029	13.56	19.9
	11/15/2016	2.47	41.6	7.07	1,725	12.95	3.70
	1/17/2017	2.19	-15.0	7.01	2,580	10.95	14.8
	3/6/2017	0.05	38.8	7.05	1,273	11.12	9.89
	4/25/2017	0.07	3.5	7.01	2,242	12.11	8.04
	6/13/2017	0.14	-14.1	7.05	2,300	15.96	17.8
	7/17/2017	0.18	14.6	7.11	2,197	15.79	8.83
MW-16-07	8/8/2016	0.80	18.4	6.96	1,796	12.71	5.55
	9/26/2016	0.54	26.8	7.40	1,978	12.64	5.53
	11/15/2016	0.77	-4.6	7.05	1,639	12.25	7.15
	1/17/2017	1.28	31.7	6.92	1,760	11.94	4.23
	3/6/2017	0.08	20.7	6.96	1,290	11.89	3.88
	4/25/2017	0.06	-27.3	6.97	2,189	12.07	2.53
	6/12/2017	0.09	-25.5	6.95	2,111	13.57	3.68
	7/17/2017	0.06	7.7	6.96	1,658	12.91	2.71

Notes:

mg/L - milligrams per liter.

mV - milliVolt.

SU - standard unit.

umhos/cm - micro-mhos per centimeter.

deg C - degrees celcius.

NTU - nephelometric Turbidity Units.

LEGEND

- MONITORING WELL
- APPROXIMATE BOUNDARY OF FLY ASH BASIN
- INFERRED GROUNDWATER FLOW DIRECTION
- POTENTIOMETRIC SURFACE CONTOUR LINE (DASHED WHERE INFERRED)
- (582.69) STATIC WATER ELEVATION IN FEET (NAVD, 1988)

NOTES

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

N

0 600 1,200 Feet

1 " = 600 '

1:7,200

PROJECT:
DTE ELECTRIC COMPANY
MONROE POWER PLANT FLY ASH BASIN
7955 EAST DUNBAR ROAD
MONROE, MICHIGAN

TITLE:
POTENTIOMETRIC SURFACE MAP AUGUST 2016

DRAWN BY:	B DEEGAN	PROJ NO.:	265996.0001
CHECKED BY:	C. SCIESZKA		
APPROVED BY:	V. BUENING		**FIGURE 1**
DATE:	JANUARY 2018		

TRC
1540 Eisenhower Place
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Phone: 734.971.7080
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FILE NO.: 265996-0001-001.mxd

Plot Date: 1/12/2018, 09:15:35 AM by SMAJOR -- LAYOUT:ANSI B(11"x17")
Path: E:\DTE\CCR_Sites\2017_265996\265996-0001-001.mxd
Coordinate System: NAD 1983 UTM Zone 17N (Meter)
Map Rotation: 0
TRC - GIS

LEGEND

- MONITORING WELL
- APPROXIMATE BOUNDARY OF FLY ASH BASIN
- INFERRED GROUNDWATER FLOW DIRECTION
- POTENTIOMETRIC SURFACE CONTOUR LINE (DASHED WHERE INFERRED)
- (582.69) STATIC WATER ELEVATION IN FEET (NAVD, 1988)

NOTES

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

N

0 600 1,200 Feet

1 " = 600 '

1:7,200

PROJECT:
DTE ELECTRIC COMPANY
MONROE POWER PLANT FLY ASH BASIN
7955 EAST DUNBAR ROAD
MONROE, MICHIGAN

TITLE:
POTENTIOMETRIC SURFACE MAP SEPTEMBER 2016

DRAWN BY:	B DEEGAN	PROJ NO.:	265996.0001
CHECKED BY:	C. SCIESZKA		
APPROVED BY:	V. BUENING		**FIGURE 2**
DATE:	JANUARY 2018		

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FILE NO.: 265996-0001-002.mxd

TRC - GIS
Coordinate System: NAD 1983 UTM Zone 17N (Meter)
Map Rotation: 0
Plot Date: 1/12/2018, 09:18:03 AM by SMAJOR -- LAYOUT:ANSI B(11"x17")
Path: E:\DTE\CCR_Sites\2017_265996\265996-0001-002.mxd

LEGEND

- MONITORING WELL
- APPROXIMATE BOUNDARY OF FLY ASH BASIN
- INFERRED GROUNDWATER FLOW DIRECTION
- POTENTIOMETRIC SURFACE CONTOUR LINE (DASHED WHERE INFERRED)
- (582.69) STATIC WATER ELEVATION IN FEET (NAVD, 1988)

NOTES

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

N

0 600 1,200 Feet

1 " = 600 '

1:7,200

PROJECT:
DTE ELECTRIC COMPANY
MONROE POWER PLANT FLY ASH BASIN
7955 EAST DUNBAR ROAD
MONROE, MICHIGAN

TITLE:
POTENTIOMETRIC SURFACE MAP
NOVEMBER 2016

DRAWN BY:	B DEEGAN	PROJ NO.:	265996.0001
CHECKED BY:	C. SCIESZKA		
APPROVED BY:	V. BUENING		**FIGURE 3**
DATE:	JANUARY 2018		

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FILE NO.: 265996-0001-003.mxd

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Coordinate System: NAD 1983 UTM Zone 17N (Meter)
Map Rotation: 0
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Path: E:\DTE\CCR_Sites\2017_265996\265996-0001-003.mxd

LEGEND

- MONITORING WELL
- APPROXIMATE BOUNDARY OF FLY ASH BASIN
- INFERRED GROUNDWATER FLOW DIRECTION
- POTENTIOMETRIC SURFACE CONTOUR LINE (DASHED WHERE INFERRED)
- (582.69) STATIC WATER ELEVATION IN FEET (NAVD, 1988)

NOTES

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

N

0 600 1,200 Feet

1 " = 600 '
1:7,200

PROJECT:
DTE ELECTRIC COMPANY
MONROE POWER PLANT FLY ASH BASIN
7955 EAST DUNBAR ROAD
MONROE, MICHIGAN

TITLE:
POTENTIOMETRIC SURFACE MAP
JANUARY 2017

DRAWN BY:	B DEEGAN	PROJ NO.:	265996.0001
CHECKED BY:	C. SCIESZKA		
APPROVED BY:	V. BUENING		**FIGURE 4**
DATE:	JANUARY 2018		

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FILE NO.: 265996-0001-004.mxd

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Coordinate System: NAD 1983 UTM Zone 17N (Meter)
Map Rotation: 0
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Path: E:\DTE\CCR_Sites\2017_265996\265996-0001-004.mxd

LEGEND

- MONITORING WELL
- APPROXIMATE BOUNDARY OF FLY ASH BASIN
- INFERRED GROUNDWATER FLOW DIRECTION
- POTENTIOMETRIC SURFACE CONTOUR LINE (DASHED WHERE INFERRED)
- (582.69) STATIC WATER ELEVATION IN FEET (NAVD, 1988)

NOTES

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

N

0 600 1,200 Feet

1 " = 600 '

1:7,200

PROJECT:
DTE ELECTRIC COMPANY
MONROE POWER PLANT FLY ASH BASIN
7955 EAST DUNBAR ROAD
MONROE, MICHIGAN

TITLE:
POTENTIOMETRIC SURFACE MAP MARCH 2017

DRAWN BY:	B DEEGAN	PROJ NO.:	265996.0001
CHECKED BY:	C. SCIESZKA		
APPROVED BY:	V. BUENING		**FIGURE 5**
DATE:	JANUARY 2018		

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FILE NO.: 265996-0001-005.mxd

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Coordinate System: NAD 1983 UTM Zone 17N (Meter)
Map Rotation: 0
Plot Date: 1/12/2018, 09:25:06 AM by SMAJOR -- LAYOUT: ANSI B(11"x17")
Path: E:\DTE\CCR_Sites\2017_265996\265996-0001-005.mxd

LEGEND

- MONITORING WELL
- APPROXIMATE BOUNDARY OF FLY ASH BASIN
- INFERRED GROUNDWATER FLOW DIRECTION
- POTENTIOMETRIC SURFACE CONTOUR LINE (DASHED WHERE INFERRED)
- (582.69) STATIC WATER ELEVATION IN FEET (NAVD, 1988)

NOTES

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

N

0 600 1,200 Feet

1 " = 600 '

1:7,200

PROJECT:
DTE ELECTRIC COMPANY
MONROE POWER PLANT FLY ASH BASIN
7955 EAST DUNBAR ROAD
MONROE, MICHIGAN

TITLE:
POTENTIOMETRIC SURFACE MAP
APRIL 2017

DRAWN BY:	B DEEGAN	PROJ NO.:	265996.0001
CHECKED BY:	C. SCIESZKA		
APPROVED BY:	V. BUENING		**FIGURE 6**
DATE:	JANUARY 2018		

TRC
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Coordinate System: NAD 1983 UTM Zone 17N (Meter)
Map Rotation: 0
TRC - GIS

LEGEND

- MONITORING WELL
- APPROXIMATE BOUNDARY OF FLY ASH BASIN
- INFERRED GROUNDWATER FLOW DIRECTION
- POTENTIOMETRIC SURFACE CONTOUR LINE (DASHED WHERE INFERRED)
- (582.69) STATIC WATER ELEVATION IN FEET (NAVD, 1988)

