Department of Energy
Washington, DC 20585

December 11, 2019

Mr. David Seely, Remedial Project Manager
U.S. Environmental Protection Agency
Region 5 (SR-6J)
77 W. Jackson Blvd.
Chicago, IL 60604-3590

Mr. Brian Nickel, EPA Supervisor, DERR
Ohio Environmental Protection Agency
401 E. 5th Street
Dayton, OH 45402

Subject: Final Sitewide Groundwater Monitoring Report, Mound, Ohio, Site for Calendar Year 2018

Dear Mr. Seely and Mr. Nickel:

Enclosed is the Department of Energy Office of Legacy Management (LM) final *Sitewide Groundwater Monitoring Report, Mound, Ohio, Site for Calendar Year 2018* (LMSMND/S24210). This report, dated June 2019, was transmitted to the U.S. Environmental Protection Agency (EPA) and Ohio EPA for review on June 11.

On July 15, the Ohio EPA provided a letter with comments that did not require a revision to the report. LM responses to Ohio EPA comments are enclosed.

To date, EPA has not provided comments or approval of the 2018 sitewide groundwater report provided to the regulators in June 2019. Should EPA submit comments on the 2018 sitewide groundwater report that necessitate a revision to the enclosed final report, LM will issue a revised final 2018 sitewide groundwater report.

The enclosed report will be placed in the Comprehensive Environmental Response, Compensation and Liability Act Information Repository for the Mound, Ohio, Site, and will be posted to the U.S. Department of Energy Office of Legacy management Mound Website (https://www.lm.doe.gov/Mound/Sites.aspx) under "Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Administrative Record Database."

Please contact me at (513) 648-3333 or Sue.Smiley@lm.doe.gov, if you have any questions. Please send any correspondence to:

U.S. Department of Energy
Office of Legacy Management
10995 Hamilton-Cleves Hwy.
Harrison, OH 45030

Sincerely,

SUSAN SMILEY
Digitally signed by SUSAN SMILEY
Date: 2019.12.11 14:07:03 -05'00'

Susan L. Smiley
Mound Site Manager

Enclosures

cc w/enclosures:
G. Hooten, DOE-LM (e)
B. Zimmerman, DOE-LM (e)
B. Cato, Navarro (e)
M. Lutz, Navarro (e)
DOE Read File
File: MND 3500-04

DOE Responses to Ohio EPA Comments on the Sitewide Groundwater Monitoring Report – Calendar Year 2018, LMS/MND/S24210
(Ohio EPA comments transmitted in letter dated July 15, 2019)

Comment	Response
Comment 1, Navarro-Data Review and Validation Report: Preservation and Holding Times, Page E-2: The April 17, 2018 Data Review and Validation Report indicates that the tritium analysis for sample location 0346 could not be performed because the glass bottle for that aliquot was received broken; however, elsewhere in the 2018 report a result for tritium in 0346 is reported. Please clarify whether a first quarter tritium result was obtained from 0346.	Location 0346 was resampled on February 8, 2018 and is included in the referenced validation report.
Comment 2, Section 4.5 Page 35: Section 4.5 of the 2018 report provides final recommendations and states that tritium levels have only exceeded the tritium MCL at seep 0601 since MNA remedy monitoring was initiated in 2009. Seep 0601 has been below the tritium MCL for two consecutive years of semiannual sampling and a downward trend has been in place since 2007. Section 4.5 also states that in accordance with the O&M Plan, tow consecutive years of tritium levels below the MCL qualify for a recommendation to the core Team to discontinue sampling. The U.S. EPA guidance document titles "*Recommended Approach for Evaluating Completion of Groundwater Restoration Remedial Actions at a Groundwater Monitoring Well, August 2014, OWER 9283.1-44*" recommends that a minimum of four data points be used for analysis of the remediation monitoring phase (phase of data collection used to demonstrate that groundwater has reached cleanup levels for all COCs). It also states that the attainment monitoring phase (which occurs after is it demonstrated that the remediation monitoring phase is complete) is intended to provide data that are evaluated to help support a defensible determination that: a) the groundwater in the well met the cleanup level for each COC and b) provides assurance that the groundwater will continue to meet the COC cleanup level in the future. This U.S. EPA guidance recommends a minimum of eight additional consecutive monitoring events for the attainment monitoring phase. Although it appears that tritium has been below its MCL for at least the last four monitoring events in all monitoring wells and seeps, it is recommended that at least an additional four consecutive data points, beginning with the first sampling event in 2019, be collected from seep 0601 for the attainment monitoring phase to ensure that groundwater will continue to meet the COC cleanup levels in the future.	DOE is agreeable to obtaining 4 additional data points from seep 0601 to obtain data that can demonstrate that the levels of tritium in groundwater will remain below the MCL.

LMS/MND/S24210

Sitewide Groundwater Monitoring Report Mound, Ohio, Site

Calendar Year 2018

June 2019

U.S. DEPARTMENT OF ENERGY | Legacy Management

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Abbreviations

BVA	Buried Valley Aquifer
DCE	dichloroethene
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ft	feet
ft MSL	feet above mean sea level
MCL	maximum contaminant level
MK	Mann-Kendall
µg/L	micrograms per liter
MNA	monitored natural attenuation
nCi/L	nanocuries per liter
Ohio EPA	Ohio Environmental Protection Agency
PCE	tetrachloroethene (perchloroethene)
RAO	remedial action objective
RIN	report identification number
TCE	trichloroethene
VC	vinyl chloride
VOC	volatile organic compound
VSP	Visual Sample Plan

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1.0 Introduction

1.1 Purpose

This report was prepared in support of the selected remedies for Phase I and Parcels 6, 7, and 8 of the Mound, Ohio, Site as outlined in the *Operations and Maintenance Plan for the U.S. Department of Energy Mound, Ohio, Site* (Sitewide Operations and Maintenance Plan) (DOE 2015). It summarizes the data collected in 2018 and documents the progress of the monitored natural attenuation (MNA) remedies for both areas of the Mound site. All sampling and data analyses were performed in accordance with the Sitewide Operations and Maintenance Plan, unless noted otherwise.

This report includes data collected during the groundwater sampling performed in 2018. Data are presented in both time-series and map-view plots. Trend analysis was performed on selected wells using the nonparametric Mann-Kendall (MK) test. This type of long-term trend analysis can be used to confirm trends in contaminant concentrations over time. The time-series plots will also be used to evaluate changes in data over time and interpret the effectiveness of the MNA remedy.

This report also documents operational changes that occurred during the reporting period and identifies maintenance activities associated with the monitoring wells being sampled.

1.2 Project Description

The Mound site[1] is in Miamisburg, Ohio, approximately 10 miles southwest of Dayton. In 1995, the U.S. Department of Energy (DOE) Mound Plant, named after the Miamisburg Indian Mound adjacent to the site, comprised 120 buildings on 306 acres. The Great Miami River, west of the site, flows from northeast to southwest through Miamisburg and dominates the geography of the region surrounding the site. Figure 1 shows the locations of Phase I (in green) and Parcels 6, 7, and 8 (in purple).

DOE remediated the Mound site to an “industrial/commercial use” standard consistent with the exposure assumptions provided in the *Mound 2000 Residual Risk Evaluation Methodology, Mound Plant* (DOE 1997) and endorsed by the U.S. Environmental Protection Agency (EPA) and Ohio Environmental Protection Agency (Ohio EPA). The remedies for groundwater at the site combine groundwater monitoring and institutional controls in the form of deed restrictions on future land and groundwater use. These combined remedies will prevent current and future exposure of workers, the public, and the environment to contaminated groundwater from the Mound site.

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[1] The Mound site has also been called the Mound Laboratory, Mound Laboratories, the Mound Plant (EPA ID OH6890008984), the USDOE Mound Plant, the Mound Facility, the USDOE Mound Facility, the Miamisburg Environmental Management Project (MEMP), and the Miamisburg Closure Project (MCP). Currently, LM uses Mound, Ohio, Site as the formal name of the site.

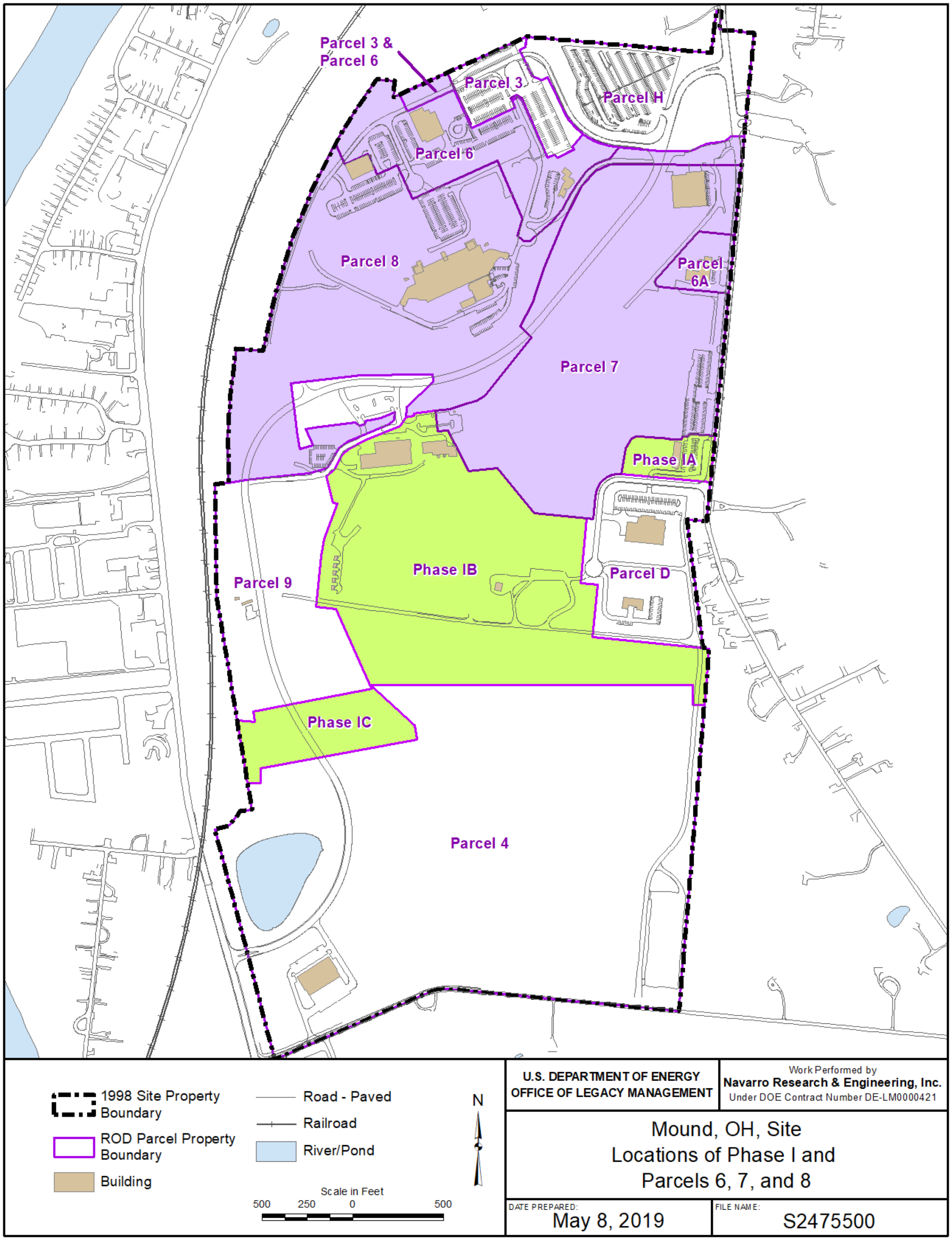

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Figure 1. Locations of Phase I and Parcels 6, 7, and 8

The long-term remedial action objective (RAO) for groundwater is to meet Safe Drinking Water Act maximum contaminant levels (MCLs) through MNA in the Phase I and Parcels 6, 7, and 8 areas. Until these goals are achieved, the near-term RAO is to prohibit the extraction and use of groundwater underlying the premises unless prior written approval is obtained from EPA, Ohio EPA, and the Ohio Department of Health.

1.2.1 Phase I

Phase I is an approximately 52-acre area made up of three distinct sections. It lies on the southern border of the former production area of the Mound site. This area contains monitoring wells that are screened in both the Buried Valley Aquifer (BVA) and the upgradient bedrock aquifer system. MNA is being used as the remedy for a small, discrete section of the bedrock groundwater system contaminated with trichloroethene (TCE) to ensure that concentrations of TCE within the bedrock groundwater are decreasing to levels below the Safe Drinking Water Act MCL and do not impact the downgradient BVA.

1.2.2 Parcels 6, 7, and 8

Parcels 6, 7, and 8 occupy approximately 101 acres of the northern portion of the Mound Plant site. The main production facilities were located within Parcels 6 and 8, an area called the Main Hill. A tributary valley runs between these two parcels and Parcel 7; it contains a narrow tongue of glacial deposits that is hydraulically connected with the BVA. Groundwater within the fractured bedrock beneath the Main Hill area, and in topographic highs within Parcel 7, flows along horizontal bedding planes and fractures and ultimately discharges to naturally occurring seeps or to the downgradient BVA.

Two monitoring wells on the western the edge of the BVA indicate volatile organic compound (VOC) impact, primarily TCE, which exceeds MCLs of the Safe Drinking Water Act. MNA is the remedy for the VOCs in groundwater associated with the Main Hill. Sampling is being performed to assess the contaminant concentrations and verify that the BVA offsite and downgradient of these wells is not being adversely impacted.

Five seeps are also associated with this area and are located along the Main Hill of the plant property. Two seeps are within the plant property boundary, and the remaining three are offsite to the north. Several seeps have elevated levels of tritium and VOCs. These seeps, as well as several downgradient wells, are being monitored to verify that source removal (buildings and soil) on the Main Hill will result in decreasing concentrations over time.

1.3 Geology and Hydrology

The aquifer system at the Mound site consists of two distinct hydrogeologic environments: groundwater flow through the Ordovician shale and limestone bedrock beneath the hills, and groundwater flow within the unconsolidated glacial deposits and alluvium associated with the BVA in the Great Miami River valley. A thin tributary valley, which is located along the southern edge of the Main Hill, divides the two main portions of the Mound site and contains a narrow tongue of glacial deposits that is hydraulically connected with the BVA.

The bedrock flow system is dominated by fracture flow and is not considered a highly productive aquifer. Groundwater flow in the bedrock typically mimics the topography, with groundwater discharging to the BVA or at seeps from the upper bedrock. The BVA is dominated by porous flow, with interbedded gravel deposits providing the major pathway for water movement. The unconsolidated deposits are Quaternary-age sediments that consist of both glacial and fluvial deposits. The BVA is a highly productive aquifer capable of yielding a significant quantity of water. It is designated a sole-source aquifer. Groundwater flow in the BVA flows south, following the downstream course of the Great Miami River. The general structure and flow characteristics for these two interconnected systems are depicted in Figure 2.

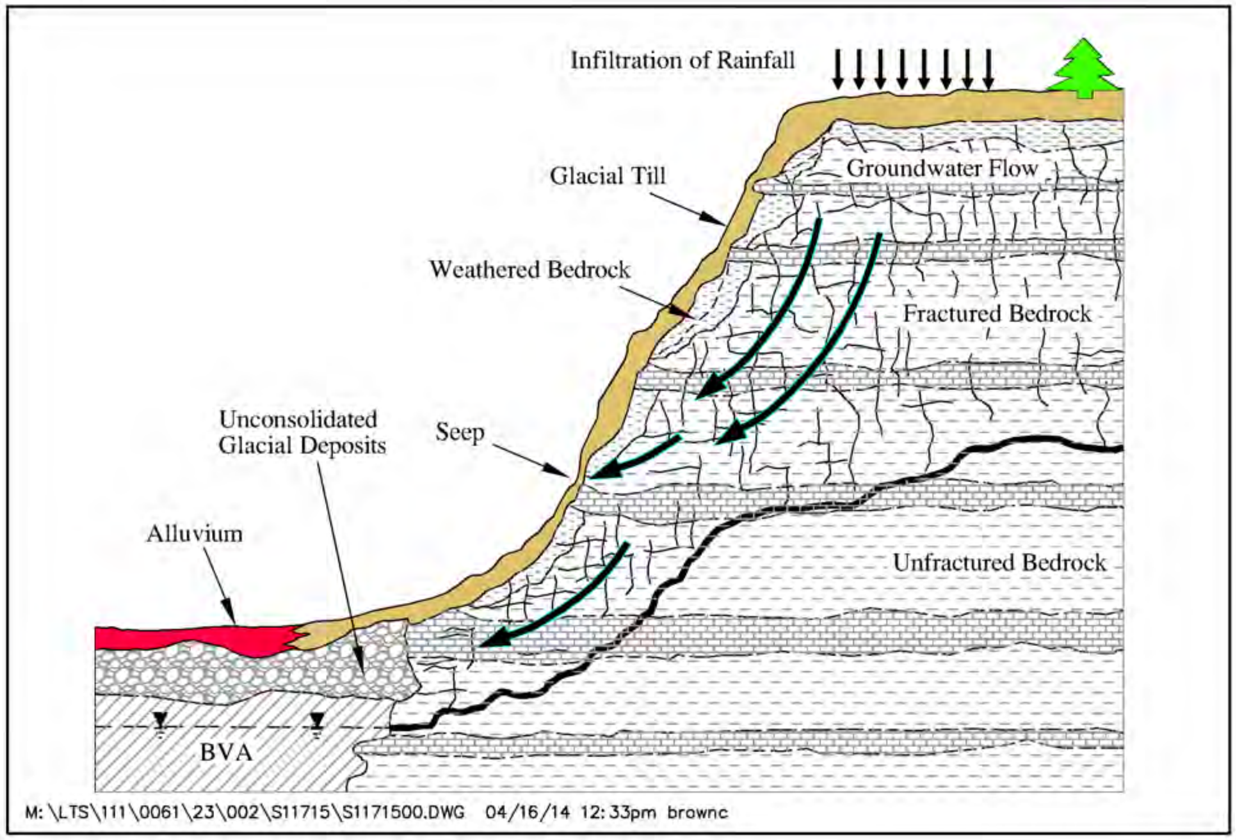

Figure 2. Generalized Cross Section Showing Flow from Bedrock to the BVA

For detailed descriptions of the geology, lithology, and groundwater flow regimes at the Mound site and specific hydrogeologic information for each area, refer to hydrogeologic investigation reports and work plans prepared for the site (DOE 1992, DOE 1994a, DOE 1994b, DOE 1995, and DOE 1999).

2.0 Monitoring Programs

2.1 Phase I

The Phase I groundwater monitoring program was established to verify that the BVA is not negatively affected by TCE-contaminated groundwater within the bedrock aquifer system. Groundwater in Phase I is monitored for TCE and its degradation products to verify that concentrations of TCE are decreasing by natural attenuation. The objective of this monitoring is to protect the BVA by verifying that the concentration of TCE near well 0411, well 0443, and seep 0617 is decreasing and confirm that TCE is not adversely affecting the BVA.

Well P064 was added to the Phase I MNA remedy monitoring program starting in 2018 to monitor groundwater discharge from the bedrock to the BVA and sampling at wells 0400, 0402, and P033 was discontinued. These changes to the monitoring program were approved by EPA and Ohio EPA during the August 17, 2017, Core Team meeting.

2.1.1 Monitored Natural Attenuation of TCE

Under the Phase I MNA monitoring program, samples are collected semiannually from selected wells and one seep (Figure 3) and analyzed as outlined in Table 1. Sampling was performed in the first and third quarters of 2018.

Table 1. Remedy (MNA) Monitoring for Phase I

Monitoring Location	Area	Parameters
Well 0411	Well 0411 area	TCE DCE VC
Well 0443		
Well 0353	Bedrock monitoring	
Well 0444		
Well 0445		
Seep 0617		
Well P064	BVA monitoring	

Note:
All locations are sampled semiannually.

Abbreviations:
DCE = dichloroethane
VC = vinyl chloride

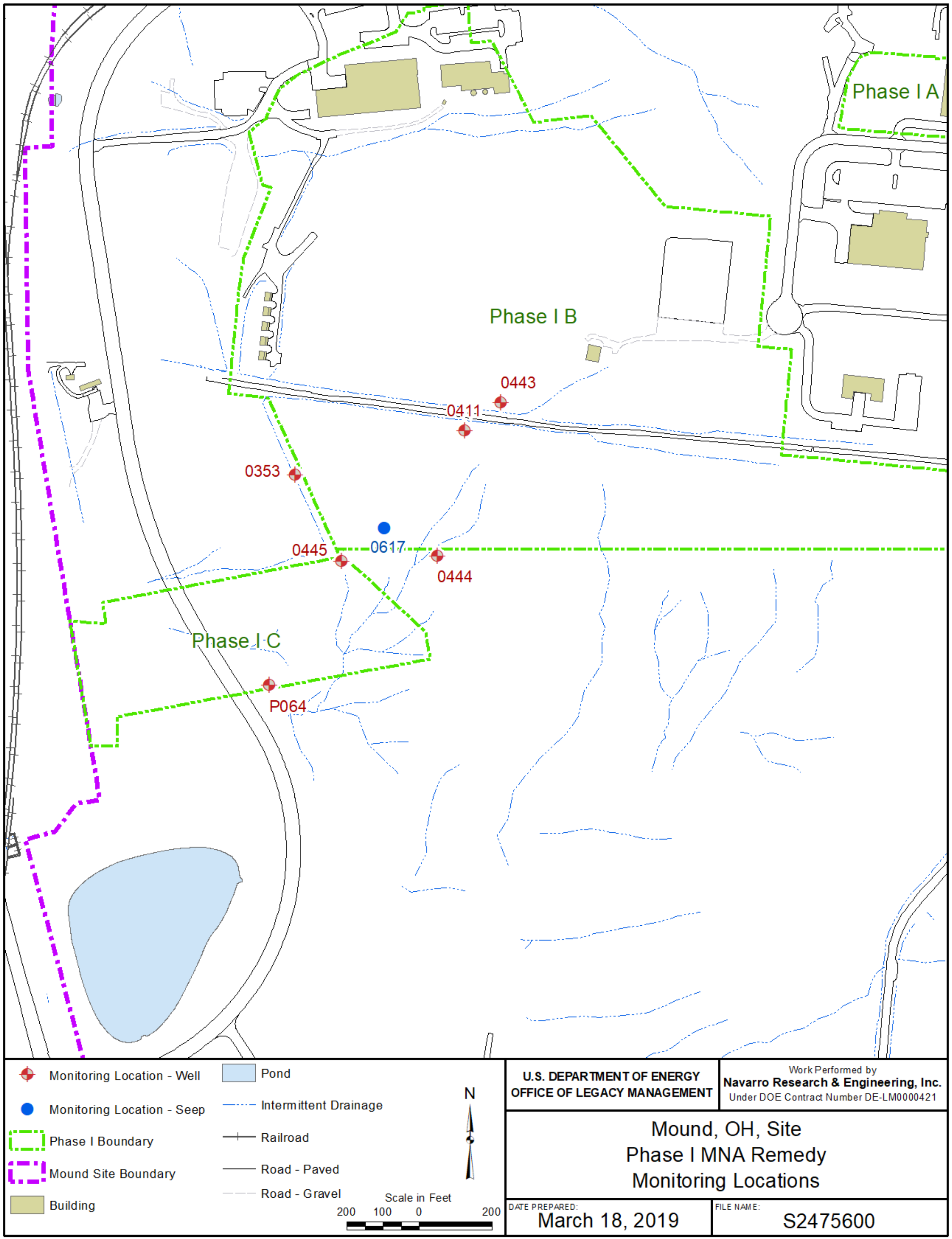

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Figure 3. Phase I MNA Remedy Monitoring Locations

2.1.2 Triggers

The contaminant data are evaluated against previous data collected at each location to determine if MNA is adequately addressing groundwater impact and to monitor the geochemical conditions in the aquifer. Trigger levels and response actions have been established for each contaminant as presented in the Sitewide Operations and Maintenance Plan (DOE 2015). The triggers and MCLs for each contaminant are summarized in Table 2.

Table 2. Trigger Levels for Phase I MNA Remedy

Location	TCE (µg/L)	DCE (µg/L)	Vinyl Chloride (µg/L)
Well 0353	5	70	2
Well 0411	30	70	2
Well 0443	18	70	2
Well 0444	5	70	2
Well 0445	5	70	2
WellP064	5	70	2
Seep 0617	16	70	2
MCL	5	70	2

Abbreviations:
DCE = dichloroethene
µg/L = micrograms per liter

EPA and Ohio EPA must be notified if trigger levels are exceeded. After notification, the Core Team (EPA, Ohio EPA, and DOE) will determine an appropriate course of action.

2.2 Parcels 6, 7, and 8

Groundwater in the Parcels 6, 7, and 8 area is monitored for TCE and its degradation products to verify that the downgradient BVA is not affected and that concentrations are decreasing. In addition, groundwater discharging from seeps is monitored for tritium and TCE and its degradation products to verify that source removal has resulted in decreasing concentrations over time.

The sampling program focuses on the following areas:

- **Well 0315/0347 Area:** Wells at the edge of the BVA on the southwestern corner of Parcel 8 that have elevated concentrations of VOCs. The program consists of wells that have TCE concentrations greater than the MCL and downgradient wells to the west. Wells 0315 and 0347 (source wells) and other selected downgradient BVA wells are monitored for VOCs—namely, tetrachloroethene (also known as perchloroethene or PCE), dichloroethene (DCE) isomers, TCE, and vinyl chloride (VC).
- **Main Hill Seeps:** Seeps on the northern and southern sides of the Main Hill that have elevated concentrations of VOCs and tritium. The program consists of seeps and downgradient wells to the west. Water from seeps 0601, 0602, 0605, 0606, and 0607 is collected and analyzed for VOCs and tritium. Select wells within the BVA that are

downgradient of the bedrock groundwater discharge area of the Main Hill are also sampled to monitor VOCs and tritium.

2.2.1 Monitored Natural Attenuation of TCE and Tritium

Under the Parcels 6, 7, and 8 MNA monitoring program, samples are collected quarterly for VOCs and semiannually for tritium in selected wells and seeps (Figure 4). Table 3 provides a summary of the monitoring locations as specified in the Sitewide Operations and Maintenance Plan.

Table 3. Monitoring for Parcels 6, 7, and 8 Area

Monitoring Location	Area	VOC	Tritium
Well 0315	Source wells	X	
Well 0347		X	
Well 0118	Downgradient BVA monitoring	X	X
Well 0124		X	
Well 0126		X	
Well 0138		X	X
Well 0346		X	X
Well 0379		X	X
Well 0386		X	
Well 0387		X	
Well 0389		X	
Well 0392		X	
Seep 0601	Main Hill seeps	X	X
Seep 0602		X	X
Seep 0605		X	X
Seep 0606		X	X
Seep 0607		X	X

Note:
VOCs monitored are PCE, TCE, *cis*-1,2-DCE, *trans*-1,2-DCE, and VC.

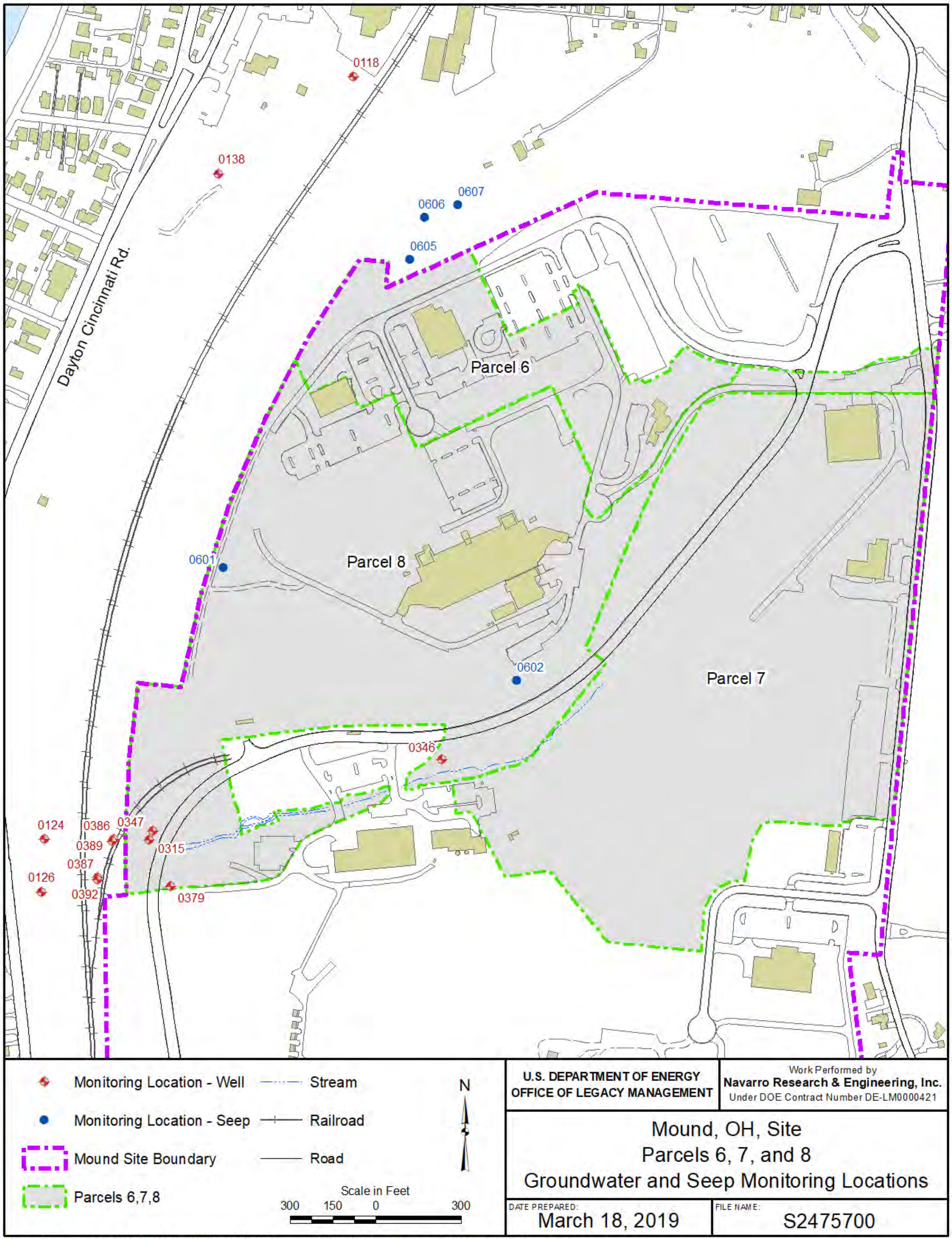

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Figure 4. Parcels 6, 7, and 8 Remedy Monitoring Locations

2.2.2 Triggers

The contaminant data are evaluated against previous data collected at each location to determine if downward trends are occurring. Trigger levels and response actions have been established for each contaminant as presented in the Sitewide Operations and Maintenance Plan (DOE 2015). The triggers and MCLs for each contaminant are summarized in Table 4.

Table 4. Trigger Levels for Parcels 6, 7, and 8 Monitoring Locations

Location	TCE (µg/L)	PCE (µg/L)	Tritium (nCi/L)
Well 0315	30		
Well 0347	30		
Well 0124	5		
Well 0126	5		
Well 0386	5		
Well 0387	5		
Well 0389	5		
Well 0392	5		
Seep 0601		75	1500
Seep 0605	150		
MCL	5	70	2

Abbreviations:
µg/L = micrograms per liter
nCi/L = nanocuries per liter

EPA and Ohio EPA must be notified if these trigger levels are exceeded. After notification, the Mound Core Team (EPA, Ohio EPA, and DOE) will determine an appropriate course of action.

2.3 Monitoring Network

The monitoring well and seep locations sampled under these programs were selected to provide data of sufficient quality to meet the objectives of the groundwater remedies for either Phase I or Parcels 6, 7, and 8. These wells were initially installed to support various site characterization activities and were designed and constructed to provide high-quality groundwater data. Appendix A contains construction information for each well used to support these remedies.

2.4 Deviations from the Sitewide Operations and Maintenance Plan

Sampling was performed as outlined in the Sitewide Operations and Maintenance Plan (DOE 2015), which compiles the sampling requirements outlined in previous plans for each area. Modifications to these monitoring programs (e.g., reduction in sampling frequency or discontinuation of monitoring locations) are also incorporated into the Sitewide Operations and Maintenance Plan.

Sampling was performed as follows:

- All required locations in Phase I were sampled in 2018.
- All required locations in Parcels 6, 7, and 8 were sampled in 2018 with the exception of seep 0602, which was dry (no visible flow) during the third-quarter sampling event.
- Site-specific sampling methods for the Mound site were followed during these sampling events. These methods were approved by the Mound Core Team and are integrated into the Sitewide Operations and Maintenance Plan.

2.5 Trend Analysis Methodology

Groundwater data from select locations are evaluated for trends in contaminant concentrations over time. The computer program ProUCL (ProUCL, Version 5.1.002), developed by Lockheed Martin and EPA, was used to perform trend analysis; the method used was the Mann-Kendall test.

The Mann-Kendall test is a nonparametric statistical procedure that is appropriate for analyzing trends in data over time. There is no requirement that the data be normally distributed or that the trend, if present, be linear. The Mann-Kendall test can be used if there are missing values and values below the detection limit. The assumption of independence requires that the time between samples be sufficiently large so that there is no correlation between measurements collected at different times. All locations were previously evaluated for seasonality as part of the annual review in 2014 (DOE 2015). Those results indicated there are no seasonal trends in contaminant data collected from any of the monitoring locations.

The Mann-Kendall procedure tests whether to reject the null hypothesis (H_0) and accept the alternative hypothesis (H_α), where:

- The null hypothesis (H_0) is that there is no monotonic trend in the series.
- The alternate hypothesis (H_α) is that a monotonic trend exists.

The initial assumption of the Mann-Kendall test is that the null H_0 hypothesis is true and that the data must be convincing beyond a reasonable doubt before H_0 is rejected and H_α is accepted. One of three alternative hypotheses is chosen:

1. A monotonic downward trend exists.
2. Either a monotonic upward or monotonic downward trend exists.
3. A monotonic upward trend exists.

Results of the trend analyses for each monitoring program are presented in Section 3.0. A summary of the Mann-Kendall statistical approach used for this report, as well as the specified error rates and data assumptions, is presented in Appendix B. Data analysis reports for each well and parameter are also included in Appendix B.

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3.0 Phase I MNA Remedy

3.1 Monitoring Results

Monitoring results for 2018 (Table 5) continue to show low-level detections of TCE and *cis*-1,2-DCE, a TCE degradation product, in source area wells 0411 and 0443 and seep 0617. All VOC concentrations were below the applicable trigger levels (Table 2). Concentrations of TCE at these locations continue to exceed the MCL of 5 micrograms per liter (µg/L). No detectable concentrations of *trans*-1,2-DCE or VC were reported at the two source wells and the seep monitoring locations. Downgradient BVA monitoring well P064 had detectable concentrations of TCE and *cis*-1,2-DCE that were below the MCL but indicated slight impact attributable to VOCs originating from the Phase I area. No detectable concentrations of *trans*-1,2-DCE or VC were reported in the BVA or bedrock wells.

Table 5. Summary of VOC Monitoring Results in Phase I for 2018

Well ID	Location	Parameter	First Semiannual Event	Second Semiannual Event
Source Area Wells and Seep				
0411	0411 Area	TCE (µg/L)	**10.1**	**9.0**
		cis-1,2-DCE (µg/L)	0.84 (J)	2.1
0443	0411 Area	TCE (µg/L)	**8.9**	**6.4**
		cis-1,2-DCE (µg/L)	0.39 (J)	0.36 (J)
0617	Seep/ Bedrock	TCE (µg/L)	**5.4**	**6.0**
		cis-1,2-DCE (µg/L)	1.4	1.4
Bedrock/BVA Monitoring Wells				
0353	Bedrock	TCE (µg/L)	ND (<1)	ND (<1)
		cis-1,2-DCE (µg/L)	ND (<1)	ND (<1)
0444	Bedrock	TCE (µg/L)	ND (<1)	ND (<1)
		cis-1,2-DCE (µg/L)	ND (<1)	ND (<1)
0445	Bedrock	TCE (µg/L)	ND (<1)	ND (<1)
		cis-1,2-DCE (µg/L)	ND (<1)	ND (<1)
P064	BVA	TCE (µg/L)	1.1	1.1
		cis-1,2-DCE (µg/L)	ND (<1)	0.36 (J)

Note:
Values in **bold** exceed the MCL of 5 µg/L for TCE.

Abbreviations:
J = estimated value less than the reporting limit
ND = not detected above reporting limit

TCE concentrations in well 0411 (Figure 5) have decreased since monitoring began in 1999; however, since 2002, the concentrations of TCE in this well have ranged between 9 and 15 µg/L. Concentrations of TCE in well 0443 and seep 0617 have varied since monitoring of these locations started in 2002. Concentrations of TCE in well 0443 have been consistently greater than the MCL since 2010. The time–concentration plots for well 0443 and seep 0617 indicate that concentrations vary and are lower than those in well 0411.

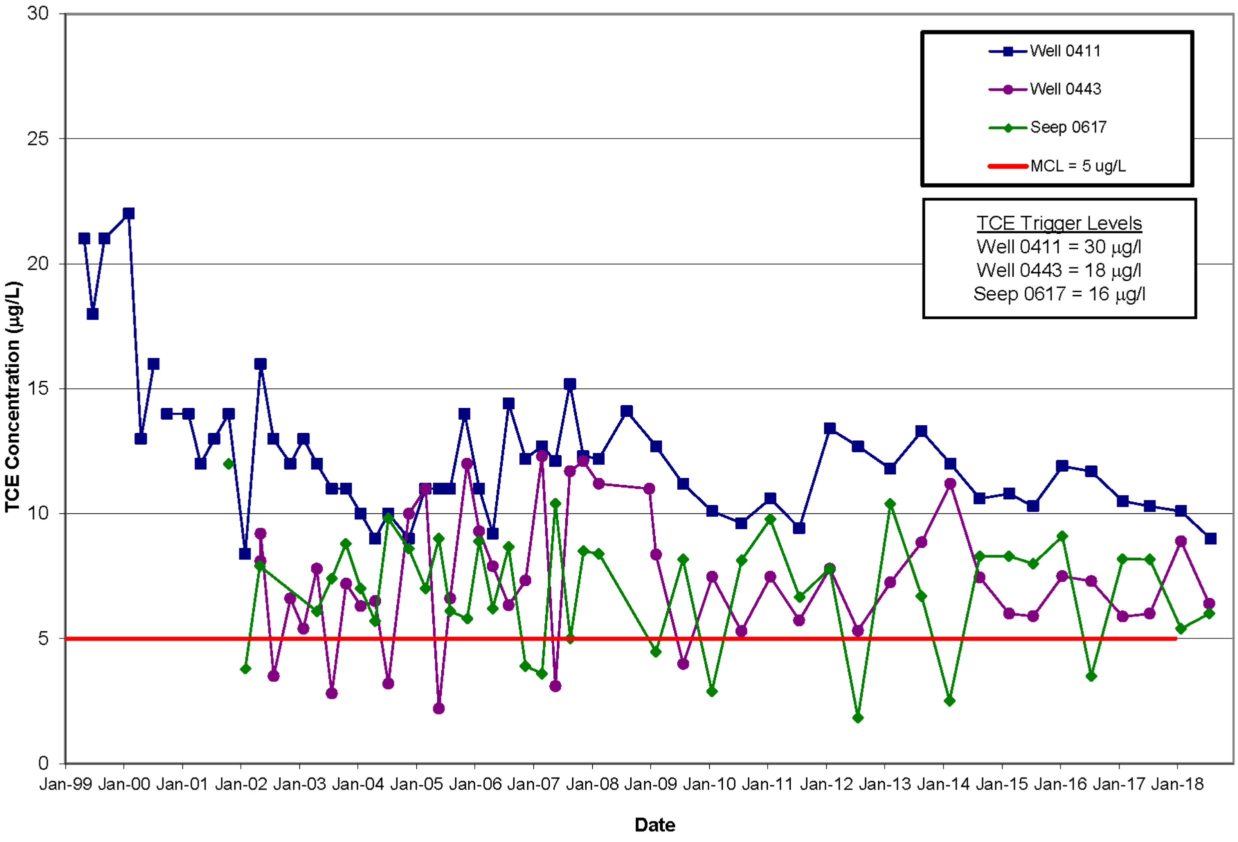

Figure 5. TCE Concentrations in Phase I, 1999–2018

The concentrations of *cis*-1,2-DCE in groundwater (Figure 6) continue to be varied. Concentrations greater than the reporting limit of 1 µg/L have consistently been reported in well 0411 and seep 0617. Historically, concentrations of *cis*-1,2-DCE in well 0411 were generally greater than those measured in seep 0617; however, over the past few years, the concentrations have been similar. Estimated detections lower than 1 µg/L have been reported in well 0443 since 2009. None of the locations had concentrations of *cis*-1,2-DCE that exceeded the MCL of 70 µg/L.

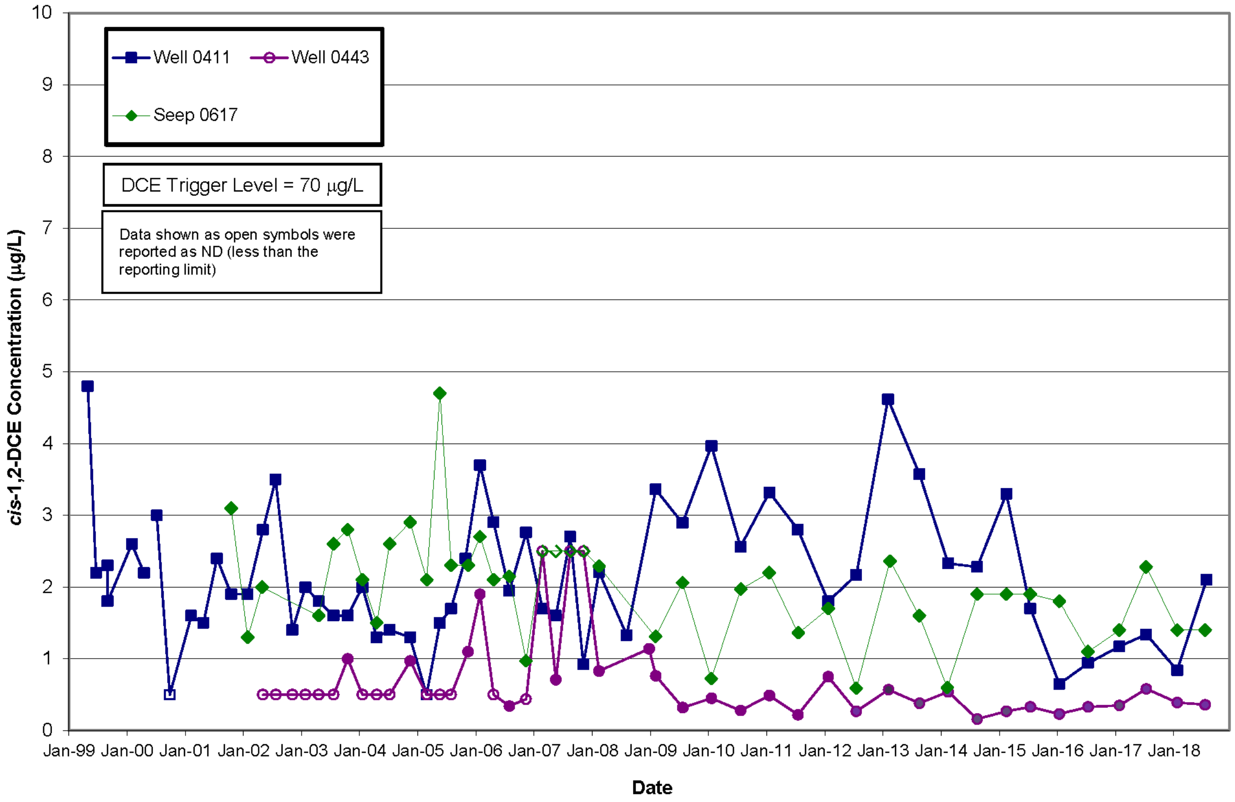

Figure 6. cis-*1,2-DCE Concentrations in Phase I, 1999–2018*

The average concentrations of TCE and *cis*-1,2-DCE in groundwater (Figure 7) indicate that impact is localized in the bedrock groundwater near wells 0411 and 0443 and seep 0617. Data from downgradient BVA monitoring well P064 indicate the concentrations of VOCs are low at the point where bedrock groundwater enters the BVA.

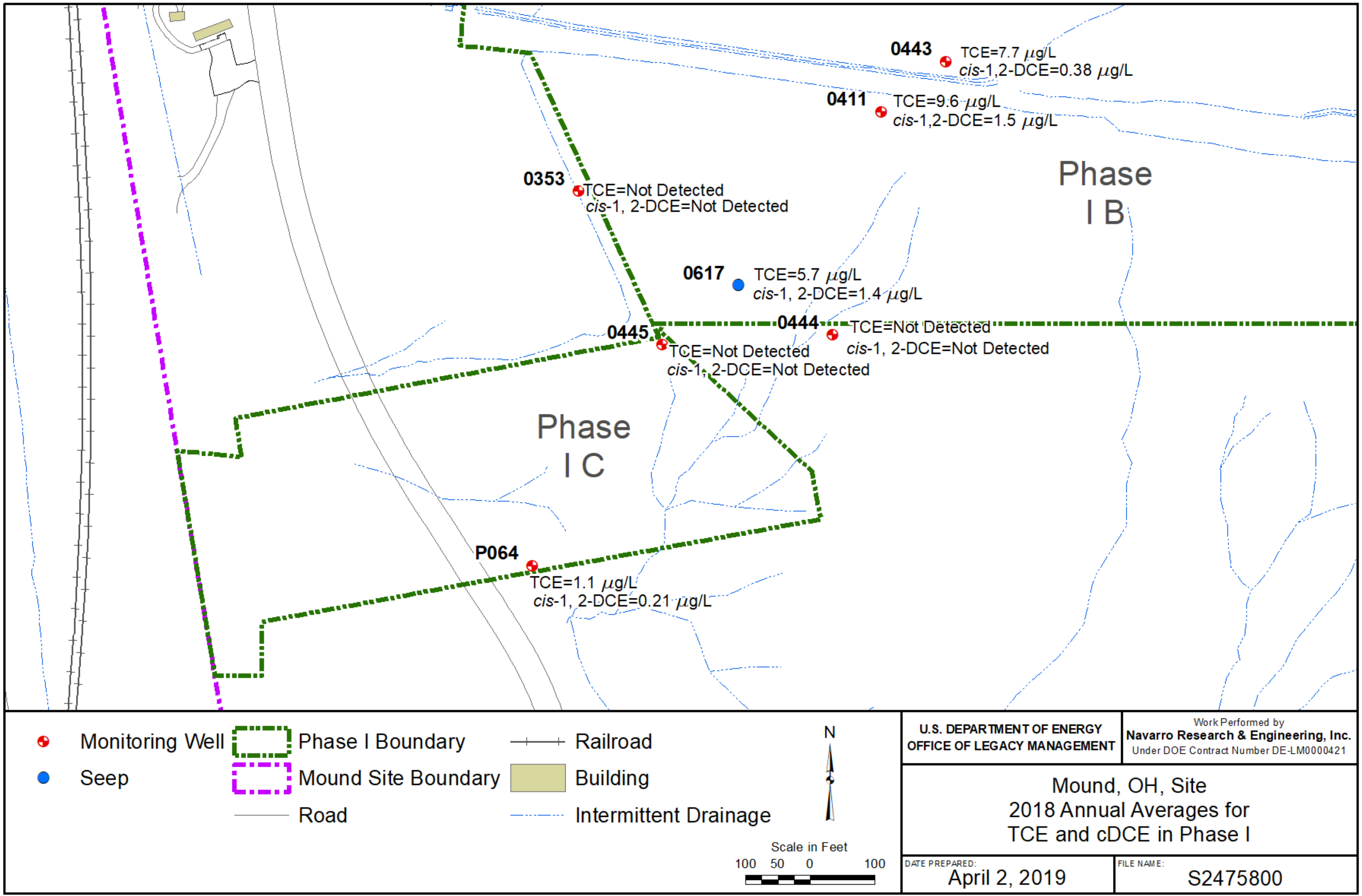

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Figure 7. 2018 Annual Averages for TCE and DCE in Phase I

3.2 Trend Analysis

Mann-Kendall trend analysis was performed using data collected since 1999 and indicates downward trends for TCE in well 0411 and for *cis*-1,2-DCE in well 0443 and seep 0617 (Table 6). Trend analysis was not performed for the remainder of the wells because results consistently showed nondetects or sporadic detections. There is not a sufficient number of data points from well P064 for trend analysis. Summary reports providing details for each statistical evaluation for each monitoring location are contained in Appendix B.

Table 6. Trend Analysis Results for TCE and DCE in Phase I

Location	Analyte	Trend
Well 0411	TCE	**Down**
Well 0443		None
Seep 0617		None
Well 0411	*cis*-1,2-DCE	None
Well 0443		**Down**
Seep 0617		**Down**

Evaluation of the downward trend in TCE concentrations in well 0411 may indicate the time frame when concentrations may approach the MCL of 5 µg/L. The nonparametric slope calculated from the data suggests that the MCL may be reached by 2044, which is similar to the estimated time frame from previous annual reports. The remainder of the locations were less than the MCL or no trend was present; therefore, no timeframes are estimated.

Table 7 summarizes the results from each annual trend analyses performed since 2007 in Phase I for source area monitoring wells 0411 and 0443 and seep 0617. Results show continued downward trends in TCE concentrations in well 0411 since the monitoring program was started. No trends in the data are observed in TCE concentrations in well 0443 and 0617. No trends in the *cis*-1,2-DCE data have been observed at well 0411 since 2016. Downward trends in *cis*-1,2-DCE have been observed at both well 0443 and seep 0617 since 2014 and 2012, respectively.

Table 7. Summary of Trend Analysis Results for Phase I

Location	Analyte	Year											
		2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Well 0411	TCE	D	D	D	D	D	D	D	D	D	D	D	D
Well 0443		N	U	N	N	N	N	N	N	N	N	N	N
Seep 0617		N	N	N	N	N	N	N	N	N	N	N	N
Well 0411	cDCE	---	N	N	N	N	N	N	U	U	N	N	N
Well 0443		---	U	N	N	N	N	N	D	D	D	D	D
Seep 0617		---	N	N	N	N	D	D	D	D	D	D	D

Abbreviations:
D = downward trend
N = no trend (either upward or downward)
U = upward trend

3.3 Groundwater Elevations

A map of the average groundwater elevations measured in the Phase I area during 2018 (Figure 8) represents the two flow regimes present at the Mound site: bedrock and the unconsolidated materials of the BVA. The approximate location of contact of the BVA with the bedrock is indicated in this figure. Groundwater originating from the well 0411/0443 area flows southwest within the bedrock, following the bedrock topography. This groundwater enters the BVA along this contact. Flow within the BVA is generally to the south-southeast (parallel to the bedrock contact). Appendix C presents a summary of the groundwater elevations measured during 2018.

3.4 Recommendations

No samples in 2018 were above trigger levels, the concentrations of TCE and *cis*-1,2-DCE in BVA monitoring wells continue to remain below MCL's indicating no impacts to the BVA, and no upward trends demonstrate that analyte concentrations are not statistically increasing. No changes to the Phase I MNA monitoring program are recommended at this time and the monitoring frequency remain semiannual for 2019.

