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Operable Unit 1 Field Demonstration Project Completion Report Mound, Ohio, Site

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U.S. DEPARTMENT OF ENERGY | Legacy Management

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Appendix A Groundwater Quality Data, Year Four
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Abbreviations

BVA	Buried Valley Aquifer
cDCE	*cis*-1,2-dichloroethene
COV	coefficient of variation
cVOC	chlorinated volatile organic compounds
CY	calendar year
DCE	dichloroethene
DO	dissolved oxygen
DOE	U.S. Department of Energy
EA	enhanced attenuation
EPA	U.S. Environmental Protection Agency
Fe	iron
ft	feet
ft/ft	feet per foot
MAROS	Monitoring and Remediation Optimization System
MCL	maximum contaminant level
µg/L *or* ug/L	micrograms per liter
mg/L	milligrams per liter
mL	milliliters
MNA	monitored natural attenuation
mV	millivolts
Ohio EPA	Ohio Environment Protection Agency
ORP	oxidation-reduction potential
OU-1	Operable Unit 1
PCE	tetrachloroethene (perchloroethene)
PCR	polymerase chain reaction
P&T	pump and treatment
qPCR	quantitative polymerase chain reaction
ROD	record of decision
S	Mann-Kendall statistic
spp.	species (plural)
TCE	trichloroethene
TOC	total organic carbon
VC	vinyl chloride

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1.0 Introduction

At the Mound, Ohio, Site, chlorinated volatile organic compounds (cVOCs) originating from the former landfill impacted the groundwater in Operable Unit 1 (OU-1). The baseline groundwater remedy is groundwater pump and treatment (P&T). Following the removal of source materials from the former landfill, the Mound Core Team, which consists of representatives from the U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA), and the Ohio Environmental Protection Agency (Ohio EPA), supported by other stakeholders (e.g., the Ohio Department of Health), assessed the feasibility of switching from the active P&T remedy to a passive remedy based on attenuation. Toward this end, an enhanced attenuation (EA) strategy based on the creation of structured geochemical zones was developed. This EA strategy addresses the residual areas of elevated cVOCs in soil and groundwater while minimizing the rebound of groundwater concentrations above regulatory limits (e.g., EPA maximum contaminant levels [MCLs]) and avoiding plume expansion while the P&T system is turned off. The goals of the field demonstration are to document the establishment and maintenance of these treatment zones, monitor changes in cVOC concentrations in groundwater, and support the development of a time frame to achieve levels at or below the relevant MCLs throughout the OU-1 groundwater plume.

To better evaluate the EA strategy, DOE conducted a field demonstration using edible oils to enhance the natural attenuation processes. The field demonstration was designed to determine whether structured geochemical zones that expedite the attenuation of cVOCs in groundwater underlying OU-1 could be established and sustained, thus facilitating transition of the site to monitored natural attenuation (MNA). The EA approach at OU-1 was designed based on structured geochemical zones and relies on groundwater flow through a succession of anaerobic and aerobic zones. The field demonstration was initially scheduled to operate for 3 years. Lower than typical water levels and increased hydraulic gradients caused by a large offsite dewatering operation and regional drought conditions during the second year, however, perturbed the trends (DOE 2017). As a result, the Core Team supported extending the period of field demonstration to include the collection of a fourth year of data.

This final report describes the conclusive outcome of the field demonstration using results from the evaluation of data collected from the attenuation zones as outlined in the *Field Demonstration Work Plan for Using Edible Oils to Achieve Enhanced Attenuation of cVOCs and a Groundwater Exit Strategy for the OU-1 Area, Mound, Ohio* (DOE 2014a) (also called the "Field Demonstration Work Plan"), the *OU-1 Enhanced Attenuation Field Demonstration Edible Oil Deployment Design, Mound, Ohio, Site* (DOE 2014b) (also called the "Deployment Design"), and the *OU-1 Enhanced Attenuation Field Demonstration Sampling and Analysis Plan, Mound, Ohio, Site* (DOE 2014c) (also called the "Sampling and Analysis Plan").

This report also details the results from the fourth year of monitoring. Interim reports were prepared for the previous 3 years (DOE 2016; DOE 2017; DOE 2018) describing the status of the field demonstration and results from the evaluation of data collected. The interim reports also provided an evaluation of each of the test goals and determined whether contingency measures were needed and whether the field demonstration should continue.

1.1 Approach

The EA Field Demonstration at OU-1 was designed based on structured geochemical zones and relies on groundwater flow through a succession of anaerobic and aerobic zones. The anaerobic zones stimulate relatively rapid degradation of the original solvent source compounds (e.g., cVOCs such as tetrachloroethene [PCE] and trichloroethene [TCE]). The surrounding aerobic areas encourage relatively rapid degradation of daughter products (dichloroethene [DCE] and vinyl chloride [VC]), as well as enhanced cometabolism of TCE resulting from utilization of methane and other reduced hydrocarbons that are formed and released from the anaerobic zones. A key technical-conceptual basis for utilizing structured geochemical zones is the relative rate of degradation of various cVOCs under anaerobic and aerobic conditions (Figure 1).

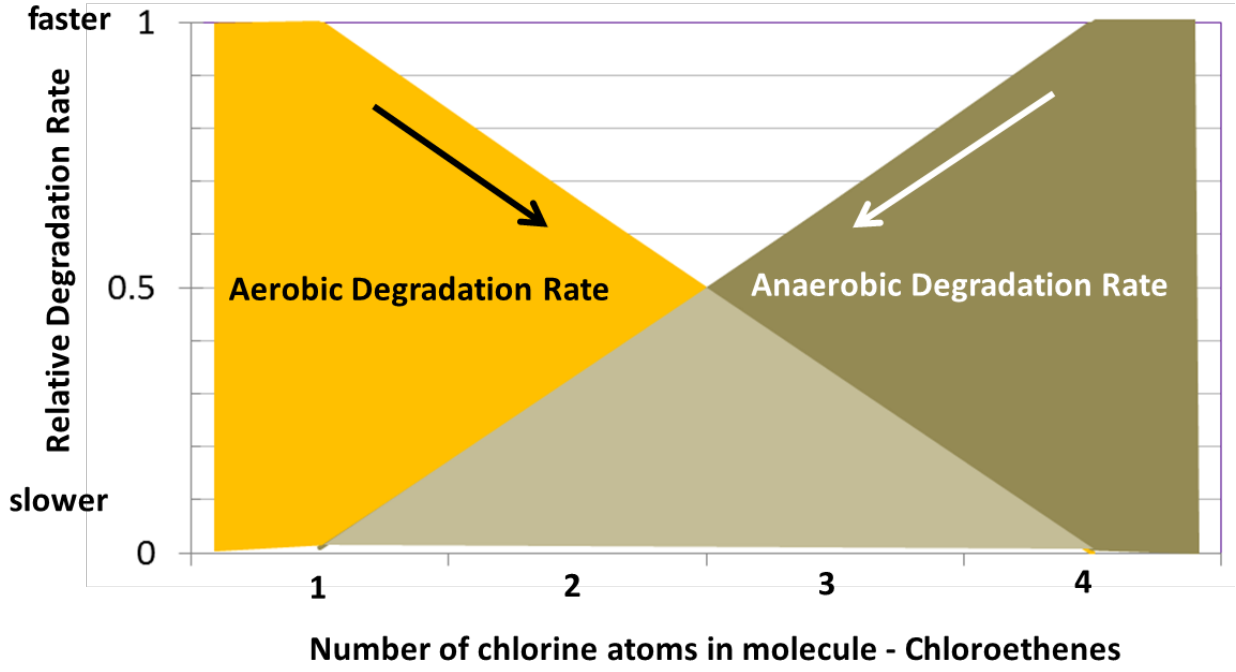


Figure 1. Relative Rates of Chloroethene Degradation Under Anaerobic and Aerobic Conditions (after Hazen 2010)

As shown in Figure 1, aerobic processes are relatively fast for cVOCs with fewer chlorines, such as VC and DCE. The most highly chlorinated ethene, PCE, has been documented as not degrading at a detectible rate under aerobic conditions. Conversely, anaerobic processes are relatively fast for chloroethenes with more chlorines, such as PCE and TCE. Anaerobically, DCE and VC are reduced relatively slowly and require somewhat specific microorganisms to degrade. The hybrid structured geochemical zone approach supports reasonable progress toward remedial goals based on the complementary strengths of the different attenuation and degradation processes that occur in the two redox conditions. The strategy also minimizes adverse collateral impacts that may ensue when converting an aerially extensive region of an aquifer from baseline aerobic conditions to strongly anaerobic conditions. Finally, structured geochemical zones allow the microbial communities to work in sequence in environments to allow the overall degradation to be relatively rapid and robust.

The final deployment design was documented in the Deployment Design and consisted of neat oil injection at 6 locations within the OU-1 landfill footprint and emulsified oil injection at 19 locations throughout the OU-1 area. The injection of emulsified oil was used to form treatment zones to address the aquifer beneath the former landfill area and address cVOC-impacted groundwater downgradient of the former landfill.

Monitoring wells were divided into different categories based on their location within the treatment area, as outlined in the Sampling and Analysis Plan. Groundwater was sampled to assess the performance of the deployment strategy for long-term attenuation of cVOCs in the OU-1 area. The goal of the performance monitoring was to collect data to:

- Measure the effects of neat and emulsified oil emplacement within the treatment zones.
- Assess any changes in the size or location of anaerobic areas in the treatment zones.
- Measure cometabolic and abiotic conditions along the lateral and distal portions of the treatment zones.
- Determine whether there is any reduction in PCE and TCE concentrations within the treatment zones.

1.2 Objectives

The purpose of the field demonstration was to determine whether discrete treatment zones could be established that facilitate the attenuation of cVOCs in OU-1 groundwater. Edible oils (neat and emulsified) were used to create treatment zones to reduce the concentrations of TCE and PCE in groundwater and stimulate (enhance) the attenuation of these parent compounds and their degradation (daughter) products. The goal of the field demonstration was to show that these treatment zones could be established and effectively maintained such that cVOC concentrations in groundwater can decrease to MCLs in a reasonable time frame.

The overall objectives of the field demonstration were developed in the Field Demonstration Work Plan. The objectives were to:

- Assess the performance and viability of attenuation using structured geochemical zones as a remediation strategy for OU-1 groundwater.
- Stabilize the plume and minimize or mitigate the potential for plume growth.
- Develop the biogeochemical conditions to accelerate progress toward remedial objectives and transition the strategy for groundwater in OU-1 to MNA.

Enabling objectives for the field demonstration as outlined in the Work Plan included:

- Monitoring oil and amendment emplacement and effects on groundwater biogeochemistry.
- Determining cVOC degradation and degradation rates.
- Assessing degradation (daughter) products and their subsequent degradation.
- Assessing degradation pathways (reductive dechlorination, cometabolism, abiotic).
- Assessing the recruitment of appropriate bacteria (i.e., fermentative, dechlorination, and cometabolic) and biomass.

- Assessing the ability of the oil deployment to stabilize and shrink the groundwater plume and to provide a sustainable treatment to meet the cleanup level of 5 micrograms per liter (µg/L) TCE.
- Determine long-term operation, maintenance, and monitoring requirements.

As the field demonstration progressed, these objectives were modified or expanded to address changes that occurred. A modification was assessing the ability of the structured geochemical zones to provide sustainable treatment to meet the cleanup levels for the remaining VOCs (i.e., PCE, DCE, and VC).

1.3 Summary of Years One–Three of the Enhanced Attenuation Field Demonstration

The results from the field demonstration through Year Three showed that the structured geochemical zones developed as projected, progressed as anticipated, and were working as designed.

Below is a summary of observations from the first 3 years of the field demonstration.

cVOC Behavior

- Changes observed in the concentrations of parent and daughter cVOCs in OU-1 monitoring wells located in the anaerobic treatment zones and downgradient of those areas confirmed reductive dechlorination in the anaerobic treatment zones. Data from wells within the treatment zones typically had declining concentrations of parent cVOCs, as expected, and increasing concentrations of daughter products. Lower concentrations of daughter products (*cis*-1,2-dichloroethene [cDCE] and VC) in wells downgradient of the treatment zones are consistent with aerobic metabolism or cometabolism.
- Monitoring and Remediation Optimization System (MAROS) plume evaluation analysis showed that the structured geochemical zones were working as designed. Overall, the moment analyses indicated (1) cVOC parent plume strength was decreasing and the plumes could generally be classified as stable or shrinking, (2) cVOC plumes were behaving as anticipated, as indicated by decreasing or stable total dissolved mass, (3) stable or upgradient direction of movement of the center of mass, and (4) continued transformation by reductive dechlorination and generally decreasing concentration trends in a majority of the monitoring wells.
- Concentrations and concentration trends in the downgradient sentinel wells demonstrated that the cVOC plume was not expanding. Concentrations were below the MCLs for PCE, TCE, and VC in all sentinel well samples.
- The volatile organic compound concentrations throughout the plume were projected to be below the target MCLs of 2 µg/L for VC and 5 µg/L for PCE and TCE within 5–10 years (calendar year [CY] 2019–CY 2024), which was faster than the original EA design projection of 13 years (CY 2027).

Aquifer Geochemistry

- Aquifer geochemistry changed from an oxidizing to a reducing condition as indicated by oxidation-reduction potential (ORP) and dissolved oxygen (DO) data. Indications of increased microbial activity were observed through increases in metabolic byproducts and methane concentrations in groundwater samples.
- The chemistry of the aquifer at the downgradient wells continued to indicate higher ORP values and DO concentrations.

Microbial Communities

- Microbial counts increased following the EA deployment for total bacteria, chlorinated-solvent-reducing bacteria, aerobic cometabolic bacteria, methanogens, and sulfate reducers. Chlorinated-solvent-reducing bacterial counts showed significant increases in treatment zones.
- The wells in the treatment zones showed significant increases in chlorinated-solvent-reducing bacteria that are capable of degrading TCE and PCE. Side-gradient, intermediate, and downgradient wells also showed increases in chlorinated-solvent-reducing bacteria counts.

A number of items were identified from the previous 3 years of the EA Field Demonstration that provided key information. The watch list items are listed below.

- **Wells with rebound:** Isolated areas (notably near well 0305) exhibited rebound (increased concentrations) for TCE and PCE in Year One. The concentrations in well 0305 (and other mid-plume wells) are expected to decrease in the future as the upgradient sources attenuate. Documentation of stabilization of concentrations and development of downward concentration (attenuation) trends in these wells is needed for assessment of the longer-term effectiveness of the EA remedy and the refinement of the projected remediation time frames.
- **MAROS statistical trends in the plume spread (uniformity) for TCE:** This trend should stabilize and then decrease in the future following an initial response to the EA deployment, which knocked down the highest concentrations within the baseline plume.
- **Assess significance of cVOCs daughter product formation:** Evaluate cVOC data to assess the occurrence of cDCE stall and VC accumulation. Specifically, document whether (a) cDCE and VC concentrations remain in an acceptable range, (b) the temporal patterns of cDCE and VC concentrations are acceptable (e.g., peak and decline), and (c) total chlorinated solvent (moles) in the plume continues to decrease over time.
- **Geochemical conditions for the anaerobic treatment zones:** Sulfate was moderately high prior to the injections and decreased significantly after injections. There was some sulfate rebound in August 2015. Sulfate and total organic carbon (TOC) concentrations will need to be watched to ensure maintenance of the structured geochemical zones. The overall trends indicate that the structured geochemical zones are still in development due to the slow release of the electron donor from the soybean oil after the fast utilization of the lactate electron donor.
- **Microbial data in mid-plume and distal wells:** The development of microbial communities into transitional and significant ranges (for cometabolic and reductive

dechlorination species) should be watched for as the impacts of upgradient injections wash through these areas.

2.0 Year Four Data Results

The sampling strategy in the Sampling and Analysis Plan was designed to provide sufficient data to meet the field demonstration objectives as stated in Section 1. Measurements were made in a representative set of wells within and outside of the treatment zones and downgradient of the treatment zones. The protocol for evaluation of the data is outlined in the Field Demonstration Work Plan. The data generated from this fourth year (August 2017 through August 2018) of sampling are used to support the multiple lines of evidence related to EA and the establishment of structured geochemical zones and to provide an initial assessment of progress for switching from the active P&T remedy to a passive remedy based on attenuation. All data from the fourth year of monitoring, including validation qualifiers, are summarized in Appendix A.

2.1 Groundwater Quality

Groundwater samples were collected as part of the postdeployment monitoring program (Table 1) from selected wells in the OU-1 area (Figure 2) in accordance with the Sampling and Analysis Plan. As in the previous three years, groundwater sampling was performed quarterly during Year Four of the field demonstration.

2.1.1 cVOC Distribution

Data collected from the wells in August 2018 are used to illustrate the distribution of cVOCs in the groundwater at the end of the fourth year of the field demonstration (Figure 3 through Figure 6). Low levels of PCE and TCE (parent compounds) were detected throughout the OU-1 area. The MCL for PCE (5 μg/L) was exceeded in treatment zone wells P053 and P059 during Year Four. Concentrations of TCE greater than the MCL (5 μg/l) were measured in interior wells 0305 and 0418 and southern treatment zone well P059 in Year Four. Overall, the footprint of the parent compound plumes (PCE and TCE) remained stable during Year Four. The daughter product, cDCE, was observed throughout the plume primarily as discrete areas of higher concentrations; however, the concentrations of cDCE do not exceed the MCL of 70 mg/L. The daughter product, VC, was observed mainly in the two dissolved phase source areas. The MCL for VC (2 μg/L) was exceeded in treatment zone wells 0410, 0419, P054, P056, and P060 and interior well 0417.

Table 1. Monitoring Program During Postdeployment

Category	Well IDs	Analytes	Frequency
Treatment zone	0410 0419 0451 P054 P056 P059 P060	VOCs Indicator/field parameters Anions Ammonia Dissolved iron Light hydrocarbons Dissolved gases TOC	First 6 months: monthly Remainder of the monitoring period: quarterly
Upgradient/lateral area	0379 0416 0422	VOCs Indicator/field parameters Anions Dissolved iron	
Interior impact area	0418 P057 P058	VOCs Indicator/field parameters Anions Total organic carbon Ammonia Dissolved iron Light hydrocarbons Dissolved gases	
Downgradient/Sentinel	0402 P031 P061 P062 P063	VOCs Indicator/field parameters Anions Ammonia Dissolved iron TOC Dissolved gases	
Other wells	0305 0417 0423 0424 0425 0452 P015 P027 P053	VOCs	Quarterly

Abbreviations:
VOCs = volatile organic compounds
TOC = total organic carbon

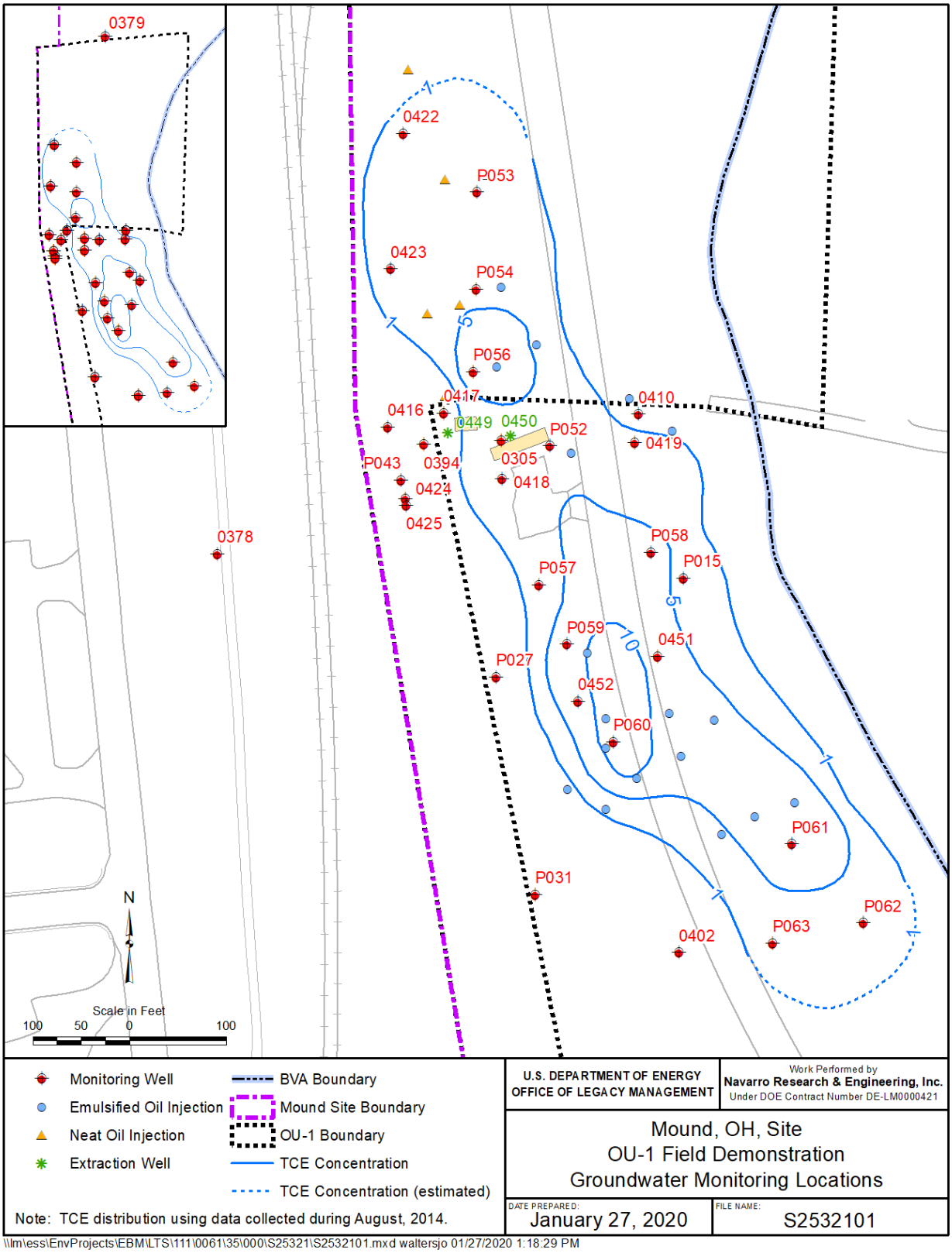


Figure 2. OU-1 Field Demonstration Groundwater Monitoring Locations

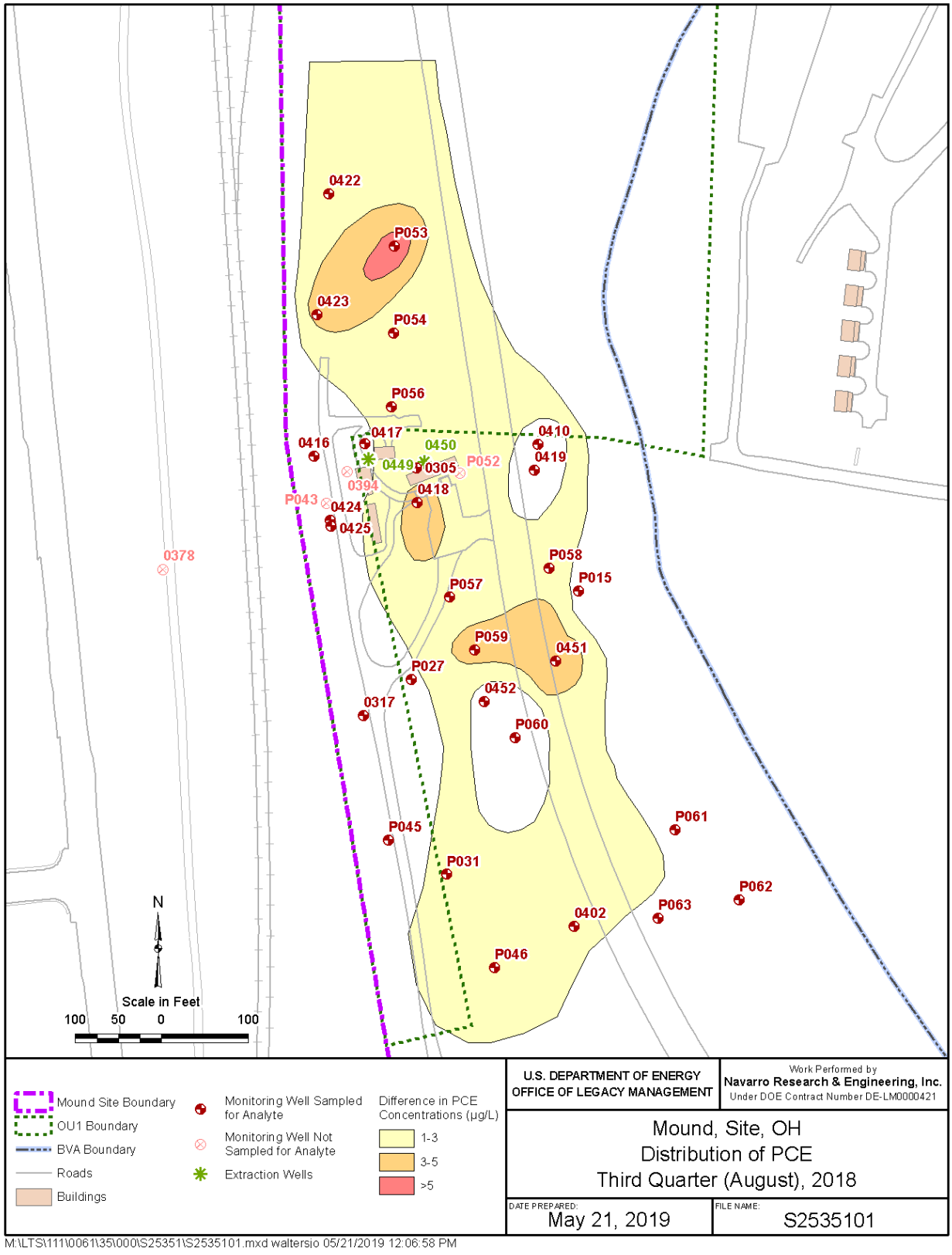


Figure 3. Mound Site OU-1 Distribution of PCE, August 2018

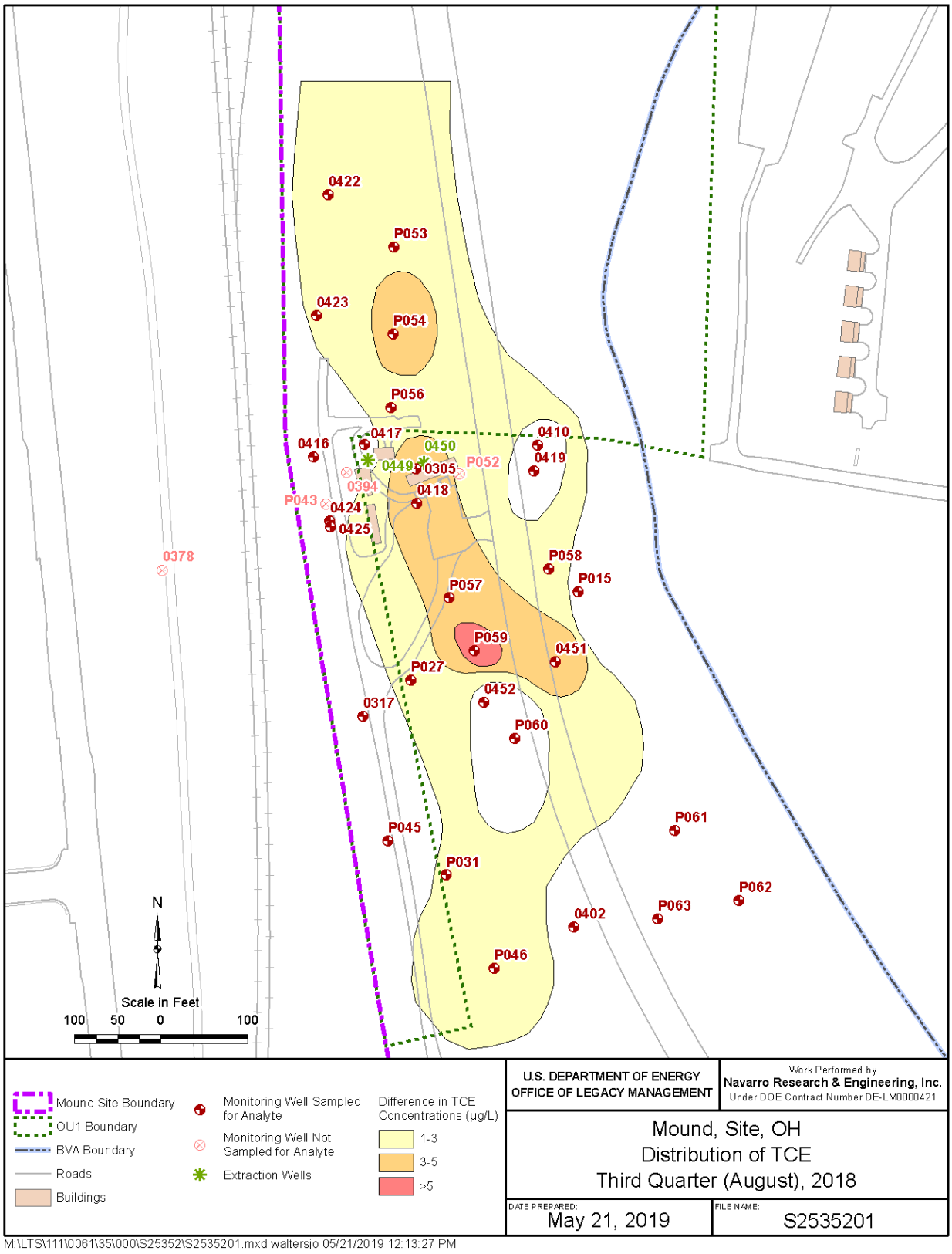


Figure 4. Mound Site OU-1 Distribution of TCE, August 2018

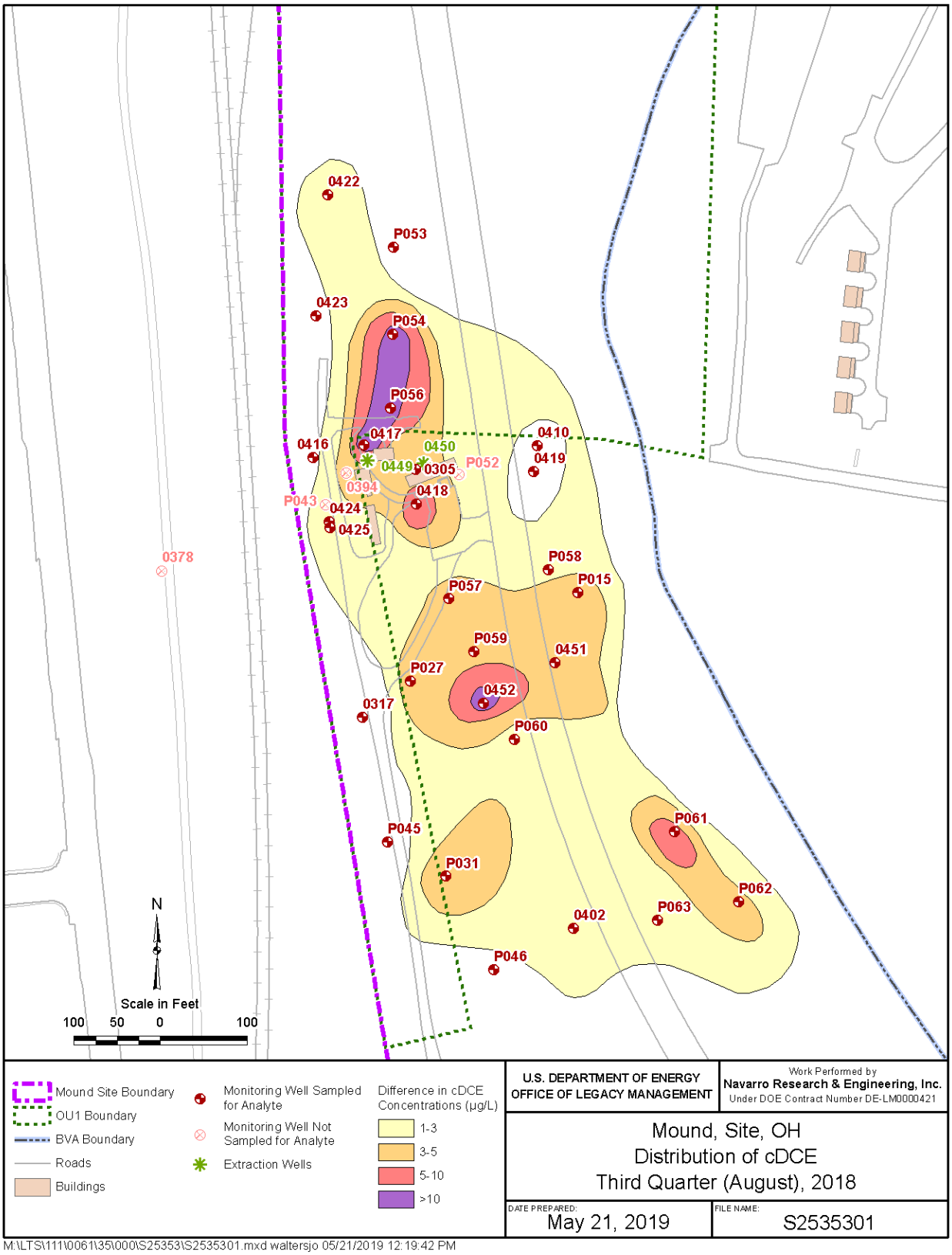


Figure 5. Mound Site OU-1 Distribution of cDCE, August 2018

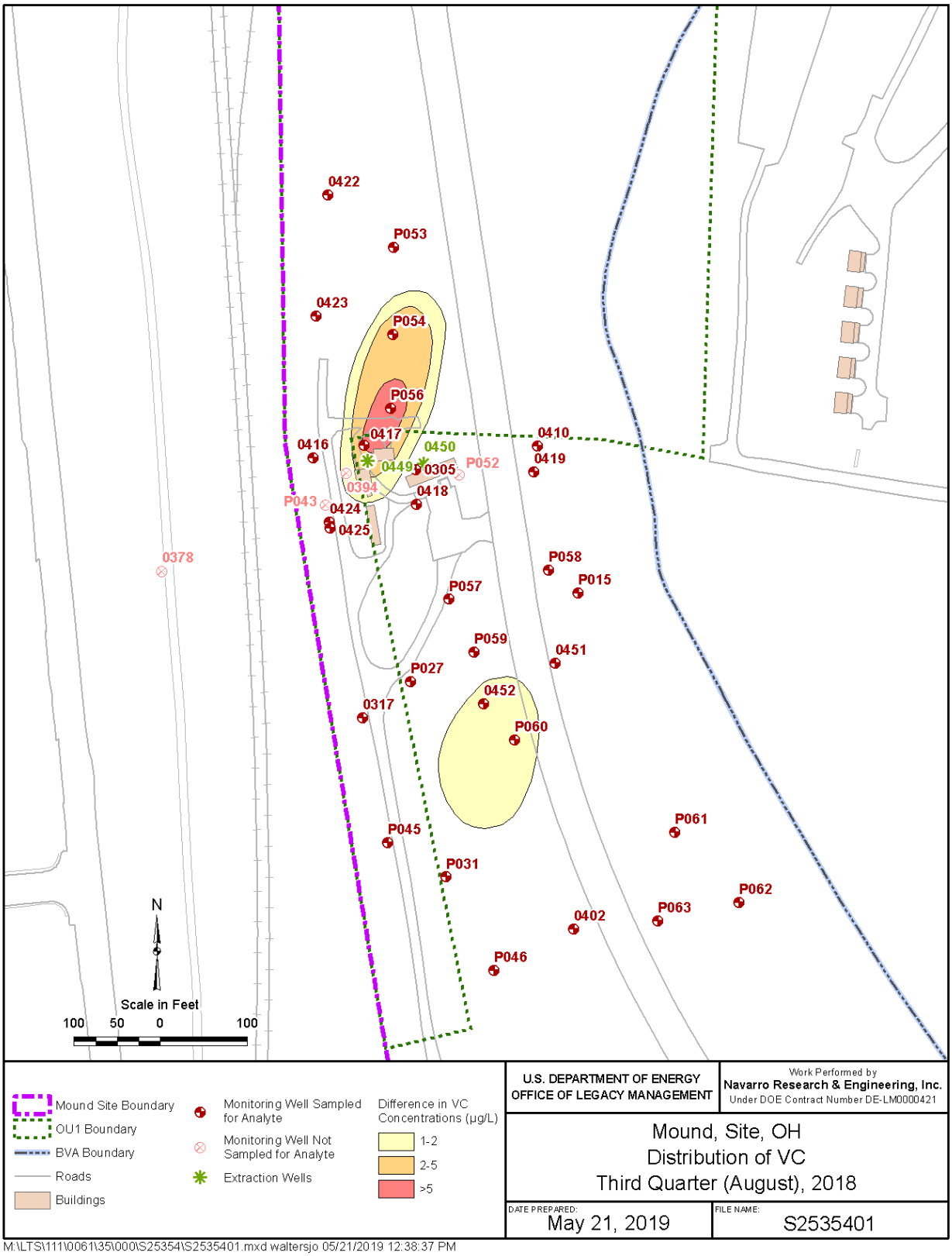


Figure 6. Mound Site OU-1 Distribution of VC, August 2018

2.1.2 Aquifer Geochemistry

The attenuation condition parameters of DO, ORP, TOC, alkalinity, and pH aid the definition and evaluation of the structured geochemical zones for anaerobic and aerobic degradation processes. Figure 7 through Figure 10 present the data and the contour plots of DO. Figure 11 through Figure 14 present the data and contour plots of ORP. While there was variability observed in the geochemical data from quarter to quarter, the majority of monitoring data supports a reasonable-composite interpretation of the geochemical conditions and the status of the structured geochemical zones. The following are key observations of the attenuation condition parameters during the fourth year:

- DO generally remained less than 1 milligram per liter (mg/L) in and near the treatment zones—these conditions were typically in range to support anaerobic reductive dechlorination. However, during each of these sampling events, the groundwater table indicated influences from either inflow from the river or discharge from the bedrock to the east resulting in the distribution of DO in the demonstration area being not as defined as in previous years. It is possible that DO may exhibit a seasonal trend and should be included in the monitoring watch list moving forward.
- ORP (in millivolts [mV]) generally remained negative in the treatment zones, to support reductive dechlorination.
- TOC remained the highest in the treatment zone areas, and its distribution remained relatively unchanged and was not plotted. However, TOC concentrations should be monitored to verify that structured geochemical zones are sustainable, as levels have remained low throughout the field demonstration period.
- The pH remained around 7 and is ideal for both anaerobic and aerobic microbial processes. Alkalinity averaged around 400 mg/L and is supporting the neutral pH conditions.

Key Points:

The data indicate that groundwater is exposed to sequential anaerobic and aerobic conditions as it moves from upgradient to downgradient through the footprint of the former OU1 groundwater plume.

Overall, the structured geochemical zones were maintained throughout the field demonstration and conditions remain favorable for both anaerobic and aerobic degradation processes along the flow path.

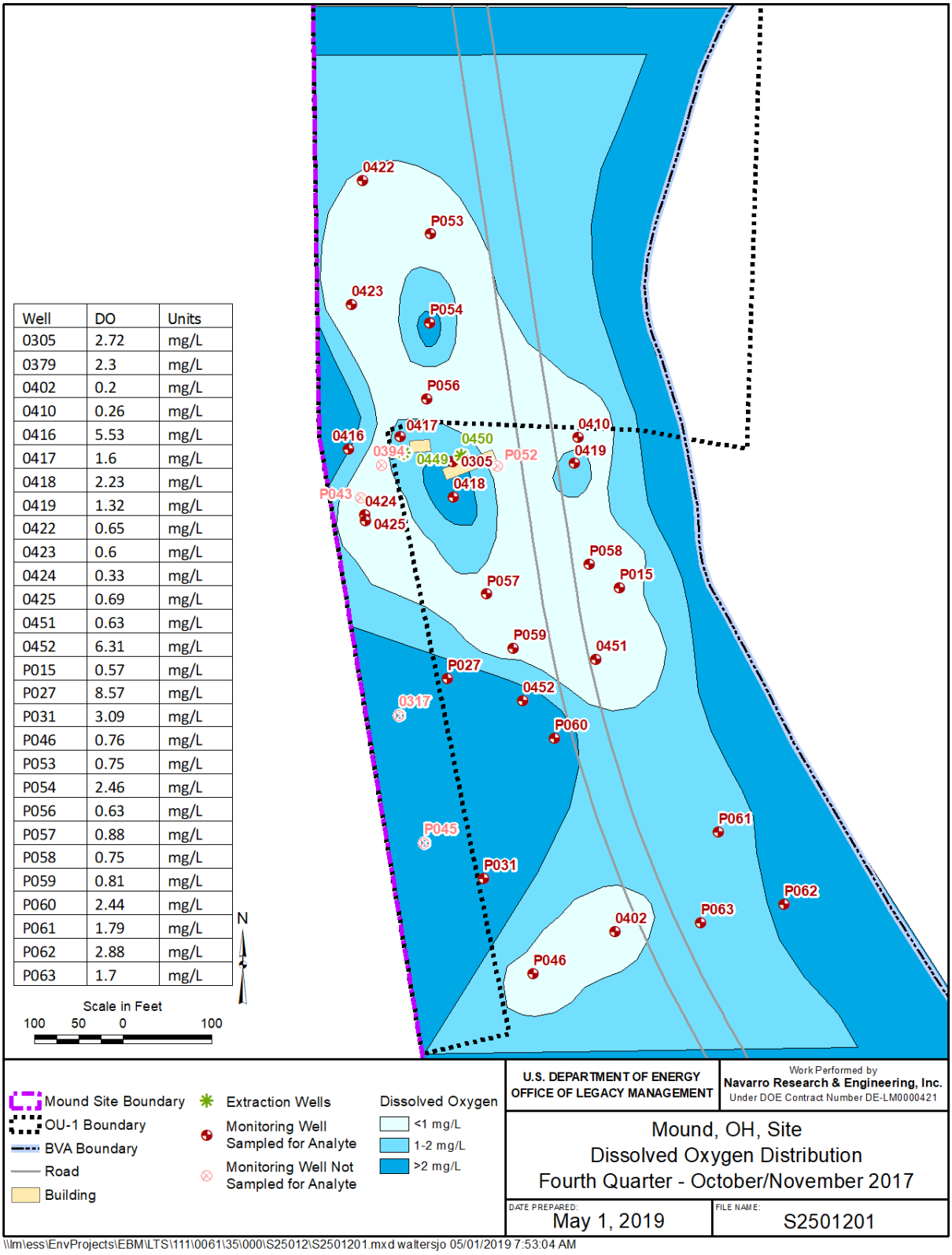
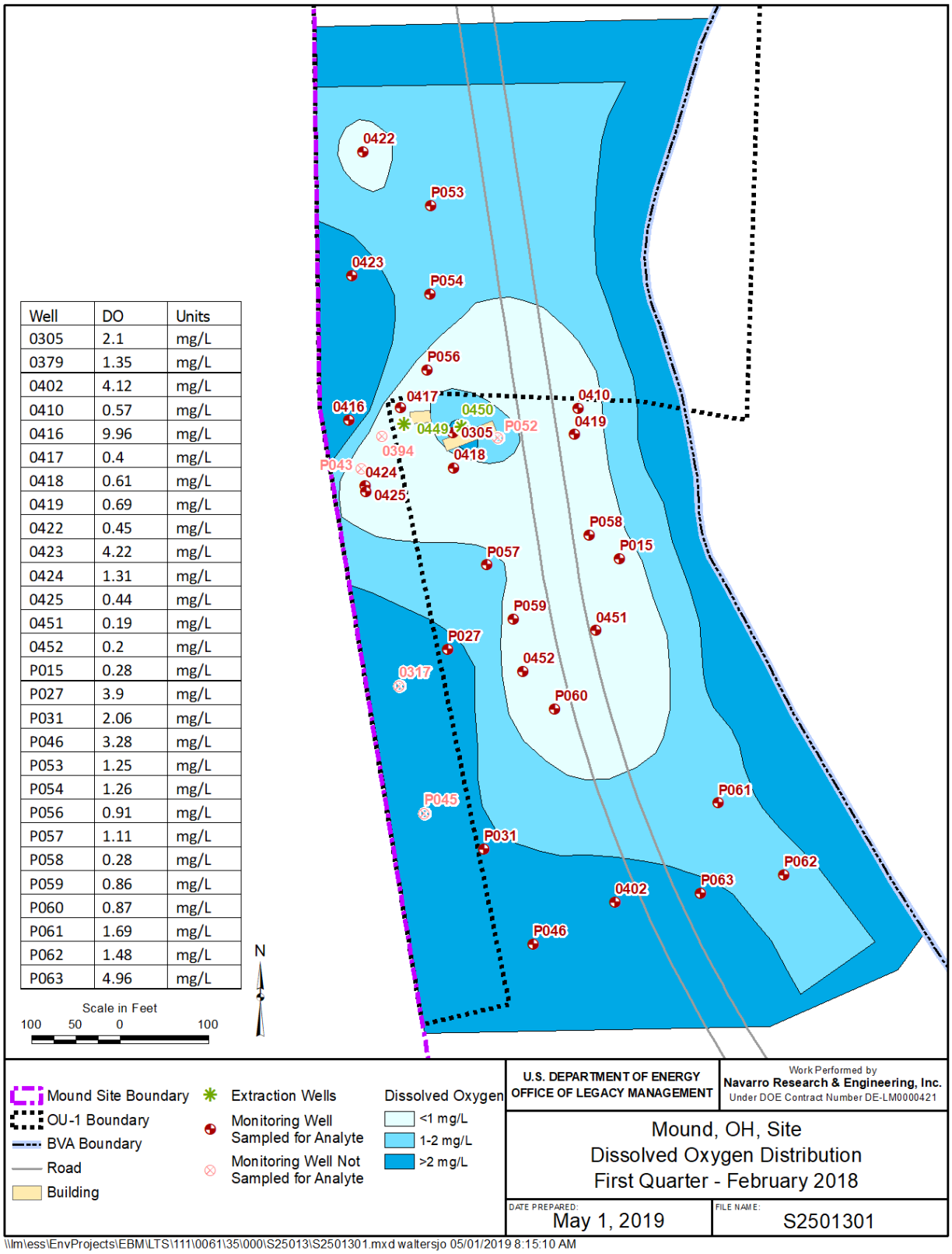


Figure 7. Dissolved Oxygen Distribution, Fourth Quarter, October/November 2017



Well	DO	Units
0305	2.1	mg/L
0379	1.35	mg/L
0402	4.12	mg/L
0410	0.57	mg/L
0416	9.96	mg/L
0417	0.4	mg/L
0418	0.61	mg/L
0419	0.69	mg/L
0422	0.45	mg/L
0423	4.22	mg/L
0424	1.31	mg/L
0425	0.44	mg/L
0451	0.19	mg/L
0452	0.2	mg/L
P015	0.28	mg/L
P027	3.9	mg/L
P031	2.06	mg/L
P046	3.28	mg/L
P053	1.25	mg/L
P054	1.26	mg/L
P056	0.91	mg/L
P057	1.11	mg/L
P058	0.28	mg/L
P059	0.86	mg/L
P060	0.87	mg/L
P061	1.69	mg/L
P062	1.48	mg/L
P063	4.96	mg/L

Figure 8. Dissolved Oxygen Distribution, First Quarter, February 2018

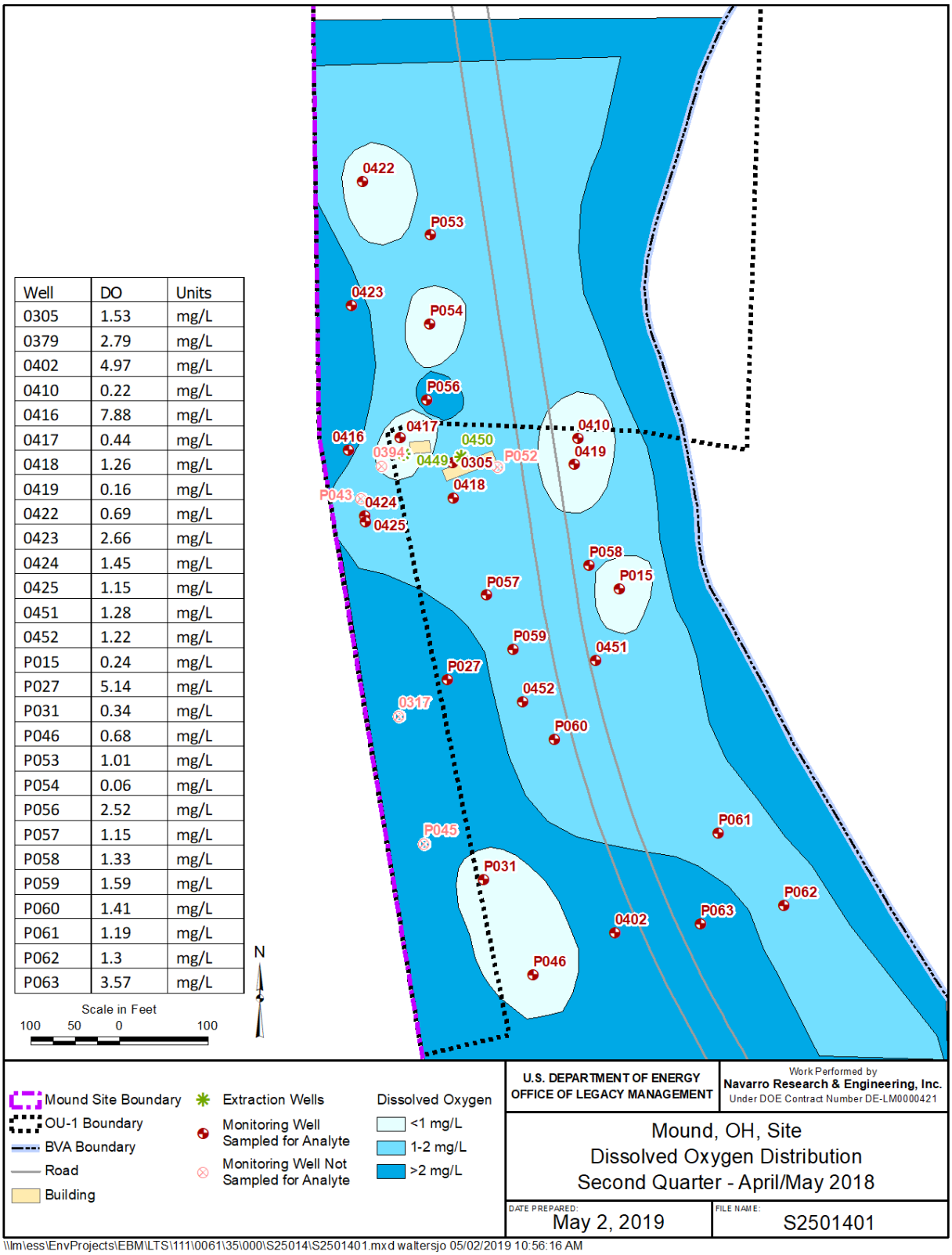


Figure 9. Dissolved Oxygen Distribution, Second Quarter, April/May 2018

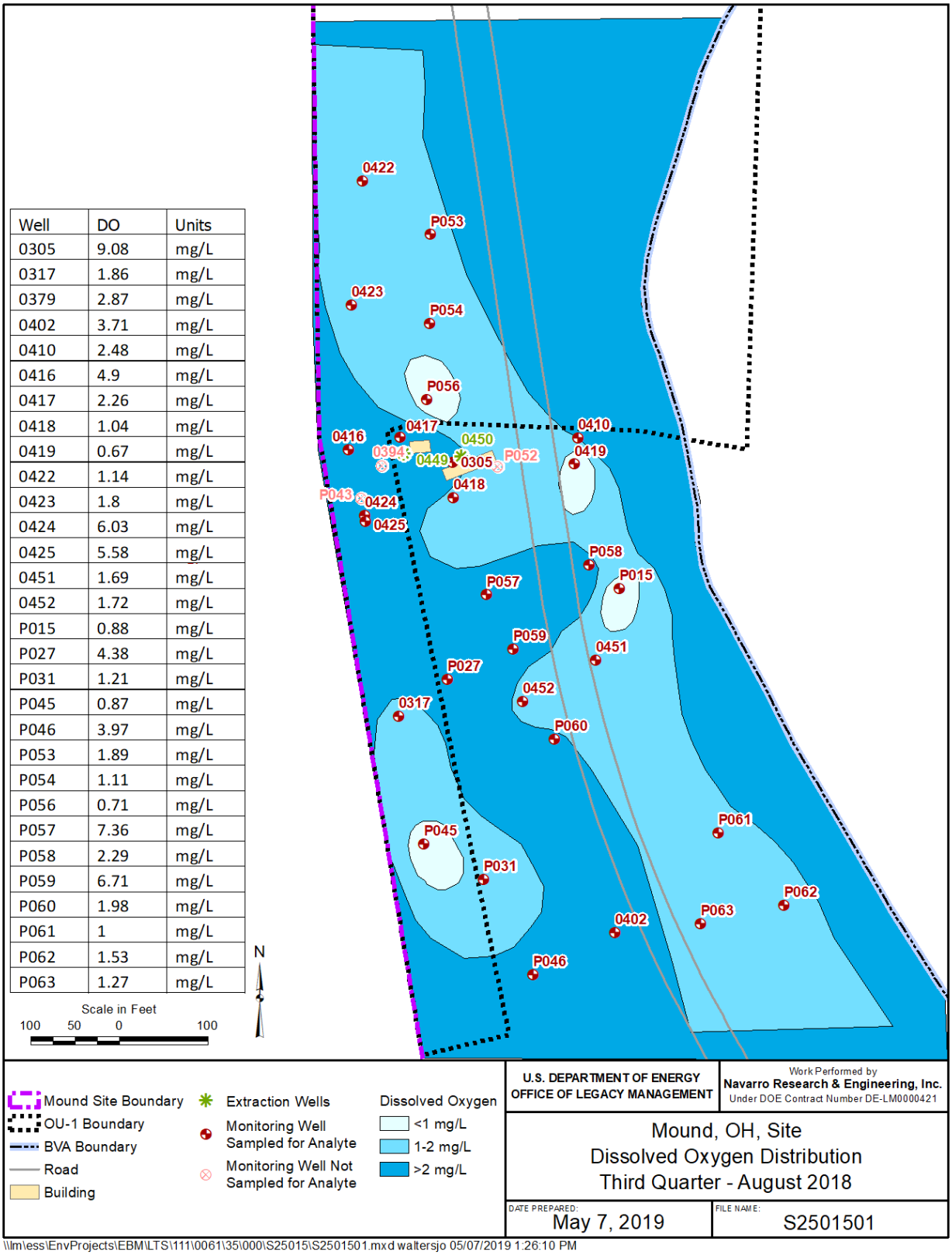
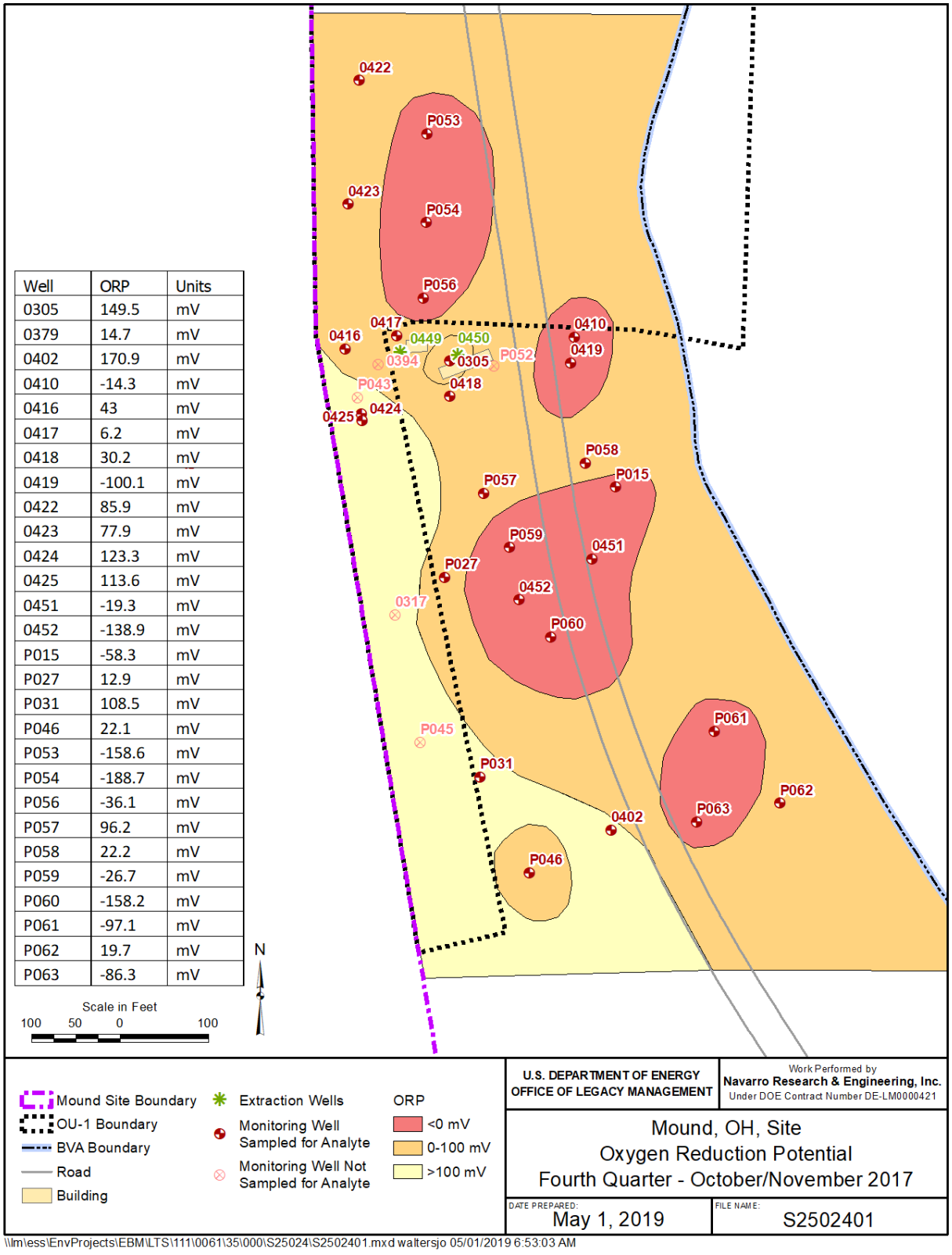
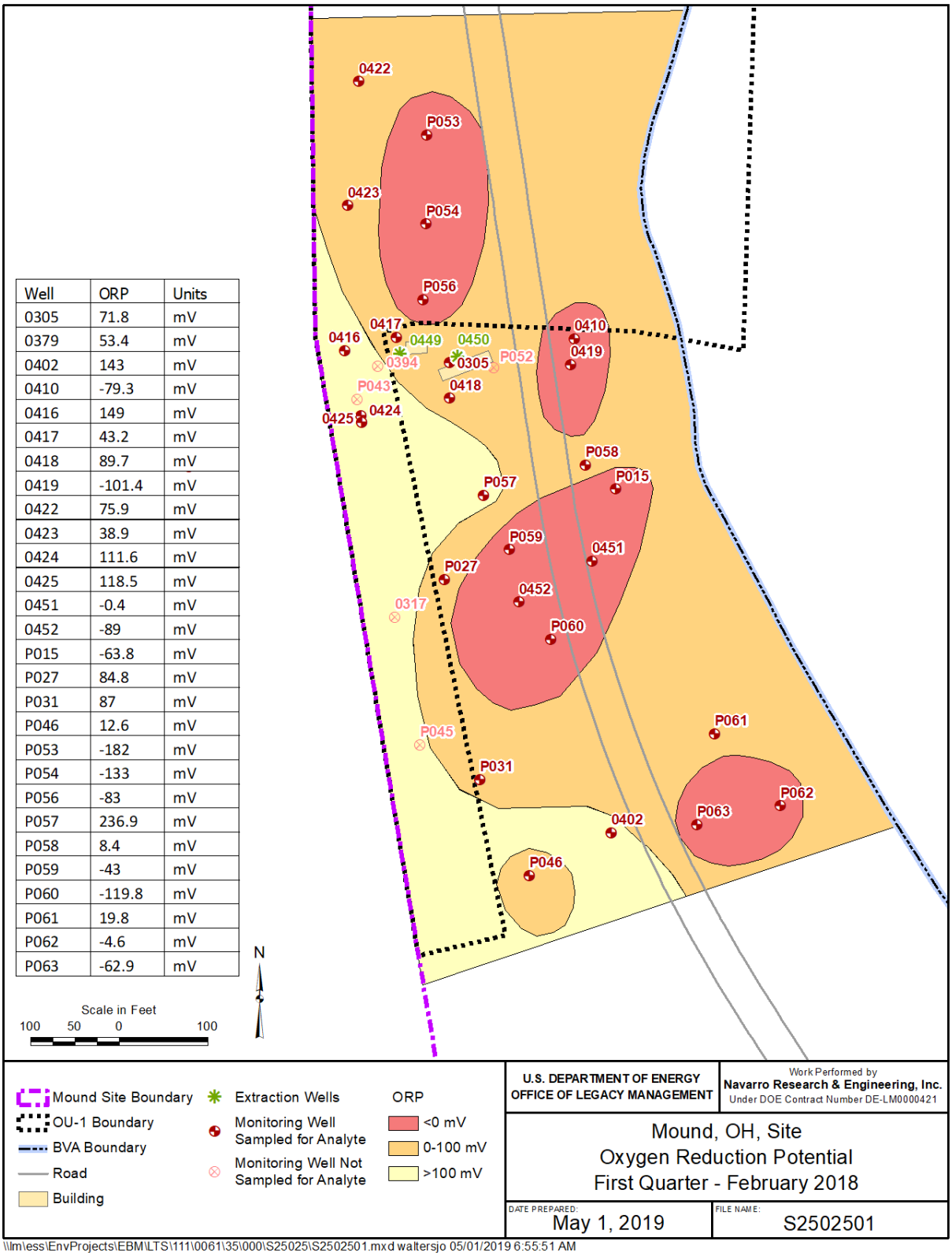


Figure 10. Dissolved Oxygen Distribution, Third Quarter, August 2018



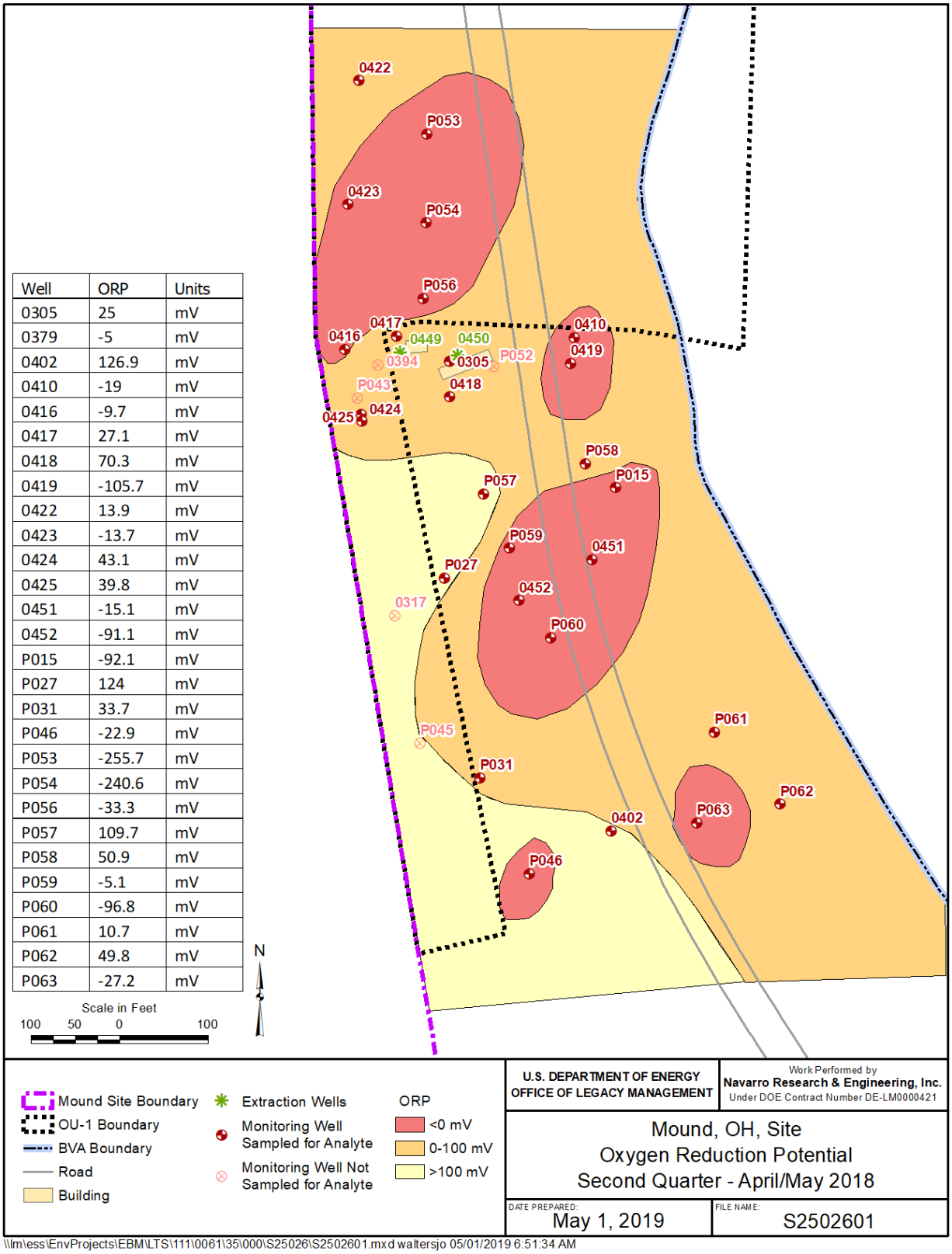
Well	ORP	Units
0305	149.5	mV
0379	14.7	mV
0402	170.9	mV
0410	-14.3	mV
0416	43	mV
0417	6.2	mV
0418	30.2	mV
0419	-100.1	mV
0422	85.9	mV
0423	77.9	mV
0424	123.3	mV
0425	113.6	mV
0451	-19.3	mV
0452	-138.9	mV
P015	-58.3	mV
P027	12.9	mV
P031	108.5	mV
P046	22.1	mV
P053	-158.6	mV
P054	-188.7	mV
P056	-36.1	mV
P057	96.2	mV
P058	22.2	mV
P059	-26.7	mV
P060	-158.2	mV
P061	-97.1	mV
P062	19.7	mV
P063	-86.3	mV

Figure 11. Oxidation-Reduction Potential, Fourth Quarter, October/November 2017



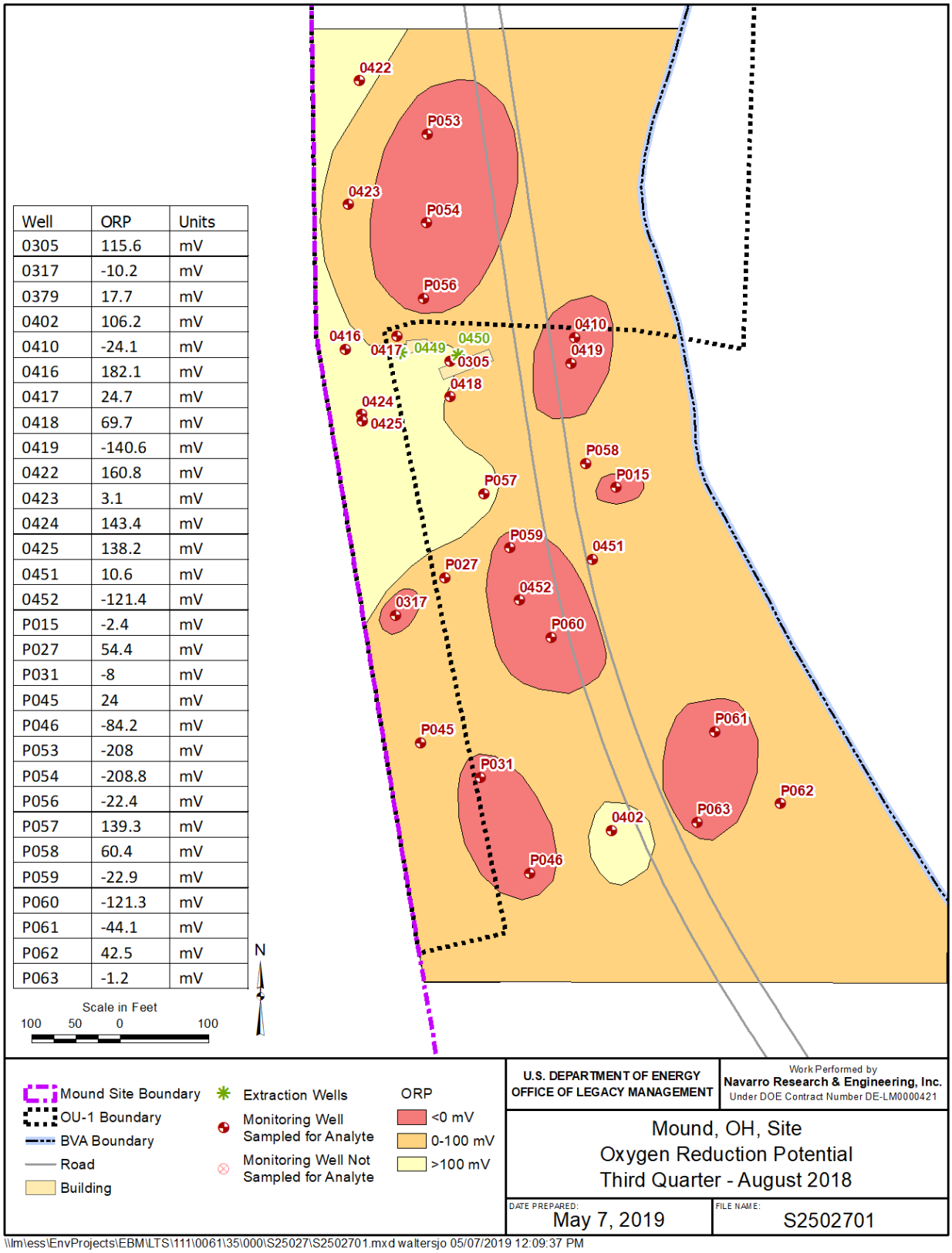
Well	ORP	Units
0305	71.8	mV
0379	53.4	mV
0402	143	mV
0410	-79.3	mV
0416	149	mV
0417	43.2	mV
0418	89.7	mV
0419	-101.4	mV
0422	75.9	mV
0423	38.9	mV
0424	111.6	mV
0425	118.5	mV
0451	-0.4	mV
0452	-89	mV
P015	-63.8	mV
P027	84.8	mV
P031	87	mV
P046	12.6	mV
P053	-182	mV
P054	-133	mV
P056	-83	mV
P057	236.9	mV
P058	8.4	mV
P059	-43	mV
P060	-119.8	mV
P061	19.8	mV
P062	-4.6	mV
P063	-62.9	mV

Figure 12. Oxidation-Reduction Potential, First Quarter, February 2018



Well	ORP	Units
0305	25	mV
0379	-5	mV
0402	126.9	mV
0410	-19	mV
0416	-9.7	mV
0417	27.1	mV
0418	70.3	mV
0419	-105.7	mV
0422	13.9	mV
0423	-13.7	mV
0424	43.1	mV
0425	39.8	mV
0451	-15.1	mV
0452	-91.1	mV
P015	-92.1	mV
P027	124	mV
P031	33.7	mV
P046	-22.9	mV
P053	-255.7	mV
P054	-240.6	mV
P056	-33.3	mV
P057	109.7	mV
P058	50.9	mV
P059	-5.1	mV
P060	-96.8	mV
P061	10.7	mV
P062	49.8	mV
P063	-27.2	mV

Figure 13. Oxidation-Reduction Potential, Second Quarter, April/May 2018



Well	ORP	Units
0305	115.6	mV
0317	-10.2	mV
0379	17.7	mV
0402	106.2	mV
0410	-24.1	mV
0416	182.1	mV
0417	24.7	mV
0418	69.7	mV
0419	-140.6	mV
0422	160.8	mV
0423	3.1	mV
0424	143.4	mV
0425	138.2	mV
0451	10.6	mV
0452	-121.4	mV
P015	-2.4	mV
P027	54.4	mV
P031	-8	mV
P045	24	mV
P046	-84.2	mV
P053	-208	mV
P054	-208.8	mV
P056	-22.4	mV
P057	139.3	mV
P058	60.4	mV
P059	-22.9	mV
P060	-121.3	mV
P061	-44.1	mV
P062	42.5	mV
P063	-1.2	mV

Figure 14. Oxidation-Reduction Potential, Third Quarter, August 2018

2.1.3 Competing Electron Acceptors

Dissolved oxygen, sulfate, and nitrate are the primary competing electron acceptors. Competing electron acceptors in anaerobic zones can reduce the effectiveness of reductive dechlorination of cVOCs by consuming the organic amendments. It should be noted that during the design phase, an evaluation was performed to assess the potential longevity of the deployed oil (DOE 2014a). This determination considered the impact of oxidation of the oil by competing electrons acceptors (i.e., sulfate, nitrate, and oxygen). Figure 15 through Figure 18 present the data and the contour plots of sulfate. Data for DO were presented in the previous section. The following are key observations of the competing electron acceptors during the fourth year.