NOTES

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

N

0 600 1,200 Feet

1 " = 600 '

1:7,200

PROJECT:
DTE ELECTRIC COMPANY
MONROE POWER PLANT FLY ASH BASIN
7955 EAST DUNBAR ROAD
MONROE, MICHIGAN

TITLE:
POTENTIOMETRIC SURFACE MAP
JUNE 2017

DRAWN BY:	B DEEGAN	PROJ NO.:	265996.0001
CHECKED BY:	C. SCIESZKA		
APPROVED BY:	V. BUENING		**FIGURE 7**
DATE:	JANUARY 2018		

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Path: E:\DTE\CCR_Sites\2017_265996\265996-0001-007.mxd
Coordinate System: NAD 1983 UTM Zone 17N (Meter)
Map Rotation: 0

TRC - GIS

LEGEND

- MONITORING WELL
- APPROXIMATE BOUNDARY OF FLY ASH BASIN
- INFERRED GROUNDWATER FLOW DIRECTION
- POTENTIOMETRIC SURFACE CONTOUR LINE (DASHED WHERE INFERRED)
- (582.69) STATIC WATER ELEVATION IN FEET (NAVD, 1988)

NOTES

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

0 600 1,200 Feet

1 " = 600 '

1:7,200

PROJECT:
DTE ELECTRIC COMPANY
MONROE POWER PLANT FLY ASH BASIN
7955 EAST DUNBAR ROAD
MONROE, MICHIGAN

TITLE:
POTENTIOMETRIC SURFACE MAP
JULY 2017

DRAWN BY:	S MAJOR	PROJ NO.:	265996.0001
CHECKED BY:	C. SCIESZKA		
APPROVED BY:	V. BUENING		**FIGURE 8**
DATE:	JANUARY 2018		

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

FILE NO.: 265996-0001-010.mxd

TRC - GIS
Coordinate System: NAD 1983 UTM Zone 17N (Meter)
Map Rotation: 0
Plot Date: 1/12/2018, 09:37:31 AM by SMAJOR -- LAYOUT: ANSI B(11"x17")
Path: E:\DTE\CCR_Sites\2017_265996\265996-0001-010.mxd

Appendix B
Data Quality Review

Laboratory Data Quality Review
Groundwater Monitoring Event September 2017
DTE Electric Company Monroe Fly Ash Basin (DTE MFAB)

Groundwater samples were collected by TRC for the September 2017 sampling event. Samples were analyzed for anions, pH, total metals, and total dissolved solids by Test America Laboratories, Inc. (Test America), located in Canton, Ohio. The laboratory analytical results are reported in laboratory report J85237-1.

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

- MW-16-01
- MW-16-02
- MW-16-03
- MW-16-04
- MW-16-05
- MW-16-06
- MW-16-07

Each sample was analyzed for the following constituents:

Analyte Group	Method
Anions (Chloride, Fluoride, Sulfate)	EPA 300.0
pH	EPA 9040C
Total Metals	EPA 6010B
Total Dissolved Solids	SM 2540C
Alkalinity	SM 2320B

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;
- Data for method blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures;
- Percent recoveries for matrix spike (MS) and matrix spike duplicates (MSD). Percent recoveries are calculated for each analyte spiked and used to assess bias due to sample matrix effects;

- Reporting limits (RLs) compared to project-required RLs;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes;
- Data for laboratory control samples (LCSs). The LCSs are used to assess the accuracy of the analytical method using a clean matrix;
- Data for laboratory duplicates. The laboratory duplicates are replicate analyses of one sample and are used to assess the precision of the analytical method; and
- Overall usability of the data.

This data usability report addresses the following items:

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

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:

- Target analytes were not detected in the method blank.
- Dup-01 corresponds with MW-16-07; relative percent differences (RPDs) between the parent and duplicate sample were within the QC limits.
- Laboratory duplicates were performed on sample MW-16-01 for alkalinity and on sample MW-16-02 for pH; RPDs between the parent and duplicate sample were within the QC limits.
- MS/MSD analyses were performed on sample MW-16-01 and MW-16-02 for anions (chloride and fluoride). Percent recoveries and RPDs were within the QC limits.

Appendix C
Statistical Background Limits

Technical Memorandum

Date: January 15, 2018

To: DTE Electric Company

From: Darby Litz, TRC
Sarah Holmstrom, TRC
Jane Li, TRC

Project No.: 265996.0001.0000 Phase 001, Task 001

Subject: Background Statistical Evaluation – DTE Electric Company, Monroe Power Plant Fly Ash Basin, Monroe, Michigan

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Pursuant to the United States Environmental Protection Agency's (U.S. EPA's) Resource Conservation and Recovery Act (RCRA) Federal Final Rule for Hazardous and Solid Waste Management System Disposal of Coal Combustion Residuals from Electric Utilities (herein after "the CCR Rule") promulgated on April 17, 2015, the owner or operator of a CCR Unit must collect a minimum of eight rounds of background groundwater data to initiate a detection monitoring program and evaluate statistically significant increases above background (40 CFR §257.94). This memorandum presents the background statistical limits derived for the DTE Electric Company (DTE Electric) Monroe Power Plant (MONPP) Fly Ash Basin (FAB) CCR unit (the Site).

DTE Electric operates the MONPP FAB in Monroe, Michigan. The property has been used continuously for the operation of the MONPP FAB since approximately 1975 and is constructed over a natural clay-rich soil base. The MONPP FAB and landfill is a licensed Type III solid waste disposal facility in accordance with Michigan's regulations, and currently accepts coal ash from DTE Electric's MONPP. The landfill qualifies as a CCR storage unit. Therefore, it is required to be monitored under the CCR Rule.

A groundwater monitoring system has been established for MONPP FAB CCR unit (TRC, October 2017), which established the following locations for detection monitoring.

MW-16-01	MW-16-02	MW-16-03
MW-16-04	MW-16-05	MW-16-06
MW-16-07		

Following the baseline data collection period (August 2016 through July 2017), the background data for the Site were evaluated in accordance with the *Groundwater Statistical Evaluation Plan* (Stats Plan) (TRC, October 2017). Background data were evaluated in ChemStat™ statistical software. ChemStat™ is a software tool that is commercially available for performing statistical evaluation consistent with procedures outlined in U.S. EPA's Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (Unified Guidance; UG). Within the ChemStat™ statistical program (and the UG), prediction limits (PLs) were selected to perform the statistical calculation for background limits. Use of PLs is recommended by the UG to provide high statistical power and is an acceptable approach for intrawell detection monitoring under the CCR rule. PLs were calculated for each of the CCR Appendix III parameters. The following narrative describes the methods employed and the results obtained and the ChemStat™ output files are included as an attachment.

The set of background wells utilized for MONPP FAB CCR Unit includes MW-16-01 through MW-16-07. The background evaluation included the following steps:

- Review of data quality checklists 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 nondetects for each baseline/background well-constituent (w/c) pair;
- Distribution of the data; and
- Calculation of the upper PLs for each cumulative baseline/background data set (upper and lower PLs 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, as provided by the laboratory, method blanks, laboratory control spikes, laboratory duplicates. The data were found to be complete and usable for the purposes of the CCR monitoring program.

Time versus Concentration Graphs

The time versus concentration (T v. C) graphs (Attachment A) did not show potential or suspect outliers for any of the 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, 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

No outliers were identified in the T v. C graphs. Therefore, outlier testing was not applicable.

Distribution of the Data Sets

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

Prediction Limits

Table 1 presents the calculated PLs for the background/baseline data sets. For normal and lognormal distributions, PLs are calculated for 95 percent confidence using parametric methods. For nonnormal background datasets, a nonparametric PL is utilized, resulting in the highest value from the background dataset as the PL. The achieved confidence levels for nonparametric prediction limits depend entirely on the number of background data points, which are shown in the ChemStat™ outputs. Verification resampling (1 of 2) is recommended per the Stats Plan and UG to achieve performance standards specified in the CCR rules.

Attachments

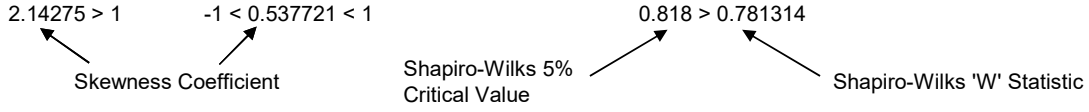
Table 1 – Summary of Descriptive Statistics and Prediction Limit Calculations
Attachment A – Background Concentration Time-Series Charts
Attachment B – ChemStat™ Prediction Limit Outputs

Tables

Table 1
Summary of Descriptive Statistics and Prediction Limit Calculations
Background Statistical Evaluation
DTE Electric Company – Monroe Fly Ash Basin