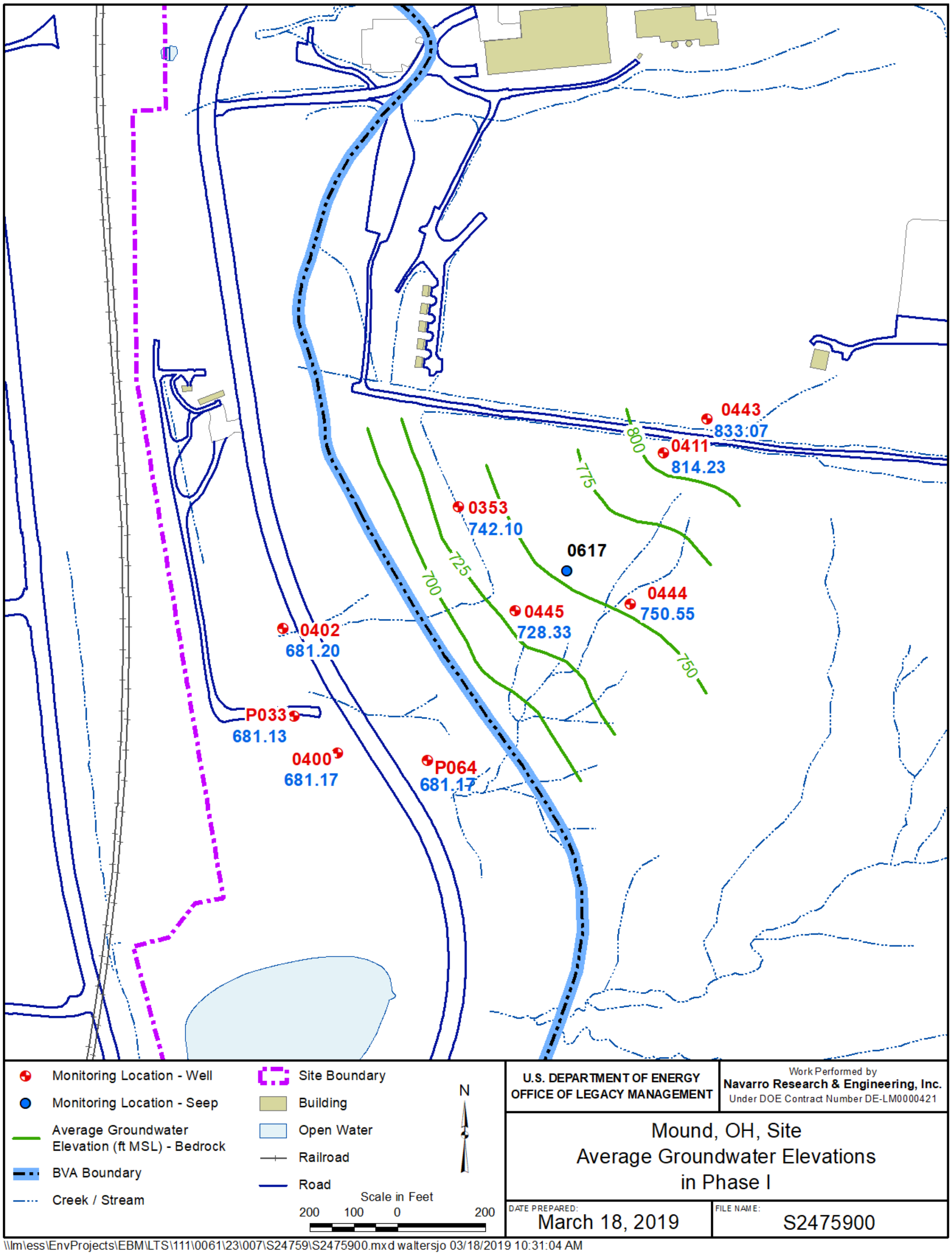

Figure 8. 2018 Average Groundwater Elevations in Phase I (in ft MSL)

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4.0 Parcels 6, 7, and 8 MNA Remedy

4.1 Monitoring Results—VOCs

4.1.1 Seeps

Concentrations of TCE were reported in all of the Main Hill seeps; however, only seep 0602 exceeded the MCL of 5 µg/L (Table 8) in 2018 during the Q1-2018 sampling event. The trigger level of 150 µg/L for TCE in seep 0605 (Table 4) was not exceeded in 2018. Concentrations of PCE were above the MCL in seep 0601 for all sampling events. All PCE concentrations for seep 0601 were well below the trigger level of 75ug/L in 2018. A low concentration of PCE (less than 1 µg/L) was reported as an estimated value below the detection limit in seep 0605. *cis*-1,2-DCE was reported in all of the seeps; seep 0602 had the highest concentrations. Estimated detections of *trans*-1,2-DCE (less than 1 µg/L) were reported in seep 0602. No VC was detected in the seeps.

Table 8. Summary of VOC Results in the Main Hill Seeps for 2018

Location	Area	VOC Concentrations				
		VOC	**Q1**	**Q2**	**Q3**	**Q4**
0601	Onsite	PCE (µg/L)	**10.5**	**12.9**	**9.7**	**6.2**
		TCE (µg/L)	3.8	2.9	1.2	0.72 (J)
		cis-1,2-DCE (µg/L)	0.65 (J)	0.48(J)	044 (J)	ND (<1)
		trans-1,2-DCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
0602	Onsite	PCE (µg/L)	ND (<1)	ND (<1)	DRY	ND (<1)
		TCE (µg/L)	**8.6**	4.1		0.46 (J)
		cis-1,2-DCE (µg/L)	6.2	4.5		2.0
		trans-1,2-DCE (µg/L)	0.31 (J)	0.31 (J)		ND (<1)
0605	Offsite	PCE (µg/L)	ND (<1)	0.34 (J)	ND (< 1)	ND (<1)
		TCE (µg/L)	0.30 (J)	3.1	1.1	1.3
		cis-1,2-DCE (µg/L)	ND (<1)	1.1	0.96 (J)	3.1
		trans-1,2-DCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
0606	Offsite	PCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
		TCE (µg/L)	3.9	ND (<1)	ND (<1)	ND (<1)
		cis-1,2-DCE (µg/L)	1.3	ND (<1)	ND (<1)	ND (<1)
		trans-1,2-DCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
0607	Offsite	PCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
		TCE (µg/L)	0.85 (J)	1.3	1.1	0.51 (J)
		cis-1,2-DCE (µg/L)	ND (<1)	0.51 (J)	0.62 (J)	0.42 (J)
		trans-1,2-DCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)

Notes:
PCE trigger level at seep 0601 = 75 µg/L.
TCE trigger level at the seeps = 150 µg/L.
Values in **bold** exceed the MCL.

Abbreviations:
J = estimated value that is less than the reporting limit
ND = not detected
Q = quarter

A graph of TCE concentrations measured in the seeps since the remediation of contaminated buildings and soil on the Main Hill (completed in mid-2006) (Figure 9) shows that the highest concentrations of TCE were measured in seeps 0602 and 0605. After the completion of site improvements and the closure of the tritium capture pits on the Main Hill in 2011, VOC concentrations have been less variable and decreasing. Data from the past few years show that elevated concentrations of TCE only occur in seep 0602, periodically.

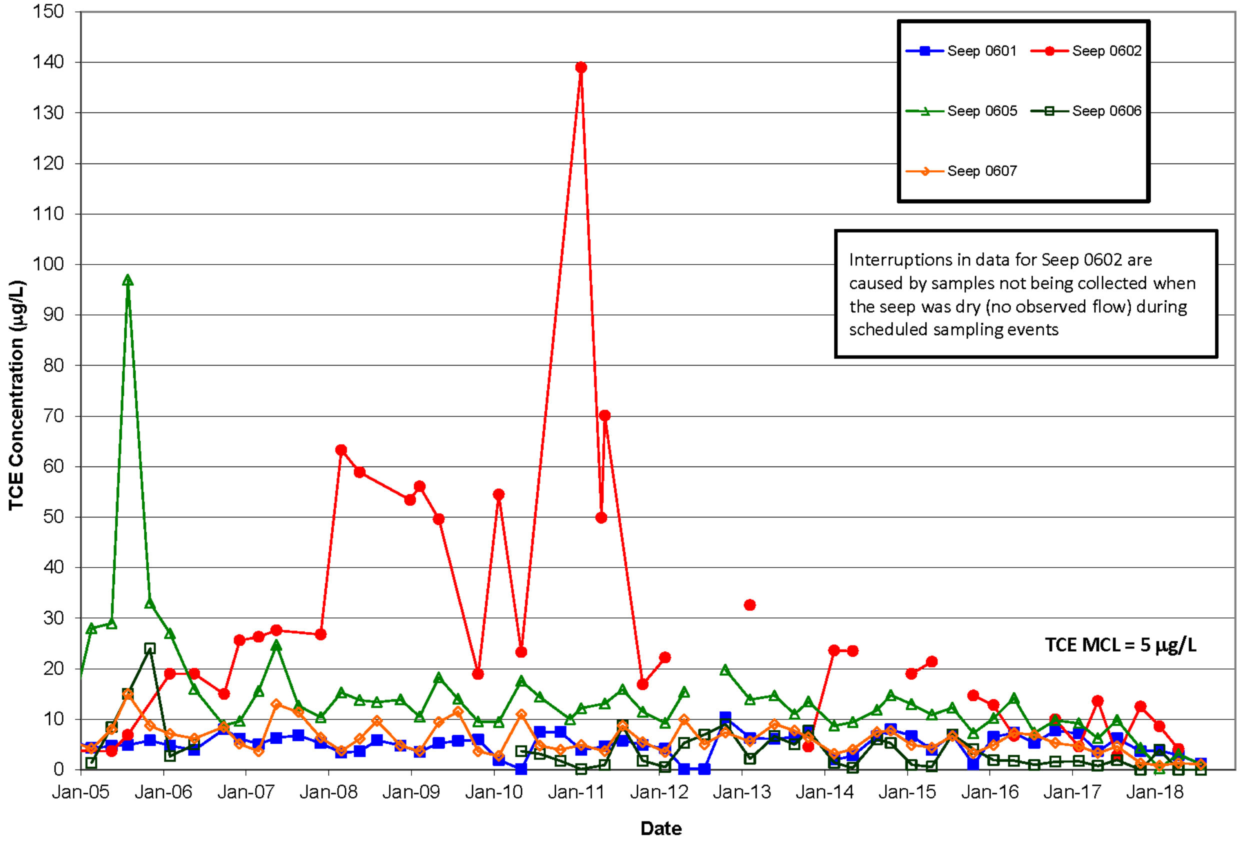

Figure 9. TCE Concentrations in Parcels 6, 7, and 8 Main Hill Seeps

Seep 0601 is the only location where PCE was routinely reported, although an estimated value less than 1 µg/L was reported in seep 0605 during 2018. PCE concentrations in this seep (Figure 10) are similar to those measured before remediation on the Main Hill.

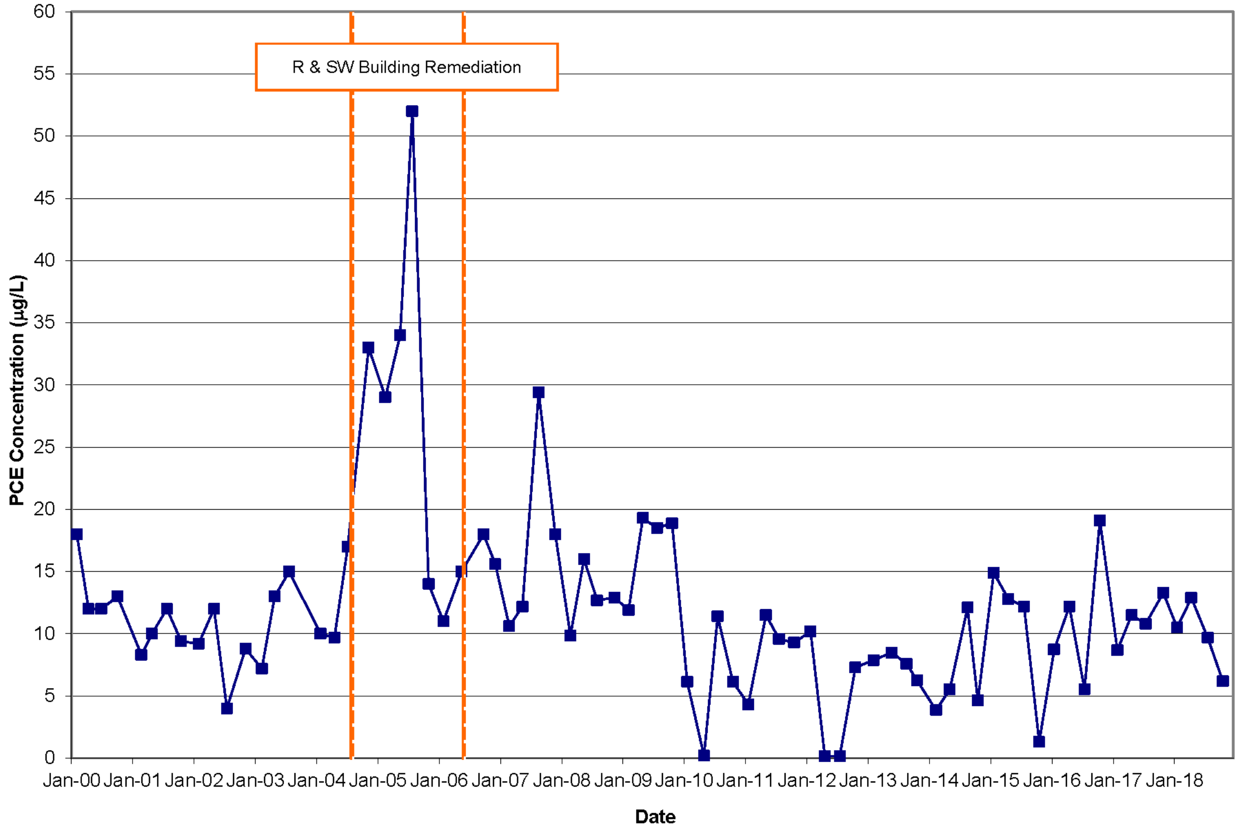

Figure 10. PCE Concentrations in Parcels 6, 7, and 8 Seep 0601

4.1.2 Groundwater

Monitoring results for 2018 (Table 9) continue to show TCE in wells 0315, 0347, 0379, and 0386; the highest concentrations are detected in well 0347 (source area well), where concentrations exceeded the MCL. The MCL for TCE was exceeded only during the first quarter of 2018 in well 0315 (source area well). The concentrations of TCE reported in wells 0315 and 0347 were below the trigger level of 30 µg/L established for these source area wells (Table 4). Wells 0379 and 0386 are within the tributary valley, where wells 0315 and 0347 are also located (Figure 4). An estimated detection of TCE was reported in well 0389, and no detectable concentrations of TCE were measured in the other wells.

Estimated detections of PCE less than 1 µg/L were reported in wells 0126 and 0379. These wells are located where the tributary valley enters the BVA. No trigger levels for PCE have been set for these locations. No detectable concentrations of *cis*-1,2-DCE, *trans*-1,2-DCE, or VC were reported in any of the wells monitored as part of this program.

Table 9. Summary of VOC Results in Parcels 6, 7, and 8 Groundwater for 2018

Location	**Area**	**VOC Concentrations**				
		VOC	**Q1**	**Q2**	**Q3**	**Q4**
Onsite Wells						
0315	Source Area	PCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
		TCE (µg/L)	**5.2**	3.5	4.1	4.4
0347		PCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
		TCE (µg/L)	**20.7**	**11.7**	**21.8**	**16.1**
0346	Onsite	PCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
		TCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
0379		PCE (µg/L)	0.44 (J)	ND (<1)	0.40 (J)	0.43 (J)
		TCE (µg/L)	1.4	1.2	1.6	1.3
Downgradient Wells—Near (offsite)						
0386	BVA	PCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
		TCE (µg/L)	2.5	2.9	3.0	2.0
0387		PCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
		TCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
0389		PCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
		TCE (µg/L)	ND (<1)	ND (<1)	0.54 (J)	ND (<1)
0392		PCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
		TCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
Downgradient Wells—Far (offsite)						
0118	BVA	PCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
		TCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
0124		PCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
		TCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
0126		PCE (µg/L)	0.79 (J)	0.85 (J)	0.78 (J)	0.87 (J)
		TCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
0138		PCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
		TCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)

Notes:
TCE trigger level for wells 0315 and 0347 = 30 µg/L.
TCE trigger level for other wells = 5 µg/L.
Values in **bold** exceed the MCL.

Abbreviations:
J = estimated value that is less than the reporting limit
ND = not detected
Q = quarter

A graph of TCE concentrations measured in select wells shows that concentrations in wells 0315 and 0347 have consistently been greater than the MCL of 5 µg/L (Figure 11), although TCE concentrations in well 0315 have periodically been lower than the MCL in the last 3 years. The concentrations of TCE in the downgradient wells have been below the MCL since 2000. The pattern in TCE concentrations in wells 0315 and 0347 has been similar since 2012. The concentrations in well 0347 are always higher and have greater changes (increases and decreases) compared to those in well 0315. An overall decrease in TCE concentrations can be observed beginning at the same time. It is likely that surface water influences noted in previous reports (DOE 2014a; DOE 2014b) have been reduced or eliminated and more-recent data reflect concentrations of TCE in groundwater that are not influenced by infiltration of surface water through the exposed tritium capture pits.

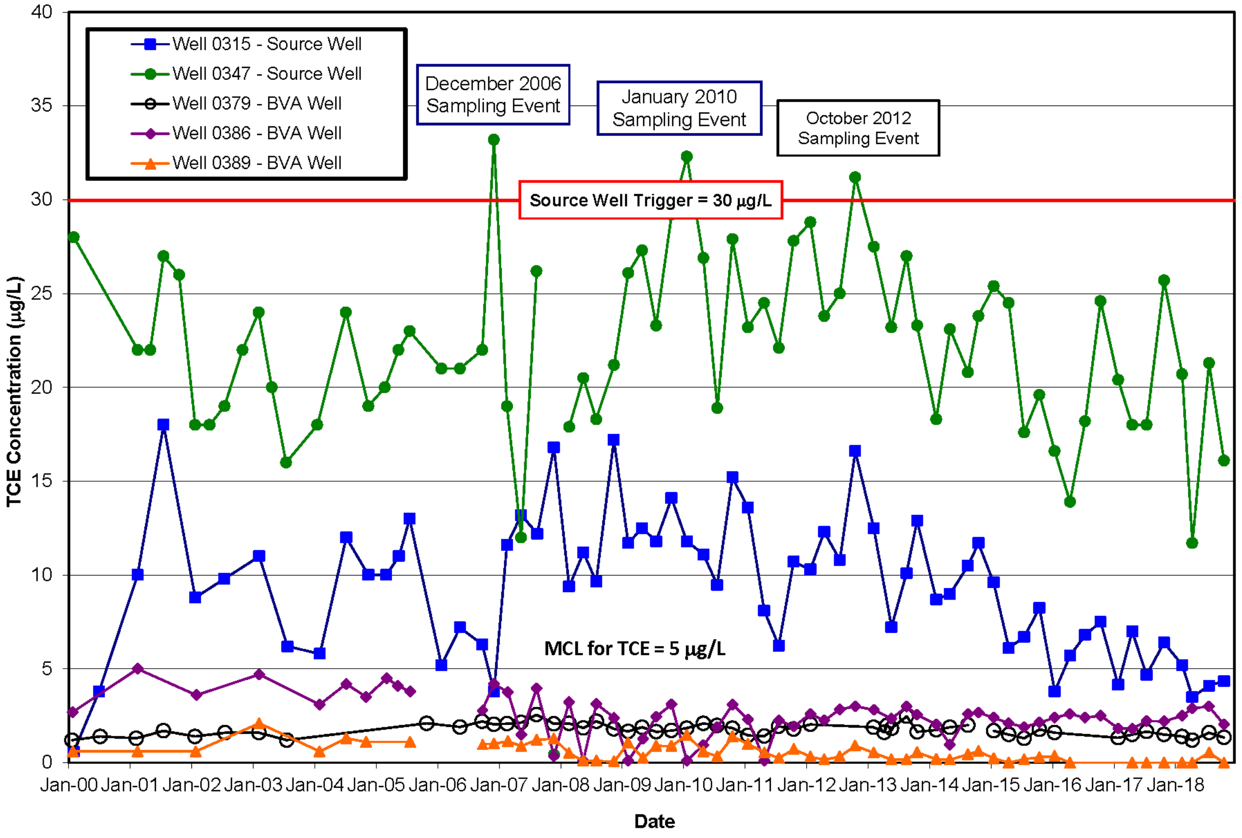

Figure 11. TCE Concentrations in Parcels 6, 7, and 8 Groundwater

Data collected over the past several years indicate variable concentrations of VOCs, primarily TCE, in the groundwater in Parcels 6, 7, and 8 as exhibited from the data from seep 0602 (Figure 9) and wells 0315 and 0347 (Figure 11). Seep 0602 and the downgradient wells 0315 and 0347 are in the tributary valley, which is along the southern edge of the Main Hill. As discussed in Section 1.3, the tributary valley is a narrow tongue of glacial deposits connected to the BVA that overlies the fractured bedrock at the site. Water infiltrating on the Main Hill moves through the fractured bedrock and ultimately discharges into the unconsolidated materials. TCE-impacted groundwater that originated on the Main Hill discharges to seeps or the tributary valley (DOE 2017). Annual average TCE concentrations from wells within the tributary valley show that the deep wells that are screened directly above the bedrock (wells 0347, 0386, and 0387) have the highest TCE concentrations and monitor the TCE-impacted groundwater discharging from the bedrock.

4.1.3 Distribution of TCE

The average concentrations of TCE (Figure 12) in the Main Hill area indicates that the highest concentrations are were measured in groundwater in well 0347. Seeps 0601 and 0602 on the Main Hill had the highest TCE concentrations measured in the seeps. Historically, concentrations of TCE were higher in the seeps than in the groundwater monitoring wells. This year it was observed that the concentrations of TCE in wells 0315 and 0347 were higher than those measured in the upgradient seeps. TCE concentrations that were below the MCL were reported in near downgradient well pair 0386 and 0389 that are screened in the BVA.

4.2 Monitoring Results—Tritium

Tritium levels in the Main Hill seeps continued to be higher than those in the downgradient groundwater wells (Table 10). The highest tritium activity continued to be measured in seep 0601, which is onsite. No location exceeded the MCL of 20 nanocuries per liter (nCi/L) or the trigger level of 1500 nCi/L in 2018 (Table 4). The wells had tritium levels similar to background (0.77 nCi/L [DOE 1996]).

Table 10. Summary of Tritium Results in the Main Hill Area for 2018

Location	Tritium Activity (nCi/L)	
	Semiannual Period 1	Semiannual Period 2
Seeps		
0601	7.3	19.0
0602	1.5	DRY
0605	2.7	4.6
0606	1.4	2.9
0607	2.3	2.4
Downgradient Wells		
0118	ND (<0.35)	ND (<0.31)
0138	ND (<0.35)	0.35 (J)
0346	0.38 (J)	ND (<0.4)
0347	1.1	1.2
0379	0.71 (J)	0.49 (J)

Note:
Tritium trigger level at the seeps = 1500 nCi/L.

Abbreviations:
J = estimated value that is less than the reporting limit
ND = not detected

Tritium levels in the seeps were highest during remediation activities on the Main Hill (2004−2006). Tritium data collected after building demolition and soil removal indicate decreasing levels in all of the seeps (Figure 13). The decrease in tritium levels in post-remediation data supports that the majority of the source was removed from the Main Hill area and that, with continued flushing, levels will continue to decline. Starting in 2009, the tritium levels in all seeps except seep 0601 were lower than the MCL of 20 nCi/L. The levels of tritium in seep 0601 have been below the MCL since 2017.

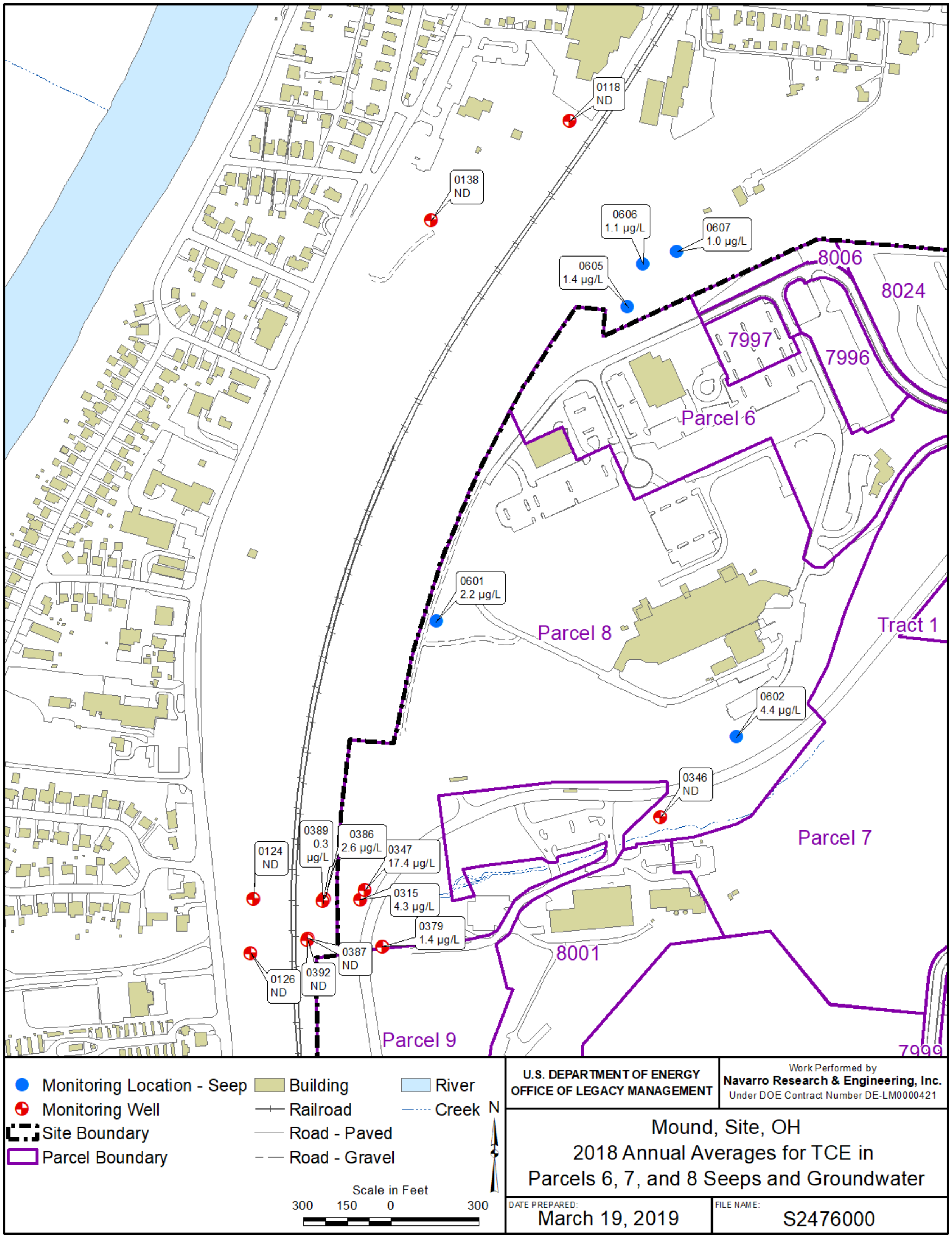

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Figure 12. 2018 Annual Averages for TCE in Parcels 6, 7, and 8 Seeps and Groundwater

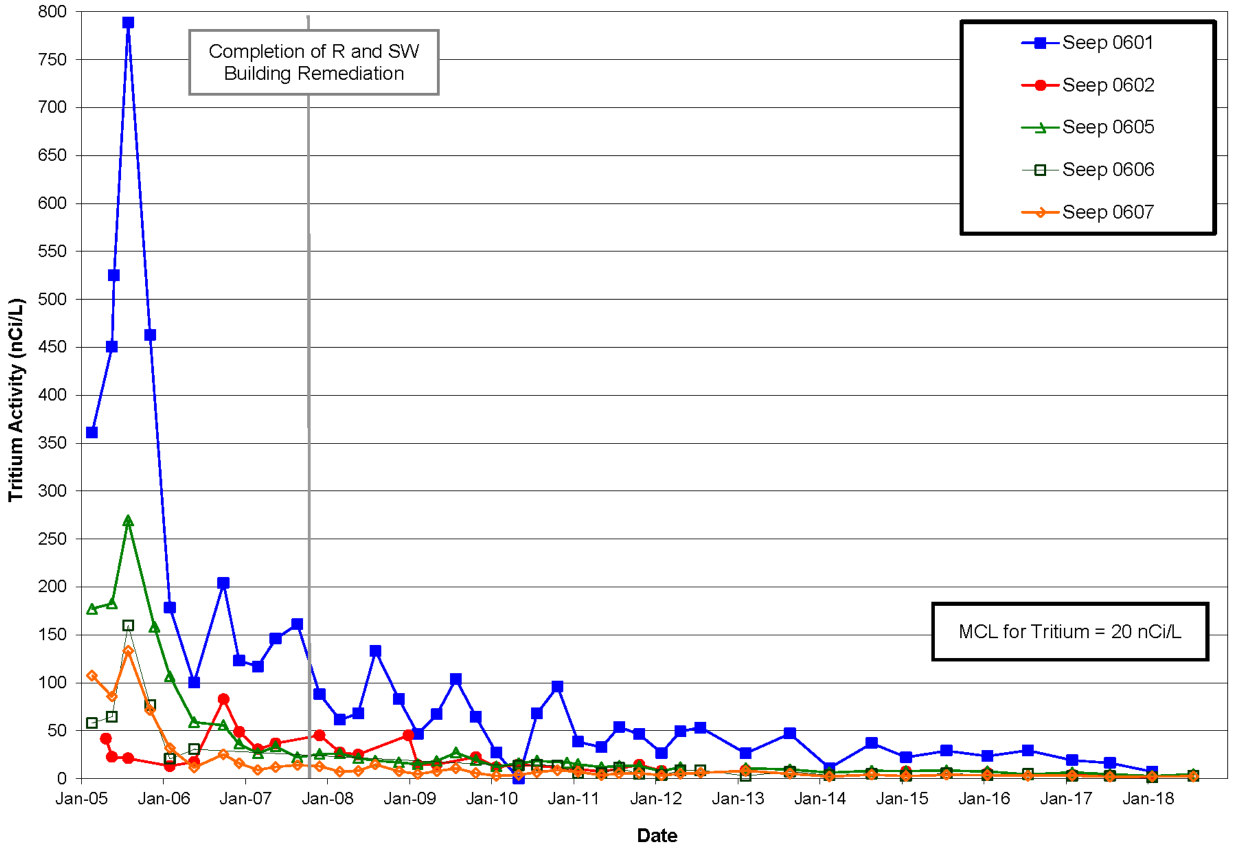

Figure 13. Tritium Activity in Parcels 6, 7, and 8 Main Hill Seeps

A graph of tritium levels in downgradient wells (Figure 14) illustrates that groundwater impact in the wells lagged behind impact expressed in the seeps. Groundwater impact increased near the end of remediation activities on the Main Hill, and impact in the seeps occurred as remediation activities were being performed and began to decrease as activities were completed. The tritium levels in the wells also responded quickly to remediation activities. Well 0347 has the highest levels of tritium, and tritium levels in wells 0138, 0346, and 0379 have leveled off and continue to be similar to background. All tritium levels in the monitoring wells were below the MCL of 20 nCi/L.

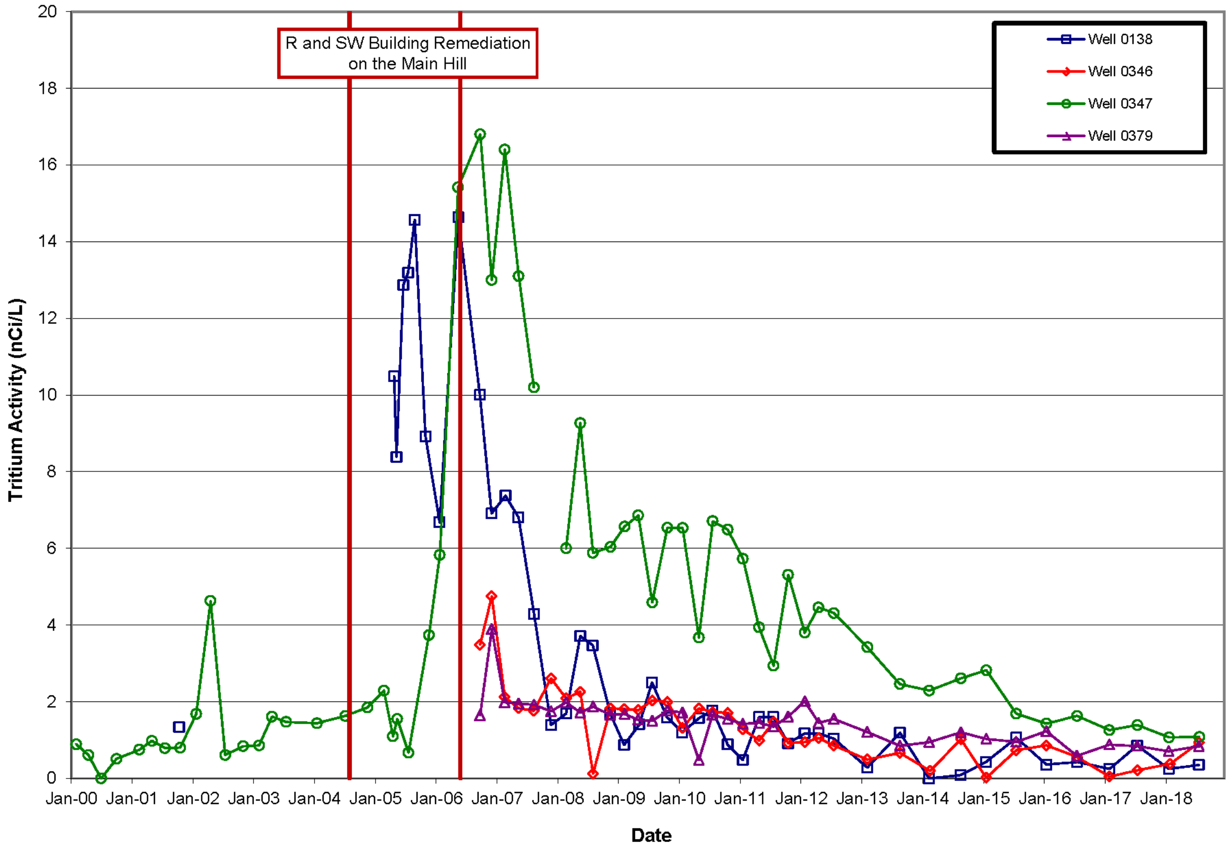

Figure 14. Tritium Activity in Parcels 6, 7, and 8 Wells 0138, 0346, 0347, and 0379

The distribution of tritium in groundwater (Figure 15) in the Main Hill area indicates that the greatest impact is still associated with the seeps, particularly seep 0601. Downgradient wells showed some levels of tritium similar to background. Figure 15 depicts the 2018 annual averages of tritium in the monitoring network.

4.3 Trend Analysis

Trend analysis was performed on VOCs and tritium data using the nonparametric MK test. Trend analysis is reported for data collected since 2005. This period was selected to represent data collected since the completion of remediation activities on the Main Hill.

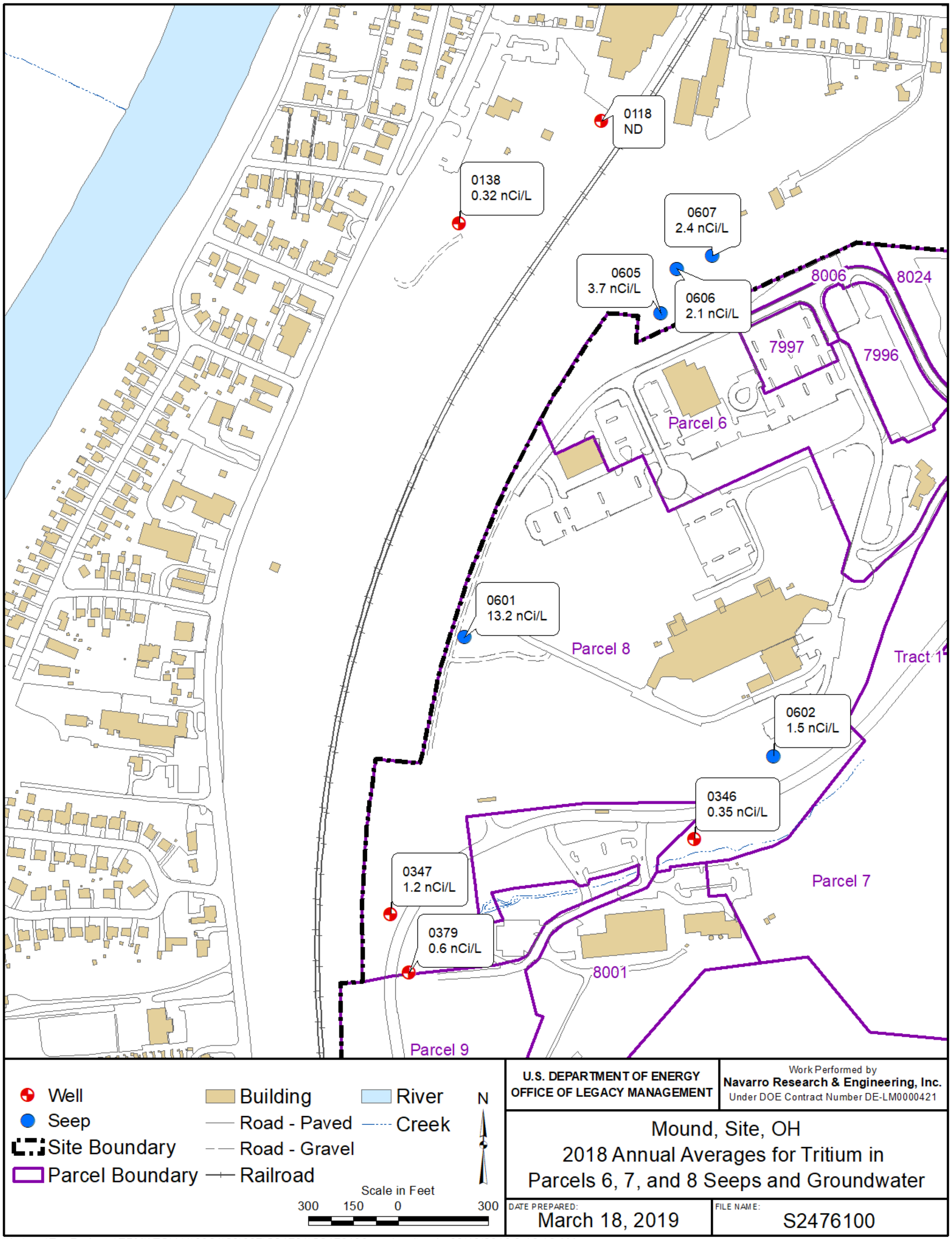

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Figure 15. 2018 Annual Averages for Tritium in Parcels 6, 7, and 8 Seeps and Groundwater

4.3.1 VOCs

Trend analysis of TCE data collected since 2005 indicates downward trends for seeps 0602, 0605, 0606, and 0607 and wells 0315, 0347, and 0389 (Table 11). Trend analysis was not performed on data from the remainder of the wells because results consistently showed nondetects or sporadic estimated detections. Summary reports providing details for each statistical evaluation for each monitoring location are in Appendix B.

Table 11. Trend Analysis Results for VOCs in Parcels 6, 7, and 8 (2005–2018)

Location	Trend
TCE	
Seep 0601	None
Seep 0602	**Down**
Seep 0605	**Down**
Seep 0606	**Down**
Seep 0607	**Down**
Well 0315	**Down**
Well 0347	**Down**
Well 0386	None
Well 0389	**Down**
PCE	
Seep 0601	**Down**
***cis*-1,2-DCE**	
Seep 0602	**Down**
Seep 0605	**Down**

Concentrations of PCE in seep 0601 were evaluated for a trend in PCE concentrations (Table 11), and a downward trend was indicated. Data from seeps 0602 and 0605 were evaluated for trends in *cis*-1,2-DCE concentrations (Table 11), and downward trends were calculated for both seeps.

A separate trend analysis of TCE data collected since 2012 was performed (Table 12) to better evaluate more recent trends. As previously noted, the influences of surface water entering the subsurface appear to have been reduced or eliminated. Starting in 2012, similar patterns in concentration changes were observed in wells 0315 and 0347. Downward trends were calculated for seeps 0602, 0605, 0606, and 0607 and wells 0315 and 0347. The slope calculated for the well 0347 data suggests that the MCL may be reached by 2027.

Table 12. Trend Analysis Results for TCE in Parcels 6, 7, and 8 (2012–2018)

Location	**Trend**
Seep 0601	None
Seep 0602	**Down**
Seep 0605	**Down**
Seep 0606	**Down**
Seep 0607	**Down**
Well 0315	**Down**
Well 0347	**Down**
Well 0386	None
Well 0389	None

Table 13 summarizes the results from annual trend analyses of VOC data in Parcels 6, 7, and 8 since 2007. Results show that upward trends in TCE concentrations observed in the seeps (from 2007 to 2012) have reverted to either no trends or downward trends, starting in 2013. In 2017 and 2018, four out of five seeps showed downward trends in TCE concentrations. Source wells 0315 and 0347 showed upward trends between 2009 and 2014. Downward trends have been observed in both of these source wells starting this year (2018). TCE concentrations in seep 0601 and well 0386 vary enough to exhibit no trend in 2018. Downward trends in PCE and *cis*-1,2-DCE in seeps 0601 and 0605 started in 2011, and a downward trend in *cis*-1,2-DCE in seep 0602 started in 2016. These downward trends are attributable to source removal and efforts in 2011 to reduce the impact of surface water entering the subsurface on the Main Hill (DOE 2014a; DOE 2014b).

Table 13. Summary of Trend Analysis Results for VOCs in Parcels 6, 7, and 8

Location	Analyte	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Seep 0601	TCE	U	N	N	N	N	N	N	N	N	N	N	N
Seep 0602		U	U	U	U	U	U	N	N	N	N	D	D
Seep 0605		D	D	D	D	D	D	D	D	D	D	D	D
Seep 0606		---	---	---	N	N	N	N	N	N	N	D	D
Seep 0607		N	N	N	N	N	N	N	N	N	N	D	D
Well 0315		N	N	U	N	N	N	N	N	N	N	D	D
Well 0347		N	N	N	N	N	U	U	U	N	N	N	D
Well 0386		N	D	D	D	D	D	N	D	D	D	D	N
Well 0389		N	N	N	N	N	N	D	D	D	D	D	D
Seep 0601	PCE	---	---	N	N	D	D	D	D	D	D	D	D
Seep 0602	cDCE	---	---	---	---	N	N	N	N	N	D	D	D
Seep 0605		---	---	---	---	D	D	D	D	D	D	D	D

Abbreviations:
D = downward trend
N = no trend (either upward or downward)
U = upward trend

4.3.2 Tritium

Trend analysis for tritium data collected since 2005 was performed for all seeps and wells where detectable levels have been consistently measured. The trend analysis showed that downward trends in activity were observed in all seeps and wells (Table 14). Summary reports providing details for each statistical evaluation for each monitoring location are in Appendix B.

Table 14. Summary of Trend Analysis Results for Tritium in the Main Hill Seeps and Downgradient Wells

Location	Trend
Seeps	
Seep 0601	**Down**
Seep 0602	**Down**
Seep 0605	**Down**
Seep 0606	**Down**
Seep 0607	**Down**
Wells	
Well 0138	**Down**
Well 0346	**Down**
Well 0347	**Down**
Well 0379	**Down**

Table 15 summarizes the results from annual trend analysis of tritium data in Parcels 6, 7, and 8 since 2007. Results of the trend analysis of tritium data indicate downward trends for all of the seeps and wells starting in 2011, with the exception of well 0347, where no trends were observed from 2011 through 2013 and downward trends have been observed since 2014. The downward trends determined from post-remediation data support that the majority of the source of contamination was removed from the Main Hill area during remediation, and that flushing and radioactive decay have continued to lower the levels.

Table 15. Summary of Trend Analysis Results for Tritium in Parcels 6, 7, and 8

Location	Analyte	Year											
		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Seep 0601	Tritium	D	D	D	D	D	D	D	D	D	D	D	D
Seep 0602		N	N	N	N	D	D	D	D	D	D	D	D
Seep 0605		---	---	---	D	D	D	D	D	D	D	D	D
Seep 0606		D	D	D	D	D	D	D	D	D	D	D	D
Seep 0607		D	D	D	D	D	D	D	D	D	D	D	D
Well 0138		D	D	D	D	D	D	D	D	D	D	D	D
Well 0346		N	N	N	D	D	D	D	D	D	D	D	D
Well 0347		N	N	N	D	N	N	N	D	D	D	D	D
Well 0379		N	N	D	D	D	D	D	D	D	D	D	D

Abbreviations:
D = downward trend
N = no trend (either upward or downward)

4.4 Groundwater Elevations

A map of the average groundwater elevations measured in the Parcels 6, 7, and 8 area during 2018 (Figure 16) represents the two flow regimes present at the Mound site: bedrock and the unconsolidated materials of the BVA. The approximate location of contact of the BVA with the bedrock is indicated on this figure. Groundwater originating from the well Main Hill area flows within the bedrock, following the bedrock topography. This groundwater enters the BVA along this contact, and flow within the BVA is parallel to the bedrock contact. Appendix C presents a summary of the groundwater elevations measured during 2018.

4.5 Recommendations

TCE concentrations greater than the MCL continued to be measured in seeps and in downgradient monitoring wells. The concentrations of VOCs continue to be variable at a few locations, although recent data (since 2012) indicate decreasing VOC concentrations at most locations. Quarterly sampling will continue at the seep and monitoring well locations in 2019 to determine if the system has stabilized since efforts were taken to reduce surface water infiltration into the subsurface (DOE 2014a; DOE 2014b) and VOCs continue to attenuate naturally. The evaluation of the 2018 data indicates that no changes to the VOC monitoring program should be made at this time.

All seeps and downgradient wells were below the MCL for tritium in 2018 and downward trends have been observed for all seeps and wells since 2011 and 2014, respectively. Historically, only seep 0601 has routinely shown levels of tritium that exceeded the MCL since MNA remedy monitoring was initiated in 2009. Tritium levels at this location have been below the MCL for two consecutive years of semiannual sampling and a downtrend has been in place since 2007. In accordance with the O&M plan, two consecutive years of tritium levels below the MCL qualify for a recommendation to the Core Team to discontinue sampling. Based on the downward trend for tritium in the seeps and groundwater monitoring wells and two consecutive years of tritium data below the MCL in seep 0601, it is recommended that the tritium monitoring program for Parcels 6, 7, and 8 be discontinued.

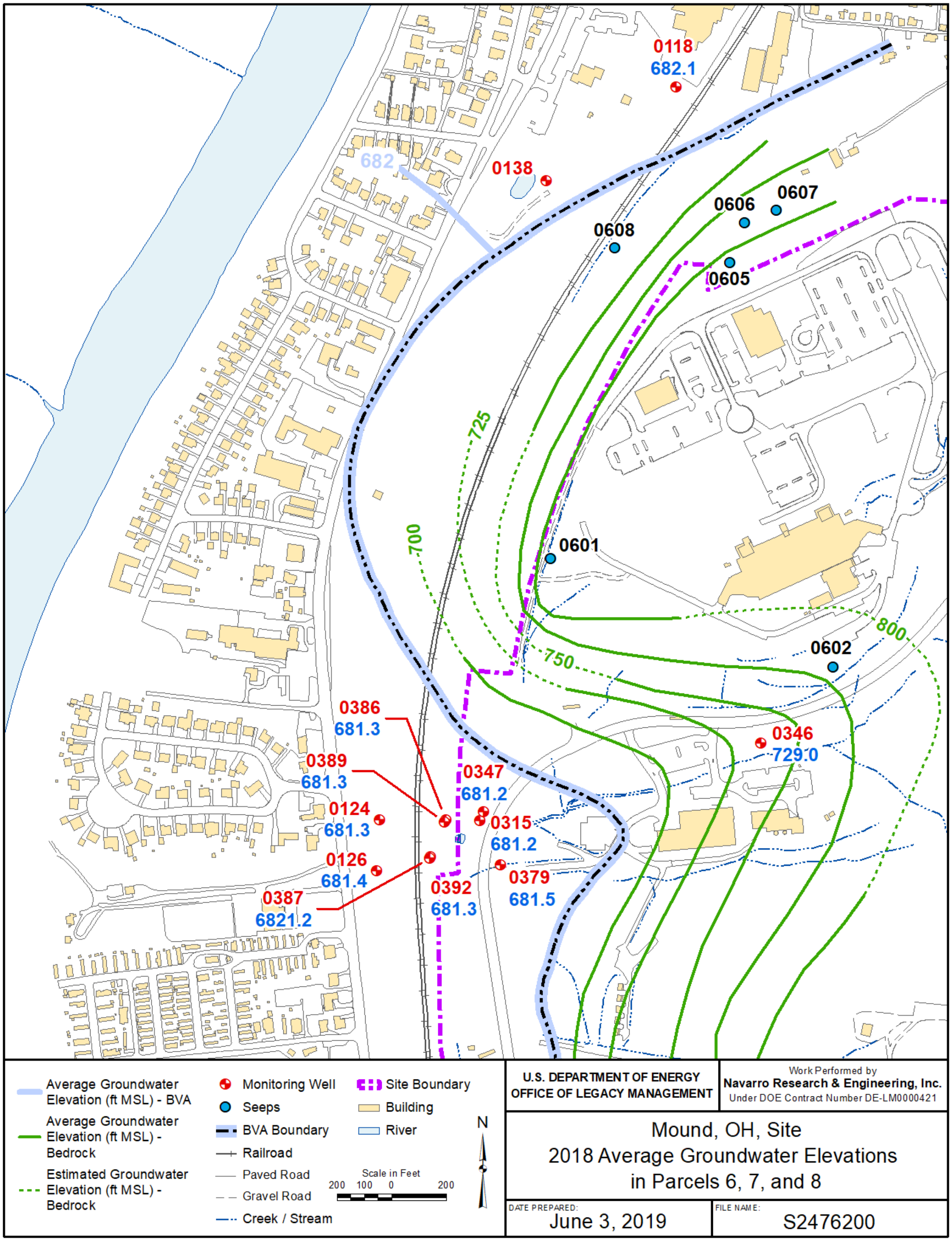

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Figure 16. 2018 Averages for Groundwater Elevations in Parcels 6, 7, and 8

5.0 Inspection of the Monitoring System

A routine maintenance program has been established for the long-term groundwater monitoring locations at the Mound site. This program includes periodic inspections that focus on the integrity of each well and the condition of the protective casing and surface pad, the surrounding area, and the route of access. These inspections are usually performed during each sampling event.

Overall, the wells were in good condition. Two incidents involving wells in the monitoring program were noted:

1. Vandalism of well 0411 (Phase I).
2. Dedicated sampling pump missing from well 0138 (Parcels 6, 7, and 8).

It was discovered during the July 2018 (third quarter 2018) sampling event that well 0411 had been vandalized. When sampling personnel arrived at the location, they found the lid to the protective casing open and the lock missing. As part of their inspection, the samplers attempted to pull the pump, but it became lodged inside the well casing. Using a downhole camera, it was determined that a joint in the well casing had some corrosion and was preventing the well pump from passing through the casing. It was decided to pull the sample tubing from the pump and push the pump to the bottom of the well so that a new pump could be placed on top of the old pump. A temporary bladder pump was used to sample the well for the July 2018 sampling event and a new pump was installed.

During the October 2018 (fourth quarter 2018) sampling event, it was discovered that although well 0138 was locked when the samplers arrived at the location, the dedicated sampling pump had been removed. A downhole camera was used to determine that nothing had been dropped down into the well case and that the well was in good condition. A temporary bladder pump was used to sample the well for the October 2018 sampling event.

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6.0 Data Validation

All data collected were validated in accordance with procedures specified in the Sitewide Operations and Maintenance Plan (DOE 2015). This procedure also fulfills the requirements of applicable procedures in the *Mound Methods Compendium* (MD 80045). Data validation was documented in reports prepared for each data package. All 2018 data, including data validation qualifiers, are summarized in Appendix D.

Laboratory performance is assessed by a review and evaluation of the following quality indicators:

- Sample shipping and receiving practices
- Chain of custody
- Laboratory blanks
- Preparation blanks
- Laboratory replicates
- Serial dilutions
- Detection limits
- Peak integrations
- Matrix spikes and matrix spike duplicates
- Holding times
- Instrument calibrations
- Interference check samples
- Radiochemical uncertainty
- Laboratory control samples
- Sample dilutions
- Surrogate recoveries
- Confirmation analyses
- Electronic data

A total of eight report identification numbers (RINs) were established for the 2018 environmental sampling efforts at the Mound site. A RIN is a set of samples that is relinquished to the laboratory using a Chain of Custody form. Data Assessment Reports are prepared for each RIN and are presented in Appendix E.

The laboratory prepares an analytical package for each RIN that includes a summary of results, a complete set of supporting analytical data for every analysis reported, and an electronic data deliverable that is used to upload analytical data into databases for validation and qualification before the data are released. Every RIN received from the laboratory is thoroughly reviewed and evaluated before the data package is finalized and released to the public. Table 16 lists the RINs associated with this report.

Table 16. RINs for Mound Site Calendar Year 2018 Sampling

RIN	Area	Sampling Date(s)
MND01-01.1801001	Parcels 6, 7, and 8	January 29–February 1, 2018
MND01-01.1802002		February 5–8, 2018
MND01-01.1804003		April 23–25, 2018
MND01-01.1807004		July 30–August 2, 2018
MND01-01.1810005		October 29–30, 2018
MND01-02.1801001	Phase I	January 29–30, 2018
MND01-02.1807002		July 30–31, 2018
MND01-02.1808003		August 9, 2018

The Data Assessment Reports also summarize and assess the sampling quality control for each sampling event. The following items are included:

- Sampling protocol
- Trip blanks
- Outliers
- Equipment blanks
- Field duplicates

7.0 References

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DOE (U.S. Department of Energy), 1995. *Operable Unit 1 Record of Decision*, *Mound Plant, Miamisburg, Ohio*, June.

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DOE (U.S. Department of Energy), 1999. *Work Plan for Environmental Restoration of the DOE Mound Site, The Mound 2000 Approach*, February.

DOE (U.S. Department of Energy), 2014a. *Sitewide Groundwater Monitoring Report, Calendar Year 2012*, *Mound, Ohio*, LMS/MND/S10184, Office of Legacy Management, February.

DOE (U.S. Department of Energy), 2014b. *Sitewide Groundwater Monitoring Report, Mound, Ohio, Site, Calendar Year 2013*, LMS/MND/S11737, Office of Legacy Management, May.

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DOE (U.S. Department of Energy), 2017. *Sitewide Groundwater Monitoring Report, Mound, Ohio, Site, Calendar Year 2016*, LMS/MND/S15892, Office of Legacy Management, June.

Mound Methods Compendium, Issue 2, MD-80045, prepared by BWXT of Ohio Inc.