- DO was generally less than 2 mg/L during Year 4 in the OU-1 cVOC plume and remained in the range to support anaerobic reductive dechlorination.
- Sulfate concentrations were detected at levels that may compete with reductive dichlorination. These levels are similar to those measured at the end of the third year.
- Nitrate concentrations were similar to previous years and remained low during the fourth year; it is not a concern and, therefore, is not plotted.

Key Points:

The structured geochemical zones continue to be maintained and are favorable for both anaerobic and aerobic degradation processes.

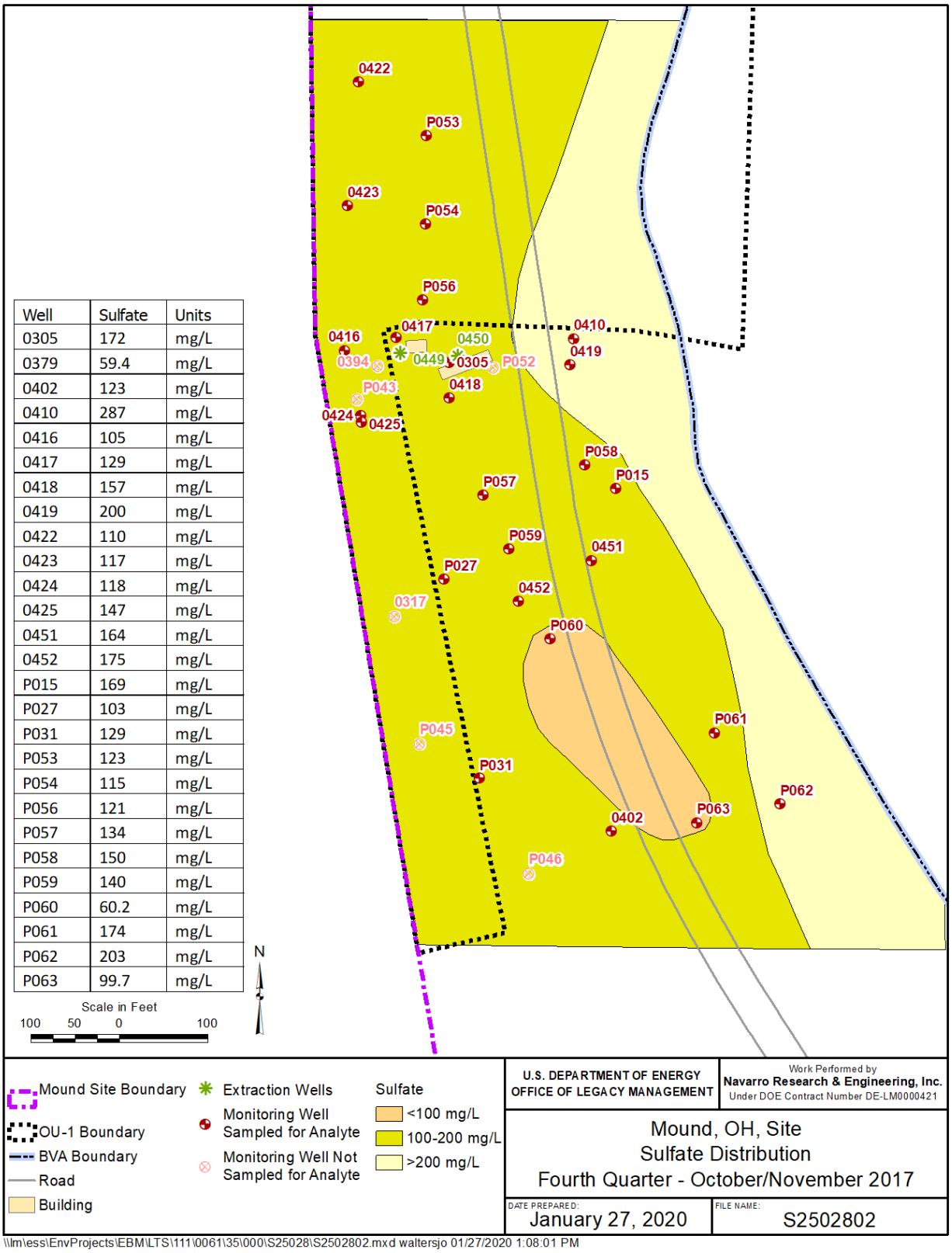
Competing electron acceptors (DO and nitrate) and diagnostic indicator parameters (methane and iron) remain in range to support reductive dechlorination in the treatment zones.

Sulfate concentrations will need to be monitored to verify the structured geochemical zones are sustainable, as sulfate is measured at levels that may reduce the effectiveness of reductive dichlorination as a competing electron acceptor

2.1.4 Diagnostic Indicators

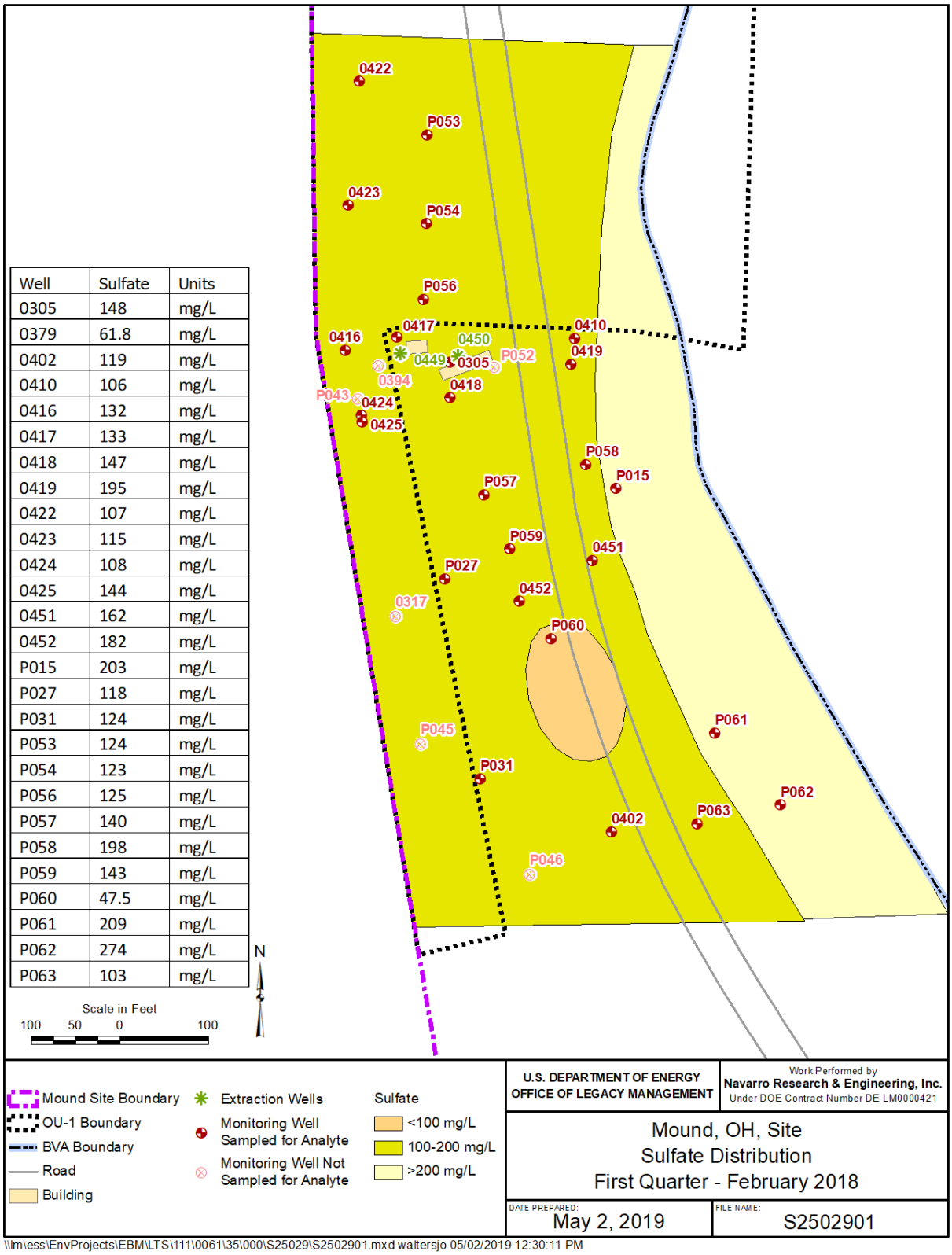
Diagnostic indicators are used to support the other geochemical parameters to evaluate the reducing conditions to support reductive dechlorination. Figure 19 through Figure 22 show contour plots of methane, and Figure 23 through Figure 26 show contour plots of dissolved iron during the fourth year. The following are key observations of the diagnostic indicators during the fourth year.

- Methane continued to be measured in the treatment zones, indicating reducing conditions and methanogenesis. Methane can also be used in the downgradient aerobic zones as a substrate to facilitate cometabolism of TCE.
- Dissolved iron, an indicator of reducing conditions, remained elevated in the treatment zones.
- The parameters continue to support the assessment that conditions in the treatment zones are favorable for reductive dechlorination.



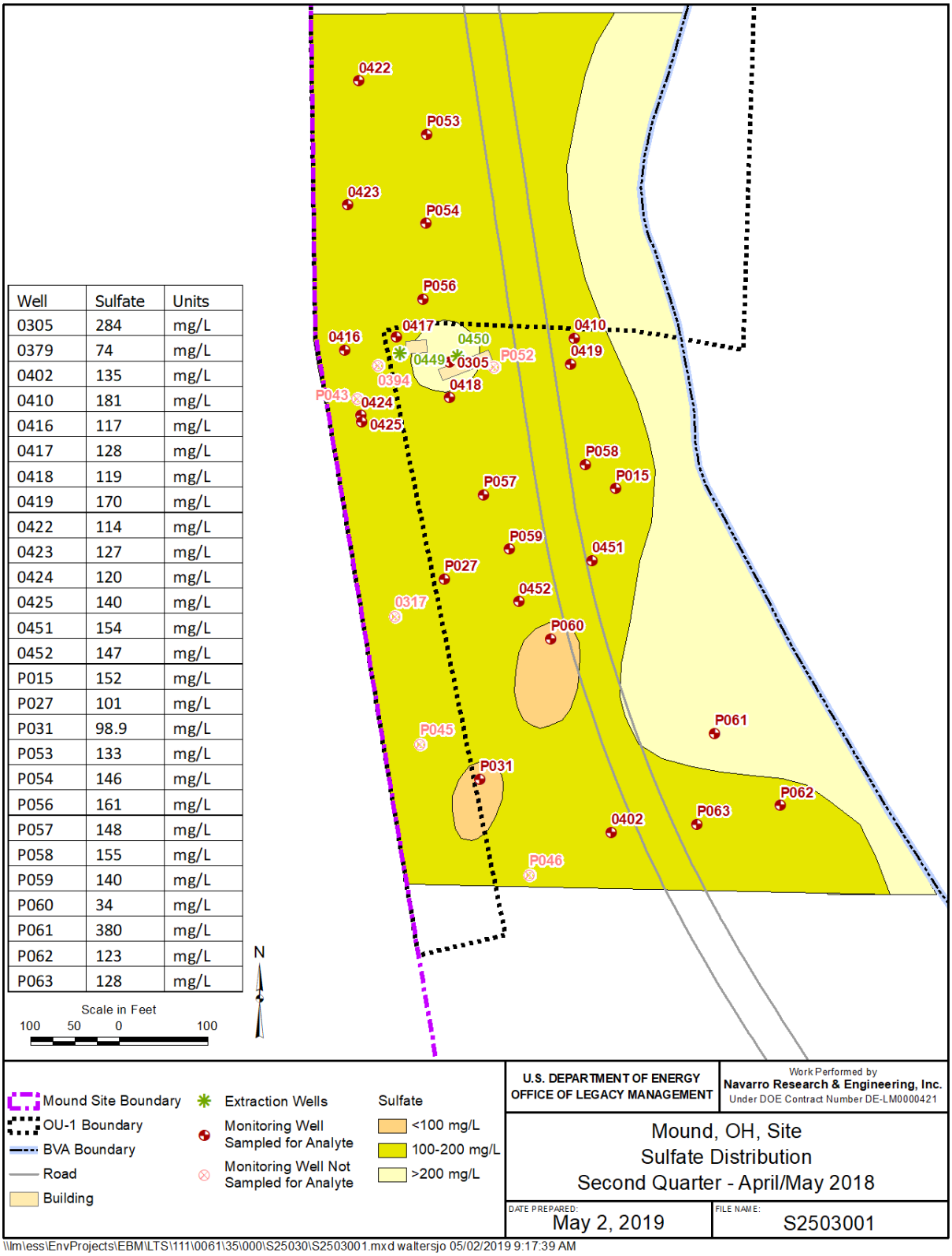
Well	Sulfate	Units
0305	172	mg/L
0379	59.4	mg/L
0402	123	mg/L
0410	287	mg/L
0416	105	mg/L
0417	129	mg/L
0418	157	mg/L
0419	200	mg/L
0422	110	mg/L
0423	117	mg/L
0424	118	mg/L
0425	147	mg/L
0451	164	mg/L
0452	175	mg/L
P015	169	mg/L
P027	103	mg/L
P031	129	mg/L
P053	123	mg/L
P054	115	mg/L
P056	121	mg/L
P057	134	mg/L
P058	150	mg/L
P059	140	mg/L
P060	60.2	mg/L
P061	174	mg/L
P062	203	mg/L
P063	99.7	mg/L

Figure 15. Sulfate Distribution, Fourth Quarter, October/November 2017



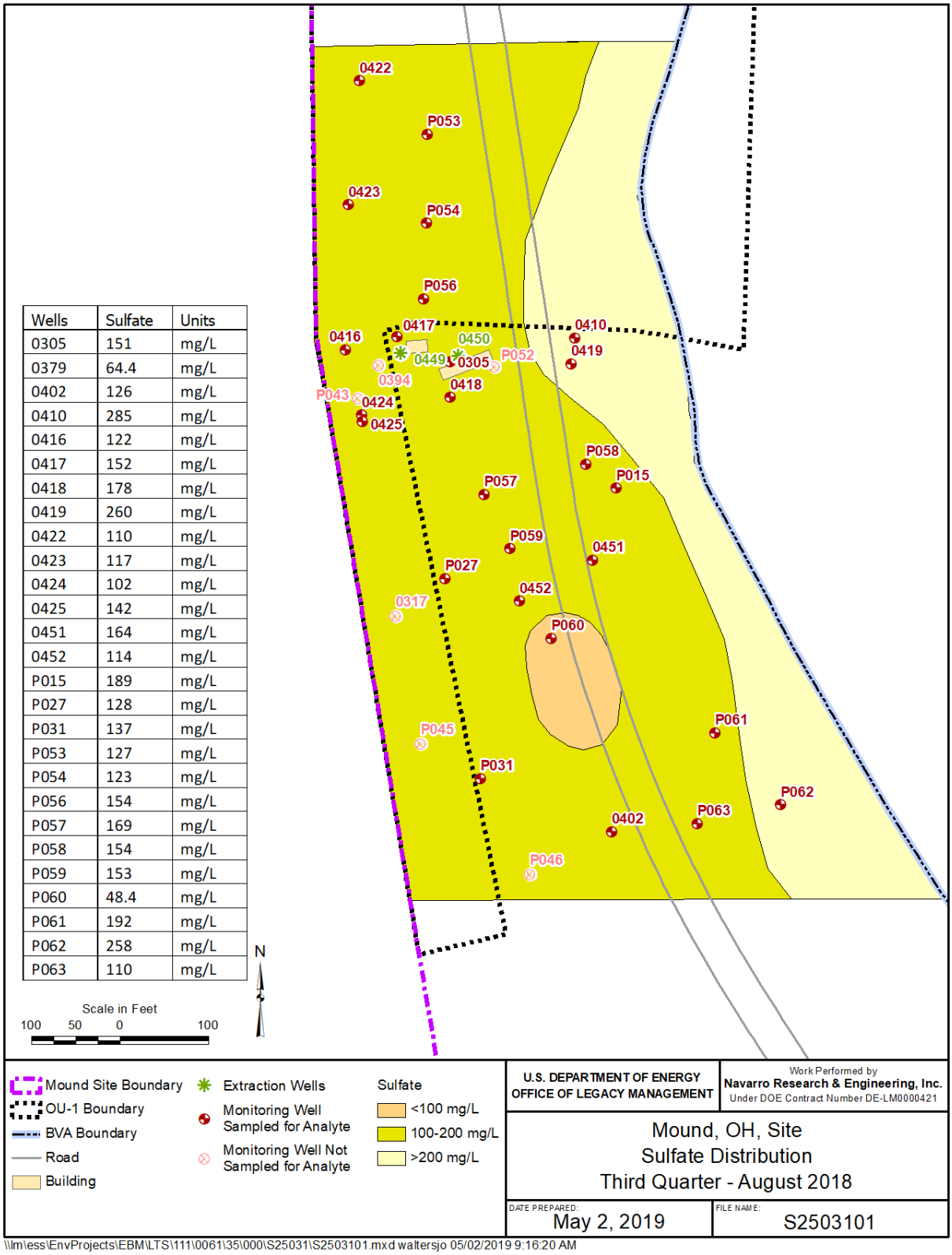
Well	Sulfate	Units
0305	148	mg/L
0379	61.8	mg/L
0402	119	mg/L
0410	106	mg/L
0416	132	mg/L
0417	133	mg/L
0418	147	mg/L
0419	195	mg/L
0422	107	mg/L
0423	115	mg/L
0424	108	mg/L
0425	144	mg/L
0451	162	mg/L
0452	182	mg/L
P015	203	mg/L
P027	118	mg/L
P031	124	mg/L
P053	124	mg/L
P054	123	mg/L
P056	125	mg/L
P057	140	mg/L
P058	198	mg/L
P059	143	mg/L
P060	47.5	mg/L
P061	209	mg/L
P062	274	mg/L
P063	103	mg/L

Figure 16. Sulfate Distribution, First Quarter, February 2018



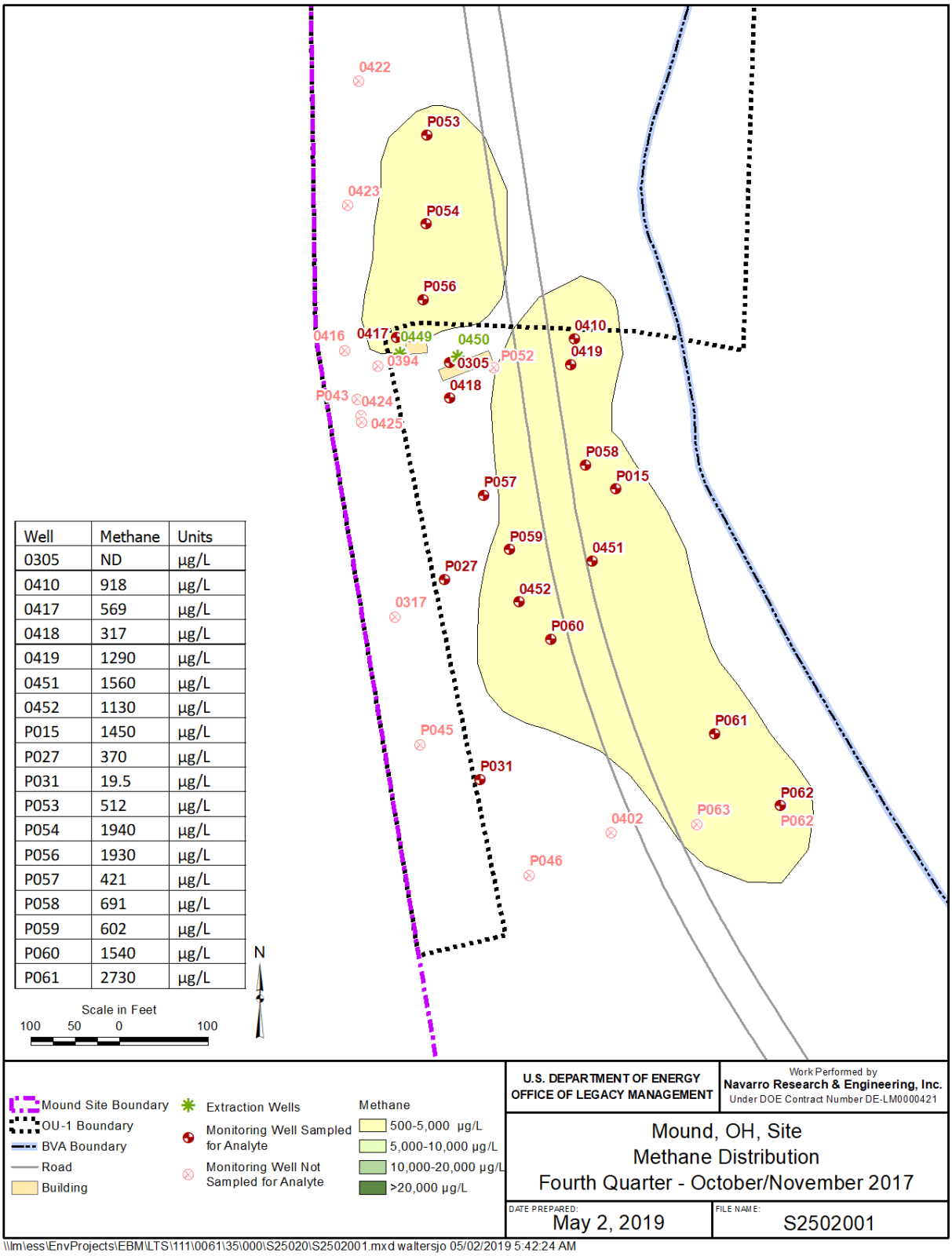
Well	Sulfate	Units
0305	284	mg/L
0379	74	mg/L
0402	135	mg/L
0410	181	mg/L
0416	117	mg/L
0417	128	mg/L
0418	119	mg/L
0419	170	mg/L
0422	114	mg/L
0423	127	mg/L
0424	120	mg/L
0425	140	mg/L
0451	154	mg/L
0452	147	mg/L
P015	152	mg/L
P027	101	mg/L
P031	98.9	mg/L
P053	133	mg/L
P054	146	mg/L
P056	161	mg/L
P057	148	mg/L
P058	155	mg/L
P059	140	mg/L
P060	34	mg/L
P061	380	mg/L
P062	123	mg/L
P063	128	mg/L

Figure 17. Sulfate Distribution, Second Quarter, April/May 2018



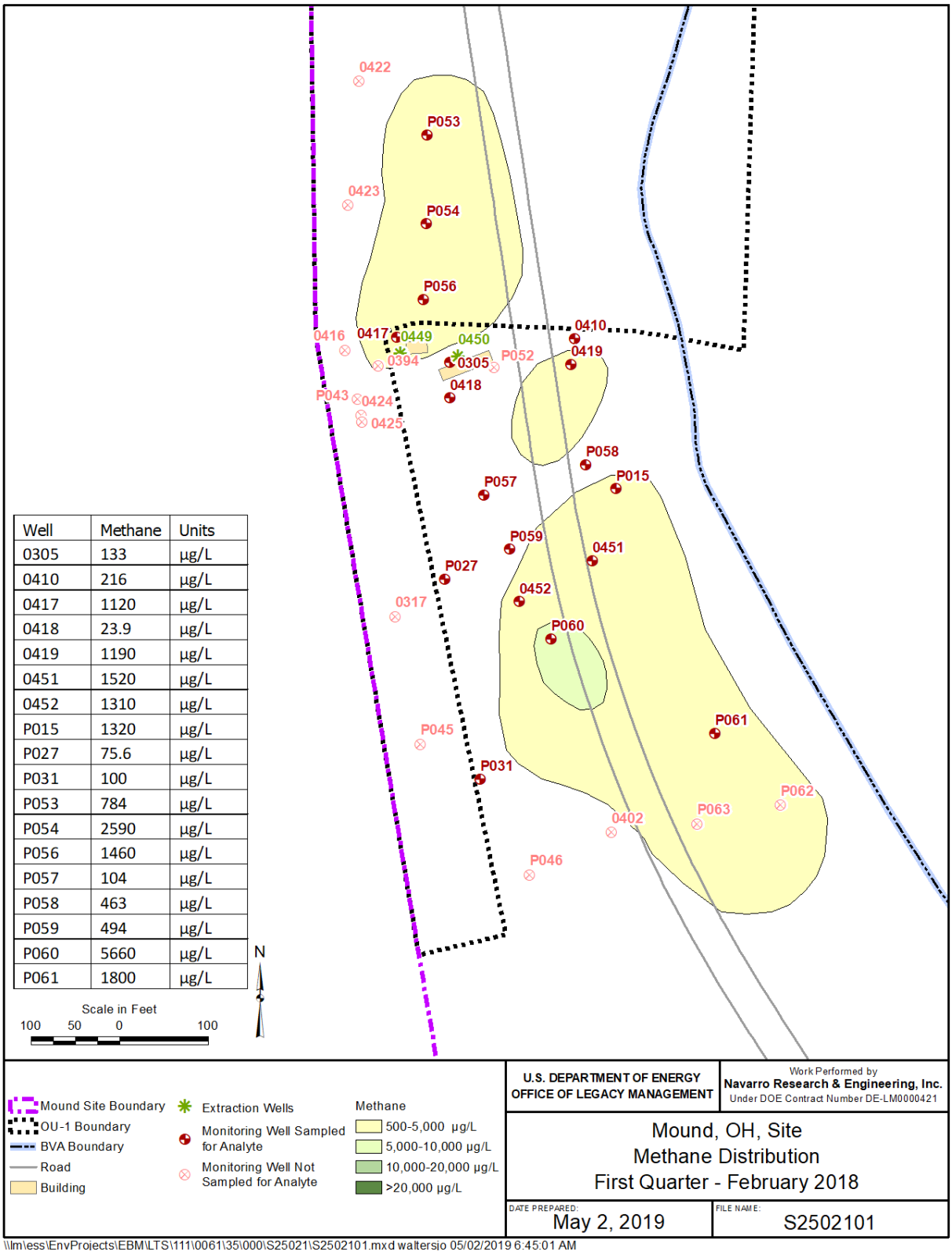
Wells	Sulfate	Units
0305	151	mg/L
0379	64.4	mg/L
0402	126	mg/L
0410	285	mg/L
0416	122	mg/L
0417	152	mg/L
0418	178	mg/L
0419	260	mg/L
0422	110	mg/L
0423	117	mg/L
0424	102	mg/L
0425	142	mg/L
0451	164	mg/L
0452	114	mg/L
P015	189	mg/L
P027	128	mg/L
P031	137	mg/L
P053	127	mg/L
P054	123	mg/L
P056	154	mg/L
P057	169	mg/L
P058	154	mg/L
P059	153	mg/L
P060	48.4	mg/L
P061	192	mg/L
P062	258	mg/L
P063	110	mg/L

Figure 18. Sulfate Distribution, Third Quarter, August 2018



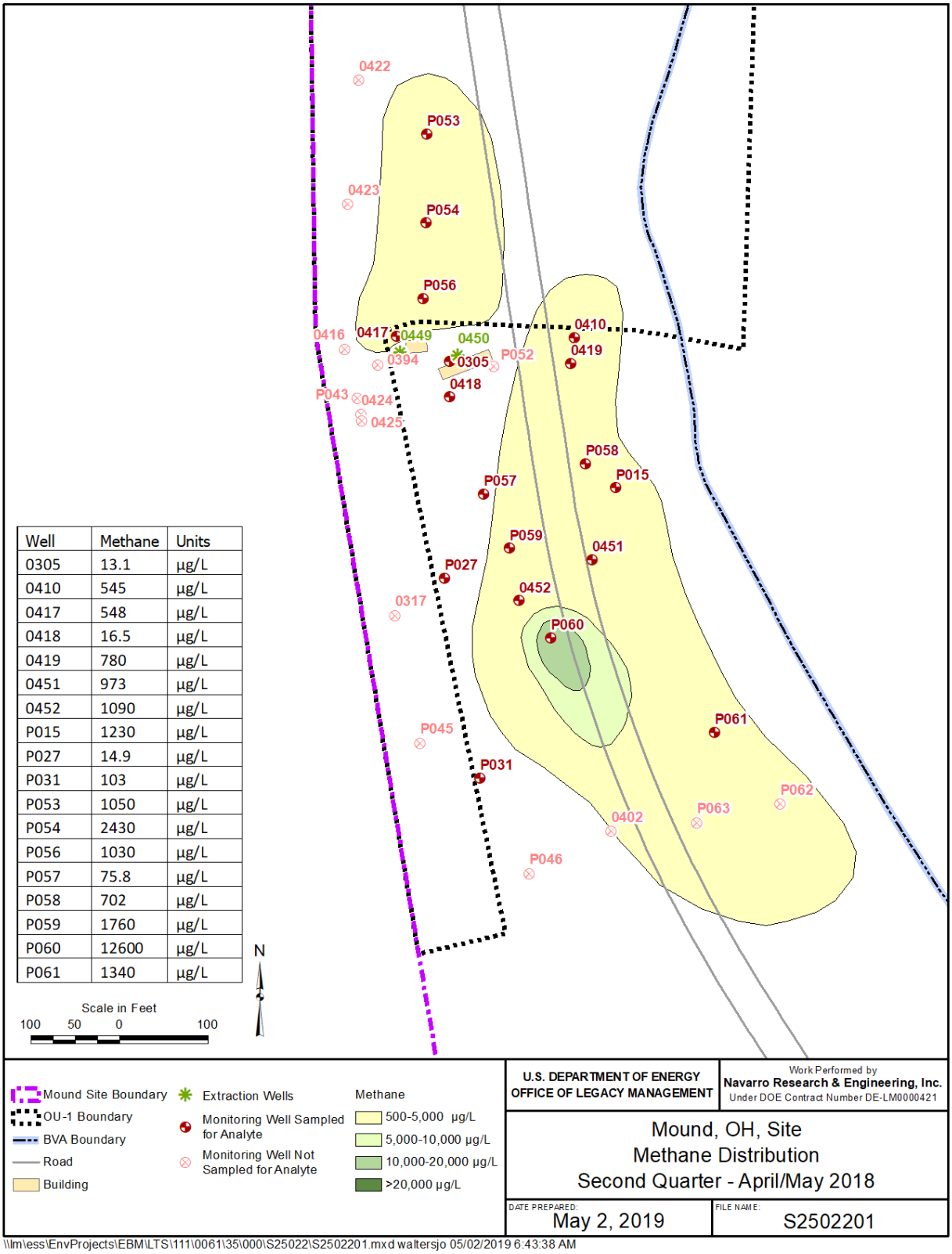
Well	Methane	Units
0305	ND	µg/L
0410	918	µg/L
0417	569	µg/L
0418	317	µg/L
0419	1290	µg/L
0451	1560	µg/L
0452	1130	µg/L
P015	1450	µg/L
P027	370	µg/L
P031	19.5	µg/L
P053	512	µg/L
P054	1940	µg/L
P056	1930	µg/L
P057	421	µg/L
P058	691	µg/L
P059	602	µg/L
P060	1540	µg/L
P061	2730	µg/L

Figure 19. Methane Distribution, Fourth Quarter, October/November 2017



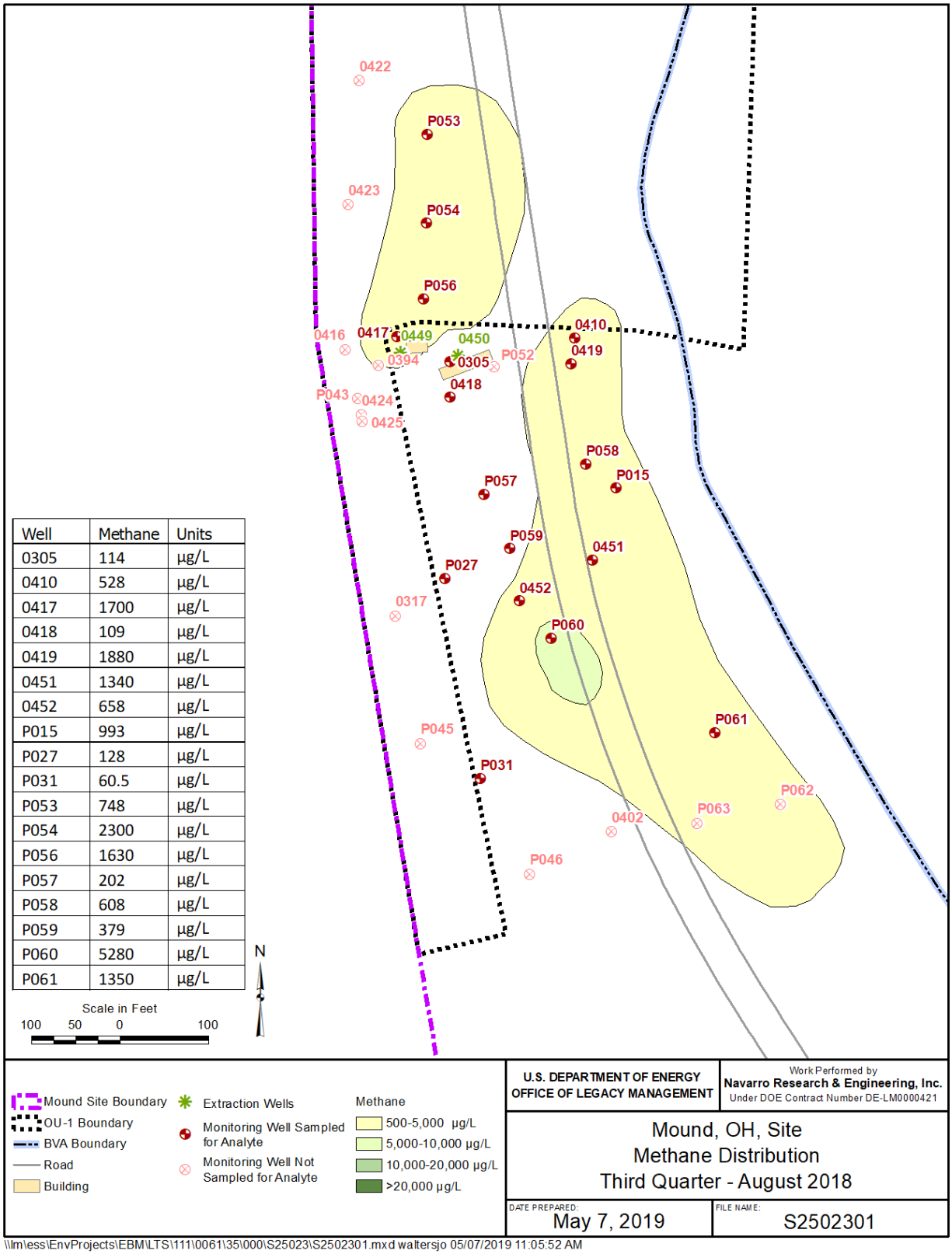
Well	Methane	Units
0305	133	µg/L
0410	216	µg/L
0417	1120	µg/L
0418	23.9	µg/L
0419	1190	µg/L
0451	1520	µg/L
0452	1310	µg/L
P015	1320	µg/L
P027	75.6	µg/L
P031	100	µg/L
P053	784	µg/L
P054	2590	µg/L
P056	1460	µg/L
P057	104	µg/L
P058	463	µg/L
P059	494	µg/L
P060	5660	µg/L
P061	1800	µg/L

Figure 20. Methane Distribution, First Quarter, February 2018



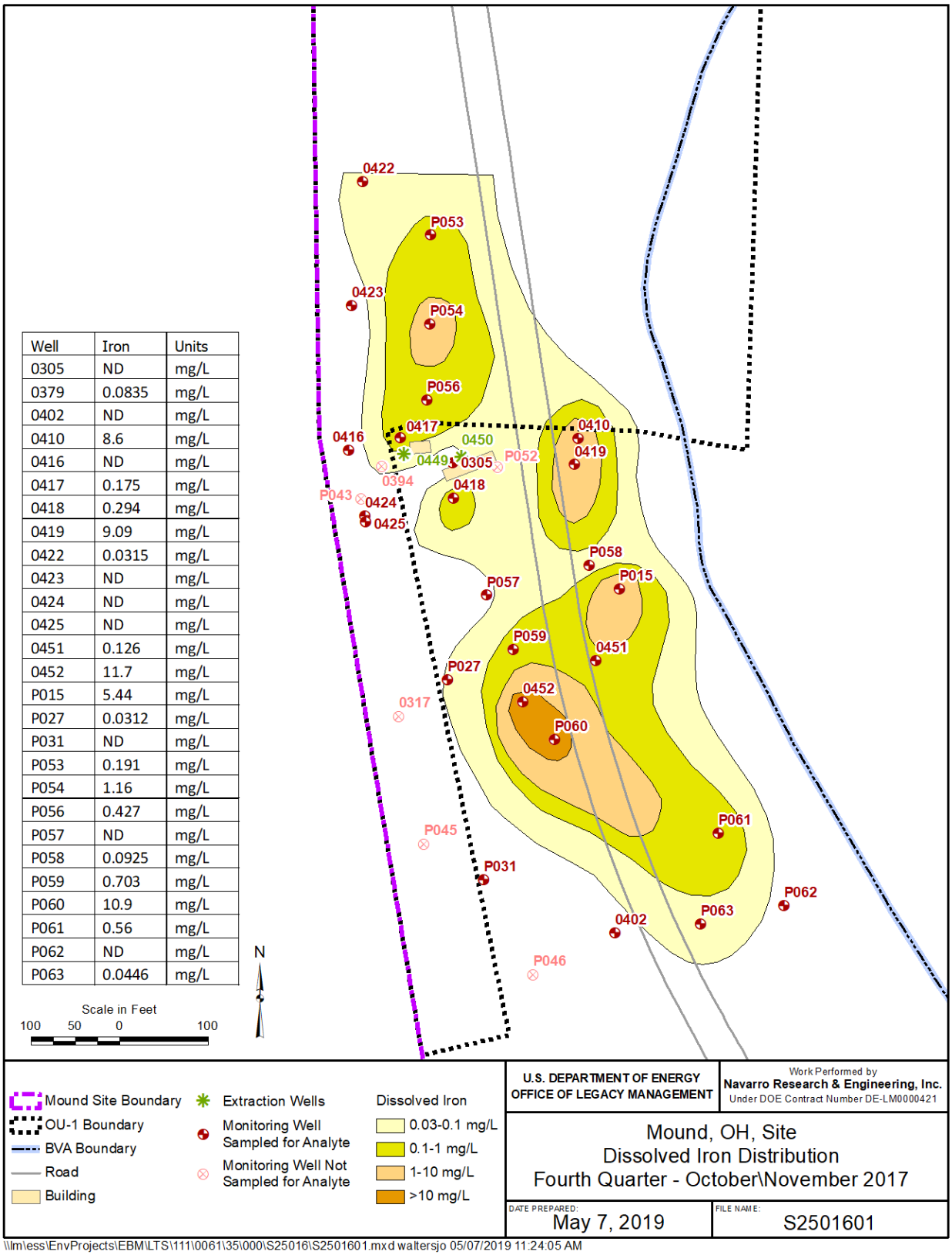
Well	Methane	Units
0305	13.1	µg/L
0410	545	µg/L
0417	548	µg/L
0418	16.5	µg/L
0419	780	µg/L
0451	973	µg/L
0452	1090	µg/L
P015	1230	µg/L
P027	14.9	µg/L
P031	103	µg/L
P053	1050	µg/L
P054	2430	µg/L
P056	1030	µg/L
P057	75.8	µg/L
P058	702	µg/L
P059	1760	µg/L
P060	12600	µg/L
P061	1340	µg/L

Figure 21. Methane Distribution, Second Quarter, April/May 2018



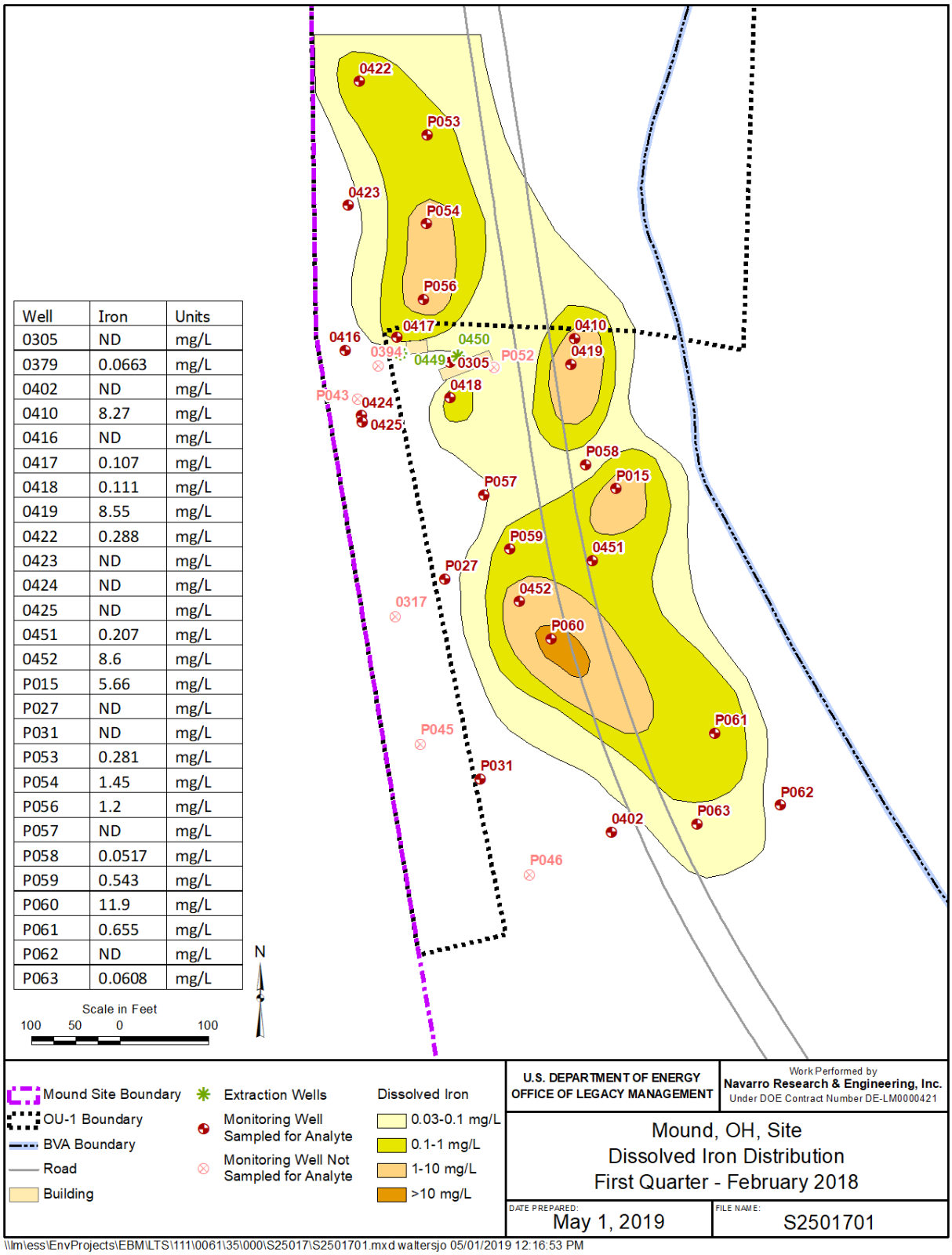
Well	Methane	Units
0305	114	µg/L
0410	528	µg/L
0417	1700	µg/L
0418	109	µg/L
0419	1880	µg/L
0451	1340	µg/L
0452	658	µg/L
P015	993	µg/L
P027	128	µg/L
P031	60.5	µg/L
P053	748	µg/L
P054	2300	µg/L
P056	1630	µg/L
P057	202	µg/L
P058	608	µg/L
P059	379	µg/L
P060	5280	µg/L
P061	1350	µg/L

Figure 22. Methane Distribution, Third Quarter, August 2018



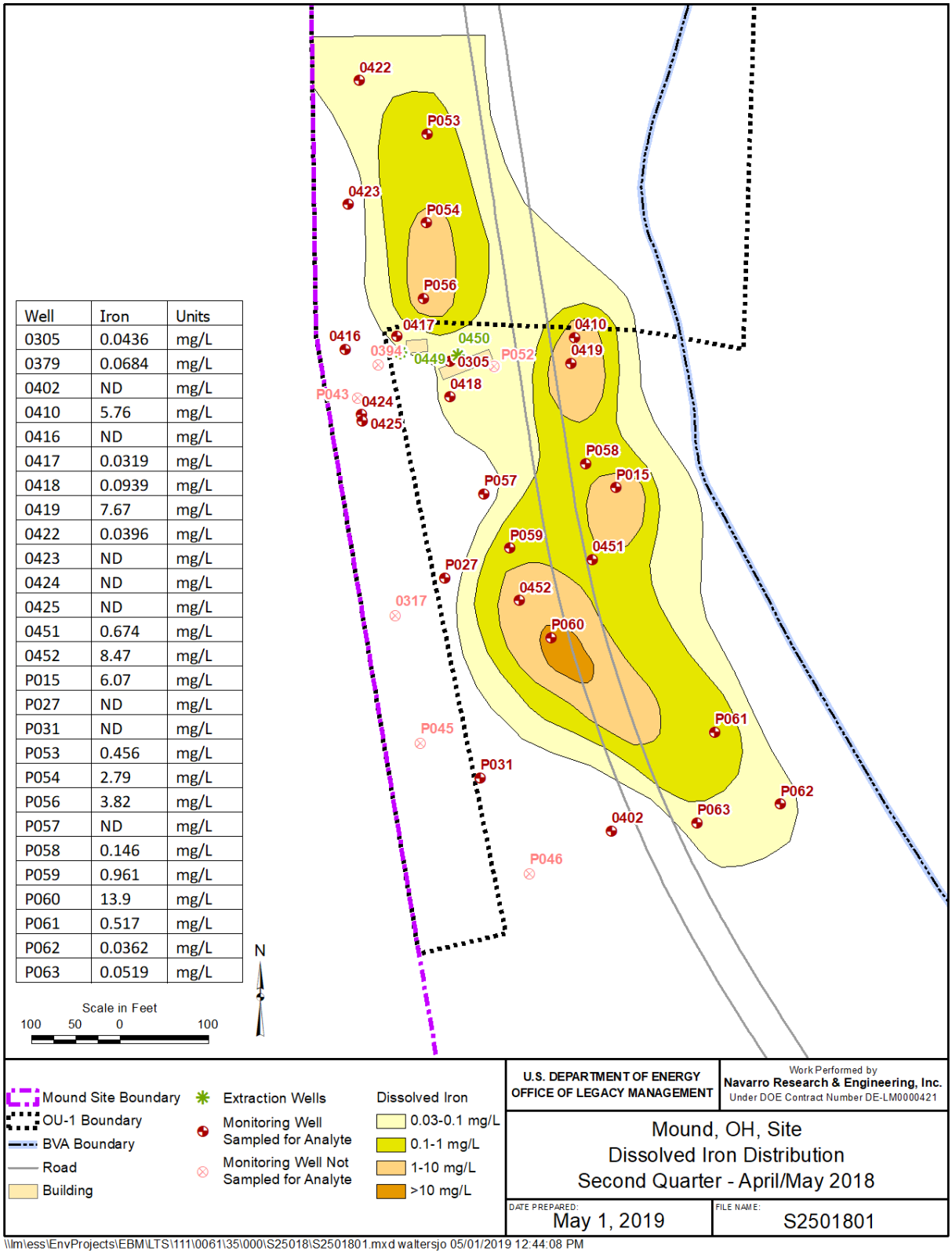
Well	Iron	Units
0305	ND	mg/L
0379	0.0835	mg/L
0402	ND	mg/L
0410	8.6	mg/L
0416	ND	mg/L
0417	0.175	mg/L
0418	0.294	mg/L
0419	9.09	mg/L
0422	0.0315	mg/L
0423	ND	mg/L
0424	ND	mg/L
0425	ND	mg/L
0451	0.126	mg/L
0452	11.7	mg/L
P015	5.44	mg/L
P027	0.0312	mg/L
P031	ND	mg/L
P053	0.191	mg/L
P054	1.16	mg/L
P056	0.427	mg/L
P057	ND	mg/L
P058	0.0925	mg/L
P059	0.703	mg/L
P060	10.9	mg/L
P061	0.56	mg/L
P062	ND	mg/L
P063	0.0446	mg/L

Figure 23. Dissolved Iron Distribution, Fourth Quarter, October/November 2017



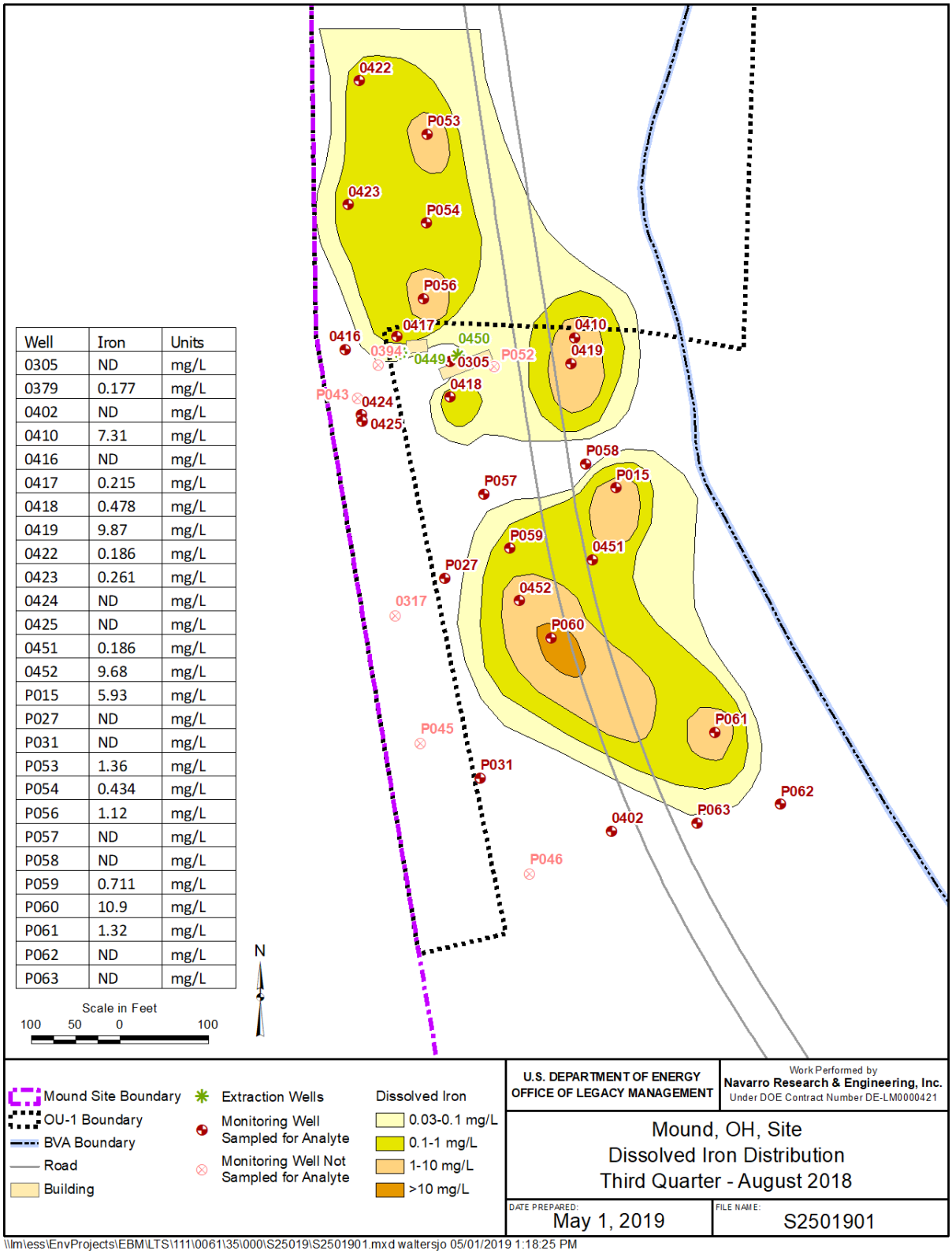
Well	Iron	Units
0305	ND	mg/L
0379	0.0663	mg/L
0402	ND	mg/L
0410	8.27	mg/L
0416	ND	mg/L
0417	0.107	mg/L
0418	0.111	mg/L
0419	8.55	mg/L
0422	0.288	mg/L
0423	ND	mg/L
0424	ND	mg/L
0425	ND	mg/L
0451	0.207	mg/L
0452	8.6	mg/L
P015	5.66	mg/L
P027	ND	mg/L
P031	ND	mg/L
P053	0.281	mg/L
P054	1.45	mg/L
P056	1.2	mg/L
P057	ND	mg/L
P058	0.0517	mg/L
P059	0.543	mg/L
P060	11.9	mg/L
P061	0.655	mg/L
P062	ND	mg/L
P063	0.0608	mg/L

Figure 24. Dissolved Iron Distribution, First Quarter, February 2018



Well	Iron	Units
0305	0.0436	mg/L
0379	0.0684	mg/L
0402	ND	mg/L
0410	5.76	mg/L
0416	ND	mg/L
0417	0.0319	mg/L
0418	0.0939	mg/L
0419	7.67	mg/L
0422	0.0396	mg/L
0423	ND	mg/L
0424	ND	mg/L
0425	ND	mg/L
0451	0.674	mg/L
0452	8.47	mg/L
P015	6.07	mg/L
P027	ND	mg/L
P031	ND	mg/L
P053	0.456	mg/L
P054	2.79	mg/L
P056	3.82	mg/L
P057	ND	mg/L
P058	0.146	mg/L
P059	0.961	mg/L
P060	13.9	mg/L
P061	0.517	mg/L
P062	0.0362	mg/L
P063	0.0519	mg/L

Figure 25. Dissolved Iron Distribution, Second Quarter, April/May 2018



Well	Iron	Units
0305	ND	mg/L
0379	0.177	mg/L
0402	ND	mg/L
0410	7.31	mg/L
0416	ND	mg/L
0417	0.215	mg/L
0418	0.478	mg/L
0419	9.87	mg/L
0422	0.186	mg/L
0423	0.261	mg/L
0424	ND	mg/L
0425	ND	mg/L
0451	0.186	mg/L
0452	9.68	mg/L
P015	5.93	mg/L
P027	ND	mg/L
P031	ND	mg/L
P053	1.36	mg/L
P054	0.434	mg/L
P056	1.12	mg/L
P057	ND	mg/L
P058	ND	mg/L
P059	0.711	mg/L
P060	10.9	mg/L
P061	1.32	mg/L
P062	ND	mg/L
P063	ND	mg/L

Figure 26. Dissolved Iron Distribution, Third Quarter, August 2018

2.2 Microbial Communities

For the microbial monitoring, six wells that represent different biogeochemical settings were sampled to provide information on changes within and downgradient of the reductive treatment zones, as well as provide insights on changes near the original source and in the distal portion of the plume. The wells generally represent the different target biogeochemical regimes—anaerobic treatment zones (0419, P056, P060), plume interior (P058), and the distal area (P031 and P061). The selected wells provide site-specific information about the impact of the EA deployment on the microbial community; the changes in these wells should generally represent the expected changes in similar settings throughout the OU-1 groundwater over the course of the field demonstration.

Evaluation of the microbial community was performed by Microbial Insights Inc. in Knoxville, Tennessee, using QuantArray-Chlor, a hybrid technology platform combining parallel detection on DNA microarrays with quantification by quantitative polymerase chain reaction (qPCR). QuantArray-Chlor uses nucleic acid extracted from water samples (or other media) to provide quantitative estimates of target organisms or genes, specifically:

- Total number of organisms and information on organisms that signify potentially competing and interacting biological processes.
- Halo-respiring bacteria (e.g., *Dehalococcoides*, *Dehalobacter*, *Dehalogenimonas*, *Desulfitobacterium*) and associated functional genes involved in reductive dechlorination of chlorinated ethenes, chlorinated ethanes, and related compounds.
- Functional genes involved in aerobic (co)metabolic pathways for the biodegradation of chlorinated solvents and various daughter compounds.

The results from Year Four are discussed in Section 3.3.2. All microbial data from the fourth year of the field demonstration are summarized in Appendix B. Overall, the data indicate a robust microbial community was created after EA deployment and has been maintained throughout the field demonstration.

2.3 Groundwater Flow

Water-level measurements were taken monthly in OU-1 to monitor the groundwater flow direction and rate. During Year 4, the groundwater flow typically remained parallel to the interface of the Buried Valley Aquifer (BVA) with the bedrock to the east (consistent with historical conditions in OU-1) and groundwater gradients were approximately 0.002 feet per foot (ft/ft) (typical gradient for OU-1 area). Figure 27 depicts the typical water table observed in OU-1 and was created using data for June 2018. All groundwater elevation data from the fourth year of the field demonstration are summarized in Appendix C. However, the groundwater flow directions in the OU-1 area were varied during some months due to several transient conditions (e.g., changes in river stage and influx from bedrock aquifer). There were several periods during the fourth year of measurable precipitation or elevated river stages that influence the groundwater table for periods of time and influenced the groundwater geochemistry. Both conditions resulted in the introduction of more oxygenated water into the OU-1 area thereby increasing the dissolved oxygen concentrations.

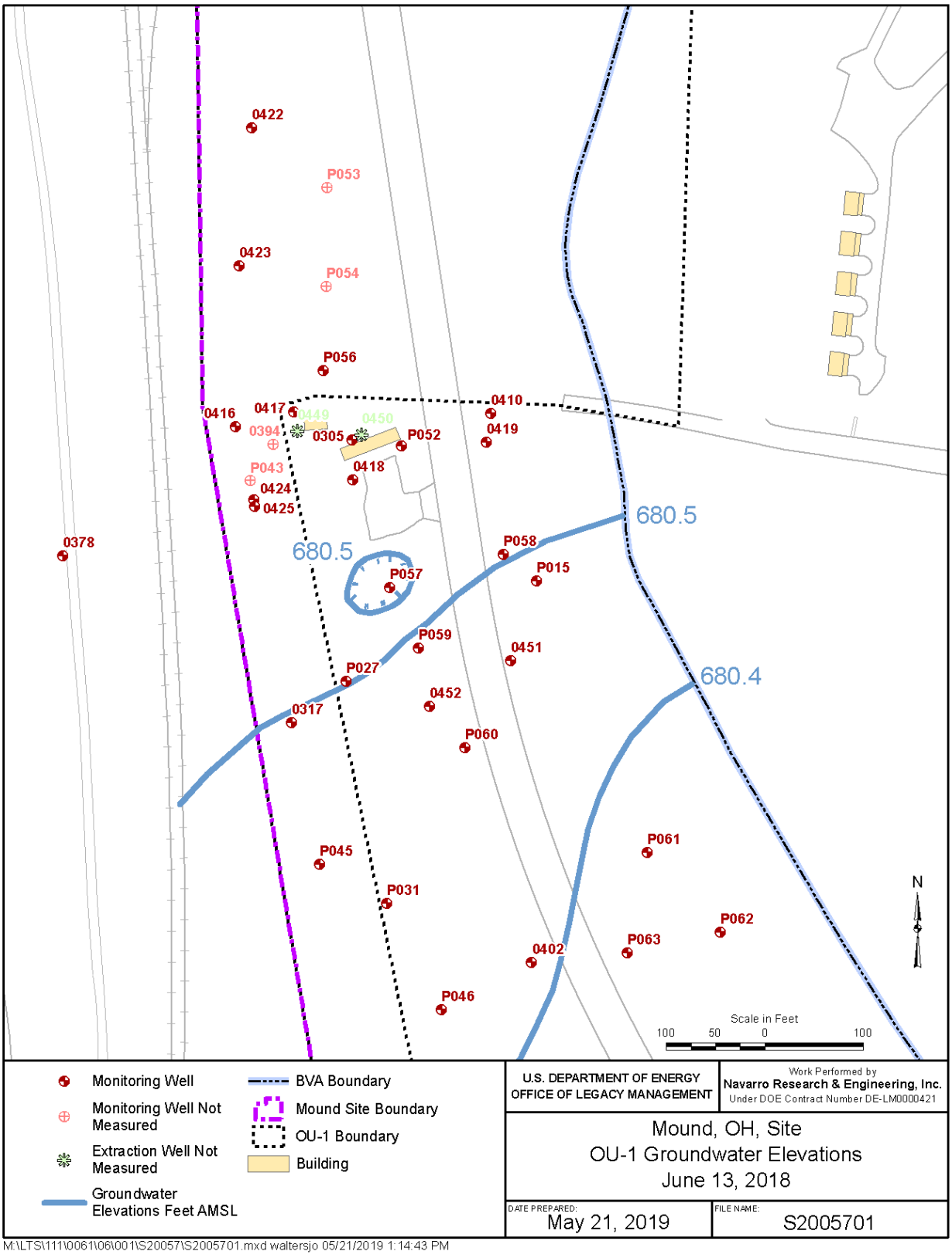


Figure 27. Groundwater Elevations in OU-1, June 13, 2018

3.0 Attenuation of cVOCs

The goal of the field demonstration is to create treatment zones by injecting edible oil (neat and emulsified) into the subsurface, initially reducing the concentrations of PCE and TCE and over time stimulating existing attenuation processes to further degrade cVOCs. Data collected from selected monitoring wells will be evaluated to determine whether the use of emulsified oils to enhance the attenuation processes is viable in OU-1.

The effectiveness of the oil treatment will be discussed in terms of lines of evidence similar to those outlined in EPA's document *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites* (OSWER 9200.4-17P) to evaluate the use of MNA as a remedy. The lines of evidence are:

First Line of Evidence: Historical groundwater data that demonstrate a clear and meaningful trend of decreasing contaminant mass or concentration over time and the presence of degradation (daughter) products at appropriate monitoring points. This typically includes graphical techniques using the cVOC data and statistical tests, such as the Mann-Kendall test.

Second Line of Evidence: Hydrogeologic and geochemical data that can be used to demonstrate indirectly the types of natural attenuation processes at the site and the rate at which such processes will reduce contaminant concentrations to required levels. Example analytes include competing electron acceptors (e.g., oxygen, sulfate, and nitrate), helpful electron donors (e.g., hydrocarbons and hydrogen), and diagnostic indicators/byproducts (e.g., methane and iron).

Third Line of Evidence: Other information, such as data from field or microcosm studies, which directly demonstrate or quantify the occurrence of a particular natural attenuation process and ability to degrade contaminants of concern.

3.1 First Line of Evidence—Trends in cVOC Mass and Concentration

The objective of the first line of evidence is to document trends in concentration and mass of cVOCs and daughter products over time and in individual wells. MAROS Version 3.0 was used to evaluate the first line of evidence based on individual well concentration trends and the overall dissolved plume mass trends. Individual well trends rely on Mann-Kendall statistics to determine the concentration trend category (increasing, probably increasing, stable, no trend, probably decreasing, or decreasing). For the overall plume, MAROS uses a method of moments analysis to estimate total dissolved mass for each sampling event (zeroth moment), center of mass location (first moment), and plume spread (second moment). To calculate the moments, MAROS integrates the data spatially using a mesh creation method known as Delaunay Triangulation / Voronoi Diagram spatial geometry and accounts for varying concentrations and aquifer thicknesses in different areas of the plume. The trends for each of these overall plume characteristics can be calculated using multiple sampling events. Similar to trending data from the individual wells, Mann-Kendall statistics are used in the moment analysis to determine the trend category. Detailed information about the model is available in the *MAROS User Guide and Technical Manual*.

3.1.1 Concentration Trends for cVOCs in OU-1 Monitoring Wells

The MAROS evaluation covered the period from August 2014 (starting baseline values established as the first sampling event before oil deployment was initiated in late August 2014) through August 2018. The statistical Mann-Kendall results from MAROS for the various contaminants in the OU-1 monitoring wells provide an assessment of cVOC concentration trends following deployment of the EA and covering the time frame of the field demonstration. The statistics address such questions as:

- Is a contaminant concentration increasing, decreasing, or stable?
- Was a contaminant ever detected in a well?
- How much confidence is there in the trends?

Table 2 summarizes the statistical trends for each cVOC and daughter product in each of 27 OU-1 monitoring wells during the period of August 2014 through August 2018. Trend directions identified in Table 2 express the confidence in the concentration trend (i.e., increasing, probably increasing, no trend, stable, probably decreasing, and decreasing) as calculated using MAROS.

Table 2. Summary of MAROS Statistical Trends and MCL Exceedances

Well	Analyte	Number of Samples	Number of Detects	Result (µg/L) August 2018	Trend 08/2014–08/2018	Exceedance 08/2014–08/2018	Current Condition (08/2018)
0305	PCE	19	19	1.74	S	○	○
0305	TCE	19	19	4.42	S	○	○
0305	cDCE	19	16	2.99	NT	○	○
0305	VC	19	6	ND	PI	○	○
0379	PCE	39	36	0.49 J	NT	○	○
0379	TCE	39	39	1.52	D	○	○
0379	cDCE	39	0	ND	ND	○	○
0379	VC	39	0	ND	ND	○	○
0402	PCE	36	27	1.24	S	○	○
0402	TCE	36	21	1.00	NT	○	○
0402	cDCE	36	9	1.78	I	○	○
0402	VC	36	3	ND	I	○	○
0410	PCE	21	9	ND	PD	○	○
0410	TCE	21	9	ND	NT	○	○
0410	cDCE	21	18	0.82 J	D	○	○
0410	VC	21	13	0.62 J	NT	○	○
0416	PCE	23	0	ND	ND	○	○
0416	TCE	23	0	ND	ND	○	○
0416	cDCE	23	0	ND	ND	○	○
0416	VC	23	0	ND	ND	○	○
0417	PCE	19	19	0.99J	PD	○	○
0417	TCE	19	19	0.95J	S	○	○
0417	cDCE	19	17	20.10	I	○	○
0417	VC	19	12	5.52	I	○	○
0418	PCE	23	23	2.97	NT	○	○
0418	TCE	23	23	4.01	I	○	○
0418	cDCE	23	21	6.17	NT	○	○
0418	VC	23	8	ND	NT	○	○
0419	PCE	21	7	ND	NT	○	○
0419	TCE	21	8	ND	NT	○	○
0419	cDCE	21	20	0.91J	D	○	○
0419	VC	21	13	0.51J	I	○	○
0422	PCE	23	23	2.41	PD	○	○
0422	TCE	23	23	1.76	D	○	○
0422	cDCE	23	1	1.37	I	○	○
0422	VC	23	0	ND	ND	○	○
0423	PCE	18	18	2.99	S	○	○
0423	TCE	18	18	1.20	S	○	○
0423	cDCE	18	14	ND	I	○	○
0423	VC	18	0	ND	ND	○	○

Table 2. Summary of MAROS Statistical Trends and MCL Exceedances (continued)

Well	Analyte	Number of Samples	Number of Detects	Result (µg/L) August 2018	Trend 08/2014–08/2018	Exceedance 08/2014–08/2018	Current Condition (08/2018)
0424	PCE	17	8	ND	S	○	○
0424	TCE	17	2	ND	I	○	○
0424	cDCE	17	0	ND	ND	○	○
0424	VC	17	0	ND	ND	○	○
0425	PCE	17	17	0.99 J	I	○	○
0425	TCE	17	15	0.91 J	I	○	○
0425	cDCE	17	7	1.56	I	○	○
0425	VC	17	0	ND	ND	○	○
0451	PCE	21	21	4.06	D	○	○
0451	TCE	21	21	3.47	D	○	○
0451	cDCE	21	21	4.34	I	○	○
0451	VC	21	4	ND	I	○	○
0452	PCE	20	10	ND	D	○	○
0452	TCE	20	18	ND	D	○	○
0452	cDCE	20	19	14.80	I	○	○
0452	VC	20	3	1.13	I	○	○
P015	PCE	17	11	ND	D	○	○
P015	TCE	17	15	ND	D	○	○
P015	cDCE	17	16	4.27	S	○	○
P015	VC	17	5	ND	I	○	○
P027	PCE	21	21	0.73 J	S	○	○
P027	TCE	21	16	1.66	I	○	○
P027	cDCE	21	14	3.22	I	○	○
P027	VC	21	5	0.66 J	I	○	○
P031	PCE	25	25	1.12	I	○	○
P031	TCE	25	18	1.20	I	○	○
P031	cDCE	25	12	3.00	I	○	○
P031	VC	25	3	ND	I	○	○
P053	PCE	18	18	5.08	S	○	○
P053	TCE	18	18	2.67	D	○	○
P053	cDCE	18	12	0.52 J	NT	○	○
P053	VC	18	0	ND	ND	○	○
P054	PCE	22	21	0.55 J	D	○	○
P054	TCE	22	22	4.52	NT	○	○
P054	cDCE	22	21	16.40	I	○	○
P054	VC	22	13	3.89	I	○	○
P056	PCE	23	22	1.47	D	○	○
P056	TCE	23	23	1.59	D	○	○
P056	cDCE	23	23	18.90	I	○	○
P056	VC	23	20	8.07	I	○	○

Table 2. Summary of MAROS Statistical Trends and MCL Exceedances (continued)

Well	Analyte	Number of Samples	Number of Detects	Result (µg/L) August 2018	Trend 08/2014–08/2018	Exceedance 08/2014–08/2018	Current Condition (08/2018)
P057	PCE	21	21	1.92	I	○	○
P057	TCE	21	21	4.20	I	○	○
P057	cDCE	21	19	4.77	I	○	○
P057	VC	21	6	ND	I	○	○
P058	PCE	21	21	2.55	D	○	○
P058	TCE	21	21	2.13	D	○	○
P058	cDCE	21	21	2.91	NT	○	○
P058	VC	21	6	0.56 J	I	○	○
P059	PCE	21	21	4.62	D	○	○
P059	TCE	21	21	4.95	D	○	○
P059	cDCE	21	21	4.40	I	○	○
P059	VC	21	3	ND	I	○	○
P060	PCE	23	13	ND	D	○	○
P060	TCE	23	18	ND	D	○	○
P060	cDCE	23	23	2.69	PD	○	○
P060	VC	23	10	1.58	I	○	○
P061	PCE	26	18	ND	D	○	○
P061	TCE	26	25	0.65 J	D	○	○
P061	cDCE	26	19	7.79	I	○	○
P061	VC	26	1	ND	I	○	○
P062	PCE	26	25	0.42 J	D	○	○
P062	TCE	26	21	ND	D	○	○
P062	cDCE	26	15	3.91	I	○	○
P062	VC	26	0	ND	ND	○	○
P063	PCE	29	29	0.69 J	D	○	○
P063	TCE	29	25	ND	D	○	○
P063	cDCE	29	20	1.62	NT	○	○
P063	VC	29	5	ND	I	○	○

Abbreviations:

Concentration codes: ND = not detected
J = estimated value
red = exceeded MCL in August 2018

Trend codes: D = downward trend
I = increasing trend

NT = no trend
PD = possible downward trend
PI = possible upward trend
S = stable
Exceedance: Did the constituent exceed MCL at any time during the period August 2014–August 2018 green = no, red-orange = yes

Current condition codes: green = below MCL
red-orange = above MCL

The concentration trend analyses are shown graphically on maps to better illustrate the spatial trends with symbols and color coding (PCE in Figure 28, TCE in Figure 29, cDCE in Figure 30, and VC in Figure 31). The well name is listed in bold for wells with a contaminant concentration that exceeded an MCL in the baseline samples or during any sampling period (August 2014–August 2018); non-bold symbols indicate wells in which contaminant concentrations were below the MCL during every sampling period. Well locations circled in green had a concentration below the MCL in the most recent sampling period (August 2018); well locations circled in red had a concentration above the MCL in the most recent sampling period (August 2018). Wells marked with an up arrow had increasing or probably increasing trends; wells marked with a horizontal line had stable concentrations or no trend; wells marked with a down arrow had decreasing or probably decreasing trends; wells marked with a "0" had no detection in any sample.

Based on the table and figures, the following are key observations for the individual concentration well trends:

- PCE—For the 10 wells that had concentrations exceeding the MCL (5 µg/L) during the period from August 2014 to August 2018, 8 of these wells were classified as decreasing or probably decreasing trends and 2 wells were classified as stable or having no trend. At the end of the field demonstration (Year Four), only one OU-1 monitoring well exceeded the MCL for PCE (Well P053 at 5.1 µg/L).
- TCE—For the 10 wells that had concentrations exceeding the MCL (5 µg/L) at any time during the period from August 2014 to August 2018, 7 of these wells were classified as decreasing or probably decreasing trends, 2 of the wells were classified as stable or having no trend, and one well was classified as having increased or probably increasing trends. Note that the well that was classified as increasing (0418) was below the MCL at the end of the field demonstration. At the end of Year Four, none of the OU-1 monitoring wells exceeded the MCL for TCE.
- cDCE—Only well P054 had concentrations of DCE greater than the MCL (70 µg/L) during the period from August 2014 to August 2018. The trend in cDCE in this well was classified as increasing and the concentration was below the MCL at the end of Year Four. None of the monitoring wells exceeded the MCL at the end of the field demonstration.
- VC—For the six wells that had concentrations of VC greater than the MCL (2 µg/L) during the period from August 2014 to August 2018, one of these wells was classified as stable or having no trend and five were classified as having increased or probably increasing trends.

Key Points:

The trends in individual well concentrations for the parent products (PCE and TCE) are decreasing in most of the OU-1 wells. At the end of Year Four, only one well had concentrations of PCE greater than the MCL and none of the wells had concentrations of TCE greater than the MCL.

Daughter products, cDCE and VC, have increasing trends in the OU-1 plume, particularly in and near the treatment zones, indicating reductive dechlorination of the parent products. Only two had concentrations of VC greater than the MCL at the end of Year Four.

At the start of the field demonstration, there were 27 exceedances of MCLs. By the end of the field demonstration, the number of MCL exceedances was reduced to four (August 2018).