Monitoring Well	Skewness Test		Shapiro-Wilks Test (5% Critical Value)		Outliers Removed	Prediction Limit Test	Prediction Limit
	Un-Transformed Data	Natural Log Transformed Data	Un-Transformed Data	Natural Log Transformed Data			
Appendix III							
Boron (ug/L)							
MW-16-01	-1 < 0.167705 < 1	--	--	--	N	Parametric	310
MW-16-02	-1 < 0.189903 < 1	--	--	--	N	Parametric	470
MW-16-03	-1 < -0.0751609 < 1	--	--	--	N	Parametric	510
MW-16-04	>50% Non-Detect	--	--	--	N	Non-Parametric	210
MW-16-05	-1 < 0.282475 < 1	--	--	--	N	Parametric	280
MW-16-06	-1 < -0.311091 < 1	--	--	--	N	Parametric	400
MW-16-07	-1 < -0.878206 < 1	--	--	--	N	Parametric	280
Calcium (ug/L)							
MW-16-01	-1 < -0.207579 < 1	--	--	--	N	Parametric	450,000
MW-16-02	-1 < 0.384794 < 1	--	--	--	N	Parametric	430,000
MW-16-03	-1 < 0.42921 < 1	--	--	--	N	Parametric	490,000
MW-16-04	-1 > -1.0588	-1 > -1.13701	0.818 < 0.879119	--	N	Parametric	610,000
MW-16-05	-1 < 0 < 1	--	--	--	N	Parametric	440,000
MW-16-06	-1 < -0.384794 < 1	--	--	--	N	Parametric	420,000
MW-16-07	-1 < 0.284605 < 1	--	--	--	N	Parametric	440,000
Chloride (mg/L)							
MW-16-01	-1 > -1.40642	-1 > -1.77056	0.818 < 0.826001	--	N	Parametric	14
MW-16-02	-1 < -0.691361 < 1	--	--	--	N	Parametric	15
MW-16-03	-1 > -1.48824	-1 > -1.61823	0.818 > 0.779035	0.818 > 0.750893	N	Non-Parametric	20
MW-16-04	-1 < -0.799533 < 1	--	--	--	N	Parametric	39
MW-16-05	-1 < -1.6207	-1 > -1.86936	0.818 > 0.720465	0.818 > 0.654166	N	Non-Parametric	12
MW-16-06	-1 < -1.18771	-1 > -1.26234	0.818 > 0.716331	0.818 > 0.710616	N	Non-Parametric	12
MW-16-07	-1 < -0.469884 < 1	--	--	--	N	Parametric	13
Fluoride (mg/L)							
MW-16-01	-1 < -0.315179 < 1	--	--	--	N	Parametric	2.1
MW-16-02	-1 < -2.67648e-015 < 1	--	--	--	N	Parametric	1.8
MW-16-03	-1 < 0.0724471 < 1	--	--	--	N	Parametric	1.8
MW-16-04	-1 < 0.453171 < 1	--	--	--	N	Parametric	1.1
MW-16-05	-1 < -0.0842382 < 1	--	--	--	N	Parametric	1.7
MW-16-06	-1 < -0.0724471 < 1	--	--	--	N	Parametric	1.8
MW-16-07	-1 < 5.15164e-015 < 1	--	--	--	N	Parametric	1.8

Notes:

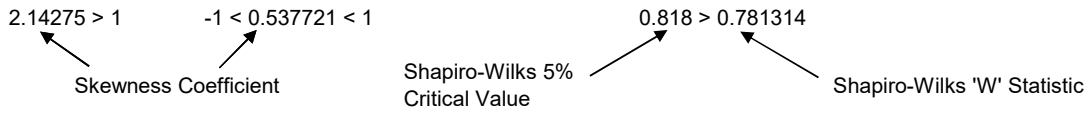


ug/L = micrograms per liter
mg/L = milligrams per liter
SU = standard units

Table 1
Summary of Descriptive Statistics and Prediction Limit Calculations
Background Statistical Evaluation
DTE Electric Company – Monroe Fly Ash Basin

Monitoring Well	Skewness Test		Shapiro-Wilks Test (5% Critical Value)		Outliers Removed	Prediction Limit Test	Prediction Limit
	Un-Transformed Data	Natural Log Transformed Data	Un-Transformed Data	Natural Log Transformed Data			
pH (SU)							
MW-16-01	-1 < 0.943826 < 1	--	--	--	N	Parametric	6.3 - 9.0
MW-16-02	1.31816	1.2979 > 1	0.818 < 0.853216	--	N	Parametric	6.9 - 7.3
MW-16-03	-1 < -0.774615 < 1	--	--	--	N	Parametric	6.7 - 7.3
MW-16-04	1.48086 > 1	1.44944 > 1	0.818 > 0.791445	0.818 > 0.798258	N	Non-Parametric	7.0 - 7.5
MW-16-05	1.41222 > 1	1.36764 > 1	0.818 < 0.825294	--	N	Parametric	6.6 - 7.7
MW-16-06	1.85089 > 1	1.83706 > 1	0.818 > 0.699609	0.818 > 0.704141	N	Non-Parametric	7.0 - 7.3
MW-16-07	2.04057 > 1	2.02941 > 1	0.818 > 0.604641	0.818 > 0.609456	N	Non-Parametric	6.9 - 7.4
Sulfate (mg/L)							
MW-16-01	-1 < -0.0543951 < 1	--	--	--	N	Parametric	1,500
MW-16-02	-1 < -0.660484 < 1	--	--	--	N	Parametric	1,700
MW-16-03	-1 < 0 < 1	--	--	--	N	Parametric	1,700
MW-16-04	-1 < 0.0543951 < 1	--	--	--	N	Parametric	1,500
MW-16-05	-1 < -0.516398 < 1	--	--	--	N	Parametric	1,600
MW-16-06	-1 < 0.32397 < 1	--	--	--	N	Parametric	1,600
MW-16-07	-1 < 0 < 1	--	--	--	N	Parametric	1,600
Total Dissolved Solids (mg/L)							
MW-16-01	-1 < 0.0543951 < 1	--	--	--	N	Parametric	2,200
MW-16-02	1.1547 > 1	1.1547 > 1	0.818 > 0.566231	0.818 > 0.566231	N	Non-Parametric	2,300
MW-16-03	-1 > -1.1547	-1 > -1.1547	0.818 > 0.566231	0.818 > 0.566231	N	Non-Parametric	2,300
MW-16-04	-1 > -1.9997	-1 > -2.05737	0.818 > 0.576798	0.818 > 0.560738	N	Non-Parametric	2,200
MW-16-05	-1 < -0.0543951 < 1	--	--	--	N	Parametric	2,200
MW-16-06	-1 < -0.516398 < 1	--	--	--	N	Parametric	2,300
MW-16-07	-1 < 0 < 1	--	--	--	N	Parametric	2,200

Notes:

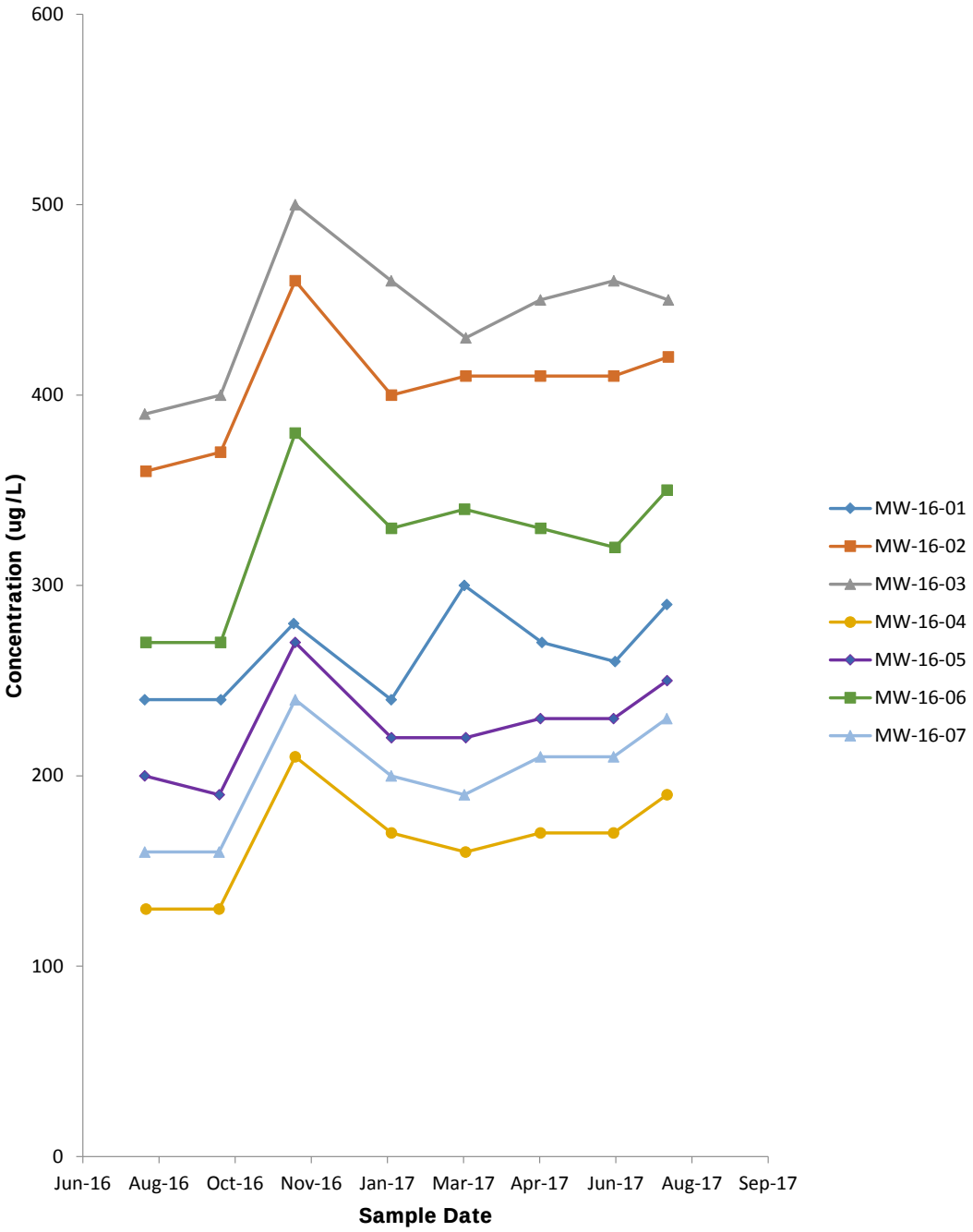


ug/L = micrograms per liter
mg/L = milligrams per liter
SU = standard units

Attachment A

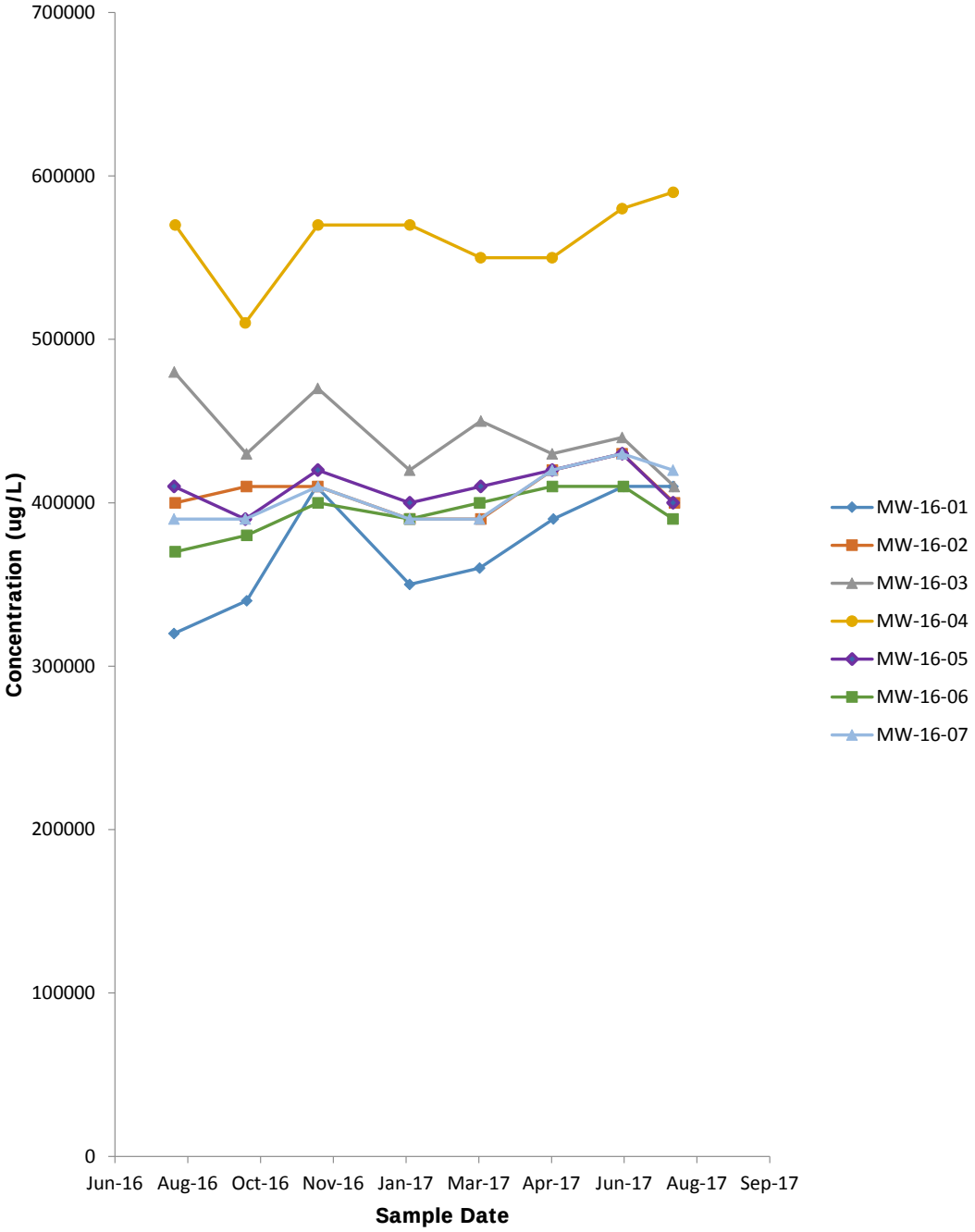
Background Concentration Time-Series Charts

Time-Series Plots
DTE Electric Company - Monroe Fly Ash Basin
Monroe, Michigan
Boron



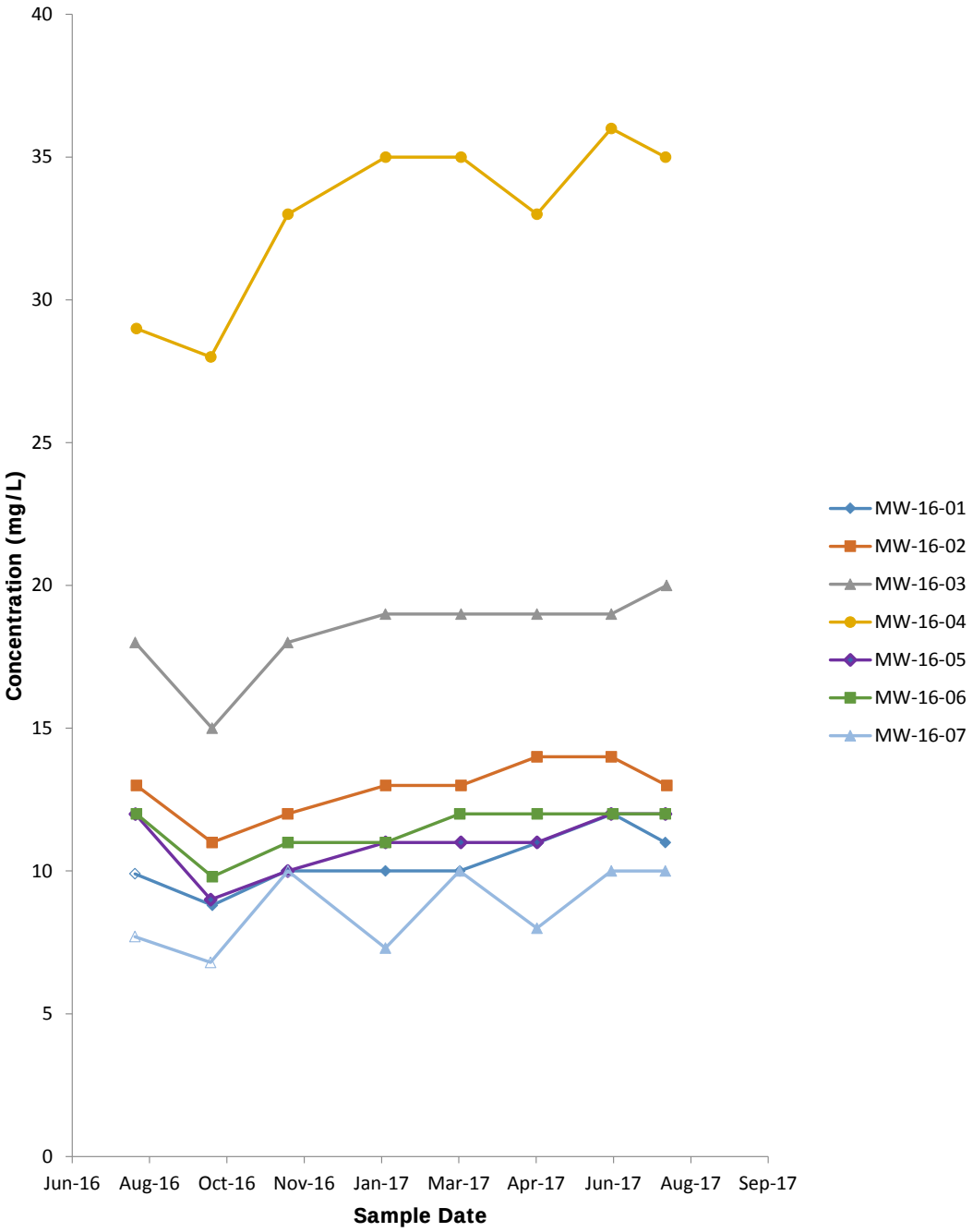
Open symbols denote non-detect concentrations.