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Appendix A

Well Construction Summary

Table A-1. Well Construction Summary

Location ID	Program	Northing	Easting	Ground Elevation (ft MSL)	TOC Elevation (ft MSL)	Well Depth (ft)	Top of Screen Elevation (ft MSL)	Bottom of Screen Elevation (ft MSL)	Screen Length (ft)	Well Material	Screened Formation
0118	Parcels 6, 7, 8	600464.95	1464737.80	705.36	704.86	40.1	674.73	664.73	10	4-inch SS	BVA
0124	Parcels 6, 7, 8	597789.14	1463654.10	704.18	705.12	55.9	659.18	649.18	10	4-inch SS	BVA
0126	Parcels 6, 7, 8	597603.58	1463643.30	704.61	705.54	54.8	660.78	650.78	10	4-inch SS	BVA
0138	Parcels 6, 7, 8	600124.02	1464263.30	698.59	697.76	40.2	667.59	657.59	10	4-inch SS	BVA
0315	Phase I	597786.28	1464020.40	722.57	723.99	54.8	679.17	669.17	10	4-inch SS	BVA
0346	Parcels 6, 7, 8	598070.11	1465048.90	743.50	742.97	45.5	702.50	697.50	5	4-inch SS	BVA
0347	Parcels 6, 7, 8	597819.31	1464034.10	723.76	725.20	68.4	666.76	656.76	10	4-inch SS	BVA
0353	Phase I	596686.11	1464609.40	744.04	745.33	19.3	731.04	726.04	5	4-inch SS	Bedrock
0379	Parcels 6, 7, 8	597624.41	1464095.90	715.24	716.11	40.9	685.24	675.24	10	4-inch SS	BVA
0386	Parcels 6, 7, 8	597789.23	1463896.00	725.16	724.79	86.6	648.16	638.16	10	4-inch SS	BVA
0387	Parcels 6, 7, 8	597654.63	1463839.50	721.26	720.89	81.6	644.26	639.26	5	4-inch SS	BVA
0389	Parcels 6, 7, 8	597781.29	1463891.90	724.96	724.65	51.7	682.96	672.96	10	4-inch SS	BVA
0392	Parcels 6, 7, 8	597648.77	1463838.30	721.18	720.84	44.7	681.18	676.18	5	4-inch SS	BVA
0411	Phase I	596808.81	1465077.10	834.83	836.57	39.7	806.89	796.89	10	2-inch SS	Bedrock
0443	Phase I	596886.22	1465177.11	856.89	858.78	39.6	829.20	819.20	10	2-inch PVC	Bedrock
0444	Phase I	596463.35	1465001.58	770.71	773.00	32.8	750.20	740.20	10	2-inch PVC	Bedrock
0445	Phase I	596448.12	1464738.54	741.29	743.43	42.5	710.93	700.93	10	2-inch PVC	Bedrock
P064	Phase I	596106.72	1464537.47	726.82	729.98	56.9	680.08	670.08	10	2-inch PVC	BVA
0601	Parcels 6, 7, 8	598743.22	1464280.80	817.52						Seep	Bedrock
0602	Parcels 6, 7, 8	598346.65	1465311.40	779.61						Seep	Bedrock
0605	Parcels 6, 7, 8	599824.63	1464935.40	817.70						Seep	Bedrock
0606	Parcels 6, 7, 8	599971.45	1464989.00	789.23						Seep	Bedrock
0607	Parcels 6, 7, 8	600015.30	1465105.70	797.00						Seep	Bedrock
0617	Phase I	596539.80	1464855.80	766.07						Seep	Bedrock

Abbreviations:
ft MSL = feet above mean sea level; PVC = polyvinyl chloride; SS = stainless steel; TOC = top of casing

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Appendix B

Mann-Kendall Trending Summaries

Mann-Kendall Test for Monotonic Trend
(from Battelle Memorial Institute, 2018)

The purpose of the Mann-Kendall (MK) test (Mann 1945, Kendall 1975, Gilbert 1987) is to statistically assess if there is a monotonic upward or downward trend of the variable of interest over time. A monotonic upward (downward) trend means that the variable consistently increases (decreases) through time, but the trend may or may not be linear.

Selected Statistical Testing Approach

The MK test can be used in place of a parametric linear regression analysis that is used to test if the slope of the estimated linear regression line is different from zero. The regression analysis requires that the residuals from the fitted regression line be normally distributed, an assumption not required by the MK test. Hence, the MK test is a nonparametric (distribution-free) test.

Calculations to Determine Whether a Trend Exists

The MK test is used to decide whether to reject the null hypothesis (H_o) that no monotonic trend exists in favor of the alternative hypothesis (H_a) that a monotonic trend exists.

One of three alternative hypotheses is chosen:

1. A monotonic downward trend exists.
2. Either a monotonic upward or monotonic downward trend exists.
3. A monotonic upward trend exists.

The data obtained over time must be convincing beyond a reasonable doubt before the MK test will reject the H_o and accept the H_a hypothesis.

The MK test is conducted as follows (from Gilbert 1987, pp. 209–213):

1. List the data in the order in which they were collected over time, x_1, x_2,.x_n, which denote the measurements obtained at times 1, 2, …, n, respectively. The data are not necessarily (and need not be) collected at equally spaced time intervals, although equally spaced sampling over time is often preferred.

2. Determine the sign of all $n(n - 1)/2$ possible differences $x_j - x_k$, where $j > k$. These differences are

   $x_2 - x_1, x_3 - x_1, x_n - x_1, x_3 - x_2, x_4 - x_2, x_n - x_{n-2}, x_n - x_{n-1}$

3. Let $\mathrm{sgn}(x_j - x_k)$ be an indicator function that takes on the values 1, 0, or –1 according to the sign of $x_j - x_k$, that is:

$$\mathrm{sgn}(x_j - x_k) = 1 \qquad \text{if } x_j - x_k > 0$$

$\text{sgn}(x_j - x_k) = 0 \qquad \text{if } x_j - x_k = 0,$
or if the sign of $x_j - x_k$ cannot be determined
due to nondetects

$\text{sgn}(x_j - x_k) = -1 \quad \text{if } x_j - x_k < 0$

For example, if $x_j - x_k > 0$, then the observation at time *j*, denoted by x_j, is greater than the observation at time *k*, denoted by x_k.

4. Compute

$$S = \sum_{k=1}^{n-1} \sum_{j=k+1}^{n} \mathbf{sgn}(x_j - x_k)$$

which is the number of positive differences minus the number of negative differences. If *S* is a positive number, observations obtained later in time tend to be *larger* than observations made earlier. If *S* is a negative number, then observations made later in time tend to be *smaller* than observations made earlier.

5. If $n \leq 10$, follow the procedure described in Gilbert (1987, page 209, Section 16.4.1) by looking up *S* in a table of probabilities (Gilbert 1987, Table A18, page 272). If this probability is less than α (the probability of concluding a trend exists when there is none), then reject the null hypothesis and conclude the trend exists. If *n* cannot be found in the table of probabilities (which can happen if there are tied data values), the next value farther from zero in the table is used. For example, if $S = 12$ and there is no value for $S = 12$ in the table, it is handled the same as $S = 13$.

   If $n > 10$, continue with steps 6 through 8 to determine whether a trend exists. This follows the procedure described in Gilbert (1987, page 211, Section 16.4.2).

6. Compute the variance of *S* as follows:

$$VAR(S) = \frac{1}{18}\left[n(n-1)(2n+5) - \sum_{p=1}^{g} t_p(t_p - 1)(2t_p + 5) \right]$$

where *g* is the number of tied groups and t_p is the number of observations in the *p*th group. For example, in the sequence of measurements in time (23, 24, 29, 6, 29, 24, 24, 29, 23) we have $g = 3$ tied groups, for which $t_1 = 2$ for the tied value 23, $t_2 = 3$ for the tied value 24, and $t_3 = 3$ for the tied value 29.

7. Compute the MK test statistic, Z_{MK}, as follows:

$$Z_{MK} = \frac{S-1}{\sqrt{VAR(S)}} \quad \text{if} \quad S > 0$$

$$Z_{MK} = 0 \quad \text{if} \quad S = 0$$

$$Z_{MK} = \frac{S+1}{\sqrt{VAR(S)}} \quad \text{if} \quad S < 0$$

A positive value of Z_{MK} indicates that the data tend to increase with time; a negative value of Z_{MK} indicates that the data tend to decrease with time.

8. Finally, the hypothesis is tested. H_o is rejected and H_a is accepted if $Z_{MK} \leq -Z_{1-\alpha}$ where:
   - H_o (null hypothesis): no monotonic trend exists
   - H_a (alternative hypothesis): a downward monotonic trend exists

   Alpha (α) is the Type I error rate, which is the user-specified small probability that can be tolerated that the MK test will falsely reject the null hypothesis (i.e., will conclude a trend exists when there is none)

   $Z_{1-\alpha}$ is the $100(1 - \alpha)^{th}$ percentile of the standard normal distribution. For example, if $\alpha = 0.05$, then $Z_{1-\alpha} = 1.64485$. Values of $Z_{1-\alpha}$ are provided in many statistics books (for example, Gilbert 1987, Table A1, page 254) and statistical software packages.

   The following parameters were used:

alpha (α)	0.05 (5%)
beta (β)	0.1 (10%)
standard deviation of residuals from trend line	3%

Assumptions

The following assumptions underlie the MK test:

1. When no trend is present, the measurements (observations or data) obtained over time are independent and identically distributed. The assumption of independence means that the observations are not serially correlated over time.
2. The observations obtained over time are representative of the true conditions at sampling times.
3. The sample collection, handling, and measurement methods provide unbiased and representative observations of the underlying populations over time.

The MK test does not require that the measurements or the residuals about a trend line be normally distributed or that the trend, if present, be linear.

The MK test can be computed if there are missing values (no measurements for some sampling times), but the performance of the test will be adversely affected. The assumption of independence requires that the time between samples be sufficiently long so that there is no correlation between measurements collected at different times.

References

Battelle Memorial Institute, 2018. Visual Sampling Plan Users Guide.

Cleveland, W.S., 1979. “Robust Locally Weighted Regression and Smoothing Scatterplots,” *Journal of the American Statistical Association* 74(368):829–836.

Gilbert, R.O., 1987. *Statistical Methods for Environmental Pollution Monitoring,* Wiley & Sons, New York.

Hirsch, R.M., J.R. Slack, and R.A. Smith, 1982. “Techniques of trend analysis for monthly water quality data,” *Water Resources Research* 18(1):107–121.

Kendall, M.G., 1975. *Rank Correlation Methods*, 4th ed., Charles Griffin, London.

Mann, H.B., 1945. “Non-parametric tests against trend,” *Econometrica* 13:163–171.

	A	B	C	D	E	F	G	H	I	J	K	L
1				**Mann-Kendall Trend Test Analysis**								
2	User Selected Options			Well 0138 Tritium								
3	Date/Time of Computation			ProUCL 5.12/1/2019 9:02:20 AM								
4	From File			WorkSheet.xls								
5	Full Precision			OFF								
6	Confidence Coefficient			0.95								
7	Level of Significance			0.05								
8												
9	C1											
10												
11	**General Statistics**											
12	Number or Reported Events Not Used				0							
13	Number of Generated Events				45							
14	Number Values Reported (n)				45							
15	Minimum				250							
16	Maximum				14630							
17	Mean				3639							
18	Geometric Mean				1838							
19	Median				1570							
20	Standard Deviation				4289							
21	Coefficient of Variation				1.179							
22												
23	**Mann-Kendall Test**											
24	M-K Test Value (S)				-746							
25	Critical Value (0.05)				-1.645							
26	Standard Deviation of S				102.2							
27	Standardized Value of S				-7.289							
28	Approximate p-value				1.567E-13							
29												
30	**Statistically significant evidence of a decreasing**											
31	**trend at the specified level of significance.**											

	A	B	C	D	E	F	G	H	I	J	K	L
1				**Mann-Kendall Trend Test Analysis**								
2	User Selected Options			Well 0315 TCE (since 2005)								
3	Date/Time of Computation			ProUCL 5.11/31/2019 5:30:13 PM								
4	From File			WorkSheet.xls								
5	Full Precision			OFF								
6	Confidence Coefficient			0.95								
7	Level of Significance			0.05								
8												
9	**C1**											
10												
11	**General Statistics**											
12	Number or Reported Events Not Used				0							
13	Number of Generated Events				55							
14	Number Values Reported (n)				55							
15	Minimum				3.5							
16	Maximum				17.2							
17	Mean				9.459							
18	Geometric Mean				8.736							
19	Median				9.65							
20	Standard Deviation				3.563							
21	Coefficient of Variation				0.377							
22												
23	**Mann-Kendall Test**											
24	M-K Test Value (S)				-546							
25	Critical Value (0.05)				-1.645							
26	Standard Deviation of S				137.7							
27	Standardized Value of S				-3.957							
28	Approximate p-value				3.7986E-5							
29												
30	**Statistically significant evidence of a decreasing**											
31	**trend at the specified level of significance.**											

	A	B	C	D	E	F	G	H	I	J	K	L
1				**Mann-Kendall Trend Test Analysis**								
2	User Selected Options			Well 0315 TCE (since 2012)								
3	Date/Time of Computation			ProUCL 5.12/1/2019 8:36:09 AM								
4	From File			WorkSheet.xls								
5	Full Precision			OFF								
6	Confidence Coefficient			0.95								
7	Level of Significance			0.05								
8												
9	**C1**											
10												
11	**General Statistics**											
12	Number or Reported Events Not Used				0							
13	Number of Generated Events				28							
14	Number Values Reported (n)				28							
15	Minimum				3.5							
16	Maximum				16.6							
17	Mean				8.079							
18	Geometric Mean				7.437							
19	Median				7.38							
20	Standard Deviation				3.307							
21	Coefficient of Variation				0.409							
22												
23	**Mann-Kendall Test**											
24	M-K Test Value (S)				-234							
25	Critical Value (0.05)				-1.645							
26	Standard Deviation of S				50.62							
27	Standardized Value of S				-4.603							
28	Approximate p-value				2.0796E-6							
29												
30	**Statistically significant evidence of a decreasing**											
31	**trend at the specified level of significance.**											

	A	B	C	D	E	F	G	H	I	J	K	L
1				**Mann-Kendall Trend Test Analysis**								
2	User Selected Options			Well 0346 Tritium								
3	Date/Time of Computation			ProUCL 5.12/1/2019 9:04:37 AM								
4	From File			WorkSheet.xls								
5	Full Precision			OFF								
6	Confidence Coefficient			0.95								
7	Level of Significance			0.05								
8												
9	**C1**											
10												
11	**General Statistics**											
12	Number or Reported Events Not Used				0							
13	Number of Generated Events				45							
14	Number Values Reported (n)				45							
15	Minimum				18.6							
16	Maximum				14900							
17	Mean				2098							
18	Geometric Mean				1221							
19	Median				1730							
20	Standard Deviation				2484							
21	Coefficient of Variation				1.184							
22												
23	**Mann-Kendall Test**											
24	M-K Test Value (S)				-793							
25	Critical Value (0.05)				-1.645							
26	Standard Deviation of S				102.2							
27	Standardized Value of S				-7.749							
28	Approximate p-value				4.633E-15							
29												
30	**Statistically significant evidence of a decreasing**											
31	**trend at the specified level of significance.**											

1		**Mann-Kendall Trend Test Analysis**
2	User Selected Options	Well 0347 TCE (since 2005)
3	Date/Time of Computation	ProUCL 5.11/31/2019 5:37:43 PM
4	From File	WorkSheet.xls
5	Full Precision	OFF
6	Confidence Coefficient	0.95
7	Level of Significance	0.05
8		
9	**C1**	
10		
11	**General Statistics**	
12	Number or Reported Events Not Used	0
13	Number of Generated Events	52
14	Number Values Reported (n)	52
15	Minimum	0.431
16	Maximum	33.2
17	Mean	22.11
18	Geometric Mean	20.39
19	Median	22.6
20	Standard Deviation	5.673
21	Coefficient of Variation	0.257
22		
23	**Mann-Kendall Test**	
24	M-K Test Value (S)	-238
25	Critical Value (0.05)	-1.645
26	Standard Deviation of S	126.7
27	Standardized Value of S	-1.871
28	Approximate p-value	0.0307
29		
30	**Statistically significant evidence of a decreasing**	
31	**trend at the specified level of significance.**	

	A	B	C	D	E	F	G	H	I	J	K	L
1				**Mann-Kendall Trend Test Analysis**								
2	User Selected Options			Well 0347 TCE (since 2012)								
3	Date/Time of Computation			ProUCL 5.12/1/2019 8:40:03 AM								
4	From File			WorkSheet.xls								
5	Full Precision			OFF								
6	Confidence Coefficient			0.95								
7	Level of Significance			0.05								
8												
9	C1											
10												
11	**General Statistics**											
12	Number or Reported Events Not Used				0							
13	Number of Generated Events				30							
14	Number Values Reported (n)				30							
15	Minimum				11.7							
16	Maximum				31.2							
17	Mean				21.65							
18	Geometric Mean				21.18							
19	Median				21.55							
20	Standard Deviation				4.445							
21	Coefficient of Variation				0.205							
22												
23	**Mann-Kendall Test**											
24	M-K Test Value (S)				-177							
25	Critical Value (0.05)				-1.645							
26	Standard Deviation of S				56.03							
27	Standardized Value of S				-3.141							
28	Approximate p-value				8.4180E-4							
29												
30	**Statistically significant evidence of a decreasing**											
31	**trend at the specified level of significance.**											

	Label	Value
1		**Mann-Kendall Trend Test Analysis**
2	User Selected Options	Well 0347 Tritium
3	Date/Time of Computation	ProUCL 5.12/1/2019 9:05:53 AM
4	From File	WorkSheet.xls
5	Full Precision	OFF
6	Confidence Coefficient	0.95
7	Level of Significance	0.05
8		
9	**C1**	
10		
11	**General Statistics**	
12	Number or Reported Events Not Used	0
13	Number of Generated Events	44
14	Number Values Reported (n)	44
15	Minimum	157
16	Maximum	16800
17	Mean	5182
18	Geometric Mean	3600
19	Median	4125
20	Standard Deviation	4273
21	Coefficient of Variation	0.825
22		
23	**Mann-Kendall Test**	
24	M-K Test Value (S)	-522
25	Critical Value (0.05)	-1.645
26	Standard Deviation of S	98.87
27	Standardized Value of S	-5.27
28	Approximate p-value	6.8387E-8
29		
30	**Statistically significant evidence of a decreasing**	
31	**trend at the specified level of significance.**	

1		**Mann-Kendall Trend Test Analysis**
2	User Selected Options	Well 0379 Tritium
3	Date/Time of Computation	ProUCL 5.12/1/2019 9:07:18 AM
4	From File	WorkSheet.xls
5	Full Precision	OFF
6	Confidence Coefficient	0.95
7	Level of Significance	0.05
8		
9	**C1**	
10		
11	**General Statistics**	
12	Number or Reported Events Not Used	0
13	Number of Generated Events	38
14	Number Values Reported (n)	38
15	Minimum	479
16	Maximum	3890
17	Mean	1442
18	Geometric Mean	1324
19	Median	1515
20	Standard Deviation	605.2
21	Coefficient of Variation	0.42
22		
23	**Mann-Kendall Test**	
24	M-K Test Value (S)	-420
25	Critical Value (0.05)	-1.645
26	Standard Deviation of S	79.51
27	Standardized Value of S	-5.27
28	Approximate p-value	6.8319E-8
29		
30	**Statistically significant evidence of a decreasing**	
31	**trend at the specified level of significance.**	

	A	B	C	D	E	F	G	H	I	J	K	L
1				**Mann-Kendall Trend Test Analysis**								
2	User Selected Options			Well 0386 TCE (since 2005)								
3	Date/Time of Computation			ProUCL 5.11/31/2019 5:35:08 PM								
4	From File			WorkSheet.xls								
5	Full Precision			OFF								
6	Confidence Coefficient			0.95								
7	Level of Significance			0.05								
8												
9	C1											
10												
11	**General Statistics**											
12	Number or Reported Events Not Used				0							
13	Number of Generated Events				47							
14	Number Values Reported (n)				47							
15	Minimum				0.11							
16	Maximum				3.96							
17	Mean				2.15							
18	Geometric Mean				1.727							
19	Median				2.35							
20	Standard Deviation				0.893							
21	Coefficient of Variation				0.415							
22												
23	**Mann-Kendall Test**											
24	M-K Test Value (S)				46							
25	Critical Value (0.05)				1.645							
26	Standard Deviation of S				109							
27	Standardized Value of S				0.413							
28	Approximate p-value				0.34							
29												
30	**Insufficient evidence to identify a significant**											
31	**trend at the specified level of significance.**											

	A	B	C	D	E	F	G	H	I	J	K	L
1				**Mann-Kendall Trend Test Analysis**								
2	User Selected Options			Well 0386 TCE (since 2012)								
3	Date/Time of Computation			ProUCL 5.12/1/2019 8:41:59 AM								
4	From File			WorkSheet.xls								
5	Full Precision			OFF								
6	Confidence Coefficient			0.95								
7	Level of Significance			0.05								
8												
9	C1											
10												
11	**General Statistics**											
12	Number or Reported Events Not Used				0							
13	Number of Generated Events				28							
14	Number Values Reported (n)				28							
15	Minimum				0.97							
16	Maximum				3.04							
17	Mean				2.383							
18	Geometric Mean				2.332							
19	Median				2.4							
20	Standard Deviation				0.448							
21	Coefficient of Variation				0.188							
22												
23	**Mann-Kendall Test**											
24	M-K Test Value (S)				-65							
25	Critical Value (0.05)				-1.645							
26	Standard Deviation of S				50.54							
27	Standardized Value of S				-1.266							
28	Approximate p-value				0.103							
29												
30	**Insufficient evidence to identify a significant**											
31	**trend at the specified level of significance.**											

	Mann-Kendall Trend Test Analysis
User Selected Options	Well 0389 TCE (since 2005)
Date/Time of Computation	ProUCL 5.11/31/2019 5:40:13 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number or Reported Events Not Used	0
Number of Generated Events	47
Number Values Reported (n)	47
Minimum	0.16
Maximum	1.48
Mean	0.53
Geometric Mean	0.406
Median	0.408
Standard Deviation	0.383
Coefficient of Variation	0.722

Mann-Kendall Test	
M-K Test Value (S)	-433
Critical Value (0.05)	-1.645
Standard Deviation of S	108.1
Standardized Value of S	-3.998
Approximate p-value	3.1955E-5

Statistically significant evidence of a decreasing trend at the specified level of significance.

	A–C	D–E
1		**Mann-Kendall Trend Test Analysis**
2	User Selected Options	Well 0389 TCE (since 2012)
3	Date/Time of Computation	ProUCL 5.12/1/2019 8:44:27 AM
4	From File	WorkSheet.xls
5	Full Precision	OFF
6	Confidence Coefficient	0.95
7	Level of Significance	0.05
8		
9	**C1**	
10		
11	**General Statistics**	
12	Number or Reported Events Not Used	0
13	Number of Generated Events	28
14	Number Values Reported (n)	28
15	Minimum	0.16
16	Maximum	0.9
17	Mean	0.344
18	Geometric Mean	0.281
19	Median	0.21
20	Standard Deviation	0.235
21	Coefficient of Variation	0.683
22		
23	**Mann-Kendall Test**	
24	M-K Test Value (S)	-38
25	Critical Value (0.05)	-1.645
26	Standard Deviation of S	48.47
27	Standardized Value of S	-0.763
28	Approximate p-value	0.223
29		
30	**Insufficient evidence to identify a significant**	
31	**trend at the specified level of significance.**	

	A–C	D–L
1		**Mann-Kendall Trend Test Analysis**
2	User Selected Options	Well 0411 cis-1,2-DCE
3	Date/Time of Computation	ProUCL 5.11/30/2019 3:56:35 PM
4	From File	WorkSheet.xls
5	Full Precision	OFF
6	Confidence Coefficient	0.95
7	Level of Significance	0.05
8		
9	C1	
10		
11	**General Statistics**	
12	Number or Reported Events Not Used	0
13	Number of Generated Events	58
14	Number Values Reported (n)	58
15	Minimum	0.65
16	Maximum	4.8
17	Mean	2.206
18	Geometric Mean	2.025
19	Median	2.055
20	Standard Deviation	0.915
21	Coefficient of Variation	0.415
22		
23	**Mann-Kendall Test**	
24	M-K Test Value (S)	-35
25	Critical Value (0.05)	-1.645
26	Standard Deviation of S	149
27	Standardized Value of S	-0.228
28	Approximate p-value	0.41
29		
30	**Insufficient evidence to identify a significant**	
31	**trend at the specified level of significance.**	

	A	B	C	D	E	F	G	H	I	J	K	L
1				**Mann-Kendall Trend Test Analysis**								
2	User Selected Options			Well 0411 TCE								
3	Date/Time of Computation			ProUCL 5.11/30/2019 3:45:52 PM								
4	From File			WorkSheet.xls								
5	Full Precision			OFF								
6	Confidence Coefficient			0.95								
7	Level of Significance			0.05								
8												
9	**C1**											
10												
11	**General Statistics**											
12	Number or Reported Events Not Used				0							
13	Number of Generated Events				55							
14	Number Values Reported (n)				55							
15	Minimum				8.4							
16	Maximum				22							
17	Mean				12.16							
18	Geometric Mean				11.93							
19	Median				12							
20	Standard Deviation				2.557							
21	Coefficient of Variation				0.21							
22												
23	**Mann-Kendall Test**											
24	M-K Test Value (S)				-432							
25	Critical Value (0.05)				-1.645							
26	Standard Deviation of S				137.5							
27	Standardized Value of S				-3.134							
28	Approximate p-value				8.6152E-4							
29												
30	**Statistically significant evidence of a decreasing**											
31	**trend at the specified level of significance.**											

	A	B	C	D	E	F	G	H	I	J	K	L
1				**Mann-Kendall Trend Test Analysis**								
2	User Selected Options			0443 cis-1,2-DCE								
3	Date/Time of Computation			ProUCL 5.11/30/2019 3:53:20 PM								
4	From File			WorkSheet.xls								
5	Full Precision			OFF								
6	Confidence Coefficient			0.95								
7	Level of Significance			0.05								
8												
9	C1											
10												
11	**General Statistics**											
12	Number or Reported Events Not Used				0							
13	Number of Generated Events				43							
14	Number Values Reported (n)				43							
15	Minimum				0.22							
16	Maximum				5							
17	Mean				0.801							
18	Geometric Mean				0.639							
19	Median				0.75							
20	Standard Deviation				0.747							
21	Coefficient of Variation				0.933							
22												
23	**Mann-Kendall Test**											
24	M-K Test Value (S)				-447							
25	Critical Value (0.05)				-1.645							
26	Standard Deviation of S				94.67							
27	Standardized Value of S				-4.711							
28	Approximate p-value				1.2318E-6							
29												
30	**Statistically significant evidence of a decreasing**											
31	**trend at the specified level of significance.**											

1		**Mann-Kendall Trend Test Analysis**
2	User Selected Options	Well 0443 TCE
3	Date/Time of Computation	ProUCL 5.11/30/2019 3:50:01 PM
4	From File	WorkSheet.xls
5	Full Precision	OFF
6	Confidence Coefficient	0.95
7	Level of Significance	0.05
8		
9	**C1**	
10		
11	**General Statistics**	
12	Number or Reported Events Not Used	0
13	Number of Generated Events	44
14	Number Values Reported (n)	44
15	Minimum	2.2
16	Maximum	14
17	Mean	7.492
18	Geometric Mean	6.928
19	Median	7.26
20	Standard Deviation	2.816
21	Coefficient of Variation	0.376
22		
23	**Mann-Kendall Test**	
24	M-K Test Value (S)	68
25	Critical Value (0.05)	1.645
26	Standard Deviation of S	98.85
27	Standardized Value of S	0.678
28	Approximate p-value	0.249
29		
30	**Insufficient evidence to identify a significant**	
31	**trend at the specified level of significance.**	

	A	B	C	D	E	F	G	H	I	J	K	L
1				**Mann-Kendall Trend Test Analysis**								
2	User Selected Options			Seep 0601 PCE								
3	Date/Time of Computation			ProUCL 5.11/31/2019 6:03:42 PM								
4	From File			WorkSheet.xls								
5	Full Precision			OFF								
6	Confidence Coefficient			0.95								
7	Level of Significance			0.05								
8												
9	C1											
10												
11	**General Statistics**											
12	Number or Reported Events Not Used				0							
13	Number of Generated Events				57							
14	Number Values Reported (n)				57							
15	Minimum				0.1							
16	Maximum				52							
17	Mean				11.97							
18	Geometric Mean				8.078							
19	Median				11							
20	Standard Deviation				8.657							
21	Coefficient of Variation				0.723							
22												
23	**Mann-Kendall Test**											
24	M-K Test Value (S)				-389							
25	Critical Value (0.05)				-1.645							
26	Standard Deviation of S				145.2							
27	Standardized Value of S				-2.671							
28	Approximate p-value				0.00378							
29												
30	**Statistically significant evidence of a decreasing**											
31	**trend at the specified level of significance.**											

	A	B	C	D	E	F	G	H	I	J	K	L
1				**Mann-Kendall Trend Test Analysis**								
2	User Selected Options			Seep 0601 TCE (since 2005)								
3	Date/Time of Computation			ProUCL 5.11/31/2019 5:14:28 PM								
4	From File			WorkSheet.xls								
5	Full Precision			OFF								
6	Confidence Coefficient			0.95								
7	Level of Significance			0.05								
8												
9	C1											
10												
11	**General Statistics**											
12	Number or Reported Events Not Used				0							
13	Number of Generated Events				56							
14	Number Values Reported (n)				56							
15	Minimum				0.11							
16	Maximum				10.3							
17	Mean				4.931							
18	Geometric Mean				3.893							
19	Median				5.165							
20	Standard Deviation				2.23							
21	Coefficient of Variation				0.452							
22												
23	**Mann-Kendall Test**											
24	M-K Test Value (S)				-15							
25	Critical Value (0.05)				-1.645							
26	Standard Deviation of S				141.5							
27	Standardized Value of S				-0.099							
28	Approximate p-value				0.461							
29												
30	**Insufficient evidence to identify a significant**											
31	**trend at the specified level of significance.**											

	A	B	C	D	E	F	G	H	I	J	K	L
1				**Mann-Kendall Trend Test Analysis**								
2	User Selected Options			Seep 0601 TCE (since 2012)								
3	Date/Time of Computation			ProUCL 5.12/1/2019 8:26:10 AM								
4	From File			WorkSheet.xls								
5	Full Precision			OFF								
6	Confidence Coefficient			0.95								
7	Level of Significance			0.05								
8												
9	C1											
10												
11	**General Statistics**											
12	Number or Reported Events Not Used				0							
13	Number of Generated Events				28							
14	Number Values Reported (n)				28							
15	Minimum				0.16							
16	Maximum				10.3							
17	Mean				4.843							
18	Geometric Mean				3.469							
19	Median				5.69							
20	Standard Deviation				2.715							
21	Coefficient of Variation				0.561							
22												
23	**Mann-Kendall Test**											
24	M-K Test Value (S)				-40							
25	Critical Value (0.05)				-1.645							
26	Standard Deviation of S				50.6							
27	Standardized Value of S				-0.771							
28	Approximate p-value				0.22							
29												
30	**Insufficient evidence to identify a significant**											
31	**trend at the specified level of significance.**											

	A–C	D–E
1		**Mann-Kendall Trend Test Analysis**
2	User Selected Options	Seep 0601 Tritium
3	Date/Time of Computation	ProUCL 5.12/1/2019 8:55:05 AM
4	From File	WorkSheet.xls
5	Full Precision	OFF
6	Confidence Coefficient	0.95
7	Level of Significance	0.05
8		
9	**C1**	
10		
11	**General Statistics**	
12	Number or Reported Events Not Used	0
13	Number of Generated Events	44
14	Number Values Reported (n)	44
15	Minimum	89.3
16	Maximum	789040
17	Mean	116197
18	Geometric Mean	56359
19	Median	57600
20	Standard Deviation	160703
21	Coefficient of Variation	1.383
22		
23	**Mann-Kendall Test**	
24	M-K Test Value (S)	-689
25	Critical Value (0.05)	-1.645
26	Standard Deviation of S	98.87
27	Standardized Value of S	-6.959
28	Approximate p-value	1.714E-12
29		
30	**Statistically significant evidence of a decreasing**	
31	**trend at the specified level of significance.**	

	Mann-Kendall Trend Test Analysis
User Selected Options	Seep 0602 cis-1,2-DCE
Date/Time of Computation	ProUCL 5.11/31/2019 6:01:47 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics

Number or Reported Events Not Used	0
Number of Generated Events	39
Number Values Reported (n)	39
Minimum	1.95
Maximum	42.3
Mean	15.87
Geometric Mean	12.74
Median	15.2
Standard Deviation	9.903
Coefficient of Variation	0.624

Mann-Kendall Test

M-K Test Value (S)	-286
Critical Value (0.05)	-1.645
Standard Deviation of S	82.63
Standardized Value of S	-3.449
Approximate p-value	2.8129E-4

Statistically significant evidence of a decreasing trend at the specified level of significance.

	A	B	C	D	E	F	G	H	I	J	K	L
1				**Mann-Kendall Trend Test Analysis**								
2	User Selected Options			Seep 0602 TCE (since 2005)								
3	Date/Time of Computation			ProUCL 5.11/31/2019 5:18:17 PM								
4	From File			WorkSheet.xls								
5	Full Precision			OFF								
6	Confidence Coefficient			0.95								
7	Level of Significance			0.05								
8												
9	**C1**											
10												
11	**General Statistics**											
12	Number or Reported Events Not Used				0							
13	Number of Generated Events				35							
14	Number Values Reported (n)				35							
15	Minimum				0.46							
16	Maximum				139							
17	Mean				28.94							
18	Geometric Mean				18.59							
19	Median				22.2							
20	Standard Deviation				27.14							
21	Coefficient of Variation				0.938							
22												
23	**Mann-Kendall Test**											
24	M-K Test Value (S)				-324							
25	Critical Value (0.05)				-1.645							
26	Standard Deviation of S				70.41							
27	Standardized Value of S				-4.588							
28	Approximate p-value				2.2427E-6							
29												
30	**Statistically significant evidence of a decreasing**											
31	**trend at the specified level of significance.**											

	A	B	C	D	E	F	G	H	I	J	K	L
1				**Mann-Kendall Trend Test Analysis**								
2	User Selected Options			Seep 0602 TCE (since 2012)								
3	Date/Time of Computation			ProUCL 5.12/1/2019 8:27:44 AM								
4	From File			WorkSheet.xls								
5	Full Precision			OFF								
6	Confidence Coefficient			0.95								
7	Level of Significance			0.05								
8												
9	C1											
10												
11	**General Statistics**											
12	Number or Reported Events Not Used				0							
13	Number of Generated Events				18							
14	Number Values Reported (n)				18							
15	Minimum				0.46							
16	Maximum				32.6							
17	Mean				13.2							
18	Geometric Mean				9.393							
19	Median				12.65							
20	Standard Deviation				8.922							
21	Coefficient of Variation				0.676							
22												
23	**Mann-Kendall Test**											
24	M-K Test Value (S)				-96							
25	Tabulated p-value				0							
26	Standard Deviation of S				26.38							
27	Standardized Value of S				-3.601							
28	Approximate p-value				1.5852E-4							
29												
30	**Statistically significant evidence of a decreasing**											
31	**trend at the specified level of significance.**											

	A	B	C	D	E	F	G	H	I	J	K	L
1				**Mann-Kendall Trend Test Analysis**								
2	User Selected Options			Seep 0602 Tritium								
3	Date/Time of Computation			ProUCL 5.12/1/2019 8:56:26 AM								
4	From File			WorkSheet.xls								
5	Full Precision			OFF								
6	Confidence Coefficient			0.95								
7	Level of Significance			0.05								
8												
9	**C1**											
10												
11	**General Statistics**											
12	Number or Reported Events Not Used				0							
13	Number of Generated Events				27							
14	Number Values Reported (n)				27							
15	Minimum				1490							
16	Maximum				82700							
17	Mean				19133							
18	Geometric Mean				13350							
19	Median				14500							
20	Standard Deviation				17673							
21	Coefficient of Variation				0.924							
22												
23	**Mann-Kendall Test**											
24	M-K Test Value (S)				-253							
25	Critical Value (0.05)				-1.645							
26	Standard Deviation of S				47.97							
27	Standardized Value of S				-5.253							
28	Approximate p-value				7.4650E-8							
29												
30	**Statistically significant evidence of a decreasing**											
31	**trend at the specified level of significance.**											

1		**Mann-Kendall Trend Test Analysis**
2	User Selected Options	Seep 0605 cis-1,2-DCE
3	Date/Time of Computation	ProUCL 5.11/31/2019 6:05:27 PM
4	From File	WorkSheet.xls
5	Full Precision	OFF
6	Confidence Coefficient	0.95
7	Level of Significance	0.05
8		
9	C1	
10		
11	**General Statistics**	
12	Number or Reported Events Not Used	0
13	Number of Generated Events	49
14	Number Values Reported (n)	49
15	Minimum	0.16
16	Maximum	32.2
17	Mean	5.26
18	Geometric Mean	3.194
19	Median	2.9
20	Standard Deviation	6.694
21	Coefficient of Variation	1.273
22		
23	**Mann-Kendall Test**	
24	M-K Test Value (S)	-631
25	Critical Value (0.05)	-1.645
26	Standard Deviation of S	116
27	Standardized Value of S	-5.431
28	Approximate p-value	2.8067E-8
29		
30	**Statistically significant evidence of a decreasing**	
31	**trend at the specified level of significance.**	

	A	B	C	D	E	F	G	H	I	J	K	L
1				**Mann-Kendall Trend Test Analysis**								
2	User Selected Options			Seep 0605 TCE (since 2005)								
3	Date/Time of Computation			ProUCL 5.11/31/2019 5:20:11 PM								
4	From File			WorkSheet.xls								
5	Full Precision			OFF								
6	Confidence Coefficient			0.95								
7	Level of Significance			0.05								
8												
9	C1											
10												
11	**General Statistics**											
12	Number or Reported Events Not Used				0							
13	Number of Generated Events				53							
14	Number Values Reported (n)				53							
15	Minimum				0.3							
16	Maximum				97							
17	Mean				13.78							
18	Geometric Mean				10.59							
19	Median				12.2							
20	Standard Deviation				13.01							
21	Coefficient of Variation				0.944							
22												
23	**Mann-Kendall Test**											
24	M-K Test Value (S)				-647							
25	Critical Value (0.05)				-1.645							
26	Standard Deviation of S				130.4							
27	Standardized Value of S				-4.955							
28	Approximate p-value				3.6087E-7							
29												
30	**Statistically significant evidence of a decreasing**											
31	**trend at the specified level of significance.**											

	A	B	C	D	E	F	G	H	I	J	K	L
1				**Mann-Kendall Trend Test Analysis**								
2	User Selected Options			Seep 0605 TCE (since 2012)								
3	Date/Time of Computation			ProUCL 5.12/1/2019 8:29:12 AM								
4	From File			WorkSheet.xls								
5	Full Precision			OFF								
6	Confidence Coefficient			0.95								
7	Level of Significance			0.05								
8												
9	**C1**											
10												
11	**General Statistics**											
12	Number or Reported Events Not Used				0							
13	Number of Generated Events				27							
14	Number Values Reported (n)				27							
15	Minimum				0.3							
16	Maximum				19.8							
17	Mean				9.723							
18	Geometric Mean				7.55							
19	Median				9.88							
20	Standard Deviation				4.783							
21	Coefficient of Variation				0.492							
22												
23	**Mann-Kendall Test**											
24	M-K Test Value (S)				-201							
25	Critical Value (0.05)				-1.645							
26	Standard Deviation of S				47.97							
27	Standardized Value of S				-4.169							
28	Approximate p-value				1.5271E-5							
29												
30	**Statistically significant evidence of a decreasing**											
31	**trend at the specified level of significance.**											

	Mann-Kendall Trend Test Analysis
User Selected Options	Seep 0605 Tritium
Date/Time of Computation	ProUCL 5.12/1/2019 8:57:45 AM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05
C1	
General Statistics	
Number or Reported Events Not Used	0
Number of Generated Events	42
Number Values Reported (n)	42
Minimum	2690
Maximum	269300
Mean	32502
Geometric Mean	17239
Median	15450
Standard Deviation	52936
Coefficient of Variation	1.629
Mann-Kendall Test	
M-K Test Value (S)	-695
Critical Value (0.05)	-1.645
Standard Deviation of S	92.27
Standardized Value of S	-7.521
Approximate p-value	2.715E-14

Statistically significant evidence of a decreasing trend at the specified level of significance.

	A	B	C	D	E	F	G	H	I	J	K	L
1				**Mann-Kendall Trend Test Analysis**								
2	User Selected Options			Seep 0606 TCE (since 2005)								
3	Date/Time of Computation			ProUCL 5.11/31/2019 5:22:09 PM								
4	From File			WorkSheet.xls								
5	Full Precision			OFF								
6	Confidence Coefficient			0.95								
7	Level of Significance			0.05								
8												
9	C1											
10												
11	**General Statistics**											
12	Number or Reported Events Not Used				0							
13	Number of Generated Events				37							
14	Number Values Reported (n)				37							
15	Minimum				0.15							
16	Maximum				9.01							
17	Mean				3.039							
18	Geometric Mean				1.731							
19	Median				1.88							
20	Standard Deviation				2.669							
21	Coefficient of Variation				0.878							
22												
23	**Mann-Kendall Test**											
24	M-K Test Value (S)				-179							
25	Critical Value (0.05)				-1.645							
26	Standard Deviation of S				76.4							
27	Standardized Value of S				-2.33							
28	Approximate p-value				0.0099							
29												
30	**Statistically significant evidence of a decreasing**											
31	**trend at the specified level of significance.**											

	A	B	C	D	E	F	G	H	I	J	K	L
1				**Mann-Kendall Trend Test Analysis**								
2	User Selected Options			Seep 0606 TCE (since 2012)								
3	Date/Time of Computation			ProUCL 5.12/1/2019 8:30:54 AM								
4	From File			WorkSheet.xls								
5	Full Precision			OFF								
6	Confidence Coefficient			0.95								
7	Level of Significance			0.05								
8												
9	C1											
10												
11	**General Statistics**											
12	Number or Reported Events Not Used				0							
13	Number of Generated Events				28							
14	Number Values Reported (n)				28							
15	Minimum				0.16							
16	Maximum				9.01							
17	Mean				3.017							
18	Geometric Mean				1.641							
19	Median				1.845							
20	Standard Deviation				2.749							
21	Coefficient of Variation				0.911							
22												
23	**Mann-Kendall Test**											
24	M-K Test Value (S)				-160							
25	Critical Value (0.05)				-1.645							
26	Standard Deviation of S				50.53							
27	Standardized Value of S				-3.147							
28	Approximate p-value				8.2587E-4							
29												
30	**Statistically significant evidence of a decreasing**											
31	**trend at the specified level of significance.**											

	A	B	C	D	E	F	G	H	I	J	K	L
1				**Mann-Kendall Trend Test Analysis**								
2	User Selected Options			Seep 0606 Tritium								
3	Date/Time of Computation			ProUCL 5.12/1/2019 8:59:03 AM								
4	From File			WorkSheet.xls								
5	Full Precision			OFF								
6	Confidence Coefficient			0.95								
7	Level of Significance			0.05								
8												
9	**C1**											
10												
11	**General Statistics**											
12	Number or Reported Events Not Used				0							
13	Number of Generated Events				26							
14	Number Values Reported (n)				26							
15	Minimum				1360							
16	Maximum				159930							
17	Mean				16253							
18	Geometric Mean				7307							
19	Median				5670							
20	Standard Deviation				32914							
21	Coefficient of Variation				2.025							
22												
23	**Mann-Kendall Test**											
24	M-K Test Value (S)				-240							
25	Critical Value (0.05)				-1.645							
26	Standard Deviation of S				45.36							
27	Standardized Value of S				-5.269							
28	Approximate p-value				6.8506E-8							
29												
30	**Statistically significant evidence of a decreasing**											
31	**trend at the specified level of significance.**											

	A	B	C	D	E	F	G	H	I	J	K	L
1				**Mann-Kendall Trend Test Analysis**								
2	User Selected Options			Seep 0607 TCE (since 2005)								
3	Date/Time of Computation			ProUCL 5.11/31/2019 5:24:00 PM								
4	From File			WorkSheet.xls								
5	Full Precision			OFF								
6	Confidence Coefficient			0.95								
7	Level of Significance			0.05								
8												
9	**C1**											
10												
11	**General Statistics**											
12	Number or Reported Events Not Used				0							
13	Number of Generated Events				52							
14	Number Values Reported (n)				52							
15	Minimum				0.51							
16	Maximum				13							
17	Mean				5.727							
18	Geometric Mean				4.851							
19	Median				5.085							
20	Standard Deviation				2.879							
21	Coefficient of Variation				0.503							
22												
23	**Mann-Kendall Test**											
24	M-K Test Value (S)				-401							
25	Critical Value (0.05)				-1.645							
26	Standard Deviation of S				126.7							
27	Standardized Value of S				-3.157							
28	Approximate p-value				7.9830E-4							
29												
30	**Statistically significant evidence of a decreasing**											
31	**trend at the specified level of significance.**											

	A	B	C	D	E	F	G	H	I	J	K	L
1				**Mann-Kendall Trend Test Analysis**								
2	User Selected Options			Seep 0607 TCE (since 2012)								
3	Date/Time of Computation			ProUCL 5.12/1/2019 8:32:44 AM								
4	From File			WorkSheet.xls								
5	Full Precision			OFF								
6	Confidence Coefficient			0.95								
7	Level of Significance			0.05								
8												
9	**C1**											
10												
11	**General Statistics**											
12	Number or Reported Events Not Used				0							
13	Number of Generated Events				28							
14	Number Values Reported (n)				28							
15	Minimum				0.51							
16	Maximum				9.95							
17	Mean				4.948							
18	Geometric Mean				4.033							
19	Median				4.865							
20	Standard Deviation				2.546							
21	Coefficient of Variation				0.515							
22												
23	**Mann-Kendall Test**											
24	M-K Test Value (S)				-178							
25	Critical Value (0.05)				-1.645							
26	Standard Deviation of S				50.62							
27	Standardized Value of S				-3.497							
28	Approximate p-value				2.3535E-4							
29												
30	**Statistically significant evidence of a decreasing**											
31	**trend at the specified level of significance.**											

	A	B	C	D	E	F	G	H	I	J	K	L
1				**Mann-Kendall Trend Test Analysis**								
2	User Selected Options			Seep 0607 Tritium								
3	Date/Time of Computation			ProUCL 5.12/1/2019 9:00:26 AM								
4	From File			WorkSheet.xls								
5	Full Precision			OFF								
6	Confidence Coefficient			0.95								
7	Level of Significance			0.05								
8												
9	**C1**											
10												
11	**General Statistics**											
12	Number or Reported Events Not Used				0							
13	Number of Generated Events				41							
14	Number Values Reported (n)				41							
15	Minimum				2080							
16	Maximum				133130							
17	Mean				12240							
18	Geometric Mean				6872							
19	Median				5750							
20	Standard Deviation				22595							
21	Coefficient of Variation				1.846							
22												
23	**Mann-Kendall Test**											
24	M-K Test Value (S)				-599							
25	Critical Value (0.05)				-1.645							
26	Standard Deviation of S				89.03							
27	Standardized Value of S				-6.717							
28	Approximate p-value				9.267E-12							
29												
30	**Statistically significant evidence of a decreasing**											
31	**trend at the specified level of significance.**											

1		**Mann-Kendall Trend Test Analysis**
2	User Selected Options	Seep 0617 cis-1,2-DCE
3	Date/Time of Computation	ProUCL 5.11/30/2019 4:07:03 PM
4	From File	WorkSheet.xls
5	Full Precision	OFF
6	Confidence Coefficient	0.95
7	Level of Significance	0.05
8		
9	C1	
10		
11	**General Statistics**	
12	Number or Reported Events Not Used	0
13	Number of Generated Events	43
14	Number Values Reported (n)	43
15	Minimum	0.59
16	Maximum	4.7
17	Mean	1.97
18	Geometric Mean	1.82
19	Median	2
20	Standard Deviation	0.755
21	Coefficient of Variation	0.383
22		
23	**Mann-Kendall Test**	
24	M-K Test Value (S)	-246
25	Critical Value (0.05)	-1.645
26	Standard Deviation of S	95.52
27	Standardized Value of S	-2.565
28	Approximate p-value	0.00516
29		
30	**Statistically significant evidence of a decreasing**	
31	**trend at the specified level of significance.**	

	A	B	C	D	E	F	G	H	I	J	K	L
1				**Mann-Kendall Trend Test Analysis**								
2			User Selected Options	Seep 0617 TCE								
3			Date/Time of Computation	ProUCL 5.11/30/2019 4:02:49 PM								
4			From File	WorkSheet.xls								
5			Full Precision	OFF								
6			Confidence Coefficient	0.95								
7			Level of Significance	0.05								
8												
9			C1									
10												
11			**General Statistics**									
12				Number or Reported Events Not Used	0							
13				Number of Generated Events	41							
14				Number Values Reported (n)	41							
15				Minimum	1.84							
16				Maximum	10.4							
17				Mean	7							
18				Geometric Mean	6.56							
19				Median	7.76							
20				Standard Deviation	2.189							
21				Coefficient of Variation	0.313							
22												
23			**Mann-Kendall Test**									
24				M-K Test Value (S)	-74							
25				Critical Value (0.05)	-1.645							
26				Standard Deviation of S	89.01							
27				Standardized Value of S	-0.82							
28				Approximate p-value	0.206							
29												
30	**Insufficient evidence to identify a significant**											
31	**trend at the specified level of significance.**											

Appendix C

2018 Groundwater Elevations

Table C-1. Phase I Groundwater Elevations

Well ID	Date/Time	Elevation of Top of Casing (ft AMSL)	Depth from Top of Casing (ft)	Groundwater Elevation (ft AMSL)
0353	2018-01-29 09:33:00	745.33	1.58	743.75
	2018-07-30 09:34:00		4.88	740.45
0400	2018-01-10 00:00:00	705.11	25.55	679.56
	2018-02-13 00:00:00		23.98	681.13
	2018-03-15 00:00:00		21.86	683.25
	2018-04-11 00:00:00		19.44	685.67
	2018-05-29 00:00:00		24.50	680.61
	2018-06-13 00:00:00		24.76	680.35
	2018-07-10 00:00:00		24.77	680.34
	2018-08-02 00:00:00		25.59	679.52
	2018-09-13 00:00:00		23.78	681.33
	2018-09-19 00:00:00		24.00	681.11
	2018-10-16 00:00:00		25.06	680.05
0402	2018-01-10 00:00:00	704.02	24.34	679.68
	2018-02-06 12:15:00		24.55	679.47
	2018-02-13 00:00:00		22.81	681.21
	2018-03-15 00:00:00		20.76	683.26
	2018-04-11 00:00:00		18.43	685.59
	2018-05-01 10:20:00		21.62	682.40
	2018-05-29 00:00:00		23.32	680.70
	2018-06-13 00:00:00		23.53	680.49
	2018-07-10 00:00:00		23.60	680.42
	2018-08-02 00:00:00		24.39	679.63
	2018-08-08 13:10:00		24.75	679.27
	2018-09-13 00:00:00		22.56	681.46
	2018-09-19 00:00:00		22.83	681.19
	2018-10-16 00:00:00		23.87	680.15
	2018-11-07 10:00:00		20.90	683.12
0411	2018-01-30 11:00:00	836.57	15.58	820.99
	2018-08-09 12:15:00		29.11	807.46
0443	2018-01-30 10:30:00	858.78	25.71	833.07
	2018-07-30 10:35:00		water level was below the top of the pump	
0444	2018-01-30 09:05:00	773.00	20.10	752.90
	2018-07-30 12:40:00		24.80	748.20
0445	2018-01-29 13:00:00	743.43	14.50	728.93
	2018-07-30 13:31:00		15.70	727.73

Abbreviation:
ft AMSL = feet above mean sea level

Table C-2. Parcels 6, 7, and 8 Groundwater Elevations

Well ID	Date/Time	Elevation of Top of Casing (ft AMSL)	Depth from Top of Casing (ft)	Groundwater Elevation (ft AMSL)
0118	2018-01-31 12:09:00	704.86	22.02	682.84
	2018-04-23 09:52:00		20.88	683.98
	2018-07-31 13:00:00		24.12	680.74
	2018-10-29 13:47:00		24.12	680.74
0124	2018-01-30 13:46:00	705.12	23.33	681.79
	2018-04-23 11:56:00		21.56	683.56
	2018-07-30 12:55:00		25.14	679.98
	2018-10-30 10:18:00		25.28	679.84
0126	2018-01-10 00:00:00	705.54	25.56	679.98
	2018-01-31 13:06:00		23.71	681.83
	2018-02-13 00:00:00		24.11	681.43
	2018-03-15 00:00:00		22.31	683.23
	2018-04-11 00:00:00		20.13	685.41
	2018-04-23 11:28:00		21.98	683.56
	2018-05-29 00:00:00		24.59	680.95
	2018-06-13 00:00:00		24.81	680.73
	2018-07-10 00:00:00		24.86	680.68
	2018-07-30 12:25:00		25.61	679.93
	2018-08-02 00:00:00		25.62	679.92
	2018-09-13 00:00:00		23.76	681.78
	2018-09-19 00:00:00		24.11	681.43
	2018-10-16 00:00:00		25.11	680.43
	2018-10-30 09:50:00		25.71	679.83
0138	2018-01-31 12:35:00	No top of casing elevation; temporary completion	25.27	No groundwater elevations calculated
	2018-04-23 09:15:00		24.15	
	2018-07-30 13:31:00		27.20	
	2018-10-30 13:53:00		27.28	
0315	2018-02-01 10:19:00	723.99	42.22	681.77
	2018-04-24 12:40:00		40.55	683.44
	2018-08-02 09:00:00		44.10	679.89
	2018-10-29 11:25:00		44.15	679.84
0346	2018-01-30 13:20:00	742.97	13.80	729.17
	2018-02-08 09:05:00		13.89	729.08
	2018-04-25 10:20:00		12.20	730.77
	2018-08-01 13:03:00		14.66	728.31
	2018-10-29 09:58:00		15.18	727.79
0347	2018-02-01 09:40:00	725.20	43.43	681.77
	2018-04-24 13:11:00		41.75	683.45
	2018-08-02 09:53:00		45.35	679.85
	2018-10-29 12:31:00		45.37	679.83