Of the wells that were classified as increasing, three were below the MCL at the end of Year Four. At the end of the field demonstration (August 2018), two wells were above the MCL (2 µg/L) for VC (wells P054 and P056 with VC concentrations of 3.1 and 8.1 µg/L, respectively).

- PCE and TCE were identified as statistically increasing in three wells (0425, P027, and P031) on the western boundary of the VOC plume. The concentrations of PCE and TCE along the western edge of the plume have been low, generally, less than 1.5 µg/L with some sporadic hits around 2 µg/L. The trends in these wells are small, and it is anticipated that concentrations should stabilize and remain below the MCLs, as the concentrations upgradient of these wells have been below the MCL since 2017.
- The anaerobic daughter products cDCE and VC were generally identified as statistically increasing in various wells within the OU-1 plume, particularly in the wells that are in or near the anaerobic treatment zones. The concentrations of cDCE (accumulating up to 20 to 35 µg/L in the source and treatment areas) have generally remained below the MCL (70 µg/L) throughout the OU-1 plume. VC has formed and is seen at low concentrations in and immediately downgradient of the anaerobic treatment zones. This is the expected behavior for VC because it is generated in the treatment zones but is subject to relatively rapid degradation in the surrounding aerobic groundwater, limiting the potential for downgradient spread.
- The OU-1 monitoring well network had 27 exceedances of MCLs in the baseline condition in 2014. By the end of the field demonstration, the number of MCL exceedances was reduced to four (in August 2018). Several wells have concentrations just above or just below the MCLs; therefore, the number of exceedances is expected to vary as the site progresses toward remediation goals. Nonetheless, the significant observed improvement in groundwater quality is a direct result of the EA deployment.

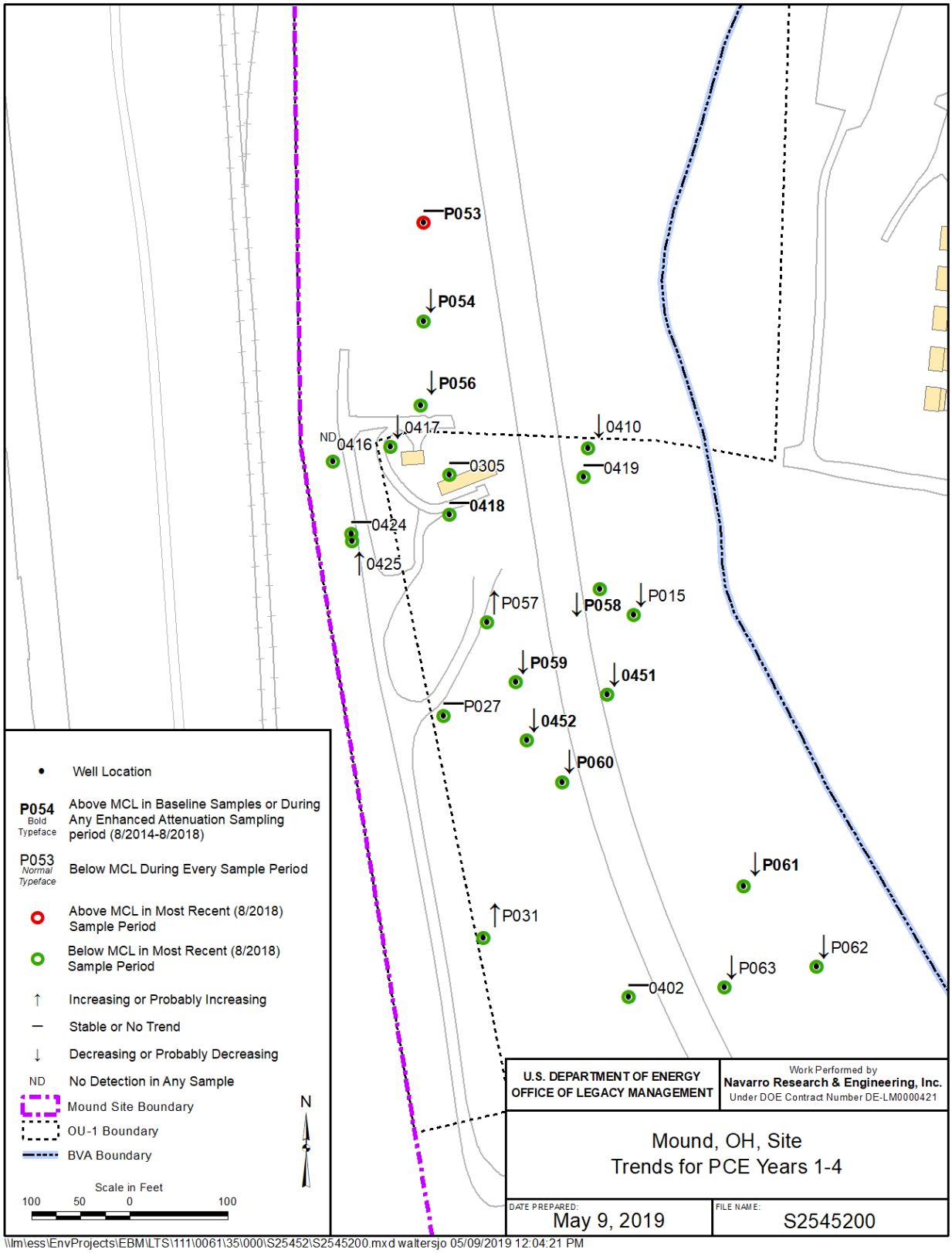


Figure 28. Trends for PCE Years 1–4

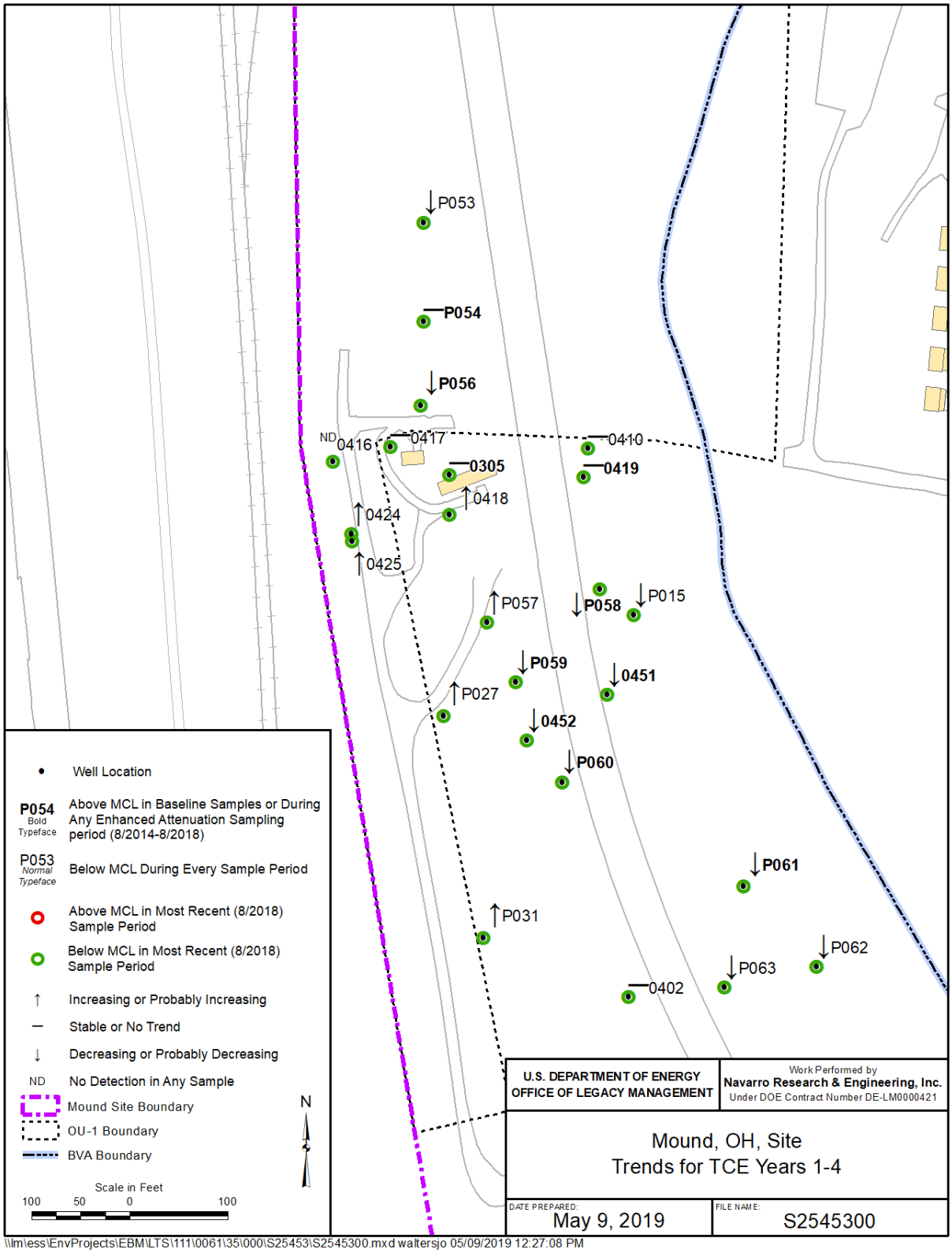


Figure 29. Trends for TCE Years 1–4

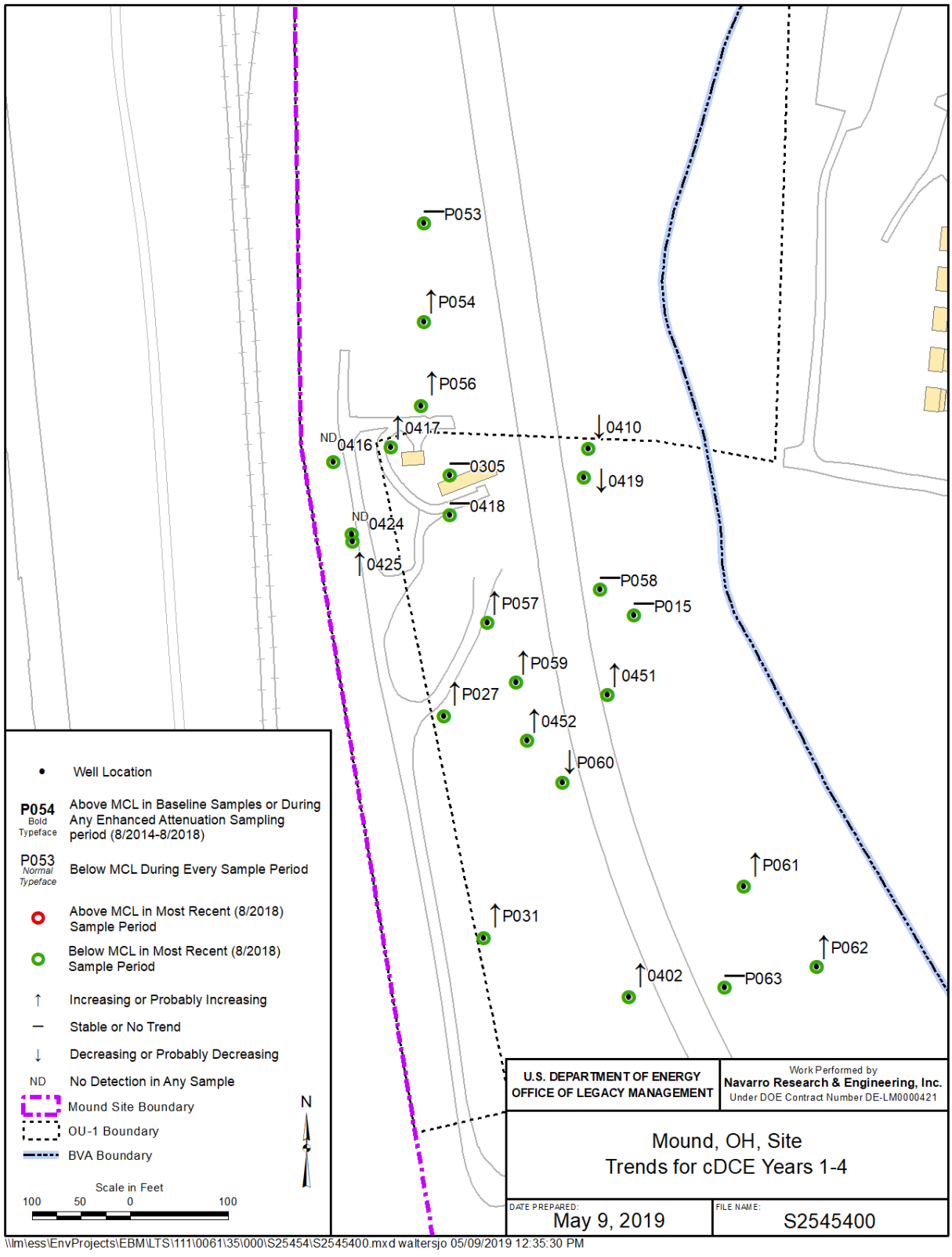


Figure 30. Trends for cDCE Years 1–4

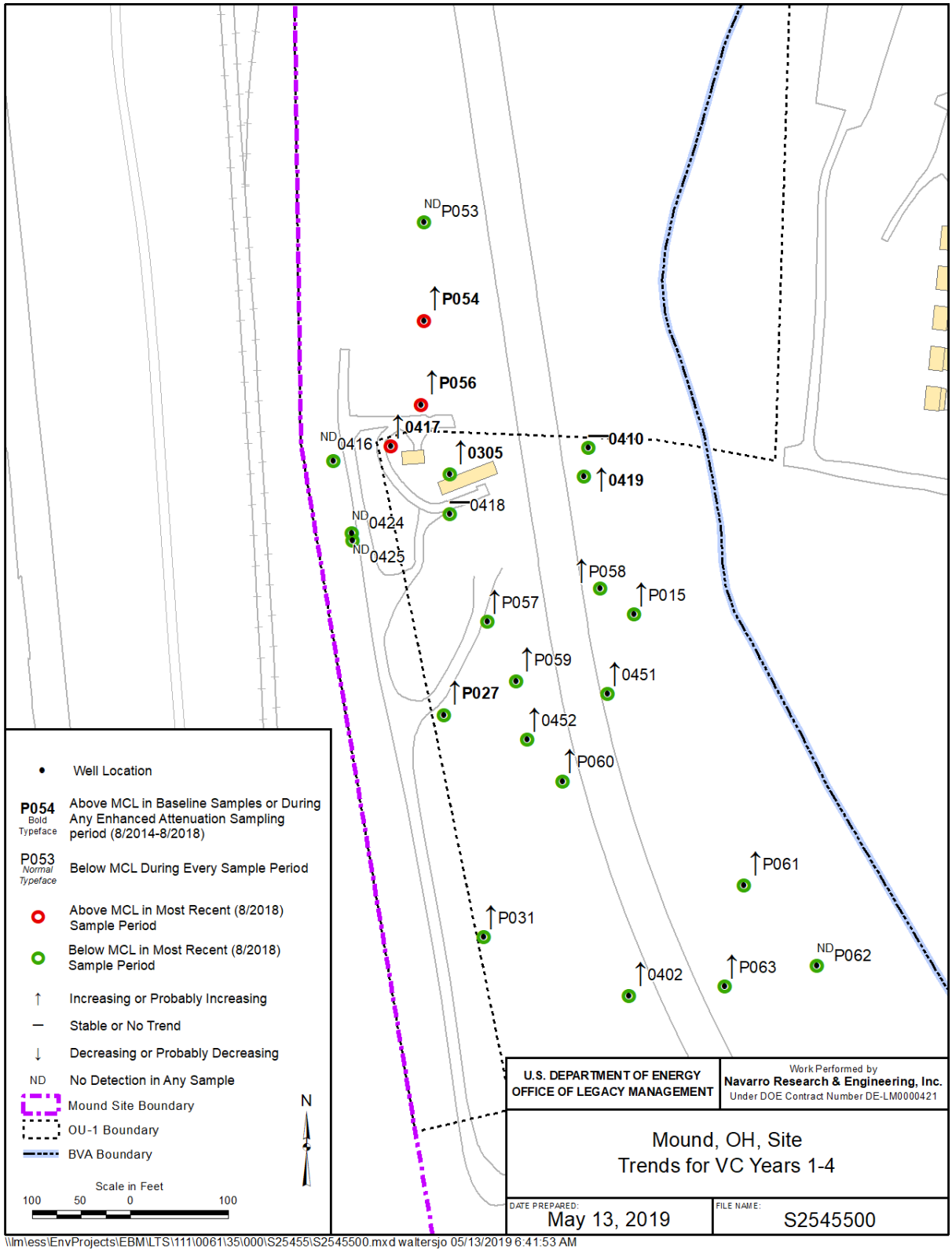


Figure 31. Trends for VC Years 1–4

3.1.2 Plume Mass Trends for cVOCs in OU-1 Groundwater Plume

Analysis of the stability of the dissolved plume mass using MAROS (after Aziz et al. 2012) covered the period from August 2014 to August 2018. The moment analyses and statistical Mann-Kendall results from MAROS for the various contaminants in the OU-1 plume provide an assessment of the overall stability of the cVOC plume, addressing such questions as

- Is the mass increasing, decreasing, or stable?
- Is the center of mass of the plume moving?
- Is the plume expanding or contracting?
- How much confidence is there in the trends?

MAROS was used with site-specific data that included groundwater flow direction to the south-southeast at a rate of 57 feet per year with a porosity of 0.25. The aquifer thickness was estimated for each well. Wells P054 and P056 were considered original source wells, wells 0422, 0423, and P031 were considered delineation wells, and all other wells were considered tail wells (i.e., wells located downgradient of the source zones).

MAROS plume stability analysis uses a method of moments to provide an estimated mass, *x*- and *y*-coordinates for the center of mass, and the spread (uniformity) of the mass within the plume. There are three calculated moments from MAROS:

- The *zeroth moment* is the sum of concentrations for all the monitoring wells and is an estimate of the total dissolved mass in the plume. MAROS provides a consistent approach for dissolved mass estimation that is intended to support assessment of changes over time. A decreasing trend in dissolved mass (zeroth moment) for any contaminant is primary evidence that the plume of that contaminant will trend toward shrinking.
- The *first moment* estimates the center of mass for each sample event and contaminant. The changing center of mass locations indicate the movement of the center of mass over time, with the *x*-axis representing its major migration direction (i.e., groundwater flow direction) and *y*-axis representing lateral movement perpendicular to the flow direction. The calculation is based on the original source location, so a positive (increasing) trend along the *x*-axis indicates that the center of mass is moving downgradient, and a negative (decreasing) trend along the *x*-axis indicates that the center of mass is moving back toward the source. Trends along the y-axis indicate shifting of the center of mass over time.
- The *second moment* represents the spread of the contaminants (uniformity) within the plume in the *x*- and *y*-directions, with the *x*-axis representing its major migration direction (i.e., groundwater flow direction) and the *y*-axis representing lateral expansion. The trend over time is influenced by the location and strength of the center of mass. A positive (increasing) trend indicates the concentrations of the contaminants within the plume are becoming more uniform.

The Mann-Kendall analysis is used to estimate the statistical trend for each parameter and the confidence of each trend. Each of these moments are used to evaluate the overall stability of the plume. Table 3 outlines the decision-making matrix for measuring the statistical strength of each trend using the Mann-Kendall statistic (*S*), the coefficient of variation (COV), and the confidence in the trend as determined by MAROS. The confidence in the trend is the probability of rejecting

the null hypothesis that there is no trend and is calculated by subtracting the probability of no trend from 1.

Table 3. MAROS Mann-Kendall Analysis Decision Matrix

Mann-Kendall Statistic	Confidence in the Trend	Concentration Trend
S > 0	>95%	Increasing
S > 0	90% to 95%	Possibly increasing
S > 0	<90%	No trend
S ≤ 0	<90% and COV ≥1	No trend
S ≤ 0	<90% and COV <1	Stable
S < 0	90% to 95%	Probably decreasing
S < 0	95%	Decreasing

Figure 32 shows the dissolved plume mass of parent and daughter products over time using the zeroth moment analysis. Figure 33 shows the same data converted to dissolved plume moles based on molecular weight. The interpretation of data in moles is a good way of looking at the overall distribution of cVOCs undergoing chemical transformations, particularly for stepwise reductive dechlorination processes, since moles relate to the total number of molecules of each constituent. Time zero on these plots indicates the approximate start of the oil injections. MAROS provides an estimate of the mass and uses one-half the detection limit for nondetected constituents. Figure 34 shows the molar distribution of the parent and daughter products at different time periods and total calculated moles. Table 4 provides the mass output from MAROS for the individual cVOCs and the calculated moles.

The following are key observations of the dissolved plume mass trends from August 2014 to August 2018:

- PCE and TCE masses decreased significantly. As expected, following the injection of electron donor (vegetable oil), the masses of daughter products (primarily cDCE) increased. This is consistent with the transformation by reductive dechlorination (PCE ► TCE ► cDCE ► VC) in the anaerobic treatment zones.
- Perturbations from the water-table fluctuations during the summer of 2016 (approximately day 600 to day 800) impacted dissolved cVOCs and MAROS mass estimates during that time frame. Other factors contributing to the mass trends and variability include groundwater-level changes, continued source loading, or back diffusion and dynamic interactions between the structured geochemical zones and the microbial community.
- The increase in the mole fraction of cDCE and VC shown in Table 4 and pie charts in Figure 32 demonstrates that significant reductive attenuation processes in the anaerobic treatment zones have developed and are continuing.
- Based on the data, the mass and moles calculated by MAROS for the OU-1 plume appear to have "stabilized" over the past 2 years. This suggests that the contaminant mass balance at the site might be characterized by an emergent pseudo-steady-state condition where inputs and transformation processes are in rough balance with the observed concentrations and distribution. Future changes are expected to occur relatively slowly over the next several years as the residual secondary source materials are exhausted.

Table 4. MAROS Zeroth Moment Results During Years One–Four, Mass and Moles

		Mass (kg)					Moles				
Effective Date	Day	PCE	TCE	cDCE	VC	Total	PCE Mol	TCE Mol	cDCE Mol	VC Mol	Total
8/15/2014	-30	0.062	0.058	0.004	0.002	0.126	0.377	0.442	0.040	0.031	0.890
11/15/2014	62	0.072	0.073	0.018	0.003	0.166	0.432	0.555	0.190	0.049	1.225
2/15/2015	154	0.047	0.039	0.045	0.004	0.135	0.281	0.296	0.468	0.061	1.106
5/15/2015	243	0.033	0.027	0.031	0.003	0.095	0.202	0.206	0.324	0.046	0.777
8/15/2015	335	0.030	0.033	0.052	0.003	0.118	0.179	0.255	0.535	0.047	1.016
11/15/2015	427	0.028	0.042	0.066	0.006	0.143	0.169	0.321	0.685	0.100	1.275
2/15/2016	519	0.023	0.036	0.051	0.005	0.115	0.140	0.272	0.528	0.080	1.020
5/15/2016	609	0.021	0.031	0.065	0.008	0.125	0.128	0.233	0.672	0.130	1.164
8/15/2016	701	0.026	0.055	0.089	0.011	0.180	0.155	0.420	0.915	0.172	1.662
11/15/2016	793	0.028	0.051	0.080	0.013	0.171	0.168	0.387	0.821	0.205	1.581
2/15/2017	885	0.023	0.037	0.054	0.014	0.129	0.141	0.285	0.562	0.216	1.204
5/15/2017	974	0.020	0.032	0.057	0.009	0.118	0.123	0.242	0.584	0.149	1.098
8/15/2017	1066	0.022	0.030	0.054	0.009	0.116	0.135	0.230	0.558	0.147	1.070
11/15/2017	1158	0.022	0.030	0.087	0.019	0.158	0.135	0.229	0.898	0.298	1.561
2/15/2018	1250	0.024	0.028	0.063	0.010	0.125	0.144	0.217	0.645	0.158	1.165
5/15/2018	1339	0.018	0.022	0.044	0.008	0.092	0.107	0.167	0.452	0.131	0.857
8/15/2018	1431	0.025	0.029	0.068	0.012	0.135	0.153	0.224	0.702	0.199	1.278

Abbreviation:
kg = kilograms

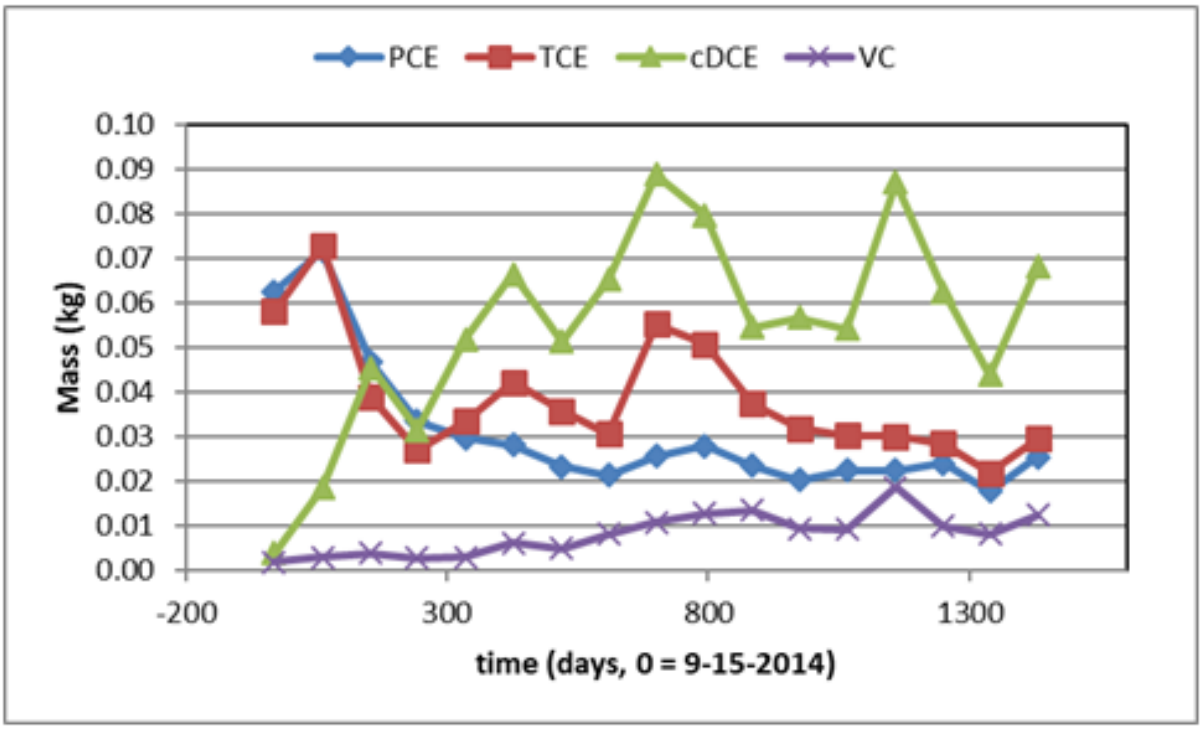


Figure 32. Estimated Dissolved Plume Mass over Time

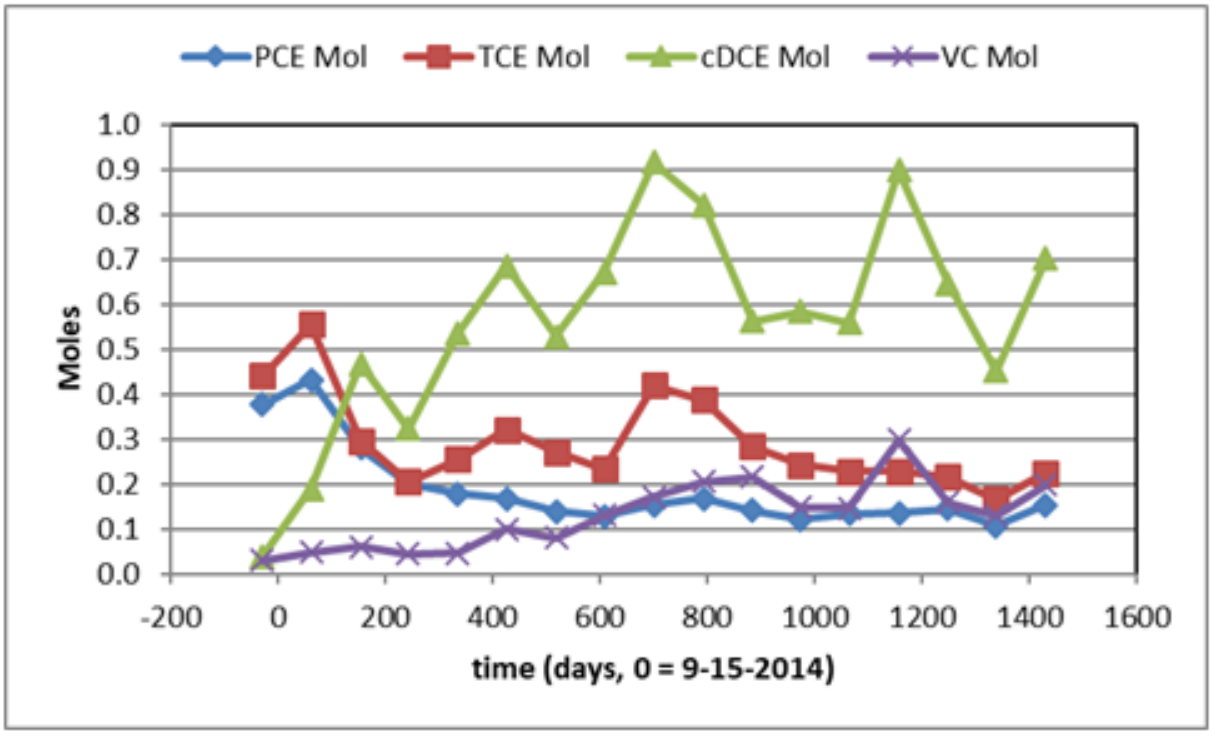


Figure 33. Estimated Dissolved Plume Mass (in moles) over Time

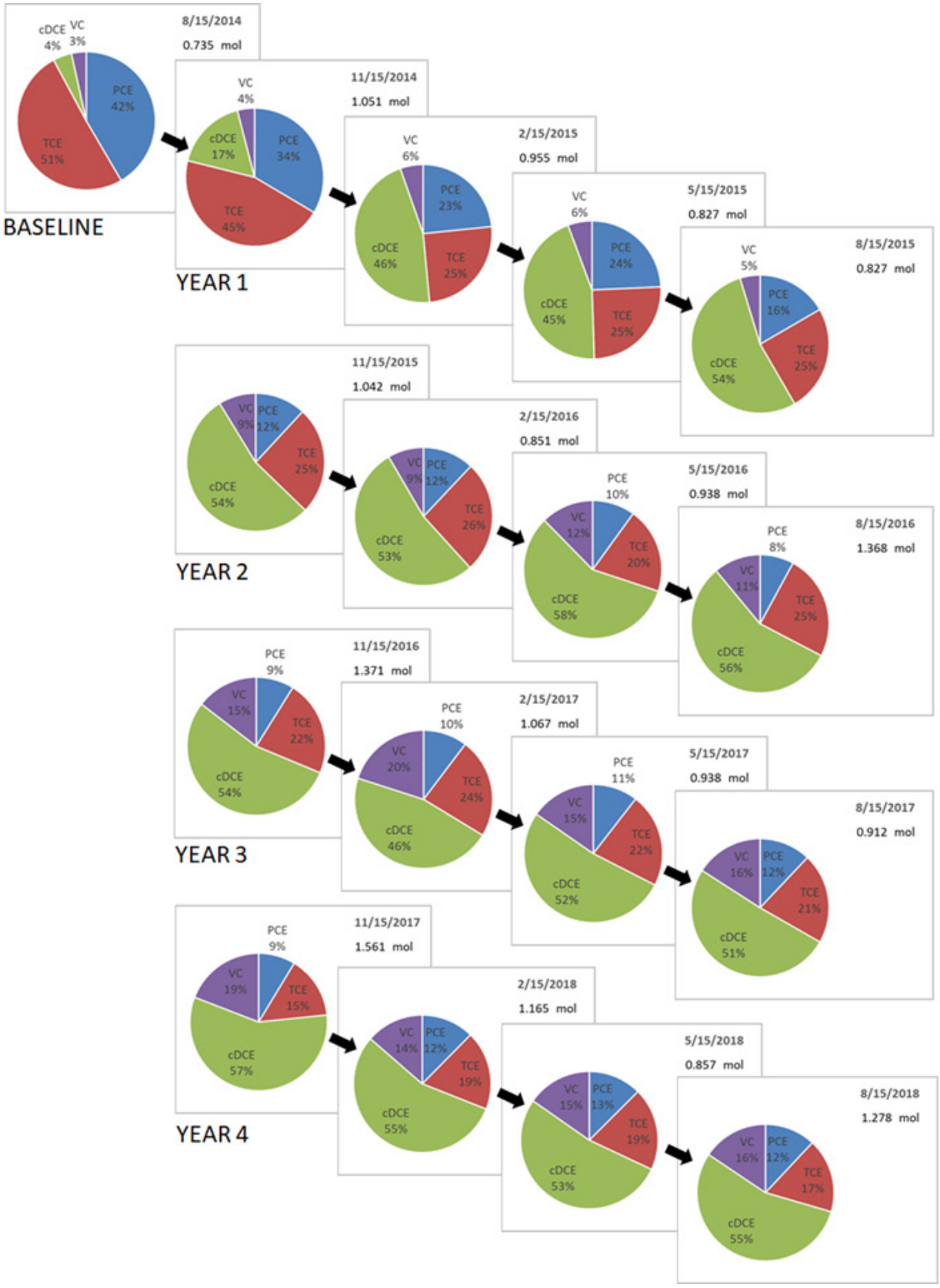


Figure 34. Molar Distribution of cVOCs over Time

Table 5 summarizes the plume moment analyses described above for each cVOC and includes the concentrations trend and the confidence in the trend. The following are key observations from the moment analysis.

- The changes in masses over time (*zeroth moment*) are acting as follows: PCE and TCE are decreasing while cDCE and VC are increasing. The trends in mass relate to the change in the plumes of the various cVOCs over time from the baseline conditions. The trends in this metric suggest that the plumes are acting as follows: the plumes for PCE and TCE are statistically shrinking, and the plumes for cDCE and VC are statistically expanding. The expanding trend in cDCE and VC is expected because these degradation daughter products show low or trace concentrations in the baseline plume.
- The change in the center of the plume mass over time (*first moment*) is decreasing for PCE and TCE in the *x*-direction (i.e., groundwater flow direction), indicating that the center of mass for the parent compounds is moving upgradient toward the original source. This is consistent with the degradation of these parent compounds. The center of the plume mass is stable in the *x*-direction for cDCE, consistent with the formation of this intermediate daughter product within the OU-1 plume footprint and stabilization of the resulting footprint during the field demonstration. Similarly, no statistical trend in the center of mass is in the plume for VC, consistent with the low and sporadic nature of the detections of this daughter product.
- The change in the distribution of contaminants about the center of mass over time (*second moment*) is an indicator in the change of plume uniformity (also referred to as plume spread in MAROS). The trend for the second moment for the PCE plume was decreasing in the *x*-direction (i.e., groundwater flow direction) and increasing in the *y*-direction (i.e., lateral expansion), suggesting that the distribution has become less uniform (i.e., more discrete zones) over time and some lateral expansion has occurred. The MCL for PCE (5 µg/L) was only exceeded in one well by the end of Year 4 and is within the landfill footprint. The trend for the second moment for the TCE plume was decreasing in both the *x*- and *y*-directions,

Key Points:

The changes in mass (or moles) of the cVOCs are consistent with transformation by reductive dechlorination in the anaerobic treatment zones. The relatively low mass (moles) of cDCE and VC is consistent with loss of daughter products by aerobic degradations processes.

The ratios of the moles of various cVOCs in the plume were relatively stable during Year 3 and Year 4, suggesting that the system may be in a new pseudo steady-state mass balance; the evolution of this mass balance over time is an important item for a watch list moving forward to help assess remediation time required to achieve MCLs for all constituents.

Overall, the moment analysis indicates that PCE and TCE mass can be classified as stable or shrinking. The concentration and mass trend analyses suggest that the structured geochemical zones are working as designed.

The moment analysis indicates that the cDCE mass can be classified as expanding; however, the generation of daughter products was anticipated. Concentrations remain below the MCL.

The moment analysis indicated that the VC mass can be classified as stable.

indicating the plume is shrinking and becoming more uniform over time (i.e., the hot spots have been mitigated). For cDCE, the second moment in the *x*-direction was increasing and in the *y*-direction was stationary, indicating that this plume is expanding, as anticipated, and has become less uniform (i.e., some discrete areas of higher concentrations have formed in or near the anaerobic treatment zones). However, the cDCE concentrations are below MCL in all wells, and the cDCE remains within the original footprint of the OU-1 plume. For VC, the second moment in the *x*-direction was stable and no trend was observed in the *y*-direction, consistent with the relatively low and sporadic occurrence of VC in the OU-1 groundwater.

Table 5. Summary of MAROS Plume Moment Analysis

cVOC	Moment Type	Confidence in Trend (%)	Trend	Description
PCE	Zeroth moment	100.00	D	Dissolved mass
	First moment *x*	100.00	D	Δ Center of mass (*x*)
	First moment *y*	99.90	I	Δ Center of mass (*y*)
	Second moment *x*	99.90	D	Plume spread (*x*)
	Second moment *y*	97.40	I	Plume spread (*y*)
TCE	Zeroth moment	99.90	D	Dissolved mass
	First moment *x*	100.00	D	Δ Center of mass (*x*)
	First moment *y*	96.20	I	Δ Center of mass (*y*)
	Second moment *x*	100.00	D	Plume spread (*x*)
	Second moment *y*	94.60	PD	Plume spread (*y*)
cDCE	Zeroth moment	99.90	I	Dissolved mass
	First moment *x*	51.60	NT	Δ Center of mass (*x*)
	First moment *y*	98.30	D	Δ Center of mass (*y*)
	Second moment *x*	99.50	I	Plume spread (*x*)
	Second moment *y*	58.00	S	Plume spread (*y*)
VC	Zeroth moment	100.00	I	Dissolved mass
	First moment *x*	67.20	S	Δ Center of mass (*x*)
	First moment *y*	99.90	D	Δ Center of mass (*y*)
	Second moment *x*	75.50	S	Plume spread (*x*)
	Second moment *y*	78.00	NT	Plume spread (*y*)

Abbreviations:
Δ = delta (change in)
D = downward trend
I = increasing trend
NT = no trend
PD = possible decreasing trend
S = stable

3.2 Second Line of Evidence—Geochemical Footprint

The objective of the second line of evidence is to evaluate geochemical data that can be used to demonstrate indirectly the types of attenuation processes in different areas as the structured geochemical zones are developed at the site.

Example analytes include attenuation conditions (e.g., oxygen, ORP, pH, TOC), competing electron acceptors (compounds that receive electrons instead of cVOCs in attenuation reactions) in anaerobic zones (e.g., oxygen, sulfate, and nitrate), and diagnostic indicators (e.g., methane and iron). The geochemistry was manipulated by the addition of the emulsified soybean oil amendment. The product has both fast and slow release electron donors. Lactate (fast release) increases microbial growth while rapidly creating anaerobic conditions in the treatment zones. Soybean oil droplets are retained on the aquifer materials and slowly ferment to provide electron donors to maintain reducing conditions.

The following are key observations related to sitewide geochemistry during the EA Field Demonstration:

- Prior to the EA deployment, the entire site was predominantly aerobic. Following deployment, predominantly anaerobic zones developed near and downgradient of electron donor injection.
- The data indicate development of distinct zones within the aquifer with reduced conditions that are variable for reductive dechlorination.
- The data indicate shifts of geochemistry toward cometabolic (oxidation) conditions in the plume interior and sentinel well areas.
- Postdeployment, the patterns of anaerobic and aerobic conditions are consistent with the structured geochemical zone design basis. The sequence of anaerobic and aerobic conditions along the flow path of OU-1 groundwater provides conditions that maximize the degradation opportunities of parent (PCE and TCE) and daughter (DCE and VC) chlorinated ethenes and mitigates the potential for excessive buildup of VC.

3.3 Third Line of Evidence—Enhanced Attenuation Microbial Community Data

The objective of the third line of evidence is to document that one or more recognized attenuation mechanisms are occurring at the site. In the case of OU-1, the site-specific documentation of attenuation mechanisms needs to focus on the design basis of structured geochemical zones and how the attenuation will be manifested in observable patterns of contaminant concentrations and changes in the microbial community. Thus, the two subtopics supporting the third line of evidence are (1) the presence and pattern of daughter products and (2) the subsurface microbial response to the EA deployment. In both subtopics, the data should demonstrate that the expected anaerobic and aerobic attenuation mechanisms are operating in the target areas. In the anaerobic treatment zones, the EA strategy would be validated by the presence and sequential appearance or disappearance of daughter products via reductive dechlorination and the presence of significant populations of organisms that have been documented to attenuate cVOCs under anaerobic conditions. In the surrounding near-field aerobic zones, the EA strategy would be validated by low concentrations of reductive dechlorination daughters (due to aerobic degradation of these compounds) and by the presence of significant populations of organisms that have genetic markers for known cometabolic enzymes. Collection of the supporting data for the third line of evidence, from both anaerobic and aerobic areas, provides a robust approach to determine whether recognized attenuation mechanisms are in place in the OU-1 groundwater. These data, combined with the geochemistry and other lines

of evidence, will assist DOE, regulators, and stakeholders in assessing the performance of the EA Field Demonstration.

3.3.1 Presence and Pattern of Daughter Products

The following graphs depict the concentration of parent and daughter cVOCs in key OU-1 monitoring wells. The wells included in these graphs are those identified in the Field Demonstration Work Plan (well 0305 was also included in these graphs because concentrations in this monitoring well increased, that is, rebounded following the EA deployment and P&T system turnoff).

These graphs are organized according to their assigned setting (anaerobic treatment zone, plume interior, sentinel wells) for evaluation and discussion. In general, the data provide confirmation of reductive dechlorination in the anaerobic treatment zones. The relatively low levels of DCE and VC in downgradient wells are consistent with aerobic metabolism or cometabolism. The low concentrations in the sentinel wells provide field confirmation that the plume has not expanded downgradient during the monitoring period. The wells identified in the work plan (with the addition of 0305) effectively document the groundwater and contaminant responses and are representative of the data from the entire well network.

3.3.1.1 Anaerobic Treatment Zone

Figure 35 through Figure 40 show the concentrations of parent and daughter cVOCs over time for wells assigned to the anaerobic treatment zones in the Sampling and Analysis Plan. The *y*-scales for these graphs were set so that the vertical changes from graph to graph are roughly equivalent. The following are key observations for the anaerobic treatment zone wells:

- Concentrations of parent compounds (PCE and TCE) in anaerobic treatment zone wells generally decreased during the first three years of the field demonstration (Figure 35 through Figure 40). Well P054 decreased during Year One but spiked near the end of Year Two (Figure 38). PCE and TCE concentrations in well P054 then decreased and are now at or near the concentrations before the spike. A special sampling indicated that the concentration oscillation was associated with large water-level changes from the combined effects of downgradient dewatering operations and regional drought conditions. The data suggested that the spike was likely a sampling artifact due to the presence of the deployed neat oil in the water sample (neat oil was deployed in the deep vadose zone near well P054). The results of the special sampling are discussed in the Year Three report (DOE 2018).
- Daughter products (cDCE in all wells and VC in most wells) were observed in anaerobic treatment zone wells (Figure 35 through Figure 40). In all wells, the pattern of daughter products over time was a reasonable variant of the patterns observed in the scientific literature for bioremediation or biostimulation sites. In particular, the cVOC concentrations in wells P060, 0410, 0419, and P059 (Figure 36, Figure 37, Figure 39, and Figure 40) exhibit a “classic” pattern in which the daughter products form and degrade in sequence.
- Well P056 (Figure 35) also exhibits this pattern but has a second peak of daughter products consistent with its position downgradient of P054. The second peak indicates that the oscillation observed in well P054 is localized and any associated contaminants in groundwater are rapidly degrading as water moves downgradient.

- A number of wells exhibit some degree of cDCE stall, a condition in which cDCE degradation is relatively slow and levels build up above parent levels (see data on wells P056, P060, and P054 in Figure 35, Figure 36, and Figure 38). In general, the cDCE concentrations in these wells stabilized and decreased during Year Three and Year Four. All cDCE concentrations in source wells were below the MCL (70 µg/L) at the end of fourth year.
- VC was detected in the anaerobic treatment zone wells during the first three years of the EA Field Demonstration. Wells P054 and P056 were above the MCL for VC (2 µg/L) at the end of Year Four.

The structured geochemical zones impact both the localized and overall plume-scale makeup of cVOCs. Specifically, transient formation of cDCE and VC was expected. These daughter products are subject to a number of degradation pathways that break the anaerobic dechlorination sequence, particularly in downgradient near-field aerobic zones.

The geochemical structure of the EA deployment is designed to limit the potential for both temporal and spatial impacts of cVOC daughter products. In the case of cDCE, aerobic degradation processes must operate at rates that mitigate "cDCE stall," when parent solvents break down to cDCE and build up to adversely high levels for an extended period. The scenario for VC is similar, except that this constituent has a higher toxicity and lower regulatory limit (MCL), so the potential for VC formation in all remediation systems that employ electron donor injection for cVOCs should be closely monitored. Note that the strategy to deploy EA focused on generating geochemical conditions in which both *cis*-DCE and VC can degrade aerobically and, thus, limit the deep anaerobic conditions that can result in the formation of VC.

Key data that would indicate that cDCE stall and VC accumulation are under control include (a) cDCE and VC concentrations remain below MCLs (or any exceedances are minor or transient and in small or interior areas of the plume); (b) cDCE and VC concentrations peak and then start to decline; and (c) total chlorinated solvent (moles) in the plume stabilize or decrease significantly over time.

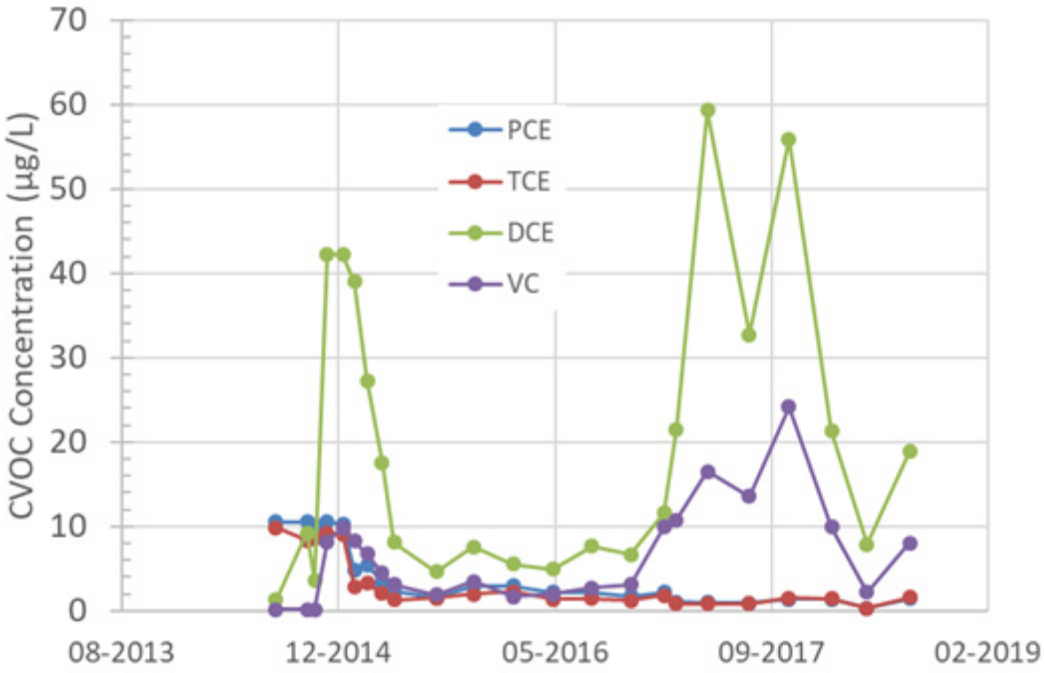


Figure 35. Data for Chlorinated Ethenes in Well P056 for Samples Collected During Years 1–4 of the Enhanced Attenuation Field Demonstration

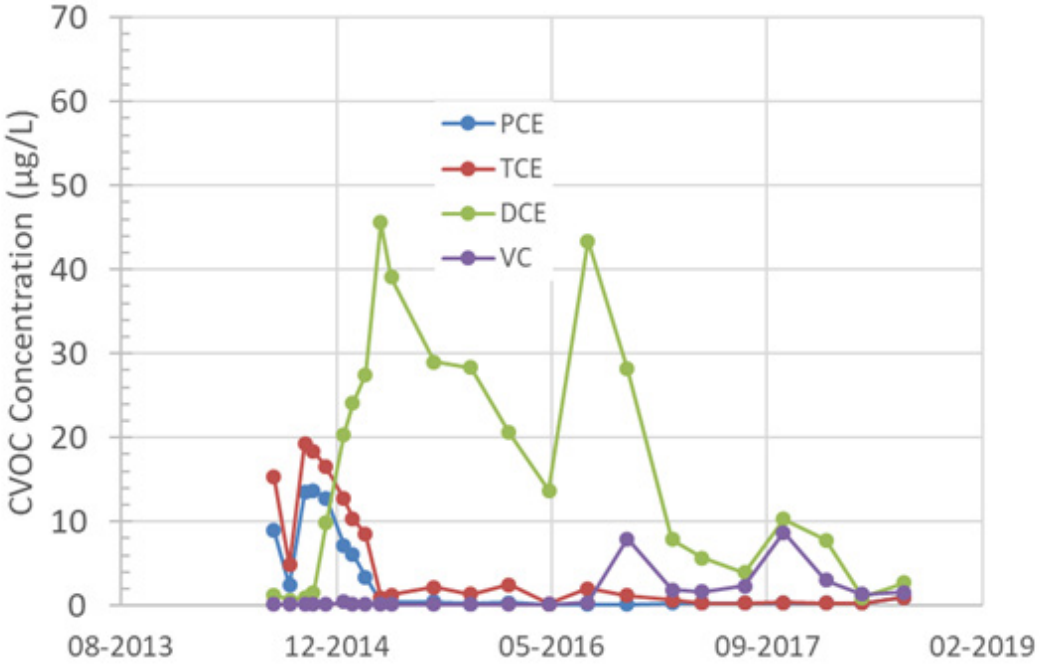


Figure 36. Data for Chlorinated Ethenes in Well P060 for Samples Collected During Years 1–4 of the Enhanced Attenuation Field Demonstration

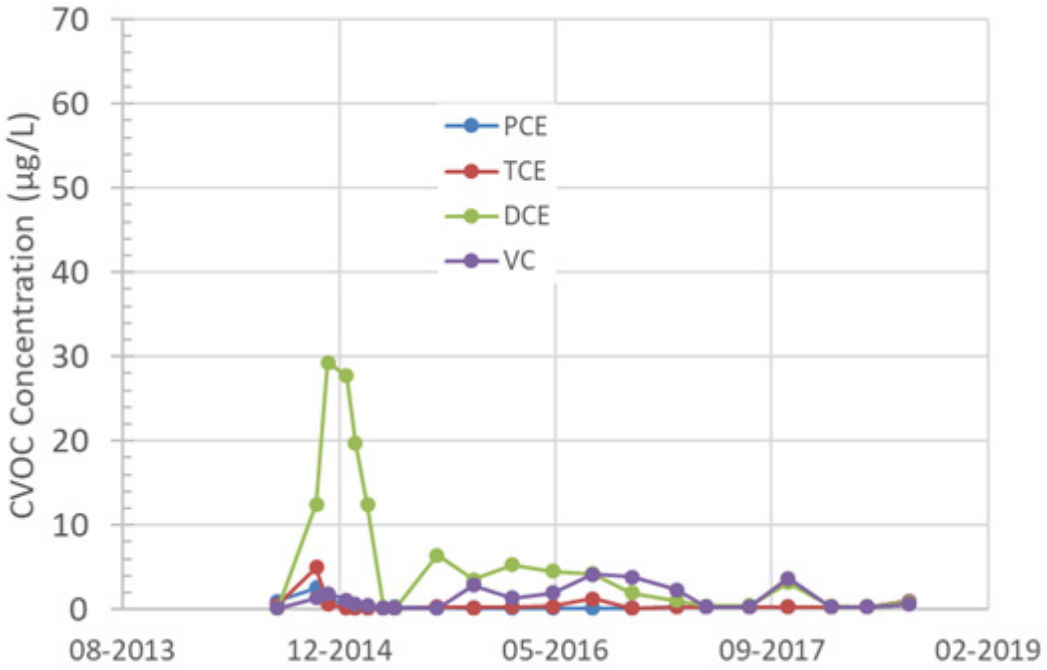


Figure 37. Data for Chlorinated Ethenes in Well 0410 for Samples Collected During Years 1–4 of the Enhanced Attenuation Field Demonstration

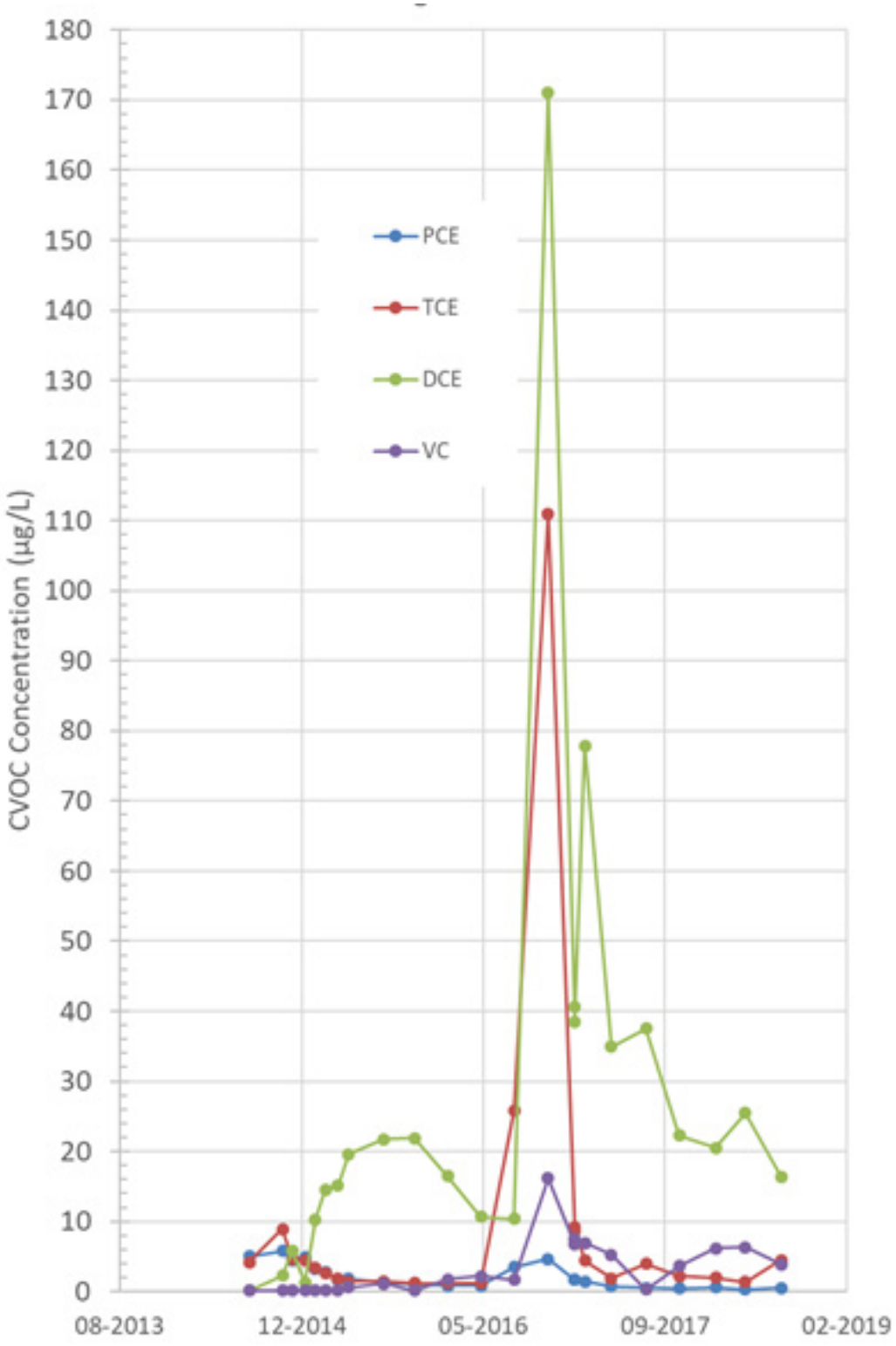


Figure 38. Data for Chlorinated Ethenes in Well P054 for Samples Collected During Years 1–4 of the Enhanced Attenuation Field Demonstration

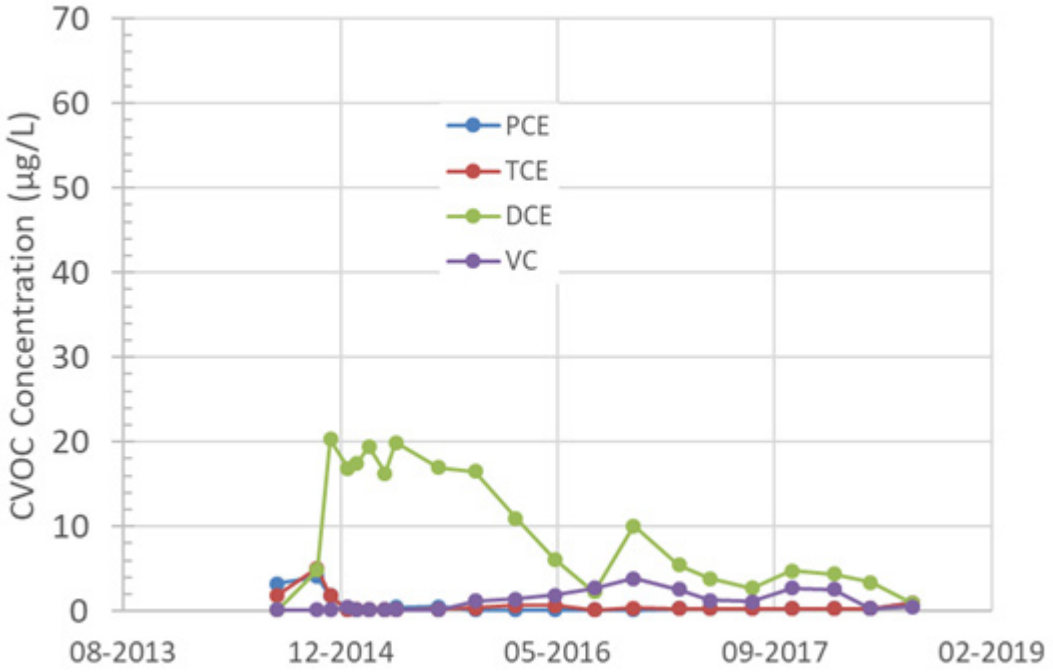


Figure 39. Data for Chlorinated Ethenes in Well 0419 for Samples Collected During Years 1–4 of the Enhanced Attenuation Field Demonstration

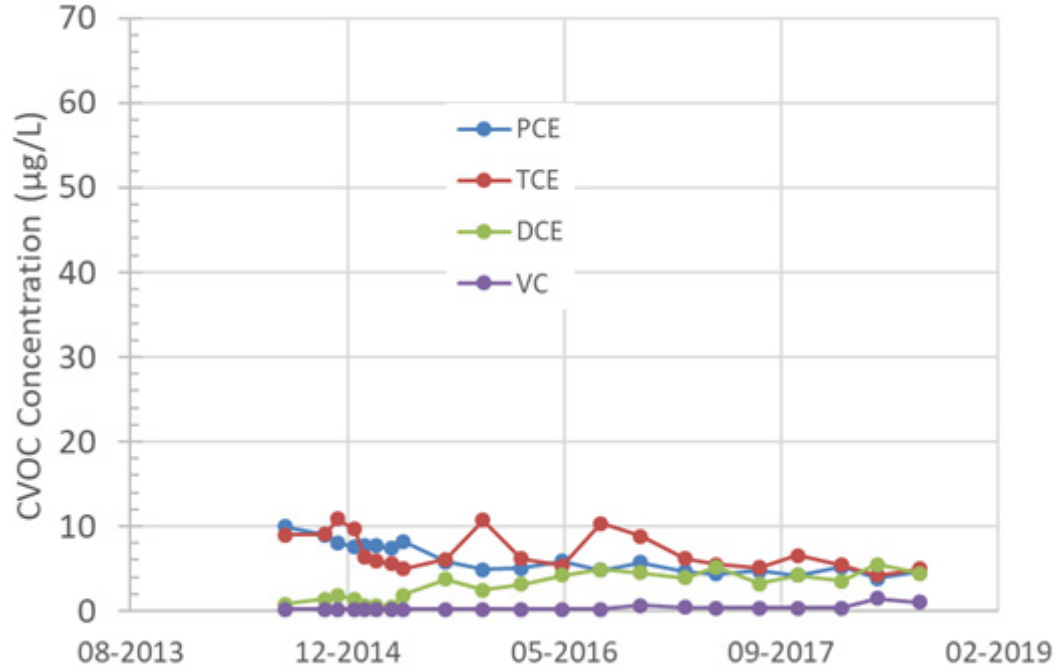


Figure 40. Data for Chlorinated Ethenes in Well P059 for Samples Collected During Years 1–4 of the Enhanced Attenuation Field Demonstration

3.3.1.2 Plume Interior

Figure 41 through Figure 44 show the concentrations of parent and daughter cVOCs over time for wells designated in the plume interior in the Sampling and Analysis Plan. Note that the *y*-scale on all of the plume interior well plots is the same, but the scale is different (lower) than that on the treatment zone well plots. The following are key observations for the plume interior wells:

- During Years One and Two, parent cVOCs (PCE and TCE) increased in well 0305 and then decreased during Year Three and Four (Figure 41). This monitoring well is roughly collocated with the original P&T recovery wells and is immediately downgradient of the former landfill source. As noted in the Field Demonstration Work Plan (DOE 2014a), some rebound was expected in this area following the EA deployment and turnoff of the P&T system. The magnitude of rebound was substantially less than previously observed (during previous rebound testing and periods of P&T shutdown), suggesting that the vadose-zone oil deployment is reducing the contaminant flux from the former landfill area. The observed rebound appears to have stabilized and is now decreasing.
- Daughter products were detected in all designated plume interior wells. At the end of Year Three, cDCE and VC concentrations were below the MCL in all of these wells (Figure 44). The daughter products in the assigned plume interior wells are relatively low compared to those of the anaerobic treatment zone wells. This pattern is consistent with attenuation of the cVOC daughter products in aerobic conditions. The daughter products would be expected to degrade as water flows out of anaerobic treatment zones and into and through the plume interior, where DO levels are above 1 to 2 μg/L.
- Parent cVOC concentrations in the assigned plume interior wells (P058, 0451, and 0417) were stable or decreasing during field demonstration (Figure 42, Figure 43, and Figure 44, respectively).

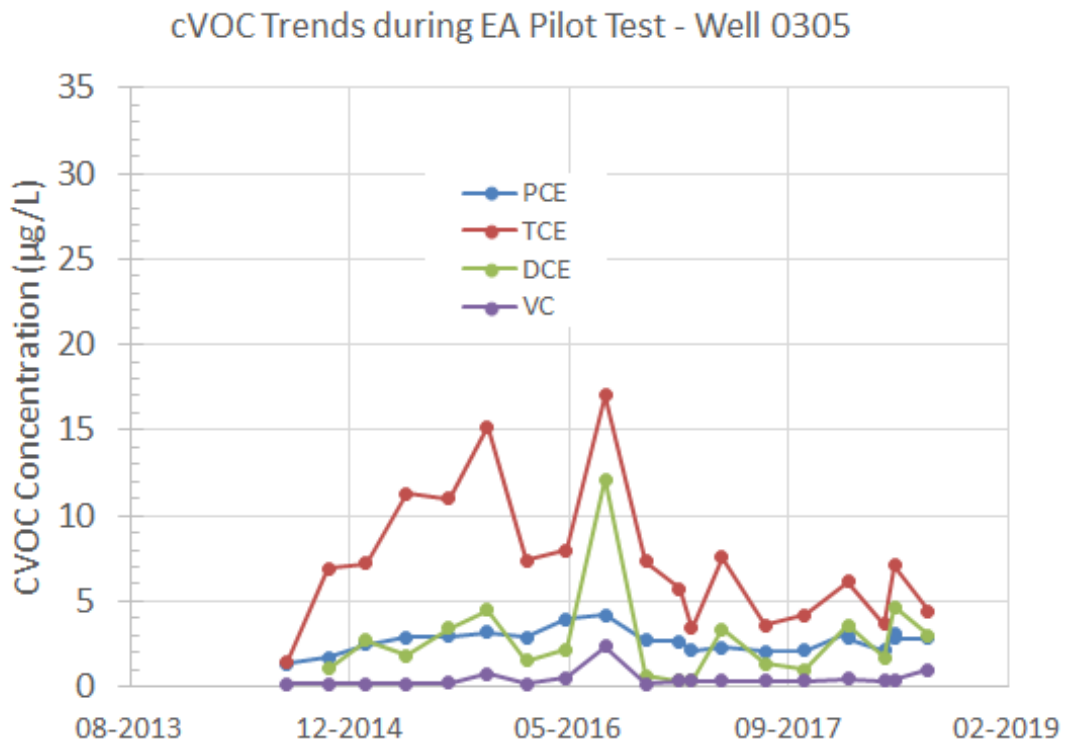


Figure 41. Data for Chlorinated Ethenes in Well 0305 for Samples Collected During Years 1–4 of the Enhanced Attenuation Field Demonstration

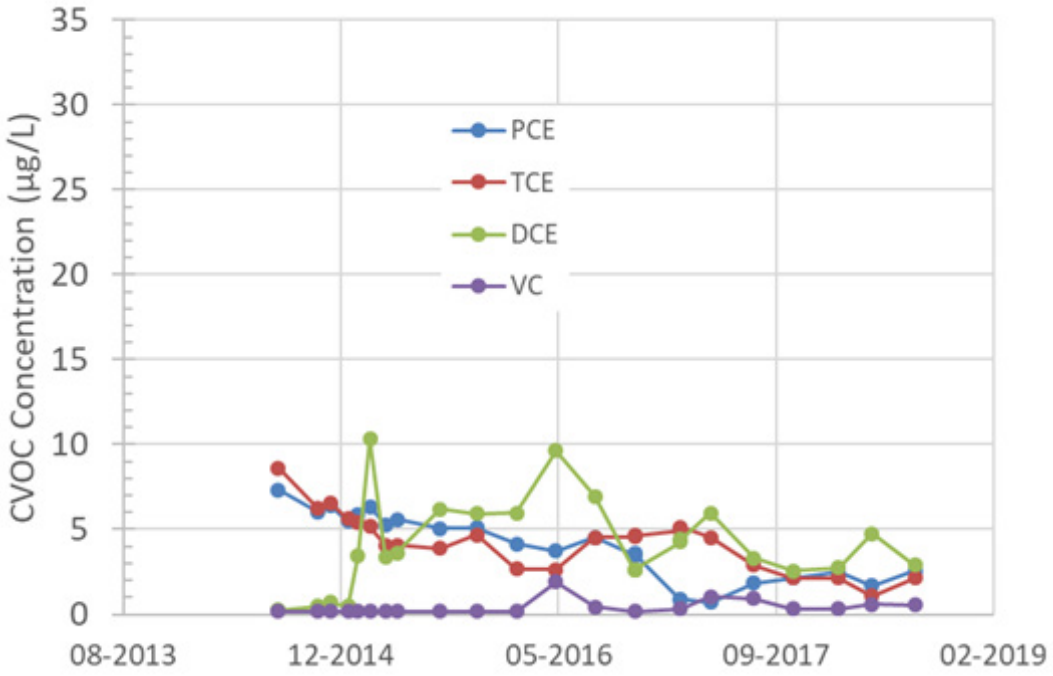


Figure 42. Data for Chlorinated Ethenes in Well P058 for Samples Collected During Years 1–4 of the Enhanced Attenuation Field Demonstration

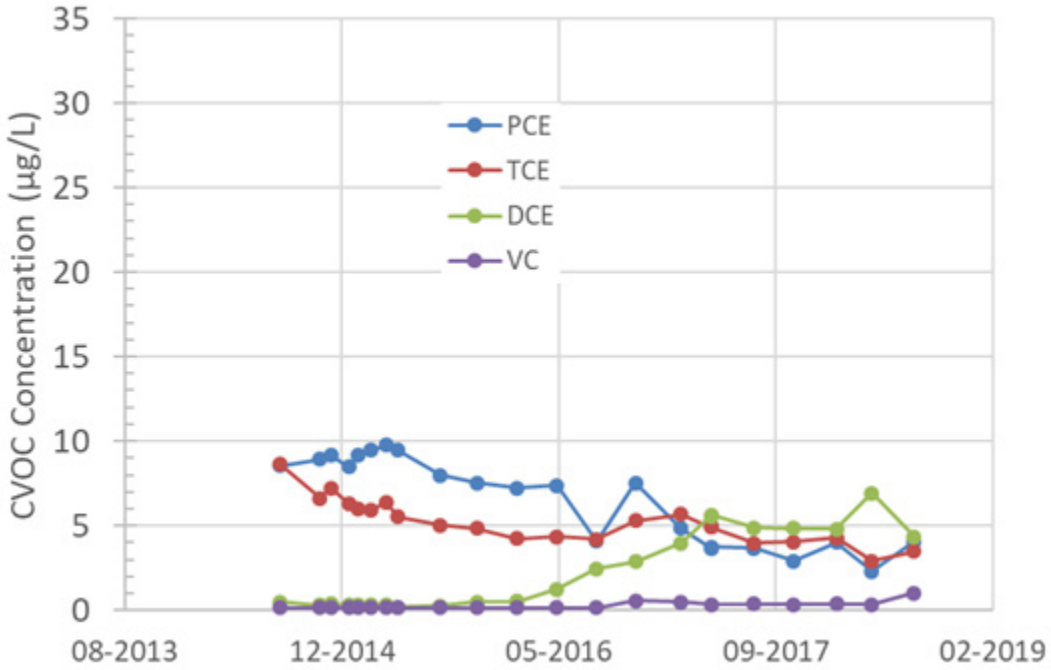


Figure 43. Data for Chlorinated Ethenes in Well 0451 for Samples Collected During Years 1–4 of the Enhanced Attenuation Field Demonstration

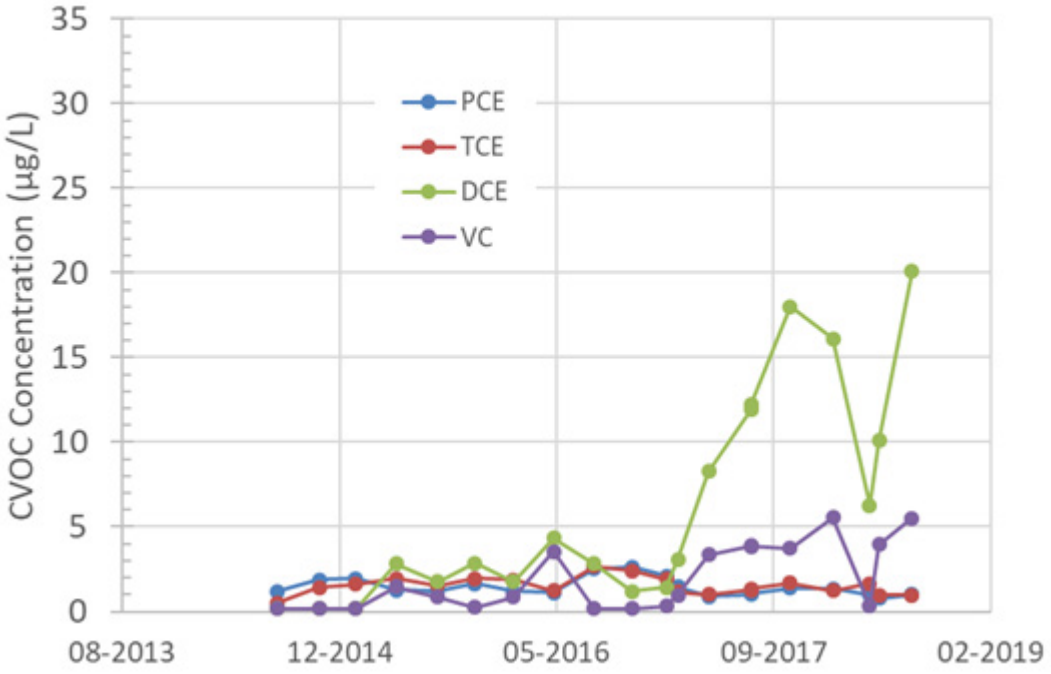


Figure 44. Data for Chlorinated Ethenes in Well 0417 for Samples Collected During Years 1–4 of the Enhanced Attenuation Field Demonstration

3.3.1.3 Sentinel Wells

Figure 45 through Figure 49 show the concentrations of parent and daughter cVOCs over time for sentinel wells near the distal edge of the plume. Note that the *y*-scale on the plots for the sentinel wells is the same as that on the plots for the plume interior wells. Figure 45 through Figure 47 include the designated sentinel wells and represent a key technical and regulatory objective of the EA Field Demonstration: assuring that the overall OU-1 plume does not spread or expand. Wells 0402 and P031 have also been included to assess this objective. The following are key observations for the assigned sentinel wells:

- Parent cVOC (PCE and TCE) concentrations in the sentinel wells generally decreased (or remained stable below MCLs) throughout the field demonstration (Figure 45 through Figure 47). Notably, the parent cVOC concentrations in well P061 that started over the MCLs in the baseline data are now at or below detection levels.
- Daughter products were detected in the sentinel wells (Figure 45 through Figure 49). At the end of Year Three, cDCE and VC were below MCLs in all sentinel wells. Note that anaerobic treatment zones were located just upgradient of some of the sentinel wells. Thus, the similarity of the cVOC patterns in the sentinel wells to those in the plume interior wells is reasonable and expected. As with the plume interior wells, the low concentrations of daughter products observed in the sentinel wells are consistent with attenuation of cVOC daughter products in aerobic conditions. Daughter products would be expected to degrade as water flows out of anaerobic treatment zones and into the sentinel area, where DO levels are above 1 to 2 mg/L. None of the parent or daughter products concentrations were above the MCLs in any of the sentinel wells at the end of Year Four.