Time-Series Plots
DTE Electric Company - Monroe Fly Ash Basin
Monroe, Michigan
Calcium



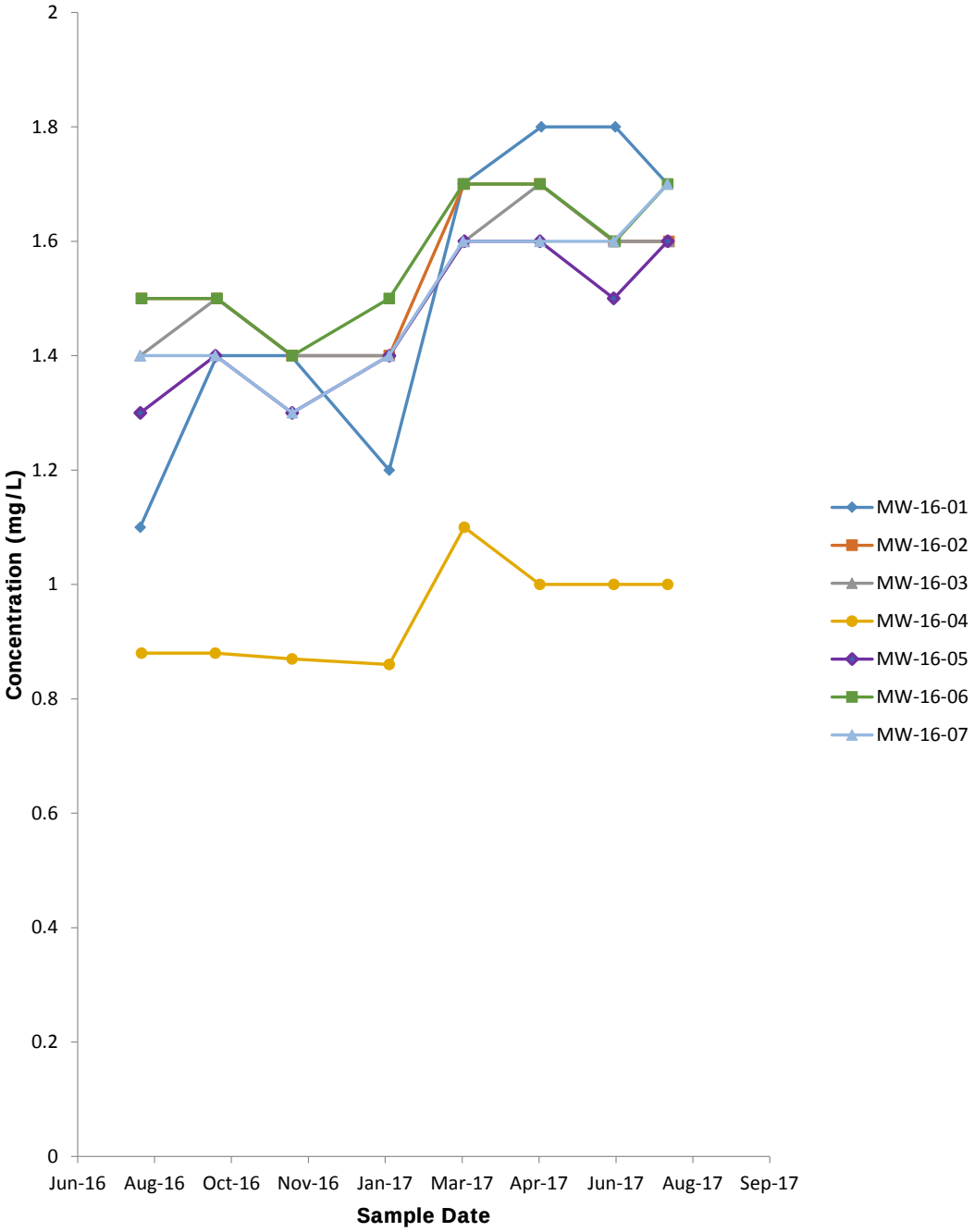
Open symbols denote non-detect concentrations.

Time-Series Plots
DTE Electric Company - Monroe Fly Ash Basin
Monroe, Michigan
Chloride



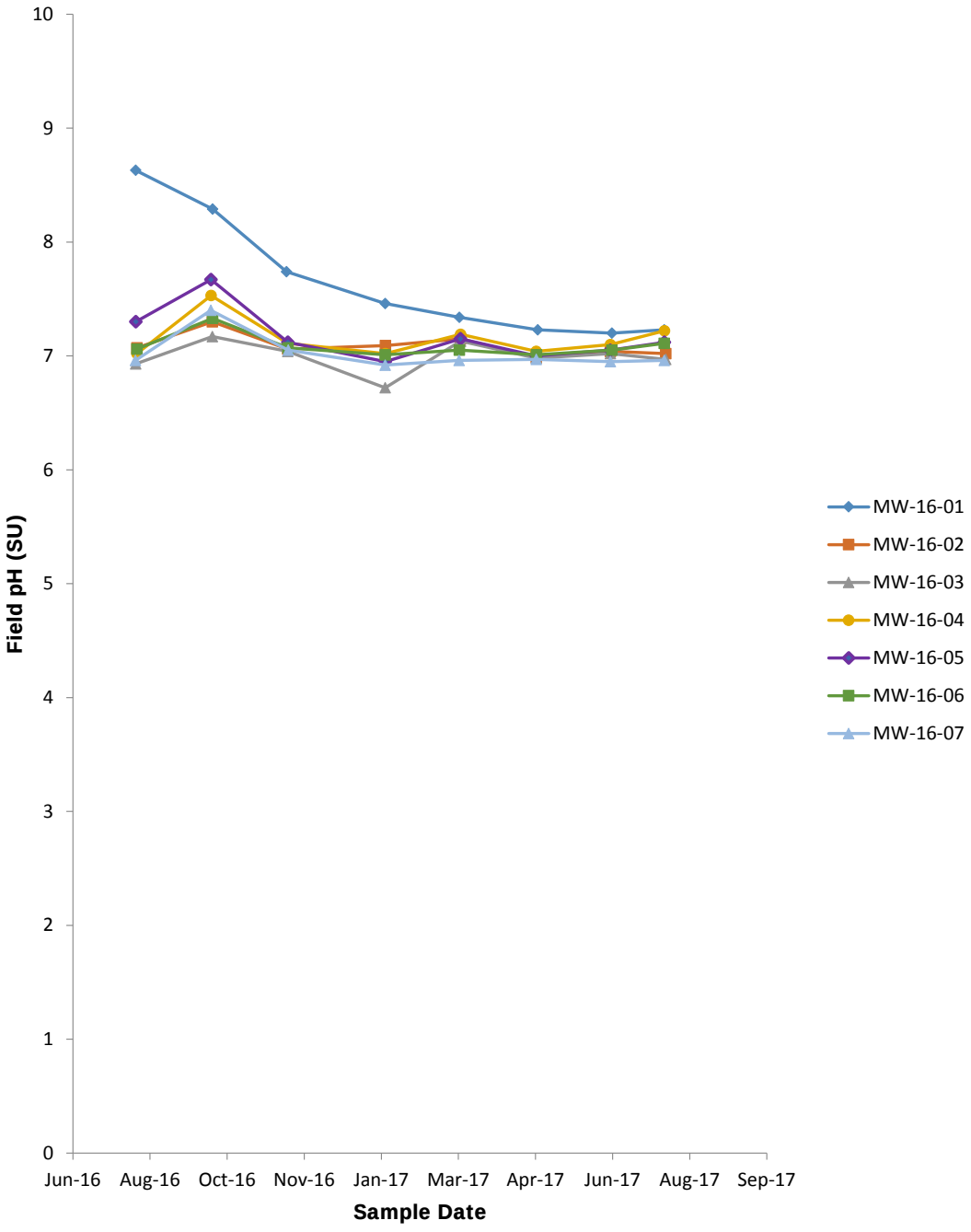
Open symbols denote non-detect concentrations.

Time-Series Plots
DTE Electric Company - Monroe Fly Ash Basin
Monroe, Michigan
Fluoride