Table C-2. Parcels 6, 7, and 8 Groundwater Elevations (continued)

Well ID	Date/Time	Elevation of Top of Casing (ft AMSL)	Depth from Top of Casing (ft)	Groundwater Elevation (ft AMSL)
0379	2018-01-10 00:00:00	716.11	36.16	679.95
	2018-01-30 12:50:00		34.36	681.75
	2018-02-08 09:50:00		34.62	681.49
	2018-02-13 00:00:00		34.75	681.36
	2018-03-15 00:00:00		32.85	683.26
	2018-04-11 00:00:00		30.62	685.49
	2018-04-25 11:50:00		32.80	683.31
	2018-05-02 13:34:00		33.70	682.41
	2018-05-29 00:00:00		35.16	680.95
	2018-06-13 00:00:00		35.38	680.73
	2018-07-10 00:00:00		35.42	680.69
	2018-07-31 13:28:00		36.25	679.86
	2018-08-02 00:00:00		36.20	679.91
	2018-08-07 13:13:00		36.37	679.74
	2018-09-13 00:00:00		34.33	681.78
	2018-09-19 00:00:00		34.64	681.47
	2018-10-16 00:00:00		35.69	680.42
	2018-10-29 14:20:00		36.27	679.84
	2018-11-07 09:28:00		32.56	683.55
0386	2018-01-31 10:05:00	724.79	42.87	681.92
	2018-04-24 10:48:00		41.28	683.51
	2018-08-01 10:32:00		44.90	679.89
	2018-10-30 12:11:00		44.98	679.81
0387	2018-01-31 09:13:00	720.89	39.16	681.73
	2018-04-24 09:53:00		37.50	683.39
	2018-08-01 09:45:00		41.10	679.79
	2018-10-30 12:53:00		41.12	679.77
0389	2018-01-31 09:44:00	724.65	42.88	681.77
	2018-04-24 10:23:00		41.20	683.45
	2018-08-01 10:05:00		44.75	679.90
	2018-10-30 12:30:00		44.65	680.00
0392	2018-01-31 08:55:00	720.84	38.97	681.87
	2018-04-24 09:21:00		37.30	683.54
	2018-08-01 09:25:00		40.85	679.99
	2018-10-30 13:22:00		40.93	679.91

Abbreviation:
ft AMSL = feet above mean sea level

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Appendix D

2018 Groundwater and Seep Data Tables

Table D-1. Phase I Groundwater Data

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0353	*cis*-1,2-Dichloroethene	1/29/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
0353	Dissolved oxygen	1/29/2018	4.5				mg/L	F
		7/30/2018	0.59				mg/L	F
0353	Oxidation–reduction potential	1/29/2018	139.8				mV	F
		7/30/2018	38.7				mV	F
0353	pH	1/29/2018	7.28				s.u.	F
		7/30/2018	7.08				s.u.	F
0353	Specific conductance	1/29/2018	1330				µmho/cm	F
		7/30/2018	1230				µmho/cm	F
0353	Temperature	1/29/2018	9				°C	F
		7/30/2018	16.6				°C	F
0353	Tetrachloroethene	1/29/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
0353	*trans*-1,2-Dichloroethene	1/29/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
0353	Trichloroethene	1/29/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
0353	Turbidity	1/29/2018	19.3				NTU	F
		7/30/2018	8.71				NTU	F
0353	Vinyl chloride	1/29/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
0411	*cis*-1,2-Dichloroethene	1/30/2018	0.84	0.16	J		µg/L	F
		8/9/2018	2.11	0.16			µg/L	D
		8/9/2018	2.08	0.16			µg/L	F
0411	Dissolved oxygen	1/30/2018	1.62				mg/L	F
		8/9/2018	1.44				mg/L	F

Table D-1. Phase I Groundwater Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0411	Oxidation–reduction potential	1/30/2018	106.7				mV	F
		8/9/2018	150.6				mV	F
0411	pH	1/30/2018	7.08				s.u.	F
		8/9/2018	7.08				s.u.	F
0411	Specific conductance	1/30/2018	1310				µmho/cm	F
		8/9/2018	6950				µmho/cm	F
0411	Temperature	1/30/2018	10.7				°C	F
		8/9/2018	14.8				°C	F
0411	Tetrachloroethene	1/30/2018	0.16	0.16	U		µg/L	F
		8/9/2018	0.16	0.16	U		µg/L	D
		8/9/2018	0.16	0.16	U		µg/L	F
0411	*trans*-1,2-Dichloroethene	1/30/2018	0.16	0.16	U		µg/L	F
		8/9/2018	0.16	0.16	U		µg/L	D
		8/9/2018	0.16	0.16	U		µg/L	F
0411	Trichloroethene	1/30/2018	10.1	0.16			µg/L	F
		8/9/2018	8.87	0.16			µg/L	D
		8/9/2018	9.01	0.16			µg/L	F
0411	Turbidity	1/30/2018	25.4				NTU	F
		8/9/2018	7.51				NTU	F
0411	Vinyl chloride	1/30/2018	0.16	0.16	U		µg/L	F
		8/9/2018	0.16	0.16	U		µg/L	D
		8/9/2018	0.16	0.16	U		µg/L	F
0443	*cis*-1,2-Dichloroethene	1/30/2018	0.39	0.16	J		µg/L	F
		7/30/2018	0.36	0.16	J		µg/L	F
0443	Dissolved oxygen	1/30/2018	3.18				mg/L	F
		7/30/2018	6.61				mg/L	F
0443	Oxidation–reduction potential	1/30/2018	78.7				mV	F
		7/30/2018	37.4				mV	F
0443	pH	1/30/2018	7.07				s.u.	F
		7/30/2018	7.07				s.u.	F

Table D-1. Phase I Groundwater Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0443	Specific conductance	1/30/2018	1230				µmho/cm	F
		7/30/2018	1370				µmho/cm	F
0443	Temperature	1/30/2018	11.5				°C	F
		7/30/2018	15.4				°C	F
0443	Tetrachloroethene	1/30/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
0443	*trans*-1,2-Dichloroethene	1/30/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
0443	Trichloroethene	1/30/2018	8.93	0.16			µg/L	F
		7/30/2018	6.38	0.16			µg/L	F
0443	Turbidity	1/30/2018	3.13				NTU	F
		7/30/2018	49.9				NTU	F
0443	Vinyl chloride	1/30/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
0444	*cis*-1,2-Dichloroethene	1/30/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
0444	Dissolved oxygen	1/30/2018	2.13				mg/L	F
		7/30/2018	4.69				mg/L	F
0444	Oxidation–reduction potential	1/30/2018	182.7				mV	F
		7/30/2018	31				mV	F
0444	pH	1/30/2018	7.05				s.u.	F
		7/30/2018	7.1				s.u.	F
0444	Specific conductance	1/30/2018	1250				µmho/cm	F
		7/30/2018	1230				µmho/cm	F
0444	Temperature	1/30/2018	10.9				°C	F
		7/30/2018	15.4				°C	F
0444	Tetrachloroethene	1/30/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
0444	*trans*-1,2-Dichloroethene	1/30/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F

Table D-1. Phase I Groundwater Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0444	Trichloroethene	1/30/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
0444	Turbidity	1/30/2018	32.6				NTU	F
		7/30/2018	4.57				NTU	F
0444	Vinyl chloride	1/30/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
0445	*cis*-1,2-Dichloroethene	1/29/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
0445	Dissolved oxygen	1/29/2018	1.67				mg/L	F
		7/30/2018	0.21				mg/L	F
0445	Oxidation–reduction potential	1/29/2018	–26.4				mV	F
		7/30/2018	–116.3				mV	F
0445	pH	1/29/2018	7.19				s.u.	F
		7/30/2018	7.17				s.u.	F
0445	Specific conductance	1/29/2018	1511				µmho/cm	F
		7/30/2018	18140				µmho/cm	F
0445	Temperature	1/29/2018	10.5				°C	F
		7/30/2018	16.2				°C	F
0445	Tetrachloroethene	1/29/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
0445	*trans*-1,2-Dichloroethene	1/29/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
0445	Trichloroethene	1/29/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
0445	Turbidity	1/29/2018	5				NTU	F
		7/30/2018	9.93				NTU	F
0445	Vinyl chloride	1/29/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F

Table D-1. Phase I Groundwater Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
P064	*cis*-1,2-Dichloroethene	1/30/2018	0.16	0.16	U		µg/L	F
		1/30/2018	0.16	0.16	U		µg/L	D
		7/31/2018	0.36	0.16	J		µg/L	F
		7/31/2018	0.36	0.16	J		µg/L	D
P064	Dissolved oxygen	1/30/2018	2.85				mg/L	F
		7/31/2018	2.43				mg/L	F
P064	Oxidation–reduction potential	1/30/2018	184.7				mV	F
		7/31/2018	71				mV	F
P064	pH	1/30/2018	6.96				s.u.	F
		7/31/2018	6.79				s.u.	F
P064	Specific conductance	1/30/2018	1400				µmho/cm	F
		7/31/2018	1240				µmho/cm	F
P064	Temperature	1/30/2018	11.7				°C	F
		7/31/2018	14.2				°C	F
P064	Tetrachloroethene	1/30/2018	0.73	0.16	J		µg/L	D
		1/30/2018	0.72	0.16	J		µg/L	F
		7/31/2018	0.8	0.16	J		µg/L	F
		7/31/2018	0.67	0.16	J		µg/L	D
P064	*trans*-1,2-Dichloroethene	1/30/2018	0.16	0.16	U		µg/L	D
		1/30/2018	0.16	0.16	U		µg/L	F
		7/31/2018	0.16	0.16	U		µg/L	F
		7/31/2018	0.16	0.16	U		µg/L	D
P064	Trichloroethene	1/30/2018	1.12	0.16			µg/L	D
		1/30/2018	1.14	0.16			µg/L	F
		7/31/2018	1.12	0.16			µg/L	F
		7/31/2018	1.1	0.16			µg/L	D
P064	Turbidity	1/30/2018	17.8				NTU	F
		7/31/2018	2.29				NTU	F

Table D-1. Phase I Groundwater Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
P064	Vinyl chloride	1/30/2018	0.16	0.16	U		µg/L	D
		1/30/2018	0.16	0.16	U		µg/L	F
		7/31/2018	0.16	0.16	U		µg/L	F
		7/31/2018	0.16	0.16	U		µg/L	D

Abbreviations:
D = analyte determined in diluted sample
F = low flow sampling method used
J = estimated value
µg/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

Table D-2. Parcels 6, 7, and 8 Groundwater Data

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0118	*cis*-1,2-Dichloroethene	1/31/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/31/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0118	Dissolved oxygen	1/31/2018	5.8				mg/L	F
		4/23/2018	7.41				mg/L	F
		7/31/2018	6.61				mg/L	F
		10/29/2018	6.69				mg/L	F
0118	Oxidation–reduction potential	1/31/2018	255.5				mV	F
		4/23/2018	59.9				mV	F
		7/31/2018	63.3				mV	F
		10/29/2018	157.7				mV	F
0118	pH	1/31/2018	7.22				s.u.	F
		4/23/2018	7.17				s.u.	F
		7/31/2018	7.01				s.u.	F
		10/29/2018	7.26				s.u.	F
0118	Specific conductance	1/31/2018	1100				µmho/cm	F
		4/23/2018	1120				µmho/cm	F
		7/31/2018	1090				µmho/cm	F
		10/29/2018	1120				µmho/cm	F
0118	Temperature	1/31/2018	13.8				°C	F
		4/23/2018	13.8				°C	F
		7/31/2018	14.5				°C	F
		10/29/2018	14.3				°C	F
0118	Tetrachloroethene	1/31/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/31/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F

Table D-2. Parcels 6, 7, and 8 Groundwater Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0118	*trans*-1,2-Dichloroethene	1/31/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/31/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0118	Trichloroethene	1/31/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/31/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0118	Tritium	1/31/2018	92.6	278	U		pCi/L	F
		7/31/2018	-43.9	325	U		pCi/L	F
0118	Turbidity	1/31/2018	5.43				NTU	F
		4/23/2018	3.98				NTU	F
		7/31/2018	11.8				NTU	F
		10/29/2018	37.9				NTU	F
0118	Vinyl chloride	1/31/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/31/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0124	*cis*-1,2-Dichloroethene	1/30/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0124	Dissolved oxygen	1/30/2018	2.51				mg/L	F
		4/23/2018	3.19				mg/L	F
		7/30/2018	2.84				mg/L	F
		10/30/2018	5.76				mg/L	F
0124	Oxidation–reduction potential	1/30/2018	163.6				mV	F
		4/23/2018	64.1				mV	F
		7/30/2018	109.7				mV	F
		10/30/2018	166.2				mV	F

Table D-2. Parcels 6, 7, and 8 Groundwater Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0124	pH	1/30/2018	6.96				s.u.	F
		4/23/2018	6.88				s.u.	F
		7/30/2018	6.95				s.u.	F
		10/30/2018	6.94				s.u.	F
0124	Specific conductance	1/30/2018	1160				µmho/cm	F
		4/23/2018	1190				µmho/cm	F
		7/30/2018	1250				µmho/cm	F
		10/30/2018	1250				µmho/cm	F
0124	Temperature	1/30/2018	13.2				°C	F
		4/23/2018	13.6				°C	F
		7/30/2018	14.4				°C	F
		10/30/2018	13.8				°C	F
0124	Tetrachloroethene	1/30/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0124	*trans*-1,2-Dichloroethene	1/30/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0124	Trichloroethene	1/30/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0124	Turbidity	1/30/2018	6.86				NTU	F
		4/23/2018	1.44				NTU	F
		7/30/2018	1.49				NTU	F
		10/30/2018	1.89				NTU	F

Table D-2. Parcels 6, 7, and 8 Groundwater Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0124	Vinyl chloride	1/30/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0126	*cis*-1,2-Dichloroethene	1/31/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0126	Dissolved oxygen	1/31/2018	2.39				mg/L	F
		4/23/2018	0.39				mg/L	F
		7/30/2018	2.74				mg/L	F
		10/30/2018	2.67				mg/L	F
0126	Oxidation–reduction potential	1/31/2018	247.1				mV	F
		4/23/2018	54.9				mV	F
		7/30/2018	115.7				mV	F
		10/30/2018	198				mV	F
0126	pH	1/31/2018	6.99				s.u.	F
		4/23/2018	6.99				s.u.	F
		7/30/2018	7.04				s.u.	F
		10/30/2018	6.91				s.u.	F
0126	Specific conductance	1/31/2018	1210				µmho/cm	F
		4/23/2018	1250				µmho/cm	F
		7/30/2018	1300				µmho/cm	F
		10/30/2018	1310				µmho/cm	F
0126	Temperature	1/31/2018	13.5				°C	F
		4/23/2018	13.7				°C	F
		7/30/2018	14.8				°C	F
		10/30/2018	13.6				°C	F

Table D-2. Parcels 6, 7, and 8 Groundwater Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0126	Tetrachloroethene	1/31/2018	0.79	0.16	J		µg/L	F
		4/23/2018	0.85	0.16	J		µg/L	F
		7/30/2018	0.78	0.16	J		µg/L	F
		10/30/2018	0.87	0.16	J		µg/L	F
0126	*trans*-1,2-Dichloroethene	1/31/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0126	Trichloroethene	1/31/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0126	Turbidity	1/31/2018	2.27				NTU	F
		4/23/2018	0.43				NTU	F
		7/30/2018	0.32				NTU	F
		10/30/2018	0.43				NTU	F
0126	Vinyl chloride	1/31/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0138	*cis*-1,2-Dichloroethene	1/31/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0138	Dissolved oxygen	1/31/2018	3.61				mg/L	F
		4/23/2018	7.97				mg/L	F
		7/30/2018	5.81				mg/L	F
		10/30/2018	2.95				mg/L	F

Table D-2. Parcels 6, 7, and 8 Groundwater Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0138	Oxidation–reduction potential	1/31/2018	247.6				mV	F
		4/23/2018	63.4				mV	F
		7/30/2018	125.9				mV	F
		10/30/2018	139.1				mV	F
0138	pH	1/31/2018	7.1				s.u.	F
		4/23/2018	7.08				s.u.	F
		7/30/2018	7.18				s.u.	F
		10/30/2018	7.21				s.u.	F
0138	Specific conductance	1/31/2018	1160				µmho/cm	F
		4/23/2018	1200				µmho/cm	F
		7/30/2018	1210				µmho/cm	F
		10/30/2018	1210				µmho/cm	F
0138	Temperature	1/31/2018	12.6				°C	F
		4/23/2018	13.2				°C	F
		7/30/2018	14.9				°C	F
		10/30/2018	16.1				°C	F
0138	Tetrachloroethene	1/31/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0138	*trans*-1,2-Dichloroethene	1/31/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0138	Trichloroethene	1/31/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0138	Tritium	1/31/2018	250	280	U		pCi/L	F
		7/30/2018	350	312		J	pCi/L	F

Table D-2. Parcels 6, 7, and 8 Groundwater Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0138	Turbidity	1/31/2018	4.24				NTU	F
		4/23/2018	1.66				NTU	F
		7/30/2018	10.2				NTU	F
		10/30/2018	3.8				NTU	F
0138	Vinyl chloride	1/31/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0315	*cis*-1,2-Dichloroethene	2/1/2018	0.16	0.16	U		µg/L	F
		4/24/2018	0.16	0.16	U		µg/L	F
		8/2/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0315	Dissolved oxygen	2/1/2018	1.22				mg/L	F
		4/24/2018	0.39				mg/L	F
		8/2/2018	2.04				mg/L	F
		10/29/2018	3.69				mg/L	F
0315	Oxidation–reduction potential	2/1/2018	4.7				mV	F
		4/24/2018	–53.2				mV	F
		8/2/2018	–43.8				mV	F
		10/29/2018	–60.6				mV	F
0315	pH	2/1/2018	7.08				s.u.	F
		4/24/2018	7.12				s.u.	F
		8/2/2018	7.15				s.u.	F
		10/29/2018	7.24				s.u.	F
0315	Specific conductance	2/1/2018	1650				µmho/cm	F
		4/24/2018	1710				µmho/cm	F
		8/2/2018	1760				µmho/cm	F
		10/29/2018	1750				µmho/cm	F

Table D-2. Parcels 6, 7, and 8 Groundwater Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0315	Temperature	2/1/2018	13.5				C	F
		4/24/2018	13.9				C	F
		8/2/2018	15.4				C	F
		10/29/2018	15				C	F
0315	Tetrachloroethene	2/1/2018	0.16	0.16	U		µg/L	F
		4/24/2018	0.16	0.16	U		µg/L	F
		8/2/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0315	*trans*-1,2-Dichloroethene	2/1/2018	0.16	0.16	U		µg/L	F
		4/24/2018	0.16	0.16	U		µg/L	F
		8/2/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0315	Trichloroethene	2/1/2018	5.21	0.16			µg/L	F
		4/24/2018	3.5	0.16			µg/L	F
		8/2/2018	4.12	0.16			µg/L	F
		10/29/2018	4.36	0.16			µg/L	F
0315	Turbidity	2/1/2018	101				NTU	F
		4/24/2018	611				NTU	F
		8/2/2018	42.5				NTU	F
		10/29/2018	132				NTU	F
0315	Vinyl chloride	2/1/2018	0.16	0.16	U		µg/L	F
		4/24/2018	0.16	0.16	U		µg/L	F
		8/2/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0346	*cis*-1,2-Dichloroethene	1/30/2018	0.16	0.16	U		µg/L	F
		4/25/2018	0.16	0.16	U		µg/L	F
		8/1/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F

Table D-2. Parcels 6, 7, and 8 Groundwater Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0346	Dissolved oxygen	1/30/2018	9.25				mg/L	F
		2/8/2018	2.2				mg/L	F
		4/25/2018	3.22				mg/L	F
		8/1/2018	3.67				mg/L	F
		10/29/2018	4.49				mg/L	F
0346	Oxidation–reduction potential	1/30/2018	141.2				mV	F
		2/8/2018	24.6				mV	F
		4/25/2018	40.2				mV	F
		8/1/2018	58.3				mV	F
		10/29/2018	227.8				mV	F
0346	pH	1/30/2018	7.64				s.u.	F
		2/8/2018	7.25				s.u.	F
		4/25/2018	7.22				s.u.	F
		8/1/2018	7.1				s.u.	F
		10/29/2018	7.08				s.u.	F
0346	Specific conductance	1/30/2018	710				µmho/cm	F
		2/8/2018	1580				µmho/cm	F
		4/25/2018	910				µmho/cm	F
		8/1/2018	400				µmho/cm	F
		10/29/2018	1110				µmho/cm	F
0346	Temperature	1/30/2018	13.6				°C	F
		2/8/2018	13				°C	F
		4/25/2018	13.1				°C	F
		8/1/2018	14.8				°C	F
		10/29/2018	14.4				°C	F
0346	Tetrachloroethene	1/30/2018	0.16	0.16	U		µg/L	F
		4/25/2018	0.16	0.16	U		µg/L	F
		8/1/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F

Table D-2. Parcels 6, 7, and 8 Groundwater Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0346	*trans*-1,2-Dichloroethene	1/30/2018	0.16	0.16	U		µg/L	F
		4/25/2018	0.16	0.16	U		µg/L	F
		8/1/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0346	Trichloroethene	1/30/2018	0.16	0.16	U		µg/L	F
		4/25/2018	0.16	0.16	U		µg/L	F
		8/1/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0346	Tritium	2/8/2018	377	255		J	pCi/L	F
		8/1/2018	93.5	328	U		pCi/L	F
0346	Turbidity	1/30/2018	33				NTU	F
		2/8/2018	46.2				NTU	F
		4/25/2018	31.9				NTU	F
		8/1/2018	41.8				NTU	F
		10/29/2018	37.6				NTU	F
0346	Vinyl chloride	1/30/2018	0.16	0.16	U		µg/L	F
		4/25/2018	0.16	0.16	U		µg/L	F
		8/1/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0347	*cis*-1,2-Dichloroethene	2/1/2018	0.16	0.16	U		µg/L	F
		2/1/2018	0.16	0.16	U		µg/L	D
		4/24/2018	0.16	0.16	U		µg/L	F
		8/2/2018	0.16	0.16	U		µg/L	D
		8/2/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0347	Dissolved oxygen	2/1/2018	1.27				mg/L	F
		4/24/2018	0.45				mg/L	F
		8/2/2018	1.77				mg/L	F
		10/29/2018	7.59				mg/L	F

Table D-2. Parcels 6, 7, and 8 Groundwater Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0347	Oxidation–reduction potential	2/1/2018	–21.6				mV	F
		4/24/2018	–42.1				mV	F
		8/2/2018	–31.8				mV	F
		10/29/2018	–38.1				mV	F
0347	pH	2/1/2018	6.85				s.u.	F
		4/24/2018	7.05				s.u.	F
		8/2/2018	6.78				s.u.	F
		10/29/2018	6.85				s.u.	F
0347	Specific conductance	2/1/2018	1610				µmho/cm	F
		4/24/2018	1730				µmho/cm	F
		8/2/2018	1810				µmho/cm	F
		10/29/2018	1780				µmho/cm	F
0347	Temperature	2/1/2018	13.5				°C	F
		4/24/2018	13.7				°C	F
		8/2/2018	15				°C	F
		10/29/2018	14.6				°C	F
0347	Tetrachloroethene	2/1/2018	0.16	0.16	U		µg/L	F
		2/1/2018	0.16	0.16	U		µg/L	D
		4/24/2018	0.16	0.16	U		µg/L	F
		8/2/2018	0.16	0.16	U		µg/L	D
		8/2/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0347	*trans*-1,2-Dichloroethene	2/1/2018	0.16	0.16	U		µg/L	D
		2/1/2018	0.16	0.16	U		µg/L	F
		4/24/2018	0.16	0.16	U		µg/L	F
		8/2/2018	0.16	0.16	U		µg/L	D
		8/2/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F

Table D-2. Parcels 6, 7, and 8 Groundwater Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0347	Trichloroethene	2/1/2018	19.7	0.16			µg/L	D
		2/1/2018	20.7	0.16			µg/L	F
		4/24/2018	11.7	0.16			µg/L	F
		8/2/2018	21.8	0.16			µg/L	D
		8/2/2018	21.3	0.16			µg/L	F
		10/29/2018	16.1	0.16			µg/L	F
0347	Tritium	2/1/2018	1140	262			pCi/L	D
		2/1/2018	1070	259			pCi/L	F
		8/2/2018	1230	313			pCi/L	D
		8/2/2018	1080	314			pCi/L	F
0347	Turbidity	2/1/2018	25.3				NTU	F
		4/24/2018	30.3				NTU	F
		8/2/2018	17.2				NTU	F
		10/29/2018	26.2				NTU	F
0347	Vinyl chloride	2/1/2018	0.16	0.16	U		µg/L	F
		2/1/2018	0.16	0.16	U		µg/L	D
		4/24/2018	0.16	0.16	U		µg/L	F
		8/2/2018	0.16	0.16	U		µg/L	D
		8/2/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0379	*cis*-1,2-Dichloroethene	1/30/2018	0.16	0.16	U		µg/L	F
		2/8/2018	0.333	0.333	U		µg/L	F
		4/25/2018	0.16	0.16	U		µg/L	F
		5/2/2018	0.333	0.333	U		µg/L	F
		7/31/2018	0.16	0.16	U		µg/L	F
		8/7/2018	0.333	0.333	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	D
		11/7/2018	0.333	0.333	U		µg/L	F

Table D-2. Parcels 6, 7, and 8 Groundwater Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0379	Dissolved oxygen	1/30/2018	3.35				mg/L	F
		2/8/2018	1.35			F	mg/L	F
		4/25/2018	3.21				mg/L	F
		5/2/2018	2.79				mg/L	F
		7/31/2018	5.42				mg/L	F
		8/7/2018	2.87				mg/L	F
		10/29/2018	2.2				mg/L	F
		11/7/2018	2.7				mg/L	F
0379	Oxidation–reduction potential	1/30/2018	67.4				mV	F
		2/8/2018	53.4			F	mV	F
		4/25/2018	1211.1				mV	F
		5/2/2018	–5				mV	F
		7/31/2018	17.7				mV	F
		8/7/2018	123.4				mV	F
		10/29/2018	107.4				mV	F
		11/7/2018	–36.1				mV	F
0379	pH	1/30/2018	7.1				s.u.	F
		2/8/2018	7.19			F	s.u.	F
		4/25/2018	7.18				s.u.	F
		5/2/2018	7.21				s.u.	F
		7/31/2018	7.01				s.u.	F
		8/7/2018	7.14				s.u.	F
		10/29/2018	7.23				s.u.	F
		11/7/2018	6.99				s.u.	F

Table D-2. Parcels 6, 7, and 8 Groundwater Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0379	Specific conductance	1/30/2018	1640				µmho/cm	F
		2/8/2018	1710			F	µmho/cm	F
		4/25/2018	1500				µmho/cm	F
		5/2/2018	1490				µmho/cm	F
		7/31/2018	1580				µmho/cm	F
		8/7/2018	1700				µmho/cm	F
		10/29/2018	1660				µmho/cm	F
		11/7/2018	1870				µmho/cm	F
0379	Temperature	1/30/2018	13.8				°C	F
		2/8/2018	12.1			F	°C	F
		4/25/2018	14.1				°C	F
		5/2/2018	16.2				°C	F
		7/31/2018	15.8				°C	F
		8/7/2018	16.9				°C	F
		10/29/2018	15				°C	F
		11/7/2018	13.9				°C	F
0379	Tetrachloroethene	1/30/2018	0.44	0.16	J		µg/L	F
		2/8/2018	0.44	0.333	J		µg/L	F
		4/25/2018	0.16	0.16	U		µg/L	F
		5/2/2018	0.333	0.333	U		µg/L	F
		7/31/2018	0.4	0.16	J		µg/L	F
		8/7/2018	0.57	0.333	J		µg/L	F
		10/29/2018	0.4	0.16	J		µg/L	F
		10/29/2018	0.43	0.16	J		µg/L	D
		11/7/2018	0.45	0.333	J	J	µg/L	F

Table D-2. Parcels 6, 7, and 8 Groundwater Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0379	*trans*-1,2-Dichloroethene	1/30/2018	0.16	0.16	U		µg/L	F
		2/8/2018	0.333	0.333	U		µg/L	F
		4/25/2018	0.16	0.16	U		µg/L	F
		5/2/2018	0.333	0.333	U		µg/L	F
		7/31/2018	0.16	0.16	U		µg/L	F
		8/7/2018	0.333	0.333	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	D
		11/7/2018	0.333	0.333	U		µg/L	F
0379	Trichloroethene	1/30/2018	1.45	0.16			µg/L	F
		2/8/2018	1.53	0.333			µg/L	F
		4/25/2018	1.21	0.16			µg/L	F
		5/2/2018	1.38	0.333			µg/L	F
		7/31/2018	1.57	0.16			µg/L	F
		8/7/2018	1.47	0.333			µg/L	F
		10/29/2018	1.3	0.16			µg/L	D
		10/29/2018	1.34	0.16			µg/L	F
		11/7/2018	1.55	0.333			µg/L	F
0379	Tritium	1/30/2018	707	263		J	pCi/L	F
		7/31/2018	488	326		J	pCi/L	F
0379	Turbidity	1/30/2018	18.1				NTU	F
		2/8/2018	28			F	NTU	F
		4/25/2018	11.8				NTU	F
		5/2/2018	8.23				NTU	F
		7/31/2018	143				NTU	F
		8/7/2018	6.78				NTU	F
		10/29/2018	2.74				NTU	F
		11/7/2018	8.76				NTU	F

Table D-2. Parcels 6, 7, and 8 Groundwater Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0379	Vinyl chloride	1/30/2018	0.16	0.16	U		µg/L	F
		2/8/2018	0.333	0.333	U		µg/L	F
		4/25/2018	0.16	0.16	U		µg/L	F
		5/2/2018	0.333	0.333	U		µg/L	F
		7/31/2018	0.16	0.16	U		µg/L	F
		8/7/2018	0.333	0.333	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	D
		11/7/2018	0.333	0.333	U		µg/L	F
0386	*cis*-1,2-Dichloroethene	1/31/2018	0.16	0.16	U		µg/L	F
		4/24/2018	0.16	0.16	U		µg/L	F
		8/1/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0386	Dissolved oxygen	1/31/2018	2.29				mg/L	F
		4/24/2018	3.48				mg/L	F
		8/1/2018	2.09				mg/L	F
		10/30/2018	2.86				mg/L	F
0386	Oxidation–reduction potential	1/31/2018	273.1				mV	F
		4/24/2018	84.3				mV	F
		8/1/2018	69.7				mV	F
		10/30/2018	173.7				mV	F
0386	pH	1/31/2018	6.86				s.u.	F
		4/24/2018	6.95				s.u.	F
		8/1/2018	6.69				s.u.	F
		10/30/2018	6.93				s.u.	F
0386	Specific conductance	1/31/2018	1370				µmho/cm	F
		4/24/2018	1390				µmho/cm	F
		8/1/2018	1430				µmho/cm	F
		10/30/2018	1420				µmho/cm	F

Table D-2. Parcels 6, 7, and 8 Groundwater Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0386	Temperature	1/31/2018	12				°C	F
		4/24/2018	13.7				°C	F
		8/1/2018	13.8				°C	F
		10/30/2018	13.4				°C	F
0386	Tetrachloroethene	1/31/2018	0.16	0.16	U		µg/L	F
		4/24/2018	0.16	0.16	U		µg/L	F
		8/1/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0386	*trans*-1,2-Dichloroethene	1/31/2018	0.16	0.16	U		µg/L	F
		4/24/2018	0.16	0.16	U		µg/L	F
		8/1/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0386	Trichloroethene	1/31/2018	2.51	0.16			µg/L	F
		4/24/2018	2.89	0.16			µg/L	F
		8/1/2018	3.02	0.16			µg/L	F
		10/30/2018	2.03	0.16			µg/L	F
0386	Turbidity	1/31/2018	16.3				NTU	F
		4/24/2018	7.4				NTU	F
		8/1/2018	2.13				NTU	F
		10/30/2018	1.37				NTU	F
0386	Vinyl chloride	1/31/2018	0.16	0.16	U		µg/L	F
		4/24/2018	0.16	0.16	U		µg/L	F
		8/1/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0387	*cis*-1,2-Dichloroethene	1/31/2018	0.16	0.16	U		µg/L	F
		4/24/2018	0.16	0.16	U		µg/L	F
		8/1/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F

Table D-2. Parcels 6, 7, and 8 Groundwater Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0387	Dissolved oxygen	1/31/2018	2.22				mg/L	F
		4/24/2018	0.84				mg/L	F
		8/1/2018	8.03				mg/L	F
		10/30/2018	2.45				mg/L	F
0387	Oxidation–reduction potential	1/31/2018	277.8				mV	F
		4/24/2018	88.3				mV	F
		8/1/2018	69				mV	F
		10/30/2018	46.5				mV	F
0387	pH	1/31/2018	6.95				s.u.	F
		4/24/2018	6.99				s.u.	F
		8/1/2018	6.79				s.u.	F
		10/30/2018	7.07				s.u.	F
0387	Specific conductance	1/31/2018	1310				µmho/cm	F
		4/24/2018	1410				µmho/cm	F
		8/1/2018	1300				µmho/cm	F
		10/30/2018	1390				µmho/cm	F
0387	Temperature	1/31/2018	11.6				C	F
		4/24/2018	13				C	F
		8/1/2018	13.8				C	F
		10/30/2018	13.9				C	F
0387	Tetrachloroethene	1/31/2018	0.16	0.16	U		µg/L	F
		4/24/2018	0.16	0.16	U		µg/L	F
		8/1/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0387	*trans*-1,2-Dichloroethene	1/31/2018	0.16	0.16	U		µg/L	F
		4/24/2018	0.16	0.16	U		µg/L	F
		8/1/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F

Table D-2. Parcels 6, 7, and 8 Groundwater Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0387	Trichloroethene	1/31/2018	0.16	0.16	U		µg/L	F
		4/24/2018	0.16	0.16	U		µg/L	F
		8/1/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0387	Turbidity	1/31/2018	2.6				NTU	F
		4/24/2018	1.02				NTU	F
		8/1/2018	2.06				NTU	F
		10/30/2018	0.7				NTU	F
0387	Vinyl chloride	1/31/2018	0.16	0.16	U		µg/L	F
		4/24/2018	0.16	0.16	U		µg/L	F
		8/1/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0389	*cis*-1,2-Dichloroethene	1/31/2018	0.16	0.16	U		µg/L	F
		4/24/2018	0.16	0.16	U		µg/L	F
		8/1/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0389	Dissolved oxygen	1/31/2018	2.45				mg/L	F
		4/24/2018	2.15				mg/L	F
		8/1/2018	0.42				mg/L	F
		10/30/2018	2.09				mg/L	F
0389	Oxidation–reduction potential	1/31/2018	278.7				mV	F
		4/24/2018	86.5				mV	F
		8/1/2018	69.1				mV	F
		10/30/2018	169				mV	F
0389	pH	1/31/2018	6.82				s.u.	F
		4/24/2018	6.85				s.u.	F
		8/1/2018	6.79				s.u.	F
		10/30/2018	7.02				s.u.	F

Table D-2. Parcels 6, 7, and 8 Groundwater Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0389	Specific conductance	1/31/2018	1340				µmho/cm	F
		4/24/2018	1410				µmho/cm	F
		8/1/2018	1440				µmho/cm	F
		10/30/2018	1490				µmho/cm	F
0389	Temperature	1/31/2018	11.4				°C	F
		4/24/2018	12.9				°C	F
		8/1/2018	14.1				°C	F
		10/30/2018	14				°C	F
0389	Tetrachloroethene	1/31/2018	0.16	0.16	U		µg/L	F
		4/24/2018	0.16	0.16	U		µg/L	F
		8/1/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0389	*trans*-1,2-Dichloroethene	1/31/2018	0.16	0.16	U		µg/L	F
		4/24/2018	0.16	0.16	U		µg/L	F
		8/1/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0389	Trichloroethene	1/31/2018	0.16	0.16	U		µg/L	F
		4/24/2018	0.16	0.16	U		µg/L	F
		8/1/2018	0.54	0.16	J		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0389	Turbidity	1/31/2018	29.6				NTU	F
		4/24/2018	32.7				NTU	F
		8/1/2018	32.9				NTU	F
		10/30/2018	29				NTU	F
0389	Vinyl chloride	1/31/2018	0.16	0.16	U		µg/L	F
		4/24/2018	0.16	0.16	U		µg/L	F
		8/1/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F

Table D-2. Parcels 6, 7, and 8 Groundwater Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0392	*cis*-1,2-Dichloroethene	1/31/2018	0.16	0.16	U		µg/L	F
		4/24/2018	0.16	0.16	U		µg/L	D
		4/24/2018	0.16	0.16	U		µg/L	F
		8/1/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0392	Dissolved oxygen	1/31/2018	4.97				mg/L	F
		4/24/2018	3.64				mg/L	F
		8/1/2018	5.01				mg/L	F
		10/30/2018	4.2				mg/L	F
0392	Oxidation–reduction potential	1/31/2018	294.8				mV	F
		4/24/2018	126.5				mV	F
		8/1/2018	78.8				mV	F
		10/30/2018	163.5				mV	F
0392	pH	1/31/2018	6.72				s.u.	F
		4/24/2018	6.78				s.u.	F
		8/1/2018	6.6				s.u.	F
		10/30/2018	6.92				s.u.	F
0392	Specific conductance	1/31/2018	1290				µmho/cm	F
		4/24/2018	1450				µmho/cm	F
		8/1/2018	1250				µmho/cm	F
		10/30/2018	1310				µmho/cm	F
0392	Temperature	1/31/2018	11.2				°C	F
		4/24/2018	13.3				°C	F
		8/1/2018	14.6				°C	F
		10/30/2018	15				°C	F
0392	Tetrachloroethene	1/31/2018	0.16	0.16	U		µg/L	F
		4/24/2018	0.16	0.16	U		µg/L	D
		4/24/2018	0.16	0.16	U		µg/L	F
		8/1/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F

Table D-2. Parcels 6, 7, and 8 Groundwater Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0392	*trans*-1,2-Dichloroethene	1/31/2018	0.16	0.16	U		µg/L	F
		4/24/2018	0.16	0.16	U		µg/L	D
		4/24/2018	0.16	0.16	U		µg/L	F
		8/1/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0392	Trichloroethene	1/31/2018	0.16	0.16	U		µg/L	F
		4/24/2018	0.16	0.16	U		µg/L	D
		4/24/2018	0.16	0.16	U		µg/L	F
		8/1/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F
0392	Turbidity	1/31/2018	1.43				NTU	F
		4/24/2018	0.87				NTU	F
		8/1/2018	3.98				NTU	F
		10/30/2018	1.23				NTU	F
0392	Vinyl chloride	1/31/2018	0.16	0.16	U		µg/L	F
		4/24/2018	0.16	0.16	U		µg/L	D
		4/24/2018	0.16	0.16	U		µg/L	F
		8/1/2018	0.16	0.16	U		µg/L	F
		10/30/2018	0.16	0.16	U		µg/L	F

Abbreviations:
D = analyte determined in diluted sample
F = low flow sampling method used
J = estimated value
µg/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

Table D-3. Seep Data

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0601	*cis*-1,2-Dichloroethene	1/29/2018	0.65	0.16	J		µg/L	F
		4/23/2018	0.48	0.16	J		µg/L	F
		7/30/2018	0.44	0.16	J		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0601	Dissolved oxygen	1/29/2018	3.8				mg/L	F
		4/23/2018	5.28				mg/L	F
		7/30/2018	5.97				mg/L	F
		10/29/2018	8.35				mg/L	F
0601	Oxidation–reduction potential	1/29/2018	53.9				mV	F
		4/23/2018	174.3				mV	F
		7/30/2018	148.8				mV	F
		10/29/2018	62.7				mV	F
0601	pH	1/29/2018	7.15				s.u.	F
		4/23/2018	7.08				s.u.	F
		7/30/2018	7.83				s.u.	F
		10/29/2018	7.65				s.u.	F
0601	Specific conductance	1/29/2018	900				µmho/cm	F
		4/23/2018	1270				µmho/cm	F
		7/30/2018	1450				µmho/cm	F
		10/29/2018	1370				µmho/cm	F
0601	Temperature	1/29/2018	13.6				°C	F
		4/23/2018	12.7				°C	F
		7/30/2018	14.6				°C	F
		10/29/2018	14.6				°C	F
0601	Tetrachloroethene	1/29/2018	10.5	0.16			µg/L	F
		4/23/2018	12.9	0.16			µg/L	F
		7/30/2018	9.69	0.16			µg/L	F
		10/29/2018	6.18	0.16			µg/L	F

Table D-3. Seep Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0601	*trans*-1,2-Dichloroethene	1/29/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0601	Trichloroethene	1/29/2018	3.85	0.16			µg/L	F
		4/23/2018	2.91	0.16			µg/L	F
		7/30/2018	1.2	0.16			µg/L	F
		10/29/2018	0.72	0.16	J		µg/L	F
0601	Tritium	1/29/2018	7340	248			pCi/L	F
		7/30/2018	19000	316			pCi/L	F
0601	Turbidity	1/29/2018	10.6				NTU	F
		4/23/2018	44.1				NTU	F
		7/30/2018	484				NTU	F
		10/29/2018	999			>	NTU	F
0601	Vinyl chloride	1/29/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0602	*cis*-1,2-Dichloroethene	1/29/2018	6.16	0.16			µg/L	F
		4/23/2018	4.51	0.16			µg/L	F
		10/29/2018	1.95	0.16			µg/L	F
0602	Dissolved oxygen	1/29/2018	6.6				mg/L	F
		4/23/2018	6.46				mg/L	F
		10/29/2018	3.94				mg/L	F
0602	Oxidation–reduction potential	1/29/2018	71.6				mV	F
		4/23/2018	80.3				mV	F
		10/29/2018	–48.3				mV	F
0602	pH	1/29/2018	7.24				s.u.	F
		4/23/2018	7.3				s.u.	F
		10/29/2018	7.91				s.u.	F

Table D-3. Seep Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0602	Specific conductance	1/29/2018	1220				µmho/cm	F
		4/23/2018	1120				µmho/cm	F
		10/29/2018	1450				µmho/cm	F
0602	Temperature	1/29/2018	6.7				°C	F
		4/23/2018	12.5				°C	F
		10/29/2018	13.7				°C	F
0602	Tetrachloroethene	1/29/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0602	*trans*-1,2-Dichloroethene	1/29/2018	0.38	0.16	J		µg/L	F
		4/23/2018	0.31	0.16	J		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0602	Trichloroethene	1/29/2018	8.56	0.16			µg/L	F
		4/23/2018	4.06	0.16			µg/L	F
		10/29/2018	0.46	0.16	J		µg/L	F
0602	Tritium	1/29/2018	1490	254			pCi/L	F
0602	Turbidity	1/29/2018	25.9				NTU	F
		4/23/2018	83.1				NTU	F
		10/29/2018	154				NTU	F
0602	Vinyl chloride	1/29/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0605	*cis*-1,2-Dichloroethene	1/29/2018	0.16	0.16	U		µg/L	F
		4/23/2018	1.09	0.16			µg/L	F
		7/30/2018	0.96	0.16	J		µg/L	F
		10/29/2018	3.06	0.16			µg/L	F
0605	Dissolved oxygen	1/29/2018	2.03				mg/L	F
		4/23/2018	7.76				mg/L	F
		7/30/2018	7.13				mg/L	F
		10/29/2018	2.27				mg/L	F

Table D-3. Seep Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0605	Oxidation–reduction potential	1/29/2018	–11.2				mV	F
		4/23/2018	54				mV	F
		7/30/2018	–39.2				mV	F
		10/29/2018	–61.2				mV	F
0605	pH	1/29/2018	7.4				s.u.	F
		4/23/2018	7.34				s.u.	F
		7/30/2018	7.38				s.u.	F
		10/29/2018	7.45				s.u.	F
0605	Specific conductance	1/29/2018	2590				µmho/cm	F
		4/23/2018	1850				µmho/cm	F
		7/30/2018	1880				µmho/cm	F
		10/29/2018	1620				µmho/cm	F
0605	Temperature	1/29/2018	9				°C	F
		4/23/2018	9.8				°C	F
		7/30/2018	16.6				°C	F
		10/29/2018	11.8				°C	F
0605	Tetrachloroethene	1/29/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.34	0.16	J		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0605	*trans*-1,2-Dichloroethene	1/29/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0605	Trichloroethene	1/29/2018	0.3	0.16	J		µg/L	F
		4/23/2018	3.1	0.16			µg/L	F
		7/30/2018	1.08	0.16			µg/L	F
		10/29/2018	1.31	0.16			µg/L	F
0605	Tritium	1/29/2018	2690	252			pCi/L	F
		7/30/2018	4620	338			pCi/L	F

Table D-3. Seep Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0605	Turbidity	1/29/2018	999			>	NTU	F
		4/23/2018	505				NTU	F
		7/30/2018	212				NTU	F
		10/29/2018	999			>	NTU	F
0605	Vinyl chloride	1/29/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0606	*cis*-1,2-Dichloroethene	1/29/2018	1.32	0.16			µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0606	Dissolved oxygen	1/29/2018	10.73				mg/L	F
		4/23/2018	8.86				mg/L	F
		7/30/2018	7.26				mg/L	F
		10/29/2018	9.52				mg/L	F
0606	Oxidation–reduction potential	1/29/2018	18.8				mV	F
		4/23/2018	257.3				mV	F
		7/30/2018	116				mV	F
		10/29/2018	114.2				mV	F
0606	pH	1/29/2018	7.52				s.u.	F
		4/23/2018	7.43				s.u.	F
		7/30/2018	7.49				s.u.	F
		10/29/2018	7.5				s.u.	F
0606	Specific conductance	1/29/2018	1130				µmho/cm	F
		4/23/2018	1490				µmho/cm	F
		7/30/2018	1910				µmho/cm	F
		10/29/2018	1500				µmho/cm	F

Table D-3. Seep Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0606	Temperature	1/29/2018	5				°C	F
		4/23/2018	8.7				°C	F
		7/30/2018	19.1				°C	F
		10/29/2018	10.8				°C	F
0606	Tetrachloroethene	1/29/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0606	*trans*-1,2-Dichloroethene	1/29/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0606	Trichloroethene	1/29/2018	3.86	0.16			µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0606	Tritium	1/29/2018	1360	252			pCi/L	F
		7/30/2018	2870	333			pCi/L	F
0606	Turbidity	1/29/2018	999			>	NTU	F
		4/23/2018	882				NTU	F
		7/30/2018	1000			>	NTU	F
		10/29/2018	999			>	NTU	F
0606	Vinyl chloride	1/29/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0607	*cis*-1,2-Dichloroethene	1/29/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.51	0.16	J		µg/L	F
		7/30/2018	0.62	0.16	J		µg/L	F
		10/29/2018	0.42	0.16	J		µg/L	F

Table D-3. Seep Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0607	Dissolved oxygen	1/29/2018	8.05				mg/L	F
		4/23/2018	8.54				mg/L	F
		7/30/2018	9.06				mg/L	F
		10/29/2018	8.76				mg/L	F
0607	Oxidation–reduction potential	1/29/2018	113.3				mV	F
		4/23/2018	265.4				mV	F
		7/30/2018	88.1				mV	F
		10/29/2018	199.6				mV	F
0607	pH	1/29/2018	7.31				s.u.	F
		4/23/2018	7.14				s.u.	F
		7/30/2018	7.44				s.u.	F
		10/29/2018	7.05				s.u.	F
0607	Specific conductance	1/29/2018	2460				µmho/cm	F
		4/23/2018	1520				µmho/cm	F
		7/30/2018	1550				µmho/cm	F
		10/29/2018	1450				µmho/cm	F
0607	Temperature	1/29/2018	13				°C	F
		4/23/2018	11.5				°C	F
		7/30/2018	14.7				°C	F
		10/29/2018	15.3				°C	F
0607	Tetrachloroethene	1/29/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0607	*trans*-1,2-Dichloroethene	1/29/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F

Table D-3. Seep Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0607	Trichloroethene	1/29/2018	0.85	0.16	J		µg/L	F
		4/23/2018	1.3	0.16			µg/L	F
		7/30/2018	1.14	0.16			µg/L	F
		10/29/2018	0.51	0.16	J		µg/L	F
0607	Tritium	2/5/2018	2270	257			pCi/L	F
		7/30/2018	2370	326			pCi/L	F
0607	Turbidity	1/29/2018	24.5				NTU	F
		4/23/2018	23.7				NTU	F
		7/30/2018	25.1				NTU	F
		10/29/2018	34.6				NTU	F
0607	Vinyl chloride	1/29/2018	0.16	0.16	U		µg/L	F
		4/23/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
		10/29/2018	0.16	0.16	U		µg/L	F
0617	*cis*-1,2-Dichloroethene	1/29/2018	1.43	0.16			µg/L	F
		7/30/2018	1.41	0.16			µg/L	F
0617	Dissolved oxygen	1/29/2018	1.29				mg/L	F
		7/30/2018	6.71				mg/L	F
0617	Oxidation–reduction potential	1/29/2018	–24				mV	F
		7/30/2018	47.8				mV	F
0617	pH	1/29/2018	7.28				s.u.	F
		7/30/2018	6.88				s.u.	F
0617	Specific conductance	1/29/2018	1350				µmho/cm	F
		7/30/2018	1650				µmho/cm	F
0617	Temperature	1/29/2018	9				°C	F
		7/30/2018	18.7				°C	F
0617	Tetrachloroethene	1/29/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F
0617	*trans*-1,2-Dichloroethene	1/29/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F

Table D-3. Seep Data (continued)

Location	Analyte	Sample Date	Value	Detection Limit	Laboratory Qualifiers	Validation Qualifiers	Units	Sample Type
0617	Trichloroethene	1/29/2018	5.4	0.16			µg/L	F
		7/30/2018	5.99	0.16			µg/L	F
0617	Turbidity	1/29/2018	33.1				NTU	F
		7/30/2018	49.2				NTU	F
0617	Vinyl chloride	1/29/2018	0.16	0.16	U		µg/L	F
		7/30/2018	0.16	0.16	U		µg/L	F

Abbreviations:
J = estimated value
µg/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 E

Data Assessment Reports

NAVARRO

Contractor to the U.S. Department of Energy Office of Legacy Management

Data Review and Validation Report

General Information

Task ID:	MND01-01.1801001
Sample Event:	January 29-February 1, 2018
Site(s):	Mound LTS&M Groundwater (Parcel 6-7-8)
Laboratory:	GEL Laboratories, Charleston, South Carolina
Work Order No.:	442977
Analysis:	Organics and Radiochemistry
Validator:	Peter Steves
Review Date:	April 17, 2018

This validation was performed according to the “Standard Practice for Validation of Environmental Data” found in Appendix A of *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351, continually updated, http://energy.gov/lm/downloads/sampling-and-analysis-plan-us-department-energy-office-legacy-management-sites). The procedure was applied at Level 3, Data Validation.

All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 1.

Table 1. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Volatile Organics, VOA	VOA-A-007	SW-846 5030B	SW-846 8260 LL
Tritium	LSC-A-001	EPA 906.0 Modified	EPA 906.0 Modified

Data Qualifier Summary

Analytical results were qualified as listed in Table 2. Refer to the attached validation worksheets and the sections below for an explanation of the data qualifiers applied.

Table 2. Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
MND01-01.1801001-015	0605	Acetone	U	Less than 10 times the trip blank
MND01-01.1801001-007	0347	Hexachlorobutadiene	J	MS less than lower acceptance limit

Sample Number	Location	Analyte	Flag	Reason
MND01-01.1801001-008	0379	Tritium	J	Less than the determination limit

Sample Shipping/Receiving

GEL Laboratories in Charleston, South Carolina, received 21 water samples on February 02, 2018, accompanied by a Chain of Custody (COC) form. The air waybill number was listed on the Sample Receipt and Review Form. The COC form was checked to confirm that all of the samples were listed with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The COC forms were complete with no errors or omissions with the following exception:

- The original COC listed the wrong collection date for locations 0124, 0346, 0379, and 0999. The COC was hand corrected and re-submitted with all date times and signatures present and correct, with the exception of the received by signature was missing.