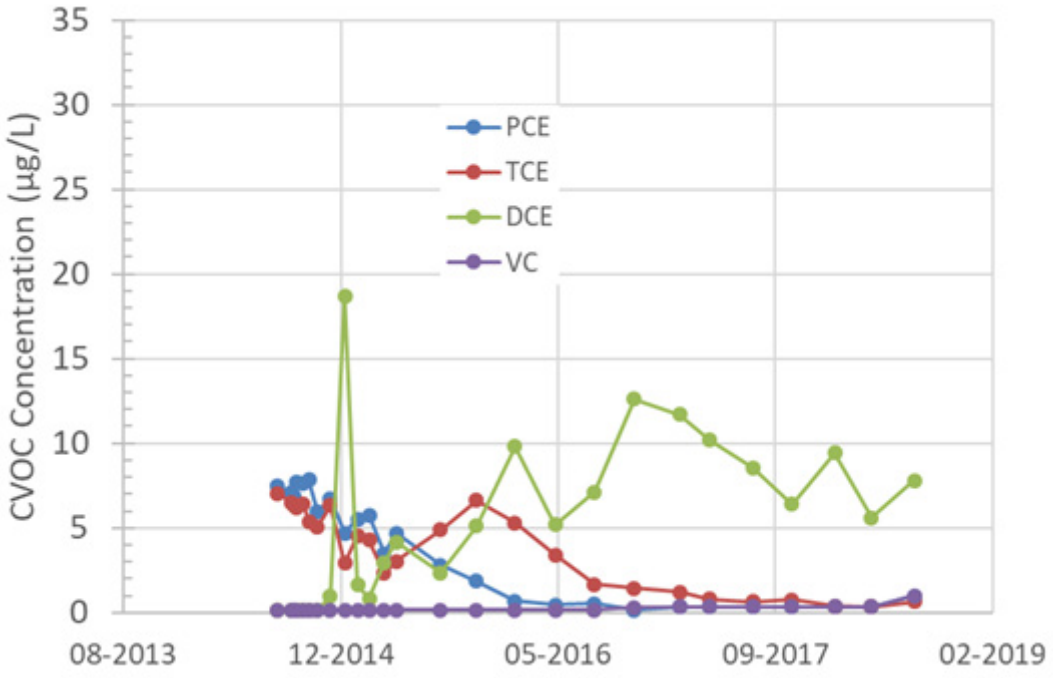


Figure 45. Data for Chlorinated Ethenes in Well P061 for Samples Collected During Years 1–4 of the Enhanced Attenuation Field Demonstration

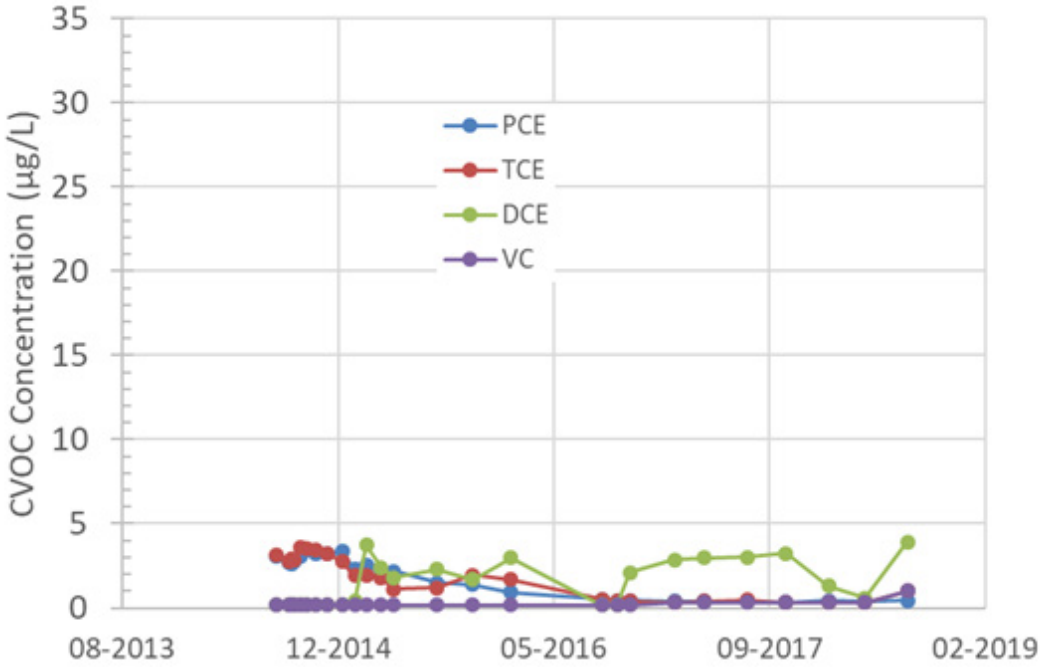


Figure 46. Data for Chlorinated Ethenes in Well P062 for Samples Collected During Years 1–4 of the Enhanced Attenuation Field Demonstration

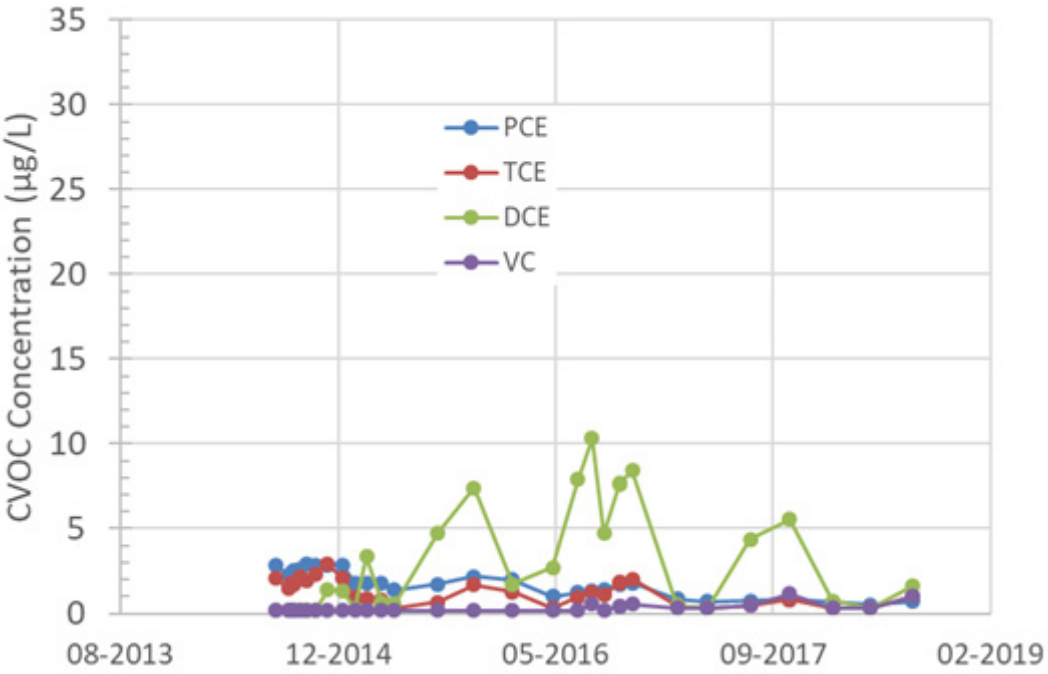


Figure 47. Data for Chlorinated Ethenes in Well P063 for Samples Collected During Years 1–4 of the Enhanced Attenuation Field Demonstration

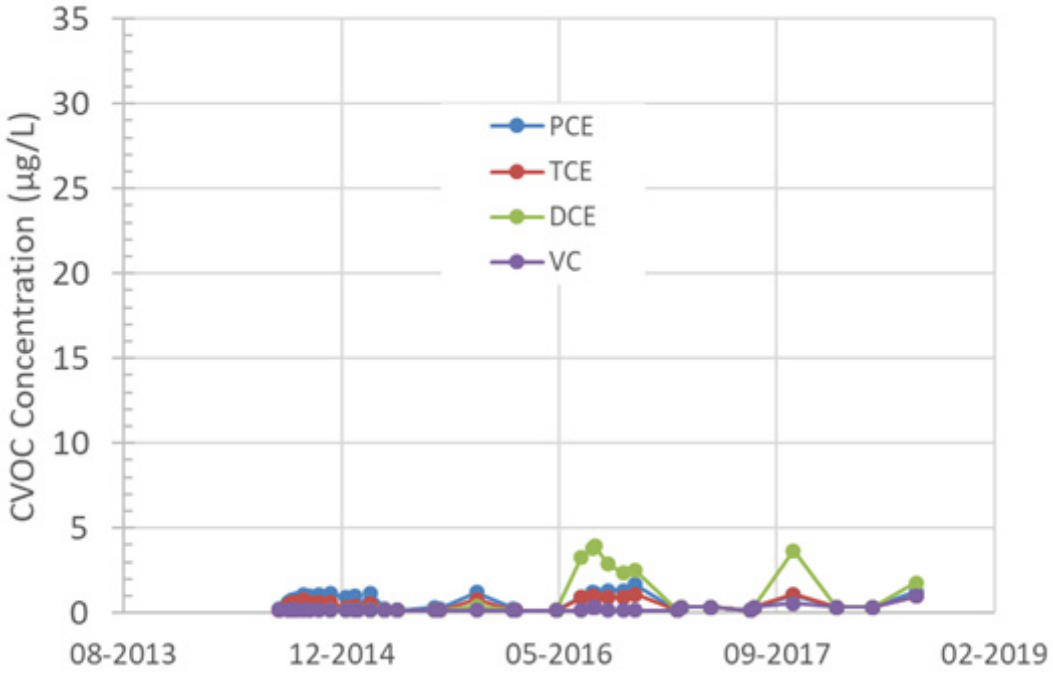


Figure 48. Data for Chlorinated Ethenes in Well 0402 for Samples Collected During Years 1–4 of the Enhanced Attenuation Field Demonstration

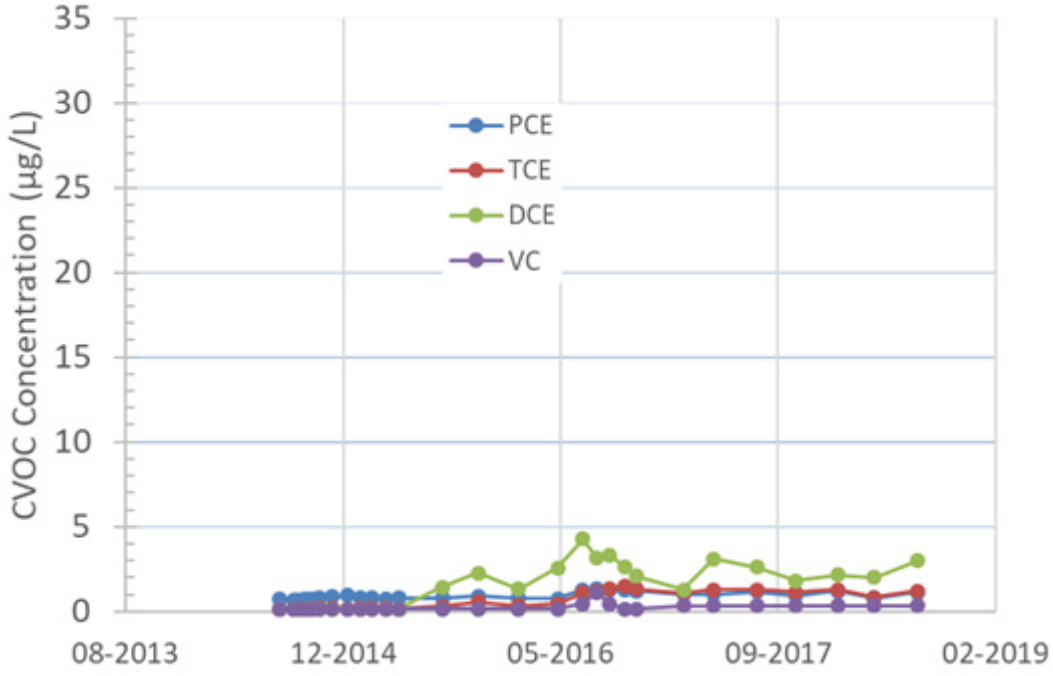


Figure 49. Data for Chlorinated Ethenes in Well P031 for Samples Collected During Years 1–4 of the Enhanced Attenuation Field Demonstration

3.3.2 Subsurface Microbial Community Response to Enhanced Attenuation Deployment

To assess the biological response of the subsurface in representative areas of the OU-1 aquifer, qPCR measurements of microbial community DNA isolated from groundwater samples were performed. For the microbial monitoring, six wells that represent different biogeochemical settings were sampled to provide information on changes within and downgradient of the reductive treatment zones, as well as provide insights on changes near the original source and in the distal portion of the plume (Figure 50). As shown, the wells generally represent the different target biogeochemical regimes—anaerobic treatment zones (0419, P056, P060), plume interior (P058), and the distal area (P031). Well P061 is a sentinel well, but it is located immediately downgradient of a set of injection wells, so it would be expected to behave similarly to an anaerobic treatment zone well or plume interior well. The selected wells provide site-specific information about the impact of the EA deployment on the microbial community; the changes in these wells should generally represent the expected changes in similar settings throughout the Mound OU-1 groundwater over the course of the field demonstration.

Samples were collected in August 2014 (baseline), November 2014, May 2015 (Year One), May 2016 (Year Two), November 2016 (Year Three), and April 2018 (Year Four). The sampling in November 2016 was performed early to obtain information to assess impacts of the lower than typical water levels and increased hydraulic gradients caused by nearby dewatering and drought conditions. The water levels had generally recovered by November 2016 so that a sampling would provide information to support an assessment of the state of the microbial community in the structured geochemical zones (i.e., the impact of dewatering and reinundating the sediments near the water table, whether the types and numbers of desired microbes were still in place, what any changes in the community suggest about the groundwater system). As part of a special study, a supplemental set of qPCR samples was collected from wells near P054 in January 2017, and these results are presented separately along with the other data from the special study in the *Operable Unit 1 Field Demonstration Year Three Status Report Mound, Ohio, Site* (DOE 2018).

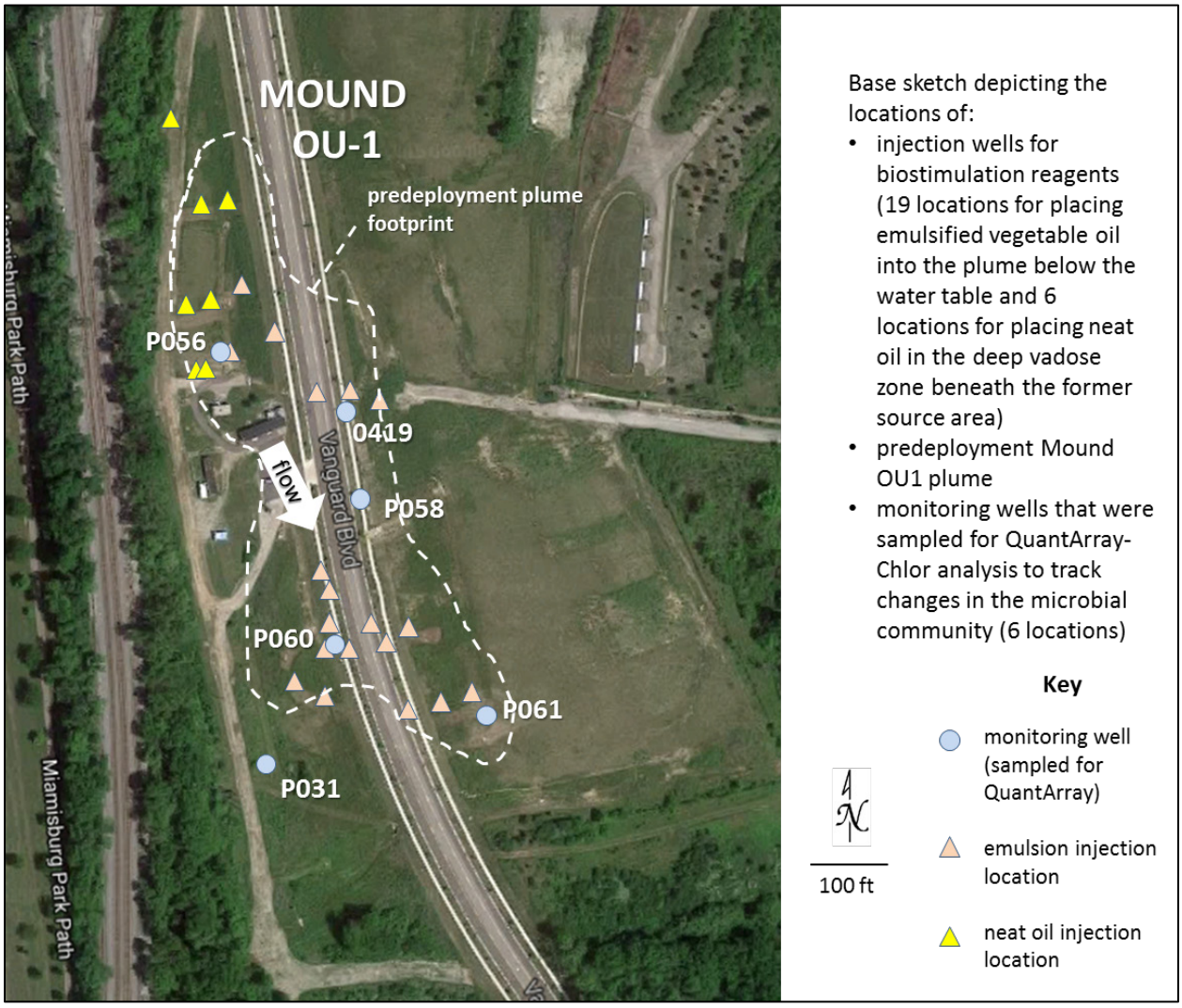


Figure 50. Microbial Community Characterization Sampling Locations

Table 6 suggests reasonable target QuantArray-Chlor results for classes of organisms and individual organisms to support the structured geochemical zones paradigm at sites with low concentrations of cVOC. For example, in the anaerobic treatment zones, target values of total eubacteria would be approximately 10^6 cells per milliliter (mL), sulfate reducers and methanotrophs would each be in the range of 10^5 cells/mL, and the sum of reductive dechlorination species would be on the order of 10^4 cells/mL (with a significant presence of species that target the subject cVOCs). Similarly, in the surrounding aerobic areas, total eubacteria, sulfate reducers, and methanogens would be lower, and the cometabolic species would be estimated from 10^3 to $>10^4$ cells/mL (with a significant presence of species that have functional enzymes that cometabolize the subject cVOCs). The microbial community data complement site geochemistry information and cVOC trends and provide site-specific confirmation that the microbial community has the target capabilities to support EA.

Table 6. Screening Bins for Interpreting the QuantArray Results

Characterization Objective Parameter	Order-of-Magnitude Bins (cells/mL)[a]
Geochemical Regime	
Total eubacteria[b]	Anaerobic (>10^6), transition (10^5 to 10^6), aerobic (<10^5)
Sulfate reducers[b]	Anaerobic (>10^5), transition (10^4 to 10^5), aerobic (<10^4)
Methanogens[b]	Strongly anaerobic (>10^5), transition (10^4 to 10^5), aerobic (<10^4)
Projected Attenuation Processes (type of attenuation and potential significance)	
Σ Reductive dechlorination species[c]	Reductive dechlorination… significant (>10^4), transitional (10^3 to 10^4), unfavorable (<10^3)
Estimated cometabolic species[c]	Aerobic cometabolism… significant (>10^4), transitional (10^3 to 10^4), unfavorable (<10^3)
Individual reductive dechlorination species	Reductive dechlorination… significant (>10^4), transitional (10^3 to 10^4), unfavorable (<10^3)
Individual cometabolic species	Aerobic cometabolism… significant (>10^4), transitional (10^3 to 10^4), unfavorable (<10^3)

Notes:

[a] All values are estimated cells per milliliter as provided by Microbial Insights. For individual species, the estimates are based on species-specific nucleic acid marker sequences (e.g., 16s rRNA). For functional enzymes, the qPCR data are converted to approximate cells per milliliter based on the average number of nucleic acid sequence copies per cell that have been documented in the literature (if available). The Σ reductive dechlorination species is the sum of the individual measured species that contribute to reductive dechlorination/attenuation. Individual cometabolic species were not measured. The "estimated cometabolic species" is an approximate value, and the calculation accounts for the fact that organisms may have multiple types and copies of cometabolic functional enzyme sequences in their DNA; the estimated cometabolic species were calculated as the average of (1) maximum value for estimated cells per milliliter associated with any of the individual cometabolic primers and (2) the sum of the estimated cells per milliliter for all of the measured cometabolic primers.

[b] Typical ranges for permeable aquifers, assuming that aerobic aquifers are oligotrophic (carbon and nutrient limited) and that, due to low oxygen solubility in water, metabolic activity in systems with eubacteria counts above 10^6 cells/mL would fully utilize the available oxygen flux. Anaerobic settings with lower eubacteria counts would occur in low-permeability silts and clays. Significant occurrence of sulfate reducers or methanogens within a microbial community is an indicator of anaerobic and strongly anaerobic conditions, respectively.

[c] Typical ranges based on sufficient organisms to contribute to measurable contaminant attenuation. "Significant" correlates to attenuation half-life of 2 to 5 years, "transition" to attenuation half-life of 5 to 15 years, and "unfavorable" to attenuation half-life >15 years. Individual species typically attenuate different subsets of the cVOCs.

Abbreviation:

Σ = summation of

Figure 51, Figure 52, and Figure 53 summarize the QuantArray data for total eubacteria, sulfate reducers and methanogens, and reductive dechlorination and cometabolic species, respectively. The various summary parameters and how these changed over time in the Mound OU-1 groundwater after the EA deployment are presented on site maps. The color coding of the backgrounds of the bar charts corresponds to the bins in Table 5. The following are key observations for the population summary parameters:

- In the baseline sampling, total eubacteria were significantly below 10^6 cells/mL (Figure 51), and sulfate reducers and methanogens were both below 10^5 cells/mL at all locations (Figure 52). This suggests that the baseline condition for the bulk OU-1 aquifer system was aerobic. Following the injection of the electron donor, these parameters increased to target levels in nearby wells (0419, P056, P060, and P061), indicating effective formation of the anaerobic treatment zones. The total eubacteria, sulfate reducers, and methanogens increased in the mid-plume (P058) and distal (P031) area, but the cell counts were at levels that

indicate aerobic and transition conditions, consistent with the objectives of structured geochemical zones.

- In most wells, the counts for sulfate reducers increased before methanogens (Figure 52), consistent with expected trends for the transition of the local environments toward anaerobic conditions. In general, following the deployment of carbon electron donor, the numbers of sulfate reducers tracked the pattern of sulfate concentrations in groundwater. The sulfate reducer initially peaked as the original sulfate present in the aquifer was transformed. Numbers of sulfate reducers generally decreased throughout Year One and then peaked again after the dewatering was stopped and groundwater levels recovered, bringing groundwater with fresh sulfate into the treatment zones. Based on the microbial ecology of the system, it is anticipated that a similar community response of decreases in sulfate reducers will occur if the water table remains stable and increases after dewatering and reinundation events.
- The microbial counts indicated that the baseline reductive dechlorination and aerobic cometabolism status was either unfavorable or transitional in all locations before the field test (Figure 53). Following deployment, reductive dechlorination species increased to significant levels in all anaerobic treatment zone wells, as well as in several mid-plume and distal locations. Cometabolic species increased to significant levels in the anaerobic treatment zone wells. Cometabolic species in the plume interior and sentinel wells generally increased to transitional levels during the 4-year monitoring period.

Following reinundation of the water-table sediments after offsite dewatering in 2016, the qPCR data indicate that the overall microbial community was relatively stable (or recovered) and that the structured geochemical zones remained in place. The community structure did show some interesting dynamics, particularly related to sulfate reducers and methanogens—sulfate reducers were generally stimulated by lowering the water levels and reinundation (likely due to fresh sulfate inputs upon rewetting), and methanogens were generally depressed (likely due to exposure of the water-table sediments to vadose-zone conditions).

At the end of the 4-year field demonstration period, the microbial community had adjusted to the decrease in the mass of VOCs, the decrease in PCE and TCE concentrations, and the generation of daughter products (cDCE and VC). A general decline in the total eubacteria counts has occurred over the 4-year period; however, at the end of the field demonstration the counts are higher than baseline counts and within acceptable levels to maintain the structured zones. The total eubacteria counts measured at the end of the field demonstration are also similar to those that were measured during the second year prior to the transient changes resulting from the dewatering events. The microbial species and enzymes associated with biodegradation generally require the presence of the target contaminants; the decrease in microbial counts can be attributed to the low concentrations of VOCs present in the groundwater (i.e., the decrease in the mass of cVOCs has resulted in a decrease in the microbial community). The makeup of the microbial species and enzymes in some wells shows adaption to the decrease in PCE and TCE and presence of cDCE and VC.

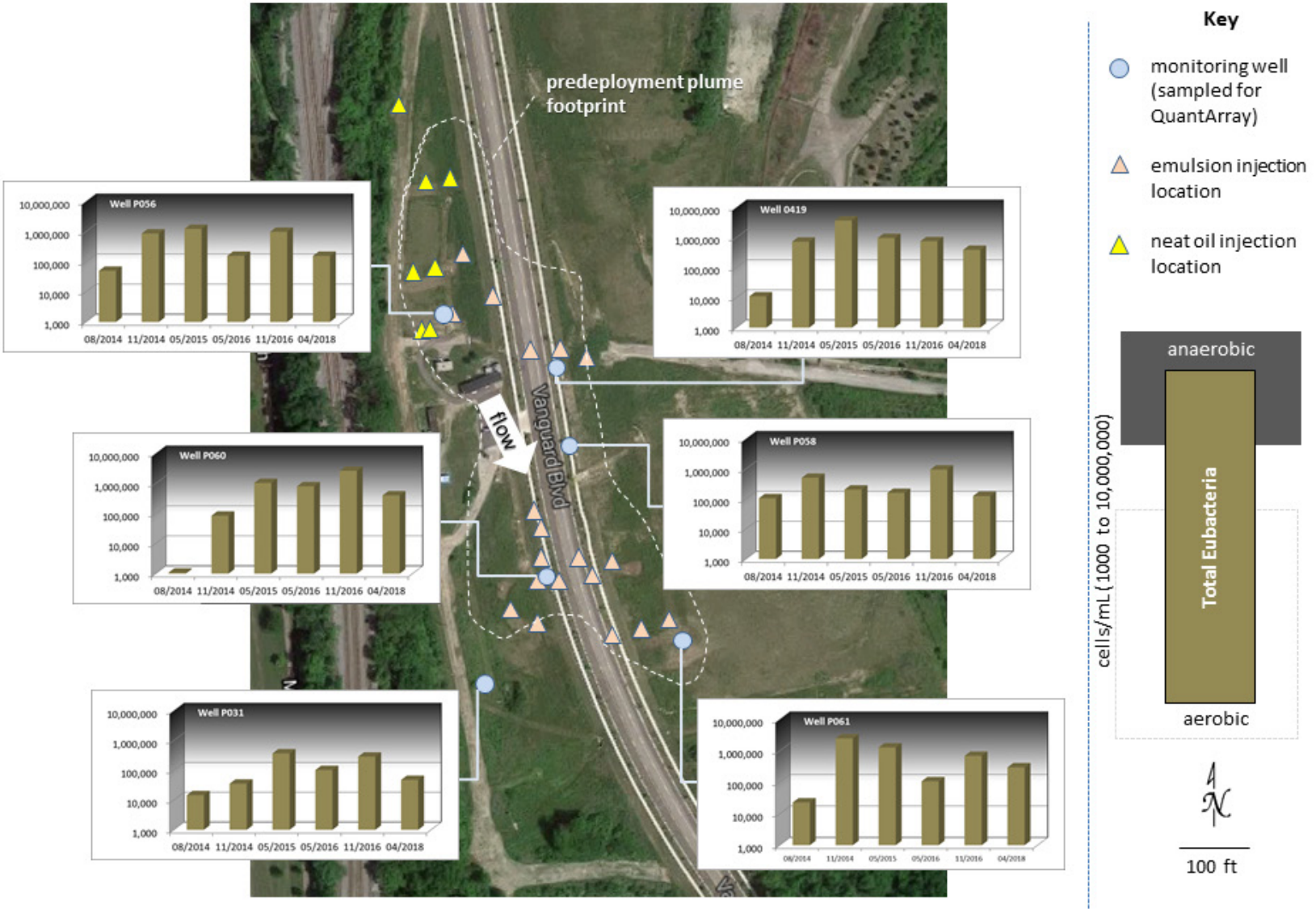


Figure 51. Changes in Total Eubacteria in Mound OU-1 Groundwater During the EA Field Demonstration (Years 1–4)

Figure 52. Changes in Sulfate Reducers and Methanogens in Mound OU-1 Groundwater During the EA Field Demonstration (Years 1–4)

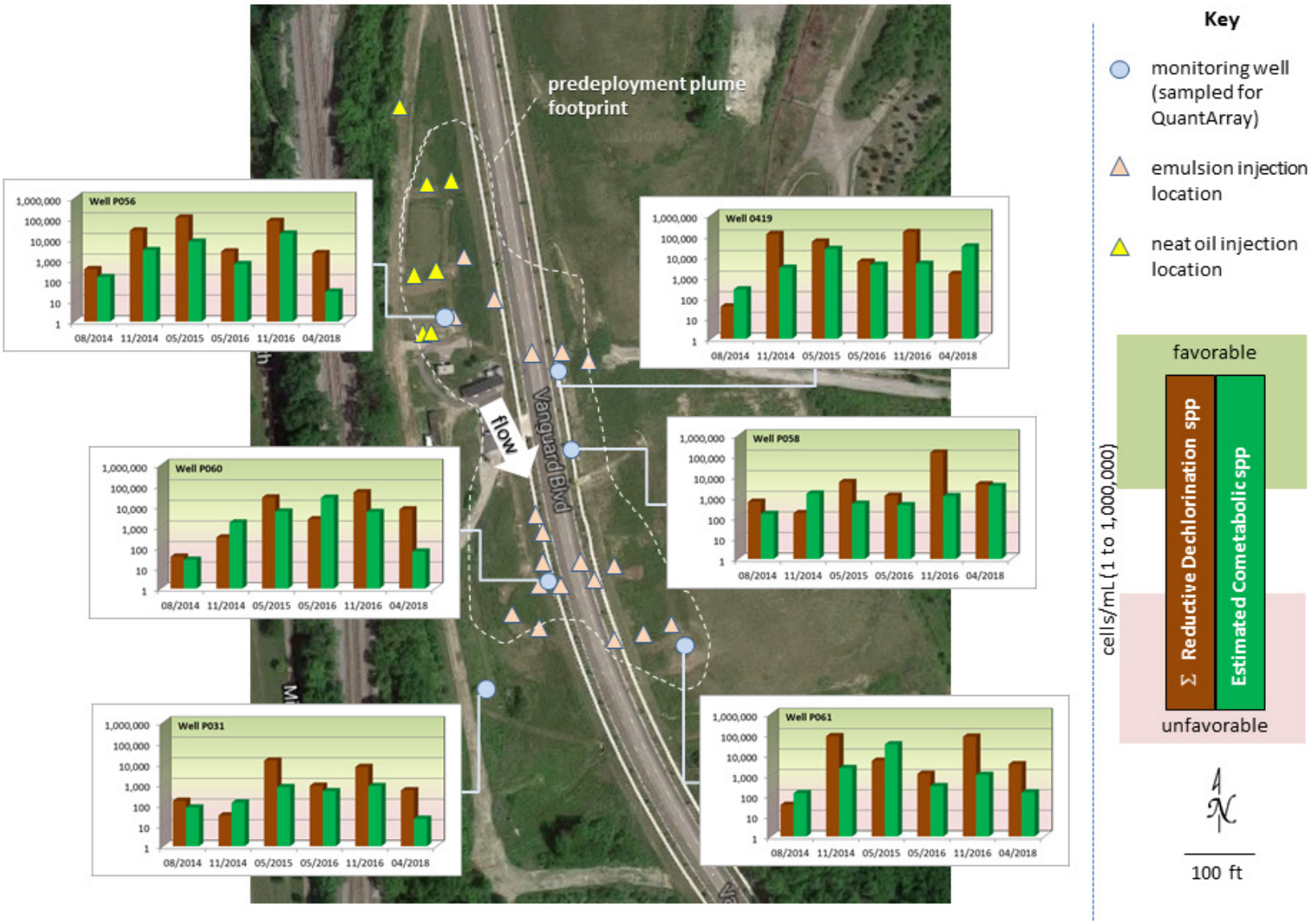


Figure 53. Changes in Reductive Dechlorination Species and Estimated Cometabolic Species in Mound OU-1 Groundwater During the EA Field Demonstration (Years 1–4)

Detailed QuantArray information on the structure of the microbial communities sampled in individual wells over time confirms the general conclusions described above. In the detailed data, enumeration of particular organisms and enzyme-specific nucleic acid sequences provide key supplementary information. Table 7 summarizes the roles of the measured organisms and enzyme markers in supporting contaminant attenuation. For anaerobic attenuation, QuantArray enumerated seven classes of organisms and six enzyme markers (four of the enzyme markers were detected during the monitoring period). For aerobic attenuation, QuantArray enumerated nine enzyme markers. The presence of significant populations of particular organisms (or organisms with particular functional enzymes) that contribute to known attenuation processes for the localized geochemical conditions provides an added level of confidence in the conceptual understanding of contaminant behavior at the site. For example, in groundwater zones with anaerobic geochemical conditions and detectable PCE, TCE, DCE, or VC, the presence of target levels of *Dehalococcoides*, *Dehalobacter*, *Desulfitobacterium*, or *Desulfuromonas* spp. validates that reductive dechlorination and related attenuation processes are occurring at sufficient rates to contribute to site remediation objectives.

Figure 54 through Figure 59 provide detailed QuantArray results for the tested wells. The data provide a snapshot of the microbial ecology and how it changes in different portions of the Mound OU-1 groundwater during the EA Field Demonstration. Each figure provides the estimated numbers (cells/mL) for organisms that contribute to anaerobic and aerobic attenuation as well as the numbers of total eubacteria and other key organism classes. For each parameter, six bars are presented that represent the pretest conditions and each postdeployment sampling event. The color coding of the backgrounds of the bar charts corresponds to the bins in Table 6.

The following are key observations for the detailed QuantArray data from the individual wells:

- For wells near the injection of the electron donor—0419 (Figure 54), P056 (Figure 56), P060 (Figure 58), and P061 (Figure 59)—the levels of several classes of organisms that contribute to anaerobic attenuation increased. In most cases, *Dehalococcoides* levels in these wells increased to levels near 10^3 cells/mL. The most significant increases were observed for other organisms that contribute to attenuation of TCE and PCE (*Dehalobacter*, *Desulfitobacterium*, and *Desulfuromonas*). Notably, the most significant increases occurred in *Dehalogenimonas*, a species that is not generally recognized in the literature as contributing to the attenuation of chlorinated ethenes such as PCE and TCE. However, recent information from Microbial Insights indicates that increase in *Dehalogenimonas* have now been observed at other test sites where the target constituents are chlorinated ethenes. In several wells, *Dehalogenimonas* was the most abundant of the measured anaerobic attenuation organisms in the final sampling period. Since halo-respiring organisms such as *Dehalogenimonas* require the presence of a target cVOC (to act as an electron acceptor), the data suggest that the *Dehalogenimonas* strain in the groundwater at the Mound site has the ability to degrade chlorinated ethenes (since these are the only cVOC contaminants that are present in significant levels in the groundwater). *Dehalogenimonas* was also in the baseline samples, suggesting that this organism is native to the site, and the ability of the Mound strain to degrade chlorinated ethenes under the site-specific conditions developed during the several decades of exposure to contamination from the former landfill. Relatively high counts of the anaerobic organisms listed above were generally maintained in the wells near the injection of the electron donor. As seen in the composite data, sulfate reducers spiked after the initial electron donor injection and again after the water levels recovered following the nearby dewatering operations.

- Also, for wells near the injection of the electron donor—0419 (Figure 54), P056 (Figure 56), P060 (Figure 58), and P061 (Figure 59)—the levels of several classes of organisms that contribute to aerobic cometabolism increased. In all cases, increases were observed for organisms with markers for methane monooxygenase functional genes as well as a variety of aromatic oxygenases. The counts of organisms that contribute to aerobic cometabolism were in the transition to a significant level in the injection location wells throughout Years One and Two.
- For the mid-plume well—P058 (Figure 57)—the levels of *Dehalogenimonas* and *Desulfuromonas* increased to the transitional category. Organisms that contain markers for cometabolic functional genes ranged between the unfavorable and transition ranges throughout Years One–Three. Note that the cVOC concentrations were low in the mid-plume area so that significant levels of functional enzymes would not necessarily be expected.
- For the distal sentinel well area—P031 (Figure 55)—the levels of *Dehalogenimonas* increased to the transitional category. Organisms that contain markers for cometabolic functional genes increased significantly but remained below 1000 cells/mL through the field demonstration.
- The detailed microbial data for well P060 provide an example of the responsiveness of the microbial community to changes in site conditions, such as the response of sulfate reducers to the presence or influx of sulfate. In well P060, detectable concentrations of VC were measured starting in 2016. Commensurate with the appearance of VC was the expression of the enzyme for VC reduction (VC reductase). This demonstrates that the microbial community is in dynamic equilibrium with site conditions and has various capabilities in the consortium to address potential stressors. The microbial data document the robustness of the structured geochemical zone strategy that is derived by reliance on a diverse natural microbial community.

Table 7. Summary of the Roles of Selected Organisms and Enzymes in cVOC Attenuation

	Reductive Dechlorination and related Attenuation Processes											Aerobic (co)Metabolism								
	organisms							enzymes				Enzymes								
	Dehalococcoides spp. (DHC)	Dehalobacter spp. (DHBt)	Dehalobacter DCM (DCM)	Dehalogenimonas spp. (DHG)	Desulfitobacterium spp. (DSB)	Dehalobium chlorocoercia (DECO)	Desulfuromonas spp. (DSM)	tceA Reductase (TCE)	BAVi Vinyl Chloride Reductase (BVC)	Vinyl Chloride Reductase (VCR)	Chloroform reductase (CFR)	Soluble Methane Monooxygenase (SMMO)	Particulate Methane Monooxygenase (PMMO)	Tolune Dioxygenase (TOD)	Phenol Hydroxylase (PHE)	Tricholorobenzene Dioxygenase (TCBO)	Toluene Monooxygenase 2 (RDEG)	Toluene Monooxygenase (RMO)	Ethene Monooxygenase (EtnC)	Epoxyalkane transferase (EtnE)
Chlorinated Ethenes																				
PCE	✚	✚	-	-	✚	-	✚	-	-	-	-	-	-	-	-	-	-	-	-	-
TCE	✚	✚	-	-	✚	-	✚	-	-	-	-	✚	✚	✚	✚	✚	✚	✚	-	-
cDCE	✚	-	-	-	-	-	-	-	✚	✚	-	✚	✚	✚	✚	✚	✚	✚	-	-
VC	✚	-	-	-	-	-	-	-	✚	✚	-	✚	✚	✚	✚	✚	✚	✚	✚	✚
other cVOCs / Notes	1	2	2	3	4	5	6	7	7	7	8	9	9	9	9	9	9	9	9	9

Notes:

0 "✚" = confirmed contributor to attenuation of the listed contaminant; "-" = does not contribute to attenuation of listed contaminant (or no data available in the literature). The organisms and enzyme markers in the chart were detected in one or more samples during the monitoring period.

1 Dehalococcoides (DHC) is confirmed to reductively degrade most classes of cVOCs, including chorinated ethenes, ethanes, methanes, phenols, benzenes and propanes.

2 Dehalobacter spp (DHBt) are confirmed to reductively degrade several classes of cVOCs, including chorinated ethenes, ethanes, methanes, and benzenes. Dehalobacter DCM (DCM) is confirmed to reductively degrade chloroform.

3 Dehalogenimonas (DHG) is confirmed to reductively degrade chorinated ethanes and propanes. Attenuation of chlorinated ethenes (e.g., PCE and TCE) has not been documented in the literature.

4 Desulfitobacterium spp. (DSB) are confirmed to reductively degrade several classes of cVOCs, including chorinated ethenes, ethanes, phenols, and propanes.

5 Dehalobium chlorocoercia (DECO) is confirmed to reductively degrade chlorinated benzenes.

6 Desulfuromonas spp. (DSM) are confirmed to reductively degrade PCE and TCE.

7 These enzymes that are associated with DHC spp and the reductive degradation of chlorinated ethanes (tceA Reductase (TCE)) or chlorinated ethene daughter products such as DCE and VC (BAVi Vinyl Chloride Reductase (BVC) and Vinyl Chloride Reductase (VCR))

8 Chloroform reductase (CFR) is an enzyme associated with reductive degradation of chloroform. Two enzyme sequences (1,1 DCA Reductase (DCA) and 1,2 DCE reductase (DCAR)) are not listed in the table because they were not detected in the groundwater at Mound OU1.

9 These enzymes are associated with the cometabolism or metabolism of a wide range of cVOCs.

3.4 Degradation Rates

Estimation of attenuation and degradation rates assists in evaluating progress toward remediation goals and projecting the remediation time frame. Thus, the overall objective of the attenuation rate evaluation is (1) to examine the trends in individual wells and changes in overall contaminant mass in the plume to determine reasonable quantitative estimates of degradation rate constants for the real-world field conditions in the plume, (2) to examine the patterns of concentration along transects to develop similar quantitative estimates, and (3) to examine

concentrations in downgradient sentinel wells to provide field confirmation that the plume is not expanding.

3.4.1 Concentration or Mass Versus Time Attenuation Rates

For this evaluation, the concentration or mass data for the parent cVOCs (PCE and TCE) are fit to either the exponential function $dC/dt = kt$ or $C/C_0 = e^{kt}$, and the key output of the analysis is the first-order degradation coefficient (k). The units of k are time^{-1}; specifically, the values calculated below for OU-1 are presented in units of 1/day. A contaminant half-life (the approximate time frame for the concentration or mass to decrease to half, i.e., $C/C_0 = 0.5$) is a useful supplementary calculation. For first-order exponential decay, the half-life is calculated using the equation $t_{½} = -0.693/k$.

Concentration-versus-time trends in individual wells provide a point estimate of attenuation rate (k_{point}) for the period of monitoring. In previous progress reports, the k_{point} values were calculated for each well—see *Operable Unit 1 Field Demonstration Year One Status Report Mound, Ohio, Site* (DOE 2016) and *Operable Unit 1 Field Demonstration Year Two Status Report Mound, Ohio, Site* (DOE 2017). At the end of Year Two, the median first-order degradation coefficients for TCE and PCE were approximately −0.0008 and −0.0023 day^{-1}, respectively. The estimated degradation rates for almost all wells were negative, indicating active cVOC degradation and attenuation throughout the OU-1 plume.

For Year Three, we discontinued the calculation of k_{point} values for the parent cVOCs since the concentrations of PCE and TCE for each of these constituents are below MCL in almost all wells (these parent compounds exceeded MCLs by a small margin in only one well). Thus, the value of calculating k_{point} values from a well network with over 95% of the wells below MCL is limited, since the goal is estimating time needed to achieve MCLs. Based on the current data and general trends (assuming a conservative nominal k_{point} of −0.0002 day^{-1}), we project that the PCE and TCE concentrations in all wells will be below MCL in all wells in the next 5–10 years if the structured geochemical zones remain active.

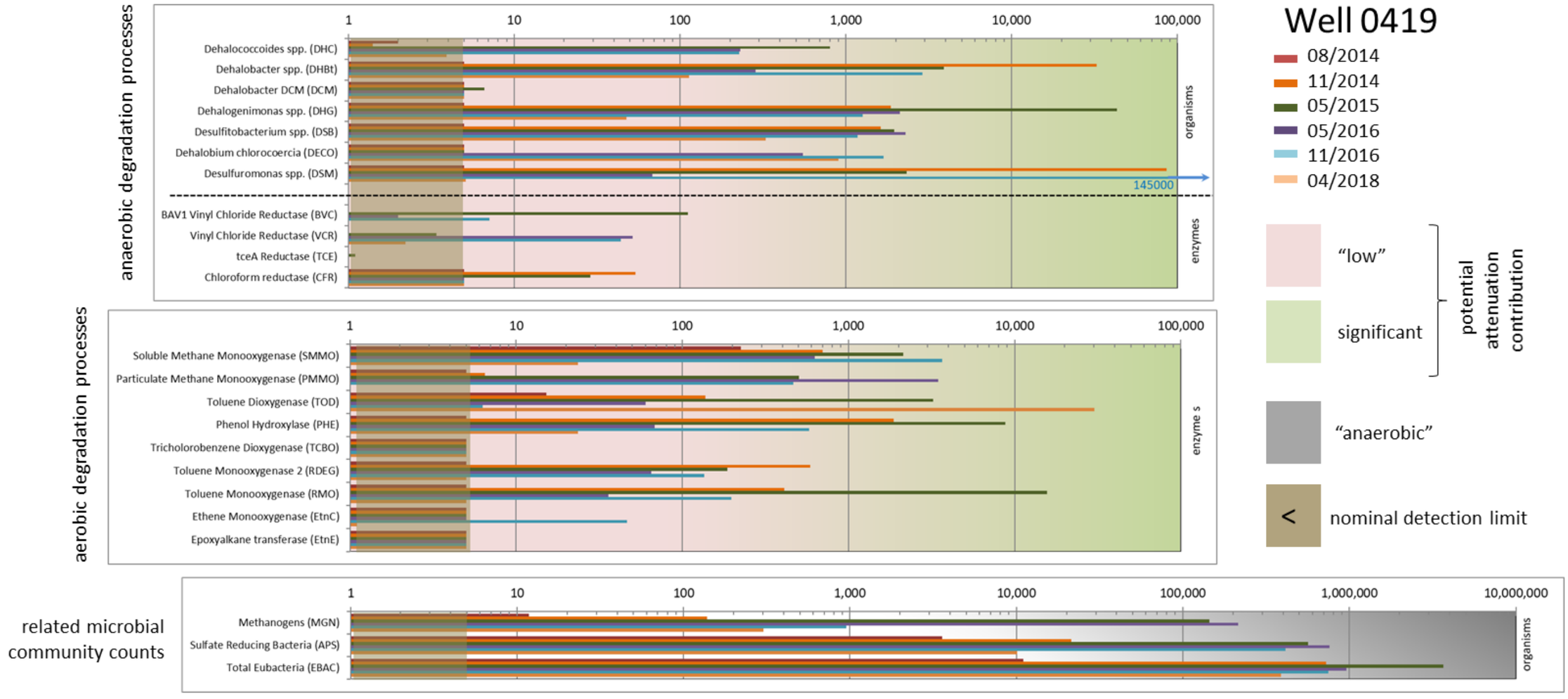


Figure 54. QuantArray Results for Well 0419

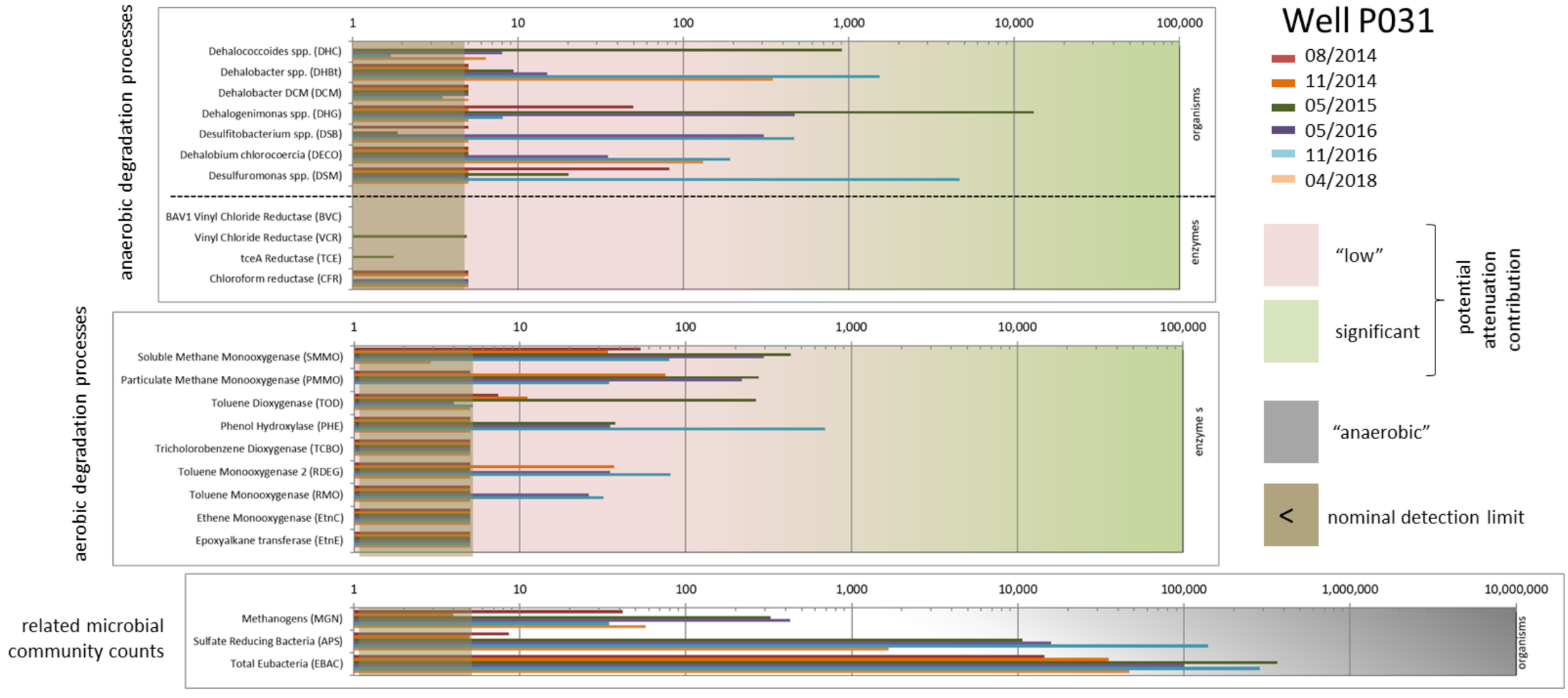


Figure 55. QuantArray Results for Well P031

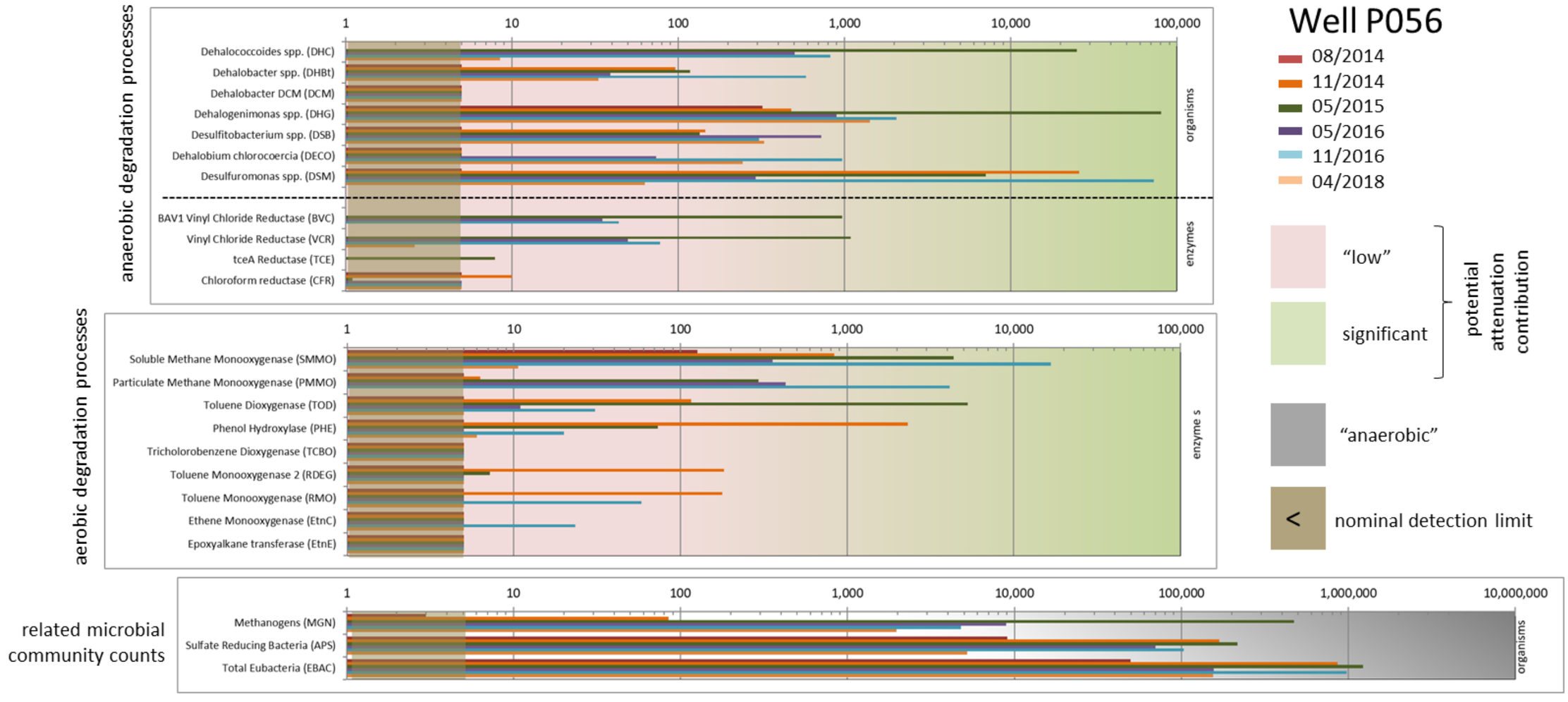


Figure 56. QuantArray Results for Well P056

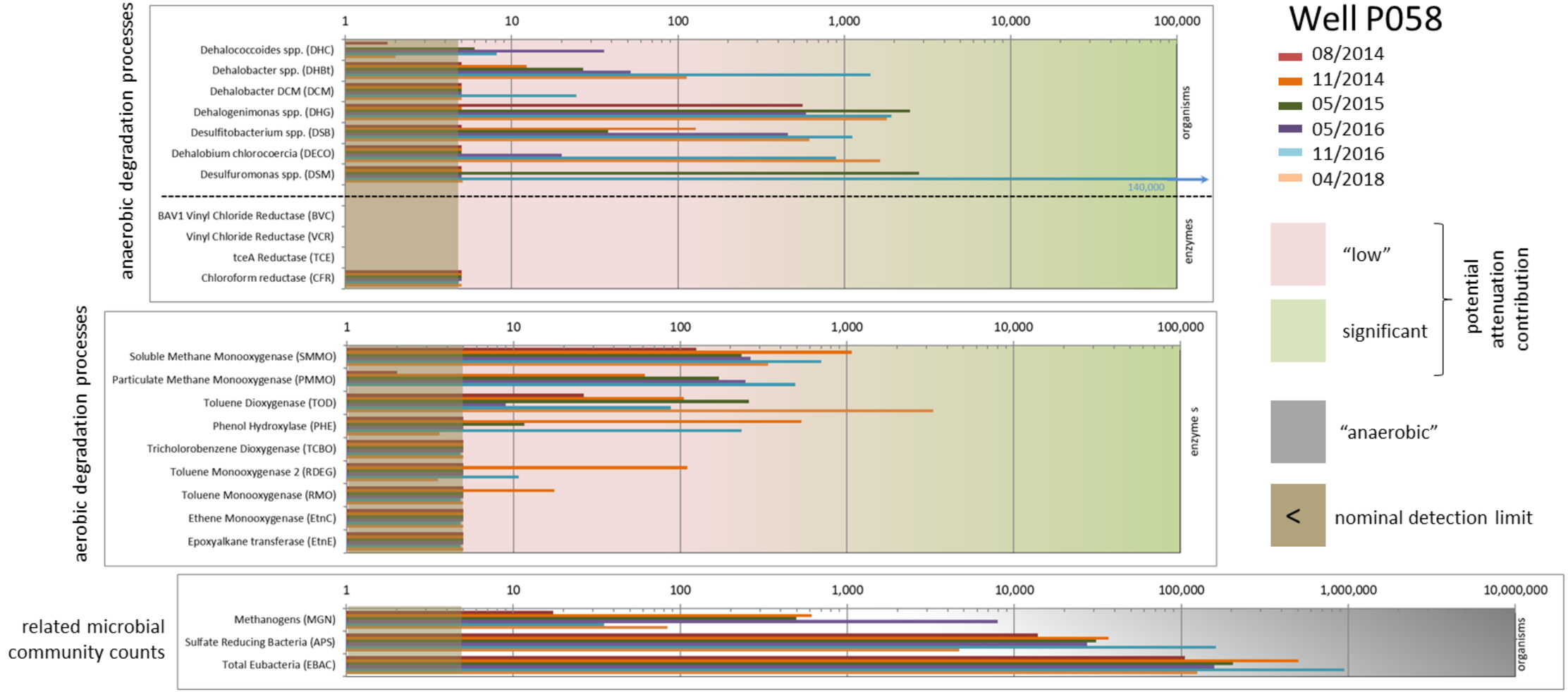


Figure 57. QuantArray Results for Well P058

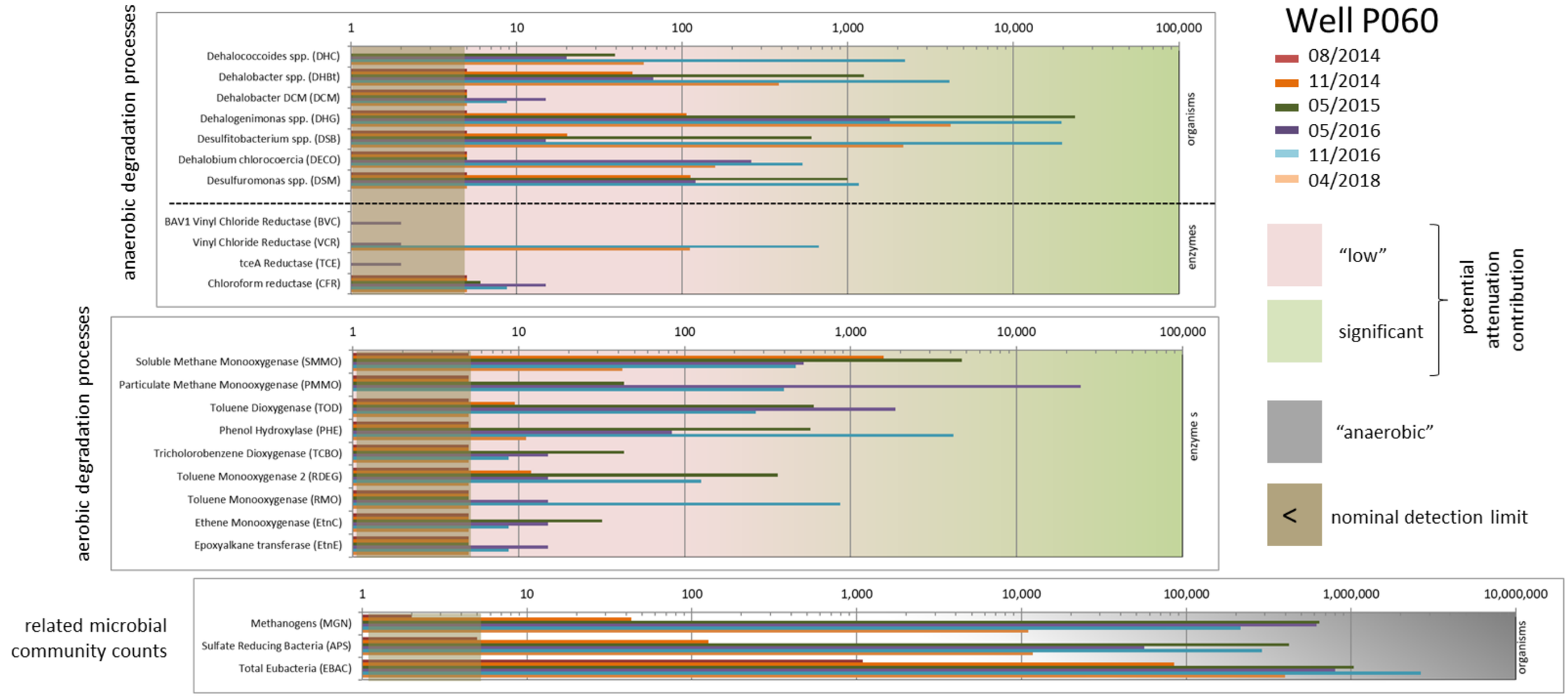


Figure 58. QuantArray Results for Well P060

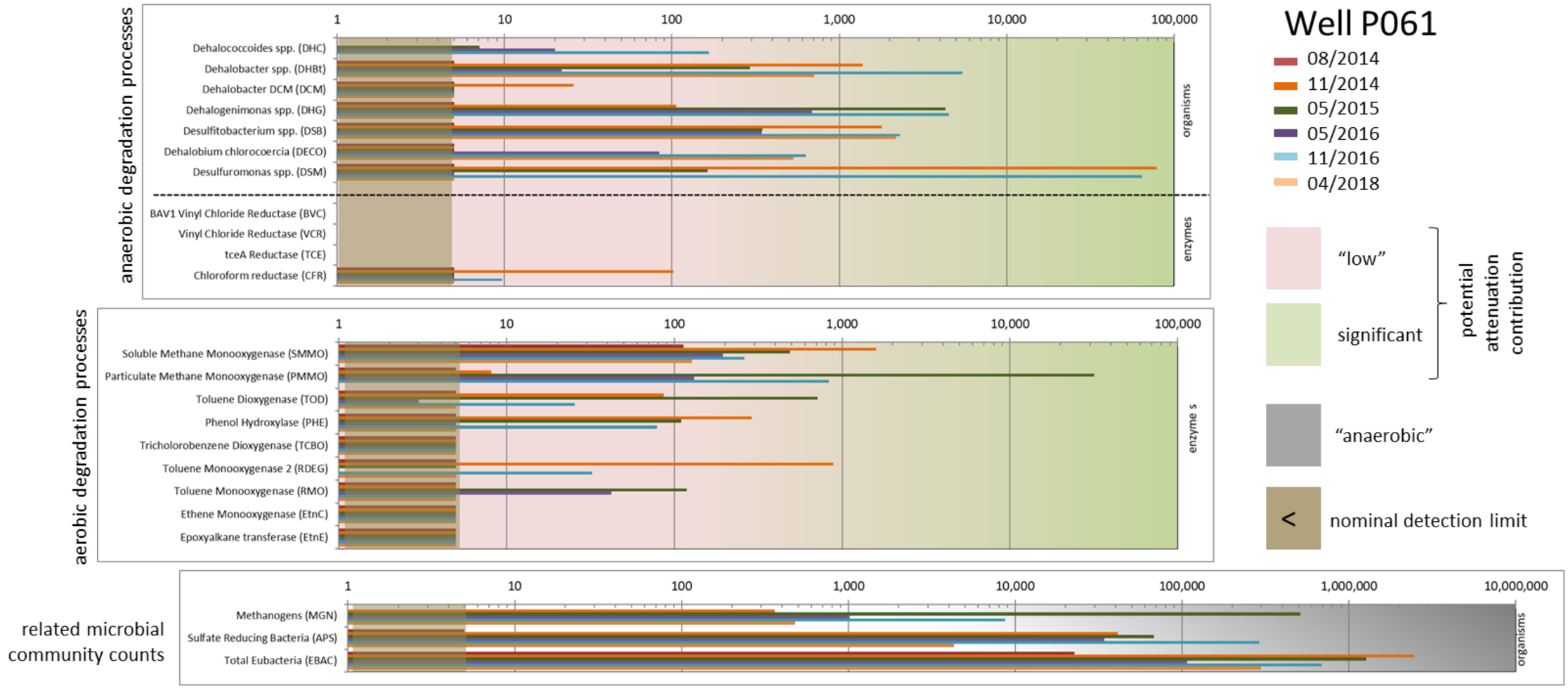


Figure 59. QuantArray Results for Well P061

3.4.2 Concentration Versus Distance Attenuation Rates

For plumes that have stabilized, concentration versus distance longsects (concentration profiles along the plume flow direction) provide a bulk (plume-scale) estimate of attenuation rate (k_{long}). The two longsects to be used in the evaluation (Figure 60) were define in the Field Demonstration Work Plan. The plotted longsects (Figure 61 and Figure 62) include the wells listed in the Field Demonstration Work Plan with well 0305 added to longsect A–A' (Figure 61) because this well is located near the path of A–A′, and well 0305 exhibited notable rebound. Longsect B–B′ was extended to include well P063. On the graphs, the baseline (August 2014), Year One (August 2015), Year Two (August 2016), Year Three (August 2017), and Year Four (August 2018) longsects are depicted. The approximate locations of the anaerobic treatment zones along the longsect path are shaded, and the individual wells used to draw the longsect are labeled. The following are key observations for the longsect plots of OU-1 monitoring wells:

- The longsects show that the concentrations of parent cVOCs have generally decreased in wells that are in (or near) the anaerobic treatment zones.
- PCE in the wells that are in the internal plume area is generally decreasing. TCE has remained stable or rebounded slightly in the internal plume zone. This rebound was not unexpected, as additional TCE can result from the reductive dechlorination in upgradient treatment zones.
- In Year One and Two of the field demonstration, the plume was still equilibrating and plume-scale degradation rates could not be calculated. However, the Year Three and Four longsects are identical, which suggests the plume equilibrated in Year Three and has stabilized; therefore, a defensible degradation rate for PCE and TCE can be preliminarily calculated using the concentration changes between wells 0451 and P061 (on B–B′) and 0418 and P060 (on A–A′). The resulting plume-scale estimates for both PCE and TCE range from approximately −0.001 to −0.002 day^{-1}. These estimates closely match the k_{point} estimates that were calculated during Years One and Two of the field demonstration. Plume-scale estimates for degradation rates for the daughter products, cDCE and VC, cannot be made at this time because the concentrations are still equilibrating (cDCE) and are sporadic or below detection for most wells (VC).

3.4.3 Downgradient Water Quality

Concentrations and concentration trends in the downgradient sentinel wells are important metrics related to potential plume status (i.e., whether the plume is expanding, stable, or shrinking). Data for the downgradient sentinel wells were shown above in Figure 45 through Figure 49 for wells P061, P062, P063, 0402, and P031, respectively. The stable or downward trends in these wells provide field-scale evidence that attenuation rates in the contaminant plume were sufficient to degrade the mass fluxes from former primary and secondary source zones during the field demonstration. The following are key observations for the concentrations and trends in OU-1 downgradient sentinel monitoring wells during this period:

- The concentrations of both PCE and TCE in sentinel well P061 have decreased since the EA deployment; both constituents were above the MCL in the baseline (August 2014) sampling event and decreased below the MCL to current levels that are below or near detection limits.
- In the other distal downgradient sentinel wells, concentrations of all constituents have remained below the MCL in all samples. At the end of Year Three, all constituents were

below their MCLs in all sentinel monitoring wells and remained below the MCLs throughout Year Four.

- The concentrations and trends in these graphs demonstrate that the OU-1 plume is not expanding and that attenuation rates in the plume have been sufficient to mitigate the potential for plume expansion during this monitoring period, even with the P&T system turned off.
- The observed stability of concentrations (below MCLs) in the sentinel wells during 2016, a period of lower than typical groundwater elevations and increased hydraulic gradients caused by downgradient dewatering operations and regional drought conditions, suggests that the EA remedy is effectively attenuating cVOCs throughout the bulk of the cVOC plume in OU-1.