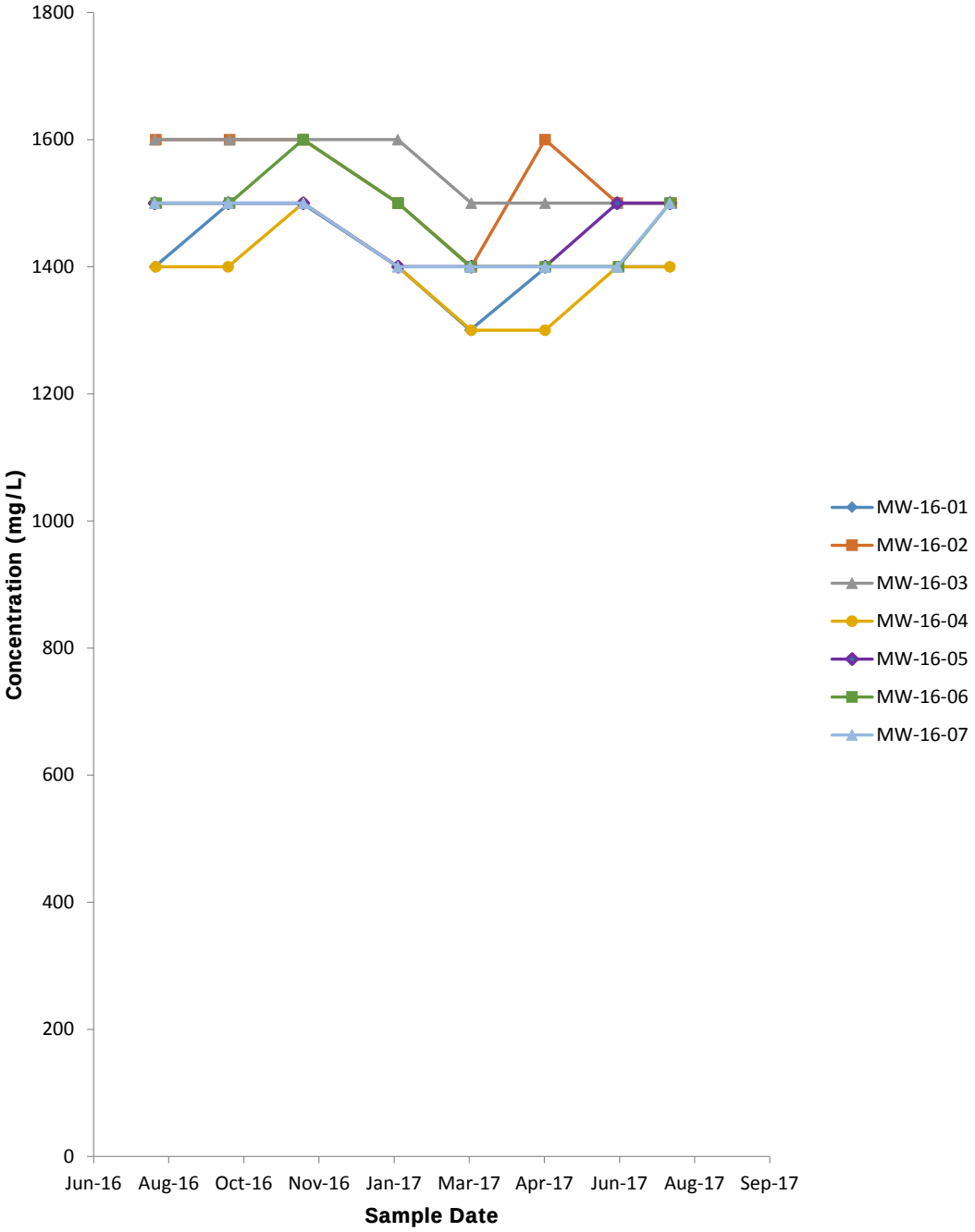


Open symbols denote non-detect concentrations.

Time-Series Plots
DTE Electric Company - Monroe Fly Ash Basin
Monroe, Michigan
pH, Field

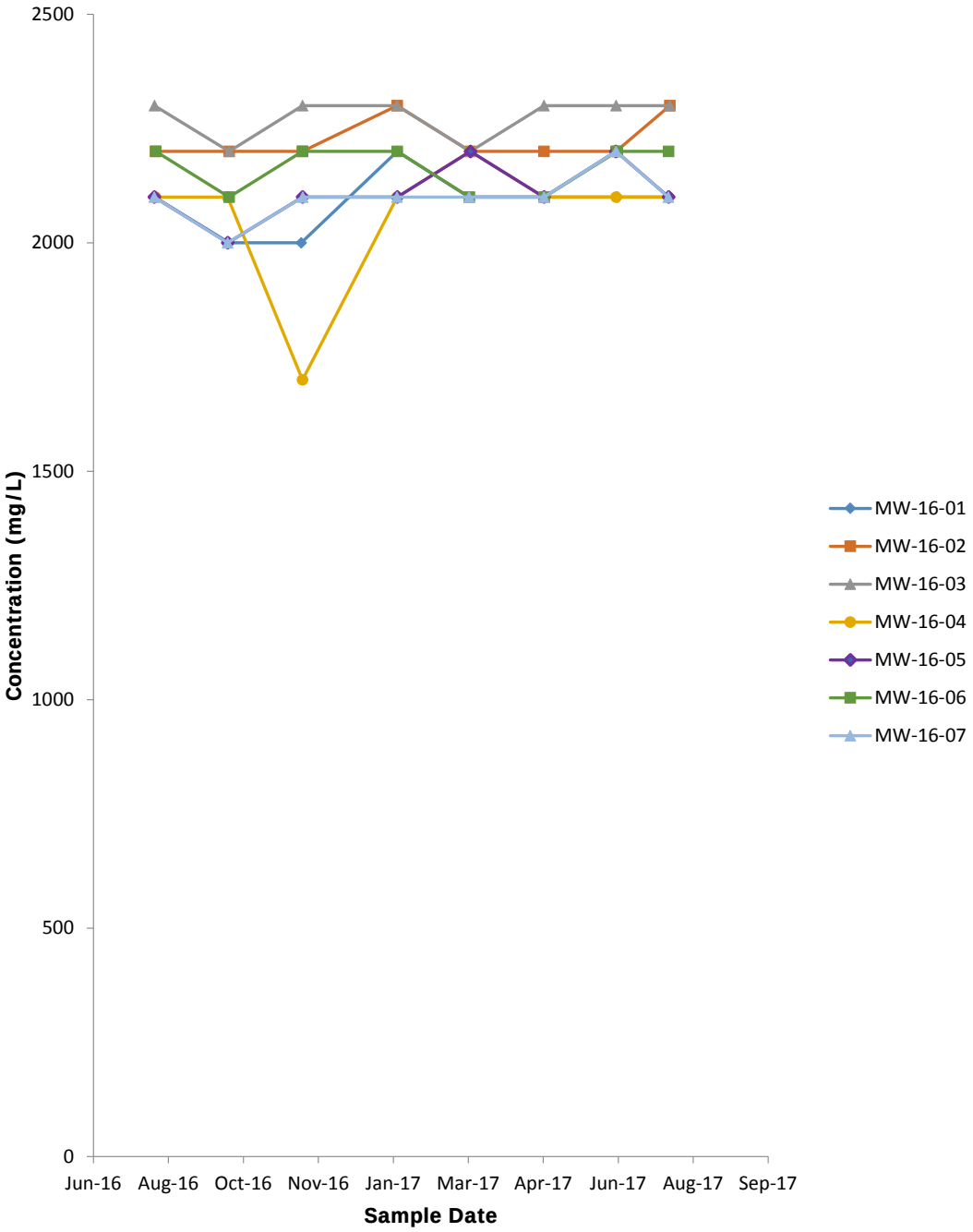


Time-Series Plots
DTE Electric Company - Monroe Fly Ash Basin
Monroe, Michigan
Sulfate



Open symbols denote non-detect concentrations.

Time-Series Plots
DTE Electric Company - Monroe Fly Ash Basin
Monroe, Michigan
Total Dissolved Solids



Open symbols denote non-detect concentrations.

Attachment B

ChemStat™ Prediction Limit Outputs

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-01
Parameter: Boron
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/8/2016	240
	9/27/2016	240
	11/14/2016	280
	1/17/2017	240
	3/6/2017	300
	4/26/2017	270 B
	6/13/2017	260
	7/17/2017	290

From 8 baseline samples
Baseline mean = 265
Baseline std Dev = 23.9046

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/18/2017	1	270	[0, 313.036]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-02
Parameter: Boron
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/9/2016	360
	9/27/2016	370
	11/15/2016	460
	1/17/2017	400
	3/7/2017	410
	4/25/2017	410 B
	6/12/2017	410
	7/18/2017	420

From 8 baseline samples
Baseline mean = 405
Baseline std Dev = 30.706

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/18/2017	1	420	[0, 466.704]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-03
Parameter: Boron
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/8/2016	390
	9/27/2016	400
	11/15/2016	500
	1/17/2017	460
	3/7/2017	430
	4/25/2017	450 B
	6/12/2017	460
	7/18/2017	450

From 8 baseline samples
Baseline mean = 442.5
Baseline std Dev = 35.3553

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/19/2017	1	460	[0, 513.547]	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-16-04
Parameter: Boron
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 62.5%
Future Samples (k) = 1
Recent Dates = 1
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 210
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Measurements	Date	Value
	8/9/2016	130
	9/26/2016	130
	11/15/2016	210
	1/17/2017	ND<170 J
	3/7/2017	ND<160 J
	4/25/2017	ND<170 JB
	6/12/2017	ND<170 J
	7/17/2017	ND<190 J

Date	Count	Mean	Significant
9/19/2017	1	170	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-05
Parameter: Boron
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/8/2016	200
	9/26/2016	190
	11/15/2016	270
	1/17/2017	220
	3/7/2017	220
	4/25/2017	230 B
	6/12/2017	230
	7/17/2017	250

From 8 baseline samples
Baseline mean = 226.25
Baseline std Dev = 25.5999

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/19/2017	1	250	[0, 277.693]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-06
Parameter: Boron
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/9/2016	270
	9/27/2016	270
	11/15/2016	380
	1/17/2017	330
	3/6/2017	340
	4/25/2017	330 B
	6/13/2017	320
	7/17/2017	350

From 8 baseline samples
Baseline mean = 323.75
Baseline std Dev = 37.7728

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/18/2017	1	340	[0, 399.655]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-07
Parameter: Boron
Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/8/2016	160
	9/26/2016	160
	11/15/2016	240
	1/17/2017	200
	3/6/2017	ND<95 J
	4/25/2017	210 B
	6/12/2017	210
	7/17/2017	230

From 8 baseline samples
Baseline mean = 188.125
Baseline std Dev = 47.5047

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/19/2017	1	200	[0, 283.586]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-01
Parameter: Calcium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/8/2016	320000
	9/27/2016	340000
	11/14/2016	410000
	1/17/2017	350000
	3/6/2017	360000
	4/26/2017	390000
	6/13/2017	410000
	7/17/2017	410000