Preservation and Holding Times

The sample shipments were received intact with the temperature inside the iced cooler at 4 °C, which complies with requirements. All samples were analyzed within the applicable holding times. All samples were received in the correct container types and had been preserved correctly for the requested analyses with these exceptions:

- The tritium analysis for sample location 0346 could not be performed because the glass bottle for that aliquot was received broken.
- Headspace was noted in all containers for sample location 9347.

Detection and Quantitation Limits

The method detection limit (MDL) was reported for all organic analytes as required. The MDL, as defined in 40 CFR 136, is the minimum concentration of an analyte that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. The practical quantitation limit (PQL) for these analytes is the lowest concentration that can be reliably measured, and is defined as 5 times the MDL.

For radiochemical analytes (those measured by radiometric counting) the MDL and PQL are not applicable, and these results are evaluated using the minimum detectable concentration (MDC), the decision level concentration (DLC), and the determination limit (DL). The DLC is the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is estimated as 3 times the 1-sigma total propagated uncertainty. Results that are greater than the MDC but less than the DLC are qualified with a U flag as not detected. The DL for radiochemical results is the lowest concentration that can be reliably measured and is defined as 3 times the MDC. Results that were not previously U qualified and are less than the DL are qualified with a J flag as estimated values.

The reported MDLs and MDCs demonstrate compliance with contractual requirements.

Laboratory Instrument Calibration

Method requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for the analytes of interest. Initial calibration verification demonstrates that the instrument is capable of acceptable performance at the beginning of the analytical run. Continuing calibration verification demonstrates that the initial calibration is still valid by checking the performance of the instrument on a continuing basis. Initial and continuing calibration standards must be prepared from independent sources to ensure the validity of the calibration. All laboratory instrument calibrations and calibration verifications were performed correctly in accordance with the cited methods.

Method SW-846 8260 LL Volatile Organics, VOA

Initial calibration of instrument VOA2 was performed on January 8, 2018 using nine calibration standards. Calibration curves are established using linear regression, quadratic regression, or the average response factor approach. Calibrations using average response factors had relative standard deviations of less than 15 percent. Linear or higher order regression calibrations had correlation coefficient values greater than 0.99 and intercepts less than 3 times the MDL. Initial and continuing calibration verification checks were made at the required frequency. Some target compounds had percent drift values greater than 20 percent but were not detected at concentrations greater than the MDL. The mass spectrometer calibration and resolution was checked at the beginning of each analytical run in accordance with the procedure.

Radiochemical Analysis

Method EPA 906.0 Modified Tritium

Liquid scintillation calibrations for instrument MOCHA and SILVER were performed on June 11, 2017 and June 10, 2017. Calibrations resulted in quench curves covering a quench number range of 127 – 345 and 126 - 346. The sample quench values were all within the calibration range. Daily calibration checks were performed February 12–13, 2018 with acceptable results.

Volatiles Internal Standards and Surrogates

The volatile internal standard recoveries and surrogate recoveries were within the acceptance ranges for all samples.

Method Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. All method blank results associated with the samples were below the PQL for all analytes. In cases where a blank concentration exceeds or equals the MDL, the associated sample results are qualified with a U flag (not detected) when the sample result is greater than the MDL but less than 5 times the blank concentration.

Trip Blank

Trip blanks were prepared and analyzed to document contamination attributable to shipping and field handling procedures. This type of blank is useful in documenting contamination of volatile organic samples. Three trip blanks were submitted with these samples. Acetone was detected in the trip blanks. Associated sample acetone results that are less than ten times the blank concentration are qualified with a U flag as not detected.

Matrix Spike Analysis

Matrix spikes are aliquots of environmental samples to which a known concentration of analyte has been added before analysis. Matrix spike and matrix-spike duplicate (MS/MSD) analysis is used to assess the performance of the method by measuring the effects of interferences caused by the sample matrix and reflects the bias of the method for the particular matrix in question. The MS/MSD data are not evaluated when the concentration of the unspiked sample is greater than 4 times the spike. The spikes met the recovery and precision criteria for all analytes evaluated with the exception of hexachlorobutadiene. The associated result is qualified with a J flag as an estimated value.

Laboratory Replicate Analysis

Laboratory replicate analyses are used to determine laboratory precision for each sample matrix. The relative percent difference for non-radiochemical replicate results that are greater than 5 times the PQL should be less than 20 percent. For results that are less than 5 times the PQL, the range should be no greater than the PQL. For the radiochemistry analyses, a laboratory control sample duplicate was analyzed in lieu of a sample duplicate, which is acceptable. The relative error ratio for radiochemical replicate results (calculated using the one-sigma total propagated uncertainty) should be less than 3, indicating acceptable precision. The replicate results met these criteria.

Laboratory Control Sample

Laboratory control samples were analyzed at the correct frequency to provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. All control sample results were acceptable.

Field Duplicate

Field duplicate samples are collected and analyzed as an indication of overall precision of the measurement process. The precision observed includes both field and laboratory precision and has more variability than laboratory duplicates, which measure only laboratory performance. A duplicate sample was collected from location 0347. The relative percent difference for duplicate results that are greater than 5 times the PQL should be less than 20 percent. For results that are less than 5 times the PQL, the range should be no greater than the PQL. For radiochemical measurements, the relative error ratio (the ratio of the absolute difference between the sample and duplicate results and the sum of the 1-sigma uncertainties) is used to evaluate duplicate results and should be less than 3. The duplicate results met the criteria.

Completeness

Results were reported in the correct units for all analytes requested using contract-required laboratory qualifiers. The analytical report included the MDL (MDC for radiochemistry) and PQL for all analytes and all required supporting documentation.

Electronic Data Deliverable (EDD) File

The EDD file arrived on March 1, 2018. The Sample Management System EDD validation module was used to verify that the EDD file was complete and in compliance with requirements. The module compares the contents of the file to the requested analyses to ensure all and only the requested data are delivered. The contents of the EDD were manually examined to verify that the sample results accurately reflect the data contained in the sample data package.

Potential Outliers

Potential outliers are results that lie outside the historical range, possibly due to transcription errors, data calculation errors, or measurement system problems. However, outliers can also represent true values outside the historical range. Potential outliers are identified by generating the Data Validation Outliers Report from data in the environmental database. The new data are compared to historical values and data that fall outside the historical data range are listed on the report along with the historical minimum and maximum values. The potential outliers are further reviewed and may be subject to statistical evaluation using the ProUCL application developed by the EPA (https://www.epa.gov/land-research/proucl-software). The review also includes an evaluation of any notable trends in the data that may indicate the outliers represent true extreme values.

There were no outliers identified and the data for this task are acceptable as qualified.

Leslie P. Steves
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Report Prepared By: ______________________________

Peter Steves
Data Validator

Data Validation Outliers Report - No Field Parameters **Report Date: 04/18/2018**

Comparison to Historical Data Since: 4/18/2007 12:00:00 AM Fraction: Any

Task: MND01-01.1801001

Analyte	Location	Analysis Location	Units	Fraction	Result	Lab Qualifier(s)	Type	HistMIN	HistMAX	HistSetSize	Outlier?
Tritium	0602	LB	pCi/L	N	1490		< HistMIN	4110	45100	19	No
Tritium	0605	LB	pCi/L	N	2690		< HistMIN	4410	33400	30	No
Trichloroethene	0605	LB	ug/L	N	0.300	J	< HistMIN	6.22	24.7	42	No
Tritium	0606	LB	pCi/L	N	1360		< HistMIN	2480	14600	20	No
Trichloroethene	0607	LB	ug/L	N	0.850	J	< HistMIN	2.74	13	43	No

FRACTION: D = Dissolved N = NA T = Total

General Data Validation Report

Page 1 of 1

Task Code: MND01-01.1801001 **Lab Code:** GEN **Validator:** Peter Steves **Validation Date:** 04-18-2018

Project: LTS&M (Parcel 6-7-8) **# Samples:** 21

Analysis Type: ☐ General Chemistry ☐ Metals ☒ Organics ☒ Radiochemistry

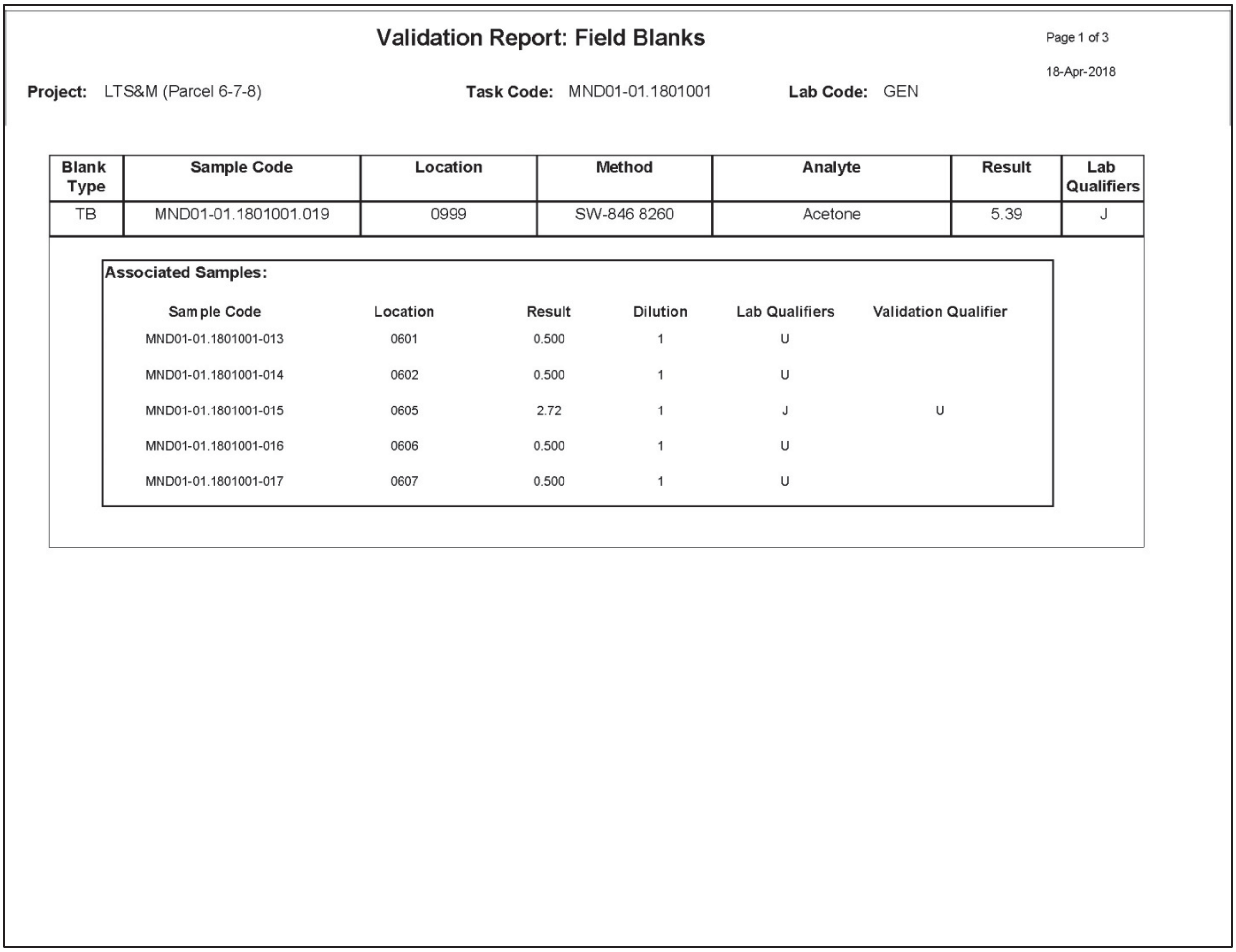
Chain of Custody

Present: OK Signed: OK Dated: OK

Sample

Integrity: OK Preservation OK Temperature: OK

Check	Summary
Holding Times:	All analyses were completed within the applicable holding times.
Detection Limits:	The reported detection limits are equal to or below the contract required limits.
Field Blanks:	There were 3 field blanks associated with this task.
Field Duplicates:	There was 1 duplicate evaluated.



Validation Report: Field Blanks

Page 1 of 3

18-Apr-2018

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1801001 **Lab Code:** GEN

Blank Type	Sample Code	Location	Method	Analyte	Result	Lab Qualifiers
TB	MND01-01.1801001.019	0999	SW-846 8260	Acetone	5.39	J

Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier
MND01-01.1801001-013	0601	0.500	1	U	
MND01-01.1801001-014	0602	0.500	1	U	
MND01-01.1801001-015	0605	2.72	1	J	U
MND01-01.1801001-016	0606	0.500	1	U	
MND01-01.1801001-017	0607	0.500	1	U	

Validation Report: Field Blanks

18-Apr-2018

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1801001 **Lab Code:** GEN

TB	MND01-01.1801001.020	0999	SW-846 8260	Acetone	5.88	J

Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier
MND01-01.1801001-002	0124	0.500	1	U	
MND01-01.1801001-006	0346	0.500	1	U	
MND01-01.1801001-008	0379	0.500	1	U	

Validation Report: Field Blanks

Page 3 of 3

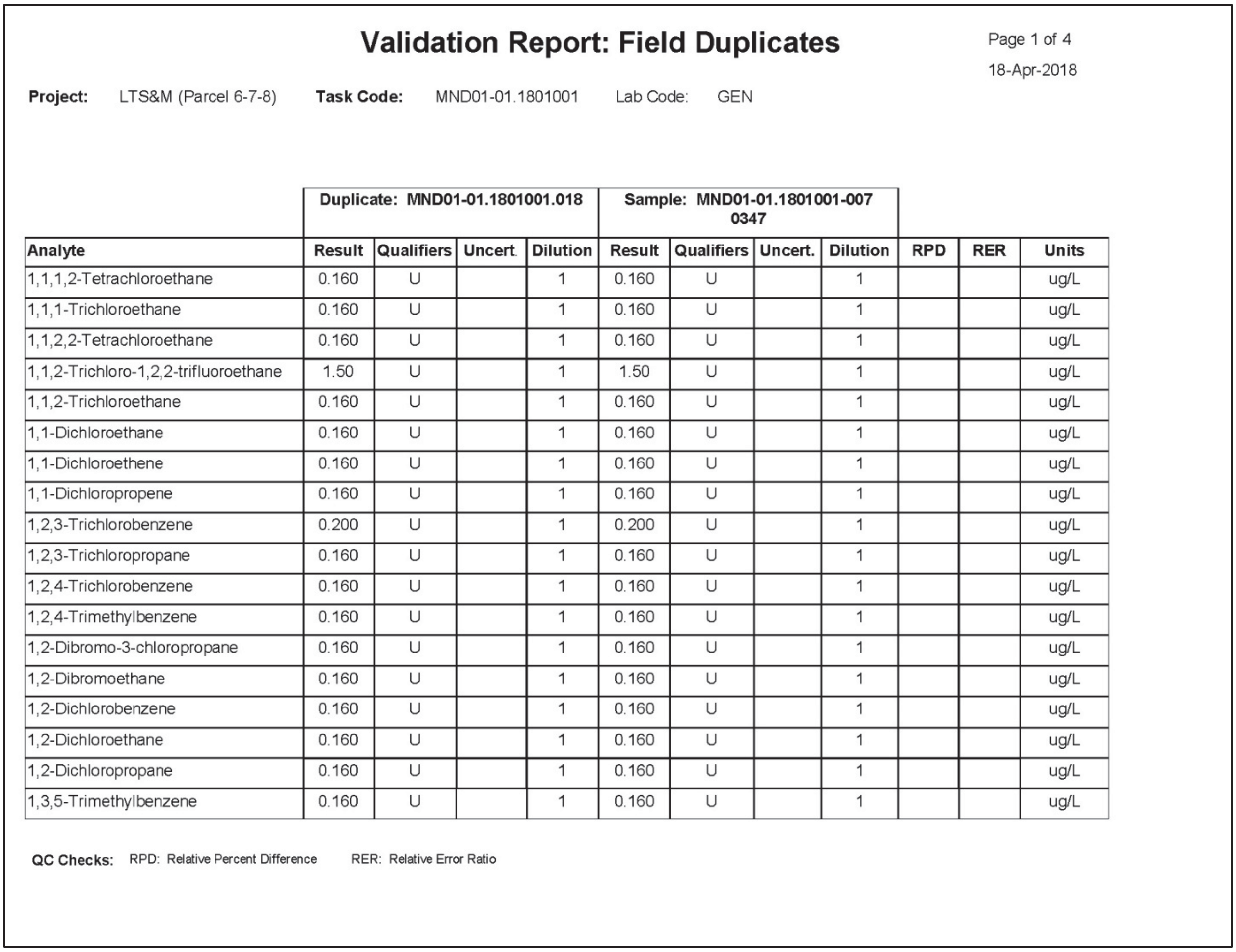
18-Apr-2018

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1801001 **Lab Code:** GEN

TB	MND01-01.1801001.021	0999	SW-846 8260	Acetone	5.12	J

Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier
MND01-01.1801001.018	0347	0.500	1	U	U
MND01-01.1801001-001	0118	0.500	1	U	
MND01-01.1801001-003	0126	0.500	1	U	
MND01-01.1801001-004	0138	0.500	1	U	
MND01-01.1801001-005	0315	0.500	1	U	
MND01-01.1801001-007	0347	0.500	1	U	
MND01-01.1801001-009	0386	0.500	1	U	
MND01-01.1801001-010	0387	0.500	1	U	
MND01-01.1801001-011	0389	0.500	1	U	
MND01-01.1801001-012	0392	0.500	1	U	



Validation Report: Field Duplicates

Page 1 of 4
18-Apr-2018

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1801001 Lab Code: GEN

	Duplicate: MND01-01.1801001.018				**Sample: MND01-01.1801001-007 0347**						
Analyte	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**RPD**	**RER**	**Units**
1,1,1,2-Tetrachloroethane	0.160	U		1	0.160	U		1			ug/L
1,1,1-Trichloroethane	0.160	U		1	0.160	U		1			ug/L
1,1,2,2-Tetrachloroethane	0.160	U		1	0.160	U		1			ug/L
1,1,2-Trichloro-1,2,2-trifluoroethane	1.50	U		1	1.50	U		1			ug/L
1,1,2-Trichloroethane	0.160	U		1	0.160	U		1			ug/L
1,1-Dichloroethane	0.160	U		1	0.160	U		1			ug/L
1,1-Dichloroethene	0.160	U		1	0.160	U		1			ug/L
1,1-Dichloropropene	0.160	U		1	0.160	U		1			ug/L
1,2,3-Trichlorobenzene	0.200	U		1	0.200	U		1			ug/L
1,2,3-Trichloropropane	0.160	U		1	0.160	U		1			ug/L
1,2,4-Trichlorobenzene	0.160	U		1	0.160	U		1			ug/L
1,2,4-Trimethylbenzene	0.160	U		1	0.160	U		1			ug/L
1,2-Dibromo-3-chloropropane	0.160	U		1	0.160	U		1			ug/L
1,2-Dibromoethane	0.160	U		1	0.160	U		1			ug/L
1,2-Dichlorobenzene	0.160	U		1	0.160	U		1			ug/L
1,2-Dichloroethane	0.160	U		1	0.160	U		1			ug/L
1,2-Dichloropropane	0.160	U		1	0.160	U		1			ug/L
1,3,5-Trimethylbenzene	0.160	U		1	0.160	U		1			ug/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio

Validation Report: Field Duplicates

Page 2 of 4

18-Apr-2018

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1801001 Lab Code: GEN

	Duplicate: MND01-01.1801001.018				**Sample: MND01-01.1801001-007 0347**						
Analyte	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**RPD**	**RER**	**Units**
1,3-Dichlorobenzene	0.160	U		1	0.160	U		1			ug/L
1,3-Dichloropropane	0.160	U		1	0.160	U		1			ug/L
1,4-Dichlorobenzene	0.160	U		1	0.160	U		1			ug/L
2,2-Dichloropropane	0.160	U		1	0.160	U		1			ug/L
2-Butanone	0.500	U		1	0.500	U		1			ug/L
2-Chlorotoluene	0.160	U		1	0.160	U		1			ug/L
2-Hexanone	0.500	U		1	0.500	U		1			ug/L
4-Chlorotoluene	0.160	U		1	0.160	U		1			ug/L
4-Methyl-2-Pentanone	0.500	U		1	0.500	U		1			ug/L
Acetone	0.500	U		1	0.500	U		1			ug/L
Benzene	0.160	U		1	0.160	U		1			ug/L
Bromobenzene	0.160	U		1	0.160	U		1			ug/L
Bromochloromethane	0.160	U		1	0.160	U		1			ug/L
Bromodichloromethane	0.160	U		1	0.160	U		1			ug/L
Bromoform	0.160	U		1	0.160	U		1			ug/L
Bromomethane	0.160	U		1	0.160	U		1			ug/L
Carbon Disulfide	0.500	U		1	0.500	U		1			ug/L
Carbon tetrachloride	1.47			1	1.54			1	4.7		ug/L
Chlorobenzene	0.160	U		1	0.160	U		1			ug/L
Chlorodibromomethane	0.160	U		1	0.160	U		1			ug/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio

19-Apr-2018

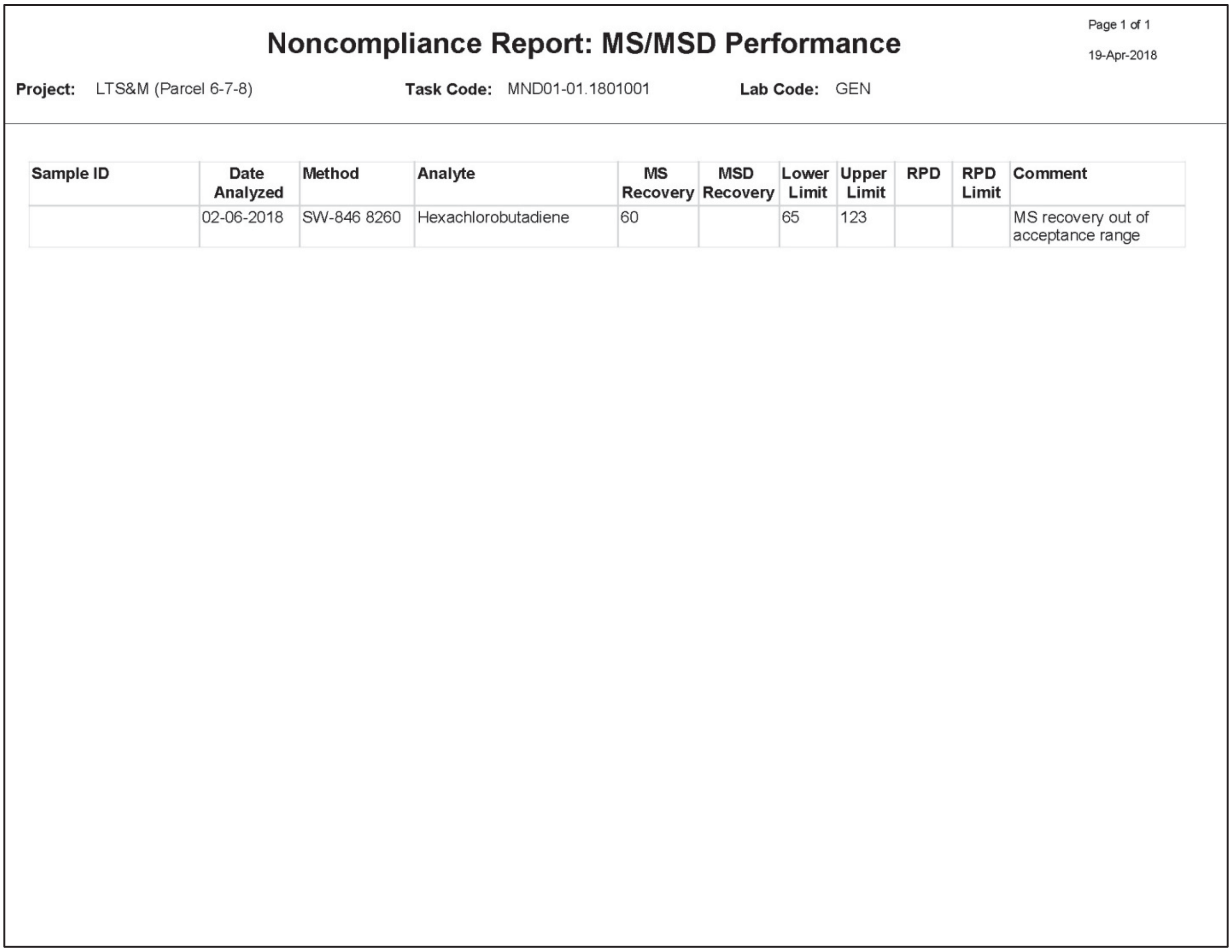
Organics Data Validation Summary

Project: LTS&M (Parcel 6-7-8)

Task Code: MND01-01.1801001

Lab Code: GEN

Surrogate Recovery:	All surrogate recoveries were within the laboratory acceptance limits.
LCS/LCSD Performance:	All LCS/LCSD results were within the laboratory acceptance limits.
MS/MSD Performance:	There was 1 MS/MSD result outside the laboratory acceptance limits.
Method Blank Performance:	All method blanks were below the MDL.



Page 1 of 1

Noncompliance Report: MS/MSD Performance

19-Apr-2018

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1801001 **Lab Code:** GEN

Sample ID	Date Analyzed	Method	Analyte	MS Recovery	MSD Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	Comment
	02-06-2018	SW-846 8260	Hexachlorobutadiene	60		65	123			MS recovery out of acceptance range

Radiochemistry Data Validation Worksheet

Page 1 of 1

19-Apr-2018

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1801001 **Lab Code:** GEN

Sample ID	Analyte	Analysis Date	QC Type	Result Type	Result	Flag	TPU	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	RER	Comments
	Tritium	02-12-2018	MS	SC	5980		1270	94.8		75	125				
	Tritium	02-13-2018	R	TRG	1190		303					10.2	100		

QC Types: LCS: Laboratory Control Sample LCSD: Laboratory Control Sample Duplicate MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

Result Types: IS: Internal Standard SC: Spike Analyte TRG: Target analyte

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio TPU: Total Propagated Uncertainty

NAVARRO

Contractor to the U.S. Department of Energy Office of Legacy Management

Data Review and Validation Report

General Information

Task ID:	MND01-01.1802002
Sample Event:	February 5 and 8, 2018
Site(s):	LTS&M (Parcel 6-7-8)
Laboratory:	GEL Laboratories, Charleston, South Carolina
Work Order No.:	443140
Analysis:	Radiochemistry
Validator:	Peter Steves
Review Date:	April 20, 2018

This validation was performed according to the "Standard Practice for Validation of Environmental Data" found in Appendix A of *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351, continually updated, http://energy.gov/lm/downloads/sampling-and-analysis-plan-us-department-energy-office-legacy-management-sites). The procedure was applied at Level 3, Data Validation.

This validation includes the evaluation of data quality indicators (DQIs) associated with the data. DQIs are the quantitative and qualitative descriptors that are used to interpret the degree of acceptability or utility of data. Indicators of data quality include the analysis of laboratory control samples to assess accuracy; duplicates and replicates to assess precision; and interference check samples to assess bias (see attached Data Validation Worksheets). The comparability, completeness, and sensitivity of the data are also evaluated in the sections to follow.

All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 1.

Table 1. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Tritium	LSC-A-001	EPA 906.0 Modified	EPA 906.0 Modified

Data Qualifier Summary

Analytical results were qualified as listed in Table 2. Refer to the attached validation worksheets and the sections below for an explanation of the data qualifiers applied.

Table 2. Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
MND01-01.1802002-006	346	Tritium	J	Less than 3 times MDC

Sample Shipping/Receiving

GEL Laboratories in Charleston, South Carolina, received 2 water samples on February 06 and 09, 2018, accompanied by Chain of Custody (COC) forms. The air waybill numbers were listed on the Sample Receipt and Review Form. The COC forms were checked to confirm that all of the samples were listed with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The COC forms were complete with no errors or omissions.

Preservation and Holding Times

The sample shipments were received intact with the temperature inside the iced coolers between 1 and 4 °C, which complies with requirements. All samples were analyzed within the applicable holding times. All samples were received in the correct container types and had been preserved correctly for the requested analyses.

Detection and Quantitation Limits

For radiochemical analytes (those measured by radiometric counting) the MDL and PQL are not applicable, and these results are evaluated using the minimum detectable concentration (MDC), the decision level concentration (DLC), and the determination limit (DL). The DLC is the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is estimated as 3 times the 1-sigma total propagated uncertainty. Results that are greater than the MDC but less than the DLC are qualified with a U flag as not detected. The DL for radiochemical results is the lowest concentration that can be reliably measured and is defined as 3 times the MDC. Results that were not previously U qualified and are less than the DL are qualified with a J flag as estimated values.

The reported MDLs and MDCs demonstrate compliance with contractual requirements.

Laboratory Instrument Calibration

Method requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for the analytes of interest. Initial calibration verification demonstrates that the instrument is capable of acceptable performance at the beginning of the analytical run. Continuing calibration verification demonstrates that the initial calibration is still valid by checking the performance of the instrument on a continuing basis. Initial and continuing calibration standards must be prepared from independent sources to ensure the validity of the calibration. All laboratory instrument

calibrations and calibration verifications were performed correctly in accordance with the cited methods.

Radiochemical Analysis

Method EPA 906.0 Modified Tritium

Liquid scintillation calibrations for instrument MOCHA and SILVER were performed on June 11, 2017 and June 10, 2017. Calibrations resulted in quench curves covering a quench number range of 127 – 345 and 126 - 346. The sample quench values were all within the calibration range. Daily calibration checks were performed February 12, 13 and 24, 2018 with acceptable results.

Matrix Spike Analysis

Matrix spikes are aliquots of environmental samples to which a known concentration of analyte has been added before analysis. Matrix spike and matrix-spike duplicate (MS/MSD) analysis is used to assess the performance of the method by measuring the effects of interferences caused by the sample matrix and reflects the bias of the method for the particular matrix in question. The MS/MSD data are not evaluated when the concentration of the unspiked sample is greater than 4 times the spike. The spikes met the recovery and precision criteria for all analytes evaluated.

Laboratory Replicate Analysis

Laboratory replicate analyses are used to determine laboratory precision for each sample matrix. The relative percent difference for non-radiochemical replicate results that are greater than 5 times the PQL should be less than 20 percent. For results that are less than 5 times the PQL, the range should be no greater than the PQL. For the radiochemistry analyses, a laboratory control sample duplicate was analyzed in lieu of a sample duplicate, which is acceptable. The relative error ratio for radiochemical replicate results (calculated using the one-sigma total propagated uncertainty) should be less than 3, indicating acceptable precision. The replicate results met these criteria.

Laboratory Control Sample

Laboratory control samples were analyzed at the correct frequency to provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. All control sample results were acceptable.

Completeness

Results were reported in the correct units for all analytes requested using contract-required laboratory qualifiers. The analytical report included the MDL (MDC for radiochemistry) and PQL for all analytes and all required supporting documentation.

Electronic Data Deliverable (EDD) File

The EDD file arrived on March 21, 2018. The Sample Management System EDD validation module was used to verify that the EDD file was complete and in compliance with requirements. The module compares the contents of the file to the requested analyses to ensure all and only the requested data are delivered. The contents of the EDD were manually examined to verify that the sample results accurately reflect the data contained in the sample data package.

Potential Outliers

Potential outliers are results that lie outside the historical range, possibly due to transcription errors, data calculation errors, or measurement system problems. However, outliers can also represent true values outside the historical range. Potential outliers are identified by generating the Data Validation Outliers Report from data in the environmental database. The new data are compared to historical values and data that fall outside the historical data range are listed on the report along with the historical minimum and maximum values. The potential outliers are further reviewed and may be subject to statistical evaluation using the ProUCL application developed by the EPA (https://www.epa.gov/land-research/proucl-software). The review also includes an evaluation of any notable trends in the data that may indicate the outliers represent true extreme values.

There were no outliers identified and the data for this Task are acceptable as qualified.

Leslie P. Steves
2018.07.23
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Report Prepared By: ____
Peter Steves
Data Validator

General Data Validation Report

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Task Code: MND01-01.1802002 **Lab Code:** GEN **Validator:** Peter Steves **Validation Date:** 04-20-2018

Project: LTS&M (Parcel 6-7-8) **# Samples:** 2

Analysis Type: ☐ General Chemistry ☐ Metals ☐ Organics ☒ Radiochemistry

Chain of Custody

Present: OK Signed: OK Dated: OK

Sample

Integrity: OK Preservation OK Temperature: OK

Check	Summary
Holding Times:	All analyses were completed within the applicable holding times.
Detection Limits:	The reported detection limits are equal to or below the contract required limits.
Field Duplicates:	There are no duplicates associated with this task.

Radiochemistry Data Validation Worksheet

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20-Apr-2018

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1802002 **Lab Code:** GEN

Sample ID	Analyte	Analysis Date	QC Type	Result Type	Result	Flag	TPU	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	RER	Comments
	Tritium	02-12-2018	LCS	SC	2610		566	101		75	125				
	Tritium	02-12-2018	MB	TRG	72.6	U	165								
	Tritium	02-24-2018	LCS	SC	2570		673	99.9		75	125				
	Tritium	02-24-2018	MB	TRG	-112	U	136								
	Tritium	02-24-2018	MS	SC	2550		663	84		75	125				
	Tritium	02-24-2018	R	TRG	452		187					17.9	100		

QC Types: LCS: Laboratory Control Sample LCSD: Laboratory Control Sample Duplicate MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

Result Types: IS: Internal Standard SC: Spike Analyte TRG: Target analyte

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio TPU: Total Propagated Uncertainty

NAVARRO

Contractor to the U.S. Department of Energy Office of Legacy Management

Data Review and Validation Report

General Information

Task ID:	MND01-01.1804003
Sample Event:	April 23-25, 2018
Site(s):	Mound LTS&M Groundwater (Parcel 6-7-8)
Laboratory:	GEL Laboratories, Charleston, South Carolina
Work Order No.:	448883
Analysis:	Organics
Validator:	Steve Donivan
Review Date:	July 23, 2018

This validation was performed according to the *Environmental Data Validation Procedure* (LMS/PRO/S15870). The procedure was applied at Level 3, Data Validation.

All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 1.

Table 1. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Volatile Organics, VOA	VOA-A-007	SW-846 5030B	SW-846 8260 LL

Data Qualifier Summary

Analytical results were qualified as listed in Table 2. Refer to the attached validation worksheets and the sections below for an explanation of the data qualifiers applied.

Table 2. Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
MND01-01.1804003-012	0392	Bromochloromethane	J	Matrix spike recovery
MND01-01.1804003-014	0602	Acetone	U	Less than 10 times the trip blank
MND01-01.1804003-021	Trip blank	Acetone	J	Calibration drift

Sample Shipping/Receiving

GEL Laboratories in Charleston, South Carolina, received 21 water samples on April 26, 2018, accompanied by a Chain of Custody (COC) form. The air waybill number was listed on the Sample Receipt and Review Form. The COC form was checked to confirm that all of the samples were listed with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The COC forms were complete with no errors or omissions .

Preservation and Holding Times

The sample shipments were received intact with the temperature inside the iced cooler at 4 °C, which complies with requirements. All samples were analyzed within the applicable holding times. All samples were received in the correct container types and had been preserved correctly for the requested analyses.

Detection and Quantitation Limits

The method detection limit (MDL) was reported for all organic analytes as required. The MDL, as defined in 40 CFR 136, is the minimum concentration of an analyte that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. The practical quantitation limit (PQL) for these analytes is the lowest concentration that can be reliably measured, and is defined as 5 times the MDL. The reported MDLs demonstrate compliance with contractual requirements.

Laboratory Instrument Calibration

Method requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for the analytes of interest. Initial calibration verification demonstrates that the instrument is capable of acceptable performance at the beginning of the analytical run. Continuing calibration verification demonstrates that the initial calibration is still valid by checking the performance of the instrument on a continuing basis. Initial and continuing calibration standards must be prepared from independent sources to ensure the validity of the calibration. All laboratory instrument calibrations and calibration verifications were performed correctly in accordance with the cited methods.

Method SW-846 8260 LL Volatile Organics, VOA

Initial calibration of instrument VOA2 was performed on April 26, 2018 using nine calibration standards. Calibration curves are established using linear regression, quadratic regression, or the average response factor approach. Calibrations using average response factors had relative standard deviations of less than 15 percent. Linear or higher order regression calibrations had correlation coefficient values greater than 0.99 and intercepts less than 3 times the MDL. Initial and continuing calibration verification checks were made at the required frequency. Some target compounds had percent drift values greater than 20 percent. Associated sample results that are greater than the MDL are qualified with a “J” flag as estimated values. The mass spectrometer calibration and resolution was checked at the beginning of each analytical run in accordance with the procedure.

Volatiles Internal Standards and Surrogates

The volatile internal standard recoveries and surrogate recoveries were within the acceptance ranges for all samples.

Method Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. All method blank results associated with the samples were below the PQL for all analytes. In cases where a blank concentration exceeds or equals the MDL, the associated sample results are qualified with a U flag (not detected) when the sample result is greater than the MDL but less than 5 times the blank concentration.

Trip Blank

Trip blanks were prepared and analyzed to document contamination attributable to shipping and field handling procedures. This type of blank is useful in documenting contamination of volatile organic samples. Three trip blanks were submitted with these samples. Acetone was detected in the trip blanks. Associated sample acetone results that are less than ten times the blank concentration are qualified with a U flag as not detected.

Matrix Spike Analysis

Matrix spikes are aliquots of environmental samples to which a known concentration of analyte has been added before analysis. Matrix spike and matrix-spike duplicate (MS/MSD) analysis is used to assess the performance of the method by measuring the effects of interferences caused by the sample matrix and reflects the bias of the method for the particular matrix in question. The MS/MSD data are not evaluated when the concentration of the unspiked sample is greater than 4 times the spike. The spikes met the recovery and precision criteria for all analytes evaluated with the exception of bromochloromethane. The associated result is qualified with a J flag as an estimated value.

Laboratory Replicate Analysis

Laboratory replicate analyses are used to determine laboratory precision for each sample matrix. The relative percent difference for non-radiochemical replicate results that are greater than 5 times the PQL should be less than 20 percent. For results that are less than 5 times the PQL, the range should be no greater than the PQL. For the radiochemistry analyses, a laboratory control sample duplicate was analyzed in lieu of a sample duplicate, which is acceptable. The relative error ratio for radiochemical replicate results (calculated using the one-sigma total propagated uncertainty) should be less than 3, indicating acceptable precision. The replicate results met these criteria.

Laboratory Control Sample

Laboratory control samples were analyzed at the correct frequency to provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. All control sample results were acceptable.

Field Duplicate

Field duplicate samples are collected and analyzed as an indication of overall precision of the measurement process. The precision observed includes both field and laboratory precision and has more variability than laboratory duplicates, which measure only laboratory performance. A duplicate sample was collected from location 0392. The relative percent difference for duplicate results that are greater than 5 times the PQL should be less than 20 percent. For results that are less than 5 times the PQL, the range should be no greater than the PQL. The duplicate results met the criteria.

Completeness

Results were reported in the correct units for all analytes requested using contract-required laboratory qualifiers. The analytical report included the MDL (MDC for radiochemistry) and PQL for all analytes and all required supporting documentation.

Electronic Data Deliverable (EDD) File

The EDD file arrived on May 23, 2018. The EDD was examined to verify that the file was complete and in compliance with requirements. The contents of the files were compared to the requested analyses to ensure all and only the requested data are delivered. The contents of the EDDs were manually examined to verify that the sample results accurately reflect the data contained in the sample data package.

Potential Outliers

Potential outliers are results that lie outside the historical range, possibly due to transcription errors, data calculation errors, or measurement system problems. However, outliers can also represent true values outside the historical range. Potential outliers are identified by generating the Data Validation Outliers Report from data in the environmental database. The new data are compared to historical values and data that fall outside the historical data range are listed on the report along with the historical minimum and maximum values. The potential outliers are further reviewed and may be subject to statistical evaluation using the ProUCL application developed by the EPA (https://www.epa.gov/land-research/proucl-software). The review also includes an evaluation of any notable trends in the data that may indicate the outliers represent true extreme values.

There were no outliers identified and the data for this task are acceptable as qualified.

Stephen Donivan

STEPHEN DONIVAN
(Affiliate)
2018.07.23 12:03:31
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Report Prepared By: ______________________________

Stephen Donivan
Laboratory Coordinator

General Data Validation Report

Task Code: MND01-01.1804003 **Lab Code:** GEN **Validator:** Stephen Donivan **Validation Date:** 07-23-2018

Project: LTS&M (Parcel 6-7-8) **# Samples:** 21

Analysis Type: ☐ General Chemistry ☐ Metals ☒ Organics ☐ Radiochemistry

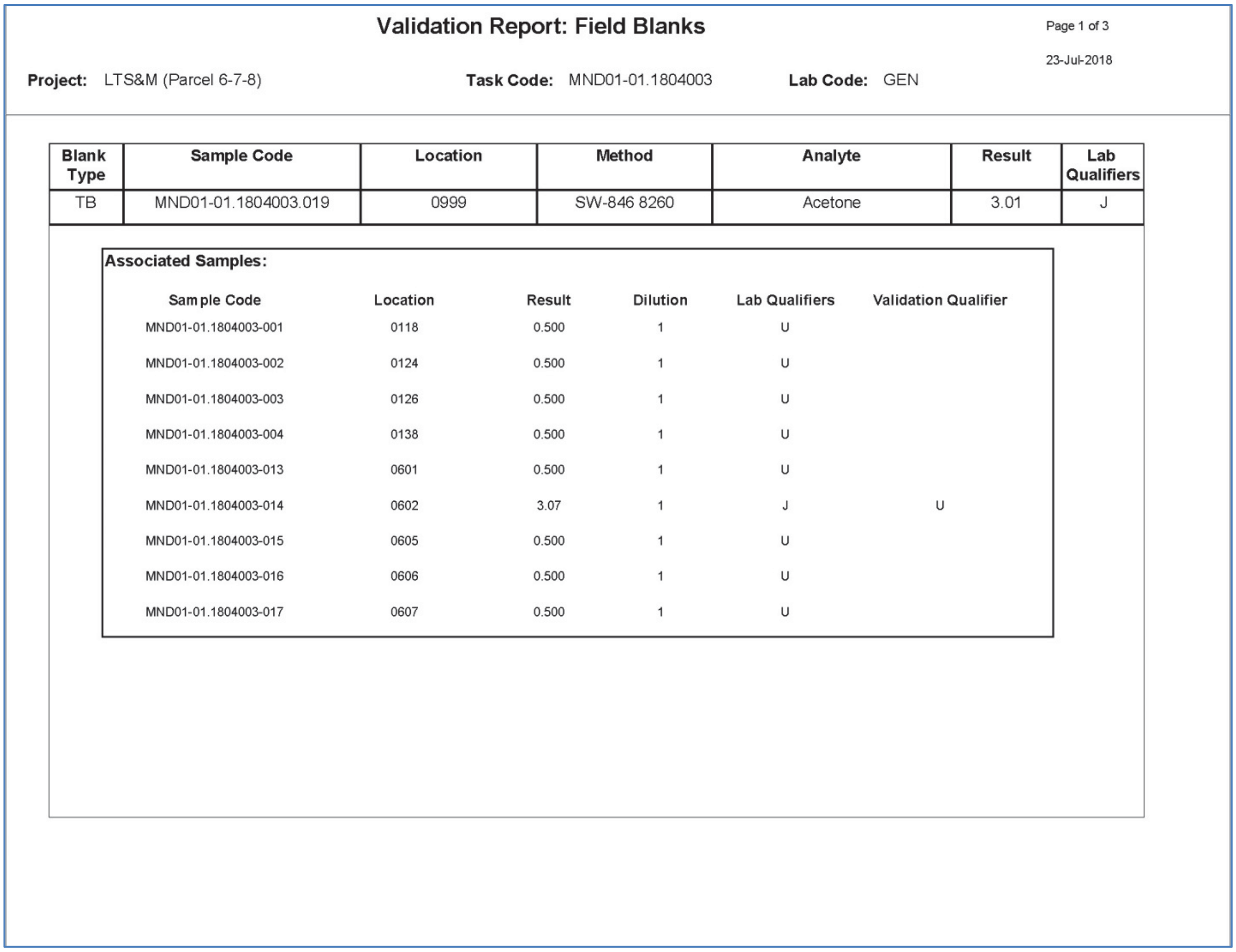
Chain of Custody

Present: OK Signed: OK Dated: OK

Sample

Integrity: OK Preservation OK Temperature: OK

Check	**Summary**
Holding Times:	All analyses were completed within the applicable holding times.
Detection Limits:	The reported detection limits are equal to or below the contract required limits.
Field Blanks:	There were 3 field blanks associated with this task.
Field Duplicates:	There was 1 duplicate evaluated.



Validation Report: Field Blanks

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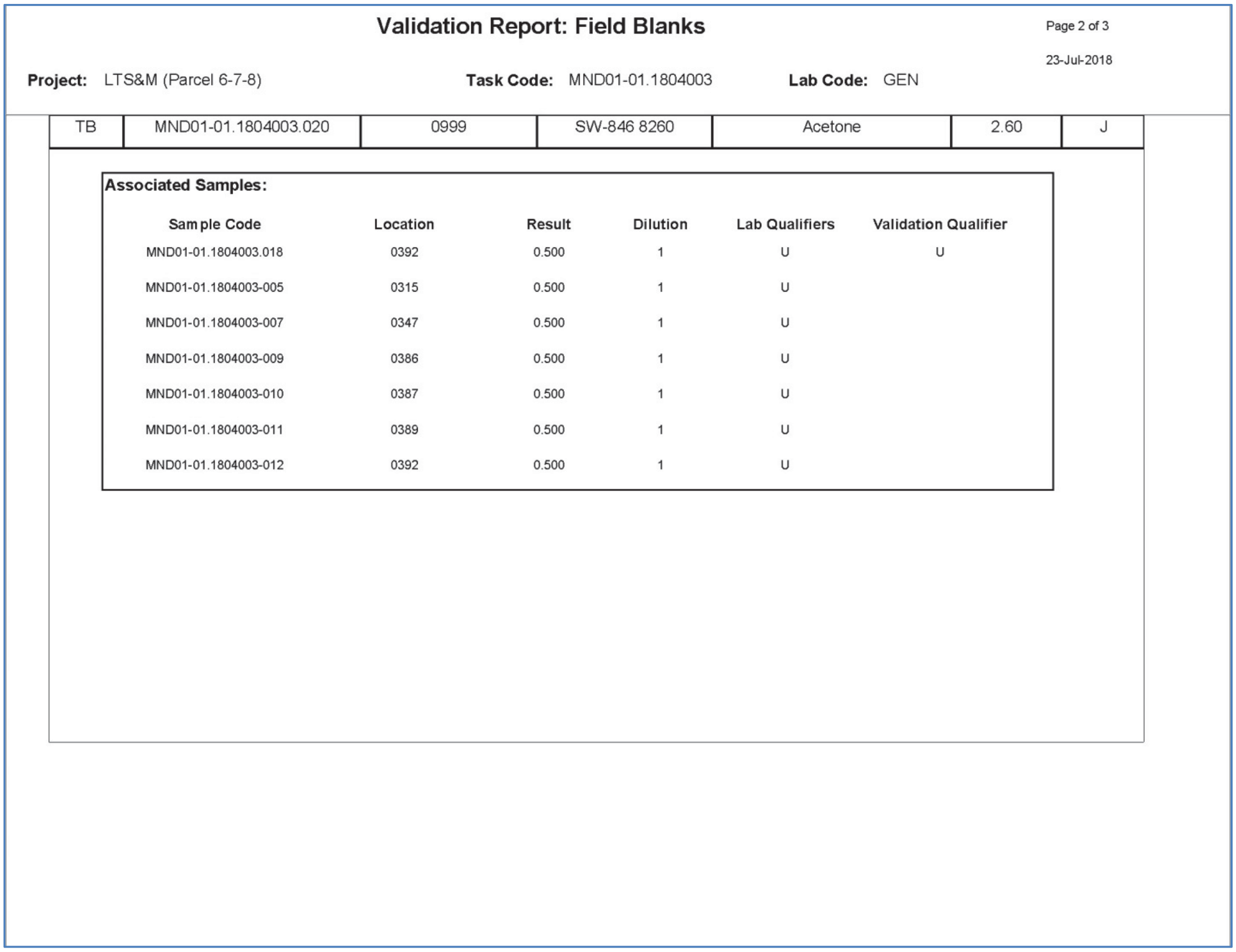
23-Jul-2018

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1804003 **Lab Code:** GEN

Blank Type	Sample Code	Location	Method	Analyte	Result	Lab Qualifiers
TB	MND01-01.1804003.019	0999	SW-846 8260	Acetone	3.01	J

Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier
MND01-01.1804003-001	0118	0.500	1	U	
MND01-01.1804003-002	0124	0.500	1	U	
MND01-01.1804003-003	0126	0.500	1	U	
MND01-01.1804003-004	0138	0.500	1	U	
MND01-01.1804003-013	0601	0.500	1	U	
MND01-01.1804003-014	0602	3.07	1	J	U
MND01-01.1804003-015	0605	0.500	1	U	
MND01-01.1804003-016	0606	0.500	1	U	
MND01-01.1804003-017	0607	0.500	1	U	



Validation Report: Field Blanks

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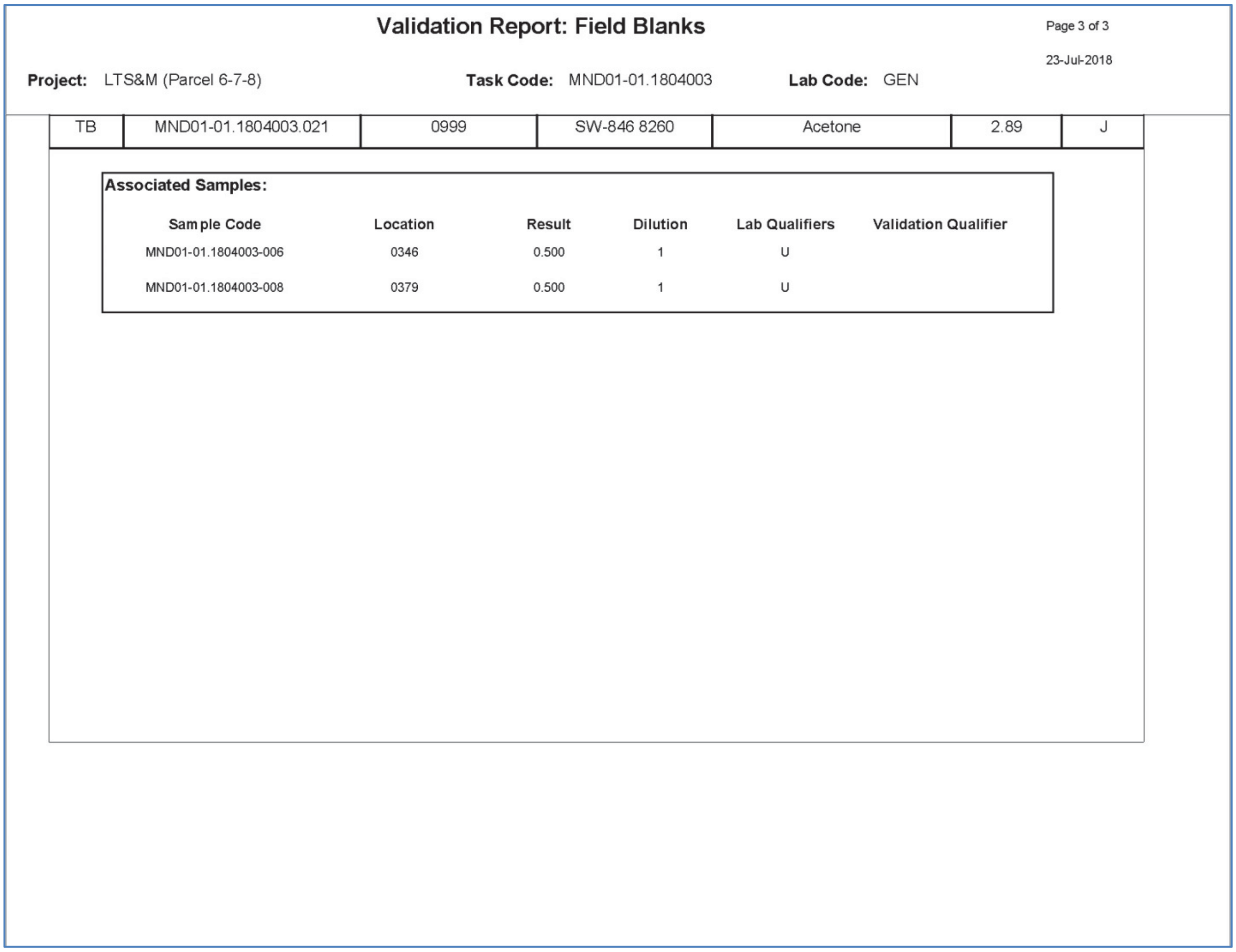
23-Jul-2018

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1804003 **Lab Code:** GEN

TB	MND01-01.1804003.020	0999	SW-846 8260	Acetone	2.60	J

Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier
MND01-01.1804003.018	0392	0.500	1	U	U
MND01-01.1804003-005	0315	0.500	1	U	
MND01-01.1804003-007	0347	0.500	1	U	
MND01-01.1804003-009	0386	0.500	1	U	
MND01-01.1804003-010	0387	0.500	1	U	
MND01-01.1804003-011	0389	0.500	1	U	
MND01-01.1804003-012	0392	0.500	1	U	