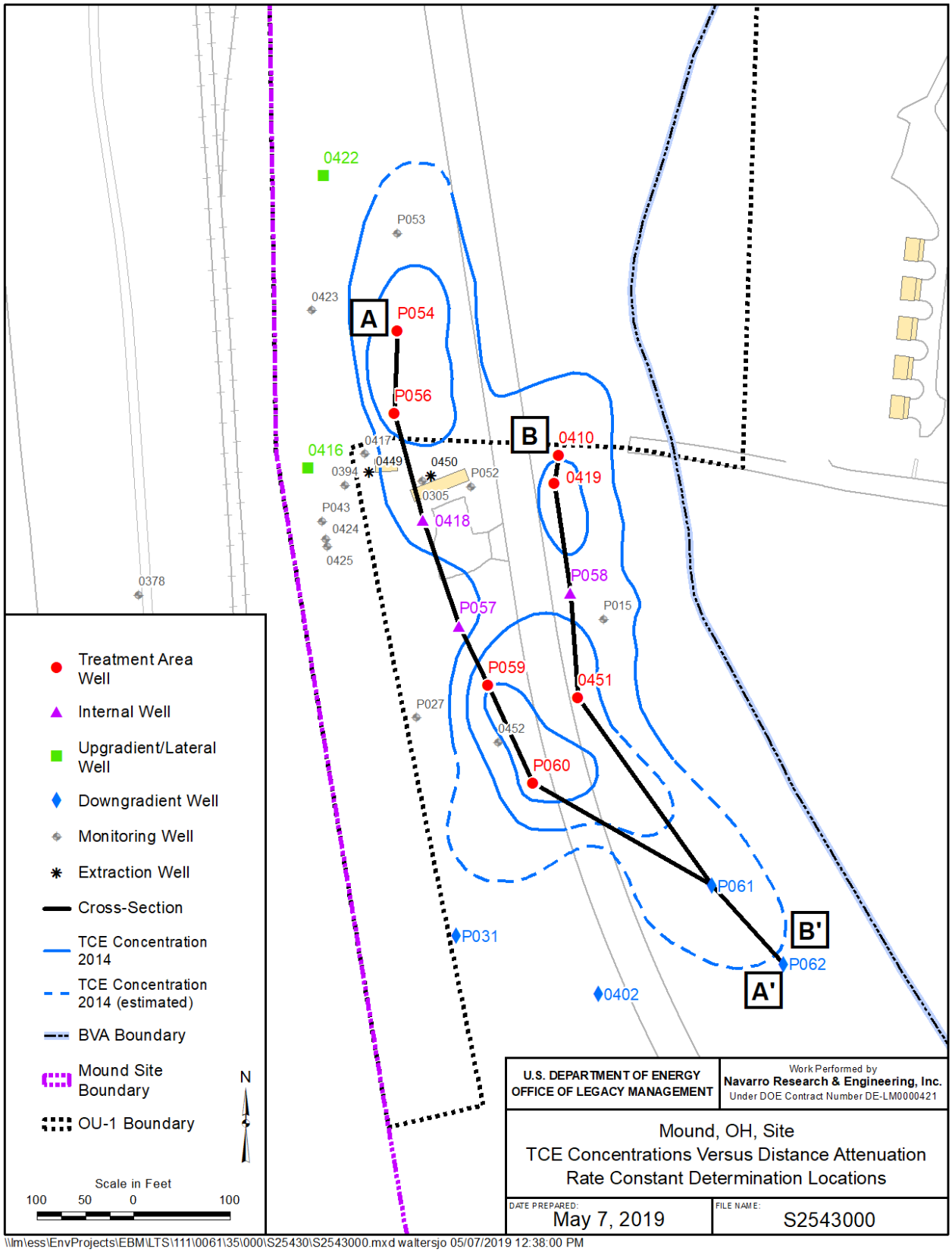


Figure 60. TCE Concentrations Versus Distance Attenuation Rate Constant Determination Locations

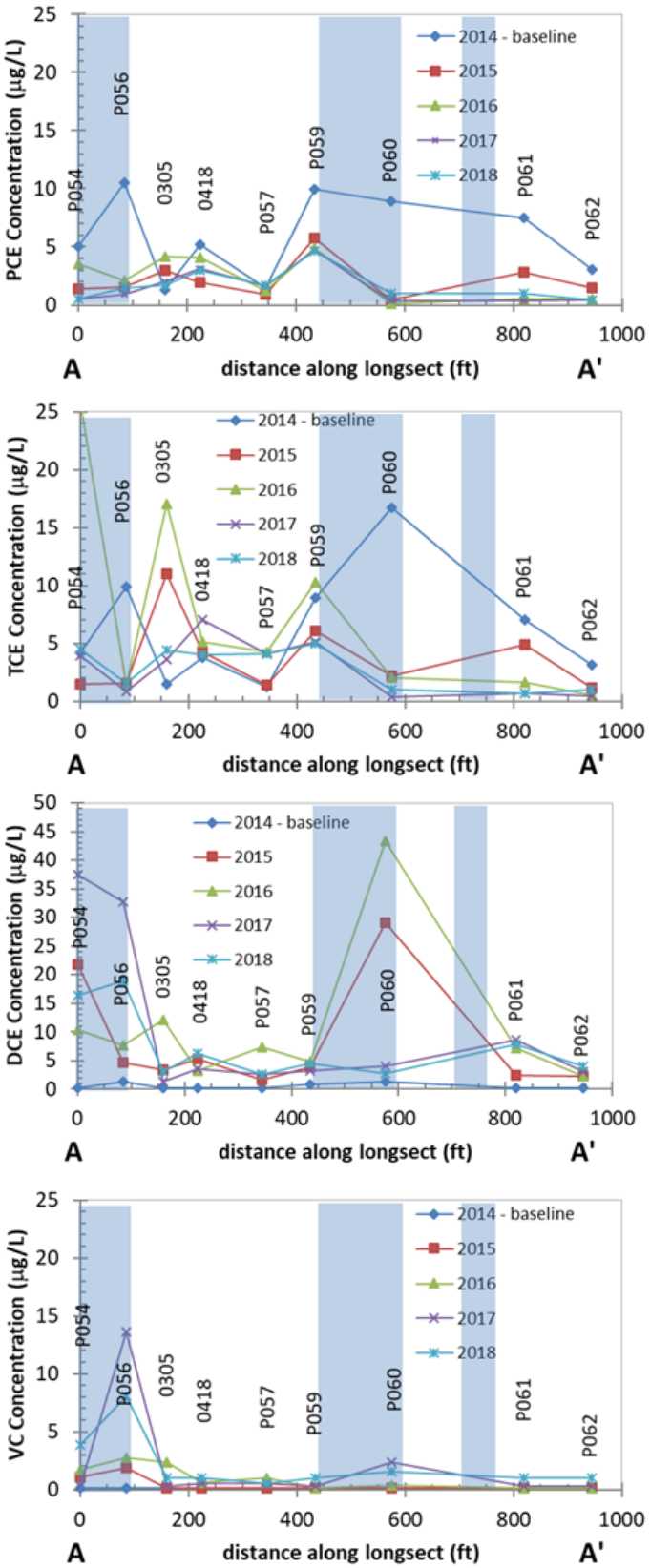


Figure 61. cVOC Distributions for Longsect A–A' for Baseline Conditions (August 2014) through Year 4 (August 2018)

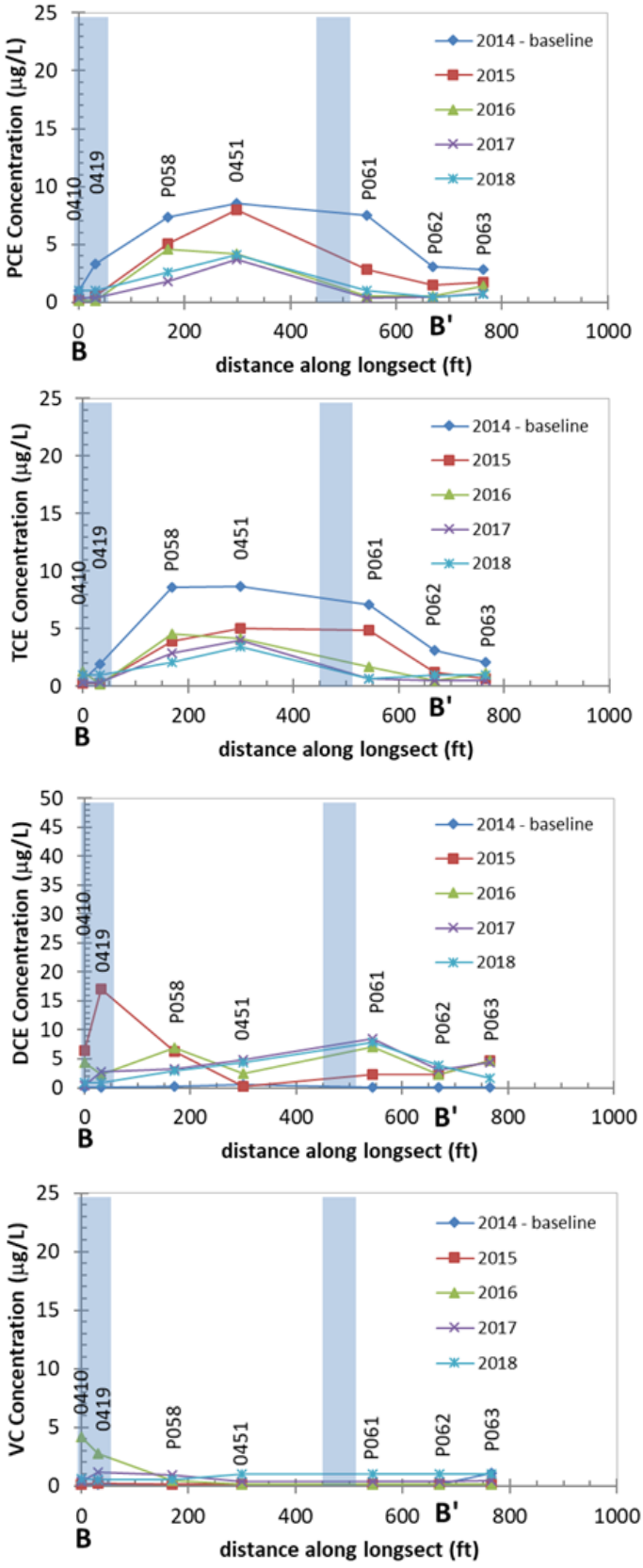


Figure 62. cVOC Distributions for Longsect B–B' for Baseline Conditions (August 2014) through Year 4 (August 2018)

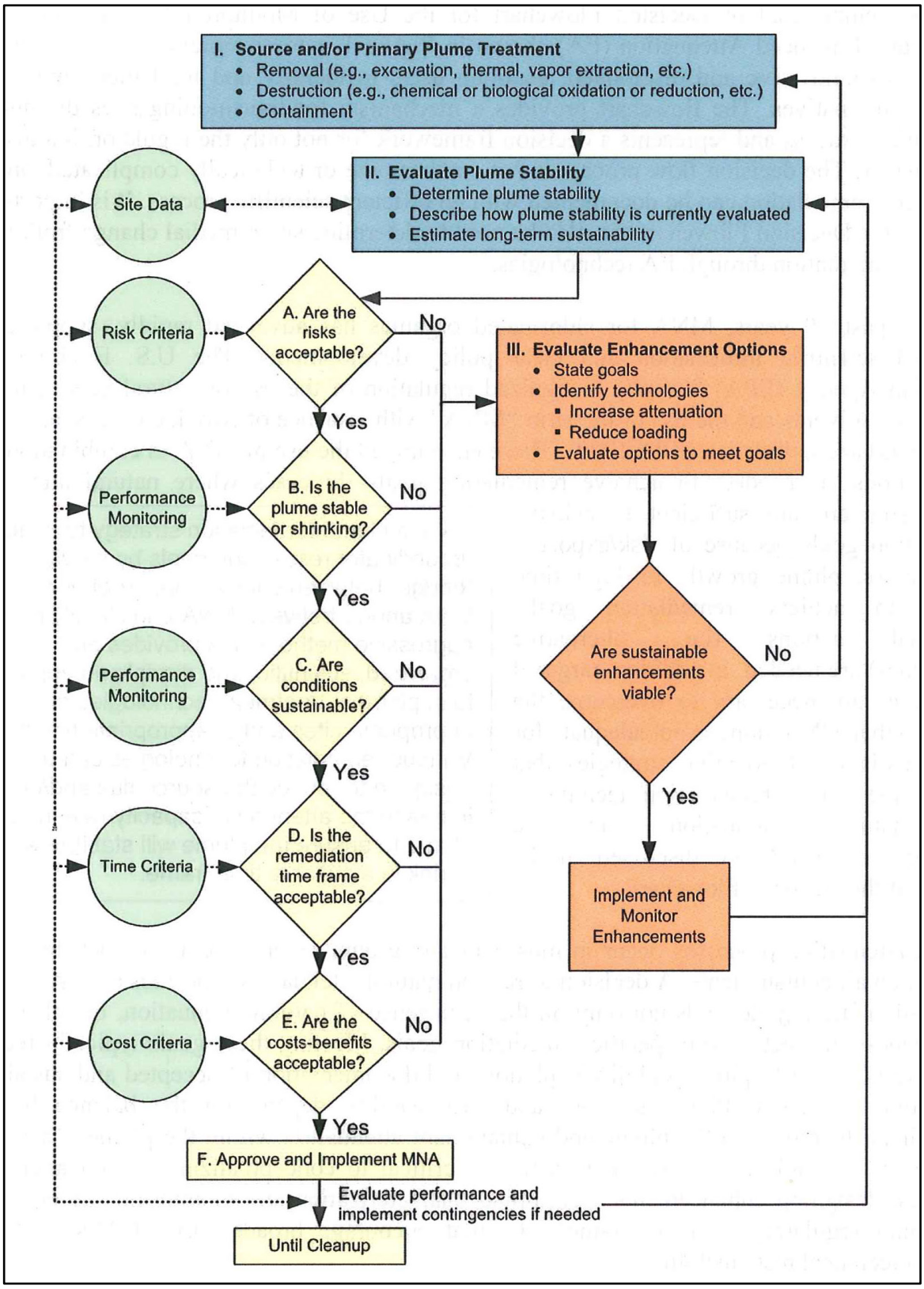
4.0 Consideration of an MNA Remedy

The consideration of MNA as a remedy to address cVOCs in OU-1 groundwater will be based on the effectiveness of the emulsified oil treatment to stimulate (enhance) the natural attenuation processes in the treatment zones and reduce PCE and TCE as well as daughter products (cDCE and VC) in groundwater. The following factors are outlined in the Work Plan (DOE 2014a) and were modeled after EPA's *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites* (OSWER 9200.4-17P). These factors are typically used when considering natural attenuation as a remedy:

- The cVOCs in groundwater can be effectively remediated by natural attenuation processes.
- The contaminant plume is stable, and the potential for the environmental conditions that influence plume stability will not change over time.
- The downgradient groundwater will not be adversely impacted as a consequence of selecting MNA as a remedy.
- The estimated time frame of remediation is reasonable compared to time frames of other, more active methods, such as P&T.
- The nature and distribution of sources can be controlled.
- The resulting transformation (daughter) products do not pose a greater risk than the parent contaminants.

Of these factors, the most important considerations regarding the suitability of MNA as a remedy include whether the contaminants are likely to be remediated by natural attenuation processes, the stability of the contaminant plume and its potential for migration, and the potential for unacceptable risk from contamination.

A decision flowchart (Figure 63) was developed by the Interstate Technology and Regulatory Council (ITRC 2007) that incorporates the factors identified in guidance documents and provides a systematic mechanism for evaluating site data and information. This flowchart evaluates natural attenuation according to established protocols, but places additional emphasis on plume stability and sustainability. If data suggest that a site is approaching MNA but does not meet the requirements of MNA, the flowchart provides an additional potential option of EA. Evaluating the potential option for EA allows for implementation of suitable activities that will modify those factors (risk, plume stability, sustainability, or time frame) that did not allow the site to directly implement MNA.



Source: ITRC 2007

Figure 63. Data Evaluation Flowchart for Enhanced Attenuation and MNA

4.1 Source and Primary Plume Treatment

The P&T was started in 1996 and is used to control contaminated groundwater beneath the former landfill and reduce contaminant concentrations to drinking water standards. Approximately 27 pounds of TCE were removed between December 1996 and April 2003. After April 2003, the mass removed by the P&T system was no longer calculated because it was negligible. A soil vapor extraction system was installed and operated from 1997 to 2003 to accelerate the removal of cVOCs from the vadose zone. This extraction system removed approximately 4105 pounds of TCE; 90% of the material was removed in the first 3 years.

Waste and contaminated soil removal activities were performed between 2007 and 2010. Approximately 99,500 cubic yards of material were removed from the OU-1 landfill area; the remaining soils in the OU-1 area meet the site cleanup objectives for future industrial/ commercial use. Excavation generally was limited to the unsaturated materials; however, in some cases, excavation proceeded to the water table. It was recognized that there were still residual sources in the landfill footprint and that these would be addressed in future decisions about groundwater.

Information from historical investigations and testing (performed after excavation of the landfill) led to the recommendation that passive methods should be considered to address the current cVOC impact in OU-1 groundwater. Consistent with the conditions at that time, EA was considered for the cVOC contamination in OU-1 groundwater. The combination of technologies that emerged for OU-1 included (1) neat (pure) vegetable oil deployment in the deep vadose zone in the former source area, (2) emulsified vegetable oil deployment within the footprint of the groundwater plume, and (3) monitoring of concentration trends, attenuation mechanisms, and rates in the plume.

4.2 Site Conditions After the Enhanced Attenuation Field Demonstration

Results from this 4 year EA Field Demonstration indicate the following:

- The dissolved PCE and TCE plumes continue to decrease in size and mass since the start of the field demonstration. Statistical tests indicate that the concentrations of the parent constituents in a majority of the wells are below the MCLs and continue to decrease. In August 2018, one well was above the MCL for PCE and no wells were above the MCL for TCE.
- Reductive (anaerobic) degradation has resulted in the formation of the daughter products cDCE and VC, primarily near the anaerobic treatment zones. The concentrations of cDCE in OU-1 groundwater are well below the MCL of 70 mg/L. The concentrations of VC were greater than the MCL in two wells and were approaching the MCL in several other wells.
- The biogeochemistry and microbial community within the structured geochemical zones are consistent with the design and appear to be stable.
- Plume stability (moment) analysis and longsect plots suggest that the plumes have stabilized, and any future changes will proceed slowly.

- The concentrations of both TCE and PCE in all wells will reliably be below the target MCLs of 5 µg/L within the original designed projection of 13 years (CY 2027).
- Additional data are required to project further trends of the daughter products cDCE and VC because these reductions are associated with exhausting residual sources of PCE and TCE in the OU-1 area.

The following are key observations related to sitewide geochemistry and attenuation mechanisms during field demonstration:

- Prior to the EA deployment, the entire site was predominantly aerobic. Following deployment, predominantly anaerobic zones developed near and downgradient of electron donor injection.
- Prior to the EA deployment, attenuation conditions over the entire site were at "slow" baseline conditions. Following deployment, enhanced cVOC reduction zones developed near and downgradient of electron donor injection. These zones also exhibited enhanced aerobic cometabolism in several areas.
- Enhanced cometabolism (oxidation) is expected to continue to develop downgradient of the injection zones. The data indicate shifts of geochemistry and microbial populations toward cometabolic conditions in the plume interior and sentinel well areas.
- Postdeployment, the patterns of anaerobic and aerobic conditions and the stimulated (enhanced) attenuation processes are consistent with the structured geochemical zone design basis. The sequence of anaerobic and aerobic conditions along the flow path of OU-1 groundwater provides conditions that maximize the degradation opportunities of parent (PCE and TCE) and daughter (DCE and VC) chlorinated ethenes and mitigates the potential for excessive buildup of VC.

4.3 Evaluation of MNA Decision Factors

The following sections address each step of the decision flowchart and provide site-specific information to evaluate whether MNA is a viable option to address cVOCs in OU-1 groundwater. Each step of the flowchart identifies one of the required factors that should be met to recommend MNA as a viable remedial option. Each section will discuss whether there are sufficient site data and information to answer 'yes" or "no" to the questions asking whether a factor has been satisfied. Typically, if a factor cannot be satisfied, the likelihood of recommending MNA as a remedy is reduced. In these cases, options that would stimulate (enhance) the natural system can be evaluated, and EA rather than MNA can be recommended as a remedial option.

4.3.1 Risk

Decision Factor: Are the risks acceptable?

Natural attenuation should not be considered as a remedy if it will not be protective of human health and the environment or alternative technologies can more reliably and cost-effectively treat the contaminants to minimize risk. The primary concern is whether the current risk to a

receptor will require additional remediation before MNA can be implemented. Assessment of risk associated with cVOCs in OU-1 groundwater relies on the following:

- Location of receptors
- Location of plume
- Concentrations of parent and daughter products
- Trends in concentrations of cVOCs

There are no receptors for groundwater at the Mound site. The records of decision (RODs) prohibit the extraction, consumption, exposure, or use in any way of the groundwater underlying the Mound site, without prior approval of the regulators. The distribution of contaminants in OU-1 groundwater shows the plume remains within the boundaries of the Mound site; therefore, there are no offsite receptors.

Data collected during Year Four of the field demonstration indicate low levels of the parent compounds PCE and TCE throughout the OU-1 groundwater plume. The MCL for PCE (5-µg/L) was exceeded in treatment zone wells P053 and P059 during Year Four. Concentrations of TCE greater than the MCL (5 µg/l) were measured in interior wells 0305 and 0418 and southern treatment zone well P059 in Year Four. Overall, the footprint of the PCE and TCE plumes remained stable during Year Four. The daughter product, cDCE, was detected throughout the plume and some of it was observed spreading in the southern part of the plume. VC (daughter product) was observed mainly in the two dissolved phase source areas. The MCL for VC (2 µg/L) was exceeded in treatment zone wells 0410, 0419, P054, P056, and P060 and in interior well 0417.

The formation of cDCE and VC during the EA Field Demonstration is consistent with the reductive dechlorination of PCE and TCE within the treatment zones. More data are needed to document degradation rates and remediation time frames for VC. These data will allow the assessment of stabilization of concentrations and development of downward concentration (attenuation) trends in OU-1 wells.

4.3.2 Plume Stability

Decision Factor: Is the plume stable or shrinking?

Plume stability, a key factor in selecting MNA as a remedy, indicates that the plume is not expanding and that its footprint is not moving. Assessment of plume stability in OU-1 relies on the following:

- Distribution of PCE, TCE, cDCE, and VC in the groundwater
- Moment analysis
- Downgradient water quality

The footprint of the parent compound, PCE and TCE, plumes decreased in size and mass since the start of the field demonstration. The daughter product cDCE was observed throughout the plume and it was observed spreading in the southern part of the plume. VC, also a daughter

product, was detected in the two dissolved phase source areas. The MCL for VC (2 µg/L) was exceeded in treatment zone wells 0410, 0419, P054, P056, and P060 and in interior well 0417 during Year Four.

The MAROS plume stability analyses indicated that the plume strength of the parent constituents is decreasing, and the plumes can generally be classified as stable or shrinking as indicated by decreasing total dissolved mass. Plume shrinkage is supported by the stable or upgradient direction of movement of the center of mass, the continual transformation of PCE and TCE by reductive dechlorination, and the generally decreasing concentration trends in a majority of the monitoring wells.

The PCE and TCE plumes have stabilized and a defensible degradation rate for PCE and TCE was calculated using the longsects. The resulting plume-scale estimates for both PCE and TCE range from approximately −0.001 to −0.002 day^{-1}. Plume-scale estimates for degradation rates for the daughter product VC cannot be made at this time because the concentrations are still equilibrating or are sporadic or below detection for most wells.

Concentrations and concentration trends in the downgradient sentinel wells are an important metric related to potential plume expansion. The concentrations and trends in these wells demonstrate that the cVOC plume is not expanding. The observed stability of concentrations and measured concentrations below MCLs in the sentinel wells during the period of downgradient dewatering operations (Year Two) suggests that EA is effectively attenuating cVOCs throughout the bulk of the cVOC plume in OU-1.

4.3.3 Sustainability

Decision Factor: Are the conditions sustainable?

In cases where biodegradation is an active attenuation mechanism, it is important to determine how sustainable it will be over the expected life of the plume. The durability of the treatment zones is influenced by a balance of sufficient electron donors to sustain adequate biodegradation and external influences during the remedial action period. It is estimated that the cVOCs in the groundwater will fall below the MCLs within 13 years (i.e., approximately 2027). Assessment of the sustainability of attenuation conditions in OU-1 relies on the following:

- Geochemistry of the aquifer
- Types of electron acceptors
- Maintenance of the microbial community
- Groundwater flow rates through the treatment zones

Prior to the EA deployment, the entire site was predominantly aerobic and attenuation conditions were at “slow” baseline conditions. Following deployment, predominantly anaerobic zones with reductive dechlorination microbial communities developed near and downgradient of electron donor injection and enhanced cVOC reduction zones developed in these same areas. Several areas also exhibited enhanced aerobic cometabolism and this enhanced cometabolism (oxidation) is expected to continue to develop downgradient of the injection zones. The data indicate shifts of geochemistry and microbial populations toward cometabolic conditions in the plume interior

and sentinel well areas. Postdeployment, the patterns of anaerobic and aerobic conditions and the stimulated (enhanced) attenuation processes are consistent with the structured geochemical zone design basis. The sequence of anaerobic and aerobic conditions along the flow path of OU-1 groundwater provides conditions that maximize the degradation opportunities of parent (PCE and TCE) and daughter (DCE and VC) chlorinated ethenes and mitigates the potential for excessive buildup of VC.

Competing electron acceptors in anaerobic zones can reduce the effectiveness of reductive dechlorination of cVOCs because the competing acceptors will consume the organic amendments (soybean oil). Dissolved oxygen, sulfate, and nitrate are the primary competing electron acceptors. The concentrations of these parameters continued to be at concentrations that support anaerobic reductive dechlorination. Although generally low, the concentrations of sulfate in the OU-1 groundwater varied throughout the field demonstration, due to inflow from the bedrock aquifer to the east. Sulfate was moderately high prior to the injections and decreased significantly after injections. Higher levels of sulfate may influence the reductive dechlorination of PCE and TCE along the eastern side of the OU-1 area and may need to be monitored to ensure sustainability of the structured geochemical zones.

Other diagnostic indicators, such as methane and TOC, are used to evaluate other geochemical parameters of aquifer conditions that support reductive dechlorination or aerobic cometabolism. Measurements of methane in the treatment zones indicate reducing conditions and methanogenesis. Methane is also used in the downgradient aerobic zones as a substrate to facilitate cometabolism of PCE and TCE. TOC remained above 2 mg/L in the treatment zones, but this value is considered low for strongly reducing environments. It is likely that the oil continues to be sorbed to the aquifer materials and is providing a long-lived carbon source since the ORP and iron data indicate reducing conditions persevere.

Prior to the EA Field Demonstration, the microbial counts indicated that the baseline reductive dechlorination and aerobic cometabolism status was either unfavorable or transitional in all locations. Following oil deployment, reductive dechlorination species increased to significant levels in all anaerobic treatment zone wells, as well as in several mid-plume and distal locations. Cometabolic species increased to significant levels in the anaerobic treatment zone wells. Cometabolic species in the plume interior and sentinel wells generally increased to transitional levels throughout the monitoring period.

A scoping calculation was performed in 2014 (DOE 2014a) to assess the potential longevity of the deployed oil. This calculation is based on the oxidation of the oil by inflow of electron acceptors (e.g., oxygen, nitrate, and sulfate) delivered into the deployment zone from upgradient, oil utilization by reduction of minerals in the deployment zone (e.g., iron (III) [Fe(III)]-containing minerals converted to dissolved Fe(II)), and oil converted to light hydrocarbons (e.g., methane) or into soluble carbon compounds. The projected time frame for complete utilization of the deployed oil is calculated to be 44 years. The results suggest that the proposed deployment volume should provide sufficient longevity to sequester and attenuate TCE and other solvents beyond the expected period of mass discharge from the residual OU-1 vadose zone and upgradient source area.

Based on a representative hydraulic conductivity value of 650 ft/day for the outwash aquifer and the average hydraulic gradient of 0.00024 ft/ft, a typical specific discharge (Darcian velocity or

specific flux) would be 0.156 ft/day or about 57 feet per year (DOE 2014a). The calculated flow direction of 152° from north suggests the preferential groundwater flow pathway is to the southeast, and runs parallel the BVA bedrock boundary.

4.3.4 Remediation Time Frames

Decision Factor: Is the remediation time frame acceptable?

An approximation of the remediation time frame was developed based on the upper range of current concentrations observed in the OU-1 plume and conservative estimate of attenuation rates based on the monitoring in the field demonstration. Starting from the end of deployment in September 2014, these projections would make the overall remediation time frame for PCE and TCE to be approximately 5 to 6 years and is consistent with the original design basis of 13 years. The daughter product cDCE is projected to remain below MCLs in the future. VC is above MCL in a few wells, and the length of time required to reach MCLs in all wells for VC cannot be projected currently.

4.3.5 Cost

Decision Factor: Are the cost benefits acceptable?

The interplay among remediation time frame, sustainability, achieving cleanup standards, performance goals, and cost-effectiveness should be considered when comparing an MNA remedy against other remedies. Table 8 summarizes the options considered during initial evaluations of potential remedies to address cVOC contamination in OU-1 groundwater in 2013. The costs for the active groundwater extraction remedies are higher than those for attenuation remedies with similar time frames.

Table 8. Costs for Potential OU-1 Remedies

Option	Duration (years)	Costs ($)		
		First Year Capital	Annual	Total
1. No Action: No P&T and long-term monitoring for cVOCs	26	0	90,000–140,000	2,340,000–3,360,000
2. Passive: Monitored Natural Attenuation with P&T contingency (well 0452)	26	17,000–21,000	102,000–169,000	2,669,000–4,415,000
3. Passive: Enhanced Attenuation (with biostimulation) and P&T contingency (well 0452)	13	350,000–377,000	102,000–169,000	1,681,000–2,574,000
4. Active: P&T using wells 0449 and 0450	26	0	270,000–355,000	7,020,000–9,230,000
5. Active: P&T using downgradient well (0452)	13	25,000–32,000	270,000–355,000	3,535,000–4,647,000

4.4 Evaluate the Suitability of MNA

The decision to implement MNA as part of a remedy relies on a demonstration that, under current conditions, the plume is stable and that plume stability can be maintained in the future. Table 9 summarizes the previously discussed decision factors and indicates whether these factors have been met under current conditions. The results of the evaluation indicate that additional information may be necessary to address the long-term sustainability of the treatment zones and the remediation time frame for VC in groundwater.

Table 9. Summary of Decision Factors for Evaluation for MNA

Decision Point	Yes or No	Comments
Are the risks acceptable?	Yes	The cVOC plume remains onsite and ICs are in place to prevent groundwater receptors.
Is the plume stable or shrinking?	Yes	• Plume stability analysis indicates the PCE and TCE plumes are decreasing in size and mass. • Plume stability analysis indicates the cDCE and VC plumes have increased in mass. • There has been some lateral spread of the cDCE plume and the plume has become less uniform. It is not anticipated that cDCE will exceed the MCL in the plume. • The VC plume footprint has been stable. • The concentrations and trends in the sentinel wells demonstrate that the OU-1 plume is not expanding and that attenuation rates in the plume have been sufficient to mitigate the potential for plume expansion.
Are the conditions sustainable?	No	It has been projected that the time frame for complete utilization of the deployed oil is 44 years. The TOC concentrations measured during the field demonstration have been low, although other indicator parameters support the maintenance of reductive zones. Other competing electron acceptors, such as sulfate and dissolved oxygen, may have transient impacts on the structured geochemical zones.
Is the remediation time frame acceptable?	No	• PCE and TCE—attainment of MCLs within the 13-year design time frame. • cDCE—it is not anticipated that cDCE will exceed the MCL within the plume. • VC—a time frame to reach the MCL cannot be determined at this time.
Are the cost benefits acceptable?	Yes	Previous estimates for remedies utilizing natural attenuation are similar or less than the cost for the current P&T remedy.

5.0 Conclusions and Recommendations

The overall goal of the EA Field Demonstration was to show that structured geochemical zones can be established and effectively maintained such that cVOC concentrations in groundwater can decrease to MCLs in a reasonable time frame.

5.1 Summary of EA Performance

The following objectives were established for the field demonstration:

- **Assess the performance and viability of attenuation using structured geochemical zones as a remediation strategy for OU-1 groundwater.**

During the field demonstration, changes in the concentrations of parent and daughter cVOCs in OU-1 monitoring wells located in the anaerobic treatment zones and downgradient of those areas provided confirmation of reductive dechlorination. The chemistry of the aquifer at the downgradient wells continues to have higher ORP values and measurable DO concentrations.

The results from the field demonstration indicate that the dissolved PCE and TCE plumes have decreased in size and mass. The concentrations of PCE and TCE throughout the plume are projected to be below the target MCL of 5 µg/L within the original design projection of 13 years (CY 2027).

- **Stabilize the plume and minimize and mitigate the potential for plume growth.**

MAROS plume evaluation analysis shows that the structured geochemical zones are working as designed. Overall, the moment analyses indicate that plume strength of the parent constituents is decreasing, the plumes can generally be classified as stable or shrinking, and the plumes are behaving as anticipated as indicated by decreasing total dissolved mass that indicates plume shrinkage, the stable or upgradient direction of movement of the center of mass, the continual transformation by reductive dechlorination, and the generally decreasing concentration trends in a majority of the monitoring wells. Key observations for each analyte are:

- PCE: The total dissolved mass of PCE in the OU-1 area has decreased. The plume has stabilized with no downgradient movement of the center of mass or spread of the plume.
- TCE: The total dissolved mass of TCE in the OU-1 area has decreased. The center of the TCE mass has receded, indicating the center of the plume mass is not moving downgradient.
- cDCE: The total dissolved mass of cDCE in the OU-1 area has increased, which was anticipated. The center of the plume mass has shown some downgradient movement and the plume has become less uniform (i.e., discrete areas of higher concentration).
- VC: The total dissolved mass of VC in the OU-1 area has increased, which was anticipated. VC stabilized by the end of the field demonstration.

Concentrations and concentration trends in the downgradient sentinel wells are an important metric related to potential plume expansion. The concentrations and trends in these wells demonstrate that the cVOC plume is not expanding. The observed stability of concentrations (below MCLs) in the sentinel wells during the period of offsite downgradient dewatering operations (Year Two) suggests that treatment zones are effectively attenuating cVOCs throughout the bulk of the cVOC plume in OU-1.

- **Develop the biogeochemical conditions to accelerate progress to remedial objectives and transition the strategy to MNA.**

The results from the field demonstration show that the structured geochemical zones have been sustained. In and near the anaerobic treatment zones, aquifer geochemistry changed from an

oxidizing to a reducing condition as indicated by ORP and DO data and indications of increased microbial activity continue to be observed through the presence of increased metabolic byproducts and methane concentrations in groundwater samples. Chlorinated-solvent-reducing bacterial counts showed significant increases in treatment zones. Within these structured geochemical zones, the dissolved TCE plume has decreased in size, and statistical tests indicate the cVOC concentrations in the majority of the source-area wells are decreasing.

All the microbial counts (total bacteria, chlorinated-solvent-reducing bacteria, aerobic cometabolic bacteria, methanogens, and sulfate reducers) increased following the EA deployment and have been sustained. The wells in the treatment zones have shown significant increases in chlorinated-solvent-reducing bacteria that are capable of degrading TCE and PCE. Side-gradient, intermediate, and downgradient wells have also shown increases in chlorinated-solvent-reducing bacteria counts. Total eubacteria, sulfate reducers, and methanogens increased in the mid-plume and distal areas and are at levels that indicate aerobic and transitional conditions, consistent with the objectives of structured geochemical zones. Following recovery of the aquifer after the effects of the nearby offsite dewatering projects, the overall microbial community remained relatively stable and structured geochemical zones remained in place.

5.2 Conclusions

Several indicators of acceptable and unacceptable performance were developed in the Field Demonstration Work Plan (DOE 2014a). The indicators related to three categories:

- Development of structured geochemical zones (Table 10)
- cVOC concentrations and trends in intermediate sentinel wells (Table 11)
- cVOC concentrations and trends in terminal sentinel wells (Table 12)

The work plan indicated that the Core Team would determine performance in each category based on a preponderance of the indicators. The resulting performance determinations in each category were used to conclude whether the overall performance of the field demonstration was acceptable and if the objectives of the study were met. As summarized in Table 10 through Table 12, the monitoring data through Year Four show that the performance was well within the acceptable classification. Table 10 through Table 12 list the original indicator parameters and metrics. If the monitoring data strongly support acceptable performance of an indicator parameter, the cell is colored green; if a preponderance of the data suggests either acceptable or unacceptable performance of an indicator parameter, the cell is colored yellow; if the data strongly support unacceptable performance of an indicator parameter, the cell is colored red. In the tables below, the items marked in yellow have been included in a suggested monitoring list.

Based on the body of data generated from the field demonstration and discussed in this completion report, it can be concluded that a passive attenuation-based remedy is a viable alternative to address cVOCs in OU-1 groundwater. In general, the indicator parameters established in the Work Plan were in the acceptable range. It can be concluded that the objectives of the field demonstration have been met based on the overall performance and maintenance of the structured geochemical zones throughout the 4-year demonstration period.

Table 10. Performance Criteria: Development of Structured Geochemical Zones

Acceptable Performance	Unacceptable Performance
Reducing conditions at injection points.	Lack of reducing conditions at injection points.
Aerobic conditions along downgradient and lateral fringes.	Lack of aerobic conditions along downgradient and lateral fringes.
Decrease in parent cVOC concentrations—daughter products below MCLs (most wells—future focus on daughter products).	No change in parent cVOC concentrations or increase in parent cVOC concentrations (P054 resolved).
Increase in cVOC daughter products.	Lack of cVOC daughter products.
Stability or shrinking of the plume.	Expansion of the plume.

Table 11. Performance Criteria: cVOC Concentrations and Trends in Intermediate Sentinel Wells

Acceptable Performance	Unacceptable Performance
Stable or decreasing cVOC concentrations.	Upward trends in cVOC concentrations.
Concentrations below 2 x MCL for PCE and TCE.	Sustained exceedance of 2 x MCL for PCE and TCE.
Aerobic conditions.	Indication of geochemical change to anaerobic.
Low concentrations of cVOC daughter products.	Appearance of significant (above MCL) cVOC daughter products.

Table 12. Performance Criteria: cVOC Concentrations and Trends in Terminal Sentinel Wells

Acceptable Performance	Unacceptable Performance
cVOC below MCL.	Sustained exceedance of MCL.
Stable or decreasing cVOC concentrations.	Upward trends in cVOC concentrations.
Aerobic conditions.	Indication of geochemical change to anaerobic.
Low concentrations of cVOC daughter products.	Appearance of significant (above MCL) cVOC daughter products.

5.3 Recommendations

It is recommended that the current P&T remedy to address cVOC-impacted groundwater in OU-1 should be shifted to an attenuation-based remedy. The data collected from the EA Field Demonstration support that cVOCs in OU-1 groundwater can be effectively addressed through reductive dechlorination and aerobic cometabolism.

The MNA evaluation documented in Section 4 indicated that two of the decision factors (sustainability and time frame) were uncertain. Therefore, during subsequent remedy evaluations, the EA should be considered as an option to address these decision factors.

5.4 Additional Actions

In the interim, monitoring of the groundwater quality, geochemistry, and microbial communities should continue. The Core Team approved a program to perform quarterly groundwater sampling and annual microbial sampling in select wells until a remedy monitoring program for OU-1 groundwater is developed. Several actions have been identified from the field demonstration that will provide key information for future remedy evaluations and have been included in this interim program:

- Monitor continued downward trends: Two wells remain above MCLs for PCE or TCE. Importantly, the formation of DCE and VC during the field demonstration exhibit increased concentrations of these constituents. Continued data are needed to document degradation rates and remediation time frames for VC. These data will allow the assessment of stabilization of concentrations and development of downward concentration (attenuation) trends in OU-1 monitoring wells.
- Monitor geochemical conditions for the anaerobic treatment zones: Sulfate was moderately high prior to the injections and decreased significantly after injections. Some rebound water was observed at the end of Year One. Sulfate concentrations remained elevated after Year One and rebounded to baseline levels at several locations at the end of Year Two. This increase is likely due to the influence of recovery of the water table after the offsite dewatering projects that occurred during Year Two were completed. Sulfate concentrations increased near well P060 during Year Three. It was noted during Year Four that DO may exhibit a seasonal trend. Sulfate, DO, and TOC concentrations will need to be monitored to ensure the structured geochemical zones persevere.
- Monitor the microbial communities within the treatment zones: The progress of microbial communities into transitional and significant ranges (for cometabolic and reductive dechlorination species) should be monitored as groundwater from upgradient treatment zones continues to move through these areas.