From 8 baseline samples
Baseline mean = 373750
Baseline std Dev = 35831.9

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/18/2017	1	380000	[0, 445754]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-02
Parameter: Calcium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/9/2016	400000
	9/27/2016	410000
	11/15/2016	410000
	1/17/2017	390000
	3/7/2017	390000
	4/25/2017	420000
	6/12/2017	430000
	7/18/2017	400000

From 8 baseline samples
Baseline mean = 406250
Baseline std Dev = 14078.9

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/18/2017	1	390000	[0, 434542]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-03
Parameter: Calcium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/8/2016	480000
	9/27/2016	430000
	11/15/2016	470000
	1/17/2017	420000
	3/7/2017	450000
	4/25/2017	430000
	6/12/2017	440000
	7/18/2017	410000

From 8 baseline samples
Baseline mean = 441250
Baseline std Dev = 24164.6

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/19/2017	1	400000	[0, 489809]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-04
Parameter: Calcium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/9/2016	570000
	9/26/2016	510000
	11/15/2016	570000
	1/17/2017	570000
	3/7/2017	550000
	4/25/2017	550000
	6/12/2017	580000
	7/17/2017	590000

From 8 baseline samples
Baseline mean = 561250
Baseline std Dev = 24748.7

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/19/2017	1	530000	[0, 610983]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-05
Parameter: Calcium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/8/2016	410000
	9/26/2016	390000
	11/15/2016	420000
	1/17/2017	400000
	3/7/2017	410000
	4/25/2017	420000
	6/12/2017	430000
	7/17/2017	400000

From 8 baseline samples
Baseline mean = 410000
Baseline std Dev = 13093.1

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/19/2017	1	390000	[0, 436311]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-06
Parameter: Calcium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/9/2016	370000
	9/27/2016	380000
	11/15/2016	400000
	1/17/2017	390000
	3/6/2017	400000
	4/25/2017	410000
	6/13/2017	410000
	7/17/2017	390000

From 8 baseline samples
Baseline mean = 393750
Baseline std Dev = 14078.9

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/18/2017	1	380000	[0, 422042]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-07
Parameter: Calcium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/8/2016	390000
	9/26/2016	390000
	11/15/2016	410000
	1/17/2017	390000
	3/6/2017	390000
	4/25/2017	420000
	6/12/2017	430000
	7/17/2017	420000

From 8 baseline samples
Baseline mean = 405000
Baseline std Dev = 16903.1

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/19/2017	1	370000	[0, 438967]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-01
Parameter: Chloride
Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/8/2016	9.9
	9/27/2016	8.8
	11/14/2016	ND<5 U
	1/17/2017	10
	3/6/2017	10
	4/26/2017	11
	6/13/2017	12
	7/17/2017	11

From 8 baseline samples
Baseline mean = 9.7125
Baseline std Dev = 2.13102

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/18/2017	1	11	[0, 13.9948]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-02
Parameter: Chloride
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/9/2016	13
	9/27/2016	11
	11/15/2016	12
	1/17/2017	13
	3/7/2017	13
	4/25/2017	14
	6/12/2017	14
	7/18/2017	13

From 8 baseline samples
Baseline mean = 12.875
Baseline std Dev = 0.991031

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/18/2017	1	13	[0, 14.8665]	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-16-03
Parameter: Chloride
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%
Future Samples (k) = 1
Recent Dates = 1
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 20
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Measurements	Date	Value
	8/8/2016	18
	9/27/2016	15
	11/15/2016	18
	1/17/2017	19
	3/7/2017	19
	4/25/2017	19
	6/12/2017	19
	7/18/2017	20

Date	Count	Mean	Significant
9/19/2017	1	18	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-04
Parameter: Chloride
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/9/2016	29
	9/26/2016	28
	11/15/2016	33
	1/17/2017	35
	3/7/2017	35
	4/25/2017	33
	6/12/2017	36
	7/17/2017	35

From 8 baseline samples
Baseline mean = 33
Baseline std Dev = 2.9761

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/19/2017	1	34	[0, 38.9805]	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-16-05
Parameter: Chloride
Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL

Total Percent Non-Detects = 12.5%
Future Samples (k) = 1
Recent Dates = 1
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 12
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Measurements	Date	Value
	8/8/2016	12
	9/26/2016	9
	11/15/2016	ND<5 U
	1/17/2017	11
	3/7/2017	11
	4/25/2017	11
	6/12/2017	12
	7/17/2017	12

Date	Count	Mean	Significant
9/19/2017	1	11	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-16-06
Parameter: Chloride
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%
Future Samples (k) = 1
Recent Dates = 1
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 12
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Measurements	Date	Value
	8/9/2016	12
	9/27/2016	9.8
	11/15/2016	11
	1/17/2017	11
	3/6/2017	12
	4/25/2017	12
	6/13/2017	12
	7/17/2017	12

Date	Count	Mean	Significant
9/18/2017	1	11	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-07
Parameter: Chloride
Original Data (Not Transformed)
Cohen's Adjustment

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/8/2016	7.7
	9/26/2016	6.8
	11/15/2016	ND<10 U
	1/17/2017	7.3
	3/6/2017	ND<10 U
	4/25/2017	8
	6/12/2017	ND<10 U
	7/17/2017	10

From 8 baseline samples
Baseline mean = 9.24155
Baseline std Dev = 2.02913

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/19/2017	1	7.8	[0, 13.3191]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-01
Parameter: Fluoride
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/8/2016	1.1
	9/27/2016	1.4
	11/14/2016	1.4
	1/17/2017	1.2
	3/6/2017	1.7
	4/26/2017	1.8
	6/13/2017	1.8
	7/17/2017	1.7

From 8 baseline samples
Baseline mean = 1.5125
Baseline std Dev = 0.274838

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/18/2017	1	1.8	[0, 2.06479]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-02
Parameter: Fluoride
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/9/2016	1.5
	9/27/2016	1.5
	11/15/2016	1.4
	1/17/2017	1.4
	3/7/2017	1.7
	4/25/2017	1.7
	6/12/2017	1.6
	7/18/2017	1.6

From 8 baseline samples
Baseline mean = 1.55
Baseline std Dev = 0.119523

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/18/2017	1	1.6	[0, 1.79018]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-03
Parameter: Fluoride
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/8/2016	1.4
	9/27/2016	1.5
	11/15/2016	1.4
	1/17/2017	1.4
	3/7/2017	1.6
	4/25/2017	1.7
	6/12/2017	1.6
	7/18/2017	1.6

From 8 baseline samples
Baseline mean = 1.525
Baseline std Dev = 0.116496

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/19/2017	1	1.5	[0, 1.7591]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-04
Parameter: Fluoride
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/9/2016	0.88
	9/26/2016	0.88
	11/15/2016	0.87
	1/17/2017	0.86
	3/7/2017	1.1
	4/25/2017	1
	6/12/2017	1
	7/17/2017	1

From 8 baseline samples
Baseline mean = 0.94875
Baseline std Dev = 0.0880645

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/19/2017	1	1	[0, 1.12572]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-05
Parameter: Fluoride
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/8/2016	1.3
	9/26/2016	1.4
	11/15/2016	1.3
	1/17/2017	1.4
	3/7/2017	1.6
	4/25/2017	1.6
	6/12/2017	1.5
	7/17/2017	1.6

From 8 baseline samples
Baseline mean = 1.4625
Baseline std Dev = 0.130247

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/19/2017	1	1.5	[0, 1.72423]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-06
Parameter: Fluoride
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/9/2016	1.5
	9/27/2016	1.5
	11/15/2016	1.4
	1/17/2017	1.5
	3/6/2017	1.7
	4/25/2017	1.7
	6/13/2017	1.6
	7/17/2017	1.7

From 8 baseline samples
Baseline mean = 1.575
Baseline std Dev = 0.116496

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/18/2017	1	1.6	[0, 1.8091]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-07
Parameter: Fluoride
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/8/2016	1.4
	9/26/2016	1.4
	11/15/2016	1.3
	1/17/2017	1.4
	3/6/2017	1.6
	4/25/2017	1.6
	6/12/2017	1.6
	7/17/2017	1.7

From 8 baseline samples
Baseline mean = 1.5
Baseline std Dev = 0.141421

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/19/2017	1	1.5	[0, 1.78419]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-01
Parameter: pH, Field
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% Two-Sided Comparison

Baseline Samples	Date	Result
	8/8/2016	8.63
	9/27/2016	8.29
	11/14/2016	7.74
	1/17/2017	7.46
	3/6/2017	7.34
	4/26/2017	7.23
	6/13/2017	7.2
	7/17/2017	7.23

From 8 baseline samples
Baseline mean = 7.64
Baseline std Dev = 0.543113

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1)/2 = 97.5 %
t is Percentile of Student's T-Test (0.95/1/2) = 0.975
Degrees of Freedom = 8 (background observations) - 1
t(0.975, 8) = 2.36462

Date	Samples	Mean	Interval	Significant
9/18/2017	1	6.92	[6.28, 9]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-02
Parameter: pH, Field
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% Two-Sided Comparison

Baseline Samples	Date	Result
	8/9/2016	7.07
	9/27/2016	7.3
	11/15/2016	7.06
	1/17/2017	7.09
	3/7/2017	7.15
	4/25/2017	6.99
	6/12/2017	7.04
	7/18/2017	7.02