Validation Report: Field Blanks

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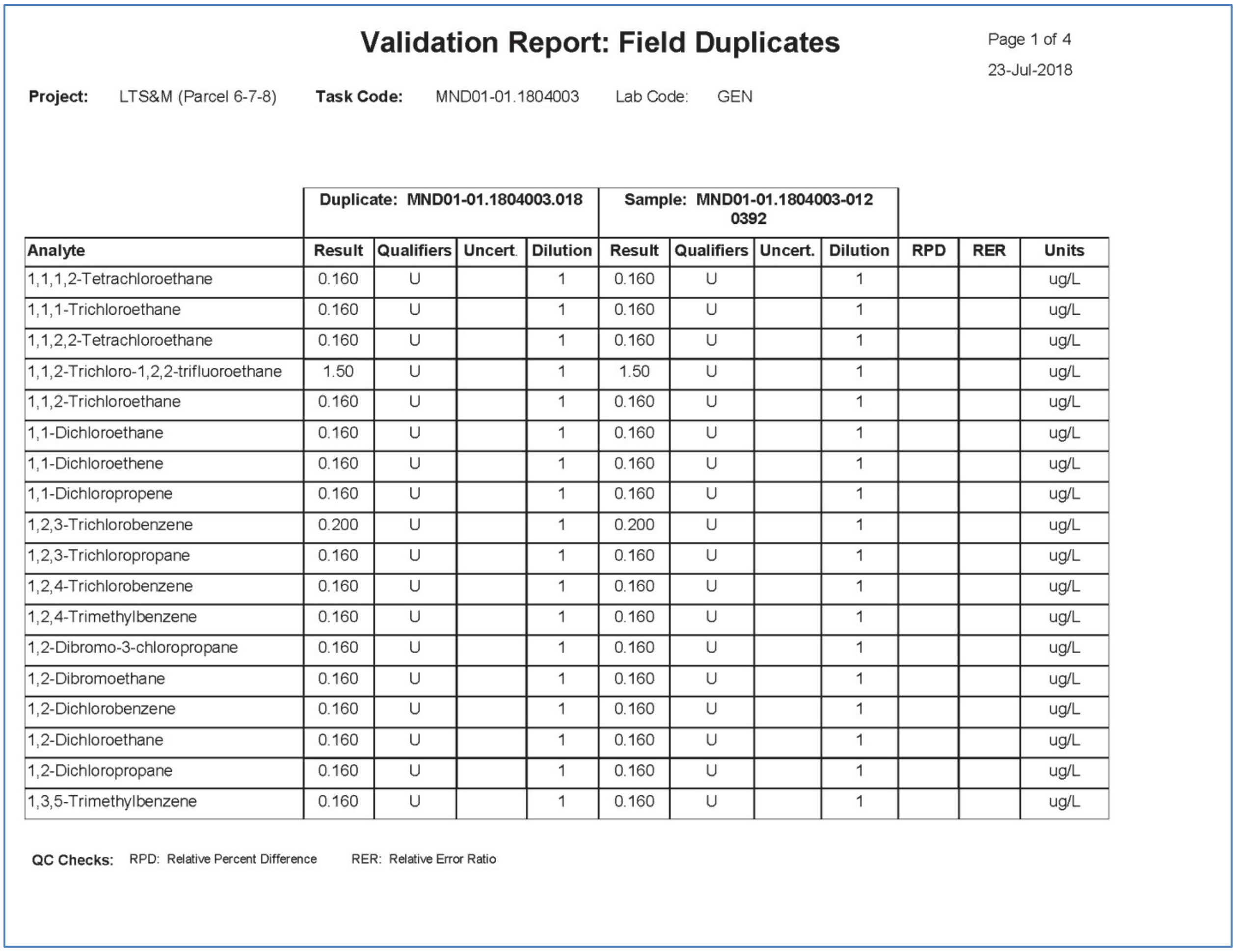
Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1804003 **Lab Code:** GEN

TB	MND01-01.1804003.021	0999	SW-846 8260	Acetone	2.89	J

Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier
MND01-01.1804003-006	0346	0.500	1	U	
MND01-01.1804003-008	0379	0.500	1	U	



Validation Report: Field Duplicates

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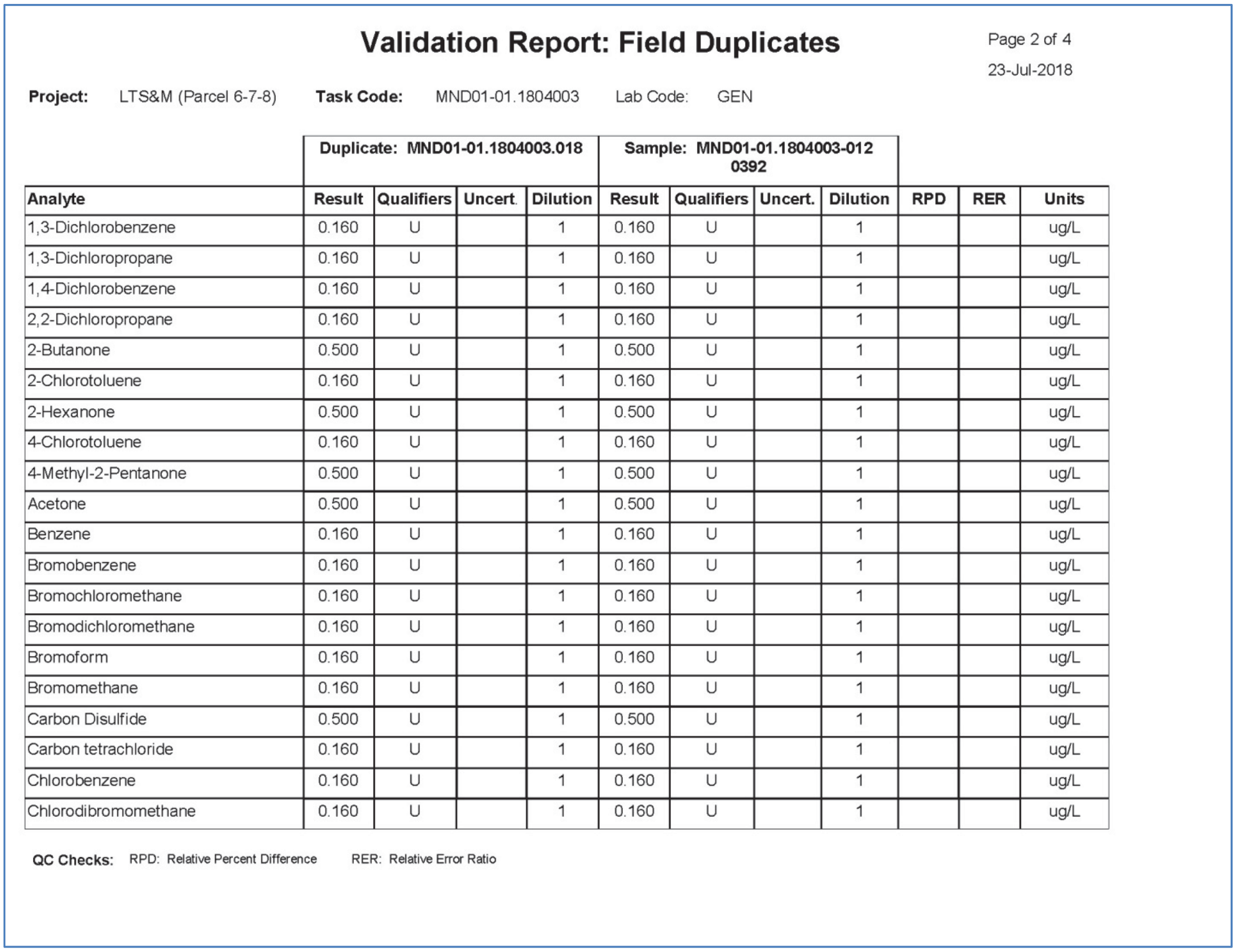
23-Jul-2018

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1804003 Lab Code: GEN

	Duplicate: MND01-01.1804003.018				**Sample: MND01-01.1804003-012 0392**						
Analyte	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**RPD**	**RER**	**Units**
1,1,1,2-Tetrachloroethane	0.160	U		1	0.160	U		1			ug/L
1,1,1-Trichloroethane	0.160	U		1	0.160	U		1			ug/L
1,1,2,2-Tetrachloroethane	0.160	U		1	0.160	U		1			ug/L
1,1,2-Trichloro-1,2,2-trifluoroethane	1.50	U		1	1.50	U		1			ug/L
1,1,2-Trichloroethane	0.160	U		1	0.160	U		1			ug/L
1,1-Dichloroethane	0.160	U		1	0.160	U		1			ug/L
1,1-Dichloroethene	0.160	U		1	0.160	U		1			ug/L
1,1-Dichloropropene	0.160	U		1	0.160	U		1			ug/L
1,2,3-Trichlorobenzene	0.200	U		1	0.200	U		1			ug/L
1,2,3-Trichloropropane	0.160	U		1	0.160	U		1			ug/L
1,2,4-Trichlorobenzene	0.160	U		1	0.160	U		1			ug/L
1,2,4-Trimethylbenzene	0.160	U		1	0.160	U		1			ug/L
1,2-Dibromo-3-chloropropane	0.160	U		1	0.160	U		1			ug/L
1,2-Dibromoethane	0.160	U		1	0.160	U		1			ug/L
1,2-Dichlorobenzene	0.160	U		1	0.160	U		1			ug/L
1,2-Dichloroethane	0.160	U		1	0.160	U		1			ug/L
1,2-Dichloropropane	0.160	U		1	0.160	U		1			ug/L
1,3,5-Trimethylbenzene	0.160	U		1	0.160	U		1			ug/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio



Validation Report: Field Duplicates

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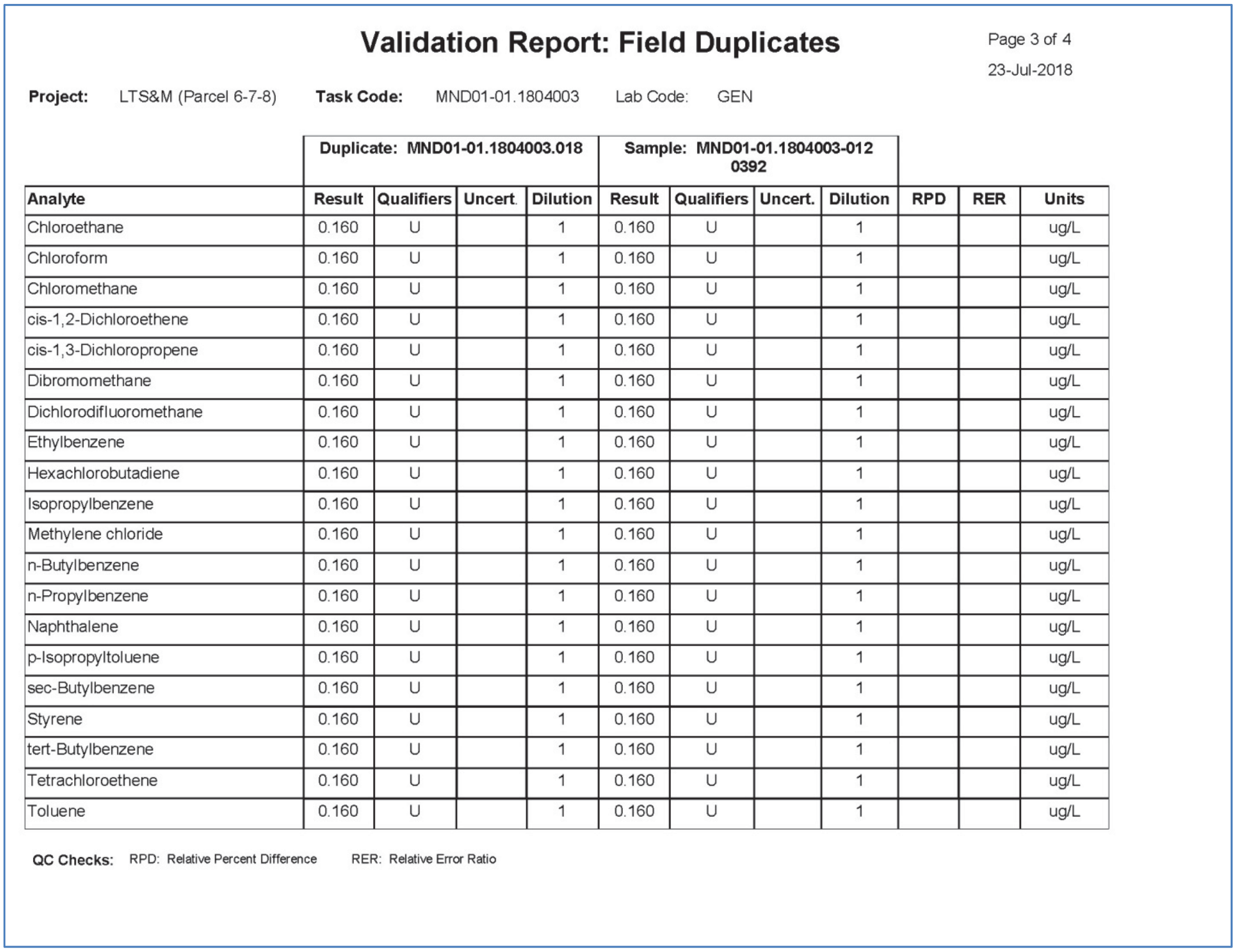
23-Jul-2018

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1804003 Lab Code: GEN

	Duplicate: MND01-01.1804003.018				**Sample: MND01-01.1804003-012 0392**						
Analyte	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**RPD**	**RER**	**Units**
1,3-Dichlorobenzene	0.160	U		1	0.160	U		1			ug/L
1,3-Dichloropropane	0.160	U		1	0.160	U		1			ug/L
1,4-Dichlorobenzene	0.160	U		1	0.160	U		1			ug/L
2,2-Dichloropropane	0.160	U		1	0.160	U		1			ug/L
2-Butanone	0.500	U		1	0.500	U		1			ug/L
2-Chlorotoluene	0.160	U		1	0.160	U		1			ug/L
2-Hexanone	0.500	U		1	0.500	U		1			ug/L
4-Chlorotoluene	0.160	U		1	0.160	U		1			ug/L
4-Methyl-2-Pentanone	0.500	U		1	0.500	U		1			ug/L
Acetone	0.500	U		1	0.500	U		1			ug/L
Benzene	0.160	U		1	0.160	U		1			ug/L
Bromobenzene	0.160	U		1	0.160	U		1			ug/L
Bromochloromethane	0.160	U		1	0.160	U		1			ug/L
Bromodichloromethane	0.160	U		1	0.160	U		1			ug/L
Bromoform	0.160	U		1	0.160	U		1			ug/L
Bromomethane	0.160	U		1	0.160	U		1			ug/L
Carbon Disulfide	0.500	U		1	0.500	U		1			ug/L
Carbon tetrachloride	0.160	U		1	0.160	U		1			ug/L
Chlorobenzene	0.160	U		1	0.160	U		1			ug/L
Chlorodibromomethane	0.160	U		1	0.160	U		1			ug/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio



Validation Report: Field Duplicates

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23-Jul-2018

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1804003 Lab Code: GEN

	Duplicate: MND01-01.1804003.018				Sample: MND01-01.1804003-012 0392						
Analyte	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**RPD**	**RER**	**Units**
Chloroethane	0.160	U		1	0.160	U		1			ug/L
Chloroform	0.160	U		1	0.160	U		1			ug/L
Chloromethane	0.160	U		1	0.160	U		1			ug/L
cis-1,2-Dichloroethene	0.160	U		1	0.160	U		1			ug/L
cis-1,3-Dichloropropene	0.160	U		1	0.160	U		1			ug/L
Dibromomethane	0.160	U		1	0.160	U		1			ug/L
Dichlorodifluoromethane	0.160	U		1	0.160	U		1			ug/L
Ethylbenzene	0.160	U		1	0.160	U		1			ug/L
Hexachlorobutadiene	0.160	U		1	0.160	U		1			ug/L
Isopropylbenzene	0.160	U		1	0.160	U		1			ug/L
Methylene chloride	0.160	U		1	0.160	U		1			ug/L
n-Butylbenzene	0.160	U		1	0.160	U		1			ug/L
n-Propylbenzene	0.160	U		1	0.160	U		1			ug/L
Naphthalene	0.160	U		1	0.160	U		1			ug/L
p-Isopropyltoluene	0.160	U		1	0.160	U		1			ug/L
sec-Butylbenzene	0.160	U		1	0.160	U		1			ug/L
Styrene	0.160	U		1	0.160	U		1			ug/L
tert-Butylbenzene	0.160	U		1	0.160	U		1			ug/L
Tetrachloroethene	0.160	U		1	0.160	U		1			ug/L
Toluene	0.160	U		1	0.160	U		1			ug/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio

Validation Report: Field Duplicates

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23-Jul-2018

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1804003 Lab Code: GEN

	Duplicate: MND01-01.1804003.018				**Sample: MND01-01.1804003-012 0392**						
Analyte	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**RPD**	**RER**	**Units**
Total Xylenes	0.160	U		1	0.160	U		1			ug/L
trans-1,2-Dichloroethene	0.160	U		1	0.160	U		1			ug/L
trans-1,3-dichloropropene	0.160	U		1	0.160	U		1			ug/L
Trichloroethene	0.160	U		1	0.160	U		1			ug/L
Trichlorofluoromethane	0.160	U		1	0.160	U		1			ug/L
Vinyl chloride	0.160	U		1	0.160	U		1			ug/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio

Organics Data Validation Summary

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23-Jul-2018

Project: LTS&M (Parcel 6-7-8)

Task Code: MND01-01.1804003

Lab Code: GEN

Surrogate Recovery:	All surrogate recoveries were within the laboratory acceptance limits.
LCS/LCSD Performance:	All LCS/LCSD results were within the laboratory acceptance limits.
MS/MSD Performance:	There was 1 MS/MSD result outside the laboratory acceptance limits.
Method Blank Performance:	All method blanks were below the MDL.

Noncompliance Report: MS/MSD Performance

23-Jul-2018

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1804003 **Lab Code:** GEN

Sample ID	Date Analyzed	Method	Analyte	MS Recovery	MSD Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	Comment
	05-02-2018	SW-846 8260	Bromochloromethane	78		79	120			

Data Review and Validation Report

General Information

Task ID:	MND01-01.1807004
Sample Event:	July 30-August 2, 2018
Site(s):	Mound LTS&M (Parcel 6-7-8)
Laboratory:	GEL Laboratories, Charleston, South Carolina
Work Order No.:	455819
Analysis:	Organics and Radiochemistry
Validator:	Samantha Tigar
Review Date:	October 22, 2018

This validation was performed according to *Environmental Data Validation Procedure* (LMS/PRO/S15870), which is available athttp://sp.lm.doe.gov/Contractor/ControlledDocuments/Controlled%20Documents/S15870_Env_DV_Procedure.pdf. The procedure was applied at Level 3, Data Validation.

All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 1.

Table 1. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Tritium	LSC-A-001	EPA 906.0 Modified	EPA 906.0 Modified
Volatile Organics, VOA	VOA-A-007	SW-846 5030B	SW-846 8260 LL

Data Qualifier Summary

Analytical results were qualified as listed in Table 2. Refer to the attached validation worksheets and the sections below for an explanation of the data qualifiers applied.

Table 2. Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
MND01-01.1807004-004	0138	Tritium	J	Less than the determination limit
MND01-01.1807004-008	0379	Tritium	J	Less than the determination limit

Sample Shipping/Receiving

GEL Laboratories in Charleston, South Carolina, received 21 water samples Between July 31 and August 3, 2018, accompanied by a Chain of Custody (COC) form. The air waybill number was listed on the Sample Receipt and Review Form. The COC form was checked to confirm that all of the samples were listed with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The COC forms were complete with no errors or omissions.

A VOA vial for location 0138 was received broken. A trip blank vial was received with headspace. Sufficient volume remained in the remaining vials for analysis.

Preservation and Holding Times

The sample shipments were received intact with the temperature inside the iced cooler between 2 °C and 4 °C, which complies with requirements. All samples were received in the correct container types and had been preserved correctly for the requested analyses. All samples were analyzed within the applicable holding times.

Detection and Quantitation Limits

The method detection limit (MDL) was reported for all organic analytes as required. The MDL, as defined in 40 CFR 136, is the minimum concentration of an analyte that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. The practical quantitation limit (PQL) for these analytes is the lowest concentration that can be reliably measured, and is defined as 5 times the MDL.

For radiochemical analytes (those measured by radiometric counting) the MDL and PQL are not applicable, and these results are evaluated using the minimum detectable concentration (MDC), the decision level concentration (DLC), and the determination limit (DL). The DLC is the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is estimated as 3 times the 1-sigma total propagated uncertainty. Results that are greater than the MDC but less than the DLC are qualified with a U flag as not detected. The DL for radiochemical results is the lowest concentration that can be reliably measured and is defined as 3 times the MDC. Results that were not previously U qualified and are less than the DL are qualified with a J flag as estimated values.

The reported MDLs and MDCs demonstrate compliance with contractual requirements.

Laboratory Instrument Calibration

Method requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for the analytes of interest. Initial calibration verification demonstrates that the instrument is capable of acceptable performance at the beginning of the analytical run. Continuing calibration verification demonstrates that the initial calibration is still valid by checking the performance of the instrument on a continuing basis. Initial and continuing calibration standards must be prepared from independent sources to ensure the validity of the calibration. All laboratory instrument calibrations and calibration verifications were performed correctly in accordance with the cited methods.

Method SW-846 8260 LL Volatile Organics, VOA
Initial calibration of instrument VOA2 was performed on July 17, 2018 using nine calibration standards. Calibration curves are established using linear regression, quadratic regression, or the average response factor approach. Calibrations using average response factors had relative standard deviations of less than 15 percent. Linear or higher order regression calibrations had correlation coefficient values greater than 0.99 and intercepts less than 3 times the MDL. Initial and continuing calibration verification checks were made at the required frequency. Some target compounds had percent drift values greater than 20 percent but were not detected at concentrations greater than the MDL. The mass spectrometer calibration and resolution was checked at the beginning of each analytical run in accordance with the procedure.

Method EPA 906.0 Modified Tritium

Liquid scintillation calibrations for instrument BROWN were performed on July 1, 2018. Calibrations resulted in quench curves covering a quench number range of 137 – 332. The sample quench values were all within the calibration range. Daily calibration checks were performed August 9 and 10, 2018 with acceptable results.

Volatiles Internal Standards and Surrogates

The volatile internal standard recoveries and surrogate recoveries were within the acceptance ranges for all samples.

Method Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. All method blank results associated with the samples were below the PQL for all analytes. In cases where a blank concentration exceeds or equals the MDL, the associated sample results are qualified with a U flag (not detected) when the sample result is greater than the MDL but less than 5 times the blank concentration.

Trip Blank

Trip blanks were prepared and analyzed to document contamination attributable to shipping and field handling procedures. This type of blank is useful in documenting contamination of volatile organic samples. Three trip blanks were submitted with these samples. Acetone and chlorobenzene were detected in the trip blanks but were not detected above the MDL in the associated samples.

Matrix Spike Analysis

Matrix spikes are aliquots of environmental samples to which a known concentration of analyte has been added before analysis. Matrix spike and matrix-spike duplicate (MS/MSD) analysis is used to assess the performance of the method by measuring the effects of interferences caused by the sample matrix and reflects the bias of the method for the particular matrix in question. The MS/MSD data are not evaluated when the concentration of the unspiked sample is greater than 4 times the spike. The spikes met the recovery and precision criteria for all analytes evaluated.

Laboratory Replicate Analysis

Laboratory replicate analyses are used to determine laboratory precision for each sample matrix. The relative percent difference for non-radiochemical replicate results that are greater than 5 times the PQL should be less than 20 percent. For results that are less than 5 times the PQL, the range should be no greater than the PQL. For the radiochemistry analyses, a laboratory control sample duplicate was analyzed in lieu of a sample duplicate, which is acceptable. The relative error ratio for radiochemical replicate results (calculated using the one-sigma total propagated uncertainty) should be less than 3, indicating acceptable precision. The replicate results met these criteria.

Laboratory Control Sample

Laboratory control samples were analyzed at the correct frequency to provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. All control sample results were acceptable.

Field Duplicate

Field duplicate samples are collected and analyzed as an indication of overall precision of the measurement process. The precision observed includes both field and laboratory precision and has more variability than laboratory duplicates, which measure only laboratory performance. The relative percent difference for duplicate results that are greater than 5 times the PQL should be less than 20 percent. For results that are less than 5 times the PQL, the range should be no greater than the PQL. For radiochemical measurements, the relative error ratio (the ratio of the absolute difference between the sample and duplicate results and the sum of the 1-sigma uncertainties) is used to evaluate duplicate results and should be less than 3. A duplicate sample was collected from location 0347. The duplicate results met the criteria.

Completeness

Results were reported in the correct units for all analytes requested using contract-required laboratory qualifiers. The analytical report included the MDL (MDC for radiochemistry) and PQL for all analytes and all required supporting documentation.

Electronic Data Deliverable (EDD) File

A revised EDD file arrived on October 26, 2018. The EDD was examined to verify that the file was complete and in compliance with requirements. The contents of the file were compared to the requested analyses to ensure all and only the requested data are delivered. The contents of the EDD were manually examined to verify that the sample results accurately reflect the data contained in the sample data package.

Field Measurements

The pre-sampling purge criteria were met for all wells. A turbidity less than 50NTU could not be achieved at monitoring well 0379.

Potential Outliers

Potential outliers are results that lie outside the historical range, possibly due to transcription errors, data calculation errors, or measurement system problems. However, outliers can also represent true values outside the historical range. Potential outliers are identified by generating the Data Validation Outliers Report from data in the environmental database. The new data are compared to historical values and data that fall outside the historical data range are listed on the report along with the historical minimum and maximum values. The potential outliers are further reviewed and may be subject to statistical evaluation using the ProUCL application developed by the EPA (https://www.epa.gov/land-research/proucl-software). The review also includes an evaluation of any notable trends in the data that may indicate the outliers represent true extreme values. There were no outliers identified and the data for this task are acceptable as qualified.

Samantha Tigar

Digitally signed by
SAMANTHA TIGAR
(Affiliate)
Date: 2018.10.29 15:26:50
-06'00'

Report Prepared By: ______________________________

Samantha Tigar
Data Validator

Page 1 of 1

General Data Validation Report

Task Code: MND01-01.1807004 **Lab Code:** GEN **Validator:** Samantha Tigar **Validation Date:** 10-10-2018

Project: LTS&M (Parcel 6-7-8) **# Samples:** 22

Analysis Type: ☐ General Chemistry ☐ Metals ☒ Organics ☒ Radiochemistry

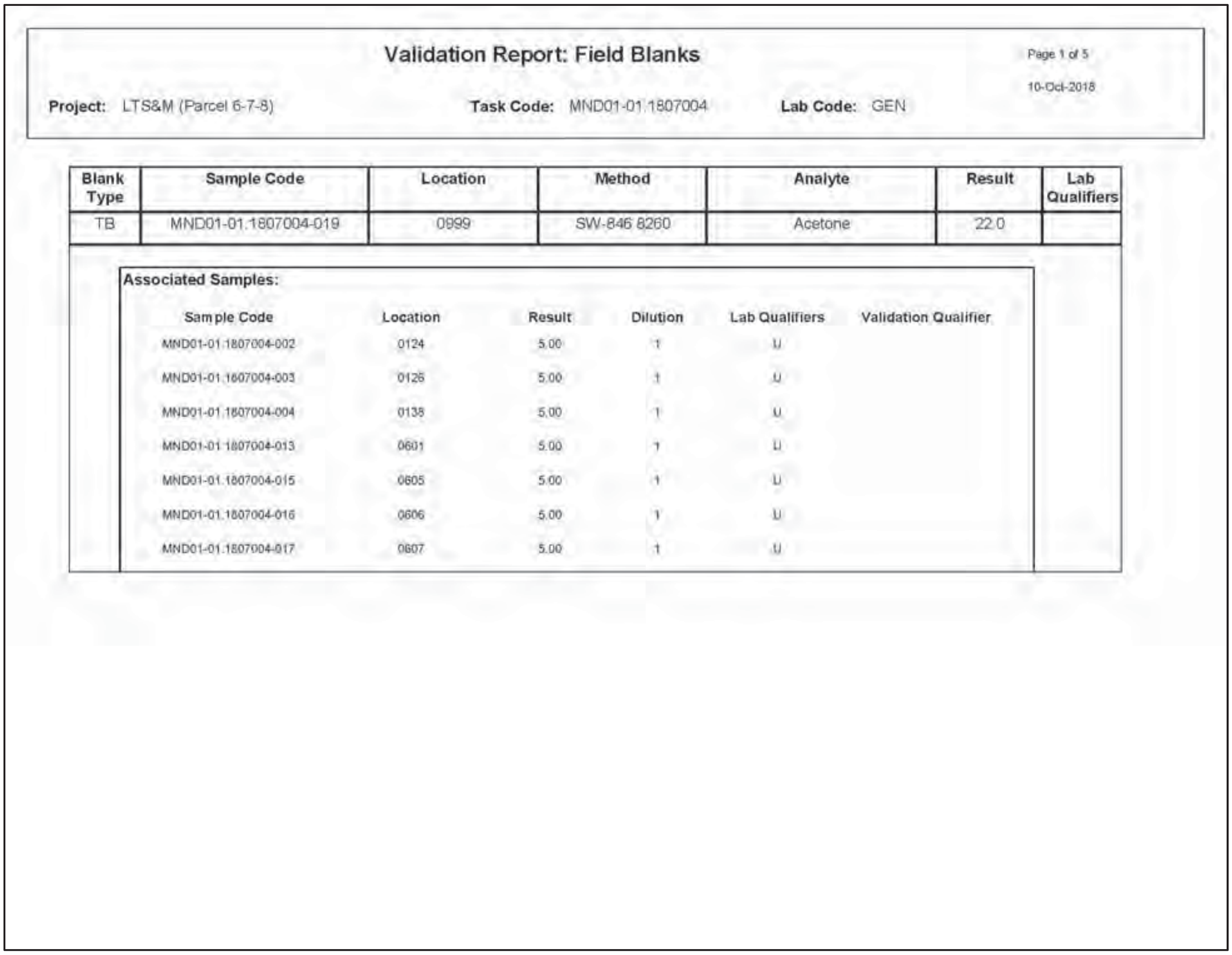
Chain of Custody

Present: OK Signed: OK Dated: OK

Sample

Integrity: OK Preservation: OK Temperature: OK

Check	Summary
Holding Times:	All analyses were completed within the applicable holding times.
Detection Limits:	The reported detection limits are equal to or below the contract required limits.
Field Blanks:	There were 4 field blanks associated with this task.
Field Duplicates:	There was 1 duplicate evaluated.



Validation Report: Field Blanks

Page 1 of 5

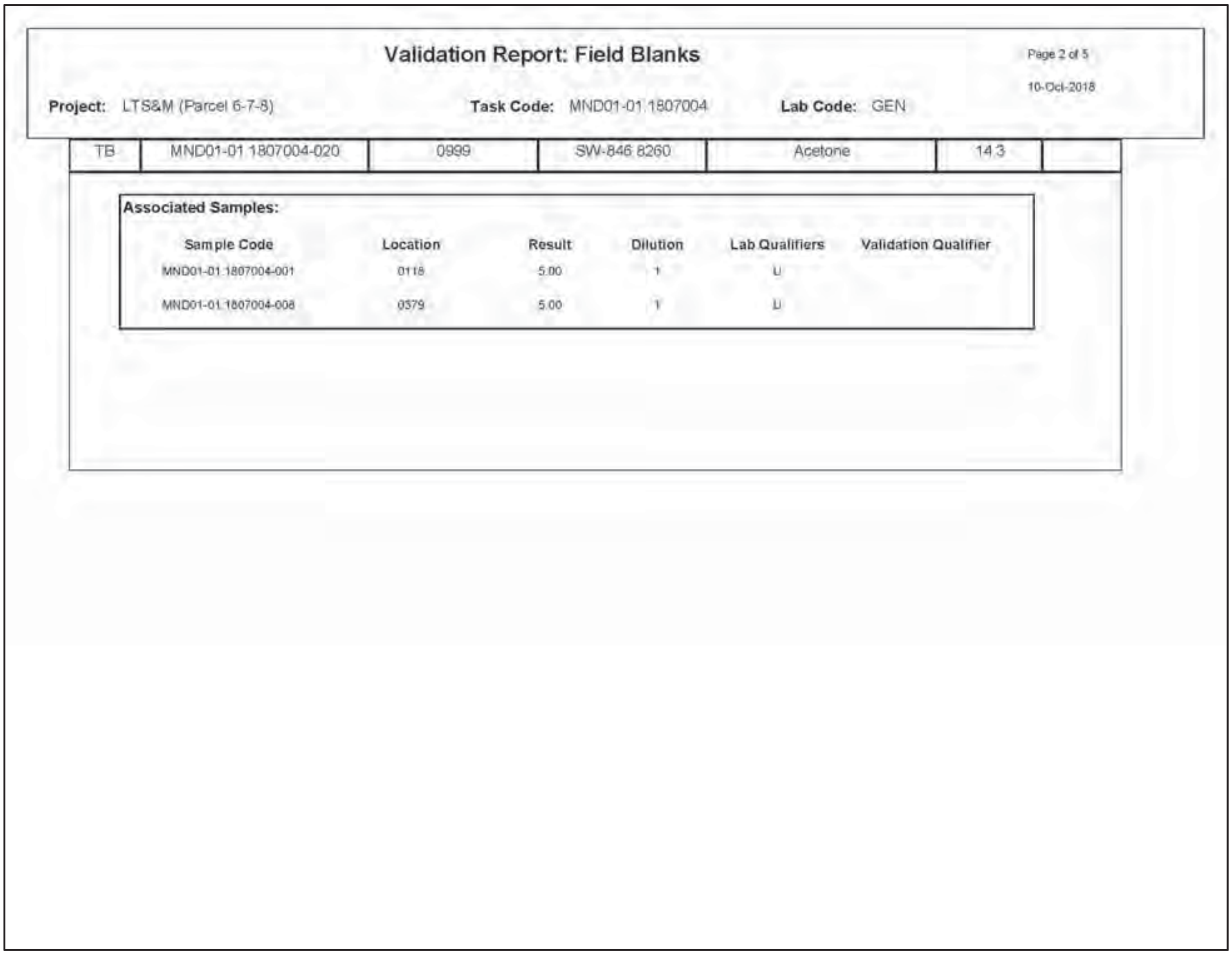
10-Oct-2018

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1807004 **Lab Code:** GEN

Blank Type	Sample Code	Location	Method	Analyte	Result	Lab Qualifiers
TB	MND01-01.1807004-019	0999	SW-846 8260	Acetone	22.0	

Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier
MND01-01.1807004-002	0124	5.00	1	U	
MND01-01.1807004-003	0126	5.00	1	U	
MND01-01.1807004-004	0138	5.00	1	U	
MND01-01.1807004-013	0601	5.00	1	U	
MND01-01.1807004-015	0605	5.00	1	U	
MND01-01.1807004-016	0606	5.00	1	U	
MND01-01.1807004-017	0607	5.00	1	U	



Validation Report: Field Blanks

Page 2 of 5

10-Oct-2018

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01 1807004 **Lab Code:** GEN

TB	MND01-01 1807004-020	0999	SW-846 8260	Acetone	14.3	

Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier
MND01-01 1807004-001	0118	5.00	1	U	
MND01-01 1807004-008	0379	5.00	1	U	

Validation Report: Field Blanks

Page 3 of 5

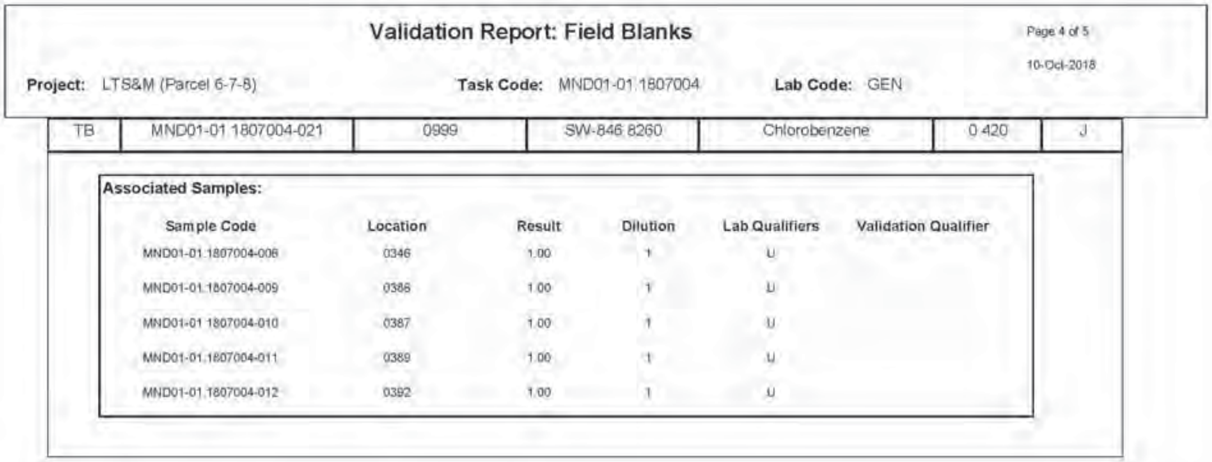
10-Oct-2018

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1807004 **Lab Code:** GEN

TB	MND01-01.1807004-021	0999	SW-846 8260	Acetone	3.90	J

Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier
MND01-01.1807004-008	0346	5.00	1	U	
MND01-01.1807004-009	0386	5.00	1	U	
MND01-01.1807004-010	0387	5.00	1	U	
MND01-01.1807004-011	0389	5.00	1	U	
MND01-01.1807004-012	0392	5.00	1	U	



Validation Report: Field Blanks

Page 4 of 5

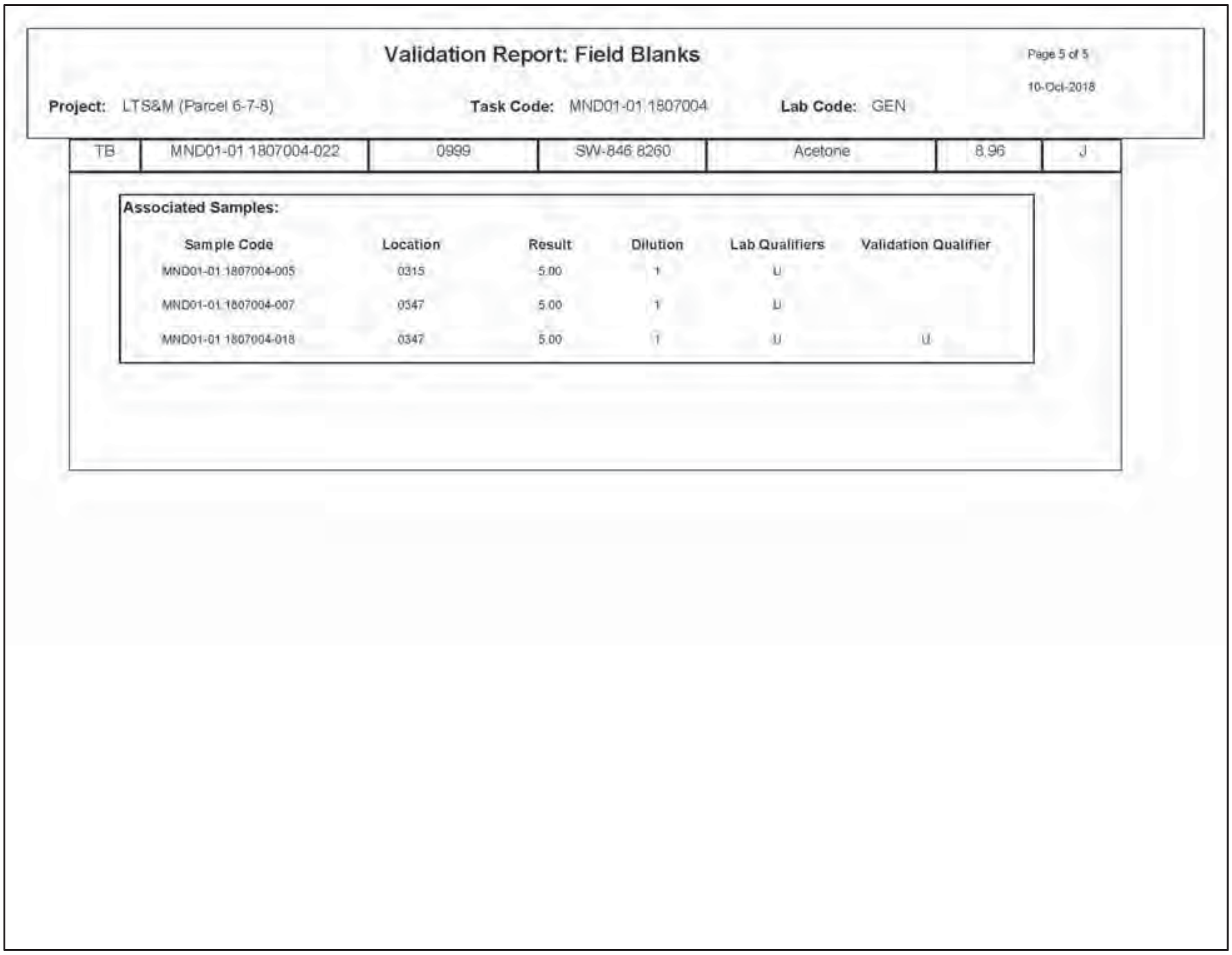
10-Oct-2018

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1807004 **Lab Code:** GEN

TB	MND01-01.1807004-021	0999	SW-846 8260	Chlorobenzene	0.420	J

Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier
MND01-01.1807004-006	0346	1.00	1	U	
MND01-01.1807004-009	0386	1.00	1	U	
MND01-01.1807004-010	0387	1.00	1	U	
MND01-01.1807004-011	0389	1.00	1	U	
MND01-01.1807004-012	0392	1.00	1	U	



Validation Report: Field Blanks

Page 5 of 5

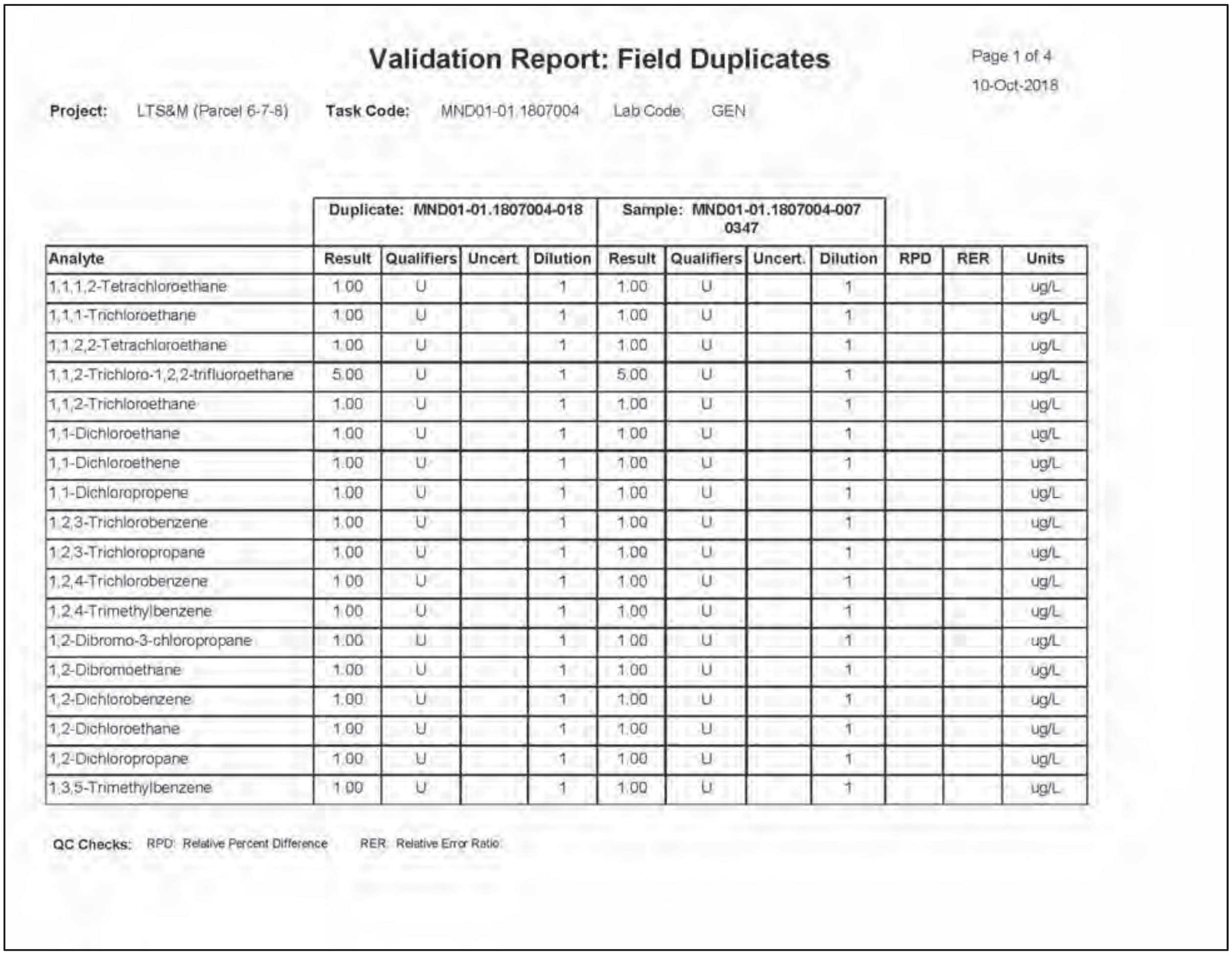
10-Oct-2018

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01 1807004 **Lab Code:** GEN

TB	MND01-01 1807004-022	0999	SW-846 8260	Acetone	8.96	J

Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier
MND01-01 1807004-005	0315	5.00	1	U	
MND01-01 1807004-007	0347	5.00	1	U	
MND01-01 1807004-018	0347	5.00	1	U	U



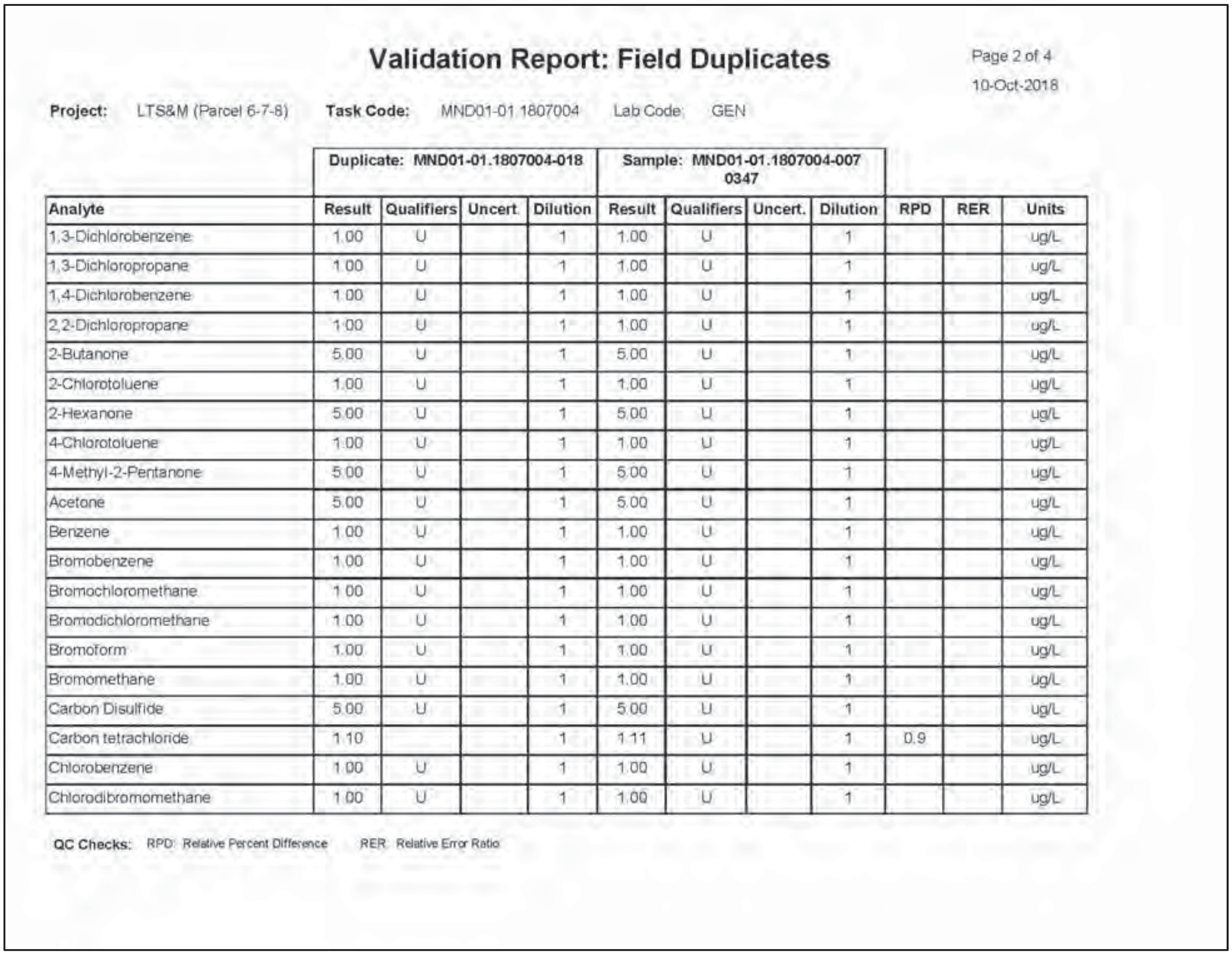
Validation Report: Field Duplicates

Page 1 of 4
10-Oct-2018

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1807004 Lab Code: GEN

	Duplicate: MND01-01.1807004-018				Sample: MND01-01.1807004-007 0347						
Analyte	**Result**	**Qualifiers**	**Uncert**	**Dilution**	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**RPD**	**RER**	**Units**
1,1,1,2-Tetrachloroethane	1.00	U		1	1.00	U		1			ug/L
1,1,1-Trichloroethane	1.00	U		1	1.00	U		1			ug/L
1,1,2,2-Tetrachloroethane	1.00	U		1	1.00	U		1			ug/L
1,1,2-Trichloro-1,2,2-trifluoroethane	5.00	U		1	5.00	U		1			ug/L
1,1,2-Trichloroethane	1.00	U		1	1.00	U		1			ug/L
1,1-Dichloroethane	1.00	U		1	1.00	U		1			ug/L
1,1-Dichloroethene	1.00	U		1	1.00	U		1			ug/L
1,1-Dichloropropene	1.00	U		1	1.00	U		1			ug/L
1,2,3-Trichlorobenzene	1.00	U		1	1.00	U		1			ug/L
1,2,3-Trichloropropane	1.00	U		1	1.00	U		1			ug/L
1,2,4-Trichlorobenzene	1.00	U		1	1.00	U		1			ug/L
1,2,4-Trimethylbenzene	1.00	U		1	1.00	U		1			ug/L
1,2-Dibromo-3-chloropropane	1.00	U		1	1.00	U		1			ug/L
1,2-Dibromoethane	1.00	U		1	1.00	U		1			ug/L
1,2-Dichlorobenzene	1.00	U		1	1.00	U		1			ug/L
1,2-Dichloroethane	1.00	U		1	1.00	U		1			ug/L
1,2-Dichloropropane	1.00	U		1	1.00	U		1			ug/L
1,3,5-Trimethylbenzene	1.00	U		1	1.00	U		1			ug/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio