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Appendix A

Groundwater Quality Data

Year Four

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Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0305	Alkalinity, Total (As CaCO3)	10/30/2017	Q4-2017	466	1.45		F	mg/L	F
0305	Alkalinity, Total (As CaCO3)	2/6/2018	Q1-2018	417	0.725			mg/L	F
0305	Alkalinity, Total (As CaCO3)	2/6/2018	Q1-2018	423	0.725			mg/L	D
0305	Alkalinity, Total (As CaCO3)	5/1/2018	Q2-2018	470	1.45			mg/L	F
0305	Alkalinity, Total (As CaCO3)	8/8/2018	Q3-2018	446	1.45			mg/L	D
0305	Alkalinity, Total (As CaCO3)	8/8/2018	Q3-2018	439	1.45			mg/L	F
0305	Ammonia Total as N	10/30/2017	Q4-2017	0.0576	0.017	J	UF	mg/L	F
0305	Ammonia Total as N	2/6/2018	Q1-2018	0.143	0.017			mg/L	D
0305	Ammonia Total as N	2/6/2018	Q1-2018	0.171	0.017			mg/L	F
0305	Ammonia Total as N	5/1/2018	Q2-2018	0.042	0.017	J		mg/L	F
0305	Ammonia Total as N	8/8/2018	Q3-2018	0.0503	0.017	J		mg/L	D
0305	Ammonia Total as N	8/8/2018	Q3-2018	0.017	0.017	U		mg/L	F
0305	Carbon Dioxide	5/1/2018	Q2-2018	100			>	mg/L	F
0305	Carbon Dioxide	8/8/2018	Q3-2018	100			>	mg/L	D
0305	Carbon Disulfide	10/30/2017	Q4-2017	1.67	1.67	U	F	ug/L	F
0305	Carbon Disulfide	2/6/2018	Q1-2018	1.67	1.67	U		ug/L	D
0305	Carbon Disulfide	2/6/2018	Q1-2018	1.67	1.67	U		ug/L	F
0305	Carbon Disulfide	5/1/2018	Q2-2018	1.67	1.67	U		ug/L	F
0305	Carbon Disulfide	8/8/2018	Q3-2018	5	1.67	U		ug/L	F
0305	Carbon Disulfide	8/8/2018	Q3-2018	5	1.67	U		ug/L	F
0305	Chloride	10/30/2017	Q4-2017	85.6	1.34		F	mg/L	F
0305	Chloride	2/6/2018	Q1-2018	120	0.067			mg/L	D
0305	Chloride	2/6/2018	Q1-2018	122	0.067			mg/L	F
0305	Chloride	5/1/2018	Q2-2018	89.7	1.68			mg/L	F
0305	Chloride	8/8/2018	Q3-2018	120	1.68			mg/L	D
0305	Chloride	8/8/2018	Q3-2018	121	1.68			mg/L	F
0305	cis-1,2-Dichloroethene	10/30/2017	Q4-2017	0.99	0.333	J	F	ug/L	D
0305	cis-1,2-Dichloroethene	2/6/2018	Q1-2018	2.87	0.333			ug/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0305	cis-1,2-Dichloroethene	2/6/2018	Q1-2018	3.57	0.333			ug/L	F
0305	cis-1,2-Dichloroethene	5/1/2018	Q2-2018	1.71	0.333			ug/L	D
0305	cis-1,2-Dichloroethene	8/8/2018	Q3-2018	4.4	0.333			ug/L	F
0305	cis-1,2-Dichloroethene	8/8/2018	Q3-2018	2.99	0.333			ug/L	D
0305	Dissolved Oxygen	10/30/2017	Q4-2017	2.72			F	mg/L	D
0305	Dissolved Oxygen	2/6/2018	Q1-2018	2.1			F	mg/L	F
0305	Dissolved Oxygen	5/1/2018	Q2-2018	1.53				mg/L	F
0305	Dissolved Oxygen	8/8/2018	Q3-2018	9.08				mg/L	F
0305	Ethane	10/30/2017	Q4-2017	10	10	U	F	ug/L	F
0305	Ethane	2/6/2018	Q1-2018	10	10	U		ug/L	F
0305	Ethane	2/6/2018	Q1-2018	10	10	U		ug/L	D
0305	Ethane	5/1/2018	Q2-2018	10	10	U		ug/L	F
0305	Ethane	8/8/2018	Q3-2018	25	10	U		ug/L	F
0305	Ethane	8/8/2018	Q3-2018	25	10	U		ug/L	F
0305	Ethene	10/30/2017	Q4-2017	10	10	U	F	ug/L	F
0305	Ethene	2/6/2018	Q1-2018	10	10	U		ug/L	F
0305	Ethene	2/6/2018	Q1-2018	10	10	U		ug/L	F
0305	Ethene	5/1/2018	Q2-2018	10	10	U		ug/L	D
0305	Ethene	8/8/2018	Q3-2018	25	10	U		ug/L	D
0305	Ethene	8/8/2018	Q3-2018	25	10	U		ug/L	F
0305	Iron	10/30/2017	Q4-2017	0.03	0.03	U	F	mg/L	F
0305	Iron	2/6/2018	Q1-2018	0.03	0.03	U		mg/L	F
0305	Iron	2/6/2018	Q1-2018	0.03	0.03	U		mg/L	D
0305	Iron	5/1/2018	Q2-2018	0.0436	0.03	B		mg/L	F
0305	Iron	8/8/2018	Q3-2018	0.03	0.03	U		mg/L	D
0305	Iron	8/8/2018	Q3-2018	0.03	0.03	U		mg/L	F
0305	Methane	10/30/2017	Q4-2017	10	10	U	F	ug/L	D
0305	Methane	2/6/2018	Q1-2018	81	10			ug/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0305	Methane	2/6/2018	Q1-2018	133	10			ug/L	D
0305	Methane	5/1/2018	Q2-2018	13.1	10	BJ		ug/L	F
0305	Methane	8/8/2018	Q3-2018	120	10			ug/L	F
0305	Methane	8/8/2018	Q3-2018	114	10			ug/L	F
0305	Nitrate as Nitrogen	10/30/2017	Q4-2017	0.997	0.165		F	mg/L	D
0305	Nitrate as Nitrogen	2/6/2018	Q1-2018	0.575	0.033			mg/L	F
0305	Nitrate as Nitrogen	2/6/2018	Q1-2018	0.64	0.033			mg/L	F
0305	Nitrate as Nitrogen	5/1/2018	Q2-2018	1.62	0.165			mg/L	F
0305	Nitrate as Nitrogen	8/8/2018	Q3-2018	0.515	0.165			mg/L	F
0305	Nitrate as Nitrogen	8/8/2018	Q3-2018	0.469	0.165	J		mg/L	F
0305	Oxidation Reduction Potential	10/30/2017	Q4-2017	149.5			F	mV	F
0305	Oxidation Reduction Potential	2/6/2018	Q1-2018	71.8			F	mV	F
0305	Oxidation Reduction Potential	5/1/2018	Q2-2018	25				mV	F
0305	Oxidation Reduction Potential	8/8/2018	Q3-2018	115.6				mV	F
0305	pH	10/30/2017	Q4-2017	6.76			F	s.u.	F
0305	pH	2/6/2018	Q1-2018	6.91			F	s.u.	F
0305	pH	5/1/2018	Q2-2018	6.96				s.u.	F
0305	pH	8/8/2018	Q3-2018	6.76				s.u.	F
0305	Phosphorus	10/30/2017	Q4-2017	0.0334	0.02	J	UF	mg/L	F
0305	Phosphorus	2/6/2018	Q1-2018	0.0379	0.02	J	U	mg/L	F
0305	Phosphorus	2/6/2018	Q1-2018	0.047	0.02	J	U	mg/L	F
0305	Phosphorus	5/1/2018	Q2-2018	0.0493	0.02	J	U	mg/L	F
0305	Phosphorus	8/8/2018	Q3-2018	0.029	0.02	J		mg/L	F
0305	Phosphorus	8/8/2018	Q3-2018	0.0439	0.02	J		mg/L	F
0305	Specific Conductance	10/30/2017	Q4-2017	1380			F	umhos/cm	F
0305	Specific Conductance	2/6/2018	Q1-2018	1390			F	umhos/cm	F
0305	Specific Conductance	5/1/2018	Q2-2018	1570				umhos/cm	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0305	Specific Conductance	8/8/2018	Q3-2018	1400				umhos/cm	F
0305	Sulfate	10/30/2017	Q4-2017	172	2.66		F	mg/L	F
0305	Sulfate	2/6/2018	Q1-2018	148	0.133			mg/L	F
0305	Sulfate	2/6/2018	Q1-2018	149	0.133			mg/L	F
0305	Sulfate	5/1/2018	Q2-2018	284	3.33			mg/L	F
0305	Sulfate	8/8/2018	Q3-2018	152	3.33			mg/L	F
0305	Sulfate	8/8/2018	Q3-2018	151	3.33			mg/L	F
0305	Temperature	10/30/2017	Q4-2017	14.5			F	C	F
0305	Temperature	2/6/2018	Q1-2018	14.7			F	C	F
0305	Temperature	5/1/2018	Q2-2018	14.6				C	F
0305	Temperature	8/8/2018	Q3-2018	14.4				C	F
0305	Tetrachloroethene	10/30/2017	Q4-2017	2.13	0.333		F	ug/L	F
0305	Tetrachloroethene	2/6/2018	Q1-2018	3.16	0.333			ug/L	F
0305	Tetrachloroethene	2/6/2018	Q1-2018	2.84	0.333			ug/L	F
0305	Tetrachloroethene	5/1/2018	Q2-2018	2.14	0.333			ug/L	F
0305	Tetrachloroethene	8/8/2018	Q3-2018	2.84	0.333			ug/L	F
0305	Tetrachloroethene	8/8/2018	Q3-2018	1.74	0.333			ug/L	F
0305	Total Organic Carbon	10/30/2017	Q4-2017	2.37	0.33		F	mg/L	F
0305	Total Organic Carbon	2/6/2018	Q1-2018	2	0.33			mg/L	F
0305	Total Organic Carbon	2/6/2018	Q1-2018	2.03	0.33			mg/L	F
0305	Total Organic Carbon	5/1/2018	Q2-2018	1.7	0.33			mg/L	F
0305	Total Organic Carbon	8/8/2018	Q3-2018	1.6	0.33			mg/L	F
0305	Total Organic Carbon	8/8/2018	Q3-2018	1.67	0.33			mg/L	F
0305	Trichloroethene	10/30/2017	Q4-2017	4.18	0.333		F	ug/L	F
0305	Trichloroethene	2/6/2018	Q1-2018	7	0.333			ug/L	F
0305	Trichloroethene	2/6/2018	Q1-2018	6.12	0.333			ug/L	F
0305	Trichloroethene	5/1/2018	Q2-2018	3.66	0.333			ug/L	F
0305	Trichloroethene	8/8/2018	Q3-2018	6.31	0.333			ug/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0305	Trichloroethene	8/8/2018	Q3-2018	4.42	0.333			ug/L	F
0305	Turbidity	10/30/2017	Q4-2017	1.07			F	NTU	F
0305	Turbidity	2/6/2018	Q1-2018	3.27			F	NTU	F
0305	Turbidity	5/1/2018	Q2-2018	2.33				NTU	F
0305	Turbidity	8/8/2018	Q3-2018	12.3				NTU	F
0305	Vinyl chloride	10/30/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
0305	Vinyl chloride	2/6/2018	Q1-2018	0.333	0.333	U		ug/L	F
0305	Vinyl chloride	2/6/2018	Q1-2018	0.45	0.333	J		ug/L	F
0305	Vinyl chloride	5/1/2018	Q2-2018	0.333	0.333	U		ug/L	F
0305	Vinyl chloride	8/8/2018	Q3-2018	1	0.333	U		ug/L	F
0305	Vinyl chloride	8/8/2018	Q3-2018	1	0.333	U		ug/L	F
0317	Carbon Dioxide	8/8/2018	Q3-2018	85				mg/L	F
0317	Carbon Disulfide	8/8/2018	Q3-2018	5	1.67	U		ug/L	F
0317	cis-1,2-Dichloroethene	8/8/2018	Q3-2018	1	0.333	U		ug/L	F
0317	Dissolved Oxygen	8/8/2018	Q3-2018	1.86				mg/L	F
0317	Oxidation Reduction Potential	8/8/2018	Q3-2018	-10.2				mV	F
0317	pH	8/8/2018	Q3-2018	7.06				s.u.	F
0317	Specific Conductance	8/8/2018	Q3-2018	1520				umhos/cm	F
0317	Temperature	8/8/2018	Q3-2018	14.6				C	F
0317	Tetrachloroethene	8/8/2018	Q3-2018	1	0.333	U		ug/L	F
0317	Trichloroethene	8/8/2018	Q3-2018	1	0.333	U		ug/L	F
0317	Turbidity	8/8/2018	Q3-2018	3.42				NTU	F
0317	Vinyl chloride	8/8/2018	Q3-2018	1	0.333	U		ug/L	F
0379	Alkalinity, Total (As CaCO3)	10/30/2017	Q4-2017	397	1.45		F	mg/L	F
0379	Alkalinity, Total (As CaCO3)	2/8/2018	Q1-2018	391	0.725			mg/L	F
0379	Alkalinity, Total (As CaCO3)	5/2/2018	Q2-2018	399	1.45			mg/L	F
0379	Alkalinity, Total (As CaCO3)	8/7/2018	Q3-2018	398	1.45			mg/L	F
0379	Carbon Dioxide	4/25/2018	Q2-2018	N/A				mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0379	Carbon Dioxide	5/2/2018	Q2-2018	N/A				mg/L	F
0379	Carbon Dioxide	7/31/2018	Q3-2018	NA				mg/L	F
0379	Carbon Dioxide	8/7/2018	Q3-2018	70				mg/L	F
0379	Carbon Disulfide	10/30/2017	Q4-2017	1.67	1.67	U	F	ug/L	F
0379	Carbon Disulfide	11/6/2017	Q4-2017	0.5	0.5	U	F	ug/L	F
0379	Carbon Disulfide	1/30/2018	Q1-2018	0.5	0.5	U		ug/L	F
0379	Carbon Disulfide	2/8/2018	Q1-2018	1.67	1.67	U		ug/L	F
0379	Carbon Disulfide	4/25/2018	Q2-2018	0.5	0.5	U		ug/L	F
0379	Carbon Disulfide	5/2/2018	Q2-2018	1.67	1.67	U		ug/L	F
0379	Carbon Disulfide	7/31/2018	Q3-2018	5	0.5	U		ug/L	F
0379	Carbon Disulfide	8/7/2018	Q3-2018	5	1.67	U		ug/L	F
0379	Chloride	10/30/2017	Q4-2017	261	3.35		F	mg/L	F
0379	Chloride	2/8/2018	Q1-2018	266	0.067			mg/L	F
0379	Chloride	5/2/2018	Q2-2018	206	3.35			mg/L	F
0379	Chloride	8/7/2018	Q3-2018	273	3.35			mg/L	F
0379	cis-1,2-Dichloroethene	10/30/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
0379	cis-1,2-Dichloroethene	11/6/2017	Q4-2017	0.16	0.16	U	F	ug/L	F
0379	cis-1,2-Dichloroethene	1/30/2018	Q1-2018	0.16	0.16	U		ug/L	F
0379	cis-1,2-Dichloroethene	2/8/2018	Q1-2018	0.333	0.333	U		ug/L	F
0379	cis-1,2-Dichloroethene	4/25/2018	Q2-2018	0.16	0.16	U		ug/L	F
0379	cis-1,2-Dichloroethene	5/2/2018	Q2-2018	0.333	0.333	U		ug/L	F
0379	cis-1,2-Dichloroethene	7/31/2018	Q3-2018	1	0.16	U		ug/L	F
0379	cis-1,2-Dichloroethene	8/7/2018	Q3-2018	1	0.333	U		ug/L	F
0379	Dissolved Oxygen	10/30/2017	Q4-2017	2.3			F	mg/L	F
0379	Dissolved Oxygen	11/6/2017	Q4-2017	2.15			F	mg/L	F
0379	Dissolved Oxygen	1/30/2018	Q1-2018	3.35				mg/L	F
0379	Dissolved Oxygen	2/8/2018	Q1-2018	1.35			F	mg/L	F
0379	Dissolved Oxygen	4/25/2018	Q2-2018	3.21				mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0379	Dissolved Oxygen	5/2/2018	Q2-2018	2.79				mg/L	F
0379	Dissolved Oxygen	7/31/2018	Q3-2018	5.42				mg/L	F
0379	Dissolved Oxygen	8/7/2018	Q3-2018	2.87				mg/L	F
0379	Iron	10/30/2017	Q4-2017	0.0835	0.03	B	F	mg/L	F
0379	Iron	2/8/2018	Q1-2018	0.0663	0.03	B		mg/L	F
0379	Iron	5/2/2018	Q2-2018	0.0684	0.03	B		mg/L	F
0379	Iron	8/7/2018	Q3-2018	0.177	0.03			mg/L	F
0379	Nitrate as Nitrogen	10/30/2017	Q4-2017	0.46	0.165	J	F	mg/L	F
0379	Nitrate as Nitrogen	2/8/2018	Q1-2018	0.292	0.033	J		mg/L	F
0379	Nitrate as Nitrogen	5/2/2018	Q2-2018	0.292	0.165	J		mg/L	F
0379	Nitrate as Nitrogen	8/7/2018	Q3-2018	0.293	0.165	J		mg/L	F
0379	Oxidation Reduction Potential	10/30/2017	Q4-2017	14.7			F	mV	F
0379	Oxidation Reduction Potential	11/6/2017	Q4-2017	-44.2			F	mV	F
0379	Oxidation Reduction Potential	1/30/2018	Q1-2018	67.4				mV	F
0379	Oxidation Reduction Potential	2/8/2018	Q1-2018	53.4			F	mV	F
0379	Oxidation Reduction Potential	4/25/2018	Q2-2018	1211.1				mV	F
0379	Oxidation Reduction Potential	5/2/2018	Q2-2018	-5				mV	F
0379	Oxidation Reduction Potential	7/31/2018	Q3-2018	17.7				mV	F
0379	Oxidation Reduction Potential	8/7/2018	Q3-2018	123.4				mV	F
0379	pH	10/30/2017	Q4-2017	7.16			F	s.u.	F
0379	pH	11/6/2017	Q4-2017	6.95			F	s.u.	F
0379	pH	1/30/2018	Q1-2018	7.1				s.u.	F
0379	pH	2/8/2018	Q1-2018	7.19			F	s.u.	F
0379	pH	4/25/2018	Q2-2018	7.18				s.u.	F
0379	pH	5/2/2018	Q2-2018	7.21				s.u.	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0379	pH	7/31/2018	Q3-2018	7.01				s.u.	F
0379	pH	8/7/2018	Q3-2018	7.14				s.u.	F
0379	Phosphorus	10/30/2017	Q4-2017	0.02	0.02	U	F	mg/L	F
0379	Phosphorus	2/8/2018	Q1-2018	0.0329	0.02	J	U	mg/L	F
0379	Phosphorus	5/2/2018	Q2-2018	0.02	0.02	U		mg/L	F
0379	Phosphorus	8/7/2018	Q3-2018	0.02	0.02	U		mg/L	F
0379	Specific Conductance	10/30/2017	Q4-2017	1660			F	umhos/cm	F
0379	Specific Conductance	11/6/2017	Q4-2017	1660			F	umhos/cm	F
0379	Specific Conductance	1/30/2018	Q1-2018	1640				umhos/cm	F
0379	Specific Conductance	2/8/2018	Q1-2018	1710			F	umhos/cm	F
0379	Specific Conductance	4/25/2018	Q2-2018	1500				umhos/cm	F
0379	Specific Conductance	5/2/2018	Q2-2018	1490				umhos/cm	F
0379	Specific Conductance	7/31/2018	Q3-2018	1580				umhos/cm	F
0379	Specific Conductance	8/7/2018	Q3-2018	1700				umhos/cm	F
0379	Sulfate	10/30/2017	Q4-2017	59.4	0.665		F	mg/L	F
0379	Sulfate	2/8/2018	Q1-2018	61.8	0.133			mg/L	F
0379	Sulfate	5/2/2018	Q2-2018	74	0.665			mg/L	F
0379	Sulfate	8/7/2018	Q3-2018	64.4	0.665			mg/L	F
0379	Temperature	10/30/2017	Q4-2017	13.2			F	C	F
0379	Temperature	11/6/2017	Q4-2017	14			F	C	F
0379	Temperature	1/30/2018	Q1-2018	13.8				C	F
0379	Temperature	2/8/2018	Q1-2018	12.1			F	C	F
0379	Temperature	4/25/2018	Q2-2018	14.1				C	F
0379	Temperature	5/2/2018	Q2-2018	16.2				C	F
0379	Temperature	7/31/2018	Q3-2018	15.8				C	F
0379	Temperature	8/7/2018	Q3-2018	16.9				C	F
0379	Tetrachloroethene	10/30/2017	Q4-2017	0.36	0.333	J	F	ug/L	F
0379	Tetrachloroethene	11/6/2017	Q4-2017	0.6	0.16	J	F	ug/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0379	Tetrachloroethene	1/30/2018	Q1-2018	0.44	0.16	J		ug/L	F
0379	Tetrachloroethene	2/8/2018	Q1-2018	0.44	0.333	J		ug/L	F
0379	Tetrachloroethene	4/25/2018	Q2-2018	0.16	0.16	U		ug/L	F
0379	Tetrachloroethene	5/2/2018	Q2-2018	0.333	0.333	U		ug/L	F
0379	Tetrachloroethene	7/31/2018	Q3-2018	0.4	0.16	J		ug/L	F
0379	Tetrachloroethene	8/7/2018	Q3-2018	0.57	0.333	J		ug/L	F
0379	Trichloroethene	10/30/2017	Q4-2017	1.29	0.333		F	ug/L	F
0379	Trichloroethene	11/6/2017	Q4-2017	1.46	0.16		F	ug/L	F
0379	Trichloroethene	1/30/2018	Q1-2018	1.45	0.16			ug/L	F
0379	Trichloroethene	2/8/2018	Q1-2018	1.53	0.333			ug/L	F
0379	Trichloroethene	4/25/2018	Q2-2018	1.21	0.16			ug/L	F
0379	Trichloroethene	5/2/2018	Q2-2018	1.38	0.333			ug/L	F
0379	Trichloroethene	7/31/2018	Q3-2018	1.57	0.16			ug/L	F
0379	Trichloroethene	8/7/2018	Q3-2018	1.47	0.333			ug/L	F
0379	Turbidity	10/30/2017	Q4-2017	2.87			F	NTU	F
0379	Turbidity	11/6/2017	Q4-2017	6.73			F	NTU	F
0379	Turbidity	1/30/2018	Q1-2018	18.1				NTU	F
0379	Turbidity	2/8/2018	Q1-2018	28			F	NTU	F
0379	Turbidity	4/25/2018	Q2-2018	11.8				NTU	F
0379	Turbidity	5/2/2018	Q2-2018	8.23				NTU	F
0379	Turbidity	7/31/2018	Q3-2018	143				NTU	F
0379	Turbidity	8/7/2018	Q3-2018	6.78				NTU	F
0379	Vinyl chloride	10/30/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
0379	Vinyl chloride	11/6/2017	Q4-2017	0.16	0.16	U	F	ug/L	F
0379	Vinyl chloride	1/30/2018	Q1-2018	0.16	0.16	U		ug/L	F
0379	Vinyl chloride	2/8/2018	Q1-2018	0.333	0.333	U		ug/L	F
0379	Vinyl chloride	4/25/2018	Q2-2018	0.16	0.16	U		ug/L	F
0379	Vinyl chloride	5/2/2018	Q2-2018	0.333	0.333	U		ug/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0379	Vinyl chloride	7/31/2018	Q3-2018	1	0.16	U		ug/L	F
0379	Vinyl chloride	8/7/2018	Q3-2018	1	0.333	U		ug/L	F
0402	Alkalinity, Total (As CaCO3)	10/30/2017	Q4-2017	439	1.45		F	mg/L	F
0402	Alkalinity, Total (As CaCO3)	2/6/2018	Q1-2018	501	0.725			mg/L	F
0402	Alkalinity, Total (As CaCO3)	5/1/2018	Q2-2018	451	1.45			mg/L	F
0402	Alkalinity, Total (As CaCO3)	8/8/2018	Q3-2018	451	1.45			mg/L	F
0402	Ammonia Total as N	10/30/2017	Q4-2017	0.0429	0.017	J	UF	mg/L	F
0402	Ammonia Total as N	2/6/2018	Q1-2018	0.121	0.017			mg/L	F
0402	Ammonia Total as N	5/1/2018	Q2-2018	0.0356	0.017	J		mg/L	F
0402	Ammonia Total as N	8/8/2018	Q3-2018	0.017	0.017	U		mg/L	F
0402	Carbon Dioxide	5/1/2018	Q2-2018	100			>	mg/L	F
0402	Carbon Dioxide	8/8/2018	Q3-2018	100			>	mg/L	F
0402	Carbon Disulfide	10/30/2017	Q4-2017	1.67	1.67	U	F	ug/L	F
0402	Carbon Disulfide	2/6/2018	Q1-2018	1.67	1.67	U		ug/L	F
0402	Carbon Disulfide	5/1/2018	Q2-2018	1.67	1.67	U		ug/L	F
0402	Carbon Disulfide	8/8/2018	Q3-2018	5	1.67	U		ug/L	F
0402	Chloride	10/30/2017	Q4-2017	145	1.34		F	mg/L	F
0402	Chloride	2/6/2018	Q1-2018	48	0.067			mg/L	F
0402	Chloride	5/1/2018	Q2-2018	71.6	1.34			mg/L	F
0402	Chloride	8/8/2018	Q3-2018	122	1.68			mg/L	F
0402	cis-1,2-Dichloroethene	10/30/2017	Q4-2017	3.67	0.333		F	ug/L	F
0402	cis-1,2-Dichloroethene	2/6/2018	Q1-2018	0.333	0.333	U		ug/L	F
0402	cis-1,2-Dichloroethene	5/1/2018	Q2-2018	0.333	0.333	U		ug/L	F
0402	cis-1,2-Dichloroethene	8/8/2018	Q3-2018	1.78	0.333			ug/L	F
0402	Dissolved Oxygen	10/30/2017	Q4-2017	0.2			F	mg/L	F
0402	Dissolved Oxygen	2/6/2018	Q1-2018	4.12			F	mg/L	F
0402	Dissolved Oxygen	5/1/2018	Q2-2018	4.97				mg/L	F
0402	Dissolved Oxygen	8/8/2018	Q3-2018	3.71				mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0402	Iron	10/30/2017	Q4-2017	0.03	0.03	U	F	mg/L	F
0402	Iron	2/6/2018	Q1-2018	0.03	0.03	U		mg/L	F
0402	Iron	5/1/2018	Q2-2018	0.03	0.03	U		mg/L	F
0402	Iron	8/8/2018	Q3-2018	0.03	0.03	U		mg/L	F
0402	Nitrate as Nitrogen	10/30/2017	Q4-2017	0.072	0.033	J	F	mg/L	F
0402	Nitrate as Nitrogen	2/6/2018	Q1-2018	2.48	0.033			mg/L	F
0402	Nitrate as Nitrogen	5/1/2018	Q2-2018	2.48	0.165			mg/L	F
0402	Nitrate as Nitrogen	8/8/2018	Q3-2018	0.426	0.165	J		mg/L	F
0402	Oxidation Reduction Potential	10/30/2017	Q4-2017	170.9			F	mV	F
0402	Oxidation Reduction Potential	2/6/2018	Q1-2018	143			F	mV	F
0402	Oxidation Reduction Potential	5/1/2018	Q2-2018	126.9				mV	F
0402	Oxidation Reduction Potential	8/8/2018	Q3-2018	106.2				mV	F
0402	pH	10/30/2017	Q4-2017	7.04			F	s.u.	F
0402	pH	2/6/2018	Q1-2018	6.66			FJ	s.u.	F
0402	pH	5/1/2018	Q2-2018	6.39				s.u.	F
0402	pH	8/8/2018	Q3-2018	6.79				s.u.	F
0402	Phosphorus	10/30/2017	Q4-2017	0.02	0.02	U	F	mg/L	F
0402	Phosphorus	2/6/2018	Q1-2018	0.0205	0.02	J	U	mg/L	F
0402	Phosphorus	5/1/2018	Q2-2018	0.0374	0.02	J	U	mg/L	F
0402	Phosphorus	8/8/2018	Q3-2018	0.0222	0.02	J		mg/L	F
0402	Specific Conductance	10/30/2017	Q4-2017	1430			F	umhos/cm	F
0402	Specific Conductance	2/6/2018	Q1-2018	1200			F	umhos/cm	F
0402	Specific Conductance	5/1/2018	Q2-2018	1270				umhos/cm	F
0402	Specific Conductance	8/8/2018	Q3-2018	1360				umhos/cm	F
0402	Sulfate	10/30/2017	Q4-2017	123	2.66		F	mg/L	F
0402	Sulfate	2/6/2018	Q1-2018	119	0.133			mg/L	F
0402	Sulfate	5/1/2018	Q2-2018	135	2.66			mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0402	Sulfate	8/8/2018	Q3-2018	126	3.33			mg/L	F
0402	Temperature	10/30/2017	Q4-2017	13.2			F	C	F
0402	Temperature	2/6/2018	Q1-2018	12.6			F	C	F
0402	Temperature	5/1/2018	Q2-2018	13.9				C	F
0402	Temperature	8/8/2018	Q3-2018	15.1				C	F
0402	Tetrachloroethene	10/30/2017	Q4-2017	1.06	0.333		F	ug/L	F
0402	Tetrachloroethene	2/6/2018	Q1-2018	0.333	0.333	U		ug/L	F
0402	Tetrachloroethene	5/1/2018	Q2-2018	0.333	0.333	U		ug/L	F
0402	Tetrachloroethene	8/8/2018	Q3-2018	1.24	0.333			ug/L	F
0402	Total Organic Carbon	10/30/2017	Q4-2017	1.84	0.33		F	mg/L	F
0402	Total Organic Carbon	2/6/2018	Q1-2018	1.69	0.33			mg/L	F
0402	Total Organic Carbon	5/1/2018	Q2-2018	1.31	0.33			mg/L	F
0402	Total Organic Carbon	8/8/2018	Q3-2018	1.32	0.33			mg/L	F
0402	Trichloroethene	10/30/2017	Q4-2017	1.08	0.333		F	ug/L	F
0402	Trichloroethene	2/6/2018	Q1-2018	0.333	0.333	U		ug/L	F
0402	Trichloroethene	5/1/2018	Q2-2018	0.333	0.333	U		ug/L	F
0402	Trichloroethene	8/8/2018	Q3-2018	1	0.333			ug/L	F
0402	Turbidity	10/30/2017	Q4-2017	0.78			F	NTU	F
0402	Turbidity	2/6/2018	Q1-2018	5.02			F	NTU	F
0402	Turbidity	5/1/2018	Q2-2018	1.65				NTU	F
0402	Turbidity	8/8/2018	Q3-2018	1.6				NTU	F
0402	Vinyl chloride	10/30/2017	Q4-2017	0.57	0.333	J	F	ug/L	F
0402	Vinyl chloride	2/6/2018	Q1-2018	0.333	0.333	U		ug/L	F
0402	Vinyl chloride	5/1/2018	Q2-2018	0.333	0.333	U		ug/L	F
0402	Vinyl chloride	8/8/2018	Q3-2018	1	0.333	U		ug/L	F
0410	Alkalinity, Total (As CaCO3)	10/30/2017	Q4-2017	399	1.45		F	mg/L	F
0410	Alkalinity, Total (As CaCO3)	2/5/2018	Q1-2018	525	0.725			mg/L	F
0410	Alkalinity, Total (As CaCO3)	5/1/2018	Q2-2018	522	1.45			mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0410	Alkalinity, Total (As CaCO3)	8/6/2018	Q3-2018	485	1.45			mg/L	F
0410	Ammonia Total as N	10/30/2017	Q4-2017	0.017	0.017	U	F	mg/L	F
0410	Ammonia Total as N	2/5/2018	Q1-2018	0.376	0.017			mg/L	F
0410	Ammonia Total as N	5/1/2018	Q2-2018	1.11	0.017			mg/L	F
0410	Ammonia Total as N	8/6/2018	Q3-2018	0.779	0.017			mg/L	F
0410	Carbon Dioxide	5/1/2018	Q2-2018	100			>	mg/L	F
0410	Carbon Dioxide	8/6/2018	Q3-2018	100			>	mg/L	F
0410	Carbon Disulfide	10/30/2017	Q4-2017	1.67	1.67	U	F	ug/L	F
0410	Carbon Disulfide	2/5/2018	Q1-2018	1.67	1.67	U		ug/L	F
0410	Carbon Disulfide	5/1/2018	Q2-2018	1.67	1.67	U		ug/L	F
0410	Carbon Disulfide	8/6/2018	Q3-2018	5	1.67	U		ug/L	F
0410	Chloride	10/30/2017	Q4-2017	147	1.34		F	mg/L	F
0410	Chloride	2/5/2018	Q1-2018	41.5	0.067			mg/L	F
0410	Chloride	5/1/2018	Q2-2018	342	6.7			mg/L	F
0410	Chloride	8/6/2018	Q3-2018	168	1.68			mg/L	F
0410	cis-1,2-Dichloroethene	10/30/2017	Q4-2017	3.17	0.333		F	ug/L	F
0410	cis-1,2-Dichloroethene	2/5/2018	Q1-2018	0.4	0.333	J		ug/L	F
0410	cis-1,2-Dichloroethene	5/1/2018	Q2-2018	0.333	0.333	U		ug/L	F
0410	cis-1,2-Dichloroethene	8/6/2018	Q3-2018	0.82	0.333	J		ug/L	F
0410	Dissolved Oxygen	10/30/2017	Q4-2017	0.26			F	mg/L	F
0410	Dissolved Oxygen	2/5/2018	Q1-2018	0.57			F	mg/L	F
0410	Dissolved Oxygen	5/1/2018	Q2-2018	0.22				mg/L	F
0410	Dissolved Oxygen	8/6/2018	Q3-2018	2.48				mg/L	F
0410	Ethane	10/30/2017	Q4-2017	10	10	U	F	ug/L	F
0410	Ethane	2/5/2018	Q1-2018	10	10	U		ug/L	F
0410	Ethane	5/1/2018	Q2-2018	10	10	U		ug/L	F
0410	Ethane	8/6/2018	Q3-2018	25	10	U		ug/L	F
0410	Ethene	10/30/2017	Q4-2017	10	10	U	F	ug/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0410	Ethene	2/5/2018	Q1-2018	10	10	U		ug/L	F
0410	Ethene	5/1/2018	Q2-2018	10	10	U		ug/L	F
0410	Ethene	8/6/2018	Q3-2018	25	10	U		ug/L	F
0410	Iron	10/30/2017	Q4-2017	8.6	0.03		F	mg/L	F
0410	Iron	2/5/2018	Q1-2018	8.27	0.03			mg/L	F
0410	Iron	5/1/2018	Q2-2018	5.76	0.03			mg/L	F
0410	Iron	8/6/2018	Q3-2018	7.31	0.03			mg/L	F
0410	Methane	10/30/2017	Q4-2017	918	50		F	ug/L	F
0410	Methane	2/5/2018	Q1-2018	216	10			ug/L	F
0410	Methane	5/1/2018	Q2-2018	545	20	B		ug/L	F
0410	Methane	8/6/2018	Q3-2018	528	50			ug/L	F
0410	Nitrate as Nitrogen	10/30/2017	Q4-2017	0.165	0.165	U	F	mg/L	F
0410	Nitrate as Nitrogen	2/5/2018	Q1-2018	0.33	0.033	U		mg/L	F
0410	Nitrate as Nitrogen	5/1/2018	Q2-2018	0.165	0.165	U		mg/L	F
0410	Nitrate as Nitrogen	8/6/2018	Q3-2018	0.165	0.165	U		mg/L	F
0410	Oxidation Reduction Potential	10/30/2017	Q4-2017	-14.3			F	mV	F
0410	Oxidation Reduction Potential	2/5/2018	Q1-2018	-79.3			F	mV	F
0410	Oxidation Reduction Potential	5/1/2018	Q2-2018	-19				mV	F
0410	Oxidation Reduction Potential	8/6/2018	Q3-2018	-24.1				mV	F
0410	pH	10/30/2017	Q4-2017	6.59			F	s.u.	F
0410	pH	2/5/2018	Q1-2018	6.89			F	s.u.	F
0410	pH	5/1/2018	Q2-2018	6.26				s.u.	F
0410	pH	8/6/2018	Q3-2018	6.41				s.u.	F
0410	Phosphorus	10/30/2017	Q4-2017	0.0308	0.02	J	UF	mg/L	F
0410	Phosphorus	2/5/2018	Q1-2018	0.0544	0.02		U	mg/L	F
0410	Phosphorus	5/1/2018	Q2-2018	0.0469	0.02	J	U	mg/L	F
0410	Phosphorus	8/6/2018	Q3-2018	0.0389	0.02	J		mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0410	Specific Conductance	10/30/2017	Q4-2017	1620			F	umhos/cm	F
0410	Specific Conductance	2/5/2018	Q1-2018	1250			F	umhos/cm	F
0410	Specific Conductance	5/1/2018	Q2-2018	2330				umhos/cm	F
0410	Specific Conductance	8/6/2018	Q3-2018	1760				umhos/cm	F
0410	Sulfate	10/30/2017	Q4-2017	287	2.66		F	mg/L	F
0410	Sulfate	2/5/2018	Q1-2018	106	0.133			mg/L	F
0410	Sulfate	5/1/2018	Q2-2018	181	13.3			mg/L	F
0410	Sulfate	8/6/2018	Q3-2018	285	3.33			mg/L	F
0410	Temperature	10/30/2017	Q4-2017	14.7			F	C	F
0410	Temperature	2/5/2018	Q1-2018	11.2			F	C	F
0410	Temperature	5/1/2018	Q2-2018	15.2				C	F
0410	Temperature	8/6/2018	Q3-2018	16.1				C	F
0410	Tetrachloroethene	10/30/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
0410	Tetrachloroethene	2/5/2018	Q1-2018	0.333	0.333	U		ug/L	F
0410	Tetrachloroethene	5/1/2018	Q2-2018	0.333	0.333	U		ug/L	F
0410	Tetrachloroethene	8/6/2018	Q3-2018	1	0.333	U		ug/L	F
0410	Total Organic Carbon	10/30/2017	Q4-2017	3.16	0.33		F	mg/L	F
0410	Total Organic Carbon	2/5/2018	Q1-2018	4.16	0.33			mg/L	F
0410	Total Organic Carbon	5/1/2018	Q2-2018	3.13	0.33			mg/L	F
0410	Total Organic Carbon	8/6/2018	Q3-2018	2.79	0.33			mg/L	F
0410	Trichloroethene	10/30/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
0410	Trichloroethene	2/5/2018	Q1-2018	0.333	0.333	U		ug/L	F
0410	Trichloroethene	5/1/2018	Q2-2018	0.333	0.333	U		ug/L	F
0410	Trichloroethene	8/6/2018	Q3-2018	1	0.333	U		ug/L	F
0410	Turbidity	10/30/2017	Q4-2017	3.36			F	NTU	F
0410	Turbidity	2/5/2018	Q1-2018	2.47			F	NTU	F
0410	Turbidity	5/1/2018	Q2-2018	1.79				NTU	F
0410	Turbidity	8/6/2018	Q3-2018	9.94				NTU	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0410	Vinyl chloride	10/30/2017	Q4-2017	3.69	0.333		F	ug/L	F
0410	Vinyl chloride	2/5/2018	Q1-2018	0.333	0.333	U		ug/L	F
0410	Vinyl chloride	5/1/2018	Q2-2018	0.333	0.333	U		ug/L	F
0410	Vinyl chloride	8/6/2018	Q3-2018	0.62	0.333	J		ug/L	F
0416	Alkalinity, Total (As CaCO3)	10/30/2017	Q4-2017	274	1.45		F	mg/L	F
0416	Alkalinity, Total (As CaCO3)	2/6/2018	Q1-2018	296	0.725			mg/L	F
0416	Alkalinity, Total (As CaCO3)	5/2/2018	Q2-2018	284	1.45			mg/L	F
0416	Alkalinity, Total (As CaCO3)	8/7/2018	Q3-2018	294	1.45			mg/L	F
0416	Carbon Dioxide	5/2/2018	Q2-2018	N/A				mg/L	F
0416	Carbon Dioxide	8/7/2018	Q3-2018	35				mg/L	F
0416	Carbon Disulfide	10/30/2017	Q4-2017	1.67	1.67	U	F	ug/L	F
0416	Carbon Disulfide	2/6/2018	Q1-2018	1.67	1.67	U		ug/L	F
0416	Carbon Disulfide	5/2/2018	Q2-2018	1.67	1.67	U		ug/L	F
0416	Carbon Disulfide	8/7/2018	Q3-2018	5	1.67	U		ug/L	F
0416	Chloride	10/30/2017	Q4-2017	59.9	0.67		F	mg/L	F
0416	Chloride	2/6/2018	Q1-2018	201	0.067			mg/L	F
0416	Chloride	5/2/2018	Q2-2018	137	1.68			mg/L	F
0416	Chloride	8/7/2018	Q3-2018	194	1.68			mg/L	F
0416	cis-1,2-Dichloroethene	10/30/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
0416	cis-1,2-Dichloroethene	2/6/2018	Q1-2018	0.333	0.333	U		ug/L	F
0416	cis-1,2-Dichloroethene	5/2/2018	Q2-2018	0.333	0.333	U		ug/L	F
0416	cis-1,2-Dichloroethene	8/7/2018	Q3-2018	1	0.333	U		ug/L	F
0416	Dissolved Oxygen	10/30/2017	Q4-2017	5.53			F	mg/L	F
0416	Dissolved Oxygen	2/6/2018	Q1-2018	9.96			F	mg/L	F
0416	Dissolved Oxygen	5/2/2018	Q2-2018	7.88				mg/L	F
0416	Dissolved Oxygen	8/7/2018	Q3-2018	4.9				mg/L	F
0416	Iron	10/30/2017	Q4-2017	0.03	0.03	U	F	mg/L	F
0416	Iron	2/6/2018	Q1-2018	0.03	0.03	U		mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0416	Iron	5/2/2018	Q2-2018	0.03	0.03	U		mg/L	F
0416	Iron	8/7/2018	Q3-2018	0.03	0.03	U		mg/L	F
0416	Nitrate as Nitrogen	10/30/2017	Q4-2017	0.534	0.165		F	mg/L	F
0416	Nitrate as Nitrogen	2/6/2018	Q1-2018	0.44	0.033	J		mg/L	F
0416	Nitrate as Nitrogen	5/2/2018	Q2-2018	0.313	0.165	J		mg/L	F
0416	Nitrate as Nitrogen	8/7/2018	Q3-2018	0.594	0.165			mg/L	F
0416	Oxidation Reduction Potential	10/30/2017	Q4-2017	43			F	mV	F
0416	Oxidation Reduction Potential	2/6/2018	Q1-2018	149			F	mV	F
0416	Oxidation Reduction Potential	5/2/2018	Q2-2018	-9.7				mV	F
0416	Oxidation Reduction Potential	8/7/2018	Q3-2018	182.1				mV	F
0416	pH	10/30/2017	Q4-2017	7.75			F	s.u.	F
0416	pH	2/6/2018	Q1-2018	7.69			F	s.u.	F
0416	pH	5/2/2018	Q2-2018	7.81				s.u.	F
0416	pH	8/7/2018	Q3-2018	7.32				s.u.	F
0416	Phosphorus	10/30/2017	Q4-2017	0.02	0.02	U	F	mg/L	F
0416	Phosphorus	2/6/2018	Q1-2018	0.0452	0.02	J	U	mg/L	F
0416	Phosphorus	5/2/2018	Q2-2018	0.0398	0.02	J	U	mg/L	F
0416	Phosphorus	8/7/2018	Q3-2018	0.0439	0.02	J		mg/L	F
0416	Specific Conductance	10/30/2017	Q4-2017	880			F	umhos/cm	F
0416	Specific Conductance	2/6/2018	Q1-2018	1420			F	umhos/cm	F
0416	Specific Conductance	5/2/2018	Q2-2018	1160				umhos/cm	F
0416	Specific Conductance	8/7/2018	Q3-2018	1370				umhos/cm	F
0416	Sulfate	10/30/2017	Q4-2017	105	1.33		F	mg/L	F
0416	Sulfate	2/6/2018	Q1-2018	132	0.133			mg/L	F
0416	Sulfate	5/2/2018	Q2-2018	117	3.33			mg/L	F
0416	Sulfate	8/7/2018	Q3-2018	122	3.33			mg/L	F
0416	Temperature	10/30/2017	Q4-2017	16.3			F	C	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0416	Temperature	2/6/2018	Q1-2018	5.8			F	C	F
0416	Temperature	5/2/2018	Q2-2018	10.6				C	F
0416	Temperature	8/7/2018	Q3-2018	18.6				C	F
0416	Tetrachloroethene	10/30/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
0416	Tetrachloroethene	2/6/2018	Q1-2018	0.333	0.333	U		ug/L	F
0416	Tetrachloroethene	5/2/2018	Q2-2018	0.333	0.333	U		ug/L	F
0416	Tetrachloroethene	8/7/2018	Q3-2018	1	0.333	U		ug/L	F
0416	Trichloroethene	10/30/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
0416	Trichloroethene	2/6/2018	Q1-2018	0.333	0.333	U		ug/L	F
0416	Trichloroethene	5/2/2018	Q2-2018	0.333	0.333	U		ug/L	F
0416	Trichloroethene	8/7/2018	Q3-2018	1	0.333	U		ug/L	F
0416	Turbidity	10/30/2017	Q4-2017	1.38			F	NTU	F
0416	Turbidity	2/6/2018	Q1-2018	1.84			F	NTU	F
0416	Turbidity	5/2/2018	Q2-2018	2.57				NTU	F
0416	Turbidity	8/7/2018	Q3-2018	3.99				NTU	F
0416	Vinyl chloride	10/30/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
0416	Vinyl chloride	2/6/2018	Q1-2018	0.333	0.333	U		ug/L	F
0416	Vinyl chloride	5/2/2018	Q2-2018	0.333	0.333	U		ug/L	F
0416	Vinyl chloride	8/7/2018	Q3-2018	1	0.333	U		ug/L	F
0417	Alkalinity, Total (As CaCO3)	10/30/2017	Q4-2017	404	1.45		F	mg/L	F
0417	Alkalinity, Total (As CaCO3)	2/5/2018	Q1-2018	421	0.725			mg/L	F
0417	Alkalinity, Total (As CaCO3)	5/1/2018	Q2-2018	378	1.45			mg/L	F
0417	Alkalinity, Total (As CaCO3)	8/6/2018	Q3-2018	403	1.45			mg/L	F
0417	Ammonia Total as N	10/30/2017	Q4-2017	0.017	0.017	U	F	mg/L	F
0417	Ammonia Total as N	2/5/2018	Q1-2018	0.231	0.017			mg/L	F
0417	Ammonia Total as N	5/1/2018	Q2-2018	0.0406	0.017	J		mg/L	F
0417	Ammonia Total as N	8/6/2018	Q3-2018	0.084	0.017	J		mg/L	F
0417	Carbon Dioxide	5/1/2018	Q2-2018	75				mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0417	Carbon Dioxide	8/6/2018	Q3-2018	60				mg/L	F
0417	Carbon Disulfide	10/30/2017	Q4-2017	1.67	1.67	U	F	ug/L	F
0417	Carbon Disulfide	2/5/2018	Q1-2018	1.67	1.67	U		ug/L	F
0417	Carbon Disulfide	5/1/2018	Q2-2018	1.67	1.67	U		ug/L	F
0417	Carbon Disulfide	8/6/2018	Q3-2018	5	1.67	U		ug/L	F
0417	Chloride	10/30/2017	Q4-2017	202	3.35		F	mg/L	F
0417	Chloride	2/5/2018	Q1-2018	186	0.067			mg/L	F
0417	Chloride	5/1/2018	Q2-2018	137	1.68			mg/L	F
0417	Chloride	8/6/2018	Q3-2018	204	3.35			mg/L	F
0417	cis-1,2-Dichloroethene	10/30/2017	Q4-2017	18	0.333		F	ug/L	F
0417	cis-1,2-Dichloroethene	2/5/2018	Q1-2018	16.1	0.333			ug/L	F
0417	cis-1,2-Dichloroethene	5/1/2018	Q2-2018	6.28	0.333			ug/L	F
0417	cis-1,2-Dichloroethene	8/6/2018	Q3-2018	20.1	0.333			ug/L	F
0417	Dissolved Oxygen	10/30/2017	Q4-2017	1.6			F	mg/L	F
0417	Dissolved Oxygen	2/5/2018	Q1-2018	0.4			F	mg/L	F
0417	Dissolved Oxygen	5/1/2018	Q2-2018	0.44				mg/L	F
0417	Dissolved Oxygen	8/6/2018	Q3-2018	2.26				mg/L	F
0417	Ethane	10/30/2017	Q4-2017	10	10	U	F	ug/L	F
0417	Ethane	2/5/2018	Q1-2018	10	10	U		ug/L	F
0417	Ethane	5/1/2018	Q2-2018	10	10	U		ug/L	F
0417	Ethane	8/6/2018	Q3-2018	25	10	U		ug/L	F
0417	Ethene	10/30/2017	Q4-2017	10	10	U	F	ug/L	F
0417	Ethene	2/5/2018	Q1-2018	10	10	U		ug/L	F
0417	Ethene	5/1/2018	Q2-2018	10	10	U		ug/L	F
0417	Ethene	8/6/2018	Q3-2018	25	10	U		ug/L	F
0417	Iron	10/30/2017	Q4-2017	0.175	0.03		F	mg/L	F
0417	Iron	2/5/2018	Q1-2018	0.107	0.03			mg/L	F
0417	Iron	5/1/2018	Q2-2018	0.0319	0.03	B		mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0417	Iron	8/6/2018	Q3-2018	0.215	0.03			mg/L	F
0417	Methane	10/30/2017	Q4-2017	569	50		F	ug/L	F
0417	Methane	2/5/2018	Q1-2018	1120	10			ug/L	F
0417	Methane	5/1/2018	Q2-2018	548	20	B		ug/L	F
0417	Methane	8/6/2018	Q3-2018	1700	50			ug/L	F
0417	Nitrate as Nitrogen	10/30/2017	Q4-2017	0.165	0.165	U	F	mg/L	F
0417	Nitrate as Nitrogen	2/5/2018	Q1-2018	0.165	0.033	U		mg/L	F
0417	Nitrate as Nitrogen	5/1/2018	Q2-2018	0.165	0.165	U		mg/L	F
0417	Nitrate as Nitrogen	8/6/2018	Q3-2018	0.165	0.165	U		mg/L	F
0417	Oxidation Reduction Potential	10/30/2017	Q4-2017	6.2			F	mV	F
0417	Oxidation Reduction Potential	2/5/2018	Q1-2018	43.2			F	mV	F
0417	Oxidation Reduction Potential	5/1/2018	Q2-2018	27.1				mV	F
0417	Oxidation Reduction Potential	8/6/2018	Q3-2018	24.7				mV	F
0417	pH	10/30/2017	Q4-2017	7.05			F	s.u.	F
0417	pH	2/5/2018	Q1-2018	7			F	s.u.	F
0417	pH	5/1/2018	Q2-2018	7.18				s.u.	F
0417	pH	8/6/2018	Q3-2018	7.11				s.u.	F
0417	Phosphorus	10/30/2017	Q4-2017	0.02	0.02	U	F	mg/L	F
0417	Phosphorus	2/5/2018	Q1-2018	0.02	0.02	U		mg/L	F
0417	Phosphorus	5/1/2018	Q2-2018	0.0354	0.02	J	U	mg/L	F
0417	Phosphorus	8/6/2018	Q3-2018	0.0324	0.02	J		mg/L	F
0417	Specific Conductance	10/30/2017	Q4-2017	1600			F	umhos/cm	F
0417	Specific Conductance	2/5/2018	Q1-2018	1620			F	umhos/cm	F
0417	Specific Conductance	5/1/2018	Q2-2018	1300				umhos/cm	F
0417	Specific Conductance	8/6/2018	Q3-2018	1640				umhos/cm	F
0417	Sulfate	10/30/2017	Q4-2017	129	6.65		F	mg/L	F
0417	Sulfate	2/5/2018	Q1-2018	133	0.133			mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0417	Sulfate	5/1/2018	Q2-2018	128	3.33			mg/L	F
0417	Sulfate	8/6/2018	Q3-2018	152	6.65			mg/L	F
0417	Temperature	10/30/2017	Q4-2017	15.1			F	C	F
0417	Temperature	2/5/2018	Q1-2018	13.8			F	C	F
0417	Temperature	5/1/2018	Q2-2018	12.9				C	F
0417	Temperature	8/6/2018	Q3-2018	14.8				C	F
0417	Tetrachloroethene	10/30/2017	Q4-2017	1.37	0.333		F	ug/L	F
0417	Tetrachloroethene	2/5/2018	Q1-2018	1.34	0.333			ug/L	F
0417	Tetrachloroethene	5/1/2018	Q2-2018	1.01	0.333			ug/L	F
0417	Tetrachloroethene	8/6/2018	Q3-2018	0.99	0.333	J		ug/L	F
0417	Total Organic Carbon	10/30/2017	Q4-2017	1.75	0.33		F	mg/L	F
0417	Total Organic Carbon	2/5/2018	Q1-2018	1.62	0.33			mg/L	F
0417	Total Organic Carbon	5/1/2018	Q2-2018	1.4	0.33			mg/L	F
0417	Total Organic Carbon	8/6/2018	Q3-2018	1.41	0.33			mg/L	F
0417	Trichloroethene	10/30/2017	Q4-2017	1.69	0.333		F	ug/L	F
0417	Trichloroethene	2/5/2018	Q1-2018	1.22	0.333			ug/L	F
0417	Trichloroethene	5/1/2018	Q2-2018	1.64	0.333			ug/L	F
0417	Trichloroethene	8/6/2018	Q3-2018	0.95	0.333	J		ug/L	F
0417	Turbidity	10/30/2017	Q4-2017	0.08			F	NTU	F
0417	Turbidity	2/5/2018	Q1-2018	1.68			F	NTU	F
0417	Turbidity	5/1/2018	Q2-2018	7.08				NTU	F
0417	Turbidity	8/6/2018	Q3-2018	24.7				NTU	F
0417	Vinyl chloride	10/30/2017	Q4-2017	3.74	0.333		F	ug/L	F
0417	Vinyl chloride	2/5/2018	Q1-2018	5.53	0.333			ug/L	F
0417	Vinyl chloride	5/1/2018	Q2-2018	0.333	0.333	U		ug/L	F
0417	Vinyl chloride	8/6/2018	Q3-2018	5.52	0.333			ug/L	F
0418	Alkalinity, Total (As CaCO3)	10/31/2017	Q4-2017	423	1.45		F	mg/L	F
0418	Alkalinity, Total (As CaCO3)	2/5/2018	Q1-2018	436	0.725			mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0418	Alkalinity, Total (As CaCO3)	5/1/2018	Q2-2018	455	1.45			mg/L	F
0418	Alkalinity, Total (As CaCO3)	8/6/2018	Q3-2018	402	1.45			mg/L	F
0418	Ammonia Total as N	10/31/2017	Q4-2017	0.0578	0.017	J	UF	mg/L	F
0418	Ammonia Total as N	2/5/2018	Q1-2018	0.0764	0.017	J		mg/L	F
0418	Ammonia Total as N	5/1/2018	Q2-2018	0.0538	0.017	J		mg/L	F
0418	Ammonia Total as N	8/6/2018	Q3-2018	0.0694	0.017	J		mg/L	F
0418	Carbon Dioxide	5/1/2018	Q2-2018	100			>	mg/L	F
0418	Carbon Dioxide	8/6/2018	Q3-2018	100			>	mg/L	F
0418	Carbon Disulfide	10/31/2017	Q4-2017	1.67	1.67	U	F	ug/L	F
0418	Carbon Disulfide	2/5/2018	Q1-2018	1.67	1.67	U		ug/L	F
0418	Carbon Disulfide	5/1/2018	Q2-2018	1.67	1.67	U		ug/L	F
0418	Carbon Disulfide	8/6/2018	Q3-2018	5	1.67	U		ug/L	F
0418	Chloride	10/31/2017	Q4-2017	141	1.34		F	mg/L	F
0418	Chloride	2/5/2018	Q1-2018	99.6	0.067			mg/L	F
0418	Chloride	5/1/2018	Q2-2018	125	1.34			mg/L	F
0418	Chloride	8/6/2018	Q3-2018	142	1.68			mg/L	F
0418	cis-1,2-Dichloroethene	10/31/2017	Q4-2017	6.06	0.333		F	ug/L	F
0418	cis-1,2-Dichloroethene	2/5/2018	Q1-2018	5.66	0.333			ug/L	F
0418	cis-1,2-Dichloroethene	5/1/2018	Q2-2018	3.09	0.333			ug/L	F
0418	cis-1,2-Dichloroethene	8/6/2018	Q3-2018	6.17	0.333			ug/L	F
0418	Dissolved Oxygen	10/31/2017	Q4-2017	2.23			F	mg/L	F
0418	Dissolved Oxygen	2/5/2018	Q1-2018	0.61			F	mg/L	F
0418	Dissolved Oxygen	5/1/2018	Q2-2018	1.26				mg/L	F
0418	Dissolved Oxygen	8/6/2018	Q3-2018	1.04				mg/L	F
0418	Ethane	10/31/2017	Q4-2017	10	10	U	F	ug/L	F
0418	Ethane	2/5/2018	Q1-2018	10	10	U		ug/L	F
0418	Ethane	5/1/2018	Q2-2018	10	10	U		ug/L	F
0418	Ethane	8/6/2018	Q3-2018	25	10	U		ug/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0418	Ethene	10/31/2017	Q4-2017	10	10	U	F	ug/L	F
0418	Ethene	2/5/2018	Q1-2018	10	10	U		ug/L	F
0418	Ethene	5/1/2018	Q2-2018	10	10	U		ug/L	F
0418	Ethene	8/6/2018	Q3-2018	25	10	U		ug/L	F
0418	Iron	10/31/2017	Q4-2017	0.294	0.03		F	mg/L	F
0418	Iron	2/5/2018	Q1-2018	0.111	0.03			mg/L	F
0418	Iron	5/1/2018	Q2-2018	0.0939	0.03	B		mg/L	F
0418	Iron	8/6/2018	Q3-2018	0.478	0.03			mg/L	F
0418	Methane	10/31/2017	Q4-2017	317	10		F	ug/L	F
0418	Methane	2/5/2018	Q1-2018	23.9	10	J		ug/L	F
0418	Methane	5/1/2018	Q2-2018	16.5	10	BJ	U	ug/L	F
0418	Methane	8/6/2018	Q3-2018	109	10			ug/L	F
0418	Nitrate as Nitrogen	10/31/2017	Q4-2017	0.066	0.066	U	F	mg/L	F
0418	Nitrate as Nitrogen	2/5/2018	Q1-2018	0.737	0.033			mg/L	F
0418	Nitrate as Nitrogen	5/1/2018	Q2-2018	1.39	0.165			mg/L	F
0418	Nitrate as Nitrogen	8/6/2018	Q3-2018	0.165	0.165	U		mg/L	F
0418	Oxidation Reduction Potential	10/31/2017	Q4-2017	30.2			F	mV	F
0418	Oxidation Reduction Potential	2/5/2018	Q1-2018	89.7			F	mV	F
0418	Oxidation Reduction Potential	5/1/2018	Q2-2018	70.3				mV	F
0418	Oxidation Reduction Potential	8/6/2018	Q3-2018	69.7				mV	F
0418	pH	10/31/2017	Q4-2017	6.99			F	s.u.	F
0418	pH	2/5/2018	Q1-2018	6.49			F	s.u.	F
0418	pH	5/1/2018	Q2-2018	6.49				s.u.	F
0418	pH	8/6/2018	Q3-2018	6.25				s.u.	F
0418	Phosphorus	10/31/2017	Q4-2017	0.0565	0.02		UF	mg/L	F
0418	Phosphorus	2/5/2018	Q1-2018	0.025	0.02	J	U	mg/L	F
0418	Phosphorus	5/1/2018	Q2-2018	0.02	0.02	U		mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0418	Phosphorus	8/6/2018	Q3-2018	0.0399	0.02	J		mg/L	F
0418	Specific Conductance	10/31/2017	Q4-2017	1450			F	umhos/cm	F
0418	Specific Conductance	2/5/2018	Q1-2018	1360			F	umhos/cm	F
0418	Specific Conductance	5/1/2018	Q2-2018	1400				umhos/cm	F
0418	Specific Conductance	8/6/2018	Q3-2018	1460				umhos/cm	F
0418	Sulfate	10/31/2017	Q4-2017	157	2.66		F	mg/L	F
0418	Sulfate	2/5/2018	Q1-2018	147	0.133			mg/L	F
0418	Sulfate	5/1/2018	Q2-2018	119	2.66			mg/L	F
0418	Sulfate	8/6/2018	Q3-2018	178	3.33			mg/L	F
0418	Temperature	10/31/2017	Q4-2017	14.6			F	C	F
0418	Temperature	2/5/2018	Q1-2018	14.7			F	C	F
0418	Temperature	5/1/2018	Q2-2018	14.8				C	F
0418	Temperature	8/6/2018	Q3-2018	16				C	F
0418	Tetrachloroethene	10/31/2017	Q4-2017	3.27	0.333		F	ug/L	F
0418	Tetrachloroethene	2/5/2018	Q1-2018	3.45	0.333			ug/L	F
0418	Tetrachloroethene	5/1/2018	Q2-2018	2.91	0.333			ug/L	F
0418	Tetrachloroethene	8/6/2018	Q3-2018	2.97	0.333			ug/L	F
0418	Total Organic Carbon	10/31/2017	Q4-2017	2.11	0.33		F	mg/L	F
0418	Total Organic Carbon	2/5/2018	Q1-2018	2.09	0.33			mg/L	F
0418	Total Organic Carbon	5/1/2018	Q2-2018	1.52	0.33			mg/L	F
0418	Total Organic Carbon	8/6/2018	Q3-2018	1.86	0.33			mg/L	F
0418	Trichloroethene	10/31/2017	Q4-2017	4.71	0.333		F	ug/L	F
0418	Trichloroethene	2/5/2018	Q1-2018	5.92	0.333			ug/L	F
0418	Trichloroethene	5/1/2018	Q2-2018	5.33	0.333			ug/L	F
0418	Trichloroethene	8/6/2018	Q3-2018	4.01	0.333			ug/L	F
0418	Turbidity	10/31/2017	Q4-2017	41.6			F	NTU	F
0418	Turbidity	2/5/2018	Q1-2018	19.5			F	NTU	F
0418	Turbidity	5/1/2018	Q2-2018	13.6				NTU	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0418	Turbidity	8/6/2018	Q3-2018	54.7				NTU	F
0418	Vinyl chloride	10/31/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
0418	Vinyl chloride	2/5/2018	Q1-2018	0.333	0.333	U		ug/L	F
0418	Vinyl chloride	5/1/2018	Q2-2018	0.333	0.333	U		ug/L	F
0418	Vinyl chloride	8/6/2018	Q3-2018	1	0.333	U		ug/L	F
0419	Alkalinity, Total (As CaCO3)	10/31/2017	Q4-2017	388	1.45		F	mg/L	F
0419	Alkalinity, Total (As CaCO3)	2/5/2018	Q1-2018	403	0.725			mg/L	F
0419	Alkalinity, Total (As CaCO3)	4/30/2018	Q2-2018	424	1.45			mg/L	F
0419	Alkalinity, Total (As CaCO3)	8/6/2018	Q3-2018	398	1.45			mg/L	F
0419	Ammonia Total as N	10/31/2017	Q4-2017	0.286	0.017		F	mg/L	F
0419	Ammonia Total as N	2/5/2018	Q1-2018	0.348	0.017			mg/L	F
0419	Ammonia Total as N	4/30/2018	Q2-2018	0.389	0.017			mg/L	F
0419	Ammonia Total as N	8/6/2018	Q3-2018	0.395	0.017			mg/L	F
0419	Carbon Dioxide	4/30/2018	Q2-2018	100				mg/L	F
0419	Carbon Dioxide	8/6/2018	Q3-2018	90				mg/L	F
0419	Carbon Disulfide	10/31/2017	Q4-2017	1.67	1.67	U	F	ug/L	F
0419	Carbon Disulfide	2/5/2018	Q1-2018	1.67	1.67	U		ug/L	F
0419	Carbon Disulfide	4/30/2018	Q2-2018	1.67	1.67	U		ug/L	F
0419	Carbon Disulfide	8/6/2018	Q3-2018	5	1.67	U		ug/L	F
0419	Chloride	10/31/2017	Q4-2017	163	3.35		F	mg/L	F
0419	Chloride	2/5/2018	Q1-2018	153	0.067			mg/L	F
0419	Chloride	4/30/2018	Q2-2018	187	2.68			mg/L	F
0419	Chloride	8/6/2018	Q3-2018	177	1.68			mg/L	F
0419	cis-1,2-Dichloroethene	10/31/2017	Q4-2017	4.77	0.333		F	ug/L	F
0419	cis-1,2-Dichloroethene	2/5/2018	Q1-2018	4.36	0.333			ug/L	F
0419	cis-1,2-Dichloroethene	4/30/2018	Q2-2018	3.38	0.333			ug/L	F
0419	cis-1,2-Dichloroethene	8/6/2018	Q3-2018	0.91	0.333	J		ug/L	F
0419	Dissolved Oxygen	10/31/2017	Q4-2017	1.32			F	mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0419	Dissolved Oxygen	2/5/2018	Q1-2018	0.69			F	mg/L	F
0419	Dissolved Oxygen	4/30/2018	Q2-2018	0.16				mg/L	F
0419	Dissolved Oxygen	8/6/2018	Q3-2018	0.67				mg/L	F
0419	Ethane	10/31/2017	Q4-2017	10	10	U	F	ug/L	F
0419	Ethane	2/5/2018	Q1-2018	10	10	U		ug/L	F
0419	Ethane	4/30/2018	Q2-2018	10	10	U		ug/L	F
0419	Ethane	8/6/2018	Q3-2018	25	10	U		ug/L	F
0419	Ethene	10/31/2017	Q4-2017	10	10	U	F	ug/L	F
0419	Ethene	2/5/2018	Q1-2018	10	10	U		ug/L	F
0419	Ethene	4/30/2018	Q2-2018	10	10	U		ug/L	F
0419	Ethene	8/6/2018	Q3-2018	25	10	U		ug/L	F
0419	Iron	10/31/2017	Q4-2017	9.09	0.03		F	mg/L	F
0419	Iron	2/5/2018	Q1-2018	8.55	0.03			mg/L	F
0419	Iron	4/30/2018	Q2-2018	7.67	0.03			mg/L	F
0419	Iron	8/6/2018	Q3-2018	9.87	0.03			mg/L	F
0419	Methane	10/31/2017	Q4-2017	1290	50		F	ug/L	F
0419	Methane	2/5/2018	Q1-2018	1190	10			ug/L	F
0419	Methane	4/30/2018	Q2-2018	780	20	B		ug/L	F
0419	Methane	8/6/2018	Q3-2018	1880	100			ug/L	F
0419	Nitrate as Nitrogen	10/31/2017	Q4-2017	0.066	0.066	U	F	mg/L	F
0419	Nitrate as Nitrogen	2/5/2018	Q1-2018	0.825	0.033	U		mg/L	F
0419	Nitrate as Nitrogen	4/30/2018	Q2-2018	0.165	0.165	U		mg/L	F
0419	Nitrate as Nitrogen	8/6/2018	Q3-2018	0.165	0.165	U		mg/L	F
0419	Oxidation Reduction Potential	10/31/2017	Q4-2017	-100.1			F	mV	F
0419	Oxidation Reduction Potential	2/5/2018	Q1-2018	-101.4			F	mV	F
0419	Oxidation Reduction Potential	4/30/2018	Q2-2018	-105.7				mV	F
0419	Oxidation Reduction Potential	8/6/2018	Q3-2018	-140.6				mV	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0419	pH	10/31/2017	Q4-2017	7.17			F	s.u.	F
0419	pH	2/5/2018	Q1-2018	7.16			F	s.u.	F
0419	pH	4/30/2018	Q2-2018	7				s.u.	F
0419	pH	8/6/2018	Q3-2018	7.31				s.u.	F
0419	Phosphorus	10/31/2017	Q4-2017	0.0512	0.02		UF	mg/L	F
0419	Phosphorus	2/5/2018	Q1-2018	0.0249	0.02	J	U	mg/L	F
0419	Phosphorus	4/30/2018	Q2-2018	0.0333	0.02	J	U	mg/L	F
0419	Phosphorus	8/6/2018	Q3-2018	0.0316	0.02	J		mg/L	F
0419	Specific Conductance	10/31/2017	Q4-2017	1610			F	umhos/cm	F
0419	Specific Conductance	2/5/2018	Q1-2018	1540			F	umhos/cm	F
0419	Specific Conductance	4/30/2018	Q2-2018	1570				umhos/cm	F
0419	Specific Conductance	8/6/2018	Q3-2018	1740				umhos/cm	F
0419	Sulfate	10/31/2017	Q4-2017	200	6.65		F	mg/L	F
0419	Sulfate	2/5/2018	Q1-2018	195	0.133			mg/L	F
0419	Sulfate	4/30/2018	Q2-2018	170	5.32			mg/L	F
0419	Sulfate	8/6/2018	Q3-2018	260	3.33			mg/L	F
0419	Temperature	10/31/2017	Q4-2017	14.6			F	C	F
0419	Temperature	2/5/2018	Q1-2018	13.8			F	C	F
0419	Temperature	4/30/2018	Q2-2018	14.9				C	F
0419	Temperature	8/6/2018	Q3-2018	15.7				C	F
0419	Tetrachloroethene	10/31/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
0419	Tetrachloroethene	2/5/2018	Q1-2018	0.333	0.333	U		ug/L	F
0419	Tetrachloroethene	4/30/2018	Q2-2018	0.333	0.333	U		ug/L	F
0419	Tetrachloroethene	8/6/2018	Q3-2018	1	0.333	U		ug/L	F
0419	Total Organic Carbon	10/31/2017	Q4-2017	2.12	0.33		F	mg/L	F
0419	Total Organic Carbon	2/5/2018	Q1-2018	2.27	0.33			mg/L	F
0419	Total Organic Carbon	4/30/2018	Q2-2018	1.86	0.33			mg/L	F
0419	Total Organic Carbon	8/6/2018	Q3-2018	2.11	0.33			mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0419	Trichloroethene	10/31/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
0419	Trichloroethene	2/5/2018	Q1-2018	0.333	0.333	U		ug/L	F
0419	Trichloroethene	4/30/2018	Q2-2018	0.333	0.333	U		ug/L	F
0419	Trichloroethene	8/6/2018	Q3-2018	1	0.333	U		ug/L	F
0419	Turbidity	10/31/2017	Q4-2017	0.11			F	NTU	F
0419	Turbidity	2/5/2018	Q1-2018	1.12			F	NTU	F
0419	Turbidity	4/30/2018	Q2-2018	0.57				NTU	F
0419	Turbidity	8/6/2018	Q3-2018	1.11				NTU	F
0419	Vinyl chloride	10/31/2017	Q4-2017	2.71	0.333		F	ug/L	F
0419	Vinyl chloride	2/5/2018	Q1-2018	2.55	0.333			ug/L	F
0419	Vinyl chloride	4/30/2018	Q2-2018	0.333	0.333	U		ug/L	F
0419	Vinyl chloride	8/6/2018	Q3-2018	0.51	0.333	J		ug/L	F
0422	Alkalinity, Total (As CaCO3)	10/31/2017	Q4-2017	400	1.45		F	mg/L	F
0422	Alkalinity, Total (As CaCO3)	2/8/2018	Q1-2018	403	0.725			mg/L	F
0422	Alkalinity, Total (As CaCO3)	5/2/2018	Q2-2018	389	1.45			mg/L	F
0422	Alkalinity, Total (As CaCO3)	8/7/2018	Q3-2018	405	1.45			mg/L	F
0422	Carbon Dioxide	5/2/2018	Q2-2018	N/A				mg/L	F
0422	Carbon Dioxide	8/7/2018	Q3-2018	100			>	mg/L	F
0422	Carbon Disulfide	10/31/2017	Q4-2017	1.67	1.67	U	F	ug/L	F
0422	Carbon Disulfide	2/8/2018	Q1-2018	1.67	1.67	U		ug/L	F
0422	Carbon Disulfide	5/2/2018	Q2-2018	1.67	1.67	U		ug/L	F
0422	Carbon Disulfide	8/7/2018	Q3-2018	5	1.67	U		ug/L	F
0422	Chloride	10/31/2017	Q4-2017	221	3.35		F	mg/L	F
0422	Chloride	2/8/2018	Q1-2018	230	0.067			mg/L	F
0422	Chloride	5/2/2018	Q2-2018	211	3.35			mg/L	F
0422	Chloride	8/7/2018	Q3-2018	245	3.35			mg/L	F
0422	cis-1,2-Dichloroethene	10/31/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
0422	cis-1,2-Dichloroethene	2/8/2018	Q1-2018	0.333	0.333	U		ug/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0422	cis-1,2-Dichloroethene	5/2/2018	Q2-2018	0.333	0.333	U		ug/L	F
0422	cis-1,2-Dichloroethene	8/7/2018	Q3-2018	1.37	0.333			ug/L	F
0422	Dissolved Oxygen	10/31/2017	Q4-2017	0.65			F	mg/L	F
0422	Dissolved Oxygen	2/8/2018	Q1-2018	0.45			F	mg/L	F
0422	Dissolved Oxygen	5/2/2018	Q2-2018	0.69				mg/L	F
0422	Dissolved Oxygen	8/7/2018	Q3-2018	1.14				mg/L	F
0422	Iron	10/31/2017	Q4-2017	0.0315	0.03	B	F	mg/L	F
0422	Iron	2/8/2018	Q1-2018	0.288	0.03			mg/L	F
0422	Iron	5/2/2018	Q2-2018	0.0396	0.03	B		mg/L	F
0422	Iron	8/7/2018	Q3-2018	0.186	0.03			mg/L	F
0422	Nitrate as Nitrogen	10/31/2017	Q4-2017	0.239	0.066		F	mg/L	F
0422	Nitrate as Nitrogen	2/8/2018	Q1-2018	0.358	0.033	J		mg/L	F
0422	Nitrate as Nitrogen	5/2/2018	Q2-2018	0.418	0.165	J		mg/L	F
0422	Nitrate as Nitrogen	8/7/2018	Q3-2018	0.343	0.165	J		mg/L	F
0422	Oxidation Reduction Potential	10/31/2017	Q4-2017	85.9			F	mV	F
0422	Oxidation Reduction Potential	2/8/2018	Q1-2018	75.9			F	mV	F
0422	Oxidation Reduction Potential	5/2/2018	Q2-2018	13.9				mV	F
0422	Oxidation Reduction Potential	8/7/2018	Q3-2018	160.8				mV	F
0422	pH	10/31/2017	Q4-2017	6.8			F	s.u.	F
0422	pH	2/8/2018	Q1-2018	6.25			F	s.u.	F
0422	pH	5/2/2018	Q2-2018	6.64				s.u.	F
0422	pH	8/7/2018	Q3-2018	6.32				s.u.	F
0422	Phosphorus	10/31/2017	Q4-2017	0.0536	0.02		UF	mg/L	F
0422	Phosphorus	2/8/2018	Q1-2018	0.0385	0.02	J	U	mg/L	F
0422	Phosphorus	5/2/2018	Q2-2018	0.02	0.02	U		mg/L	F
0422	Phosphorus	8/7/2018	Q3-2018	0.0373	0.02	J		mg/L	F
0422	Specific Conductance	10/31/2017	Q4-2017	1640			F	umhos/cm	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0422	Specific Conductance	2/8/2018	Q1-2018	1680			F	umhos/cm	F
0422	Specific Conductance	5/2/2018	Q2-2018	1580				umhos/cm	F
0422	Specific Conductance	8/7/2018	Q3-2018	1710				umhos/cm	F
0422	Sulfate	10/31/2017	Q4-2017	110	6.65		F	mg/L	F
0422	Sulfate	2/8/2018	Q1-2018	107	0.133			mg/L	F
0422	Sulfate	5/2/2018	Q2-2018	114	6.65			mg/L	F
0422	Sulfate	8/7/2018	Q3-2018	110	6.65			mg/L	F
0422	Temperature	10/31/2017	Q4-2017	13.9			F	C	F
0422	Temperature	2/8/2018	Q1-2018	13.4			F	C	F
0422	Temperature	5/2/2018	Q2-2018	14.9				C	F
0422	Temperature	8/7/2018	Q3-2018	16				C	F
0422	Tetrachloroethene	10/31/2017	Q4-2017	3	0.333		F	ug/L	F
0422	Tetrachloroethene	2/8/2018	Q1-2018	3.08	0.333			ug/L	F
0422	Tetrachloroethene	5/2/2018	Q2-2018	2.48	0.333			ug/L	F
0422	Tetrachloroethene	8/7/2018	Q3-2018	2.41	0.333			ug/L	F
0422	Trichloroethene	10/31/2017	Q4-2017	1.55	0.333		F	ug/L	F
0422	Trichloroethene	2/8/2018	Q1-2018	1.83	0.333			ug/L	F
0422	Trichloroethene	5/2/2018	Q2-2018	1.6	0.333			ug/L	F
0422	Trichloroethene	8/7/2018	Q3-2018	1.76	0.333			ug/L	F
0422	Turbidity	10/31/2017	Q4-2017	1.53			F	NTU	F
0422	Turbidity	2/8/2018	Q1-2018	3.86			F	NTU	F
0422	Turbidity	5/2/2018	Q2-2018	2.25				NTU	F
0422	Turbidity	8/7/2018	Q3-2018	3.82				NTU	F
0422	Vinyl chloride	10/31/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
0422	Vinyl chloride	2/8/2018	Q1-2018	0.333	0.333	U		ug/L	F
0422	Vinyl chloride	5/2/2018	Q2-2018	0.333	0.333	U		ug/L	F
0422	Vinyl chloride	8/7/2018	Q3-2018	1	0.333	U		ug/L	F
0423	Alkalinity, Total (As CaCO3)	10/31/2017	Q4-2017	425	1.45		F	mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0423	Alkalinity, Total (As CaCO3)	2/8/2018	Q1-2018	446	0.725			mg/L	F
0423	Alkalinity, Total (As CaCO3)	5/2/2018	Q2-2018	422	1.45			mg/L	F
0423	Alkalinity, Total (As CaCO3)	8/7/2018	Q3-2018	435	1.45			mg/L	F
0423	Carbon Dioxide	5/2/2018	Q2-2018	N/A				mg/L	F
0423	Carbon Dioxide	8/7/2018	Q3-2018	100			>	mg/L	F
0423	Carbon Disulfide	10/31/2017	Q4-2017	1.67	1.67	U	F	ug/L	F
0423	Carbon Disulfide	2/8/2018	Q1-2018	1.67	1.67	U		ug/L	F
0423	Carbon Disulfide	5/2/2018	Q2-2018	1.67	1.67	U		ug/L	F
0423	Carbon Disulfide	8/7/2018	Q3-2018	5	1.67	U		ug/L	F
0423	Chloride	10/31/2017	Q4-2017	194	3.35		F	mg/L	F
0423	Chloride	2/8/2018	Q1-2018	184	0.067			mg/L	F
0423	Chloride	5/2/2018	Q2-2018	178	1.68			mg/L	F
0423	Chloride	8/7/2018	Q3-2018	223	3.35			mg/L	F
0423	cis-1,2-Dichloroethene	10/31/2017	Q4-2017	0.87	0.333	J	F	ug/L	F
0423	cis-1,2-Dichloroethene	2/8/2018	Q1-2018	1.26	0.333			ug/L	F
0423	cis-1,2-Dichloroethene	5/2/2018	Q2-2018	0.7	0.333	J		ug/L	F
0423	cis-1,2-Dichloroethene	8/7/2018	Q3-2018	1	0.333	U		ug/L	F
0423	Dissolved Oxygen	10/31/2017	Q4-2017	0.6			F	mg/L	F
0423	Dissolved Oxygen	2/8/2018	Q1-2018	4.22			F	mg/L	F
0423	Dissolved Oxygen	5/2/2018	Q2-2018	2.66				mg/L	F
0423	Dissolved Oxygen	8/7/2018	Q3-2018	1.8				mg/L	F
0423	Iron	10/31/2017	Q4-2017	0.03	0.03	U	F	mg/L	F
0423	Iron	2/8/2018	Q1-2018	0.03	0.03	U		mg/L	F
0423	Iron	5/2/2018	Q2-2018	0.03	0.03	U		mg/L	F
0423	Iron	8/7/2018	Q3-2018	0.261	0.03			mg/L	F
0423	Nitrate as Nitrogen	10/31/2017	Q4-2017	0.133	0.066	J	F	mg/L	F
0423	Nitrate as Nitrogen	2/8/2018	Q1-2018	0.165	0.033	U		mg/L	F
0423	Nitrate as Nitrogen	5/2/2018	Q2-2018	0.165	0.165	U		mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0423	Nitrate as Nitrogen	8/7/2018	Q3-2018	0.165	0.165	U		mg/L	F
0423	Oxidation Reduction Potential	10/31/2017	Q4-2017	77.9			F	mV	F
0423	Oxidation Reduction Potential	2/8/2018	Q1-2018	38.9			F	mV	F
0423	Oxidation Reduction Potential	5/2/2018	Q2-2018	-13.7				mV	F
0423	Oxidation Reduction Potential	8/7/2018	Q3-2018	3.1				mV	F
0423	pH	10/31/2017	Q4-2017	7.01			F	s.u.	F
0423	pH	2/8/2018	Q1-2018	7.04			F	s.u.	F
0423	pH	5/2/2018	Q2-2018	7.02				s.u.	F
0423	pH	8/7/2018	Q3-2018	6.99				s.u.	F
0423	Phosphorus	10/31/2017	Q4-2017	0.0537	0.02		UF	mg/L	F
0423	Phosphorus	2/8/2018	Q1-2018	0.0424	0.02	J	U	mg/L	F
0423	Phosphorus	5/2/2018	Q2-2018	0.02	0.02	U		mg/L	F
0423	Phosphorus	8/7/2018	Q3-2018	0.0347	0.02	J		mg/L	F
0423	Specific Conductance	10/31/2017	Q4-2017	1590			F	umhos/cm	F
0423	Specific Conductance	2/8/2018	Q1-2018	1600			F	umhos/cm	F
0423	Specific Conductance	5/2/2018	Q2-2018	1500				umhos/cm	F
0423	Specific Conductance	8/7/2018	Q3-2018	1680				umhos/cm	F
0423	Sulfate	10/31/2017	Q4-2017	117	6.65		F	mg/L	F
0423	Sulfate	2/8/2018	Q1-2018	115	0.133			mg/L	F
0423	Sulfate	5/2/2018	Q2-2018	127	3.33			mg/L	F
0423	Sulfate	8/7/2018	Q3-2018	117	6.65			mg/L	F
0423	Temperature	10/31/2017	Q4-2017	14			F	C	F
0423	Temperature	2/8/2018	Q1-2018	12.5			F	C	F
0423	Temperature	5/2/2018	Q2-2018	14.1				C	F
0423	Temperature	8/7/2018	Q3-2018	14.9				C	F
0423	Tetrachloroethene	10/31/2017	Q4-2017	2.38	0.333		F	ug/L	F
0423	Tetrachloroethene	2/8/2018	Q1-2018	2.48	0.333			ug/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0423	Tetrachloroethene	5/2/2018	Q2-2018	2.36	0.333			ug/L	F
0423	Tetrachloroethene	8/7/2018	Q3-2018	2.99	0.333			ug/L	F
0423	Trichloroethene	10/31/2017	Q4-2017	1.75	0.333		F	ug/L	F
0423	Trichloroethene	2/8/2018	Q1-2018	1.91	0.333			ug/L	F
0423	Trichloroethene	5/2/2018	Q2-2018	1.89	0.333			ug/L	F
0423	Trichloroethene	8/7/2018	Q3-2018	1.2	0.333			ug/L	F
0423	Turbidity	10/31/2017	Q4-2017	0.11			F	NTU	F
0423	Turbidity	2/8/2018	Q1-2018	1.79			F	NTU	F
0423	Turbidity	5/2/2018	Q2-2018	1.06				NTU	F
0423	Turbidity	8/7/2018	Q3-2018	1.12				NTU	F
0423	Vinyl chloride	10/31/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
0423	Vinyl chloride	2/8/2018	Q1-2018	0.333	0.333	U		ug/L	F
0423	Vinyl chloride	5/2/2018	Q2-2018	0.333	0.333	U		ug/L	F
0423	Vinyl chloride	8/7/2018	Q3-2018	1	0.333	U		ug/L	F
0424	Alkalinity, Total (As CaCO3)	10/31/2017	Q4-2017	352	1.45		F	mg/L	F
0424	Alkalinity, Total (As CaCO3)	2/6/2018	Q1-2018	361	0.725			mg/L	F
0424	Alkalinity, Total (As CaCO3)	5/3/2018	Q2-2018	362	1.45			mg/L	F
0424	Alkalinity, Total (As CaCO3)	8/8/2018	Q3-2018	359	1.45			mg/L	F
0424	Carbon Dioxide	5/3/2018	Q2-2018	NA				mg/L	F
0424	Carbon Dioxide	8/8/2018	Q3-2018	NA				mg/L	F
0424	Carbon Disulfide	10/31/2017	Q4-2017	1.67	1.67	U	F	ug/L	F
0424	Carbon Disulfide	2/6/2018	Q1-2018	1.67	1.67	U		ug/L	F
0424	Carbon Disulfide	5/3/2018	Q2-2018	1.67	1.67	U		ug/L	F
0424	Carbon Disulfide	8/8/2018	Q3-2018	5	1.67	U		ug/L	F
0424	Chloride	10/31/2017	Q4-2017	132	3.35	H	JF	mg/L	F
0424	Chloride	2/6/2018	Q1-2018	153	0.067			mg/L	F
0424	Chloride	5/3/2018	Q2-2018	139	3.35			mg/L	F
0424	Chloride	8/8/2018	Q3-2018	167	1.68			mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0424	cis-1,2-Dichloroethene	10/31/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
0424	cis-1,2-Dichloroethene	2/6/2018	Q1-2018	0.333	0.333	U		ug/L	F
0424	cis-1,2-Dichloroethene	5/3/2018	Q2-2018	0.333	0.333	U		ug/L	F
0424	cis-1,2-Dichloroethene	8/8/2018	Q3-2018	1	0.333	U		ug/L	F
0424	Dissolved Oxygen	10/31/2017	Q4-2017	0.33			F	mg/L	F
0424	Dissolved Oxygen	2/6/2018	Q1-2018	1.31			F	mg/L	F
0424	Dissolved Oxygen	5/3/2018	Q2-2018	1.45				mg/L	F
0424	Dissolved Oxygen	8/8/2018	Q3-2018	6.03				mg/L	F
0424	Iron	10/31/2017	Q4-2017	0.03	0.03	U	F	mg/L	F
0424	Iron	2/6/2018	Q1-2018	0.03	0.03	U		mg/L	F
0424	Iron	5/3/2018	Q2-2018	0.03	0.03	U		mg/L	F
0424	Iron	8/8/2018	Q3-2018	0.03	0.03	U		mg/L	F
0424	Nitrate as Nitrogen	10/31/2017	Q4-2017	0.379	0.066		F	mg/L	F
0424	Nitrate as Nitrogen	2/6/2018	Q1-2018	0.404	0.033	J		mg/L	F
0424	Nitrate as Nitrogen	5/3/2018	Q2-2018	0.437	0.165	J		mg/L	F
0424	Nitrate as Nitrogen	8/8/2018	Q3-2018	0.34	0.165	J		mg/L	F
0424	Oxidation Reduction Potential	10/31/2017	Q4-2017	123.3			F	mV	F
0424	Oxidation Reduction Potential	2/6/2018	Q1-2018	111.6			F	mV	F
0424	Oxidation Reduction Potential	5/3/2018	Q2-2018	43.1				mV	F
0424	Oxidation Reduction Potential	8/8/2018	Q3-2018	143.4				mV	F
0424	pH	10/31/2017	Q4-2017	7.33			F	s.u.	F
0424	pH	2/6/2018	Q1-2018	7.38			F	s.u.	F
0424	pH	5/3/2018	Q2-2018	7.22				s.u.	F
0424	pH	8/8/2018	Q3-2018	7.01				s.u.	F
0424	Phosphorus	10/31/2017	Q4-2017	0.0434	0.02	J	UF	mg/L	F
0424	Phosphorus	2/6/2018	Q1-2018	0.0234	0.02	J	U	mg/L	F
0424	Phosphorus	5/3/2018	Q2-2018	0.0366	0.02	J	U	mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0424	Phosphorus	8/8/2018	Q3-2018	0.0269	0.02	J		mg/L	F
0424	Specific Conductance	10/31/2017	Q4-2017	1280			F	umhos/cm	F
0424	Specific Conductance	2/6/2018	Q1-2018	1350			F	umhos/cm	F
0424	Specific Conductance	5/3/2018	Q2-2018	1320				umhos/cm	F
0424	Specific Conductance	8/8/2018	Q3-2018	1360				umhos/cm	F
0424	Sulfate	10/31/2017	Q4-2017	118	6.65	H	JF	mg/L	F
0424	Sulfate	2/6/2018	Q1-2018	108	0.133			mg/L	F
0424	Sulfate	5/3/2018	Q2-2018	120	6.65			mg/L	F
0424	Sulfate	8/8/2018	Q3-2018	102	3.33			mg/L	F
0424	Temperature	10/31/2017	Q4-2017	13.8			F	C	F
0424	Temperature	2/6/2018	Q1-2018	12.1			F	C	F
0424	Temperature	5/3/2018	Q2-2018	13.5				C	F
0424	Temperature	8/8/2018	Q3-2018	15.1				C	F
0424	Tetrachloroethene	10/31/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
0424	Tetrachloroethene	2/6/2018	Q1-2018	0.333	0.333	U		ug/L	F
0424	Tetrachloroethene	5/3/2018	Q2-2018	0.333	0.333	U		ug/L	F
0424	Tetrachloroethene	8/8/2018	Q3-2018	1	0.333	U		ug/L	F
0424	Trichloroethene	10/31/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
0424	Trichloroethene	2/6/2018	Q1-2018	0.333	0.333	U		ug/L	F
0424	Trichloroethene	5/3/2018	Q2-2018	0.333	0.333	U		ug/L	F
0424	Trichloroethene	8/8/2018	Q3-2018	1	0.333	U		ug/L	F
0424	Turbidity	10/31/2017	Q4-2017	0.53			F	NTU	F
0424	Turbidity	2/6/2018	Q1-2018	0.75			F	NTU	F
0424	Turbidity	5/3/2018	Q2-2018	0.79				NTU	F
0424	Turbidity	8/8/2018	Q3-2018	1.23				NTU	F
0424	Vinyl chloride	10/31/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
0424	Vinyl chloride	2/6/2018	Q1-2018	0.333	0.333	U		ug/L	F
0424	Vinyl chloride	5/3/2018	Q2-2018	0.333	0.333	U		ug/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0424	Vinyl chloride	8/8/2018	Q3-2018	1	0.333	U		ug/L	F
0425	Alkalinity, Total (As CaCO3)	11/1/2017	Q4-2017	481	1.45		F	mg/L	F
0425	Alkalinity, Total (As CaCO3)	2/6/2018	Q1-2018	439	0.725			mg/L	D
0425	Alkalinity, Total (As CaCO3)	5/3/2018	Q2-2018	392	1.45			mg/L	F
0425	Alkalinity, Total (As CaCO3)	8/8/2018	Q3-2018	463	1.45			mg/L	F
0425	Carbon Dioxide	5/3/2018	Q2-2018	NA				mg/L	D
0425	Carbon Dioxide	8/8/2018	Q3-2018	NA				mg/L	F
0425	Carbon Disulfide	11/1/2017	Q4-2017	1.67	1.67	U	F	ug/L	F
0425	Carbon Disulfide	2/6/2018	Q1-2018	1.67	1.67	U		ug/L	D
0425	Carbon Disulfide	5/3/2018	Q2-2018	1.67	1.67	U		ug/L	F
0425	Carbon Disulfide	8/8/2018	Q3-2018	5	1.67	U		ug/L	D
0425	Chloride	11/1/2017	Q4-2017	113	1.34		F	mg/L	F
0425	Chloride	2/6/2018	Q1-2018	116	0.067			mg/L	F
0425	Chloride	5/3/2018	Q2-2018	134	3.35			mg/L	D
0425	Chloride	8/8/2018	Q3-2018	131	1.68			mg/L	F
0425	cis-1,2-Dichloroethene	11/1/2017	Q4-2017	0.43	0.333	J	F	ug/L	F
0425	cis-1,2-Dichloroethene	2/6/2018	Q1-2018	1.11	0.333			ug/L	F
0425	cis-1,2-Dichloroethene	5/3/2018	Q2-2018	1.98	0.333			ug/L	D
0425	cis-1,2-Dichloroethene	8/8/2018	Q3-2018	1.56	0.333			ug/L	F
0425	Dissolved Oxygen	11/1/2017	Q4-2017	0.69			F	mg/L	F
0425	Dissolved Oxygen	11/7/2017	Q4-2017	0.59			F	mg/L	D
0425	Dissolved Oxygen	2/6/2018	Q1-2018	0.44			F	mg/L	F
0425	Dissolved Oxygen	5/3/2018	Q2-2018	1.15				mg/L	D
0425	Dissolved Oxygen	8/8/2018	Q3-2018	5.58				mg/L	F
0425	Iron	11/1/2017	Q4-2017	0.03	0.03	U	F	mg/L	D
0425	Iron	2/6/2018	Q1-2018	0.03	0.03	U		mg/L	F
0425	Iron	5/3/2018	Q2-2018	0.03	0.03	U		mg/L	D
0425	Iron	8/8/2018	Q3-2018	0.03	0.03	U		mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0425	Nitrate as Nitrogen	11/1/2017	Q4-2017	0.403	0.066		F	mg/L	D
0425	Nitrate as Nitrogen	2/6/2018	Q1-2018	0.56	0.033			mg/L	F
0425	Nitrate as Nitrogen	5/3/2018	Q2-2018	0.389	0.165	J		mg/L	F
0425	Nitrate as Nitrogen	8/8/2018	Q3-2018	0.258	0.165	J		mg/L	D
0425	Oxidation Reduction Potential	11/1/2017	Q4-2017	113.6			F	mV	D
0425	Oxidation Reduction Potential	11/7/2017	Q4-2017	116.4			F	mV	F
0425	Oxidation Reduction Potential	2/6/2018	Q1-2018	118.5			F	mV	F
0425	Oxidation Reduction Potential	5/3/2018	Q2-2018	39.8				mV	F
0425	Oxidation Reduction Potential	8/8/2018	Q3-2018	138.2				mV	D
0425	pH	11/1/2017	Q4-2017	6.81			F	s.u.	F
0425	pH	11/7/2017	Q4-2017	6.85			F	s.u.	F
0425	pH	2/6/2018	Q1-2018	6.94			F	s.u.	D
0425	pH	5/3/2018	Q2-2018	6.79				s.u.	F
0425	pH	8/8/2018	Q3-2018	6.78				s.u.	F
0425	Phosphorus	11/7/2017	Q4-2017	0.0324	0.02	J	UF	mg/L	D
0425	Phosphorus	2/6/2018	Q1-2018	0.0474	0.02	J	U	mg/L	F
0425	Phosphorus	5/3/2018	Q2-2018	0.02	0.02	U		mg/L	D
0425	Phosphorus	8/8/2018	Q3-2018	0.0394	0.02	J		mg/L	F
0425	Specific Conductance	11/1/2017	Q4-2017	1420			F	umhos/cm	D
0425	Specific Conductance	11/7/2017	Q4-2017	1410			F	umhos/cm	F
0425	Specific Conductance	2/6/2018	Q1-2018	1440			F	umhos/cm	D
0425	Specific Conductance	5/3/2018	Q2-2018	1380				umhos/cm	F
0425	Specific Conductance	8/8/2018	Q3-2018	1440				umhos/cm	F
0425	Sulfate	11/1/2017	Q4-2017	147	2.66		F	mg/L	D
0425	Sulfate	2/6/2018	Q1-2018	144	0.133			mg/L	F
0425	Sulfate	5/3/2018	Q2-2018	140	6.65			mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0425	Sulfate	8/8/2018	Q3-2018	142	3.33			mg/L	D
0425	Temperature	11/1/2017	Q4-2017	13.4			F	C	F
0425	Temperature	11/7/2017	Q4-2017	13.8			F	C	D
0425	Temperature	2/6/2018	Q1-2018	13			F	C	F
0425	Temperature	5/3/2018	Q2-2018	13.4				C	F
0425	Temperature	8/8/2018	Q3-2018	13.4				C	F
0425	Tetrachloroethene	11/1/2017	Q4-2017	0.79	0.333	J	F	ug/L	F
0425	Tetrachloroethene	2/6/2018	Q1-2018	0.95	0.333	J		ug/L	F
0425	Tetrachloroethene	5/3/2018	Q2-2018	0.86	0.333	J		ug/L	D
0425	Tetrachloroethene	8/8/2018	Q3-2018	0.99	0.333	J		ug/L	F
0425	Trichloroethene	11/1/2017	Q4-2017	0.69	0.333	J	F	ug/L	D
0425	Trichloroethene	2/6/2018	Q1-2018	0.77	0.333	J		ug/L	F
0425	Trichloroethene	5/3/2018	Q2-2018	0.71	0.333	J		ug/L	F
0425	Trichloroethene	8/8/2018	Q3-2018	0.91	0.333	J		ug/L	D
0425	Turbidity	11/1/2017	Q4-2017	1.4			F	NTU	F
0425	Turbidity	11/7/2017	Q4-2017	1.47			F	NTU	F
0425	Turbidity	2/6/2018	Q1-2018	0.67			F	NTU	D
0425	Turbidity	5/3/2018	Q2-2018	1.47				NTU	F
0425	Turbidity	8/8/2018	Q3-2018	1.27				NTU	D
0425	Vinyl chloride	11/1/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
0425	Vinyl chloride	2/6/2018	Q1-2018	0.333	0.333	U		ug/L	F
0425	Vinyl chloride	5/3/2018	Q2-2018	0.333	0.333	U		ug/L	F
0425	Vinyl chloride	8/8/2018	Q3-2018	1	0.333	U		ug/L	D
0451	Alkalinity, Total (As CaCO3)	11/2/2017	Q4-2017	431	1.45		F	mg/L	D
0451	Alkalinity, Total (As CaCO3)	2/8/2018	Q1-2018	425	0.725			mg/L	F
0451	Alkalinity, Total (As CaCO3)	5/1/2018	Q2-2018	418	1.45			mg/L	D
0451	Alkalinity, Total (As CaCO3)	8/6/2018	Q3-2018	403	1.45			mg/L	F
0451	Ammonia Total as N	11/2/2017	Q4-2017	0.0672	0.017	J	F	mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0451	Ammonia Total as N	2/8/2018	Q1-2018	0.182	0.017			mg/L	F
0451	Ammonia Total as N	5/1/2018	Q2-2018	0.0621	0.017	J		mg/L	D
0451	Ammonia Total as N	8/6/2018	Q3-2018	0.121	0.017			mg/L	F
0451	Carbon Dioxide	5/1/2018	Q2-2018	100			>	mg/L	F
0451	Carbon Dioxide	8/6/2018	Q3-2018	100			>	mg/L	D
0451	Carbon Disulfide	11/2/2017	Q4-2017	1.67	1.67	U	F	ug/L	F
0451	Carbon Disulfide	2/8/2018	Q1-2018	1.67	1.67	U		ug/L	F
0451	Carbon Disulfide	5/1/2018	Q2-2018	1.67	1.67	U		ug/L	D
0451	Carbon Disulfide	8/6/2018	Q3-2018	5	1.67	U		ug/L	F
0451	Chloride	11/2/2017	Q4-2017	143	3.35		F	mg/L	F
0451	Chloride	2/8/2018	Q1-2018	181	0.067			mg/L	F
0451	Chloride	5/1/2018	Q2-2018	226	2.68			mg/L	F
0451	Chloride	8/6/2018	Q3-2018	208	3.35			mg/L	F
0451	cis-1,2-Dichloroethene	11/2/2017	Q4-2017	4.83	0.333		UF	ug/L	F
0451	cis-1,2-Dichloroethene	2/8/2018	Q1-2018	4.79	0.333			ug/L	F
0451	cis-1,2-Dichloroethene	5/1/2018	Q2-2018	6.91	0.333			ug/L	F
0451	cis-1,2-Dichloroethene	8/6/2018	Q3-2018	4.34	0.333			ug/L	F
0451	Dissolved Oxygen	11/2/2017	Q4-2017	0.63			F	mg/L	F
0451	Dissolved Oxygen	2/8/2018	Q1-2018	0.19			F	mg/L	F
0451	Dissolved Oxygen	5/1/2018	Q2-2018	1.28				mg/L	F
0451	Dissolved Oxygen	8/6/2018	Q3-2018	1.69				mg/L	F
0451	Ethane	11/2/2017	Q4-2017	10	10	U	F	ug/L	F
0451	Ethane	2/8/2018	Q1-2018	10	10	U		ug/L	F
0451	Ethane	5/1/2018	Q2-2018	10	10	U		ug/L	F
0451	Ethane	8/6/2018	Q3-2018	25	10	U		ug/L	F
0451	Ethene	11/2/2017	Q4-2017	10	10	U	F	ug/L	F
0451	Ethene	2/8/2018	Q1-2018	10	10	U		ug/L	F
0451	Ethene	5/1/2018	Q2-2018	10	10	U		ug/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0451	Ethene	8/6/2018	Q3-2018	25	10	U		ug/L	F
0451	Iron	11/2/2017	Q4-2017	0.126	0.03		F	mg/L	F
0451	Iron	2/8/2018	Q1-2018	0.207	0.03			mg/L	F
0451	Iron	5/1/2018	Q2-2018	0.674	0.03			mg/L	F
0451	Iron	8/6/2018	Q3-2018	0.186	0.03			mg/L	F
0451	Methane	11/2/2017	Q4-2017	1560	50		F	ug/L	F
0451	Methane	2/8/2018	Q1-2018	1520	10			ug/L	F
0451	Methane	5/1/2018	Q2-2018	973	50	B		ug/L	F
0451	Methane	8/6/2018	Q3-2018	1340	50			ug/L	F
0451	Nitrate as Nitrogen	11/2/2017	Q4-2017	0.0704	0.066	J	F	mg/L	F
0451	Nitrate as Nitrogen	2/8/2018	Q1-2018	0.165	0.033	U		mg/L	F
0451	Nitrate as Nitrogen	5/1/2018	Q2-2018	0.165	0.165	U		mg/L	F
0451	Nitrate as Nitrogen	8/6/2018	Q3-2018	0.165	0.165	U		mg/L	F
0451	Oxidation Reduction Potential	11/2/2017	Q4-2017	-19.3			F	mV	F
0451	Oxidation Reduction Potential	2/8/2018	Q1-2018	-0.4			F	mV	F
0451	Oxidation Reduction Potential	5/1/2018	Q2-2018	-15.1				mV	F
0451	Oxidation Reduction Potential	8/6/2018	Q3-2018	10.6				mV	F
0451	pH	11/2/2017	Q4-2017	6.86			F	s.u.	F
0451	pH	2/8/2018	Q1-2018	7.03			F	s.u.	F
0451	pH	5/1/2018	Q2-2018	6.85				s.u.	F
0451	pH	8/6/2018	Q3-2018	6.78				s.u.	F
0451	Phosphorus	11/2/2017	Q4-2017	0.0442	0.02	J	UF	mg/L	F
0451	Phosphorus	2/8/2018	Q1-2018	0.0321	0.02	J	U	mg/L	F
0451	Phosphorus	5/1/2018	Q2-2018	0.02	0.02	U		mg/L	F
0451	Phosphorus	8/6/2018	Q3-2018	0.0241	0.02	J		mg/L	F
0451	Specific Conductance	11/2/2017	Q4-2017	1470			F	umhos/cm	F
0451	Specific Conductance	2/8/2018	Q1-2018	1580			F	umhos/cm	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0451	Specific Conductance	5/1/2018	Q2-2018	1710				umhos/cm	F
0451	Specific Conductance	8/6/2018	Q3-2018	1630				umhos/cm	F
0451	Sulfate	11/2/2017	Q4-2017	164	6.65		F	mg/L	F
0451	Sulfate	2/8/2018	Q1-2018	162	0.133			mg/L	F
0451	Sulfate	5/1/2018	Q2-2018	154	5.32			mg/L	F
0451	Sulfate	8/6/2018	Q3-2018	164	6.65			mg/L	F
0451	Temperature	11/2/2017	Q4-2017	15			F	C	F
0451	Temperature	2/8/2018	Q1-2018	14.3			F	C	F
0451	Temperature	5/1/2018	Q2-2018	15.2				C	F
0451	Temperature	8/6/2018	Q3-2018	16.4				C	F
0451	Tetrachloroethene	11/2/2017	Q4-2017	2.92	0.333		F	ug/L	F
0451	Tetrachloroethene	2/8/2018	Q1-2018	3.99	0.333			ug/L	F
0451	Tetrachloroethene	5/1/2018	Q2-2018	2.29	0.333			ug/L	F
0451	Tetrachloroethene	8/6/2018	Q3-2018	4.06	0.333			ug/L	F
0451	Total Organic Carbon	11/2/2017	Q4-2017	2.21	0.33		F	mg/L	F
0451	Total Organic Carbon	2/8/2018	Q1-2018	1.71	0.33			mg/L	F
0451	Total Organic Carbon	5/1/2018	Q2-2018	1.44	0.33			mg/L	F
0451	Total Organic Carbon	8/6/2018	Q3-2018	1.44	0.33			mg/L	F
0451	Trichloroethene	11/2/2017	Q4-2017	4.03	0.333		F	ug/L	F
0451	Trichloroethene	2/8/2018	Q1-2018	4.27	0.333			ug/L	F
0451	Trichloroethene	5/1/2018	Q2-2018	2.91	0.333			ug/L	F
0451	Trichloroethene	8/6/2018	Q3-2018	3.47	0.333			ug/L	F
0451	Turbidity	11/2/2017	Q4-2017	0.48			F	NTU	F
0451	Turbidity	2/8/2018	Q1-2018	0.96			F	NTU	F
0451	Turbidity	5/1/2018	Q2-2018	2.93				NTU	F
0451	Turbidity	8/6/2018	Q3-2018	12.8				NTU	F
0451	Vinyl chloride	11/2/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
0451	Vinyl chloride	2/8/2018	Q1-2018	0.36	0.333	J		ug/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0451	Vinyl chloride	5/1/2018	Q2-2018	0.333	0.333	U		ug/L	F
0451	Vinyl chloride	8/6/2018	Q3-2018	1	0.333	U		ug/L	F
0452	Alkalinity, Total (As CaCO3)	11/1/2017	Q4-2017	528	1.45			mg/L	F
0452	Alkalinity, Total (As CaCO3)	2/12/2018	Q1-2018	501	0.725			mg/L	F
0452	Alkalinity, Total (As CaCO3)	5/1/2018	Q2-2018	476	1.45			mg/L	F
0452	Alkalinity, Total (As CaCO3)	8/6/2018	Q3-2018	490	1.45			mg/L	F
0452	Ammonia Total as N	11/1/2017	Q4-2017	0.811	0.017			mg/L	F
0452	Ammonia Total as N	2/12/2018	Q1-2018	0.508	0.017			mg/L	F
0452	Ammonia Total as N	5/1/2018	Q2-2018	0.357	0.017			mg/L	F
0452	Ammonia Total as N	8/6/2018	Q3-2018	0.343	0.017			mg/L	F
0452	Carbon Dioxide	5/1/2018	Q2-2018	100			>	mg/L	F
0452	Carbon Dioxide	8/6/2018	Q3-2018	100			>	mg/L	F
0452	Carbon Disulfide	11/1/2017	Q4-2017	1.67	1.67	U		ug/L	F
0452	Carbon Disulfide	2/12/2018	Q1-2018	1.67	1.67	U		ug/L	F
0452	Carbon Disulfide	5/1/2018	Q2-2018	1.67	1.67	U		ug/L	F
0452	Carbon Disulfide	8/6/2018	Q3-2018	5	1.67	U		ug/L	F
0452	Chloride	11/1/2017	Q4-2017	123	1.34			mg/L	F
0452	Chloride	2/12/2018	Q1-2018	150	0.067			mg/L	F
0452	Chloride	5/1/2018	Q2-2018	147	1.68			mg/L	F
0452	Chloride	8/6/2018	Q3-2018	162	1.68			mg/L	F
0452	cis-1,2-Dichloroethene	11/1/2017	Q4-2017	11.2	0.333			ug/L	F
0452	cis-1,2-Dichloroethene	2/12/2018	Q1-2018	12.5	0.333			ug/L	F
0452	cis-1,2-Dichloroethene	5/1/2018	Q2-2018	13.8	0.333			ug/L	F
0452	cis-1,2-Dichloroethene	8/6/2018	Q3-2018	14.8	0.333			ug/L	F
0452	Dissolved Oxygen	11/1/2017	Q4-2017	6.31				mg/L	F
0452	Dissolved Oxygen	2/12/2018	Q1-2018	0.2			F	mg/L	F
0452	Dissolved Oxygen	5/1/2018	Q2-2018	1.22				mg/L	F
0452	Dissolved Oxygen	8/6/2018	Q3-2018	1.72				mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0452	Ethane	11/1/2017	Q4-2017	10	10	U		ug/L	F
0452	Ethane	2/12/2018	Q1-2018	10	10	U		ug/L	F
0452	Ethane	5/1/2018	Q2-2018	10	10	U		ug/L	F
0452	Ethane	8/6/2018	Q3-2018	25	10	U		ug/L	F
0452	Ethene	11/1/2017	Q4-2017	10	10	U		ug/L	F
0452	Ethene	2/12/2018	Q1-2018	10	10	U		ug/L	F
0452	Ethene	5/1/2018	Q2-2018	10	10	U		ug/L	F
0452	Ethene	8/6/2018	Q3-2018	25	10	U		ug/L	F
0452	Iron	11/1/2017	Q4-2017	11.7	0.03			mg/L	F
0452	Iron	2/12/2018	Q1-2018	8.6	0.03			mg/L	F
0452	Iron	5/1/2018	Q2-2018	8.47	0.03			mg/L	F
0452	Iron	8/6/2018	Q3-2018	9.68	0.03			mg/L	F
0452	Methane	11/1/2017	Q4-2017	1130	50			ug/L	F
0452	Methane	2/12/2018	Q1-2018	1310	10			ug/L	F
0452	Methane	5/1/2018	Q2-2018	1090	50	B		ug/L	F
0452	Methane	8/6/2018	Q3-2018	658	50			ug/L	F
0452	Nitrate as Nitrogen	11/1/2017	Q4-2017	0.066	0.066	U		mg/L	F
0452	Nitrate as Nitrogen	2/12/2018	Q1-2018	0.066	0.033	HU	J	mg/L	F
0452	Nitrate as Nitrogen	5/1/2018	Q2-2018	0.165	0.165	U		mg/L	F
0452	Nitrate as Nitrogen	8/6/2018	Q3-2018	0.165	0.165	U		mg/L	F
0452	Oxidation Reduction Potential	11/1/2017	Q4-2017	-138.9				mV	F
0452	Oxidation Reduction Potential	2/12/2018	Q1-2018	-89			F	mV	F
0452	Oxidation Reduction Potential	5/1/2018	Q2-2018	-91.1				mV	F
0452	Oxidation Reduction Potential	8/6/2018	Q3-2018	-121.4				mV	F
0452	pH	11/1/2017	Q4-2017	6.85				s.u.	F
0452	pH	2/12/2018	Q1-2018	6.99			F	s.u.	F
0452	pH	5/1/2018	Q2-2018	6.92				s.u.	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0452	pH	8/6/2018	Q3-2018	6.88				s.u.	F
0452	Phosphorus	11/1/2017	Q4-2017	0.145	0.02		U	mg/L	F
0452	Phosphorus	2/12/2018	Q1-2018	0.107	0.02		U	mg/L	F
0452	Phosphorus	5/1/2018	Q2-2018	î	0.02		U	mg/L	F
0452	Phosphorus	8/6/2018	Q3-2018	0.0412	0.02	J		mg/L	F
0452	Specific Conductance	11/1/2017	Q4-2017	1590				umhos/cm	F
0452	Specific Conductance	2/12/2018	Q1-2018	1600			F	umhos/cm	F
0452	Specific Conductance	5/1/2018	Q2-2018	1590				umhos/cm	F
0452	Specific Conductance	8/6/2018	Q3-2018	1510				umhos/cm	F
0452	Sulfate	11/1/2017	Q4-2017	175	2.66			mg/L	F
0452	Sulfate	2/12/2018	Q1-2018	182	0.133			mg/L	F
0452	Sulfate	5/1/2018	Q2-2018	147	3.33			mg/L	F
0452	Sulfate	8/6/2018	Q3-2018	114	3.33			mg/L	F
0452	Temperature	11/1/2017	Q4-2017	13.4				C	F
0452	Temperature	2/12/2018	Q1-2018	13.3			F	C	F
0452	Temperature	5/1/2018	Q2-2018	14.7				C	F
0452	Temperature	8/6/2018	Q3-2018	15.6				C	F
0452	Tetrachloroethene	11/1/2017	Q4-2017	0.333	0.333	U		ug/L	F
0452	Tetrachloroethene	2/12/2018	Q1-2018	0.333	0.333	U		ug/L	F
0452	Tetrachloroethene	5/1/2018	Q2-2018	0.333	0.333	U		ug/L	F
0452	Tetrachloroethene	8/6/2018	Q3-2018	1	0.333	U		ug/L	F
0452	Total Organic Carbon	11/1/2017	Q4-2017	2.84	0.33			mg/L	F
0452	Total Organic Carbon	2/12/2018	Q1-2018	3.23	0.33			mg/L	F
0452	Total Organic Carbon	5/1/2018	Q2-2018	2	0.33			mg/L	F
0452	Total Organic Carbon	8/6/2018	Q3-2018	2	0.33			mg/L	F
0452	Trichloroethene	11/1/2017	Q4-2017	0.333	0.333	U		ug/L	F
0452	Trichloroethene	2/12/2018	Q1-2018	0.52	0.333	J		ug/L	F
0452	Trichloroethene	5/1/2018	Q2-2018	1.01	0.333			ug/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
0452	Trichloroethene	8/6/2018	Q3-2018	1	0.333	U		ug/L	F
0452	Turbidity	11/1/2017	Q4-2017	3.07				NTU	F
0452	Turbidity	2/12/2018	Q1-2018	2.34			F	NTU	F
0452	Turbidity	5/1/2018	Q2-2018	3.03				NTU	F
0452	Turbidity	8/6/2018	Q3-2018	3.11				NTU	F
0452	Vinyl chloride	11/1/2017	Q4-2017	0.333	0.333	U		ug/L	F
0452	Vinyl chloride	2/12/2018	Q1-2018	0.333	0.333	U		ug/L	F
0452	Vinyl chloride	5/1/2018	Q2-2018	0.54	0.333	J		ug/L	F
0452	Vinyl chloride	8/6/2018	Q3-2018	1.13	0.333			ug/L	F
P015	Alkalinity, Total (As CaCO3)	11/2/2017	Q4-2017	440	1.45		F	mg/L	F
P015	Alkalinity, Total (As CaCO3)	11/2/2017	Q4-2017	439	1.45		F	mg/L	F
P015	Alkalinity, Total (As CaCO3)	2/12/2018	Q1-2018	434	0.725			mg/L	F
P015	Alkalinity, Total (As CaCO3)	5/2/2018	Q2-2018	450	1.45			mg/L	F
P015	Alkalinity, Total (As CaCO3)	5/2/2018	Q2-2018	455	1.45			mg/L	F
P015	Alkalinity, Total (As CaCO3)	8/6/2018	Q3-2018	469	1.45			mg/L	F
P015	Ammonia Total as N	11/2/2017	Q4-2017	0.376	0.017		F	mg/L	F
P015	Ammonia Total as N	11/2/2017	Q4-2017	0.538	0.017		F	mg/L	F
P015	Ammonia Total as N	2/12/2018	Q1-2018	0.374	0.017			mg/L	F
P015	Ammonia Total as N	5/2/2018	Q2-2018	0.632	0.017			mg/L	F
P015	Ammonia Total as N	5/2/2018	Q2-2018	0.598	0.017			mg/L	F
P015	Ammonia Total as N	8/6/2018	Q3-2018	0.18	0.017			mg/L	F
P015	Carbon Dioxide	5/2/2018	Q2-2018	100			>	mg/L	F
P015	Carbon Dioxide	8/6/2018	Q3-2018	100			>	mg/L	F
P015	Carbon Disulfide	11/2/2017	Q4-2017	1.67	1.67	U	F	ug/L	F
P015	Carbon Disulfide	11/2/2017	Q4-2017	1.67	1.67	U	F	ug/L	F
P015	Carbon Disulfide	2/12/2018	Q1-2018	1.67	1.67	U		ug/L	F
P015	Carbon Disulfide	5/2/2018	Q2-2018	1.67	1.67	U		ug/L	F
P015	Carbon Disulfide	5/2/2018	Q2-2018	1.67	1.67	U		ug/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P015	Carbon Disulfide	8/6/2018	Q3-2018	5	1.67	U		ug/L	F
P015	Chloride	11/2/2017	Q4-2017	177	3.35		F	mg/L	F
P015	Chloride	11/2/2017	Q4-2017	177	3.35		F	mg/L	F
P015	Chloride	2/12/2018	Q1-2018	149	0.067			mg/L	F
P015	Chloride	5/2/2018	Q2-2018	149	1.68			mg/L	F
P015	Chloride	5/2/2018	Q2-2018	148	1.68			mg/L	F
P015	Chloride	8/6/2018	Q3-2018	163	1.68			mg/L	F
P015	cis-1,2-Dichloroethene	11/2/2017	Q4-2017	5.68	0.333		UF	ug/L	F
P015	cis-1,2-Dichloroethene	11/2/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
P015	cis-1,2-Dichloroethene	2/12/2018	Q1-2018	5	0.333			ug/L	F
P015	cis-1,2-Dichloroethene	5/2/2018	Q2-2018	5.12	0.333			ug/L	F
P015	cis-1,2-Dichloroethene	5/2/2018	Q2-2018	5.02	0.333			ug/L	F
P015	cis-1,2-Dichloroethene	8/6/2018	Q3-2018	4.27	0.333			ug/L	F
P015	Dissolved Oxygen	11/2/2017	Q4-2017	0.57			F	mg/L	F
P015	Dissolved Oxygen	2/12/2018	Q1-2018	0.28			F	mg/L	F
P015	Dissolved Oxygen	5/2/2018	Q2-2018	0.24				mg/L	F
P015	Dissolved Oxygen	8/6/2018	Q3-2018	0.88				mg/L	F
P015	Ethane	11/2/2017	Q4-2017	10	10	U	F	ug/L	F
P015	Ethane	11/2/2017	Q4-2017	10	10	U	F	ug/L	F
P015	Ethane	2/12/2018	Q1-2018	10	10	U		ug/L	F
P015	Ethane	5/2/2018	Q2-2018	10	10	U		ug/L	F
P015	Ethane	5/2/2018	Q2-2018	10	10	U		ug/L	F
P015	Ethane	8/6/2018	Q3-2018	25	10	U		ug/L	F
P015	Ethene	11/2/2017	Q4-2017	10	10	U	F	ug/L	F
P015	Ethene	11/2/2017	Q4-2017	10	10	U	F	ug/L	F
P015	Ethene	2/12/2018	Q1-2018	10	10	U		ug/L	F
P015	Ethene	5/2/2018	Q2-2018	10	10	U		ug/L	F
P015	Ethene	5/2/2018	Q2-2018	10	10	U		ug/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P015	Ethene	8/6/2018	Q3-2018	25	10	U		ug/L	F
P015	Iron	11/2/2017	Q4-2017	5.44	0.03		F	mg/L	F
P015	Iron	11/2/2017	Q4-2017	5.23	0.03		F	mg/L	F
P015	Iron	2/12/2018	Q1-2018	5.66	0.03			mg/L	F
P015	Iron	5/2/2018	Q2-2018	6.2	0.03			mg/L	F
P015	Iron	5/2/2018	Q2-2018	6.07	0.03			mg/L	F
P015	Iron	8/6/2018	Q3-2018	5.93	0.03			mg/L	F
P015	Methane	11/2/2017	Q4-2017	1450	50		F	ug/L	F
P015	Methane	11/2/2017	Q4-2017	1600	50		F	ug/L	F
P015	Methane	2/12/2018	Q1-2018	1320	10			ug/L	F
P015	Methane	5/2/2018	Q2-2018	1070	50	B		ug/L	F
P015	Methane	5/2/2018	Q2-2018	1230	50			ug/L	F
P015	Methane	8/6/2018	Q3-2018	993	50			ug/L	F
P015	Nitrate as Nitrogen	11/2/2017	Q4-2017	0.066	0.066	U	F	mg/L	F
P015	Nitrate as Nitrogen	11/2/2017	Q4-2017	0.066	0.066	U	F	mg/L	F
P015	Nitrate as Nitrogen	2/12/2018	Q1-2018	0.066	0.033	HU	J	mg/L	F
P015	Nitrate as Nitrogen	5/2/2018	Q2-2018	0.165	0.165	U		mg/L	F
P015	Nitrate as Nitrogen	5/2/2018	Q2-2018	0.165	0.165	U		mg/L	F
P015	Nitrate as Nitrogen	8/6/2018	Q3-2018	0.165	0.165	U		mg/L	F
P015	Oxidation Reduction Potential	11/2/2017	Q4-2017	-58.3			F	mV	F
P015	Oxidation Reduction Potential	2/12/2018	Q1-2018	-63.8			F	mV	F
P015	Oxidation Reduction Potential	5/2/2018	Q2-2018	-92.1				mV	F
P015	Oxidation Reduction Potential	8/6/2018	Q3-2018	-2.4				mV	F
P015	pH	11/2/2017	Q4-2017	6.22			F	s.u.	F
P015	pH	2/12/2018	Q1-2018	6.24			F	s.u.	F
P015	pH	5/2/2018	Q2-2018	6.2				s.u.	F
P015	pH	8/6/2018	Q3-2018	6.29				s.u.	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P015	Phosphorus	11/2/2017	Q4-2017	0.0455	0.02	J	UF	mg/L	F
P015	Phosphorus	11/2/2017	Q4-2017	0.0675	0.02		UF	mg/L	F
P015	Phosphorus	2/12/2018	Q1-2018	0.0376	0.02	J	U	mg/L	F
P015	Phosphorus	5/2/2018	Q2-2018	0.0347	0.02	J	U	mg/L	F
P015	Phosphorus	5/2/2018	Q2-2018	0.032	0.02	J	U	mg/L	F
P015	Phosphorus	8/6/2018	Q3-2018	0.0211	0.02	J		mg/L	F
P015	Specific Conductance	11/2/2017	Q4-2017	1610			F	umhos/cm	F
P015	Specific Conductance	2/12/2018	Q1-2018	1510			F	umhos/cm	F
P015	Specific Conductance	5/2/2018	Q2-2018	1500				umhos/cm	F
P015	Specific Conductance	8/6/2018	Q3-2018	1640				umhos/cm	F
P015	Sulfate	11/2/2017	Q4-2017	169	6.65		F	mg/L	F
P015	Sulfate	11/2/2017	Q4-2017	169	6.65		F	mg/L	F
P015	Sulfate	2/12/2018	Q1-2018	203	0.133			mg/L	F
P015	Sulfate	5/2/2018	Q2-2018	152	3.33			mg/L	F
P015	Sulfate	5/2/2018	Q2-2018	153	3.33			mg/L	F
P015	Sulfate	8/6/2018	Q3-2018	189	3.33			mg/L	F
P015	Temperature	11/2/2017	Q4-2017	14.6			F	C	F
P015	Temperature	2/12/2018	Q1-2018	11.6			F	C	F
P015	Temperature	5/2/2018	Q2-2018	14.9				C	F
P015	Temperature	8/6/2018	Q3-2018	17				C	F
P015	Tetrachloroethene	11/2/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
P015	Tetrachloroethene	11/2/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
P015	Tetrachloroethene	2/12/2018	Q1-2018	0.333	0.333	U		ug/L	F
P015	Tetrachloroethene	5/2/2018	Q2-2018	0.333	0.333	U		ug/L	F
P015	Tetrachloroethene	5/2/2018	Q2-2018	0.333	0.333	U		ug/L	F
P015	Tetrachloroethene	8/6/2018	Q3-2018	1	0.333	U		ug/L	F
P015	Total Organic Carbon	11/2/2017	Q4-2017	3.41	0.33		F	mg/L	F
P015	Total Organic Carbon	11/2/2017	Q4-2017	3.57	0.33		F	mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P015	Total Organic Carbon	2/12/2018	Q1-2018	2.57	0.33			mg/L	F
P015	Total Organic Carbon	5/2/2018	Q2-2018	3.18	0.33			mg/L	F
P015	Total Organic Carbon	5/2/2018	Q2-2018	3.14	0.33			mg/L	F
P015	Total Organic Carbon	8/6/2018	Q3-2018	2.44	0.33			mg/L	F
P015	Trichloroethene	11/2/2017	Q4-2017	0.53	0.333	J	UF	ug/L	F
P015	Trichloroethene	11/2/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
P015	Trichloroethene	2/12/2018	Q1-2018	0.37	0.333	J		ug/L	F
P015	Trichloroethene	5/2/2018	Q2-2018	0.333	0.333	U		ug/L	F
P015	Trichloroethene	5/2/2018	Q2-2018	0.333	0.333	U		ug/L	F
P015	Trichloroethene	8/6/2018	Q3-2018	1	0.333	U		ug/L	F
P015	Turbidity	11/2/2017	Q4-2017	1.57			F	NTU	F
P015	Turbidity	2/12/2018	Q1-2018	4.76			F	NTU	F
P015	Turbidity	5/2/2018	Q2-2018	3.19				NTU	F
P015	Turbidity	8/6/2018	Q3-2018	1.32				NTU	F
P015	Vinyl chloride	11/2/2017	Q4-2017	0.86	0.333	J	UF	ug/L	F
P015	Vinyl chloride	11/2/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
P015	Vinyl chloride	2/12/2018	Q1-2018	0.333	0.333	U		ug/L	F
P015	Vinyl chloride	5/2/2018	Q2-2018	0.333	0.333	U		ug/L	F
P015	Vinyl chloride	5/2/2018	Q2-2018	0.333	0.333	U		ug/L	F
P015	Vinyl chloride	8/6/2018	Q3-2018	1	0.333	U		ug/L	F
P027	Alkalinity, Total (As CaCO3)	11/1/2017	Q4-2017	428	1.45			mg/L	F
P027	Alkalinity, Total (As CaCO3)	2/12/2018	Q1-2018	448	0.725			mg/L	F
P027	Alkalinity, Total (As CaCO3)	5/1/2018	Q2-2018	473	1.45			mg/L	F
P027	Alkalinity, Total (As CaCO3)	8/9/2018	Q3-2018	441	1.45			mg/L	F
P027	Carbon Dioxide	5/1/2018	Q2-2018	NA				mg/L	F
P027	Carbon Dioxide	8/9/2018	Q3-2018	NA				mg/L	F
P027	Carbon Disulfide	11/1/2017	Q4-2017	1.67	1.67	U		ug/L	F
P027	Carbon Disulfide	2/12/2018	Q1-2018	1.67	1.67	U		ug/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P027	Carbon Disulfide	5/1/2018	Q2-2018	1.67	1.67	U		ug/L	F
P027	Carbon Disulfide	8/9/2018	Q3-2018	5	1.67	U		ug/L	F
P027	Chloride	11/1/2017	Q4-2017	116	1.34			mg/L	F
P027	Chloride	2/12/2018	Q1-2018	103	0.067			mg/L	F
P027	Chloride	5/1/2018	Q2-2018	52.6	0.67			mg/L	F
P027	Chloride	8/9/2018	Q3-2018	120	1.68			mg/L	F
P027	cis-1,2-Dichloroethene	11/1/2017	Q4-2017	2.72	0.333			ug/L	F
P027	cis-1,2-Dichloroethene	2/12/2018	Q1-2018	1.76	0.333			ug/L	F
P027	cis-1,2-Dichloroethene	5/1/2018	Q2-2018	0.333	0.333	U		ug/L	F
P027	cis-1,2-Dichloroethene	8/9/2018	Q3-2018	3.22	0.333			ug/L	F
P027	Dissolved Oxygen	11/1/2017	Q4-2017	8.57				mg/L	F
P027	Dissolved Oxygen	2/12/2018	Q1-2018	3.9			F	mg/L	F
P027	Dissolved Oxygen	5/1/2018	Q2-2018	5.14				mg/L	F
P027	Dissolved Oxygen	8/9/2018	Q3-2018	4.38				mg/L	F
P027	Ethane	11/1/2017	Q4-2017	10	10	U		ug/L	F
P027	Ethane	2/12/2018	Q1-2018	10	10	U		ug/L	F
P027	Ethane	5/1/2018	Q2-2018	10	10	U		ug/L	F
P027	Ethane	8/9/2018	Q3-2018	25	10	U		ug/L	F
P027	Ethene	11/1/2017	Q4-2017	10	10	U		ug/L	F
P027	Ethene	2/12/2018	Q1-2018	10	10	U		ug/L	F
P027	Ethene	5/1/2018	Q2-2018	10	10	U		ug/L	F
P027	Ethene	8/9/2018	Q3-2018	25	10	U		ug/L	F
P027	Iron	11/1/2017	Q4-2017	0.0312	0.03	B		mg/L	F
P027	Iron	2/12/2018	Q1-2018	0.03	0.03	U		mg/L	F
P027	Iron	5/1/2018	Q2-2018	0.03	0.03	U		mg/L	F
P027	Iron	8/9/2018	Q3-2018	0.03	0.03	U		mg/L	F
P027	Methane	11/1/2017	Q4-2017	370	10			ug/L	F
P027	Methane	2/12/2018	Q1-2018	75.6	10			ug/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P027	Methane	5/1/2018	Q2-2018	14.9	10	BJ	U	ug/L	F
P027	Methane	8/9/2018	Q3-2018	128	10			ug/L	F
P027	Nitrate as Nitrogen	11/1/2017	Q4-2017	0.754	0.066			mg/L	F
P027	Nitrate as Nitrogen	2/12/2018	Q1-2018	1.17	0.033	H	J	mg/L	F
P027	Nitrate as Nitrogen	5/1/2018	Q2-2018	1.5	0.165			mg/L	F
P027	Nitrate as Nitrogen	8/9/2018	Q3-2018	0.963	0.165	H		mg/L	F
P027	Oxidation Reduction Potential	11/1/2017	Q4-2017	12.9				mV	F
P027	Oxidation Reduction Potential	2/12/2018	Q1-2018	84.8			F	mV	F
P027	Oxidation Reduction Potential	5/1/2018	Q2-2018	124				mV	F
P027	Oxidation Reduction Potential	8/9/2018	Q3-2018	54.4				mV	F
P027	pH	11/1/2017	Q4-2017	6.9				s.u.	F
P027	pH	2/12/2018	Q1-2018	6.97			F	s.u.	F
P027	pH	5/1/2018	Q2-2018	6.87				s.u.	F
P027	pH	8/9/2018	Q3-2018	6.73				s.u.	F
P027	Phosphorus	11/1/2017	Q4-2017	0.0491	0.02	J	U	mg/L	F
P027	Phosphorus	2/12/2018	Q1-2018	0.0267	0.02	J	U	mg/L	F
P027	Phosphorus	5/1/2018	Q2-2018	0.037	0.02	J	U	mg/L	F
P027	Phosphorus	8/9/2018	Q3-2018	0.0227	0.02	J		mg/L	F
P027	Specific Conductance	11/1/2017	Q4-2017	1310				umhos/cm	F
P027	Specific Conductance	2/12/2018	Q1-2018	1210			F	umhos/cm	F
P027	Specific Conductance	5/1/2018	Q2-2018	1150				umhos/cm	F
P027	Specific Conductance	8/9/2018	Q3-2018	1380				umhos/cm	F
P027	Sulfate	11/1/2017	Q4-2017	103	2.66			mg/L	F
P027	Sulfate	2/12/2018	Q1-2018	118	0.133			mg/L	F
P027	Sulfate	5/1/2018	Q2-2018	101	1.33			mg/L	F
P027	Sulfate	8/9/2018	Q3-2018	128	3.33			mg/L	F
P027	Temperature	11/1/2017	Q4-2017	14				C	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P027	Temperature	2/12/2018	Q1-2018	13.4			F	C	F
P027	Temperature	5/1/2018	Q2-2018	14.2				C	F
P027	Temperature	8/9/2018	Q3-2018	14.2				C	F
P027	Tetrachloroethene	11/1/2017	Q4-2017	0.57	0.333	J		ug/L	F
P027	Tetrachloroethene	2/12/2018	Q1-2018	0.65	0.333	J		ug/L	F
P027	Tetrachloroethene	5/1/2018	Q2-2018	0.53	0.333	J		ug/L	F
P027	Tetrachloroethene	8/9/2018	Q3-2018	0.73	0.333	J		ug/L	F
P027	Trichloroethene	11/1/2017	Q4-2017	1.33	0.333			ug/L	F
P027	Trichloroethene	2/12/2018	Q1-2018	0.83	0.333	J		ug/L	F
P027	Trichloroethene	5/1/2018	Q2-2018	0.333	0.333	U		ug/L	F
P027	Trichloroethene	8/9/2018	Q3-2018	1.66	0.333			ug/L	F
P027	Turbidity	11/1/2017	Q4-2017	3.05				NTU	F
P027	Turbidity	2/12/2018	Q1-2018	7.9			F	NTU	F
P027	Turbidity	5/1/2018	Q2-2018	1.41				NTU	F
P027	Turbidity	8/9/2018	Q3-2018	4.08				NTU	F
P027	Vinyl chloride	11/1/2017	Q4-2017	0.89	0.333	J		ug/L	F
P027	Vinyl chloride	2/12/2018	Q1-2018	0.333	0.333	U		ug/L	F
P027	Vinyl chloride	5/1/2018	Q2-2018	0.333	0.333	U		ug/L	F
P027	Vinyl chloride	8/9/2018	Q3-2018	0.66	0.333	J		ug/L	F
P031	Alkalinity, Total (As CaCO3)	11/1/2017	Q4-2017	442	1.45			mg/L	F
P031	Alkalinity, Total (As CaCO3)	2/6/2018	Q1-2018	451	0.725			mg/L	F
P031	Alkalinity, Total (As CaCO3)	4/30/2018	Q2-2018	456	1.45			mg/L	F
P031	Alkalinity, Total (As CaCO3)	8/8/2018	Q3-2018	458	1.45			mg/L	F
P031	Ammonia Total as N	11/1/2017	Q4-2017	0.0309	0.017	J		mg/L	F
P031	Ammonia Total as N	2/6/2018	Q1-2018	0.0782	0.017	J		mg/L	F
P031	Ammonia Total as N	4/30/2018	Q2-2018	0.017	0.017	U		mg/L	F
P031	Ammonia Total as N	8/8/2018	Q3-2018	0.024	0.017	J	U	mg/L	F
P031	Carbon Dioxide	4/30/2018	Q2-2018	100			>	mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P031	Carbon Dioxide	8/8/2018	Q3-2018	85				mg/L	F
P031	Carbon Disulfide	11/1/2017	Q4-2017	1.67	1.67	U		ug/L	F
P031	Carbon Disulfide	2/6/2018	Q1-2018	1.67	1.67	U		ug/L	F
P031	Carbon Disulfide	4/30/2018	Q2-2018	1.67	1.67	U		ug/L	F
P031	Carbon Disulfide	8/8/2018	Q3-2018	1.67	1.67	U		ug/L	F
P031	Chloride	11/1/2017	Q4-2017	145	1.34			mg/L	F
P031	Chloride	2/6/2018	Q1-2018	115	0.067			mg/L	F
P031	Chloride	4/30/2018	Q2-2018	82.3	1.34			mg/L	F
P031	Chloride	8/8/2018	Q3-2018	129	1.68			mg/L	F
P031	cis-1,2-Dichloroethene	11/1/2017	Q4-2017	1.81	0.333			ug/L	F
P031	cis-1,2-Dichloroethene	2/6/2018	Q1-2018	2.16	0.333			ug/L	F
P031	cis-1,2-Dichloroethene	4/30/2018	Q2-2018	2.01	0.333			ug/L	F
P031	cis-1,2-Dichloroethene	8/8/2018	Q3-2018	3	0.333			ug/L	F
P031	Dissolved Oxygen	11/1/2017	Q4-2017	3.09				mg/L	F
P031	Dissolved Oxygen	2/6/2018	Q1-2018	2.06			F	mg/L	F
P031	Dissolved Oxygen	4/30/2018	Q2-2018	0.34				mg/L	F
P031	Dissolved Oxygen	8/8/2018	Q3-2018	1.21				mg/L	F
P031	Ethane	11/1/2017	Q4-2017	10	10	U		ug/L	F
P031	Ethane	2/6/2018	Q1-2018	10	10	U		ug/L	F
P031	Ethane	4/30/2018	Q2-2018	10	10	U		ug/L	F
P031	Ethane	8/8/2018	Q3-2018	10	10	U		ug/L	F
P031	Ethene	11/1/2017	Q4-2017	10	10	U		ug/L	F
P031	Ethene	2/6/2018	Q1-2018	10	10	U		ug/L	F
P031	Ethene	4/30/2018	Q2-2018	10	10	U		ug/L	F
P031	Ethene	8/8/2018	Q3-2018	10	10	U		ug/L	F
P031	Iron	11/1/2017	Q4-2017	0.03	0.03	U		mg/L	F
P031	Iron	2/6/2018	Q1-2018	0.03	0.03	U		mg/L	F
P031	Iron	4/30/2018	Q2-2018	0.03	0.03	U		mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P031	Iron	8/8/2018	Q3-2018	0.03	0.03	U		mg/L	F
P031	Methane	11/1/2017	Q4-2017	19.5	10	J		ug/L	F
P031	Methane	2/6/2018	Q1-2018	100	10			ug/L	F
P031	Methane	4/30/2018	Q2-2018	103	10	B		ug/L	F
P031	Methane	8/8/2018	Q3-2018	60.5	10			ug/L	F
P031	Nitrate as Nitrogen	11/1/2017	Q4-2017	0.424	0.066			mg/L	F
P031	Nitrate as Nitrogen	2/6/2018	Q1-2018	0.52	0.033			mg/L	F
P031	Nitrate as Nitrogen	4/30/2018	Q2-2018	0.855	0.165			mg/L	F
P031	Nitrate as Nitrogen	8/8/2018	Q3-2018	0.351	0.165	J		mg/L	F
P031	Oxidation Reduction Potential	11/1/2017	Q4-2017	108.5				mV	F
P031	Oxidation Reduction Potential	2/6/2018	Q1-2018	87			F	mV	F
P031	Oxidation Reduction Potential	4/30/2018	Q2-2018	33.7				mV	F
P031	Oxidation Reduction Potential	8/8/2018	Q3-2018	-8				mV	F
P031	pH	11/1/2017	Q4-2017	6.86				s.u.	F
P031	pH	2/6/2018	Q1-2018	6.98			F	s.u.	F
P031	pH	4/30/2018	Q2-2018	7.01				s.u.	F
P031	pH	8/8/2018	Q3-2018	7.03				s.u.	F
P031	Phosphorus	11/1/2017	Q4-2017	0.0366	0.02	J	U	mg/L	F
P031	Phosphorus	2/6/2018	Q1-2018	0.0321	0.02	J	U	mg/L	F
P031	Phosphorus	4/30/2018	Q2-2018	0.0373	0.02	J	U	mg/L	F
P031	Phosphorus	8/8/2018	Q3-2018	0.029	0.02	J	U	mg/L	F
P031	Specific Conductance	11/1/2017	Q4-2017	1420				umhos/cm	F
P031	Specific Conductance	2/6/2018	Q1-2018	1.33			F	mS/cm	F
P031	Specific Conductance	4/30/2018	Q2-2018	1410				umhos/cm	F
P031	Specific Conductance	8/8/2018	Q3-2018	1500				umhos/cm	F
P031	Sulfate	11/1/2017	Q4-2017	129	2.66			mg/L	F
P031	Sulfate	2/6/2018	Q1-2018	124	0.133			mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P031	Sulfate	4/30/2018	Q2-2018	98.9	2.66			mg/L	F
P031	Sulfate	8/8/2018	Q3-2018	137	3.33			mg/L	F
P031	Temperature	11/1/2017	Q4-2017	13.9				C	F
P031	Temperature	2/6/2018	Q1-2018	13.4			F	C	F
P031	Temperature	4/30/2018	Q2-2018	13.7				C	F
P031	Temperature	8/8/2018	Q3-2018	13.7				C	F
P031	Tetrachloroethene	11/1/2017	Q4-2017	0.94	0.333	J		ug/L	F
P031	Tetrachloroethene	2/6/2018	Q1-2018	1.22	0.333			ug/L	F
P031	Tetrachloroethene	4/30/2018	Q2-2018	0.78	0.333	J		ug/L	F
P031	Tetrachloroethene	8/8/2018	Q3-2018	1.12	0.333			ug/L	F
P031	Total Organic Carbon	11/1/2017	Q4-2017	1.47	0.33			mg/L	F
P031	Total Organic Carbon	2/6/2018	Q1-2018	1.46	0.33			mg/L	F
P031	Total Organic Carbon	4/30/2018	Q2-2018	1.13	0.33			mg/L	F
P031	Total Organic Carbon	8/8/2018	Q3-2018	1.24	0.33			mg/L	F
P031	Trichloroethene	11/1/2017	Q4-2017	1.13	0.333			ug/L	F
P031	Trichloroethene	2/6/2018	Q1-2018	1.29	0.333			ug/L	F
P031	Trichloroethene	4/30/2018	Q2-2018	0.82	0.333	J		ug/L	F
P031	Trichloroethene	8/8/2018	Q3-2018	1.2	0.333			ug/L	F
P031	Turbidity	11/1/2017	Q4-2017	2.51				NTU	F
P031	Turbidity	2/6/2018	Q1-2018	5.29			F	NTU	F
P031	Turbidity	4/30/2018	Q2-2018	0.95				NTU	F
P031	Turbidity	8/8/2018	Q3-2018	1.35				NTU	F
P031	Vinyl chloride	11/1/2017	Q4-2017	0.333	0.333	U		ug/L	F
P031	Vinyl chloride	2/6/2018	Q1-2018	0.333	0.333	U		ug/L	F
P031	Vinyl chloride	4/30/2018	Q2-2018	0.333	0.333	U		ug/L	F
P031	Vinyl chloride	8/8/2018	Q3-2018	0.333	0.333	U		ug/L	F
P045	Carbon Dioxide	8/8/2018	Q3-2018	90				mg/L	F
P045	Carbon Disulfide	8/8/2018	Q3-2018	5	1.67	U		ug/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P045	cis-1,2-Dichloroethene	8/8/2018	Q3-2018	0.8	0.333	J		ug/L	F
P045	Dissolved Oxygen	8/8/2018	Q3-2018	0.87				mg/L	F
P045	Oxidation Reduction Potential	8/8/2018	Q3-2018	24				mV	F
P045	pH	8/8/2018	Q3-2018	7.1				s.u.	F
P045	Specific Conductance	8/8/2018	Q3-2018	1510				umhos/cm	F
P045	Temperature	8/8/2018	Q3-2018	14.2				C	F
P045	Tetrachloroethene	8/8/2018	Q3-2018	1	0.333	U		ug/L	D
P045	Trichloroethene	8/8/2018	Q3-2018	1	0.333	U		ug/L	F
P045	Turbidity	8/8/2018	Q3-2018	0.89				NTU	F
P045	Vinyl chloride	8/8/2018	Q3-2018	0.52	0.333	J		ug/L	F
P046	Carbon Dioxide	5/3/2018	Q2-2018	NA				mg/L	D
P046	Carbon Dioxide	8/9/2018	Q3-2018	NA				mg/L	F
P046	Carbon Disulfide	11/1/2017	Q4-2017	1.67	1.67	U		ug/L	F
P046	Carbon Disulfide	2/12/2018	Q1-2018	1.67	1.67	U		ug/L	F
P046	Carbon Disulfide	5/3/2018	Q2-2018	1.67	1.67	U		ug/L	F
P046	Carbon Disulfide	8/9/2018	Q3-2018	5	1.67	U		ug/L	F
P046	cis-1,2-Dichloroethene	11/1/2017	Q4-2017	0.52	0.333	J		ug/L	F
P046	cis-1,2-Dichloroethene	2/12/2018	Q1-2018	0.54	0.333	J		ug/L	F
P046	cis-1,2-Dichloroethene	5/3/2018	Q2-2018	0.53	0.333	J		ug/L	D
P046	cis-1,2-Dichloroethene	8/9/2018	Q3-2018	0.61	0.333	J		ug/L	F
P046	Dissolved Oxygen	11/1/2017	Q4-2017	0.76				mg/L	F
P046	Dissolved Oxygen	2/12/2018	Q1-2018	3.28			F	mg/L	F
P046	Dissolved Oxygen	5/3/2018	Q2-2018	0.68				mg/L	D
P046	Dissolved Oxygen	8/9/2018	Q3-2018	3.97				mg/L	F
P046	Oxidation Reduction Potential	11/1/2017	Q4-2017	22.1				mV	F
P046	Oxidation Reduction Potential	2/12/2018	Q1-2018	12.6			F	mV	F
P046	Oxidation Reduction Potential	5/3/2018	Q2-2018	-22.9				mV	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P046	Oxidation Reduction Potential	8/9/2018	Q3-2018	-84.2				mV	F
P046	pH	11/1/2017	Q4-2017	6.91				s.u.	D
P046	pH	2/12/2018	Q1-2018	7.04			F	s.u.	F
P046	pH	5/3/2018	Q2-2018	7.07				s.u.	F
P046	pH	8/9/2018	Q3-2018	6.85				s.u.	F
P046	Specific Conductance	11/1/2017	Q4-2017	1390				umhos/cm	F
P046	Specific Conductance	2/12/2018	Q1-2018	1420			F	umhos/cm	F
P046	Specific Conductance	5/3/2018	Q2-2018	1430				umhos/cm	D
P046	Specific Conductance	8/9/2018	Q3-2018	1420				umhos/cm	F
P046	Temperature	11/1/2017	Q4-2017	13.3				C	D
P046	Temperature	2/12/2018	Q1-2018	12.4			F	C	F
P046	Temperature	5/3/2018	Q2-2018	13.5				C	F
P046	Temperature	8/9/2018	Q3-2018	14				C	F
P046	Tetrachloroethene	11/1/2017	Q4-2017	1.29	0.333			ug/L	F
P046	Tetrachloroethene	2/12/2018	Q1-2018	1.77	0.333			ug/L	F
P046	Tetrachloroethene	5/3/2018	Q2-2018	1.45	0.333			ug/L	D
P046	Tetrachloroethene	8/9/2018	Q3-2018	1.78	0.333			ug/L	F
P046	Trichloroethene	11/1/2017	Q4-2017	1.17	0.333			ug/L	F
P046	Trichloroethene	2/12/2018	Q1-2018	1.42	0.333			ug/L	D
P046	Trichloroethene	5/3/2018	Q2-2018	1.37	0.333			ug/L	F
P046	Trichloroethene	8/9/2018	Q3-2018	1.53	0.333			ug/L	F
P046	Turbidity	2/12/2018	Q1-2018	9.74			F	NTU	F
P046	Turbidity	5/3/2018	Q2-2018	4.79				NTU	F
P046	Turbidity	8/9/2018	Q3-2018	1.33				NTU	F
P046	Vinyl chloride	11/1/2017	Q4-2017	0.333	0.333	U		ug/L	F
P046	Vinyl chloride	2/12/2018	Q1-2018	0.333	0.333	U		ug/L	F
P046	Vinyl chloride	5/3/2018	Q2-2018	0.333	0.333	U		ug/L	F
P046	Vinyl chloride	8/9/2018	Q3-2018	1	0.333	U		ug/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P053	Alkalinity, Total (As CaCO3)	10/31/2017	Q4-2017	349	1.45		F	mg/L	F
P053	Alkalinity, Total (As CaCO3)	2/8/2018	Q1-2018	354	0.725			mg/L	F
P053	Alkalinity, Total (As CaCO3)	5/2/2018	Q2-2018	352	1.45			mg/L	F
P053	Alkalinity, Total (As CaCO3)	8/8/2018	Q3-2018	352	1.45			mg/L	F
P053	Ammonia Total as N	10/31/2017	Q4-2017	0.0795	0.017	J	UF	mg/L	F
P053	Ammonia Total as N	2/8/2018	Q1-2018	0.513	0.017			mg/L	F
P053	Ammonia Total as N	5/2/2018	Q2-2018	0.0668	0.017	J		mg/L	F
P053	Ammonia Total as N	8/8/2018	Q3-2018	0.0995	0.017	J		mg/L	F
P053	Carbon Dioxide	5/2/2018	Q2-2018	55				mg/L	F
P053	Carbon Dioxide	8/8/2018	Q3-2018	60				mg/L	F
P053	Carbon Disulfide	10/31/2017	Q4-2017	1.67	1.67	U	F	ug/L	F
P053	Carbon Disulfide	2/8/2018	Q1-2018	1.67	1.67	U		ug/L	F
P053	Carbon Disulfide	5/2/2018	Q2-2018	1.67	1.67	U		ug/L	F
P053	Carbon Disulfide	8/8/2018	Q3-2018	5	1.67	U		ug/L	F
P053	Chloride	10/31/2017	Q4-2017	182	3.35		F	mg/L	F
P053	Chloride	2/8/2018	Q1-2018	160	0.067			mg/L	F
P053	Chloride	5/2/2018	Q2-2018	123	1.34			mg/L	F
P053	Chloride	8/8/2018	Q3-2018	195	1.68			mg/L	F
P053	cis-1,2-Dichloroethene	10/31/2017	Q4-2017	0.37	0.333	J	F	ug/L	F
P053	cis-1,2-Dichloroethene	2/8/2018	Q1-2018	0.62	0.333	J		ug/L	F
P053	cis-1,2-Dichloroethene	5/2/2018	Q2-2018	0.96	0.333	J		ug/L	F
P053	cis-1,2-Dichloroethene	8/8/2018	Q3-2018	0.52	0.333	J		ug/L	F
P053	Dissolved Oxygen	10/31/2017	Q4-2017	0.75			F	mg/L	F
P053	Dissolved Oxygen	2/8/2018	Q1-2018	1.25			F	mg/L	F
P053	Dissolved Oxygen	5/2/2018	Q2-2018	1.01				mg/L	F
P053	Dissolved Oxygen	8/8/2018	Q3-2018	1.89				mg/L	F
P053	Ethane	10/31/2017	Q4-2017	10	10	U	F	ug/L	F
P053	Ethane	2/8/2018	Q1-2018	10	10	U		ug/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P053	Ethane	5/2/2018	Q2-2018	10	10	U		ug/L	F
P053	Ethane	8/8/2018	Q3-2018	25	10	U		ug/L	F
P053	Ethene	10/31/2017	Q4-2017	10	10	U	F	ug/L	F
P053	Ethene	2/8/2018	Q1-2018	10	10	U		ug/L	F
P053	Ethene	5/2/2018	Q2-2018	10	10	U		ug/L	F
P053	Ethene	8/8/2018	Q3-2018	25	10	U		ug/L	F
P053	Iron	10/31/2017	Q4-2017	0.191	0.03		F	mg/L	F
P053	Iron	2/8/2018	Q1-2018	0.281	0.03			mg/L	F
P053	Iron	5/2/2018	Q2-2018	0.456	0.03			mg/L	F
P053	Iron	8/8/2018	Q3-2018	1.36	0.03			mg/L	F
P053	Methane	10/31/2017	Q4-2017	512	20		F	ug/L	F
P053	Methane	2/8/2018	Q1-2018	784	10			ug/L	F
P053	Methane	5/2/2018	Q2-2018	1050	50			ug/L	F
P053	Methane	8/8/2018	Q3-2018	748	50			ug/L	F
P053	Nitrate as Nitrogen	10/31/2017	Q4-2017	0.907	0.066		F	mg/L	F
P053	Nitrate as Nitrogen	2/8/2018	Q1-2018	0.377	0.033	J		mg/L	F
P053	Nitrate as Nitrogen	5/2/2018	Q2-2018	0.165	0.165	U		mg/L	F
P053	Nitrate as Nitrogen	8/8/2018	Q3-2018	0.413	0.165	HJ		mg/L	F
P053	Oxidation Reduction Potential	10/31/2017	Q4-2017	-158.6			F	mV	F
P053	Oxidation Reduction Potential	2/8/2018	Q1-2018	-182			F	mV	F
P053	Oxidation Reduction Potential	5/2/2018	Q2-2018	-255.7				mV	F
P053	Oxidation Reduction Potential	8/8/2018	Q3-2018	-208				mV	F
P053	pH	10/31/2017	Q4-2017	6.95			F	s.u.	F
P053	pH	2/8/2018	Q1-2018	6.98			F	s.u.	F
P053	pH	5/2/2018	Q2-2018	7.15				s.u.	F
P053	pH	8/8/2018	Q3-2018	7.09				s.u.	F
P053	Phosphorus	10/31/2017	Q4-2017	0.0479	0.02	J	UF	mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P053	Phosphorus	2/8/2018	Q1-2018	0.048	0.02	J	U	mg/L	F
P053	Phosphorus	5/2/2018	Q2-2018	0.0329	0.02	J	U	mg/L	F
P053	Phosphorus	8/8/2018	Q3-2018	0.0291	0.02	J		mg/L	F
P053	Specific Conductance	10/31/2017	Q4-2017	1420			F	umhos/cm	F
P053	Specific Conductance	2/8/2018	Q1-2018	1310			F	umhos/cm	F
P053	Specific Conductance	5/2/2018	Q2-2018	1240				umhos/cm	F
P053	Specific Conductance	8/8/2018	Q3-2018	1520				umhos/cm	F
P053	Sulfate	10/31/2017	Q4-2017	123	6.65		F	mg/L	F
P053	Sulfate	2/8/2018	Q1-2018	124	0.133			mg/L	F
P053	Sulfate	5/2/2018	Q2-2018	133	2.66			mg/L	F
P053	Sulfate	8/8/2018	Q3-2018	127	3.33			mg/L	F
P053	Temperature	10/31/2017	Q4-2017	14.5			F	C	F
P053	Temperature	2/8/2018	Q1-2018	13.5			F	C	F
P053	Temperature	5/2/2018	Q2-2018	15.1				C	F
P053	Temperature	8/8/2018	Q3-2018	15.6				C	F
P053	Tetrachloroethene	10/31/2017	Q4-2017	4.64	0.333		F	ug/L	F
P053	Tetrachloroethene	2/8/2018	Q1-2018	5.35	0.333			ug/L	F
P053	Tetrachloroethene	5/2/2018	Q2-2018	4.32	0.333			ug/L	F
P053	Tetrachloroethene	8/8/2018	Q3-2018	5.08	0.333			ug/L	F
P053	Total Organic Carbon	10/31/2017	Q4-2017	2.85	0.33		F	mg/L	F
P053	Total Organic Carbon	2/8/2018	Q1-2018	5.81	0.33			mg/L	F
P053	Total Organic Carbon	5/2/2018	Q2-2018	2.37	0.33			mg/L	F
P053	Total Organic Carbon	8/8/2018	Q3-2018	4.28	0.33			mg/L	F
P053	Trichloroethene	10/31/2017	Q4-2017	2.39	0.333		F	ug/L	F
P053	Trichloroethene	2/8/2018	Q1-2018	2.88	0.333			ug/L	F
P053	Trichloroethene	5/2/2018	Q2-2018	2.37	0.333			ug/L	F
P053	Trichloroethene	8/8/2018	Q3-2018	2.67	0.333			ug/L	F
P053	Turbidity	10/31/2017	Q4-2017	4.28			F	NTU	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P053	Turbidity	2/8/2018	Q1-2018	6.92			F	NTU	F
P053	Turbidity	5/2/2018	Q2-2018	0.47				NTU	F
P053	Turbidity	8/8/2018	Q3-2018	1.3				NTU	F
P053	Vinyl chloride	10/31/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
P053	Vinyl chloride	2/8/2018	Q1-2018	0.333	0.333	U		ug/L	F
P053	Vinyl chloride	5/2/2018	Q2-2018	0.333	0.333	U		ug/L	F
P053	Vinyl chloride	8/8/2018	Q3-2018	1	0.333	U		ug/L	F
P054	Alkalinity, Total (As CaCO3)	10/31/2017	Q4-2017	419	1.45		F	mg/L	D
P054	Alkalinity, Total (As CaCO3)	2/8/2018	Q1-2018	409	0.725			mg/L	F
P054	Alkalinity, Total (As CaCO3)	5/1/2018	Q2-2018	378	1.45			mg/L	F
P054	Alkalinity, Total (As CaCO3)	8/8/2018	Q3-2018	402	1.45			mg/L	D
P054	Ammonia Total as N	10/31/2017	Q4-2017	0.108	0.017		UF	mg/L	F
P054	Ammonia Total as N	2/8/2018	Q1-2018	0.261	0.017			mg/L	D
P054	Ammonia Total as N	5/1/2018	Q2-2018	0.122	0.017			mg/L	F
P054	Ammonia Total as N	8/8/2018	Q3-2018	0.0983	0.017	J		mg/L	F
P054	Carbon Dioxide	5/1/2018	Q2-2018	100			>	mg/L	D
P054	Carbon Dioxide	8/8/2018	Q3-2018	80				mg/L	F
P054	Carbon Disulfide	10/31/2017	Q4-2017	1.67	1.67	U	F	ug/L	F
P054	Carbon Disulfide	2/8/2018	Q1-2018	1.67	1.67	U		ug/L	F
P054	Carbon Disulfide	5/1/2018	Q2-2018	1.67	1.67	U		ug/L	D
P054	Carbon Disulfide	8/8/2018	Q3-2018	5	1.67	U		ug/L	F
P054	Chloride	10/31/2017	Q4-2017	151	3.35		F	mg/L	D
P054	Chloride	2/8/2018	Q1-2018	171	0.067			mg/L	F
P054	Chloride	5/1/2018	Q2-2018	122	1.34			mg/L	D
P054	Chloride	8/8/2018	Q3-2018	137	1.68			mg/L	F
P054	cis-1,2-Dichloroethene	10/31/2017	Q4-2017	22.3	0.333		F	ug/L	D
P054	cis-1,2-Dichloroethene	2/8/2018	Q1-2018	20.5	0.333			ug/L	F
P054	cis-1,2-Dichloroethene	5/1/2018	Q2-2018	25.5	0.333			ug/L	D