From 8 baseline samples
Baseline mean = 7.09
Baseline std Dev = 0.0973946

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1)/2 = 97.5 %
t is Percentile of Student's T-Test (0.95/1/2) = 0.975
Degrees of Freedom = 8 (background observations) - 1
t(0.975, 8) = 2.36462

Date	Samples	Mean	Interval	Significant
9/18/2017	1	7.01	[6.85, 7.33]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-03
Parameter: pH, Field
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% Two-Sided Comparison

Baseline Samples	Date	Result
	8/8/2016	6.93
	9/27/2016	7.17
	11/15/2016	7.04
	1/17/2017	6.72
	3/7/2017	7.13
	4/25/2017	6.98
	6/12/2017	7.02
	7/18/2017	6.97

From 8 baseline samples
Baseline mean = 6.995
Baseline std Dev = 0.137425

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1)/2 = 97.5 %
t is Percentile of Student's T-Test (0.95/1/2) = 0.975
Degrees of Freedom = 8 (background observations) - 1
t(0.975, 8) = 2.36462

Date	Samples	Mean	Interval	Significant
9/19/2017	1	6.89	[6.65, 7.34]	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-16-04
Parameter: pH, Field
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%
Future Samples (k) = 1
Recent Dates = 1
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 7.53
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Measurements	Date	Value
	8/9/2016	7.02
	9/26/2016	7.53
	11/15/2016	7.11
	1/17/2017	7.02
	3/7/2017	7.19
	4/25/2017	7.04
	6/12/2017	7.1
	7/17/2017	7.22

Date	Count	Mean	Significant
9/19/2017	1	7.02	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-05
Parameter: pH, Field
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% Two-Sided Comparison

Baseline Samples	Date	Result
	8/8/2016	7.3
	9/26/2016	7.67
	11/15/2016	7.12
	1/17/2017	6.95
	3/7/2017	7.15
	4/25/2017	7
	6/12/2017	7.05
	7/17/2017	7.12

From 8 baseline samples
Baseline mean = 7.17
Baseline std Dev = 0.228035

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1)/2 = 97.5 %
t is Percentile of Student's T-Test (0.95/1/2) = 0.975
Degrees of Freedom = 8 (background observations) - 1
t(0.975, 8) = 2.36462

Date	Samples	Mean	Interval	Significant
9/19/2017	1	6.89	[6.6, 7.74]	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-16-06
Parameter: pH, Field
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%
Future Samples (k) = 1
Recent Dates = 1
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 7.33
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Measurements	Date	Value
	8/9/2016	7.06
	9/27/2016	7.33
	11/15/2016	7.07
	1/17/2017	7.01
	3/6/2017	7.05
	4/25/2017	7.01
	6/13/2017	7.05
	7/17/2017	7.11

Date	Count	Mean	Significant
9/18/2017	1	6.93	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-16-07
Parameter: pH, Field
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%
Future Samples (k) = 1
Recent Dates = 1
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 7.4
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Measurements	Date	Value
	8/8/2016	6.96
	9/26/2016	7.4
	11/15/2016	7.05
	1/17/2017	6.92
	3/6/2017	6.96
	4/25/2017	6.97
	6/12/2017	6.95
	7/17/2017	6.96

Date	Count	Mean	Significant
9/19/2017	1	6.78	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-01
Parameter: Sulfate
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/8/2016	1400
	9/27/2016	1500
	11/14/2016	1500
	1/17/2017	1400
	3/6/2017	1300
	4/26/2017	1400
	6/13/2017	1400
	7/17/2017	1400

From 8 baseline samples
Baseline mean = 1412.5
Baseline std Dev = 64.087

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/18/2017	1	1500	[0, 1541.28]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-02
Parameter: Sulfate
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/9/2016	1600
	9/27/2016	1600
	11/15/2016	1600
	1/17/2017	1500
	3/7/2017	1400
	4/25/2017	1600
	6/12/2017	1500
	7/18/2017	1500

From 8 baseline samples
Baseline mean = 1537.5
Baseline std Dev = 74.4024

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/18/2017	1	1500	[0, 1687.01]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-03
Parameter: Sulfate
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/8/2016	1600
	9/27/2016	1600
	11/15/2016	1600
	1/17/2017	1600
	3/7/2017	1500
	4/25/2017	1500
	6/12/2017	1500
	7/18/2017	1500

From 8 baseline samples
Baseline mean = 1550
Baseline std Dev = 53.4522

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/19/2017	1	1500	[0, 1657.41]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-04
Parameter: Sulfate
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/9/2016	1400
	9/26/2016	1400
	11/15/2016	1500
	1/17/2017	1400
	3/7/2017	1300
	4/25/2017	1300
	6/12/2017	1400
	7/17/2017	1400

From 8 baseline samples
Baseline mean = 1387.5
Baseline std Dev = 64.087

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/19/2017	1	1300	[0, 1516.28]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-05
Parameter: Sulfate
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/8/2016	1500
	9/26/2016	1500
	11/15/2016	1500
	1/17/2017	1400
	3/7/2017	1400
	4/25/2017	1400
	6/12/2017	1500
	7/17/2017	1500

From 8 baseline samples
Baseline mean = 1462.5
Baseline std Dev = 51.7549

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/19/2017	1	1400	[0, 1566.5]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-06
Parameter: Sulfate
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/9/2016	1500
	9/27/2016	1500
	11/15/2016	1600
	1/17/2017	1500
	3/6/2017	1400
	4/25/2017	1400
	6/13/2017	1400
	7/17/2017	1500

From 8 baseline samples
Baseline mean = 1475
Baseline std Dev = 70.7107

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/18/2017	1	1500	[0, 1617.09]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-07
Parameter: Sulfate
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/8/2016	1500
	9/26/2016	1500
	11/15/2016	1500
	1/17/2017	1400
	3/6/2017	1400
	4/25/2017	1400
	6/12/2017	1400
	7/17/2017	1500

From 8 baseline samples
Baseline mean = 1450
Baseline std Dev = 53.4522

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/19/2017	1	1400	[0, 1557.41]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-01
Parameter: Total Dissolved Solids
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/8/2016	2100
	9/27/2016	2000
	11/14/2016	2000
	1/17/2017	2200
	3/6/2017	2100
	4/26/2017	2100
	6/13/2017	2100
	7/17/2017	2100

From 8 baseline samples
Baseline mean = 2087.5
Baseline std Dev = 64.087

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/18/2017	1	2200	[0, 2216.28]	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-16-02
Parameter: Total Dissolved Solids
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%
Future Samples (k) = 1
Recent Dates = 1
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 2300
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Measurements	Date	Value
	8/9/2016	2200
	9/27/2016	2200
	11/15/2016	2200
	1/17/2017	2300
	3/7/2017	2200
	4/25/2017	2200
	6/12/2017	2200
	7/18/2017	2300

Date	Count	Mean	Significant
9/18/2017	1	2300	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-16-03
Parameter: Total Dissolved Solids
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%
Future Samples (k) = 1
Recent Dates = 1
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 2300
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Measurements	Date	Value
	8/8/2016	2300
	9/27/2016	2200
	11/15/2016	2300
	1/17/2017	2300
	3/7/2017	2200
	4/25/2017	2300
	6/12/2017	2300
	7/18/2017	2300

Date	Count	Mean	Significant
9/19/2017	1	2300	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-16-04
Parameter: Total Dissolved Solids
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%
Future Samples (k) = 1
Recent Dates = 1
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 2200
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Measurements	Date	Value
	8/9/2016	2100
	9/26/2016	2100
	11/15/2016	1700
	1/17/2017	2100
	3/7/2017	2200
	4/25/2017	2100
	6/12/2017	2100
	7/17/2017	2100

Date	Count	Mean	Significant
9/19/2017	1	2100	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-05
Parameter: Total Dissolved Solids
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/8/2016	2100
	9/26/2016	2000
	11/15/2016	2100
	1/17/2017	2100
	3/7/2017	2200
	4/25/2017	2100
	6/12/2017	2200
	7/17/2017	2100

From 8 baseline samples
Baseline mean = 2112.5
Baseline std Dev = 64.087

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/19/2017	1	2100	[0, 2241.28]	FALSE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-06
Parameter: Total Dissolved Solids
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/9/2016	2200
	9/27/2016	2100
	11/15/2016	2200
	1/17/2017	2200
	3/6/2017	2100
	4/25/2017	2100
	6/13/2017	2200
	7/17/2017	2200

From 8 baseline samples
Baseline mean = 2162.5
Baseline std Dev = 51.7549

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/18/2017	1	2300	[0, 2266.5]	TRUE

Parametric Prediction Interval Analysis

Intra-Well Comparison for MW-16-07
Parameter: Total Dissolved Solids
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 95% One-Sided Comparison

Baseline Samples	Date	Result
	8/8/2016	2100
	9/26/2016	2000
	11/15/2016	2100
	1/17/2017	2100
	3/6/2017	2100
	4/25/2017	2100
	6/12/2017	2200
	7/17/2017	2100

From 8 baseline samples
Baseline mean = 2100
Baseline std Dev = 53.4522

For 1 recent sampling event(s)
Actual confidence level is 1.0 - (0.05/1) = 95 %
t is Percentile of Student's T-Test (0.95/1) = 0.95
Degrees of Freedom = 8 (background observations) - 1
t(0.95, 8) = 1.89458

Date	Samples	Mean	Interval	Significant
9/19/2017	1	2100	[0, 2207.41]	FALSE