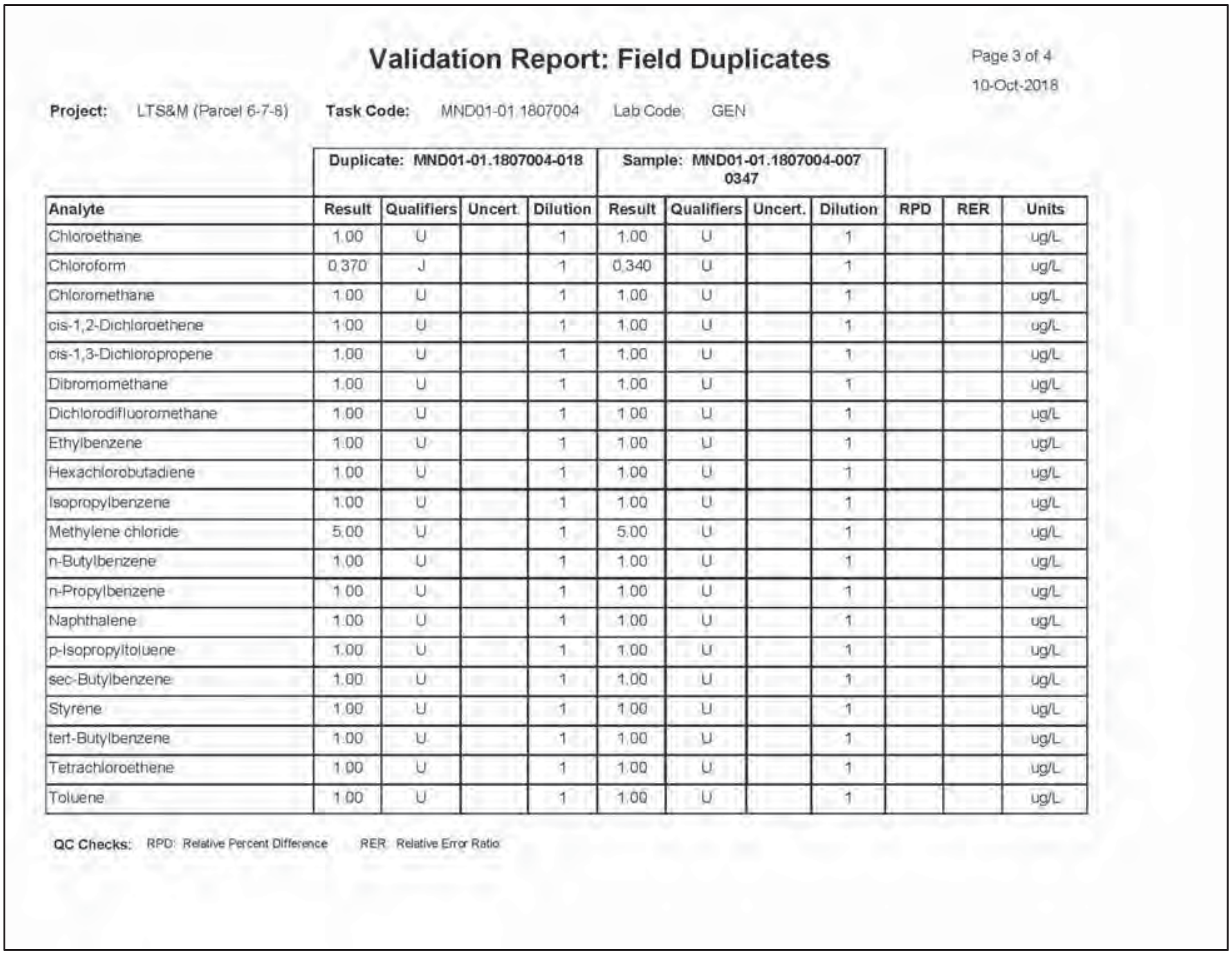
Validation Report: Field Duplicates

Page 2 of 4
10-Oct-2018

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1807004 Lab Code: GEN

	Duplicate: MND01-01.1807004-018				Sample: MND01-01.1807004-007 0347						
Analyte	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**RPD**	**RER**	**Units**
1,3-Dichlorobenzene	1.00	U		1	1.00	U		1			ug/L
1,3-Dichloropropane	1.00	U		1	1.00	U		1			ug/L
1,4-Dichlorobenzene	1.00	U		1	1.00	U		1			ug/L
2,2-Dichloropropane	1.00	U		1	1.00	U		1			ug/L
2-Butanone	5.00	U		1	5.00	U		1			ug/L
2-Chlorotoluene	1.00	U		1	1.00	U		1			ug/L
2-Hexanone	5.00	U		1	5.00	U		1			ug/L
4-Chlorotoluene	1.00	U		1	1.00	U		1			ug/L
4-Methyl-2-Pentanone	5.00	U		1	5.00	U		1			ug/L
Acetone	5.00	U		1	5.00	U		1			ug/L
Benzene	1.00	U		1	1.00	U		1			ug/L
Bromobenzene	1.00	U		1	1.00	U		1			ug/L
Bromochloromethane	1.00	U		1	1.00	U		1			ug/L
Bromodichloromethane	1.00	U		1	1.00	U		1			ug/L
Bromoform	1.00	U		1	1.00	U		1			ug/L
Bromomethane	1.00	U		1	1.00	U		1			ug/L
Carbon Disulfide	5.00	U		1	5.00	U		1			ug/L
Carbon tetrachloride	1.10			1	1.11	U		1	0.9		ug/L
Chlorobenzene	1.00	U		1	1.00	U		1			ug/L
Chlorodibromomethane	1.00	U		1	1.00	U		1			ug/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio



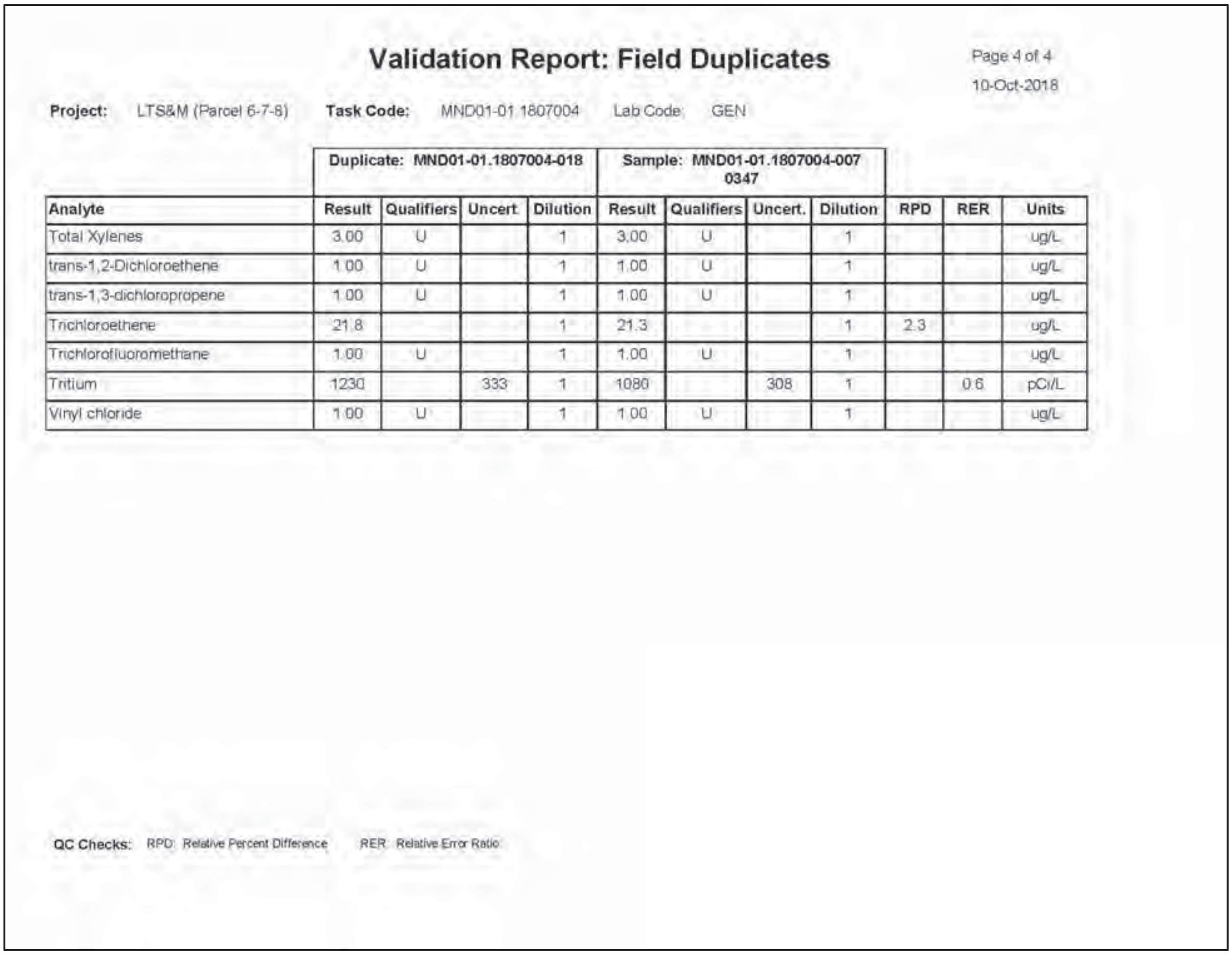
Validation Report: Field Duplicates

Page 3 of 4
10-Oct-2018

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1807004 Lab Code: GEN

	Duplicate: MND01-01.1807004-018				Sample: MND01-01.1807004-007 0347						
Analyte	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**RPD**	**RER**	**Units**
Chloroethane	1.00	U		1	1.00	U		1			ug/L
Chloroform	0.370	J		1	0.340	U		1			ug/L
Chloromethane	1.00	U		1	1.00	U		1			ug/L
cis-1,2-Dichloroethene	1.00	U		1	1.00	U		1			ug/L
cis-1,3-Dichloropropene	1.00	U		1	1.00	U		1			ug/L
Dibromomethane	1.00	U		1	1.00	U		1			ug/L
Dichlorodifluoromethane	1.00	U		1	1.00	U		1			ug/L
Ethylbenzene	1.00	U		1	1.00	U		1			ug/L
Hexachlorobutadiene	1.00	U		1	1.00	U		1			ug/L
Isopropylbenzene	1.00	U		1	1.00	U		1			ug/L
Methylene chloride	5.00	U		1	5.00	U		1			ug/L
n-Butylbenzene	1.00	U		1	1.00	U		1			ug/L
n-Propylbenzene	1.00	U		1	1.00	U		1			ug/L
Naphthalene	1.00	U		1	1.00	U		1			ug/L
p-Isopropyltoluene	1.00	U		1	1.00	U		1			ug/L
sec-Butylbenzene	1.00	U		1	1.00	U		1			ug/L
Styrene	1.00	U		1	1.00	U		1			ug/L
tert-Butylbenzene	1.00	U		1	1.00	U		1			ug/L
Tetrachloroethene	1.00	U		1	1.00	U		1			ug/L
Toluene	1.00	U		1	1.00	U		1			ug/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio



Validation Report: Field Duplicates

Page 4 of 4
10-Oct-2018

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1807004 Lab Code: GEN

	Duplicate: MND01-01.1807004-018				Sample: MND01-01.1807004-007 0347						
Analyte	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**RPD**	**RER**	**Units**
Total Xylenes	3.00	U		1	3.00	U		1			ug/L
trans-1,2-Dichloroethene	1.00	U		1	1.00	U		1			ug/L
trans-1,3-dichloropropene	1.00	U		1	1.00	U		1			ug/L
Trichloroethene	21.8			1	21.3			1	2.3		ug/L
Trichlorofluoromethane	1.00	U		1	1.00	U		1			ug/L
Tritium	1230		333	1	1080		308	1		0.6	pCi/L
Vinyl chloride	1.00	U		1	1.00	U		1			ug/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio

Organics Data Validation Summary

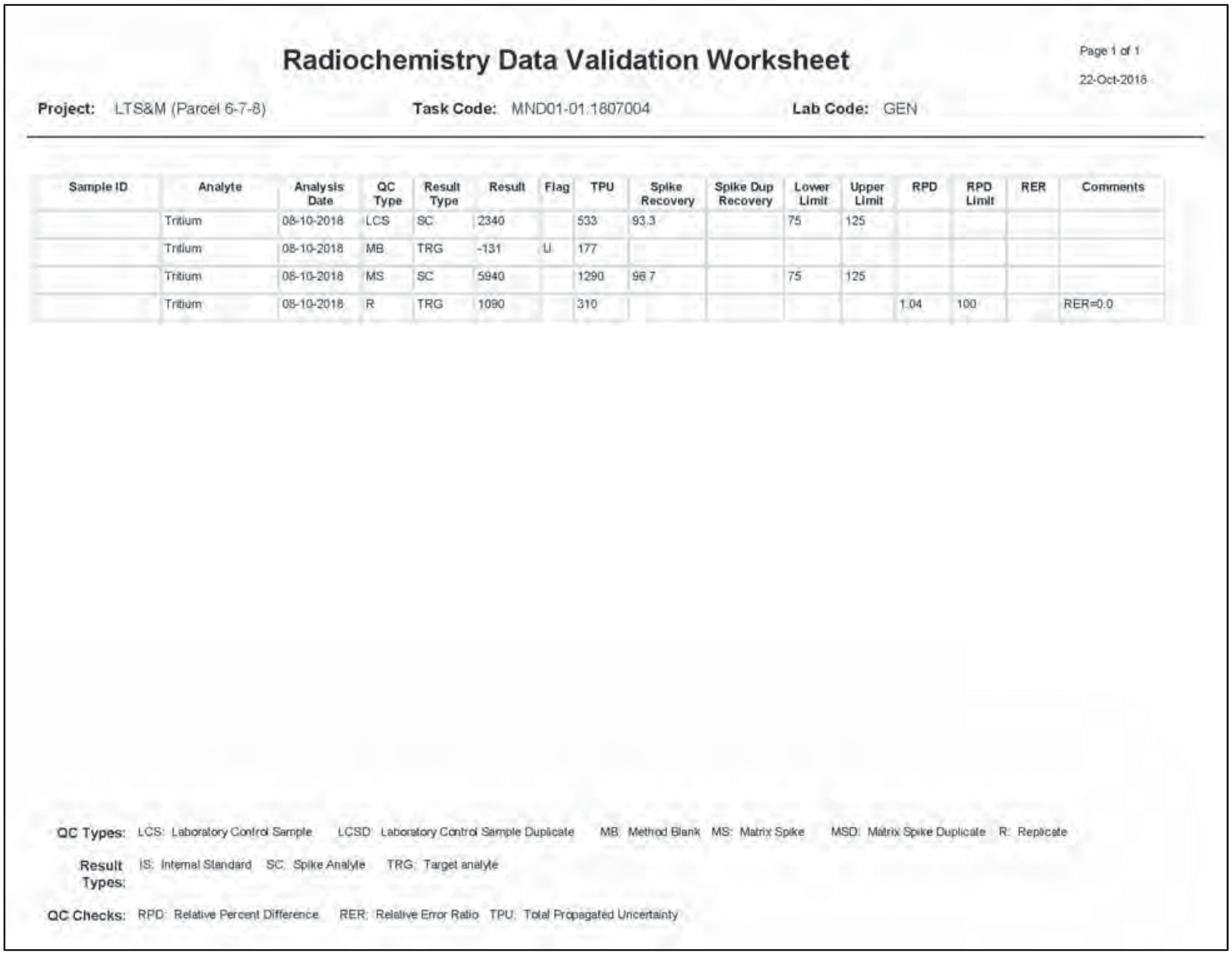
10-Oct-2018

Project: LTS&M (Parcel 6-7-8)

Task Code: MND01-01.1807004

Lab Code: GEN

Surrogate Recovery:	All surrogate recoveries were within the laboratory acceptance limits.
LCS/LCSD Performance:	All LCS/LCSD results were within the laboratory acceptance limits.
MS/MSD Performance:	All MS/MSD results were within the laboratory acceptance limits.
Method Blank Performance:	All method blanks were below the MDL.



Radiochemistry Data Validation Worksheet

Page 1 of 1
22-Oct-2018

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1807004 **Lab Code:** GEN

Sample ID	Analyte	Analysis Date	QC Type	Result Type	Result	Flag	TPU	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	RER	Comments
	Tritium	08-10-2018	LCS	SC	2340		533	93.3		75	125				
	Tritium	08-10-2018	MB	TRG	-131	U	177								
	Tritium	08-10-2018	MS	SC	5940		1290	98.7		75	125				
	Tritium	08-10-2018	R	TRG	1090		310					1.04	100		RER=0.0

QC Types: LCS: Laboratory Control Sample LCSD: Laboratory Control Sample Duplicate MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

Result Types: IS: Internal Standard SC: Spike Analyte TRG: Target analyte

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio TPU: Total Propagated Uncertainty

NAVARRO
Contractor to the U.S. Department of Energy Office of Legacy Management

Data Review and Validation Report

General Information

Task ID:	MND01-01.1810005
Sample Event:	October 29 and 30, 2018
Site(s):	Mound, Ohio: LTS&M (Parcel 6-7-8)
Laboratory:	GEL Laboratories, Charleston, South Carolina
Work Order No.:	462986
Analysis:	Organics
Validator:	Samantha Tigar
Review Date:	January 23, 2019

This validation was performed according to *Environmental Data Validation Procedure* (LMS/PRO/S15870), which is available athttp://sp.lm.doe.gov/Contractor/ControlledDocuments/Controlled%20Documents/S15870_Env_DV_Procedure.pdf. The procedure was applied at Level 3, Data Validation.

All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 1.

Table 1. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Volatile Organics, VOA	VOA-A-007	SW-846 5030B	SW-846 8260 LL

Data Qualifier Summary

Analytical results were qualified as listed in Table 2. Refer to the attached validation worksheets and the sections below for an explanation of the data qualifiers applied.

Table 2. Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
MND01-01.1810005-014	0602	2-Butanone	U	Less than 10 times the trip blank
MND01-01.1810005-015	0605	2-Butanone	U	Less than 10 times the trip blank
MND01-01.1810005-001	0118	Acetone	U	Less than 10 times the trip blank
MND01-01.1810005-002	0124	Acetone	U	Less than 10 times the trip blank
MND01-01.1810005-003	0126	Acetone	U	Less than 10 times the trip blank

Sample Number	Location	Analyte	Flag	Reason
MND01-01.1810005-004	0138	Acetone	U	Less than 10 times the trip blank
MND01-01.1810005-005	0315	Acetone	U	Less than 10 times the trip blank
MND01-01.1810005-008	0379	Acetone	U	Less than 10 times the trip blank
MND01-01.1810005-012	0392	Acetone	U	Less than 10 times the trip blank
MND01-01.1810005-013	0601	Acetone	U	Less than 10 times the trip blank
MND01-01.1810005-014	0602	Acetone	U	Less than 10 times the trip blank
MND01-01.1810005-015	0605	Acetone	U	Less than 10 times the trip blank
MND01-01.1810005-016	0606	Acetone	U	Less than 10 times the trip blank
MND01-01.1810005-018	0379	Acetone	U	Less than 10 times the trip blank

Sample Shipping/Receiving

GEL Laboratories in Charleston, South Carolina, received 20 water samples on October 31, 2018, accompanied by a Chain of Custody (COC) form. The air waybill numbers were listed on the Sample Receipt and Review Form. The COC form was checked to confirm that all of the samples were listed with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The COC forms were complete with no errors or omissions.

Preservation and Holding Times

The sample shipments were received intact with the temperatures inside the iced cooler between 1 °C and 2 °C, which complies with requirements. All samples were received in the correct container types and had been preserved correctly for the requested analyses. All samples were analyzed within the applicable holding times.

Detection and Quantitation Limits

The method detection limit (MDL) was reported for all organic analytes as required. The MDL, as defined in 40 CFR 136, is the minimum concentration of an analyte that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. The practical quantitation limit (PQL) for these analytes is the lowest concentration that can be reliably measured, and is defined as 5 times the MDL. The reported MDLs demonstrate compliance with contractual requirements.

Laboratory Instrument Calibration

Method requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for the analytes of interest. Initial calibration verification demonstrates that the instrument is capable of acceptable performance at the beginning of the analytical run. Continuing calibration verification demonstrates that the initial calibration is still valid by checking the performance of the instrument on a continuing basis. Initial and continuing calibration standards must be prepared from independent sources to ensure the validity of the calibration. All laboratory instrument

calibrations and calibration verifications were performed correctly in accordance with the cited methods.

Method SW-846 8260 LL Volatile Organics, VOA

Initial calibration of instrument VOA2 was performed on November 1, 2018 using nine calibration standards. Calibration curves are established using linear regression, quadratic regression, or the average response factor approach. Calibrations using average response factors had relative standard deviations of less than 15 percent. Linear or higher order regression calibrations had correlation coefficient values greater than 0.99 and intercepts less than 3 times the MDL. Initial and continuing calibration verification checks were made at the required frequency. Some target compounds had percent drift values greater than 20 percent but were not detected at concentrations greater than the MDL in the associated samples. The mass spectrometer calibration and resolution was checked at the beginning of each analytical run in accordance with the procedure.

Volatiles Internal Standards and Surrogates

The volatile internal standard recoveries and surrogate recoveries were within the acceptance ranges for all samples.

Method Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. All method blank results associated with the samples were below the PQL for all analytes. In cases where a blank concentration exceeds or equals the MDL, the associated sample results are qualified with a U flag (not detected) when the sample result is greater than the MDL but less than 5 times the blank concentration.

Matrix Spike Analysis

Matrix spikes are aliquots of environmental samples to which a known concentration of analyte has been added before analysis. Matrix spike and matrix-spike duplicate (MS/MSD) analysis is used to assess the performance of the method by measuring the effects of interferences caused by the sample matrix and reflects the bias of the method for the particular matrix in question. The MS/MSD data are not evaluated when the concentration of the unspiked sample is greater than 4 times the spike. The spikes met the recovery and precision criteria for all analytes evaluated.

Laboratory Replicate Analysis

Laboratory replicate analyses are used to determine laboratory precision for each sample matrix. The relative percent difference for non-radiochemical replicate results that are greater than 5 times the PQL should be less than 20 percent. For results that are less than 5 times the PQL, the range should be no greater than the PQL. The replicate results met these criteria.

Laboratory Control Sample

Laboratory control samples were analyzed at the correct frequency to provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. Several control sample results exceeded the acceptance criteria. The compounds were not detected at concentrations greater than the MDL in the associated samples and no qualification is needed.

Field Duplicate

Field duplicate samples are collected and analyzed as an indication of overall precision of the measurement process. The precision observed includes both field and laboratory precision and has more variability than laboratory duplicates, which measure only laboratory performance. The relative percent difference for duplicate results that are greater than 5 times the PQL should be less than 20 percent. For results that are less than 5 times the PQL, the range should be no greater than the PQL. A duplicate sample was collected from location 0379. The duplicate results met the criteria for all analytes, demonstrating acceptable overall precision.

Trip Blank

Trip blanks were prepared and analyzed to document contamination attributable to shipping and field handling procedures. This type of blank is useful in documenting contamination of volatile organic samples. Two trip blanks were submitted with these samples. Acetone and 2-butanone were detected in the trip blanks. All associated results greater than the MDL and less than ten times the trip blank concentrations were qualified with a U flag as not detected.

Completeness

Results were reported in the correct units for all analytes requested using contract-required laboratory qualifiers. The analytical report included the MDL and PQL for all analytes and all required supporting documentation.

Electronic Data Deliverable (EDD) File

A revised EDD file arrived on January 14, 2019. The EDD was examined to verify that the file was complete and in compliance with requirements. The contents of the file were compared to the requested analyses to ensure all and only the requested data are delivered. The contents of the EDD were manually examined to verify that the sample results accurately reflect the data contained in the sample data package.

Field Measurements

The minimum purge volume was met at all wells before sampling. A turbidity less than 50NTU could not be achieved at monitoring well 0315.

Potential Outliers

Potential outliers are results that lie outside the historical range, possibly due to transcription errors, data calculation errors, or measurement system problems. However, outliers can also represent true values outside the historical range. Potential outliers are identified by generating the Data Validation Outliers Report from data in the environmental database. The new data are compared to historical values and data that fall outside the historical data range are listed on the report along with the historical minimum and maximum values. The potential outliers are further reviewed and may be subject to statistical evaluation using the ProUCL application developed by the EPA (https://www.epa.gov/land-research/proucl-software). The review also includes an evaluation of any notable trends in the data that may indicate the outliers represent true extreme values.

Data were identified as potentially anomalous for five acetone results (see the Data Validation Outliers Report, below). These results were previously qualified with U flags (not detected) and review of the data did not indicate any laboratory errors.

Samantha Tigar

Digitally signed by Samantha M. Tigar
Date: 2019.01.23 14:47:05 -07'00'

Report Prepared By: ______________________________
Samantha Tigar
Data Validator

Data Validation Outliers Report - No Field Parameters **Report Date: 01/22/2019**

Comparison to Historical Data Since: 1/1/2008 12:00:00 AM Fraction: Any

Task: MND01-01.1810005

Analyte	Location	Analysis Location	Units	Fraction	Result	Lab Qualifier(s)	Type	HistMIN	HistMAX	HistSetSize	Potential Outlier?
Acetone	0138	LB	ug/L	N	4.30	J	> HistMAX	0.37	2.99	43	Yes
Acetone	0315	LB	ug/L	N	3.07	J	> HistMAX	0.37	2.84	46	Yes
Acetone	0392	LB	ug/L	N	3.16	J	> HistMAX	0.37	2.91	44	Yes
Acetone	0601	LB	ug/L	N	5.52		> HistMAX	0.37	2.93	53	Yes
cis-1,2-Dichloroethene	0602	LB	ug/L	N	1.95		< HistMIN	4.51	42.3	29	No
Trichloroethene	0602	LB	ug/L	N	0.460	J	< HistMIN	2.78	139	29	No
Acetone	0605	LB	ug/L	N	9.63		> HistMAX	0.37	9.59	44	Yes
Trichloroethene	0607	LB	ug/L	N	0.510	J	< HistMIN	0.85	11.5	45	No

FRACTION: D = Dissolved N = NA T = Total

General Data Validation Report

Page 1 of 1

Task Code: MND01-01 1810005 **Lab Code:** GEN **Validator:** Samantha Tigar **Validation Date:** 01-22-2019

Project: LTS&M (Parcel 6-7-8) **# Samples:** 20

Analysis Type: ☐ General Chemistry ☐ Metals ☒ Organics ☐ Radiochemistry

Chain of Custody

Present: OK Signed: OK Dated: OK

Sample

Integrity: OK Preservation OK Temperature: OK

Check	Summary
Holding Times:	All analyses were completed within the applicable holding times.
Detection Limits:	The reported detection limits are equal to or below the contract required limits.
Field Blanks:	There were 2 field blanks associated with this task.
Field Duplicates:	There was 1 duplicate evaluated.

Validation Report: Field Blanks

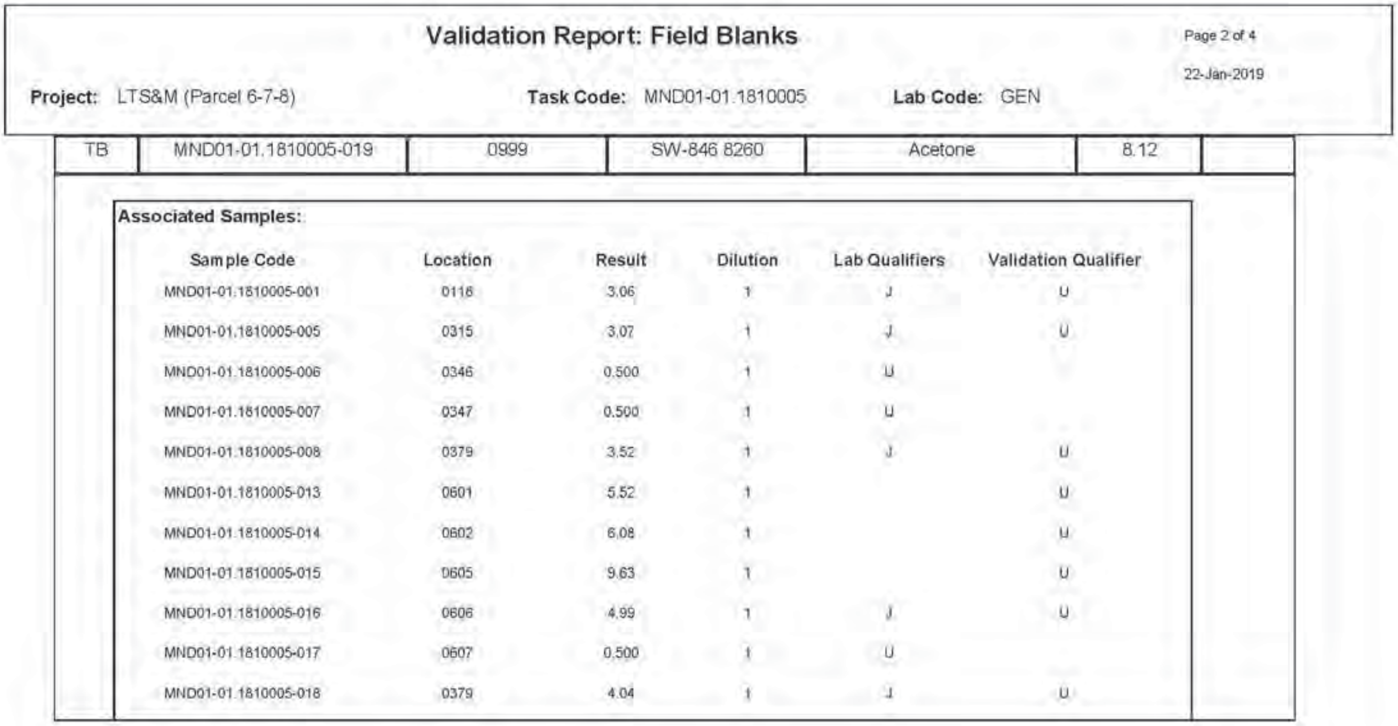
22-Jan-2019

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1810005 **Lab Code:** GEN

Blank Type	Sample Code	Location	Method	Analyte	Result	Lab Qualifiers
TB	MND01-01.1810005-019	0999	SW-846 8260	2-Butanone	4.24	J

Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier
MND01-01.1810005-001	0118	0.500	1	U	
MND01-01.1810005-005	0315	0.500	1	U	
MND01-01.1810005-006	0346	0.500	1	U	
MND01-01.1810005-007	0347	0.500	1	U	
MND01-01.1810005-008	0379	0.500	1	U	
MND01-01.1810005-013	0601	0.500	1	U	
MND01-01.1810005-014	0602	3.64	1	J	U
MND01-01.1810005-015	0605	3.74	1	J	U
MND01-01.1810005-016	0606	0.500	1	U	
MND01-01.1810005-017	0607	0.500	1	U	
MND01-01.1810005-018	0379	0.500	1	U	U



Validation Report: Field Blanks

22-Jan-2019

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1810005 **Lab Code:** GEN

TB	MND01-01.1810005-019	0999	SW-846 8260	Acetone	8.12	

Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier
MND01-01.1810005-001	0116	3.06	1	J	U
MND01-01.1810005-005	0315	3.07	1	J	U
MND01-01.1810005-006	0346	0.500	1	U	
MND01-01.1810005-007	0347	0.500	1	U	
MND01-01.1810005-008	0379	3.52	1	J	U
MND01-01.1810005-013	0601	5.52	1		U
MND01-01.1810005-014	0602	6.08	1		U
MND01-01.1810005-015	0605	9.63	1		U
MND01-01.1810005-016	0606	4.99	1	J	U
MND01-01.1810005-017	0607	0.500	1	U	
MND01-01.1810005-018	0379	4.04	1	J	U

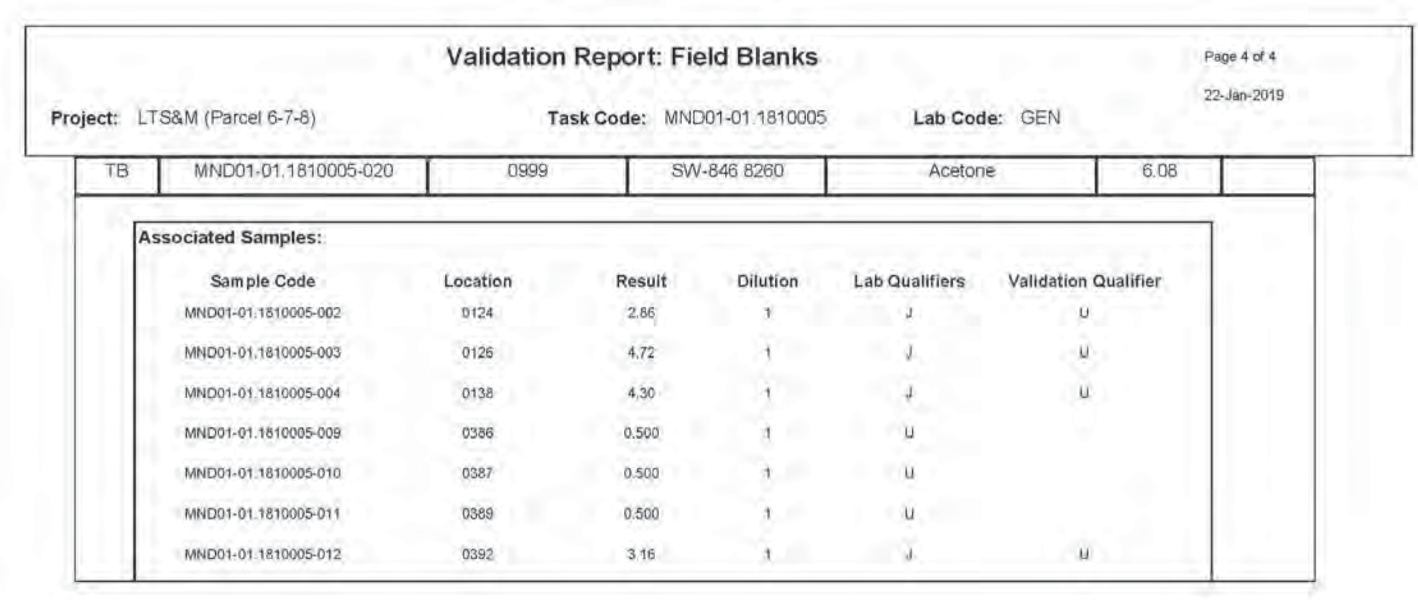
Validation Report: Field Blanks

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1810005 **Lab Code:** GEN

TB	MND01-01.1810005-020	0999	SW-846 8260	2-Butanone	4.18	J

Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier
MND01-01.1810005-002	0124	0.500	1	U	
MND01-01.1810005-003	0126	0.500	1	U	
MND01-01.1810005-004	0138	0.500	1	U	
MND01-01.1810005-009	0386	0.500	1	U	
MND01-01.1810005-010	0387	0.500	1	U	
MND01-01.1810005-011	0389	0.500	1	U	
MND01-01.1810005-012	0392	0.500	1	U	



Validation Report: Field Blanks

22-Jan-2019

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1810005 **Lab Code:** GEN

TB	MND01-01.1810005-020	0999	SW-846 8260	Acetone	6.08	

Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier
MND01-01.1810005-002	0124	2.86	1	J	U
MND01-01.1810005-003	0126	4.72	1	J	U
MND01-01.1810005-004	0138	4.30	1	J	U
MND01-01.1810005-009	0386	0.500	1	U	
MND01-01.1810005-010	0387	0.500	1	U	
MND01-01.1810005-011	0389	0.500	1	U	
MND01-01.1810005-012	0392	3.16	1	J	U

Validation Report: Field Duplicates

22-Jan-2019

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01 1810005 Lab Code GEN

	Duplicate: MND01-01.1810005-018				Sample: MND01-01.1810005-008 0379						
Analyte	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**RPD**	**RER**	**Units**
1,1,1,2-Tetrachloroethane	0.160	U		1	0.160	U		1			ug/L
1,1,1-Trichloroethane	0.160	U		1	0.160	U		1			ug/L
1,1,2,2-Tetrachloroethane	0.160	U		1	0.160	U		1			ug/L
1,1,2-Trichloro-1,2,2-trifluoroethane	1.50	U		1	1.50	U		1			ug/L
1,1,2-Trichloroethane	0.160	U		1	0.160	U		1			ug/L
1,1-Dichloroethane	0.160	U		1	0.160	U		1			ug/L
1,1-Dichloroethene	0.160	U		1	0.160	U		1			ug/L
1,1-Dichloropropene	0.160	U		1	0.160	U		1			ug/L
1,2,3-Trichlorobenzene	0.200	U		1	0.200	U		1			ug/L
1,2,3-Trichloropropane	0.160	U		1	0.160	U		1			ug/L
1,2,4-Trichlorobenzene	0.160	U		1	0.160	U		1			ug/L
1,2,4-Trimethylbenzene	0.160	U		1	0.160	U		1			ug/L
1,2-Dibromo-3-chloropropane	0.160	U		1	0.160	U		1			ug/L
1,2-Dibromoethane	0.160	U		1	0.160	U		1			ug/L
1,2-Dichlorobenzene	0.160	U		1	0.160	U		1			ug/L
1,2-Dichloroethane	0.160	U		1	0.160	U		1			ug/L
1,2-Dichloropropane	0.160	U		1	0.160	U		1			ug/L
1,3,5-Trimethylbenzene	0.160	U		1	0.160	U		1			ug/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio

Validation Report: Field Duplicates

22-Jan-2019

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1810005 Lab Code GEN

	Duplicate: MND01-01.1810005-018				Sample: MND01-01.1810005-008 0379						
Analyte	**Result**	**Qualifiers**	**Uncert**	**Dilution**	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**RPD**	**RER**	**Units**
1,3-Dichlorobenzene	0.160	U		1	0.160	U		1			ug/L
1,3-Dichloropropane	0.160	U		1	0.160	U		1			ug/L
1,4-Dichlorobenzene	0.160	U		1	0.160	U		1			ug/L
2,2-Dichloropropane	0.160	U		1	0.160	U		1			ug/L
2-Butanone	0.500	U		1	0.500	U		1			ug/L
2-Chlorotoluene	0.160	U		1	0.160	U		1			ug/L
2-Hexanone	0.500	U		1	0.500	U		1			ug/L
4-Chlorotoluene	0.160	U		1	0.160	U		1			ug/L
4-Methyl-2-Pentanone	0.500	U		1	0.500	U		1			ug/L
Acetone	4.04	J		1	3.52	U		1	13.8		ug/L
Benzene	0.160	U		1	0.160	U		1			ug/L
Bromobenzene	0.160	U		1	0.160	U		1			ug/L
Bromochloromethane	0.160	U		1	0.160	U		1			ug/L
Bromodichloromethane	0.160	U		1	0.160	U		1			ug/L
Bromoform	0.160	U		1	0.160	U		1			ug/L
Bromomethane	0.160	U		1	0.160	U		1			ug/L
Carbon Disulfide	0.500	U		1	0.500	U		1			ug/L
Carbon tetrachloride	0.650	J		1	0.650	U		1			ug/L
Chlorobenzene	0.160	U		1	0.160	U		1			ug/L
Chlorodibromomethane	0.160	U		1	0.160	U		1			ug/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio

Validation Report: Field Duplicates

22-Jan-2019

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1810005 Lab Code GEN

	Duplicate: MND01-01.1810005-018				Sample: MND01-01.1810005-008 0379						
Analyte	**Result**	**Qualifiers**	**Uncert**	**Dilution**	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**RPD**	**RER**	**Units**
Chloroethane	0.160	U		1	0.160	U		1			ug/L
Chloroform	0.160	U		1	0.160	U		1			ug/L
Chloromethane	0.160	U		1	0.160	U		1			ug/L
cis-1,2-Dichloroethene	0.160	U		1	0.160	U		1			ug/L
cis-1,3-Dichloropropene	0.160	U		1	0.160	U		1			ug/L
Dibromomethane	0.160	U		1	0.160	U		1			ug/L
Dichlorodifluoromethane	0.160	U		1	0.160	U		1			ug/L
Ethylbenzene	0.160	U		1	0.160	U		1			ug/L
Hexachlorobutadiene	0.160	U		1	0.160	U		1			ug/L
Isopropylbenzene	0.160	U		1	0.160	U		1			ug/L
Methylene chloride	0.160	U		1	0.160	U		1			ug/L
n-Butylbenzene	0.160	U		1	0.160	U		1			ug/L
n-Propylbenzene	0.160	U		1	0.160	U		1			ug/L
Naphthalene	0.160	U		1	0.160	U		1			ug/L
p-Isopropyltoluene	0.160	U		1	0.160	U		1			ug/L
sec-Butylbenzene	0.160	U		1	0.160	U		1			ug/L
Styrene	0.160	U		1	0.160	U		1			ug/L
tert-Butylbenzene	0.160	U		1	0.160	U		1			ug/L
Tetrachloroethene	0.430	J		1	0.400	U		1			ug/L
Toluene	0.160	U		1	0.160	U		1			ug/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio

Validation Report: Field Duplicates

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1810005 Lab Code GEN

	Duplicate: MND01-01.1810005-018				Sample: MND01-01.1810005-008 0379						
Analyte	**Result**	**Qualifiers**	**Uncert**	**Dilution**	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**RPD**	**RER**	**Units**
Total Xylenes	0.160	U		1	0.160	U		1			ug/L
trans-1,2-Dichloroethene	0.160	U		1	0.160	U		1			ug/L
trans-1,3-dichloropropene	0.160	U		1	0.160	U		1			ug/L
Trichloroethene	1.30			1	1.34			1	3.0		ug/L
Trichlorofluoromethane	0.160	U		1	0.160	U		1			ug/L
Vinyl chloride	0.160	U		1	0.160	U		1			ug/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio

Organics Data Validation Summary

Page 1 of 1

22-Jan-2019

Project: LTS&M (Parcel 6-7-8)

Task Code: MND01-01.1810005

Lab Code: GEN

Surrogate Recovery:	All surrogate recoveries were within the laboratory acceptance limits.
LCS/LCSD Performance:	There were 21 LCS/LCSD results outside the laboratory acceptance limits.
MS/MSD Performance:	All MS/MSD results were within the laboratory acceptance limits.
Method Blank Performance:	All method blanks were below the MDL.

Noncompliance Report: LCS/LCSD Performance

22-Jan-2019

Project: LTS&M (Parcel 6-7-8) **Task Code:** MND01-01.1810005 **Lab Code:** GEN

Sample ID	Date Analyzed	Method	Analyte	LCS Recovery	LCSD recovery	Lower Limit	Upper Limit	RPD	RPD Limit	Comment
	11-02-2018	SW-846 8260	1,1,1,2-Tetrachloroethane	121		79	120			
	11-02-2018	SW-846 8260	1,1,2,2-Tetrachloroethane	126		76	120			
	11-05-2018	SW-846 8260	1,1,2,2-Tetrachloroethane	122		76	120			
	11-02-2018	SW-846 8260	1,2,3-Trichlorobenzene	124		72	120			
	11-02-2018	SW-846 8260	1,2,3-Trichloropropane	126		70	122			
	11-05-2018	SW-846 8260	1,2,3-Trichloropropane	123		70	122			
	11-02-2018	SW-846 8260	1,2,4-Trichlorobenzene	128		71	121			
	11-02-2018	SW-846 8260	1,2-Dibromo-3-chloropropane	122		60	121			
	11-02-2018	SW-846 8260	1,2-Dichlorobenzene	122		72	120			
	11-02-2018	SW-846 8260	1,3,5-Trimethylbenzene	126		76	125			
	11-02-2018	SW-846 8260	1,3-Dichlorobenzene	125		72	120			
	11-02-2018	SW-846 8260	1,4-Dichlorobenzene	122		71	120			
	11-02-2018	SW-846 8260	2-Chlorotoluene	122		73	121			
	11-02-2018	SW-846 8260	4-Chlorotoluene	126		72	123			
	11-02-2018	SW-846 8260	Bromobenzene	122		74	120			
	11-02-2018	SW-846 8260	Naphthalene	128		69	125			
	11-02-2018	SW-846 8260	n-Propylbenzene	126		73	125			
	11-02-2018	SW-846 8260	p-Isopropyltoluene	130		74	127			
	11-02-2018	SW-846 8260	sec-Butylbenzene	127		74	126			
	11-02-2018	SW-846 8260	tert-Butylbenzene	127		74	126			
	11-02-2018	SW-846 8260	trans-1,3-dichloropropene	124		77	123			

Contractor to the U.S. Department of Energy Office of Legacy Management

Data Review and Validation Report

General Information

Task ID:	MND01-02.1801001
Sample Event:	January 29-30, 2018
Site(s):	LTS&M (Phase 1)
Laboratory:	GEL Laboratories, Charleston, South Carolina
Work Order No.:	442979
Analysis:	Organics
Validator:	Peter Steves
Review Date:	April 24, 2018

This validation was performed according to the “Standard Practice for Validation of Environmental Data” found in Appendix A of *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351, continually updated, http://energy.gov/lm/downloads/sampling-and-analysis-plan-us-department-energy-office-legacy-management-sites). The procedure was applied at Level 3, Data Validation.

This validation includes the evaluation of data quality indicators (DQIs) associated with the data. DQIs are the quantitative and qualitative descriptors that are used to interpret the degree of acceptability or utility of data. Indicators of data quality include the analysis of laboratory control samples to assess accuracy; duplicates and replicates to assess precision; and interference check samples to assess bias (see attached Data Validation Worksheets). The comparability, completeness, and sensitivity of the data are also evaluated in the sections to follow.

All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 1.

Table 1. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Volatile Organics, VOA	VOA-A-007	SW-846 5030B	SW-846 8260 LL

Data Qualifier Summary

Analytical results were qualified as listed in Table 2. Refer to the attached validation worksheets and the sections below for an explanation of the data qualifiers applied.

Table 2. Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
MND01-02.1801001-012	P064	Hexachlorobutadiene	J	Matrix spike result
MND01-02.1801001-013	P064 Duplicate	Hexachlorobutadiene	J	Matrix spike result

Sample Shipping/Receiving

GEL Laboratories in Charleston, South Carolina, received 10 water samples on February 02, 2018, accompanied by a Chain of Custody (COC) form. The air waybill number was listed on the Sample Receipt and Review Form. The COC form was checked to confirm that all of the samples were listed with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The COC forms were complete with no errors or omissions with the following exception:

- The original COC listed the wrong sample collection time for locations 0353, 0445 and 0999. The COC was hand corrected and re-submitted with all date times and signatures present and correct.

Preservation and Holding Times

The sample shipments were received intact with the temperature inside the iced cooler at 4 °C, which complies with requirements. All samples were analyzed within the applicable holding times. All samples were received in the correct container types and had been preserved correctly for the requested analyses with these exceptions:

- Headspace was noted in all containers for sample locations 0445 and P064.

Detection and Quantitation Limits

The method detection limit (MDL) was reported for all organic analytes as required. The MDL, as defined in 40 CFR 136, is the minimum concentration of an analyte that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. The practical quantitation limit (PQL) for these analytes is the lowest concentration that can be reliably measured, and is defined as 5 times the MDL.
The reported MDLs demonstrate compliance with contractual requirements.

Laboratory Instrument Calibration

Method requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for the analytes of interest. Initial calibration verification demonstrates that the instrument is capable of acceptable performance at the beginning of the analytical run. Continuing calibration verification demonstrates that the initial calibration is still valid by checking the performance of the instrument on a continuing basis. Initial and continuing calibration standards must be prepared from independent sources to ensure the validity of the calibration. All laboratory instrument

calibrations and calibration verifications were performed correctly in accordance with the cited methods.

Method SW-846 8260 LL Volatile Organics, VOA

Initial calibration of instrument VOA2 was performed on January 8, 2018 using eight calibration standards. Calibration curves are established using linear regression, quadratic regression, or the average response factor approach. Calibrations using average response factors had relative standard deviations of less than 15 percent. Linear or higher order regression calibrations had correlation coefficient values greater than 0.99 and intercepts less than 3 times the MDL. Initial and continuing calibration verification checks were made at the required frequency. Some target compounds had percent drift values greater than 20 percent but were not detected at concentrations greater than the MDL. The mass spectrometer calibration and resolution was checked at the beginning of each analytical run in accordance with the procedure.

Volatiles Internal Standards and Surrogates

The volatile internal standard recoveries and surrogate recoveries were within the acceptance ranges for all samples.

Method Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. All method blank results associated with the samples were below the PQL for all analytes. In cases where a blank concentration exceeds or equals the MDL, the associated sample results are qualified with a “U” flag (not detected) when the sample result is greater than the MDL but less than 5 times the blank concentration.

Trip Blank

Trip blanks were prepared and analyzed to document contamination attributable to shipping and field handling procedures. This type of blank is useful in documenting contamination of volatile organic samples. Two trip blanks were submitted with these samples. Acetone was detected in the trip blanks. There were no sample acetone results greater than the MDL.

Matrix Spike Analysis

Matrix spikes are aliquots of environmental samples to which a known concentration of analyte has been added before analysis. Matrix spike and matrix-spike duplicate (MS/MSD) analysis is used to assess the performance of the method by measuring the effects of interferences caused by the sample matrix and reflects the bias of the method for the particular matrix in question. The MS/MSD data are not evaluated when the concentration of the unspiked sample is greater than 4 times the spike. The spikes met the recovery and precision criteria for all analytes evaluated with the exception of hexachlorobutadiene. The associated sample hexachlorobutadiene result is qualified with a “J” flag as an estimated value.

Laboratory Replicate Analysis

Laboratory replicate analyses are used to determine laboratory precision for each sample matrix. The relative percent difference for results that are greater than 5 times the PQL should be less than 20 percent (or less than the laboratory-derived control limits for organics). For results that are less than 5 times the PQL, the range should be no greater than the PQL. The RPDs for five volatile organic compounds in the matrix spike samples exceeded the laboratory criteria; these compounds were not detected in any field sample, so no further qualification is necessary. All other replicate results met the criteria, demonstrating acceptable precision.

Laboratory Control Sample

Laboratory control samples were analyzed at the correct frequency to provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. All control sample results were acceptable.

Field Duplicate

Field duplicate samples are collected and analyzed as an indication of overall precision of the measurement process. The precision observed includes both field and laboratory precision and has more variability than laboratory duplicates, which measure only laboratory performance. A duplicate sample was collected from location P064. The relative percent difference for duplicate results that are greater than 5 times the PQL should be less than 20 percent. For results that are less than 5 times the PQL, the range should be no greater than the PQL. The duplicate results met the criteria.

Completeness

Results were reported in the correct units for all analytes requested using contract-required laboratory qualifiers. The analytical report included the MDL (MDC for radiochemistry) and PQL for all analytes and all required supporting documentation.

Electronic Data Deliverable (EDD) File

The EDD file arrived on March 22, 2018. The Sample Management System EDD validation module was used to verify that the EDD file was complete and in compliance with requirements. The module compares the contents of the file to the requested analyses to ensure all and only the requested data are delivered. The contents of the EDD were manually examined to verify that the sample results accurately reflect the data contained in the sample data package.

Potential Outliers

Potential outliers are results that lie outside the historical range, possibly due to transcription errors, data calculation errors, or measurement system problems. However, outliers can also represent true values outside the historical range. Potential outliers are identified by generating the Data Validation Outliers Report from data in the environmental database. The new data are compared to historical values and data that fall outside the historical data range are listed on the report along with the historical minimum and maximum values. The potential outliers are further reviewed and may be subject to statistical evaluation using the ProUCL application developed by the EPA (https://www.epa.gov/land-research/proucl-software). The review also includes an evaluation of any notable trends in the data that may indicate the outliers represent true extreme values.

There were no outliers identified and the data for this Task are acceptable as qualified.

Leslie P.
Steves
2018.07.23
14:32:26
-06'00'

Report Prepared By: ____

Peter Steves
Data Validator

General Data Validation Report

Task Code: MND01-02.1801001 **Lab Code:** GEN **Validator:** Peter Steves **Validation Date:** 04-24-2018

Project: LTS&M (Phase I) **# Samples:** 10

Analysis Type: ☐ General Chemistry ☐ Metals ☒ Organics ☐ Radiochemistry

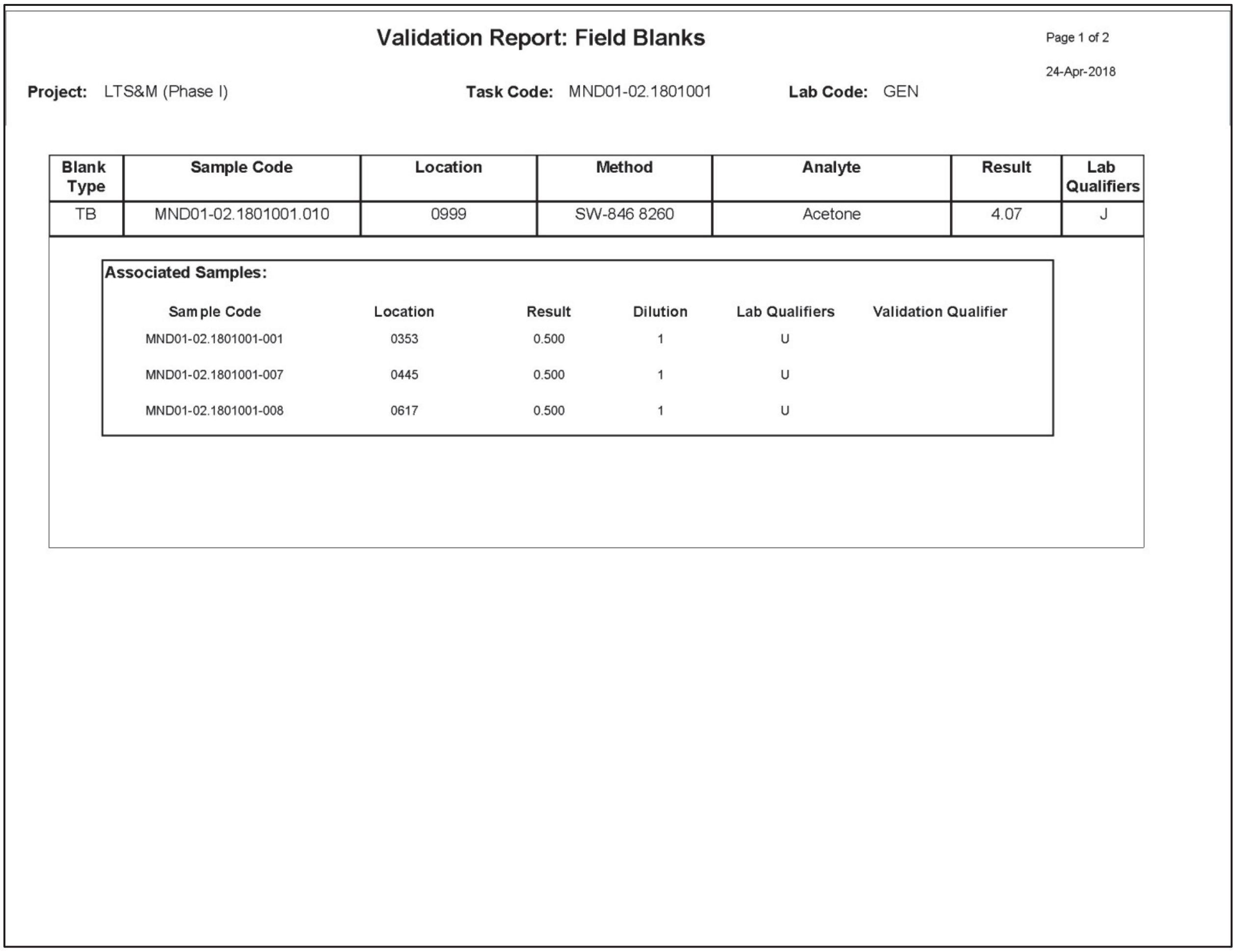
Chain of Custody

Present: OK Signed: OK Dated: OK

Sample

Integrity: OK Preservation OK Temperature: OK

Check	Summary
Holding Times:	All analyses were completed within the applicable holding times.
Detection Limits:	The reported detection limits are equal to or below the contract required limits.
Field Blanks:	There were 2 field blanks associated with this task.
Field Duplicates:	There was 1 duplicate evaluated.