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P054	cis-1,2-Dichloroethene	8/8/2018	Q3-2018	16.4	0.333			ug/L	F
P054	Dissolved Oxygen	10/31/2017	Q4-2017	2.46			F	mg/L	F
P054	Dissolved Oxygen	2/8/2018	Q1-2018	1.26			F	mg/L	F
P054	Dissolved Oxygen	5/1/2018	Q2-2018	0.06				mg/L	D
P054	Dissolved Oxygen	8/8/2018	Q3-2018	1.11				mg/L	F
P054	Ethane	10/31/2017	Q4-2017	10	10	U	F	ug/L	F
P054	Ethane	2/8/2018	Q1-2018	10	10	U		ug/L	D
P054	Ethane	5/1/2018	Q2-2018	10	10	U		ug/L	F
P054	Ethane	8/8/2018	Q3-2018	25	10	U		ug/L	F
P054	Ethene	10/31/2017	Q4-2017	10	10	U	F	ug/L	D
P054	Ethene	2/8/2018	Q1-2018	10	10	U		ug/L	F
P054	Ethene	5/1/2018	Q2-2018	10	10	U		ug/L	D
P054	Ethene	8/8/2018	Q3-2018	25	10	U		ug/L	F
P054	Iron	10/31/2017	Q4-2017	1.16	0.03		F	mg/L	D
P054	Iron	2/8/2018	Q1-2018	1.45	0.03			mg/L	F
P054	Iron	5/1/2018	Q2-2018	2.79	0.03			mg/L	D
P054	Iron	8/8/2018	Q3-2018	0.434	0.03			mg/L	F
P054	Methane	10/31/2017	Q4-2017	1940	100		F	ug/L	F
P054	Methane	2/8/2018	Q1-2018	2590	10			ug/L	D
P054	Methane	5/1/2018	Q2-2018	2430	100	B		ug/L	F
P054	Methane	8/8/2018	Q3-2018	2300	100			ug/L	F
P054	Nitrate as Nitrogen	10/31/2017	Q4-2017	0.066	0.066	U	F	mg/L	D
P054	Nitrate as Nitrogen	2/8/2018	Q1-2018	0.165	0.033	U		mg/L	F
P054	Nitrate as Nitrogen	5/1/2018	Q2-2018	0.165	0.165	U		mg/L	D
P054	Nitrate as Nitrogen	8/8/2018	Q3-2018	0.165	0.165	U		mg/L	F
P054	Oxidation Reduction Potential	10/31/2017	Q4-2017	-188.7			F	mV	F
P054	Oxidation Reduction Potential	2/8/2018	Q1-2018	-133			F	mV	D

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P054	Oxidation Reduction Potential	5/1/2018	Q2-2018	-240.6				mV	F
P054	Oxidation Reduction Potential	8/8/2018	Q3-2018	-208.8				mV	F
P054	pH	10/31/2017	Q4-2017	6.87			F	s.u.	D
P054	pH	2/8/2018	Q1-2018	6.98			F	s.u.	F
P054	pH	5/1/2018	Q2-2018	7.09				s.u.	D
P054	pH	8/8/2018	Q3-2018	7.04				s.u.	F
P054	Phosphorus	10/31/2017	Q4-2017	0.0558	0.02		UF	mg/L	F
P054	Phosphorus	2/8/2018	Q1-2018	0.0415	0.02	J	U	mg/L	D
P054	Phosphorus	5/1/2018	Q2-2018	0.0304	0.02	J	U	mg/L	F
P054	Phosphorus	8/8/2018	Q3-2018	0.0363	0.02	J		mg/L	F
P054	Specific Conductance	10/31/2017	Q4-2017	1410			F	umhos/cm	F
P054	Specific Conductance	2/8/2018	Q1-2018	1420			F	umhos/cm	F
P054	Specific Conductance	5/1/2018	Q2-2018	1310				umhos/cm	D
P054	Specific Conductance	8/8/2018	Q3-2018	1410				umhos/cm	F
P054	Sulfate	10/31/2017	Q4-2017	115	6.65		F	mg/L	D
P054	Sulfate	2/8/2018	Q1-2018	123	0.133			mg/L	F
P054	Sulfate	5/1/2018	Q2-2018	146	2.66			mg/L	D
P054	Sulfate	8/8/2018	Q3-2018	123	3.33			mg/L	F
P054	Temperature	10/31/2017	Q4-2017	14.3			F	C	F
P054	Temperature	2/8/2018	Q1-2018	13.7			F	C	F
P054	Temperature	5/1/2018	Q2-2018	15.1				C	D
P054	Temperature	8/8/2018	Q3-2018	15.6				C	F
P054	Tetrachloroethene	10/31/2017	Q4-2017	0.43	0.333	J	F	ug/L	F
P054	Tetrachloroethene	2/8/2018	Q1-2018	0.61	0.333	J		ug/L	F
P054	Tetrachloroethene	5/1/2018	Q2-2018	0.333	0.333	U		ug/L	D
P054	Tetrachloroethene	8/8/2018	Q3-2018	0.55	0.333	J		ug/L	F
P054	Total Organic Carbon	10/31/2017	Q4-2017	2.46	0.33		F	mg/L	F
P054	Total Organic Carbon	2/8/2018	Q1-2018	2.17	0.33			mg/L	D

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P054	Total Organic Carbon	5/1/2018	Q2-2018	1.66	0.33			mg/L	F
P054	Total Organic Carbon	8/8/2018	Q3-2018	2.16	0.33			mg/L	D
P054	Trichloroethene	10/31/2017	Q4-2017	2.21	0.333		F	ug/L	F
P054	Trichloroethene	2/8/2018	Q1-2018	2.02	0.333			ug/L	F
P054	Trichloroethene	5/1/2018	Q2-2018	1.4	0.333			ug/L	D
P054	Trichloroethene	8/8/2018	Q3-2018	4.52	0.333			ug/L	F
P054	Turbidity	10/31/2017	Q4-2017	7.76			F	NTU	D
P054	Turbidity	2/8/2018	Q1-2018	11.4			F	NTU	F
P054	Turbidity	5/1/2018	Q2-2018	5.49				NTU	D
P054	Turbidity	8/8/2018	Q3-2018	2.33				NTU	F
P054	Vinyl chloride	10/31/2017	Q4-2017	3.69	0.333		F	ug/L	F
P054	Vinyl chloride	2/8/2018	Q1-2018	6.18	0.333			ug/L	F
P054	Vinyl chloride	5/1/2018	Q2-2018	6.3	0.333			ug/L	D
P054	Vinyl chloride	8/8/2018	Q3-2018	3.89	0.333			ug/L	F
P056	Alkalinity, Total (As CaCO3)	10/31/2017	Q4-2017	421	1.45		F	mg/L	F
P056	Alkalinity, Total (As CaCO3)	2/8/2018	Q1-2018	403	0.725			mg/L	F
P056	Alkalinity, Total (As CaCO3)	4/30/2018	Q2-2018	384	1.45			mg/L	F
P056	Alkalinity, Total (As CaCO3)	8/7/2018	Q3-2018	399	1.45			mg/L	D
P056	Alkalinity, Total (As CaCO3)	8/7/2018	Q3-2018	388	1.45			mg/L	F
P056	Ammonia Total as N	10/31/2017	Q4-2017	0.0751	0.017	J	UF	mg/L	D
P056	Ammonia Total as N	2/8/2018	Q1-2018	0.179	0.017			mg/L	F
P056	Ammonia Total as N	4/30/2018	Q2-2018	0.158	0.017			mg/L	F
P056	Ammonia Total as N	8/7/2018	Q3-2018	0.0949	0.017	J		mg/L	F
P056	Ammonia Total as N	8/7/2018	Q3-2018	0.0644	0.017	J		mg/L	D
P056	Carbon Dioxide	4/30/2018	Q2-2018	100				mg/L	F
P056	Carbon Dioxide	8/7/2018	Q3-2018	45				mg/L	D
P056	Carbon Disulfide	10/31/2017	Q4-2017	1.67	1.67	U	F	ug/L	F
P056	Carbon Disulfide	2/8/2018	Q1-2018	1.67	1.67	U		ug/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P056	Carbon Disulfide	4/30/2018	Q2-2018	1.67	1.67	U		ug/L	D
P056	Carbon Disulfide	8/7/2018	Q3-2018	5	1.67	U		ug/L	F
P056	Carbon Disulfide	8/7/2018	Q3-2018	5	1.67	U		ug/L	F
P056	Chloride	10/31/2017	Q4-2017	148	3.35		F	mg/L	F
P056	Chloride	2/8/2018	Q1-2018	178	0.067			mg/L	D
P056	Chloride	4/30/2018	Q2-2018	150	1.68			mg/L	F
P056	Chloride	8/7/2018	Q3-2018	148	1.34			mg/L	F
P056	Chloride	8/7/2018	Q3-2018	144	1.34			mg/L	D
P056	cis-1,2-Dichloroethene	10/31/2017	Q4-2017	55.9	0.333		F	ug/L	D
P056	cis-1,2-Dichloroethene	2/8/2018	Q1-2018	21.3	0.333			ug/L	F
P056	cis-1,2-Dichloroethene	4/30/2018	Q2-2018	7.88	0.333			ug/L	F
P056	cis-1,2-Dichloroethene	8/7/2018	Q3-2018	18.9	0.333			ug/L	D
P056	cis-1,2-Dichloroethene	8/7/2018	Q3-2018	17	0.333			ug/L	F
P056	Dissolved Oxygen	10/31/2017	Q4-2017	0.63			F	mg/L	F
P056	Dissolved Oxygen	2/8/2018	Q1-2018	0.91			F	mg/L	F
P056	Dissolved Oxygen	4/30/2018	Q2-2018	2.52				mg/L	F
P056	Dissolved Oxygen	8/7/2018	Q3-2018	0.71				mg/L	F
P056	Ethane	10/31/2017	Q4-2017	10	10	U	F	ug/L	F
P056	Ethane	2/8/2018	Q1-2018	10	10	U		ug/L	F
P056	Ethane	4/30/2018	Q2-2018	10	10	U		ug/L	F
P056	Ethane	8/7/2018	Q3-2018	25	10	U		ug/L	F
P056	Ethane	8/7/2018	Q3-2018	25	10	U		ug/L	F
P056	Ethene	10/31/2017	Q4-2017	10	10	U	F	ug/L	F
P056	Ethene	2/8/2018	Q1-2018	10	10	U		ug/L	F
P056	Ethene	4/30/2018	Q2-2018	10	10	U		ug/L	F
P056	Ethene	8/7/2018	Q3-2018	25	10	U		ug/L	F
P056	Ethene	8/7/2018	Q3-2018	25	10	U		ug/L	F
P056	Iron	10/31/2017	Q4-2017	0.427	0.03		F	mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P056	Iron	2/8/2018	Q1-2018	1.2	0.03			mg/L	F
P056	Iron	4/30/2018	Q2-2018	3.82	0.03			mg/L	F
P056	Iron	8/7/2018	Q3-2018	1.12	0.03			mg/L	F
P056	Iron	8/7/2018	Q3-2018	1.09	0.03			mg/L	F
P056	Methane	10/31/2017	Q4-2017	1930	100		F	ug/L	F
P056	Methane	2/8/2018	Q1-2018	1460	10			ug/L	F
P056	Methane	4/30/2018	Q2-2018	1030	50	B		ug/L	F
P056	Methane	8/7/2018	Q3-2018	1630	100			ug/L	F
P056	Methane	8/7/2018	Q3-2018	1740	100			ug/L	F
P056	Nitrate as Nitrogen	10/31/2017	Q4-2017	0.066	0.066	U	F	mg/L	F
P056	Nitrate as Nitrogen	2/8/2018	Q1-2018	0.165	0.033	U		mg/L	F
P056	Nitrate as Nitrogen	4/30/2018	Q2-2018	0.165	0.165	U		mg/L	F
P056	Nitrate as Nitrogen	8/7/2018	Q3-2018	0.165	0.165	U		mg/L	F
P056	Nitrate as Nitrogen	8/7/2018	Q3-2018	0.165	0.165	U		mg/L	F
P056	Oxidation Reduction Potential	10/31/2017	Q4-2017	-36.1			F	mV	F
P056	Oxidation Reduction Potential	2/8/2018	Q1-2018	-83			F	mV	F
P056	Oxidation Reduction Potential	4/30/2018	Q2-2018	-33.3				mV	F
P056	Oxidation Reduction Potential	8/7/2018	Q3-2018	-22.4				mV	F
P056	pH	10/31/2017	Q4-2017	6.9			F	s.u.	F
P056	pH	2/8/2018	Q1-2018	7.03			F	s.u.	F
P056	pH	4/30/2018	Q2-2018	7				s.u.	F
P056	pH	8/7/2018	Q3-2018	7.06				s.u.	F
P056	Phosphorus	10/31/2017	Q4-2017	0.0435	0.02	J	UF	mg/L	F
P056	Phosphorus	2/8/2018	Q1-2018	0.0357	0.02	J	U	mg/L	F
P056	Phosphorus	4/30/2018	Q2-2018	0.0386	0.02	J	U	mg/L	F
P056	Phosphorus	8/7/2018	Q3-2018	0.0241	0.02	J		mg/L	F
P056	Phosphorus	8/7/2018	Q3-2018	0.0233	0.02	J		mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P056	Specific Conductance	10/31/2017	Q4-2017	1410			F	umhos/cm	F
P056	Specific Conductance	2/8/2018	Q1-2018	1450			F	umhos/cm	F
P056	Specific Conductance	4/30/2018	Q2-2018	1380				umhos/cm	F
P056	Specific Conductance	8/7/2018	Q3-2018	1400				umhos/cm	F
P056	Sulfate	10/31/2017	Q4-2017	121	6.65		F	mg/L	F
P056	Sulfate	2/8/2018	Q1-2018	125	0.133			mg/L	F
P056	Sulfate	4/30/2018	Q2-2018	161	3.33			mg/L	F
P056	Sulfate	8/7/2018	Q3-2018	151	2.66			mg/L	F
P056	Sulfate	8/7/2018	Q3-2018	154	2.66			mg/L	F
P056	Temperature	10/31/2017	Q4-2017	14.3			F	C	F
P056	Temperature	2/8/2018	Q1-2018	14			F	C	F
P056	Temperature	4/30/2018	Q2-2018	14.1				C	F
P056	Temperature	8/7/2018	Q3-2018	15.5				C	F
P056	Tetrachloroethene	10/31/2017	Q4-2017	1.37	0.333		F	ug/L	F
P056	Tetrachloroethene	2/8/2018	Q1-2018	1.34	0.333			ug/L	F
P056	Tetrachloroethene	4/30/2018	Q2-2018	0.333	0.333	U		ug/L	F
P056	Tetrachloroethene	8/7/2018	Q3-2018	1.47	0.333			ug/L	F
P056	Tetrachloroethene	8/7/2018	Q3-2018	1.36	0.333			ug/L	F
P056	Total Organic Carbon	10/31/2017	Q4-2017	1.69	0.33		F	mg/L	F
P056	Total Organic Carbon	2/8/2018	Q1-2018	1.55	0.33			mg/L	F
P056	Total Organic Carbon	4/30/2018	Q2-2018	1.37	0.33			mg/L	F
P056	Total Organic Carbon	8/7/2018	Q3-2018	1.45	0.33			mg/L	F
P056	Total Organic Carbon	8/7/2018	Q3-2018	1.39	0.33			mg/L	F
P056	Trichloroethene	10/31/2017	Q4-2017	1.5	0.333		F	ug/L	F
P056	Trichloroethene	2/8/2018	Q1-2018	1.44	0.333			ug/L	F
P056	Trichloroethene	4/30/2018	Q2-2018	0.35	0.333	J		ug/L	F
P056	Trichloroethene	8/7/2018	Q3-2018	1.59	0.333			ug/L	F
P056	Trichloroethene	8/7/2018	Q3-2018	1.42	0.333			ug/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P056	Turbidity	10/31/2017	Q4-2017	1.27			F	NTU	F
P056	Turbidity	2/8/2018	Q1-2018	1.75			F	NTU	F
P056	Turbidity	4/30/2018	Q2-2018	0.93				NTU	F
P056	Turbidity	8/7/2018	Q3-2018	1.16				NTU	F
P056	Vinyl chloride	10/31/2017	Q4-2017	24.2	0.333		F	ug/L	F
P056	Vinyl chloride	2/8/2018	Q1-2018	9.9	0.333			ug/L	F
P056	Vinyl chloride	4/30/2018	Q2-2018	2.18	0.333			ug/L	F
P056	Vinyl chloride	8/7/2018	Q3-2018	8.07	0.333			ug/L	F
P056	Vinyl chloride	8/7/2018	Q3-2018	6.67	0.333			ug/L	F
P057	Alkalinity, Total (As CaCO3)	10/31/2017	Q4-2017	412	1.45		F	mg/L	F
P057	Alkalinity, Total (As CaCO3)	2/12/2018	Q1-2018	427	0.725			mg/L	F
P057	Alkalinity, Total (As CaCO3)	5/1/2018	Q2-2018	455	1.45			mg/L	F
P057	Alkalinity, Total (As CaCO3)	8/6/2018	Q3-2018	417	1.45			mg/L	F
P057	Ammonia Total as N	10/31/2017	Q4-2017	0.017	0.017	J	UF	mg/L	F
P057	Ammonia Total as N	2/12/2018	Q1-2018	0.155	0.017			mg/L	F
P057	Ammonia Total as N	5/1/2018	Q2-2018	0.0598	0.017	J		mg/L	F
P057	Ammonia Total as N	8/6/2018	Q3-2018	0.0532	0.017	J		mg/L	F
P057	Carbon Dioxide	5/1/2018	Q2-2018	100			>	mg/L	F
P057	Carbon Dioxide	8/6/2018	Q3-2018	100				mg/L	F
P057	Carbon Disulfide	10/31/2017	Q4-2017	1.67	1.67	U	F	ug/L	F
P057	Carbon Disulfide	2/12/2018	Q1-2018	1.67	1.67	U		ug/L	F
P057	Carbon Disulfide	5/1/2018	Q2-2018	1.67	1.67	U		ug/L	F
P057	Carbon Disulfide	8/6/2018	Q3-2018	5	1.67	U		ug/L	F
P057	Chloride	10/31/2017	Q4-2017	144	1.34		F	mg/L	F
P057	Chloride	2/12/2018	Q1-2018	140	0.067			mg/L	F
P057	Chloride	5/1/2018	Q2-2018	162	1.68			mg/L	F
P057	Chloride	8/6/2018	Q3-2018	175	1.68			mg/L	F
P057	cis-1,2-Dichloroethene	10/31/2017	Q4-2017	7.24	0.333		F	ug/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P057	cis-1,2-Dichloroethene	2/12/2018	Q1-2018	5.64	0.333			ug/L	F
P057	cis-1,2-Dichloroethene	5/1/2018	Q2-2018	3.97	0.333			ug/L	F
P057	cis-1,2-Dichloroethene	8/6/2018	Q3-2018	4.77	0.333			ug/L	F
P057	Dissolved Oxygen	10/31/2017	Q4-2017	0.88			F	mg/L	F
P057	Dissolved Oxygen	2/12/2018	Q1-2018	1.11			F	mg/L	F
P057	Dissolved Oxygen	5/1/2018	Q2-2018	1.15				mg/L	F
P057	Dissolved Oxygen	8/6/2018	Q3-2018	7.36				mg/L	F
P057	Ethane	10/31/2017	Q4-2017	10	10	U	F	ug/L	F
P057	Ethane	2/12/2018	Q1-2018	10	10	U		ug/L	F
P057	Ethane	5/1/2018	Q2-2018	10	10	U		ug/L	F
P057	Ethane	8/6/2018	Q3-2018	25	10	U		ug/L	F
P057	Ethene	10/31/2017	Q4-2017	10	10	U	F	ug/L	F
P057	Ethene	2/12/2018	Q1-2018	10	10	U		ug/L	F
P057	Ethene	5/1/2018	Q2-2018	10	10	U		ug/L	F
P057	Ethene	8/6/2018	Q3-2018	25	10	U		ug/L	F
P057	Iron	10/31/2017	Q4-2017	0.03	0.03	U	F	mg/L	F
P057	Iron	2/12/2018	Q1-2018	0.03	0.03	U		mg/L	F
P057	Iron	5/1/2018	Q2-2018	0.03	0.03	U		mg/L	F
P057	Iron	8/6/2018	Q3-2018	0.03	0.03	U		mg/L	F
P057	Methane	10/31/2017	Q4-2017	421	20		F	ug/L	F
P057	Methane	2/12/2018	Q1-2018	104	10			ug/L	F
P057	Methane	5/1/2018	Q2-2018	75.8	10	B		ug/L	F
P057	Methane	8/6/2018	Q3-2018	202	10			ug/L	F
P057	Nitrate as Nitrogen	10/31/2017	Q4-2017	0.385	0.066		F	mg/L	F
P057	Nitrate as Nitrogen	2/12/2018	Q1-2018	0.57	0.033	H	J	mg/L	F
P057	Nitrate as Nitrogen	5/1/2018	Q2-2018	0.716	0.165			mg/L	F
P057	Nitrate as Nitrogen	8/6/2018	Q3-2018	0.529	0.165			mg/L	F
P057	Oxidation Reduction Potential	10/31/2017	Q4-2017	96.2			F	mV	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P057	Oxidation Reduction Potential	2/12/2018	Q1-2018	236.9			F	mV	F
P057	Oxidation Reduction Potential	5/1/2018	Q2-2018	109.7				mV	F
P057	Oxidation Reduction Potential	8/6/2018	Q3-2018	139.3				mV	F
P057	pH	10/31/2017	Q4-2017	6.9			F	s.u.	F
P057	pH	2/12/2018	Q1-2018	6.91			F	s.u.	F
P057	pH	5/1/2018	Q2-2018	6.86				s.u.	F
P057	pH	8/6/2018	Q3-2018	6.71				s.u.	F
P057	Phosphorus	10/31/2017	Q4-2017	0.0449	0.02	J	UF	mg/L	F
P057	Phosphorus	2/12/2018	Q1-2018	0.0272	0.02	J	U	mg/L	F
P057	Phosphorus	5/1/2018	Q2-2018	0.0384	0.02	J	U	mg/L	F
P057	Phosphorus	8/6/2018	Q3-2018	0.0259	0.02	J		mg/L	F
P057	Specific Conductance	10/31/2017	Q4-2017	1390			F	umhos/cm	F
P057	Specific Conductance	2/12/2018	Q1-2018	1410			F	umhos/cm	F
P057	Specific Conductance	5/1/2018	Q2-2018	1550				umhos/cm	F
P057	Specific Conductance	8/6/2018	Q3-2018	1490				umhos/cm	F
P057	Sulfate	10/31/2017	Q4-2017	134	2.66		F	mg/L	F
P057	Sulfate	2/12/2018	Q1-2018	140	0.133			mg/L	F
P057	Sulfate	5/1/2018	Q2-2018	148	3.33			mg/L	F
P057	Sulfate	8/6/2018	Q3-2018	169	3.33			mg/L	F
P057	Temperature	10/31/2017	Q4-2017	14.6			F	C	F
P057	Temperature	2/12/2018	Q1-2018	14.2			F	C	F
P057	Temperature	5/1/2018	Q2-2018	15.5				C	F
P057	Temperature	8/6/2018	Q3-2018	15				C	F
P057	Tetrachloroethene	10/31/2017	Q4-2017	1.45	0.333		F	ug/L	F
P057	Tetrachloroethene	2/12/2018	Q1-2018	1.76	0.333			ug/L	F
P057	Tetrachloroethene	5/1/2018	Q2-2018	2.07	0.333			ug/L	F
P057	Tetrachloroethene	8/6/2018	Q3-2018	1.92	0.333			ug/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P057	Total Organic Carbon	10/31/2017	Q4-2017	1.61	0.33		F	mg/L	F
P057	Total Organic Carbon	2/12/2018	Q1-2018	1.61	0.33			mg/L	F
P057	Total Organic Carbon	5/1/2018	Q2-2018	1.14	0.33			mg/L	F
P057	Total Organic Carbon	8/6/2018	Q3-2018	1.27	0.33			mg/L	F
P057	Trichloroethene	10/31/2017	Q4-2017	4.54	0.333		F	ug/L	F
P057	Trichloroethene	2/12/2018	Q1-2018	4.33	0.333			ug/L	F
P057	Trichloroethene	5/1/2018	Q2-2018	4.06	0.333			ug/L	F
P057	Trichloroethene	8/6/2018	Q3-2018	4.2	0.333			ug/L	F
P057	Turbidity	10/31/2017	Q4-2017	6.23			F	NTU	F
P057	Turbidity	2/12/2018	Q1-2018	7			F	NTU	F
P057	Turbidity	5/1/2018	Q2-2018	2.32				NTU	F
P057	Turbidity	8/6/2018	Q3-2018	7.87				NTU	F
P057	Vinyl chloride	10/31/2017	Q4-2017	1.56	0.333		F	ug/L	F
P057	Vinyl chloride	2/12/2018	Q1-2018	0.65	0.333	J		ug/L	F
P057	Vinyl chloride	5/1/2018	Q2-2018	0.333	0.333	U		ug/L	F
P057	Vinyl chloride	8/6/2018	Q3-2018	1	0.333	U		ug/L	F
P058	Alkalinity, Total (As CaCO3)	10/31/2017	Q4-2017	430	1.45		F	mg/L	F
P058	Alkalinity, Total (As CaCO3)	10/31/2017	Q4-2017	436	1.45		F	mg/L	F
P058	Alkalinity, Total (As CaCO3)	2/12/2018	Q1-2018	443	0.725			mg/L	F
P058	Alkalinity, Total (As CaCO3)	4/30/2018	Q2-2018	439	1.45			mg/L	F
P058	Alkalinity, Total (As CaCO3)	4/30/2018	Q2-2018	438	1.45			mg/L	F
P058	Alkalinity, Total (As CaCO3)	8/7/2018	Q3-2018	422	1.45			mg/L	F
P058	Ammonia Total as N	10/31/2017	Q4-2017	0.169	0.017		F	mg/L	F
P058	Ammonia Total as N	10/31/2017	Q4-2017	0.189	0.017		F	mg/L	F
P058	Ammonia Total as N	2/12/2018	Q1-2018	0.188	0.017			mg/L	F
P058	Ammonia Total as N	4/30/2018	Q2-2018	0.233	0.017			mg/L	F
P058	Ammonia Total as N	4/30/2018	Q2-2018	0.284	0.017			mg/L	F
P058	Ammonia Total as N	8/7/2018	Q3-2018	0.197	0.017			mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P058	Carbon Dioxide	4/30/2018	Q2-2018	60				mg/L	F
P058	Carbon Dioxide	8/7/2018	Q3-2018	100			>	mg/L	F
P058	Carbon Disulfide	10/31/2017	Q4-2017	1.67	1.67	U	F	ug/L	F
P058	Carbon Disulfide	10/31/2017	Q4-2017	1.67	1.67	U	F	ug/L	F
P058	Carbon Disulfide	2/12/2018	Q1-2018	1.67	1.67	U		ug/L	F
P058	Carbon Disulfide	4/30/2018	Q2-2018	1.67	1.67	U		ug/L	F
P058	Carbon Disulfide	4/30/2018	Q2-2018	1.67	1.67	U		ug/L	F
P058	Carbon Disulfide	8/7/2018	Q3-2018	5	1.67	U		ug/L	F
P058	Chloride	10/31/2017	Q4-2017	127	1.34		F	mg/L	F
P058	Chloride	10/31/2017	Q4-2017	127	1.34		F	mg/L	F
P058	Chloride	2/12/2018	Q1-2018	152	0.067			mg/L	F
P058	Chloride	4/30/2018	Q2-2018	162	1.68			mg/L	F
P058	Chloride	4/30/2018	Q2-2018	164	1.68			mg/L	F
P058	Chloride	8/7/2018	Q3-2018	227	6.7			mg/L	F
P058	cis-1,2-Dichloroethene	10/31/2017	Q4-2017	2.56	0.333		F	ug/L	F
P058	cis-1,2-Dichloroethene	10/31/2017	Q4-2017	2.82	0.333		F	ug/L	F
P058	cis-1,2-Dichloroethene	2/12/2018	Q1-2018	2.73	0.333			ug/L	F
P058	cis-1,2-Dichloroethene	4/30/2018	Q2-2018	4.59	0.333			ug/L	F
P058	cis-1,2-Dichloroethene	4/30/2018	Q2-2018	4.77	0.333			ug/L	F
P058	cis-1,2-Dichloroethene	8/7/2018	Q3-2018	2.91	0.333			ug/L	F
P058	Dissolved Oxygen	10/31/2017	Q4-2017	0.75			F	mg/L	F
P058	Dissolved Oxygen	2/12/2018	Q1-2018	0.28			F	mg/L	F
P058	Dissolved Oxygen	4/30/2018	Q2-2018	1.33				mg/L	F
P058	Dissolved Oxygen	8/7/2018	Q3-2018	2.29				mg/L	F
P058	Ethane	10/31/2017	Q4-2017	10	10	U	F	ug/L	F
P058	Ethane	10/31/2017	Q4-2017	10	10	U	F	ug/L	F
P058	Ethane	2/12/2018	Q1-2018	10	10	U		ug/L	F
P058	Ethane	4/30/2018	Q2-2018	10	10	U		ug/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P058	Ethane	4/30/2018	Q2-2018	10	10	U		ug/L	F
P058	Ethane	8/7/2018	Q3-2018	25	10	U		ug/L	F
P058	Ethene	10/31/2017	Q4-2017	10	10	U	F	ug/L	F
P058	Ethene	10/31/2017	Q4-2017	10	10	U	F	ug/L	F
P058	Ethene	2/12/2018	Q1-2018	10	10	U		ug/L	F
P058	Ethene	4/30/2018	Q2-2018	10	10	U		ug/L	F
P058	Ethene	4/30/2018	Q2-2018	10	10	U		ug/L	F
P058	Ethene	8/7/2018	Q3-2018	25	10	U		ug/L	F
P058	Iron	10/31/2017	Q4-2017	0.0925	0.03	B	F	mg/L	F
P058	Iron	10/31/2017	Q4-2017	0.092	0.03	B	F	mg/L	F
P058	Iron	2/12/2018	Q1-2018	0.0517	0.03	B		mg/L	F
P058	Iron	4/30/2018	Q2-2018	0.153	0.03			mg/L	F
P058	Iron	4/30/2018	Q2-2018	0.146	0.03			mg/L	F
P058	Iron	8/7/2018	Q3-2018	0.03	0.03	U		mg/L	F
P058	Methane	10/31/2017	Q4-2017	691	20		F	ug/L	F
P058	Methane	10/31/2017	Q4-2017	573	50		F	ug/L	F
P058	Methane	2/12/2018	Q1-2018	463	10			ug/L	F
P058	Methane	4/30/2018	Q2-2018	531	20	B		ug/L	F
P058	Methane	4/30/2018	Q2-2018	702	50			ug/L	F
P058	Methane	8/7/2018	Q3-2018	608	50			ug/L	F
P058	Nitrate as Nitrogen	10/31/2017	Q4-2017	0.066	0.066	U	F	mg/L	F
P058	Nitrate as Nitrogen	10/31/2017	Q4-2017	0.105	0.066	J	F	mg/L	F
P058	Nitrate as Nitrogen	2/12/2018	Q1-2018	0.066	0.033	HU	J	mg/L	F
P058	Nitrate as Nitrogen	4/30/2018	Q2-2018	0.165	0.165	U		mg/L	F
P058	Nitrate as Nitrogen	4/30/2018	Q2-2018	0.165	0.165	U		mg/L	F
P058	Nitrate as Nitrogen	8/7/2018	Q3-2018	0.165	0.165	U		mg/L	F
P058	Oxidation Reduction Potential	10/31/2017	Q4-2017	22.2			F	mV	F
P058	Oxidation Reduction Potential	2/12/2018	Q1-2018	8.4			F	mV	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P058	Oxidation Reduction Potential	4/30/2018	Q2-2018	50.9				mV	F
P058	Oxidation Reduction Potential	8/7/2018	Q3-2018	60.4				mV	F
P058	pH	10/31/2017	Q4-2017	6.84			F	s.u.	F
P058	pH	2/12/2018	Q1-2018	6.99			F	s.u.	F
P058	pH	4/30/2018	Q2-2018	6.81				s.u.	F
P058	pH	8/7/2018	Q3-2018	6.65				s.u.	F
P058	Phosphorus	10/31/2017	Q4-2017	0.0462	0.02	J	UF	mg/L	F
P058	Phosphorus	10/31/2017	Q4-2017	0.037	0.02	J	UF	mg/L	F
P058	Phosphorus	2/12/2018	Q1-2018	0.02	0.02	U		mg/L	F
P058	Phosphorus	4/30/2018	Q2-2018	0.0335	0.02	J	U	mg/L	F
P058	Phosphorus	4/30/2018	Q2-2018	0.02	0.02	U		mg/L	F
P058	Phosphorus	8/7/2018	Q3-2018	0.0328	0.02	J		mg/L	F
P058	Specific Conductance	10/31/2017	Q4-2017	1390			F	umhos/cm	F
P058	Specific Conductance	2/12/2018	Q1-2018	1390			F	umhos/cm	F
P058	Specific Conductance	4/30/2018	Q2-2018	1550				umhos/cm	F
P058	Specific Conductance	8/7/2018	Q3-2018	1700				umhos/cm	F
P058	Sulfate	10/31/2017	Q4-2017	150	2.66		F	mg/L	F
P058	Sulfate	10/31/2017	Q4-2017	150	2.66		F	mg/L	F
P058	Sulfate	2/12/2018	Q1-2018	198	0.133			mg/L	F
P058	Sulfate	4/30/2018	Q2-2018	155	3.33			mg/L	F
P058	Sulfate	4/30/2018	Q2-2018	155	3.33			mg/L	F
P058	Sulfate	8/7/2018	Q3-2018	154	13.3			mg/L	F
P058	Temperature	10/31/2017	Q4-2017	13.4			F	C	F
P058	Temperature	2/12/2018	Q1-2018	11.5			F	C	F
P058	Temperature	4/30/2018	Q2-2018	13.8				C	F
P058	Temperature	8/7/2018	Q3-2018	16.7				C	F
P058	Tetrachloroethene	10/31/2017	Q4-2017	2.15	0.333		F	ug/L	F
P058	Tetrachloroethene	10/31/2017	Q4-2017	2.15	0.333		F	ug/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P058	Tetrachloroethene	2/12/2018	Q1-2018	2.48	0.333			ug/L	F
P058	Tetrachloroethene	4/30/2018	Q2-2018	1.7	0.333			ug/L	F
P058	Tetrachloroethene	4/30/2018	Q2-2018	1.5	0.333			ug/L	F
P058	Tetrachloroethene	8/7/2018	Q3-2018	2.55	0.333			ug/L	F
P058	Total Organic Carbon	10/31/2017	Q4-2017	1.73	0.33		F	mg/L	F
P058	Total Organic Carbon	10/31/2017	Q4-2017	1.68	0.33		F	mg/L	F
P058	Total Organic Carbon	2/12/2018	Q1-2018	1.76	0.33			mg/L	F
P058	Total Organic Carbon	4/30/2018	Q2-2018	1.33	0.33			mg/L	F
P058	Total Organic Carbon	4/30/2018	Q2-2018	1.54	0.33			mg/L	F
P058	Total Organic Carbon	8/7/2018	Q3-2018	1.5	0.33			mg/L	F
P058	Trichloroethene	10/31/2017	Q4-2017	2.13	0.333		F	ug/L	F
P058	Trichloroethene	10/31/2017	Q4-2017	2.01	0.333		F	ug/L	F
P058	Trichloroethene	2/12/2018	Q1-2018	2.15	0.333			ug/L	F
P058	Trichloroethene	4/30/2018	Q2-2018	1.07	0.333			ug/L	F
P058	Trichloroethene	4/30/2018	Q2-2018	0.95	0.333	J		ug/L	F
P058	Trichloroethene	8/7/2018	Q3-2018	2.13	0.333			ug/L	F
P058	Turbidity	10/31/2017	Q4-2017	0.93			F	NTU	F
P058	Turbidity	2/12/2018	Q1-2018	0.65			F	NTU	F
P058	Turbidity	4/30/2018	Q2-2018	1.5				NTU	F
P058	Turbidity	8/7/2018	Q3-2018	1.68				NTU	F
P058	Vinyl chloride	10/31/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
P058	Vinyl chloride	10/31/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
P058	Vinyl chloride	2/12/2018	Q1-2018	0.333	0.333	U		ug/L	F
P058	Vinyl chloride	4/30/2018	Q2-2018	0.58	0.333	J		ug/L	F
P058	Vinyl chloride	4/30/2018	Q2-2018	0.58	0.333	J		ug/L	F
P058	Vinyl chloride	8/7/2018	Q3-2018	0.56	0.333	J		ug/L	F
P059	Alkalinity, Total (As CaCO3)	10/30/2017	Q4-2017	453	1.45		F	mg/L	F
P059	Alkalinity, Total (As CaCO3)	2/8/2018	Q1-2018	471	0.725			mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P059	Alkalinity, Total (As CaCO3)	5/1/2018	Q2-2018	466	1.45			mg/L	F
P059	Alkalinity, Total (As CaCO3)	8/6/2018	Q3-2018	466	1.45			mg/L	D
P059	Ammonia Total as N	10/30/2017	Q4-2017	0.0573	0.017	J	UF	mg/L	F
P059	Ammonia Total as N	2/8/2018	Q1-2018	0.0891	0.017	J		mg/L	F
P059	Ammonia Total as N	5/1/2018	Q2-2018	0.0524	0.017	J		mg/L	F
P059	Ammonia Total as N	8/6/2018	Q3-2018	0.0504	0.017	J		mg/L	D
P059	Carbon Dioxide	5/1/2018	Q2-2018	60				mg/L	F
P059	Carbon Dioxide	8/6/2018	Q3-2018	100			>	mg/L	D
P059	Carbon Disulfide	10/30/2017	Q4-2017	1.67	1.67	U	F	ug/L	F
P059	Carbon Disulfide	2/8/2018	Q1-2018	1.67	1.67	U		ug/L	F
P059	Carbon Disulfide	5/1/2018	Q2-2018	1.67	1.67	U		ug/L	F
P059	Carbon Disulfide	8/6/2018	Q3-2018	5	1.67	U		ug/L	D
P059	Chloride	10/30/2017	Q4-2017	165	3.35		F	mg/L	F
P059	Chloride	2/8/2018	Q1-2018	161	0.067			mg/L	D
P059	Chloride	5/1/2018	Q2-2018	149	1.68			mg/L	F
P059	Chloride	8/6/2018	Q3-2018	174	1.68			mg/L	F
P059	cis-1,2-Dichloroethene	10/30/2017	Q4-2017	4.21	0.333		F	ug/L	F
P059	cis-1,2-Dichloroethene	2/8/2018	Q1-2018	3.56	0.333			ug/L	D
P059	cis-1,2-Dichloroethene	5/1/2018	Q2-2018	5.5	0.333			ug/L	F
P059	cis-1,2-Dichloroethene	8/6/2018	Q3-2018	4.4	0.333			ug/L	F
P059	Dissolved Oxygen	10/30/2017	Q4-2017	0.81			F	mg/L	F
P059	Dissolved Oxygen	2/8/2018	Q1-2018	0.86			F	mg/L	F
P059	Dissolved Oxygen	5/1/2018	Q2-2018	1.59				mg/L	F
P059	Dissolved Oxygen	8/6/2018	Q3-2018	6.71				mg/L	D
P059	Ethane	10/30/2017	Q4-2017	10	10	U	F	ug/L	F
P059	Ethane	2/8/2018	Q1-2018	10	10	U		ug/L	F
P059	Ethane	5/1/2018	Q2-2018	10	10	U		ug/L	F
P059	Ethane	8/6/2018	Q3-2018	25	10	U		ug/L	D

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P059	Ethene	10/30/2017	Q4-2017	10	10	U	F	ug/L	F
P059	Ethene	2/8/2018	Q1-2018	10	10	U		ug/L	F
P059	Ethene	5/1/2018	Q2-2018	10	10	U		ug/L	F
P059	Ethene	8/6/2018	Q3-2018	25	10	U		ug/L	F
P059	Iron	10/30/2017	Q4-2017	0.703	0.03		F	mg/L	F
P059	Iron	2/8/2018	Q1-2018	0.543	0.03			mg/L	F
P059	Iron	5/1/2018	Q2-2018	0.961	0.03			mg/L	F
P059	Iron	8/6/2018	Q3-2018	0.711	0.03			mg/L	D
P059	Methane	10/30/2017	Q4-2017	602	50		F	ug/L	F
P059	Methane	2/8/2018	Q1-2018	494	10			ug/L	F
P059	Methane	5/1/2018	Q2-2018	1760	50	B		ug/L	F
P059	Methane	8/6/2018	Q3-2018	379	10			ug/L	F
P059	Nitrate as Nitrogen	10/30/2017	Q4-2017	0.265	0.165	J	F	mg/L	F
P059	Nitrate as Nitrogen	2/8/2018	Q1-2018	0.209	0.033	J		mg/L	F
P059	Nitrate as Nitrogen	5/1/2018	Q2-2018	0.165	0.165	U		mg/L	F
P059	Nitrate as Nitrogen	8/6/2018	Q3-2018	0.165	0.165	U		mg/L	D
P059	Oxidation Reduction Potential	10/30/2017	Q4-2017	-26.7			F	mV	F
P059	Oxidation Reduction Potential	2/8/2018	Q1-2018	-43			F	mV	D
P059	Oxidation Reduction Potential	5/1/2018	Q2-2018	-5.1				mV	F
P059	Oxidation Reduction Potential	8/6/2018	Q3-2018	-22.9				mV	F
P059	pH	10/30/2017	Q4-2017	6.85			F	s.u.	F
P059	pH	2/8/2018	Q1-2018	6.91			F	s.u.	D
P059	pH	5/1/2018	Q2-2018	6.85				s.u.	F
P059	pH	8/6/2018	Q3-2018	6.76				s.u.	F
P059	Phosphorus	10/30/2017	Q4-2017	0.02	0.02	U	F	mg/L	F
P059	Phosphorus	2/8/2018	Q1-2018	0.033	0.02	J	U	mg/L	F
P059	Phosphorus	5/1/2018	Q2-2018	0.0419	0.02	J	U	mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P059	Phosphorus	8/6/2018	Q3-2018	0.0517	0.02			mg/L	F
P059	Specific Conductance	10/30/2017	Q4-2017	1550			F	umhos/cm	D
P059	Specific Conductance	2/8/2018	Q1-2018	1540			F	umhos/cm	F
P059	Specific Conductance	5/1/2018	Q2-2018	1520				umhos/cm	F
P059	Specific Conductance	8/6/2018	Q3-2018	1520				umhos/cm	F
P059	Sulfate	10/30/2017	Q4-2017	140	6.65		F	mg/L	F
P059	Sulfate	2/8/2018	Q1-2018	143	0.133			mg/L	F
P059	Sulfate	5/1/2018	Q2-2018	140	3.33			mg/L	D
P059	Sulfate	8/6/2018	Q3-2018	153	3.33			mg/L	F
P059	Temperature	10/30/2017	Q4-2017	14.3			F	C	F
P059	Temperature	2/8/2018	Q1-2018	14.2			F	C	F
P059	Temperature	5/1/2018	Q2-2018	15.5				C	D
P059	Temperature	8/6/2018	Q3-2018	14.9				C	F
P059	Tetrachloroethene	10/30/2017	Q4-2017	4.23	0.333		F	ug/L	D
P059	Tetrachloroethene	2/8/2018	Q1-2018	5.19	0.333			ug/L	F
P059	Tetrachloroethene	5/1/2018	Q2-2018	3.81	0.333			ug/L	F
P059	Tetrachloroethene	8/6/2018	Q3-2018	4.62	0.333			ug/L	F
P059	Total Organic Carbon	10/30/2017	Q4-2017	1.78	0.33		F	mg/L	F
P059	Total Organic Carbon	2/8/2018	Q1-2018	1.59	0.33			mg/L	D
P059	Total Organic Carbon	5/1/2018	Q2-2018	1.34	0.33			mg/L	F
P059	Total Organic Carbon	8/6/2018	Q3-2018	1.2	0.33			mg/L	F
P059	Trichloroethene	10/30/2017	Q4-2017	6.56	0.333		F	ug/L	F
P059	Trichloroethene	2/8/2018	Q1-2018	5.39	0.333			ug/L	F
P059	Trichloroethene	5/1/2018	Q2-2018	4.23	0.333			ug/L	F
P059	Trichloroethene	8/6/2018	Q3-2018	4.95	0.333			ug/L	D
P059	Turbidity	10/30/2017	Q4-2017	30.6			F	NTU	D
P059	Turbidity	2/8/2018	Q1-2018	41.5			F	NTU	F
P059	Turbidity	5/1/2018	Q2-2018	39.6				NTU	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P059	Turbidity	8/6/2018	Q3-2018	46.6				NTU	F
P059	Vinyl chloride	10/30/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
P059	Vinyl chloride	2/8/2018	Q1-2018	0.333	0.333	U		ug/L	F
P059	Vinyl chloride	5/1/2018	Q2-2018	1.44	0.333			ug/L	D
P059	Vinyl chloride	8/6/2018	Q3-2018	1	0.333	U		ug/L	F
P060	Alkalinity, Total (As CaCO3)	10/30/2017	Q4-2017	484	1.45		F	mg/L	F
P060	Alkalinity, Total (As CaCO3)	2/6/2018	Q1-2018	488	0.725			mg/L	F
P060	Alkalinity, Total (As CaCO3)	4/30/2018	Q2-2018	472	1.45			mg/L	F
P060	Alkalinity, Total (As CaCO3)	8/6/2018	Q3-2018	469	1.45			mg/L	F
P060	Ammonia Total as N	10/30/2017	Q4-2017	0.443	0.017		F	mg/L	F
P060	Ammonia Total as N	2/6/2018	Q1-2018	0.699	0.017			mg/L	F
P060	Ammonia Total as N	4/30/2018	Q2-2018	0.757	0.017			mg/L	F
P060	Ammonia Total as N	8/6/2018	Q3-2018	0.649	0.017			mg/L	F
P060	Carbon Dioxide	4/30/2018	Q2-2018	100			>	mg/L	F
P060	Carbon Dioxide	8/6/2018	Q3-2018	100			>	mg/L	□
P060	Carbon Disulfide	10/30/2017	Q4-2017	1.67	1.67	U	F	ug/L	F
P060	Carbon Disulfide	2/6/2018	Q1-2018	1.67	1.67	U		ug/L	F
P060	Carbon Disulfide	4/30/2018	Q2-2018	1.67	1.67	U		ug/L	F
P060	Carbon Disulfide	8/6/2018	Q3-2018	5	1.67	U		ug/L	F
P060	Chloride	10/30/2017	Q4-2017	141	1.34		F	mg/L	F
P060	Chloride	2/6/2018	Q1-2018	142	0.067			mg/L	F
P060	Chloride	4/30/2018	Q2-2018	154	1.68			mg/L	F
P060	Chloride	8/6/2018	Q3-2018	179	1.68			mg/L	F
P060	cis-1,2-Dichloroethene	10/30/2017	Q4-2017	10.3	0.333		F	ug/L	F
P060	cis-1,2-Dichloroethene	2/6/2018	Q1-2018	7.78	0.333			ug/L	F
P060	cis-1,2-Dichloroethene	4/30/2018	Q2-2018	0.97	0.333	J		ug/L	F
P060	cis-1,2-Dichloroethene	8/6/2018	Q3-2018	2.69	0.333			ug/L	F
P060	Dissolved Oxygen	10/30/2017	Q4-2017	2.44			F	mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P060	Dissolved Oxygen	2/6/2018	Q1-2018	0.87			F	mg/L	F
P060	Dissolved Oxygen	4/30/2018	Q2-2018	1.41				mg/L	F
P060	Dissolved Oxygen	8/6/2018	Q3-2018	1.98				mg/L	F
P060	Ethane	10/30/2017	Q4-2017	10	10	U	F	ug/L	F
P060	Ethane	2/6/2018	Q1-2018	10	10	U		ug/L	F
P060	Ethane	4/30/2018	Q2-2018	10	10	U		ug/L	F
P060	Ethane	8/6/2018	Q3-2018	25	10	U		ug/L	F
P060	Ethene	10/30/2017	Q4-2017	13.4	10	J	F	ug/L	F
P060	Ethene	2/6/2018	Q1-2018	13	10	J		ug/L	F
P060	Ethene	4/30/2018	Q2-2018	10	10	U		ug/L	F
P060	Ethene	8/6/2018	Q3-2018	15	10	J		ug/L	F
P060	Iron	10/30/2017	Q4-2017	10.9	0.03		F	mg/L	F
P060	Iron	2/6/2018	Q1-2018	11.9	0.03			mg/L	F
P060	Iron	4/30/2018	Q2-2018	13.9	0.03			mg/L	F
P060	Iron	8/6/2018	Q3-2018	10.9	0.03			mg/L	F
P060	Methane	10/30/2017	Q4-2017	1540	50		F	ug/L	F
P060	Methane	2/6/2018	Q1-2018	5660	10			ug/L	F
P060	Methane	4/30/2018	Q2-2018	12600	500			ug/L	F
P060	Methane	8/6/2018	Q3-2018	5280	200			ug/L	F
P060	Nitrate as Nitrogen	10/30/2017	Q4-2017	0.165	0.165	U	F	mg/L	F
P060	Nitrate as Nitrogen	2/6/2018	Q1-2018	0.165	0.033	U		mg/L	F
P060	Nitrate as Nitrogen	4/30/2018	Q2-2018	0.165	0.165	U		mg/L	F
P060	Nitrate as Nitrogen	8/6/2018	Q3-2018	0.165	0.165	U		mg/L	F
P060	Oxidation Reduction Potential	10/30/2017	Q4-2017	-158.2			F	mV	F
P060	Oxidation Reduction Potential	2/6/2018	Q1-2018	-119.8			F	mV	F
P060	Oxidation Reduction Potential	4/30/2018	Q2-2018	-96.8				mV	F
P060	Oxidation Reduction Potential	8/6/2018	Q3-2018	-121.3				mV	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P060	pH	10/30/2017	Q4-2017	6.98			F	s.u.	F
P060	pH	2/6/2018	Q1-2018	7.06			F	s.u.	F
P060	pH	4/30/2018	Q2-2018	6.92				s.u.	F
P060	pH	8/6/2018	Q3-2018	6.88				s.u.	F
P060	Phosphorus	10/30/2017	Q4-2017	0.02	0.02	U	F	mg/L	F
P060	Phosphorus	2/6/2018	Q1-2018	0.0482	0.02	J	U	mg/L	F
P060	Phosphorus	4/30/2018	Q2-2018	0.0773	0.02		U	mg/L	F
P060	Phosphorus	8/6/2018	Q3-2018	0.0541	0.02			mg/L	F
P060	Specific Conductance	10/30/2017	Q4-2017	1380			F	umhos/cm	F
P060	Specific Conductance	2/6/2018	Q1-2018	1370			F	umhos/cm	F
P060	Specific Conductance	4/30/2018	Q2-2018	1390				umhos/cm	F
P060	Specific Conductance	8/6/2018	Q3-2018	1410				umhos/cm	F
P060	Sulfate	10/30/2017	Q4-2017	60.2	0.665		F	mg/L	F
P060	Sulfate	2/6/2018	Q1-2018	47.5	0.133			mg/L	F
P060	Sulfate	4/30/2018	Q2-2018	34	0.665			mg/L	F
P060	Sulfate	8/6/2018	Q3-2018	48.4	3.33			mg/L	F
P060	Temperature	10/30/2017	Q4-2017	14.3			F	C	F
P060	Temperature	2/6/2018	Q1-2018	14.5			F	C	F
P060	Temperature	4/30/2018	Q2-2018	14.7				C	F
P060	Temperature	8/6/2018	Q3-2018	15.2				C	F
P060	Tetrachloroethene	10/30/2017	Q4-2017	0.333	0.333	U	F	ug/L	F
P060	Tetrachloroethene	2/6/2018	Q1-2018	0.333	0.333	U		ug/L	F
P060	Tetrachloroethene	4/30/2018	Q2-2018	0.333	0.333	U		ug/L	F
P060	Tetrachloroethene	8/6/2018	Q3-2018	1	0.333	U		ug/L	F
P060	Total Organic Carbon	10/30/2017	Q4-2017	4.84	0.33		F	mg/L	F
P060	Total Organic Carbon	2/6/2018	Q1-2018	4.87	0.33			mg/L	F
P060	Total Organic Carbon	4/30/2018	Q2-2018	5.06	0.33			mg/L	F
P060	Total Organic Carbon	8/6/2018	Q3-2018	4.06	0.33			mg/L	F

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P060	Trichloroethene	10/30/2017	Q4-2017	0.4	0.333	J	F	ug/L	F
P060	Trichloroethene	2/6/2018	Q1-2018	0.333	0.333	U		ug/L	F
P060	Trichloroethene	4/30/2018	Q2-2018	0.333	0.333	U		ug/L	F
P060	Trichloroethene	8/6/2018	Q3-2018	1	0.333	U		ug/L	F
P060	Turbidity	10/30/2017	Q4-2017	5.23			F	NTU	F
P060	Turbidity	2/6/2018	Q1-2018	7.09			F	NTU	F
P060	Turbidity	4/30/2018	Q2-2018	5.36				NTU	F
P060	Turbidity	8/6/2018	Q3-2018	4.04				NTU	F
P060	Vinyl chloride	10/30/2017	Q4-2017	8.72	0.333		F	ug/L	F
P060	Vinyl chloride	2/6/2018	Q1-2018	3.05	0.333			ug/L	F
P060	Vinyl chloride	4/30/2018	Q2-2018	1.4	0.333			ug/L	F
P060	Vinyl chloride	8/6/2018	Q3-2018	1.58	0.333			ug/L	F
P061	Alkalinity, Total (As CaCO3)	10/30/2017	Q4-2017	456	1.45		F	mg/L	
P061	Alkalinity, Total (As CaCO3)	2/6/2018	Q1-2018	458	0.725			mg/L	
P061	Alkalinity, Total (As CaCO3)	4/30/2018	Q2-2018	450	1.45			mg/L	
P061	Alkalinity, Total (As CaCO3)	8/7/2018	Q3-2018	460	1.45			mg/L	
P061	Ammonia Total as N	10/30/2017	Q4-2017	0.106	0.017		UF	mg/L	
P061	Ammonia Total as N	2/6/2018	Q1-2018	0.221	0.017			mg/L	
P061	Ammonia Total as N	4/30/2018	Q2-2018	0.26	0.017			mg/L	
P061	Ammonia Total as N	8/7/2018	Q3-2018	0.109	0.017			mg/L	
P061	Carbon Dioxide	4/30/2018	Q2-2018	100			>	mg/L	
P061	Carbon Dioxide	8/7/2018	Q3-2018	95				mg/L	
P061	Carbon Disulfide	10/30/2017	Q4-2017	1.67	1.67	U	F	ug/L	
P061	Carbon Disulfide	2/6/2018	Q1-2018	1.67	1.67	U		ug/L	
P061	Carbon Disulfide	4/30/2018	Q2-2018	1.67	1.67	U		ug/L	
P061	Carbon Disulfide	8/7/2018	Q3-2018	5	1.67	U		ug/L	
P061	Chloride	10/30/2017	Q4-2017	168	3.35		F	mg/L	
P061	Chloride	2/6/2018	Q1-2018	164	0.067			mg/L	

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P061	Chloride	4/30/2018	Q2-2018	98.3	3.35			mg/L	
P061	Chloride	8/7/2018	Q3-2018	154	3.35			mg/L	
P061	cis-1,2-Dichloroethene	10/30/2017	Q4-2017	6.4	0.333		F	ug/L	
P061	cis-1,2-Dichloroethene	2/6/2018	Q1-2018	9.43	0.333			ug/L	
P061	cis-1,2-Dichloroethene	4/30/2018	Q2-2018	5.61	0.333			ug/L	
P061	cis-1,2-Dichloroethene	8/7/2018	Q3-2018	7.79	0.333			ug/L	
P061	Dissolved Oxygen	10/30/2017	Q4-2017	1.79			F	mg/L	
P061	Dissolved Oxygen	2/6/2018	Q1-2018	1.69			F	mg/L	
P061	Dissolved Oxygen	4/30/2018	Q2-2018	1.19				mg/L	
P061	Dissolved Oxygen	8/7/2018	Q3-2018	1				mg/L	
P061	Ethane	10/30/2017	Q4-2017	10	10	U	F	ug/L	
P061	Ethane	2/6/2018	Q1-2018	10	10	U		ug/L	
P061	Ethane	4/30/2018	Q2-2018	10	10	U		ug/L	
P061	Ethane	8/7/2018	Q3-2018	25	10	U		ug/L	
P061	Ethene	10/30/2017	Q4-2017	10	10	U	F	ug/L	
P061	Ethene	2/6/2018	Q1-2018	10	10	U		ug/L	
P061	Ethene	4/30/2018	Q2-2018	10	10	U		ug/L	
P061	Ethene	8/7/2018	Q3-2018	25	10	U		ug/L	
P061	Iron	10/30/2017	Q4-2017	0.56	0.03		F	mg/L	
P061	Iron	2/6/2018	Q1-2018	0.655	0.03			mg/L	
P061	Iron	4/30/2018	Q2-2018	0.517	0.03			mg/L	
P061	Iron	8/7/2018	Q3-2018	1.32	0.03			mg/L	
P061	Methane	10/30/2017	Q4-2017	2730	100		F	ug/L	
P061	Methane	2/6/2018	Q1-2018	1800	10			ug/L	
P061	Methane	4/30/2018	Q2-2018	1340	50			ug/L	
P061	Methane	8/7/2018	Q3-2018	1350	50			ug/L	
P061	Nitrate as Nitrogen	10/30/2017	Q4-2017	0.165	0.165	U	F	mg/L	
P061	Nitrate as Nitrogen	2/6/2018	Q1-2018	0.165	0.033	U		mg/L	

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P061	Nitrate as Nitrogen	4/30/2018	Q2-2018	0.165	0.165	U		mg/L	
P061	Nitrate as Nitrogen	8/7/2018	Q3-2018	0.165	0.165	U		mg/L	
P061	Oxidation Reduction Potential	10/30/2017	Q4-2017	-97.1			F	mV	
P061	Oxidation Reduction Potential	2/6/2018	Q1-2018	19.8			F	mV	
P061	Oxidation Reduction Potential	4/30/2018	Q2-2018	10.7				mV	
P061	Oxidation Reduction Potential	8/7/2018	Q3-2018	-44.1				mV	
P061	pH	10/30/2017	Q4-2017	6.88			F	s.u.	
P061	pH	2/6/2018	Q1-2018	6.92			F	s.u.	
P061	pH	4/30/2018	Q2-2018	6.88				s.u.	
P061	pH	8/7/2018	Q3-2018	6.79				s.u.	
P061	Phosphorus	10/30/2017	Q4-2017	0.0268	0.02	J	UF	mg/L	
P061	Phosphorus	2/6/2018	Q1-2018	0.0793	0.02		U	mg/L	
P061	Phosphorus	4/30/2018	Q2-2018	0.0376	0.02	J	U	mg/L	
P061	Phosphorus	8/7/2018	Q3-2018	0.0352	0.02	J		mg/L	
P061	Specific Conductance	10/30/2017	Q4-2017	1600			F	umhos/cm	
P061	Specific Conductance	2/6/2018	Q1-2018	1610			F	umhos/cm	
P061	Specific Conductance	4/30/2018	Q2-2018	1730				umhos/cm	
P061	Specific Conductance	8/7/2018	Q3-2018	1560				umhos/cm	
P061	Sulfate	10/30/2017	Q4-2017	174	6.65		F	mg/L	
P061	Sulfate	2/6/2018	Q1-2018	209	0.133			mg/L	
P061	Sulfate	4/30/2018	Q2-2018	380	6.65			mg/L	
P061	Sulfate	8/7/2018	Q3-2018	192	6.65			mg/L	
P061	Temperature	10/30/2017	Q4-2017	13.1			F	C	
P061	Temperature	2/6/2018	Q1-2018	12.6			F	C	
P061	Temperature	4/30/2018	Q2-2018	14.4				C	
P061	Temperature	8/7/2018	Q3-2018	15.7				C	
P061	Tetrachloroethene	10/30/2017	Q4-2017	0.333	0.333	U	F	ug/L	

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P061	Tetrachloroethene	2/6/2018	Q1-2018	0.333	0.333	U		ug/L	
P061	Tetrachloroethene	4/30/2018	Q2-2018	0.333	0.333	U		ug/L	
P061	Tetrachloroethene	8/7/2018	Q3-2018	1	0.333	U		ug/L	
P061	Total Organic Carbon	10/30/2017	Q4-2017	2.19	0.33		F	mg/L	
P061	Total Organic Carbon	2/6/2018	Q1-2018	1.96	0.33			mg/L	
P061	Total Organic Carbon	4/30/2018	Q2-2018	1.84	0.33			mg/L	
P061	Total Organic Carbon	8/7/2018	Q3-2018	1.52	0.33			mg/L	
P061	Trichloroethene	10/30/2017	Q4-2017	0.77	0.333	J	F	ug/L	
P061	Trichloroethene	2/6/2018	Q1-2018	0.37	0.333	J		ug/L	
P061	Trichloroethene	4/30/2018	Q2-2018	0.333	0.333	U		ug/L	
P061	Trichloroethene	8/7/2018	Q3-2018	0.65	0.333	J		ug/L	
P061	Turbidity	10/30/2017	Q4-2017	2.81			F	NTU	
P061	Turbidity	2/6/2018	Q1-2018	19.6			F	NTU	
P061	Turbidity	4/30/2018	Q2-2018	10.6				NTU	
P061	Turbidity	8/7/2018	Q3-2018	9.44				NTU	
P061	Vinyl chloride	10/30/2017	Q4-2017	0.333	0.333	U	F	ug/L	
P061	Vinyl chloride	2/6/2018	Q1-2018	0.333	0.333	U		ug/L	
P061	Vinyl chloride	4/30/2018	Q2-2018	0.333	0.333	U		ug/L	
P061	Vinyl chloride	8/7/2018	Q3-2018	1	0.333	U		ug/L	
P062	Alkalinity, Total (As CaCO3)	10/30/2017	Q4-2017	458	1.45		F	mg/L	
P062	Alkalinity, Total (As CaCO3)	2/5/2018	Q1-2018	461	0.725			mg/L	
P062	Alkalinity, Total (As CaCO3)	2/5/2018	Q1-2018	465	0.725			mg/L	
P062	Alkalinity, Total (As CaCO3)	4/30/2018	Q2-2018	455	1.45			mg/L	
P062	Alkalinity, Total (As CaCO3)	8/7/2018	Q3-2018	462	1.45			mg/L	
P062	Ammonia Total as N	10/30/2017	Q4-2017	0.207	0.017		F	mg/L	
P062	Ammonia Total as N	2/5/2018	Q1-2018	0.201	0.017			mg/L	
P062	Ammonia Total as N	2/5/2018	Q1-2018	0.205	0.017			mg/L	
P062	Ammonia Total as N	4/30/2018	Q2-2018	0.0974	0.017	J		mg/L	

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P062	Ammonia Total as N	8/7/2018	Q3-2018	0.072	0.017	J		mg/L	
P062	Carbon Dioxide	4/30/2018	Q2-2018	100			>	mg/L	
P062	Carbon Dioxide	8/7/2018	Q3-2018	100			>	mg/L	
P062	Carbon Disulfide	10/30/2017	Q4-2017	1.67	1.67	U	F	ug/L	
P062	Carbon Disulfide	2/5/2018	Q1-2018	1.67	1.67	U		ug/L	
P062	Carbon Disulfide	2/5/2018	Q1-2018	1.67	1.67	U		ug/L	
P062	Carbon Disulfide	4/30/2018	Q2-2018	1.67	1.67	U		ug/L	
P062	Carbon Disulfide	8/7/2018	Q3-2018	5	1.67	U		ug/L	
P062	Chloride	10/30/2017	Q4-2017	163	3.35		F	mg/L	
P062	Chloride	2/5/2018	Q1-2018	102	0.067			mg/L	
P062	Chloride	2/5/2018	Q1-2018	89.1	0.067			mg/L	
P062	Chloride	4/30/2018	Q2-2018	21	0.67			mg/L	
P062	Chloride	8/7/2018	Q3-2018	170	1.68			mg/L	
P062	cis-1,2-Dichloroethene	10/30/2017	Q4-2017	3.23	0.333		F	ug/L	
P062	cis-1,2-Dichloroethene	2/5/2018	Q1-2018	1.31	0.333			ug/L	
P062	cis-1,2-Dichloroethene	2/5/2018	Q1-2018	1.34	0.333			ug/L	
P062	cis-1,2-Dichloroethene	4/30/2018	Q2-2018	0.6	0.333	J		ug/L	
P062	cis-1,2-Dichloroethene	8/7/2018	Q3-2018	3.91	0.333			ug/L	
P062	Dissolved Oxygen	10/30/2017	Q4-2017	2.88			F	mg/L	
P062	Dissolved Oxygen	2/5/2018	Q1-2018	1.48			F	mg/L	
P062	Dissolved Oxygen	4/30/2018	Q2-2018	1.3				mg/L	
P062	Dissolved Oxygen	8/7/2018	Q3-2018	1.53				mg/L	
P062	Iron	10/30/2017	Q4-2017	0.03	0.03	U	F	mg/L	
P062	Iron	2/5/2018	Q1-2018	0.03	0.03	U		mg/L	
P062	Iron	2/5/2018	Q1-2018	0.03	0.03	U		mg/L	
P062	Iron	4/30/2018	Q2-2018	0.0362	0.03	B		mg/L	
P062	Iron	8/7/2018	Q3-2018	0.03	0.03	U		mg/L	
P062	Nitrate as Nitrogen	10/30/2017	Q4-2017	0.527	0.165		F	mg/L	

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P062	Nitrate as Nitrogen	2/5/2018	Q1-2018	2.11	0.033	J		mg/L	
P062	Nitrate as Nitrogen	2/5/2018	Q1-2018	2.05	0.033	J		mg/L	
P062	Nitrate as Nitrogen	4/30/2018	Q2-2018	1.58	0.33			mg/L	
P062	Nitrate as Nitrogen	8/7/2018	Q3-2018	0.165	0.165	U		mg/L	
P062	Oxidation Reduction Potential	10/30/2017	Q4-2017	19.7			F	mV	
P062	Oxidation Reduction Potential	2/5/2018	Q1-2018	-4.6			F	mV	
P062	Oxidation Reduction Potential	4/30/2018	Q2-2018	49.8				mV	
P062	Oxidation Reduction Potential	8/7/2018	Q3-2018	42.5				mV	
P062	pH	10/30/2017	Q4-2017	6.8			F	s.u.	
P062	pH	2/5/2018	Q1-2018	6.96			F	s.u.	
P062	pH	4/30/2018	Q2-2018	6.88				s.u.	
P062	pH	8/7/2018	Q3-2018	6.78				s.u.	
P062	Phosphorus	10/30/2017	Q4-2017	0.02	0.02	U	F	mg/L	
P062	Phosphorus	2/5/2018	Q1-2018	0.0443	0.02	J	U	mg/L	
P062	Phosphorus	2/5/2018	Q1-2018	0.0462	0.02	J	U	mg/L	
P062	Phosphorus	4/30/2018	Q2-2018	0.0319	0.02	J	U	mg/L	
P062	Phosphorus	8/7/2018	Q3-2018	0.0362	0.02	J		mg/L	
P062	Specific Conductance	10/30/2017	Q4-2017	1670			F	umhos/cm	
P062	Specific Conductance	2/5/2018	Q1-2018	1480			F	umhos/cm	
P062	Specific Conductance	4/30/2018	Q2-2018	1060				umhos/cm	
P062	Specific Conductance	8/7/2018	Q3-2018	1670				umhos/cm	
P062	Sulfate	10/30/2017	Q4-2017	203	6.65		F	mg/L	
P062	Sulfate	2/5/2018	Q1-2018	274	0.133			mg/L	
P062	Sulfate	2/5/2018	Q1-2018	257	0.133			mg/L	
P062	Sulfate	4/30/2018	Q2-2018	123	1.33			mg/L	
P062	Sulfate	8/7/2018	Q3-2018	258	3.33			mg/L	
P062	Temperature	10/30/2017	Q4-2017	12.6			F	C	

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P062	Temperature	2/5/2018	Q1-2018	12.2			F	C	
P062	Temperature	4/30/2018	Q2-2018	13.5				C	
P062	Temperature	8/7/2018	Q3-2018	15				C	
P062	Tetrachloroethene	10/30/2017	Q4-2017	0.333	0.333	U	F	ug/L	
P062	Tetrachloroethene	2/5/2018	Q1-2018	0.44	0.333	J		ug/L	
P062	Tetrachloroethene	2/5/2018	Q1-2018	0.46	0.333	J		ug/L	
P062	Tetrachloroethene	4/30/2018	Q2-2018	0.38	0.333	J		ug/L	
P062	Tetrachloroethene	8/7/2018	Q3-2018	0.42	0.333	J		ug/L	
P062	Total Organic Carbon	10/30/2017	Q4-2017	2.05	0.33		F	mg/L	
P062	Total Organic Carbon	2/5/2018	Q1-2018	1.89	0.33			mg/L	
P062	Total Organic Carbon	2/5/2018	Q1-2018	2.03	0.33			mg/L	
P062	Total Organic Carbon	4/30/2018	Q2-2018	1.22	0.33			mg/L	
P062	Total Organic Carbon	8/7/2018	Q3-2018	1.57	0.33			mg/L	
P062	Trichloroethene	10/30/2017	Q4-2017	0.333	0.333	U	F	ug/L	
P062	Trichloroethene	2/5/2018	Q1-2018	0.333	0.333	U		ug/L	
P062	Trichloroethene	2/5/2018	Q1-2018	0.333	0.333	U		ug/L	
P062	Trichloroethene	4/30/2018	Q2-2018	0.333	0.333	U		ug/L	
P062	Trichloroethene	8/7/2018	Q3-2018	1	0.333	U		ug/L	
P062	Turbidity	10/30/2017	Q4-2017	3.69			F	NTU	
P062	Turbidity	2/5/2018	Q1-2018	49.7			F	NTU	
P062	Turbidity	4/30/2018	Q2-2018	2.51				NTU	
P062	Turbidity	8/7/2018	Q3-2018	3.25				NTU	
P062	Vinyl chloride	10/30/2017	Q4-2017	0.333	0.333	U	F	ug/L	
P062	Vinyl chloride	2/5/2018	Q1-2018	0.333	0.333	U		ug/L	
P062	Vinyl chloride	2/5/2018	Q1-2018	0.333	0.333	U		ug/L	
P062	Vinyl chloride	4/30/2018	Q2-2018	0.333	0.333	U		ug/L	
P062	Vinyl chloride	8/7/2018	Q3-2018	1	0.333	U		ug/L	
P063	Alkalinity, Total (As CaCO3)	10/30/2017	Q4-2017	417	1.45		F	mg/L	

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P063	Alkalinity, Total (As CaCO3)	2/5/2018	Q1-2018	306	0.725			mg/L	
P063	Alkalinity, Total (As CaCO3)	5/3/2018	Q2-2018	332	1.45			mg/L	
P063	Alkalinity, Total (As CaCO3)	8/7/2018	Q3-2018	416	1.45			mg/L	
P063	Ammonia Total as N	10/30/2017	Q4-2017	0.16	0.017		F	mg/L	
P063	Ammonia Total as N	2/5/2018	Q1-2018	0.389	0.017			mg/L	
P063	Ammonia Total as N	5/3/2018	Q2-2018	0.0369	0.017	J		mg/L	
P063	Ammonia Total as N	8/7/2018	Q3-2018	0.0217	0.017	J		mg/L	
P063	Carbon Dioxide	5/3/2018	Q2-2018	100			>	mg/L	
P063	Carbon Dioxide	8/7/2018	Q3-2018	100			>	mg/L	
P063	Carbon Disulfide	10/30/2017	Q4-2017	1.67	1.67	U	F	ug/L	
P063	Carbon Disulfide	2/5/2018	Q1-2018	1.67	1.67	U		ug/L	
P063	Carbon Disulfide	5/3/2018	Q2-2018	1.67	1.67	U		ug/L	
P063	Carbon Disulfide	8/7/2018	Q3-2018	5	1.67	U		ug/L	
P063	Chloride	10/30/2017	Q4-2017	163	3.35		F	mg/L	
P063	Chloride	2/5/2018	Q1-2018	53.3	0.067			mg/L	
P063	Chloride	5/3/2018	Q2-2018	38.7	0.335			mg/L	
P063	Chloride	8/7/2018	Q3-2018	195	1.68			mg/L	
P063	cis-1,2-Dichloroethene	10/30/2017	Q4-2017	5.54	0.333		F	ug/L	
P063	cis-1,2-Dichloroethene	2/5/2018	Q1-2018	0.74	0.333	J		ug/L	
P063	cis-1,2-Dichloroethene	5/3/2018	Q2-2018	0.333	0.333	U		ug/L	
P063	cis-1,2-Dichloroethene	8/7/2018	Q3-2018	1.62	0.333			ug/L	
P063	Dissolved Oxygen	10/30/2017	Q4-2017	1.7			F	mg/L	
P063	Dissolved Oxygen	2/5/2018	Q1-2018	4.96			F	mg/L	
P063	Dissolved Oxygen	5/3/2018	Q2-2018	3.57				mg/L	
P063	Dissolved Oxygen	8/7/2018	Q3-2018	1.27				mg/L	
P063	Iron	10/30/2017	Q4-2017	0.0446	0.03	B	F	mg/L	
P063	Iron	2/5/2018	Q1-2018	0.0608	0.03	B		mg/L	
P063	Iron	5/3/2018	Q2-2018	0.0519	0.03	B		mg/L	

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P063	Iron	8/7/2018	Q3-2018	0.03	0.03	U		mg/L	
P063	Nitrate as Nitrogen	10/30/2017	Q4-2017	0.165	0.165	U	F	mg/L	
P063	Nitrate as Nitrogen	2/5/2018	Q1-2018	0.351	0.033	J		mg/L	
P063	Nitrate as Nitrogen	5/3/2018	Q2-2018	1.16	0.165			mg/L	
P063	Nitrate as Nitrogen	8/7/2018	Q3-2018	0.165	0.165	U		mg/L	
P063	Oxidation Reduction Potential	10/30/2017	Q4-2017	-86.3			F	mV	
P063	Oxidation Reduction Potential	2/5/2018	Q1-2018	-62.9			F	mV	
P063	Oxidation Reduction Potential	5/3/2018	Q2-2018	-27.2				mV	
P063	Oxidation Reduction Potential	8/7/2018	Q3-2018	-1.2				mV	
P063	pH	10/30/2017	Q4-2017	6.2			F	s.u.	
P063	pH	2/5/2018	Q1-2018	6.08			F	s.u.	
P063	pH	5/3/2018	Q2-2018	6.27				s.u.	
P063	pH	8/7/2018	Q3-2018	6.16				s.u.	
P063	Phosphorus	10/30/2017	Q4-2017	0.0365	0.02	J	UF	mg/L	
P063	Phosphorus	2/5/2018	Q1-2018	0.041	0.02	J	U	mg/L	
P063	Phosphorus	5/3/2018	Q2-2018	0.02	0.02	U		mg/L	
P063	Phosphorus	8/7/2018	Q3-2018	0.0321	0.02	J		mg/L	
P063	Specific Conductance	10/30/2017	Q4-2017	1420			F	umhos/cm	
P063	Specific Conductance	2/5/2018	Q1-2018	880			F	umhos/cm	
P063	Specific Conductance	5/3/2018	Q2-2018	940				umhos/cm	
P063	Specific Conductance	8/7/2018	Q3-2018	1450				umhos/cm	
P063	Sulfate	10/30/2017	Q4-2017	99.7	6.65		F	mg/L	
P063	Sulfate	2/5/2018	Q1-2018	103	0.133			mg/L	
P063	Sulfate	5/3/2018	Q2-2018	128	1.33			mg/L	
P063	Sulfate	8/7/2018	Q3-2018	110	3.33			mg/L	
P063	Temperature	10/30/2017	Q4-2017	12.5			F	C	
P063	Temperature	2/5/2018	Q1-2018	11.2			F	C	

Sample ID	Analyte	Sample Date	Quarter	Value	Detection Limit	Qualifier Lab	Qualifier Validation	Units	Sample Type
P063	Temperature	5/3/2018	Q2-2018	12.2				C	
P063	Temperature	8/7/2018	Q3-2018	13.3				C	
P063	Tetrachloroethene	10/30/2017	Q4-2017	0.8	0.333	J	F	ug/L	
P063	Tetrachloroethene	2/5/2018	Q1-2018	0.67	0.333	J		ug/L	
P063	Tetrachloroethene	5/3/2018	Q2-2018	0.5	0.333	J		ug/L	
P063	Tetrachloroethene	8/7/2018	Q3-2018	0.69	0.333	J		ug/L	
P063	Total Organic Carbon	10/30/2017	Q4-2017	3.41	0.33		F	mg/L	
P063	Total Organic Carbon	2/5/2018	Q1-2018	2.68	0.33			mg/L	
P063	Total Organic Carbon	5/3/2018	Q2-2018	1.52	0.33			mg/L	
P063	Total Organic Carbon	8/7/2018	Q3-2018	2.16	0.33			mg/L	
P063	Trichloroethene	10/30/2017	Q4-2017	0.81	0.333	J	F	ug/L	
P063	Trichloroethene	2/5/2018	Q1-2018	0.333	0.333	U		ug/L	
P063	Trichloroethene	5/3/2018	Q2-2018	0.333	0.333	U		ug/L	
P063	Trichloroethene	8/7/2018	Q3-2018	1	0.333	U		ug/L	
P063	Turbidity	10/30/2017	Q4-2017	1.4			F	NTU	
P063	Turbidity	2/5/2018	Q1-2018	5.81			F	NTU	
P063	Turbidity	5/3/2018	Q2-2018	2.53				NTU	
P063	Turbidity	8/7/2018	Q3-2018	1.78				NTU	
P063	Vinyl chloride	10/30/2017	Q4-2017	1.14	0.333		F	ug/L	
P063	Vinyl chloride	2/5/2018	Q1-2018	0.333	0.333	U		ug/L	
P063	Vinyl chloride	5/3/2018	Q2-2018	0.333	0.333	U		ug/L	
P063	Vinyl chloride	8/7/2018	Q3-2018	1	0.333	U		ug/L	

Abbreviations:
D = analyte determined in diluted sample
F = low flow sampling method used
J = estimated value
µg/L or ug/L = micrograms per liter
µmho/cm = micromhos per centimeter
mg/L = milligrams per liter
mV = millivolts
pCi/L = picocuries per liter
Q = quantitative result due to sampling technique
s.u. = standard unit
U = analytical result below detection limit

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Appendix B

Microbial Data

Year Four

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Location	Analyte	Sample Date	Result	Qualifiers Lab	Qualifiers Data	Detection Limit	Units
0419	1,1 DCA Reductase	4/30/2018	5000	U		100	cells/L
P031	1,1 DCA Reductase	4/30/2018	5000	U		100	cells/L
P056	1,1 DCA Reductase	4/30/2018	5000	U		100	cells/L
P058	1,1 DCA Reductase	4/30/2018	5000	U		100	cells/L
P060	1,1 DCA Reductase	4/30/2018	5000	U		100	cells/L
P061	1,1 DCA Reductase	4/30/2018	5000	U		100	cells/L
0419	1,2 DCA Reductase	4/30/2018	5000	U		100	cells/L
P031	1,2 DCA Reductase	4/30/2018	5000	U		100	cells/L
P056	1,2 DCA Reductase	4/30/2018	5000	U		100	cells/L
P058	1,2 DCA Reductase	4/30/2018	5000	U		100	cells/L
P060	1,2 DCA Reductase	4/30/2018	5000	U		100	cells/L
P061	1,2 DCA Reductase	4/30/2018	5000	U		100	cells/L
0419	BAV1 Vinyl Chloride Reductase	4/30/2018	500	U		100	cells/L
P031	BAV1 Vinyl Chloride Reductase	4/30/2018	500	U		100	cells/L
P056	BAV1 Vinyl Chloride Reductase	4/30/2018	500	U		100	cells/L
P058	BAV1 Vinyl Chloride Reductase	4/30/2018	500	U		100	cells/L
P060	BAV1 Vinyl Chloride Reductase	4/30/2018	500	U		100	cells/L
P061	BAV1 Vinyl Chloride Reductase	4/30/2018	500	U		100	cells/L
0419	Chloroform reductase	4/30/2018	5000	U		100	cells/L
P031	Chloroform reductase	4/30/2018	5000	U		100	cells/L
P056	Chloroform reductase	4/30/2018	5000	U		100	cells/L
P058	Chloroform reductase	4/30/2018	5000	U		100	cells/L
P060	Chloroform reductase	4/30/2018	5000	U		100	cells/L
P061	Chloroform reductase	4/30/2018	5000	U		100	cells/L
0419	Dehalobacter DCM	4/30/2018	5000	U		100	cells/L
P031	Dehalobacter DCM	4/30/2018	5000	U		100	cells/L
P056	Dehalobacter DCM	4/30/2018	5000	U		100	cells/L
P058	Dehalobacter DCM	4/30/2018	5000	U		100	cells/L

Location	Analyte	Sample Date	Result	Qualifiers Lab	Qualifiers Data	Detection Limit	Units
P060	Dehalobacter DCM	4/30/2018	5000	U		100	cells/L
P061	Dehalobacter DCM	4/30/2018	5000	U		100	cells/L
0419	Dehalobacter spp.	4/30/2018	113000			100	cells/L
P031	Dehalobacter spp.	4/30/2018	347000			100	cells/L
P056	Dehalobacter spp.	4/30/2018	33100			100	cells/L
P058	Dehalobacter spp.	4/30/2018	113000			100	cells/L
P060	Dehalobacter spp.	4/30/2018	384000			100	cells/L
P061	Dehalobacter spp.	4/30/2018	708000			100	cells/L
0419	Dehalobium chlorocoercia	4/30/2018	906000			100	cells/L
P031	Dehalobium chlorocoercia	4/30/2018	131000			100	cells/L
P056	Dehalobium chlorocoercia	4/30/2018	245000			100	cells/L
P058	Dehalobium chlorocoercia	4/30/2018	1650000			100	cells/L
P060	Dehalobium chlorocoercia	4/30/2018	158000			100	cells/L
P061	Dehalobium chlorocoercia	4/30/2018	531000			100	cells/L
0419	Dehalococcoides ethenogenes	4/30/2018	3900			100	cells/L
P031	Dehalococcoides ethenogenes	4/30/2018	6400			100	cells/L
P056	Dehalococcoides ethenogenes	4/30/2018	8500			100	cells/L
P058	Dehalococcoides ethenogenes	4/30/2018	2000			100	cells/L
P060	Dehalococcoides ethenogenes	4/30/2018	58500			100	cells/L
P061	Dehalococcoides ethenogenes	4/30/2018	700			100	cells/L
0419	Dehalogenimonas spp.	4/30/2018	47600			100	cells/L
P031	Dehalogenimonas spp.	4/30/2018	5000	U		100	cells/L
P056	Dehalogenimonas spp.	4/30/2018	1420000			100	cells/L
P058	Dehalogenimonas spp.	4/30/2018	1800000			100	cells/L
P060	Dehalogenimonas spp.	4/30/2018	4180000			100	cells/L
P061	Dehalogenimonas spp.	4/30/2018	5000	U		100	cells/L
0419	Desulfitobacterium spp.	4/30/2018	328000			100	cells/L
P031	Desulfitobacterium spp.	4/30/2018	328000			100	cells/L

Location	Analyte	Sample Date	Result	Qualifiers Lab	Qualifiers Data	Detection Limit	Units
P056	Desulfitobacterium spp.	4/30/2018	328000			100	cells/L
P058	Desulfitobacterium spp.	4/30/2018	616000			100	cells/L
P060	Desulfitobacterium spp.	4/30/2018	2170000			100	cells/L
P061	Desulfitobacterium spp.	4/30/2018	2170000			100	cells/L
0419	Desulfuromonas	4/30/2018	5100			100	cells/L
P031	Desulfuromonas	4/30/2018	5000	U		100	cells/L
P056	Desulfuromonas	4/30/2018	63100			100	cells/L
P058	Desulfuromonas	4/30/2018	5100			100	cells/L
P060	Desulfuromonas	4/30/2018	5000	U		100	cells/L
P061	Desulfuromonas	4/30/2018	5000	U		100	cells/L
0419	Dichloromethane dehalogenase	4/30/2018	5000	U		100	cells/L
P031	Dichloromethane dehalogenase	4/30/2018	5000	U		100	cells/L
P056	Dichloromethane dehalogenase	4/30/2018	700	J		100	cells/L
P058	Dichloromethane dehalogenase	4/30/2018	2100	J		100	cells/L
P060	Dichloromethane dehalogenase	4/30/2018	5000	U		100	cells/L
P061	Dichloromethane dehalogenase	4/30/2018	5000	U		100	cells/L
0419	Epoxyalkane transferase	4/30/2018	5000	U		100	cells/L
P031	Epoxyalkane transferase	4/30/2018	5000	U		100	cells/L
P056	Epoxyalkane transferase	4/30/2018	5000	U		100	cells/L
P058	Epoxyalkane transferase	4/30/2018	5000	U		100	cells/L
P060	Epoxyalkane transferase	4/30/2018	5000	U		100	cells/L
P061	Epoxyalkane transferase	4/30/2018	5000	U		100	cells/L
0419	Ethene Monooxygenase	4/30/2018	1100	J		100	cells/L
P031	Ethene Monooxygenase	4/30/2018	5000	U		100	cells/L
P056	Ethene Monooxygenase	4/30/2018	5000	U		100	cells/L
P058	Ethene Monooxygenase	4/30/2018	5000	U		100	cells/L
P060	Ethene Monooxygenase	4/30/2018	5000	U		100	cells/L
P061	Ethene Monooxygenase	4/30/2018	5000	U		100	cells/L

Location	Analyte	Sample Date	Result	Qualifiers Lab	Qualifiers Data	Detection Limit	Units
0419	Methanogens	4/30/2018	302000			100	cells/L
P031	Methanogens	4/30/2018	57400			100	cells/L
P056	Methanogens	4/30/2018	1970000			100	cells/L
P058	Methanogens	4/30/2018	83900			100	cells/L
P060	Methanogens	4/30/2018	11000000			100	cells/L
P061	Methanogens	4/30/2018	477000			100	cells/L
0419	PCE Reductase	4/30/2018	5000	U		100	cells/L
0419	PCE Reductase	4/30/2018	5000	U		100	cells/L
P031	PCE Reductase	4/30/2018	5000	U		100	cells/L
P031	PCE Reductase	4/30/2018	5000	U		100	cells/L
P056	PCE Reductase	4/30/2018	5000	U		100	cells/L
P056	PCE Reductase	4/30/2018	5000	U		100	cells/L
P058	PCE Reductase	4/30/2018	5000	U		100	cells/L
P058	PCE Reductase	4/30/2018	5000	U		100	cells/L
P060	PCE Reductase	4/30/2018	5000	U		100	cells/L
P060	PCE Reductase	4/30/2018	5000	U		100	cells/L
P061	PCE Reductase	4/30/2018	5000	U		100	cells/L
P061	PCE Reductase	4/30/2018	5000	U		100	cells/L
0419	Phenol Hydroxylase	4/30/2018	5000	U		100	cells/L
P031	Phenol Hydroxylase	4/30/2018	5000	U		100	cells/L
P056	Phenol Hydroxylase	4/30/2018	6000			100	cells/L
P058	Phenol Hydroxylase	4/30/2018	3600	J		100	cells/L
P060	Phenol Hydroxylase	4/30/2018	11100			100	cells/L
P061	Phenol Hydroxylase	4/30/2018	5000	U		100	cells/L
0419	Soluble Methane Monooxygenase	4/30/2018	23600			100	cells/L
P031	Soluble Methane Monooxygenase	4/30/2018	2900	J		100	cells/L
P056	Soluble Methane Monooxygenase	4/30/2018	10600			100	cells/L
P058	Soluble Methane Monooxygenase	4/30/2018	336000			100	cells/L

Location	Analyte	Sample Date	Result	Qualifiers Lab	Qualifiers Data	Detection Limit	Units
P060	Soluble Methane Monooxygenase	4/30/2018	42100			100	cells/L
P061	Soluble Methane Monooxygenase	4/30/2018	127000			100	cells/L
0419	Sulfate Reducing Bacteria	4/30/2018	10100000			100	cells/L
P031	Sulfate Reducing Bacteria	4/30/2018	1670000			100	cells/L
P056	Sulfate Reducing Bacteria	4/30/2018	5210000			100	cells/L
P058	Sulfate Reducing Bacteria	4/30/2018	4700000			100	cells/L
P060	Sulfate Reducing Bacteria	4/30/2018	11700000			100	cells/L
P061	Sulfate Reducing Bacteria	4/30/2018	4280000			100	cells/L
0419	tceA Dioxygenase	4/30/2018	500	U		100	cells/L
P031	tceA Dioxygenase	4/30/2018	500	U		100	cells/L
P056	tceA Dioxygenase	4/30/2018	500	U		100	cells/L
P058	tceA Dioxygenase	4/30/2018	500	U		100	cells/L
P060	tceA Dioxygenase	4/30/2018	500	U		100	cells/L
P061	tceA Dioxygenase	4/30/2018	500	U		100	cells/L
0419	Toluene Dioxygenase	4/30/2018	30100000			100	cells/L
P031	Toluene Dioxygenase	4/30/2018	5000	U		100	cells/L
P056	Toluene Dioxygenase	4/30/2018	5000	U		100	cells/L
P058	Toluene Dioxygenase	4/30/2018	3290000			100	cells/L
P060	Toluene Dioxygenase	4/30/2018	5000	U		100	cells/L
P061	Toluene Dioxygenase	4/30/2018	5000	U		100	cells/L
0419	Toluene Monooxygenase 2	4/30/2018	5000	U		100	cells/L
P031	Toluene Monooxygenase 2	4/30/2018	5000	U		100	cells/L
P056	Toluene Monooxygenase 2	4/30/2018	5000	U		100	cells/L
P058	Toluene Monooxygenase 2	4/30/2018	3500	J		100	cells/L
P060	Toluene Monooxygenase 2	4/30/2018	5000	U		100	cells/L
P061	Toluene Monooxygenase 2	4/30/2018	5000	U		100	cells/L
0419	Toluene Monooyxgenase	4/30/2018	5000	U		100	cells/L
P031	Toluene Monooyxgenase	4/30/2018	5000	U		100	cells/L

Location	Analyte	Sample Date	Result	Qualifiers Lab	Qualifiers Data	Detection Limit	Units
P056	Toluene Monooyxgenase	4/30/2018	5000	U		100	cells/L
P058	Toluene Monooyxgenase	4/30/2018	5000	U		100	cells/L
P060	Toluene Monooyxgenase	4/30/2018	5000	U		100	cells/L
P061	Toluene Monooyxgenase	4/30/2018	5000	U		100	cells/L
0419	Total Eubacteria	4/30/2018	387000000			100	cells/L
P031	Total Eubacteria	4/30/2018	47000000			100	cells/L
P056	Total Eubacteria	4/30/2018	155000000			100	cells/L
P058	Total Eubacteria	4/30/2018	125000000			100	cells/L
P060	Total Eubacteria	4/30/2018	399000000			100	cells/L
P061	Total Eubacteria	4/30/2018	297000000			100	cells/L
0419	trans-1,2-DCE Reductase	4/30/2018	5000	U		100	cells/L
P031	trans-1,2-DCE Reductase	4/30/2018	5000	U		100	cells/L
P056	trans-1,2-DCE Reductase	4/30/2018	5000	U		100	cells/L
P058	trans-1,2-DCE Reductase	4/30/2018	5000	U		100	cells/L
P060	trans-1,2-DCE Reductase	4/30/2018	5000	U		100	cells/L
P061	trans-1,2-DCE Reductase	4/30/2018	5000	U		100	cells/L
0419	Trichlorobenzene Dioxygenase	4/30/2018	5000	U		100	cells/L
P031	Trichlorobenzene Dioxygenase	4/30/2018	5000	U		100	cells/L
P056	Trichlorobenzene Dioxygenase	4/30/2018	5000	U		100	cells/L
P058	Trichlorobenzene Dioxygenase	4/30/2018	5000	U		100	cells/L
P060	Trichlorobenzene Dioxygenase	4/30/2018	5000	U		100	cells/L
P061	Trichlorobenzene Dioxygenase	4/30/2018	5000	U		100	cells/L
0419	Vinyl Chloride Reductase	4/30/2018	2200			100	cells/L
0419	Vinyl Chloride Reductase	4/30/2018	5000	U		100	cells/L
P031	Vinyl Chloride Reductase	4/30/2018	5000	U		100	cells/L
P031	Vinyl Chloride Reductase	4/30/2018	500	U		100	cells/L
P056	Vinyl Chloride Reductase	4/30/2018	5000	U		100	cells/L
P056	Vinyl Chloride Reductase	4/30/2018	2600			100	cells/L

Location	Analyte	Sample Date	Result	Qualifiers Lab	Qualifiers Data	Detection Limit	Units
P058	Vinyl Chloride Reductase	4/30/2018	5000	U		100	cells/L
P058	Vinyl Chloride Reductase	4/30/2018	500	U		100	cells/L
P060	Vinyl Chloride Reductase	4/30/2018	5000	U		100	cells/L
P060	Vinyl Chloride Reductase	4/30/2018	111000			100	cells/L
P061	Vinyl Chloride Reductase	4/30/2018	5000	U		100	cells/L
P061	Vinyl Chloride Reductase	4/30/2018	500	U		100	cells/L

Abbreviations:
Cells/L = cells per liter
J = estimated value
U = analytical result below detection limit

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Appendix C

Groundwater Elevation Data

Year Four

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Well ID	Groundwater Elevations (ft above mean sea level)																
	09/07/17	10/09/17	11/08/17	11/21/17	11/28/17	12/05/17	12/12/17	12/19/17	12/26/17	01/10/18	02/13/18	03/15/18	04/11/18	05/29/18	06/13/18	07/10/18	08/02/18
0305	679.72	679.57	682.93	683.45	682.94	681.24	679.93	679.53	679.84	679.79	681.22	682.99	685.37	680.78	680.53	680.52	679.73
0378	679.71	679.58	683.06	683.63	682.91	681.17	679.90	679.57	679.84	679.78	681.26	683.13	685.29	680.80	680.56	680.51	679.73
0379	679.88	679.67	683.19	683.46	683.13	681.27	679.93	679.56	679.96	679.95	681.36	683.26	685.49	680.95	680.73	680.69	679.91
0394	679.70	679.54	682.97	683.48	682.92	681.22	679.90	679.52	679.81	679.75	681.24	683.16	685.34	680.76	680.51	680.51	679.72
0402	679.61	679.36	682.64	683.20	682.88	681.36	680.10	679.55	679.77	679.68	681.21	683.26	685.59	680.70	680.49	680.42	679.63
0410	679.70	679.51	682.77	683.24	682.99	681.32	680.03	679.53	679.81	679.76	681.28	683.28	685.58	680.79	680.55	680.54	679.74
0416	679.74	679.56	683.02	683.53	682.95	681.23	679.91	679.53	679.84	679.78	681.23	683.19	685.33	680.79	680.56	680.52	679.74
0417	679.72	679.56	683.00	683.49	682.97	681.22	679.92	679.53	679.85	679.78	681.23	683.19	685.34	680.78	680.55	680.52	679.73
0418	679.69	679.48	682.92	683.44	682.93	681.24	679.93	679.49	679.82	679.73	681.22	683.16	685.40	680.72	680.53	680.47	679.68
0419	679.69	679.46	682.77	683.24	682.95	681.29	680.02	679.52	679.78	679.74	681.24	683.23	685.54	680.78	680.54	680.52	679.69
0422	679.76	679.59	683.07	683.65	683.65	681.21	679.86	679.52	679.86	679.82	681.26	683.18	685.36	680.82	680.59	680.55	679.78
0423	679.73	679.56	683.05	683.52	682.96	681.19	679.83	679.48	679.84	679.77	681.24	683.17	685.34	680.79	680.53	680.52	679.75
0424	679.71	679.54	682.99	683.51	682.94	681.23	679.93	679.51	679.86	679.79	681.23	683.19	685.35	680.76	680.56	680.51	679.73
0425	679.70	679.54	682.98	683.50	682.92	681.22	679.91	679.53	679.83	679.77	681.22	683.17	685.33	680.76	680.55	680.50	679.72
0451	679.63	679.32	682.61	683.11	682.92	681.37	680.06	679.49	679.74	679.69	681.20	683.27	685.59	680.73	680.46	680.47	679.64
0452	679.58	679.27	682.62	683.15	682.86	681.29	680.00	679.48	679.73	679.65	681.16	683.20	685.51	680.68	680.41	680.40	679.59
P015	679.62	679.32	682.63	683.11	682.89	681.30	680.00	679.46	679.71	679.63	681.16	683.21	685.53	680.69	680.42	680.42	679.62
P027	679.68	679.47	682.89	683.46	682.90	681.25	679.98	679.54	679.80	679.73	681.23	683.16	685.33	680.75	680.51	680.46	679.68
P031	679.63	679.42	682.82	683.46	682.85	681.23	679.97	679.52	679.76	679.67	681.17	683.14	685.22	680.69	680.45	680.41	679.62
P043	679.67	679.49	682.94	683.48	682.91	681.19	679.89	679.49	679.80	679.73	681.18	683.14	684.46	679.36	680.50	680.49	679.69
P052	679.66	679.48	682.81	683.29	682.94	681.23	679.92	679.49	679.81	679.75	681.14	683.19	685.45	680.73	680.51	680.46	679.70
P053	Neat oil was on the water surface—no static water level measurements were recorded/																
P054																	
P056	679.69	679.51	682.96	683.46	682.92	681.19	679.87	679.48	679.80	679.74	681.20	683.17	685.34	680.75	680.51	680.49	679.71
P057	679.58	679.39	682.81	683.37	682.81	681.14	679.85	679.46	679.71	679.59	681.11	683.06	685.25	680.61	680.40	680.35	679.56
P058	679.69	679.41	682.72	683.21	682.96	681.35	680.06	679.53	679.78	679.73	681.25	683.28	685.57	680.77	680.29	680.50	679.72
P059	679.64	679.41	682.81	683.35	682.87	681.23	679.94	679.51	679.75	679.66	681.17	683.14	685.37	680.68	680.44	680.40	679.61
P060	679.67	679.36	682.70	683.22	682.94	681.37	680.07	679.57	679.80	679.69	681.24	683.26	685.57	680.75	680.49	680.48	679.68
P061	679.45	679.11	682.35	682.90	682.76	681.24	679.95	679.36	679.58	679.48	681.03	683.15	685.54	680.52	680.25	680.27	679.43
P062	679.46	679.14	682.35	682.89	682.77	681.28	680.01	679.40	679.59	679.48	681.06	683.20	685.60	680.54	680.28	680.29	679.46
P063	679.40	679.09	682.32	682.88	682.70	681.20	679.93	679.33	679.56	679.44	680.99	683.11	685.51	680.50	680.22	680.23	679.40

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