Validation Report: Field Blanks

Page 1 of 2

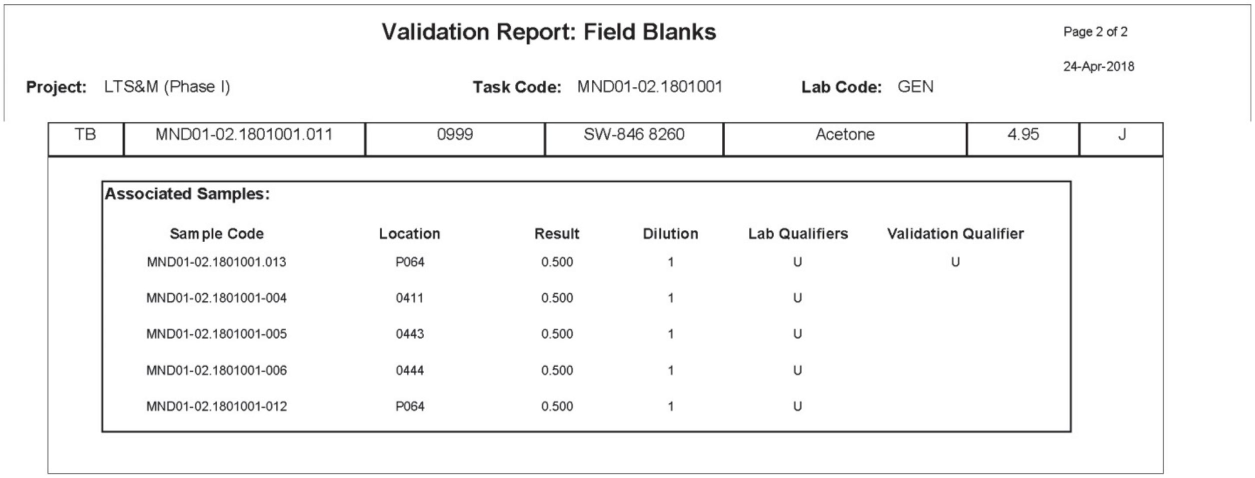
24-Apr-2018

Project: LTS&M (Phase I) **Task Code:** MND01-02.1801001 **Lab Code:** GEN

Blank Type	Sample Code	Location	Method	Analyte	Result	Lab Qualifiers
TB	MND01-02.1801001.010	0999	SW-846 8260	Acetone	4.07	J

Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier
MND01-02.1801001-001	0353	0.500	1	U	
MND01-02.1801001-007	0445	0.500	1	U	
MND01-02.1801001-008	0617	0.500	1	U	



Validation Report: Field Blanks

Page 2 of 2

24-Apr-2018

Project: LTS&M (Phase I) **Task Code:** MND01-02.1801001 **Lab Code:** GEN

TB	MND01-02.1801001.011	0999	SW-846 8260	Acetone	4.95	J

Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier
MND01-02.1801001.013	P064	0.500	1	U	U
MND01-02.1801001-004	0411	0.500	1	U	
MND01-02.1801001-005	0443	0.500	1	U	
MND01-02.1801001-006	0444	0.500	1	U	
MND01-02.1801001-012	P064	0.500	1	U	

Validation Report: Field Duplicates

Page 1 of 4

24-Apr-2018

Project: LTS&M (Phase I) **Task Code:** MND01-02.1801001 Lab Code: GEN

	Duplicate: MND01-02.1801001.013				Sample: MND01-02.1801001-012 P064						
Analyte	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**RPD**	**RER**	**Units**
1,1,1,2-Tetrachloroethane	0.160	U		1	0.160	U		1			ug/L
1,1,1-Trichloroethane	0.160	U		1	0.160	U		1			ug/L
1,1,2,2-Tetrachloroethane	0.160	U		1	0.160	U		1			ug/L
1,1,2-Trichloro-1,2,2-trifluoroethane	1.50	U		1	1.50	U		1			ug/L
1,1,2-Trichloroethane	0.160	U		1	0.160	U		1			ug/L
1,1-Dichloroethane	0.160	U		1	0.160	U		1			ug/L
1,1-Dichloroethene	0.160	U		1	0.160	U		1			ug/L
1,1-Dichloropropene	0.160	U		1	0.160	U		1			ug/L
1,2,3-Trichlorobenzene	0.200	U		1	0.200	U		1			ug/L
1,2,3-Trichloropropane	0.160	U		1	0.160	U		1			ug/L
1,2,4-Trichlorobenzene	0.160	U		1	0.160	U		1			ug/L
1,2,4-Trimethylbenzene	0.160	U		1	0.160	U		1			ug/L
1,2-Dibromo-3-chloropropane	0.160	U		1	0.160	U		1			ug/L
1,2-Dibromoethane	0.160	U		1	0.160	U		1			ug/L
1,2-Dichlorobenzene	0.160	U		1	0.160	U		1			ug/L
1,2-Dichloroethane	0.160	U		1	0.160	U		1			ug/L
1,2-Dichloropropane	0.160	U		1	0.160	U		1			ug/L
1,3,5-Trimethylbenzene	0.160	U		1	0.160	U		1			ug/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio

Validation Report: Field Duplicates

24-Apr-2018

Project: LTS&M (Phase I) **Task Code:** MND01-02.1801001 Lab Code: GEN

	Duplicate: MND01-02.1801001.013				Sample: MND01-02.1801001-012 P064						
Analyte	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**RPD**	**RER**	**Units**
1,3-Dichlorobenzene	0.160	U		1	0.160	U		1			ug/L
1,3-Dichloropropane	0.160	U		1	0.160	U		1			ug/L
1,4-Dichlorobenzene	0.160	U		1	0.160	U		1			ug/L
2,2-Dichloropropane	0.160	U		1	0.160	U		1			ug/L
2-Butanone	0.500	U		1	0.500	U		1			ug/L
2-Chlorotoluene	0.160	U		1	0.160	U		1			ug/L
2-Hexanone	0.500	U		1	0.500	U		1			ug/L
4-Chlorotoluene	0.160	U		1	0.160	U		1			ug/L
4-Methyl-2-Pentanone	0.500	U		1	0.500	U		1			ug/L
Acetone	0.500	U		1	0.500	U		1			ug/L
Benzene	0.160	U		1	0.160	U		1			ug/L
Bromobenzene	0.160	U		1	0.160	U		1			ug/L
Bromochloromethane	0.160	U		1	0.160	U		1			ug/L
Bromodichloromethane	0.160	U		1	0.160	U		1			ug/L
Bromoform	0.160	U		1	0.160	U		1			ug/L
Bromomethane	0.160	U		1	0.160	U		1			ug/L
Carbon Disulfide	0.500	U		1	0.500	U		1			ug/L
Carbon tetrachloride	0.160	U		1	0.160	U		1			ug/L
Chlorobenzene	0.160	U		1	0.160	U		1			ug/L
Chlorodibromomethane	0.160	U		1	0.160	U		1			ug/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio

Validation Report: Field Duplicates

Page 3 of 4

24-Apr-2018

Project: LTS&M (Phase I) **Task Code:** MND01-02.1801001 Lab Code: GEN

	Duplicate: MND01-02.1801001.013				Sample: MND01-02.1801001-012 P064						
Analyte	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**RPD**	**RER**	**Units**
Chloroethane	0.160	U		1	0.160	U		1			ug/L
Chloroform	0.160	U		1	0.160	U		1			ug/L
Chloromethane	0.160	U		1	0.160	U		1			ug/L
cis-1,2-Dichloroethene	0.160	U		1	0.160	U		1			ug/L
cis-1,3-Dichloropropene	0.160	U		1	0.160	U		1			ug/L
Dibromomethane	0.160	U		1	0.160	U		1			ug/L
Dichlorodifluoromethane	0.160	U		1	0.160	U		1			ug/L
Ethylbenzene	0.160	U		1	0.160	U		1			ug/L
Hexachlorobutadiene	0.160	U		1	0.160	U		1			ug/L
Isopropylbenzene	0.160	U		1	0.160	U		1			ug/L
Methylene chloride	0.160	U		1	0.160	U		1			ug/L
n-Butylbenzene	0.160	U		1	0.160	U		1			ug/L
n-Propylbenzene	0.160	U		1	0.160	U		1			ug/L
Naphthalene	0.160	U		1	0.160	U		1			ug/L
p-Isopropyltoluene	0.160	U		1	0.160	U		1			ug/L
sec-Butylbenzene	0.160	U		1	0.160	U		1			ug/L
Styrene	0.160	U		1	0.160	U		1			ug/L
tert-Butylbenzene	0.160	U		1	0.160	U		1			ug/L
Tetrachloroethene	0.730	J		1	0.720	U		1			ug/L
Toluene	0.160	U		1	0.160	U		1			ug/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio

Validation Report: Field Duplicates

24-Apr-2018

Project: LTS&M (Phase I) **Task Code:** MND01-02.1801001 Lab Code: GEN

	Duplicate: MND01-02.1801001.013				Sample: MND01-02.1801001-012 P064						
Analyte	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**RPD**	**RER**	**Units**
Total Xylenes	0.160	U		1	0.160	U		1			ug/L
trans-1,2-Dichloroethene	0.160	U		1	0.160	U		1			ug/L
trans-1,3-dichloropropene	0.160	U		1	0.160	U		1			ug/L
Trichloroethene	1.12			1	1.14			1	1.8		ug/L
Trichlorofluoromethane	0.160	U		1	0.160	U		1			ug/L
Vinyl chloride	0.160	U		1	0.160	U		1			ug/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio

Organics Data Validation Summary

Page 1 of 1

24-Apr-2018

Project: LTS&M (Phase I)

Task Code: MND01-02.1801001

Lab Code: GEN

Surrogate Recovery:	All surrogate recoveries were within the laboratory acceptance limits.
LCS/LCSD Performance:	All LCS/LCSD results were within the laboratory acceptance limits.
MS/MSD Performance:	There were 6 MS/MSD results outside the laboratory acceptance limits.
Method Blank Performance:	All method blanks were below the MDL.

Page 1 of 1

24-Apr-2018

Noncompliance Report: MS/MSD Performance

Project: LTS&M (Phase I) **Task Code:** MND01-02.1801001 **Lab Code:** GEN

Sample ID	Date Analyzed	Method	Analyte	MS Recovery	MSD Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	Comment
	02-06-2018	SW-846 8260	Hexachlorobutadiene		57	65	123	29	20	MS recovery out of acceptance range
	02-06-2018	SW-846 8260	n-Butylbenzene		68	64	128	29	20	RPD > 20%
	02-06-2018	SW-846 8260	n-Propylbenzene		77	66	124	23	20	RPD > 20%
	02-06-2018	SW-846 8260	p-Isopropyltoluene		75	66	126	25	20	RPD > 20%
	02-06-2018	SW-846 8260	sec-Butylbenzene		78	67	126	24	20	RPD > 20%
	02-06-2018	SW-846 8260	tert-Butylbenzene		79	68	124	21	20	RPD > 20%

Data Review and Validation Report

General Information

Task ID:	MND01-02.1807002
Sample Event:	July 30 and 31, 2018
Site(s):	Mound LTS&M (Phase 1)
Laboratory:	GEL Laboratories, Charleston, South Carolina
Work Order No.:	455812
Analysis:	Organics
Validator:	Samantha Tigar
Review Date:	October 23, 2018

This validation was performed according to *Environmental Data Validation Procedure* (LMS/PRO/S15870), which is available athttp://sp.lm.doe.gov/Contractor/ControlledDocuments/Controlled%20Documents/S15870_Env_DV_Procedure.pdf. The procedure was applied at Level 3, Data Validation.

All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 1.

Table 1. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Volatile Organics, VOA	VOA-A-007	SW-846 5030B	SW-846 8260 LL

Data Qualifier Summary

None of the analytical results required qualification.

Sample Shipping/Receiving

GEL Laboratories in Charleston, South Carolina, received 9 water samples on July 31 and August 1, 2018, accompanied by a Chain of Custody (COC) form. The air waybill number was listed on the Sample Receipt and Review Form. The COC form was checked to confirm that all of the samples were listed with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The COC forms were complete with no errors or omissions.

Preservation and Holding Times

The sample shipments were received intact with the temperature inside the iced coolers at 2 °C and 3 °C, which complies with requirements. All samples were received in the correct container types and had been preserved correctly for the requested analyses. All samples were analyzed within the applicable holding times.

Detection and Quantitation Limits

The method detection limit (MDL) was reported for all organic analytes as required. The MDL, as defined in 40 CFR 136, is the minimum concentration of an analyte that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. The practical quantitation limit (PQL) for these analytes is the lowest concentration that can be reliably measured, and is defined as 5 times the MDL. The reported MDLs demonstrate compliance with contractual requirements.

Laboratory Instrument Calibration

Method requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for the analytes of interest. Initial calibration verification demonstrates that the instrument is capable of acceptable performance at the beginning of the analytical run. Continuing calibration verification demonstrates that the initial calibration is still valid by checking the performance of the instrument on a continuing basis. Initial and continuing calibration standards must be prepared from independent sources to ensure the validity of the calibration. All laboratory instrument calibrations and calibration verifications were performed correctly in accordance with the cited methods.

Method SW-846 8260 LL, Volatile Organics

Initial calibration of instrument VOA2 was performed on July 17, 2018 using nine calibration standards. Calibration curves are established using linear regression, quadratic regression, or the average response factor approach. Calibrations using average response factors had relative standard deviations of less than 15 percent. Linear or higher order regression calibrations had correlation coefficient values greater than 0.99 and intercepts less than 3 times the MDL. Initial and continuing calibration verification checks were made at the required frequency. All target compounds had percent drift values less than 20 percent. The mass spectrometer calibration and resolution was checked at the beginning of each analytical run in accordance with the procedure.

Volatiles Internal Standards and Surrogates

The volatile internal standard recoveries and surrogate recoveries were within the acceptance ranges for all samples.

Method Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. All method blank results associated with the samples were below the PQL for all analytes. In cases where a blank concentration exceeds or equals the MDL, the associated sample results are qualified with a U flag (not detected) when the sample result is greater than the MDL but less than 5 times the blank concentration.

Trip Blank

Trip blanks were prepared and analyzed to document contamination attributable to shipping and field handling procedures. This type of blank is useful in documenting contamination of volatile organic samples. Two trip blanks were submitted with these samples. Acetone was detected in the trip blanks but was not detected at concentrations greater than the MDL in the associated samples.

Matrix Spike Analysis

Matrix spikes are aliquots of environmental samples to which a known concentration of analyte has been added before analysis. Matrix spike and matrix-spike duplicate (MS/MSD) analysis is used to assess the performance of the method by measuring the effects of interferences caused by the sample matrix and reflects the bias of the method for the particular matrix in question. The MS/MSD data are not evaluated when the concentration of the unspiked sample is greater than 4 times the spike. Several spike recoveries did not meet the acceptance criteria. These compounds were not detected at concentrations greater than the MDL in the associated samples and no qualification was required.

Laboratory Replicate Analysis

Laboratory replicate analyses are used to determine laboratory precision for each sample matrix. The relative percent difference for results that are greater than 5 times the PQL should be less than 20 percent (or less than the laboratory-derived control limits for organics). For results that are less than 5 times the PQL, the range should be no greater than the PQL. Several compounds exceeded the acceptance criteria but were not detected at concentrations greater than the MDL in the associated samples.

Laboratory Control Sample

Laboratory control samples were analyzed at the correct frequency to provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. All control sample results were acceptable.

Field Duplicate

Field duplicate samples are collected and analyzed as an indication of overall precision of the measurement process. The precision observed includes both field and laboratory precision and has more variability than laboratory duplicates, which measure only laboratory performance. The relative percent difference for duplicate results that are greater than 5 times the PQL should be less than 20 percent. For results that are less than 5 times the PQL, the range should be no greater than the PQL. A duplicate sample was collected from location P064. The duplicate results met the criteria for all analytes, demonstrating acceptable overall precision.

Completeness

Results were reported in the correct units for all analytes requested using contract-required laboratory qualifiers. The analytical report included the MDL and PQL for all analytes and all required supporting documentation.

Electronic Data Deliverable (EDD) File

A revised EDD file arrived on October 26, 2018. The EDD was examined to verify that the file was complete and in compliance with requirements. The contents of the file were compared to the requested analyses to ensure all and only the requested data are delivered. The contents of the EDD were manually examined to verify that the sample results accurately reflect the data contained in the sample data package.

Field Measurements

The pre-sampling purge criteria were met for all wells.

Potential Outliers

Potential outliers are results that lie outside the historical range, possibly due to transcription errors, data calculation errors, or measurement system problems. However, outliers can also represent true values outside the historical range. Potential outliers are identified by generating the Data Validation Outliers Report from data in the environmental database. The new data are compared to historical values and data that fall outside the historical data range are listed on the report along with the historical minimum and maximum values. The potential outliers are further reviewed and may be subject to statistical evaluation using the ProUCL application developed by the EPA (https://www.epa.gov/land-research/proucl-software). The review also includes an evaluation of any notable trends in the data that may indicate the outliers represent true extreme values. There were no outliers identified and the data for this task are acceptable as qualified.

Report Prepared By: Samantha Tigar

Digitally signed by
SAMANTHA TIGAR (Affiliate)
Date: 2018.10.30 15:04:13
-06'00'

Samantha Tigar
Data Validator

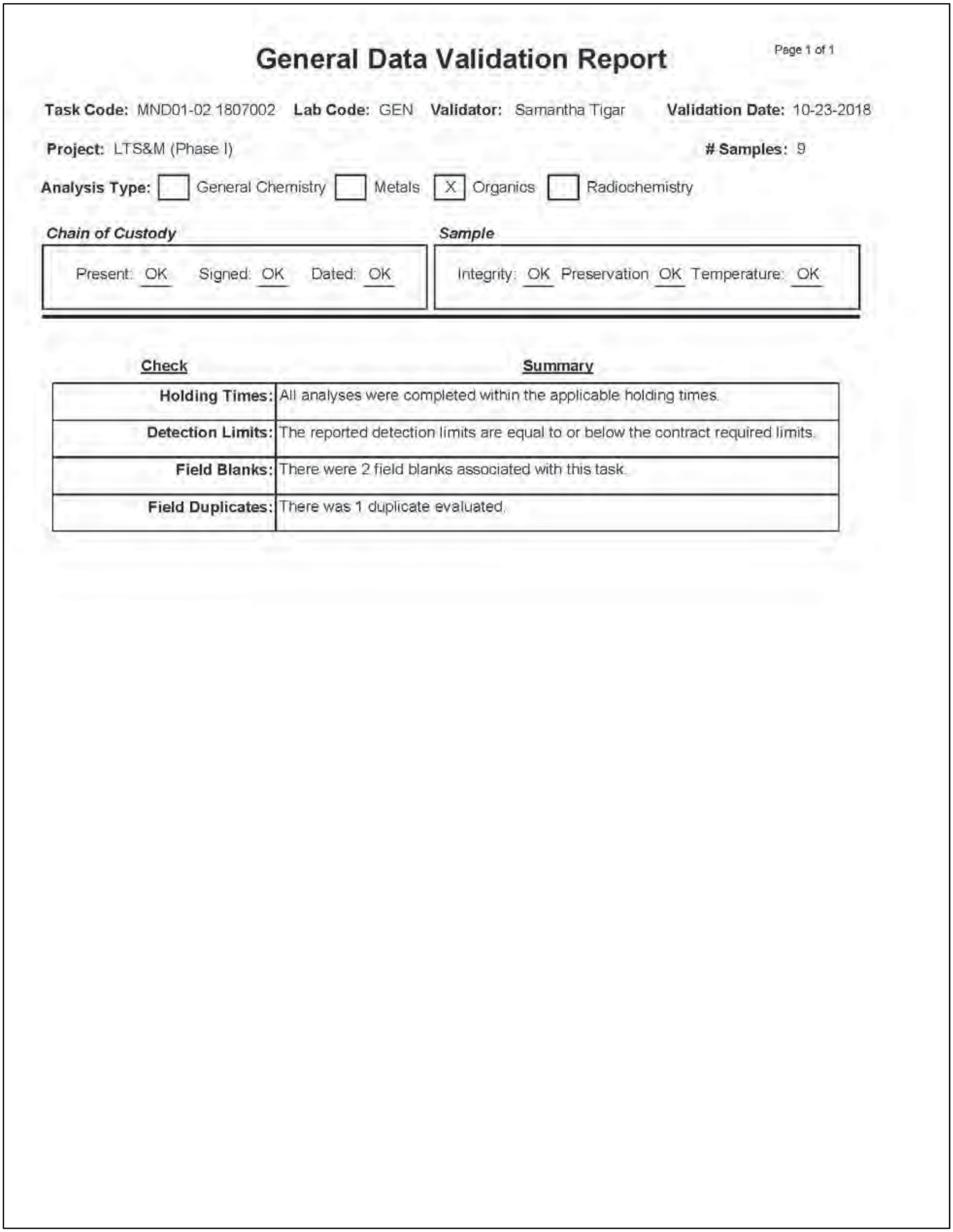
Data Validation Outliers Report - No Field Parameters **Report Date: 10/30/2018**

Comparison to Historical Data Since: 10/30/2007 12:00:00 AM Fraction: Any

Task: MND01-02.1807002

Analyte	Location	Analysis Location	Units	Fraction	Result	Lab Qualifier(s)	Type	HistMIN	HistMAX	HistSetSize	Potential Outlier?
Tetrachloroethene	P064	LB	ug/L	N	0.800	J	> HistMAX	0.67	0.75	5	No
Tetrachloroethene	P064	LB	ug/L	N	0.670	J	< HistMIN	0.71	0.8	5	No
Trichloroethene	P064	LB	ug/L	N	1.10		< HistMIN	1.12	1.54	5	No

FRACTION: D = Dissolved N = NA T = Total



Page 1 of 1

General Data Validation Report

Task Code: MND01-02 1807002 **Lab Code:** GEN **Validator:** Samantha Tigar **Validation Date:** 10-23-2018

Project: LTS&M (Phase I) **# Samples:** 9

Analysis Type: ☐ General Chemistry ☐ Metals ☒ Organics ☐ Radiochemistry

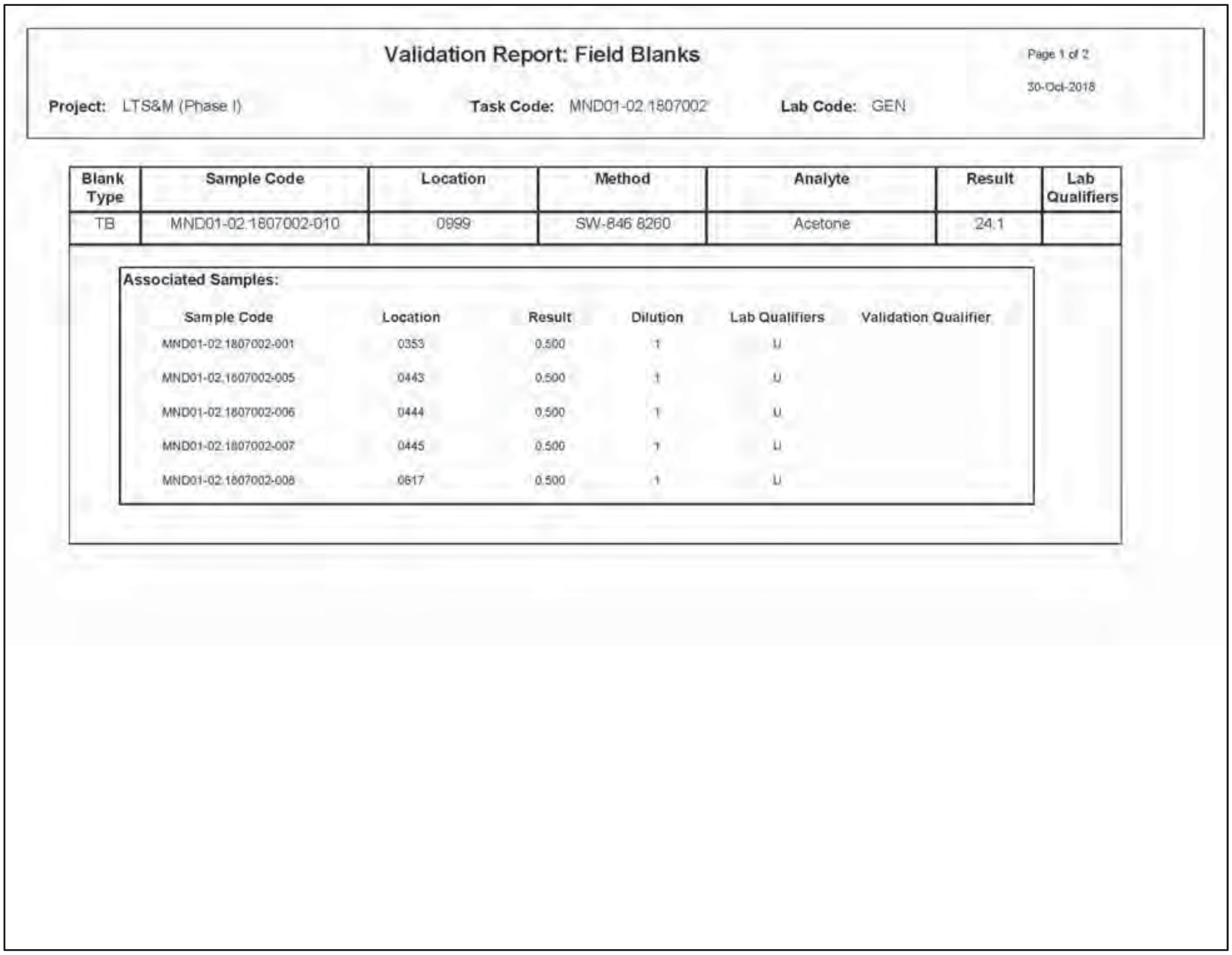
Chain of Custody

Present: OK Signed: OK Dated: OK

Sample

Integrity: OK Preservation OK Temperature: OK

Check	**Summary**
Holding Times:	All analyses were completed within the applicable holding times.
Detection Limits:	The reported detection limits are equal to or below the contract required limits.
Field Blanks:	There were 2 field blanks associated with this task.
Field Duplicates:	There was 1 duplicate evaluated.



Validation Report: Field Blanks

Page 1 of 2

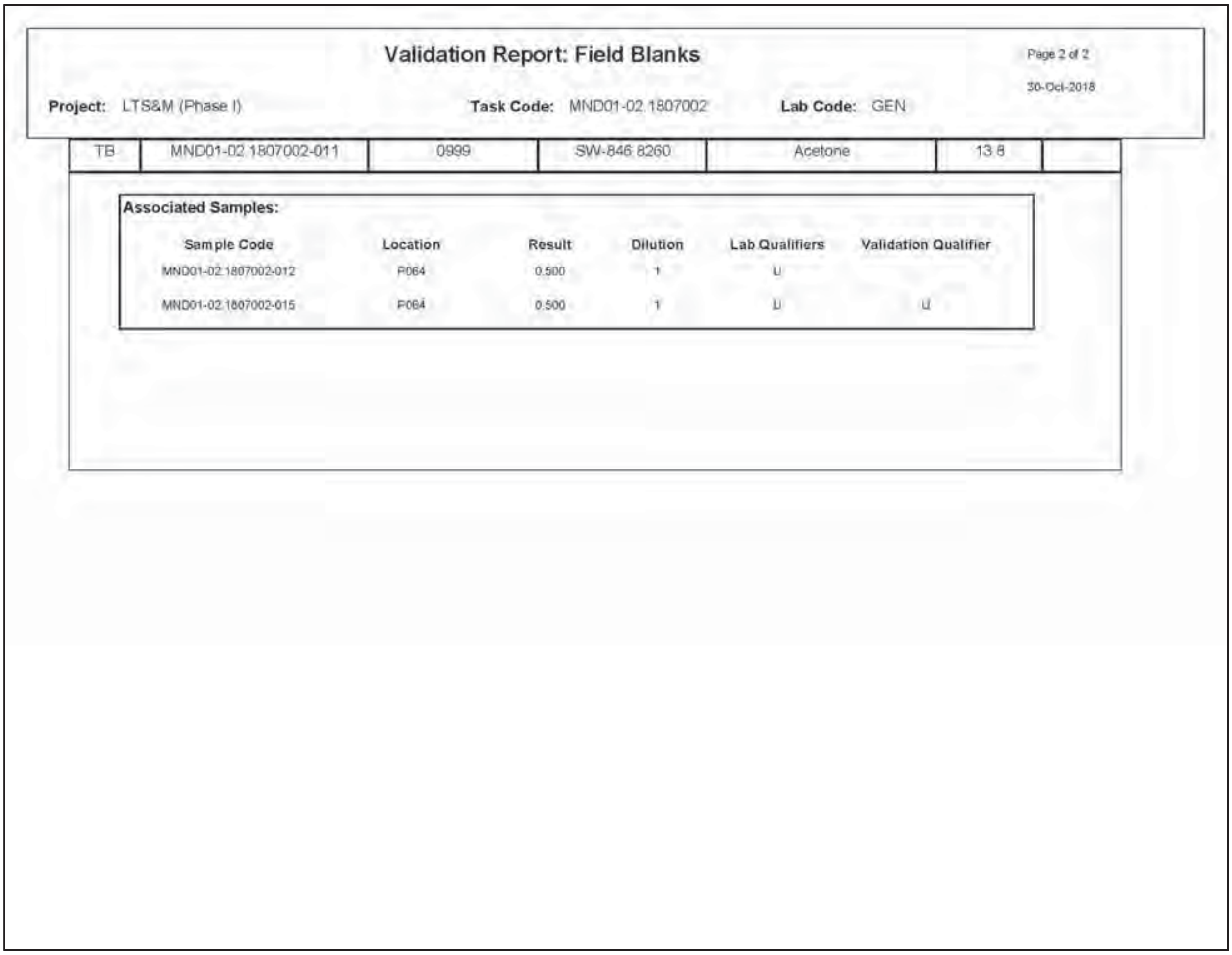
30-Oct-2018

Project: LTS&M (Phase I) **Task Code:** MND01-02.1807002 **Lab Code:** GEN

Blank Type	Sample Code	Location	Method	Analyte	Result	Lab Qualifiers
TB	MND01-02.1807002-010	0999	SW-846 8260	Acetone	24.1	

Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier
MND01-02.1807002-001	0353	0.500	1	U	
MND01-02.1807002-005	0443	0.500	1	U	
MND01-02.1807002-006	0444	0.500	1	U	
MND01-02.1807002-007	0445	0.500	1	U	
MND01-02.1807002-008	0617	0.500	1	U	



Validation Report: Field Blanks

Page 2 of 2

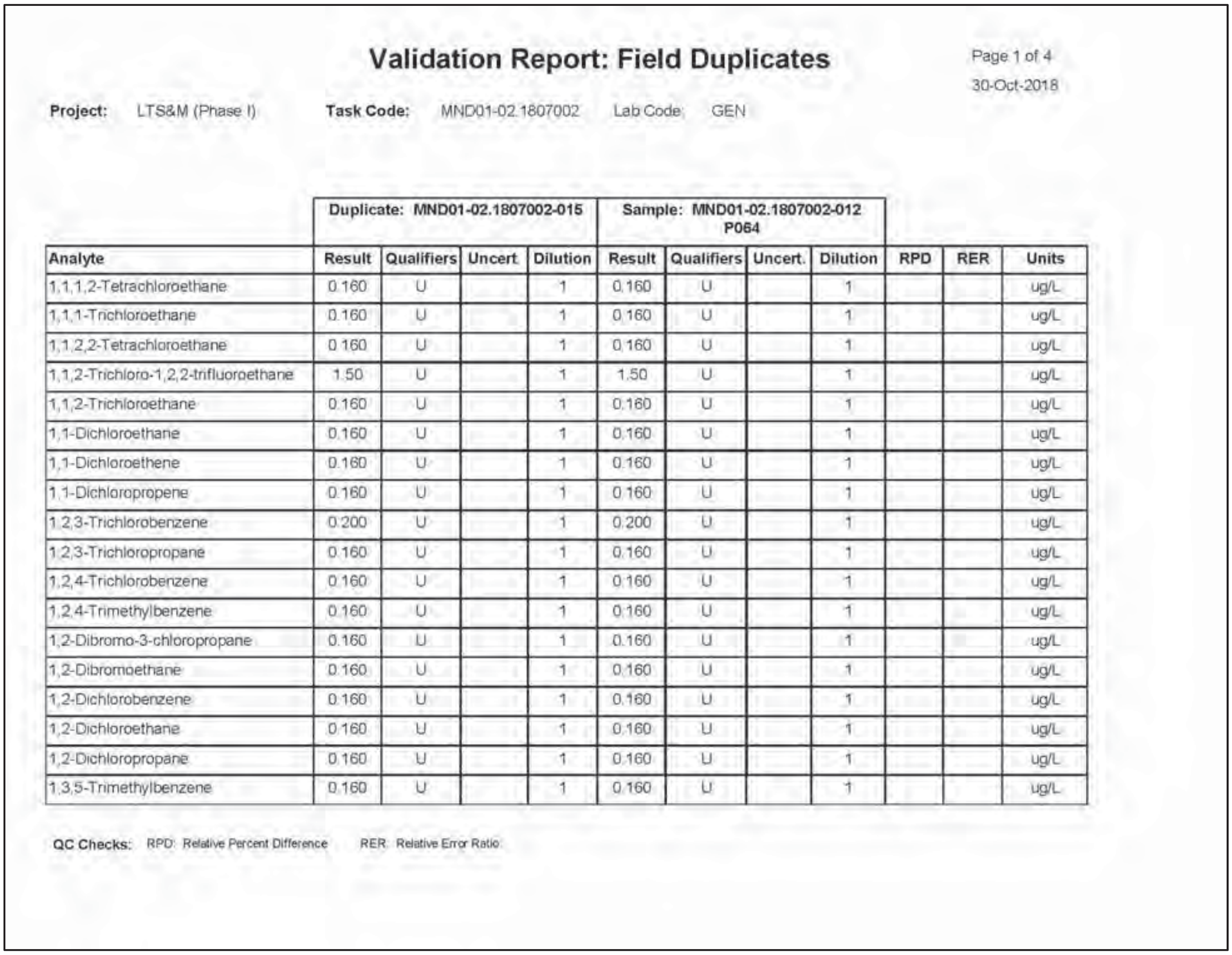
30-Oct-2018

Project: LTS&M (Phase I) **Task Code:** MND01-02.1807002 **Lab Code:** GEN

TB	MND01-02.1807002-011	0999	SW-846 8260	Acetone	13.8	

Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier
MND01-02.1807002-012	P064	0.500	1	U	
MND01-02.1807002-015	P064	0.500	1	U	U



Validation Report: Field Duplicates

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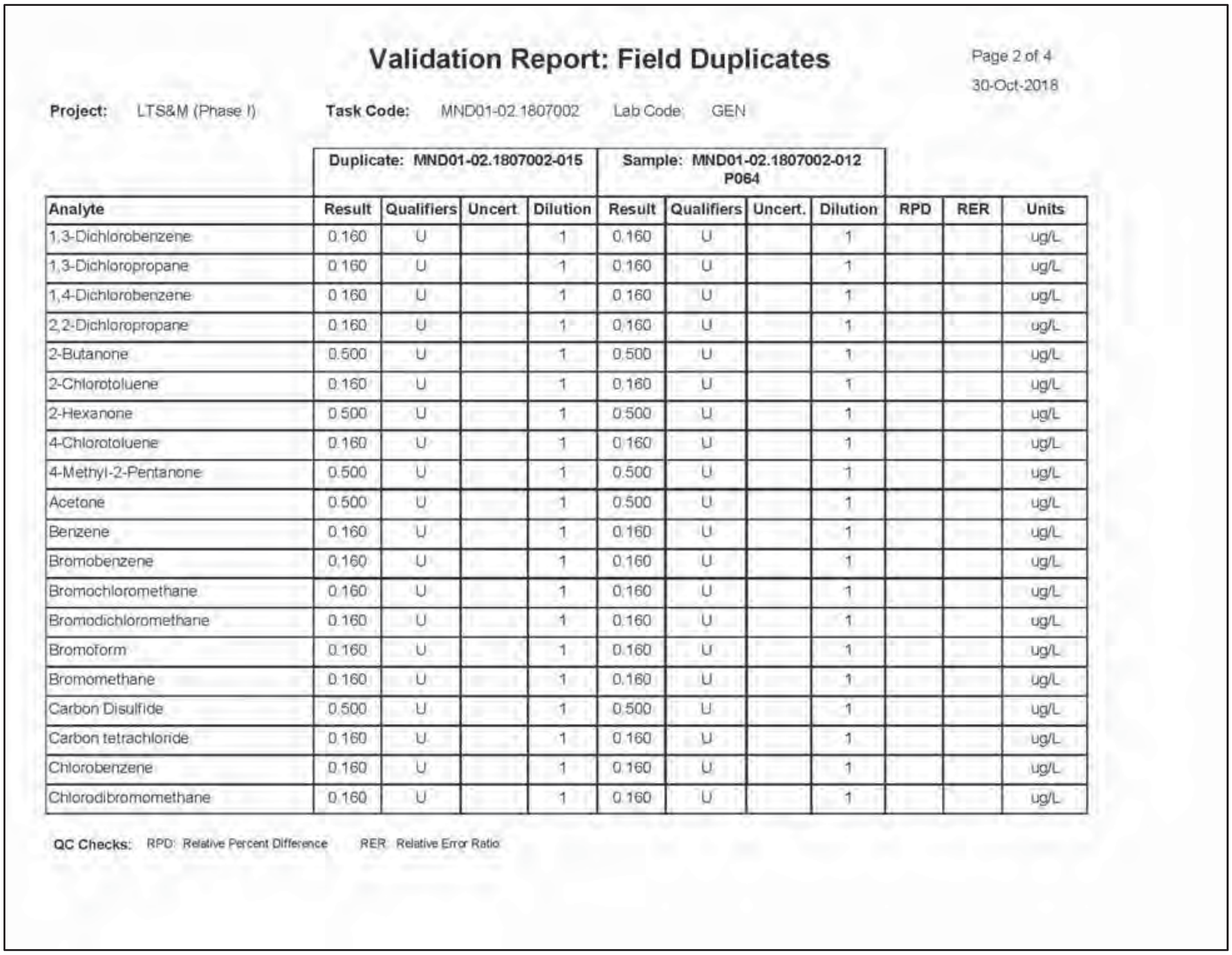
30-Oct-2018

Project: LTS&M (Phase I) **Task Code:** MND01-02.1807002 Lab Code: GEN

	Duplicate: MND01-02.1807002-015				Sample: MND01-02.1807002-012 P064						
Analyte	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**RPD**	**RER**	**Units**
1,1,1,2-Tetrachloroethane	0.160	U		1	0.160	U		1			ug/L
1,1,1-Trichloroethane	0.160	U		1	0.160	U		1			ug/L
1,1,2,2-Tetrachloroethane	0.160	U		1	0.160	U		1			ug/L
1,1,2-Trichloro-1,2,2-trifluoroethane	1.50	U		1	1.50	U		1			ug/L
1,1,2-Trichloroethane	0.160	U		1	0.160	U		1			ug/L
1,1-Dichloroethane	0.160	U		1	0.160	U		1			ug/L
1,1-Dichloroethene	0.160	U		1	0.160	U		1			ug/L
1,1-Dichloropropene	0.160	U		1	0.160	U		1			ug/L
1,2,3-Trichlorobenzene	0.200	U		1	0.200	U		1			ug/L
1,2,3-Trichloropropane	0.160	U		1	0.160	U		1			ug/L
1,2,4-Trichlorobenzene	0.160	U		1	0.160	U		1			ug/L
1,2,4-Trimethylbenzene	0.160	U		1	0.160	U		1			ug/L
1,2-Dibromo-3-chloropropane	0.160	U		1	0.160	U		1			ug/L
1,2-Dibromoethane	0.160	U		1	0.160	U		1			ug/L
1,2-Dichlorobenzene	0.160	U		1	0.160	U		1			ug/L
1,2-Dichloroethane	0.160	U		1	0.160	U		1			ug/L
1,2-Dichloropropane	0.160	U		1	0.160	U		1			ug/L
1,3,5-Trimethylbenzene	0.160	U		1	0.160	U		1			ug/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio



Validation Report: Field Duplicates

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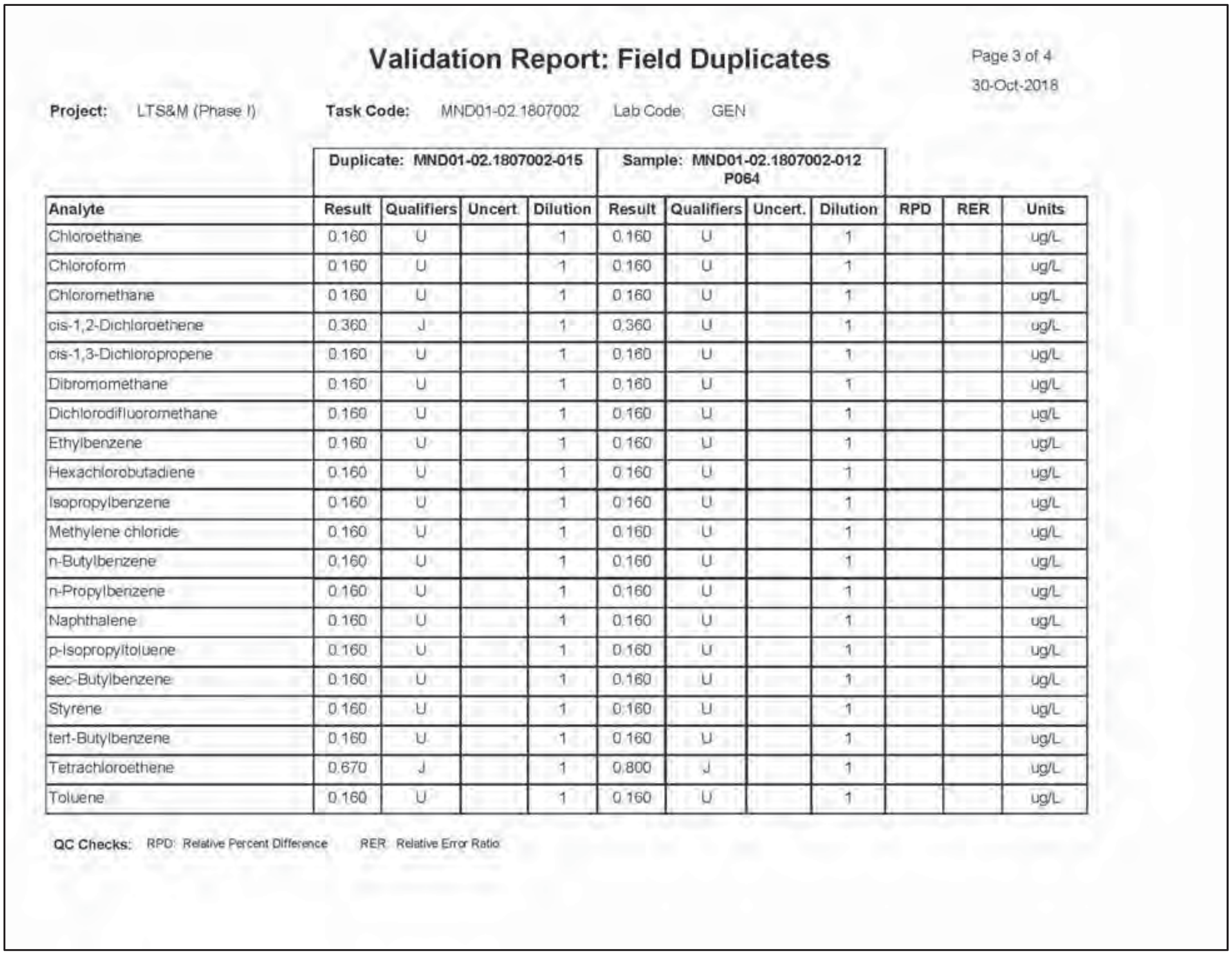
30-Oct-2018

Project: LTS&M (Phase I) **Task Code:** MND01-02.1807002 Lab Code: GEN

	Duplicate: MND01-02.1807002-015				**Sample: MND01-02.1807002-012 P064**						
Analyte	**Result**	**Qualifiers**	**Uncert**	**Dilution**	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**RPD**	**RER**	**Units**
1,3-Dichlorobenzene	0.160	U		1	0.160	U		1			ug/L
1,3-Dichloropropane	0.160	U		1	0.160	U		1			ug/L
1,4-Dichlorobenzene	0.160	U		1	0.160	U		1			ug/L
2,2-Dichloropropane	0.160	U		1	0.160	U		1			ug/L
2-Butanone	0.500	U		1	0.500	U		1			ug/L
2-Chlorotoluene	0.160	U		1	0.160	U		1			ug/L
2-Hexanone	0.500	U		1	0.500	U		1			ug/L
4-Chlorotoluene	0.160	U		1	0.160	U		1			ug/L
4-Methyl-2-Pentanone	0.500	U		1	0.500	U		1			ug/L
Acetone	0.500	U		1	0.500	U		1			ug/L
Benzene	0.160	U		1	0.160	U		1			ug/L
Bromobenzene	0.160	U		1	0.160	U		1			ug/L
Bromochloromethane	0.160	U		1	0.160	U		1			ug/L
Bromodichloromethane	0.160	U		1	0.160	U		1			ug/L
Bromoform	0.160	U		1	0.160	U		1			ug/L
Bromomethane	0.160	U		1	0.160	U		1			ug/L
Carbon Disulfide	0.500	U		1	0.500	U		1			ug/L
Carbon tetrachloride	0.160	U		1	0.160	U		1			ug/L
Chlorobenzene	0.160	U		1	0.160	U		1			ug/L
Chlorodibromomethane	0.160	U		1	0.160	U		1			ug/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio



Validation Report: Field Duplicates

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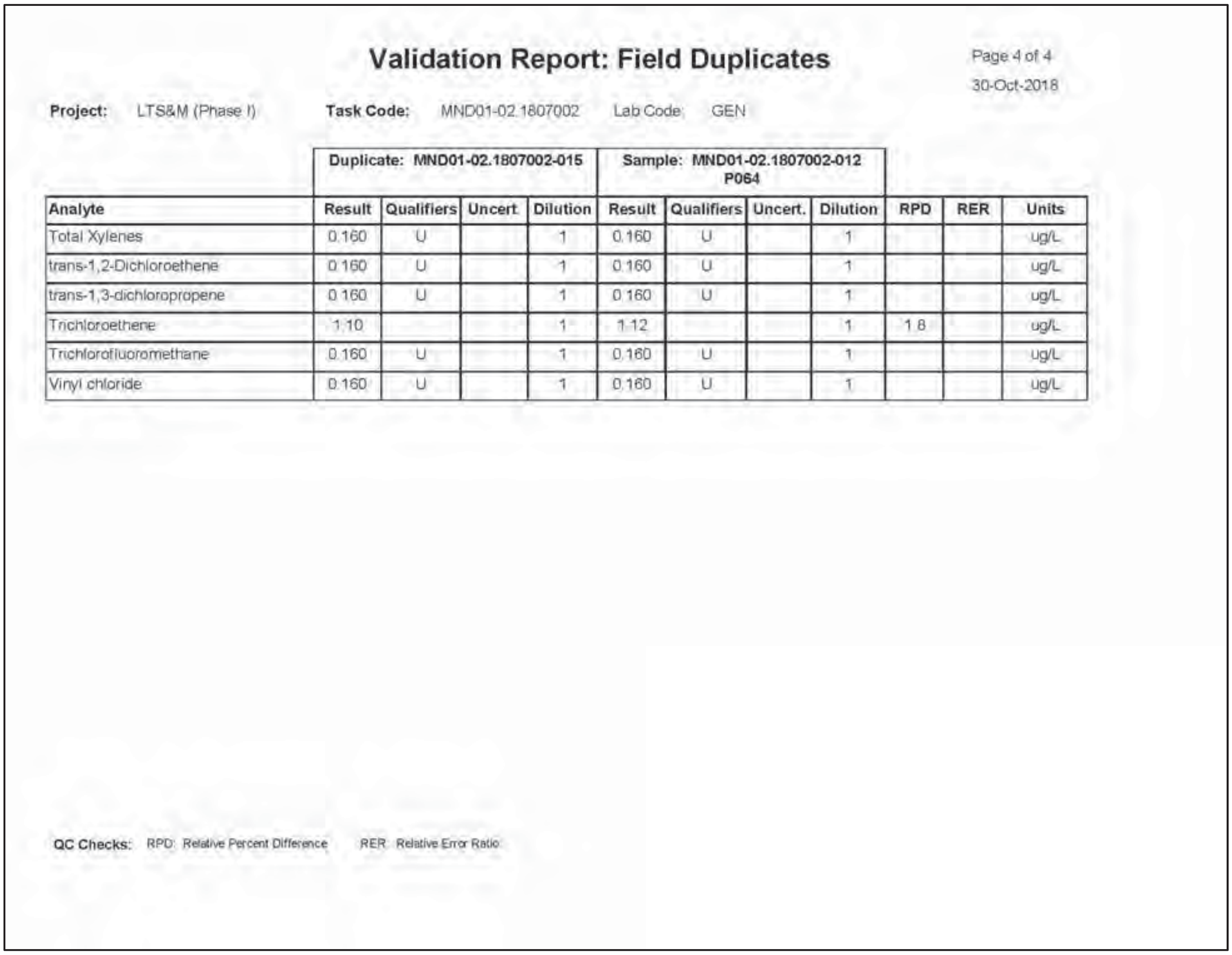
30-Oct-2018

Project: LTS&M (Phase I) **Task Code:** MND01-02.1807002 Lab Code: GEN

	Duplicate: MND01-02.1807002-015				Sample: MND01-02.1807002-012 P064						
Analyte	**Result**	**Qualifiers**	**Uncert**	**Dilution**	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**RPD**	**RER**	**Units**
Chloroethane	0.160	U		1	0.160	U		1			ug/L
Chloroform	0.160	U		1	0.160	U		1			ug/L
Chloromethane	0.160	U		1	0.160	U		1			ug/L
cis-1,2-Dichloroethene	0.360	J		1	0.360	U		1			ug/L
cis-1,3-Dichloropropene	0.160	U		1	0.160	U		1			ug/L
Dibromomethane	0.160	U		1	0.160	U		1			ug/L
Dichlorodifluoromethane	0.160	U		1	0.160	U		1			ug/L
Ethylbenzene	0.160	U		1	0.160	U		1			ug/L
Hexachlorobutadiene	0.160	U		1	0.160	U		1			ug/L
Isopropylbenzene	0.160	U		1	0.160	U		1			ug/L
Methylene chloride	0.160	U		1	0.160	U		1			ug/L
n-Butylbenzene	0.160	U		1	0.160	U		1			ug/L
n-Propylbenzene	0.160	U		1	0.160	U		1			ug/L
Naphthalene	0.160	U		1	0.160	U		1			ug/L
p-Isopropyltoluene	0.160	U		1	0.160	U		1			ug/L
sec-Butylbenzene	0.160	U		1	0.160	U		1			ug/L
Styrene	0.160	U		1	0.160	U		1			ug/L
tert-Butylbenzene	0.160	U		1	0.160	U		1			ug/L
Tetrachloroethene	0.670	J		1	0.800	J		1			ug/L
Toluene	0.160	U		1	0.160	U		1			ug/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio



Validation Report: Field Duplicates

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30-Oct-2018

Project: LTS&M (Phase I) **Task Code:** MND01-02.1807002 Lab Code: GEN

	Duplicate: MND01-02.1807002-015				**Sample: MND01-02.1807002-012 P064**						
Analyte	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**RPD**	**RER**	**Units**
Total Xylenes	0.160	U		1	0.160	U		1			ug/L
trans-1,2-Dichloroethene	0.160	U		1	0.160	U		1			ug/L
trans-1,3-dichloropropene	0.160	U		1	0.160	U		1			ug/L
Trichloroethene	1.10			1	1.12			1	1.8		ug/L
Trichlorofluoromethane	0.160	U		1	0.160	U		1			ug/L
Vinyl chloride	0.160	U		1	0.160	U		1			ug/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio

Organics Data Validation Summary

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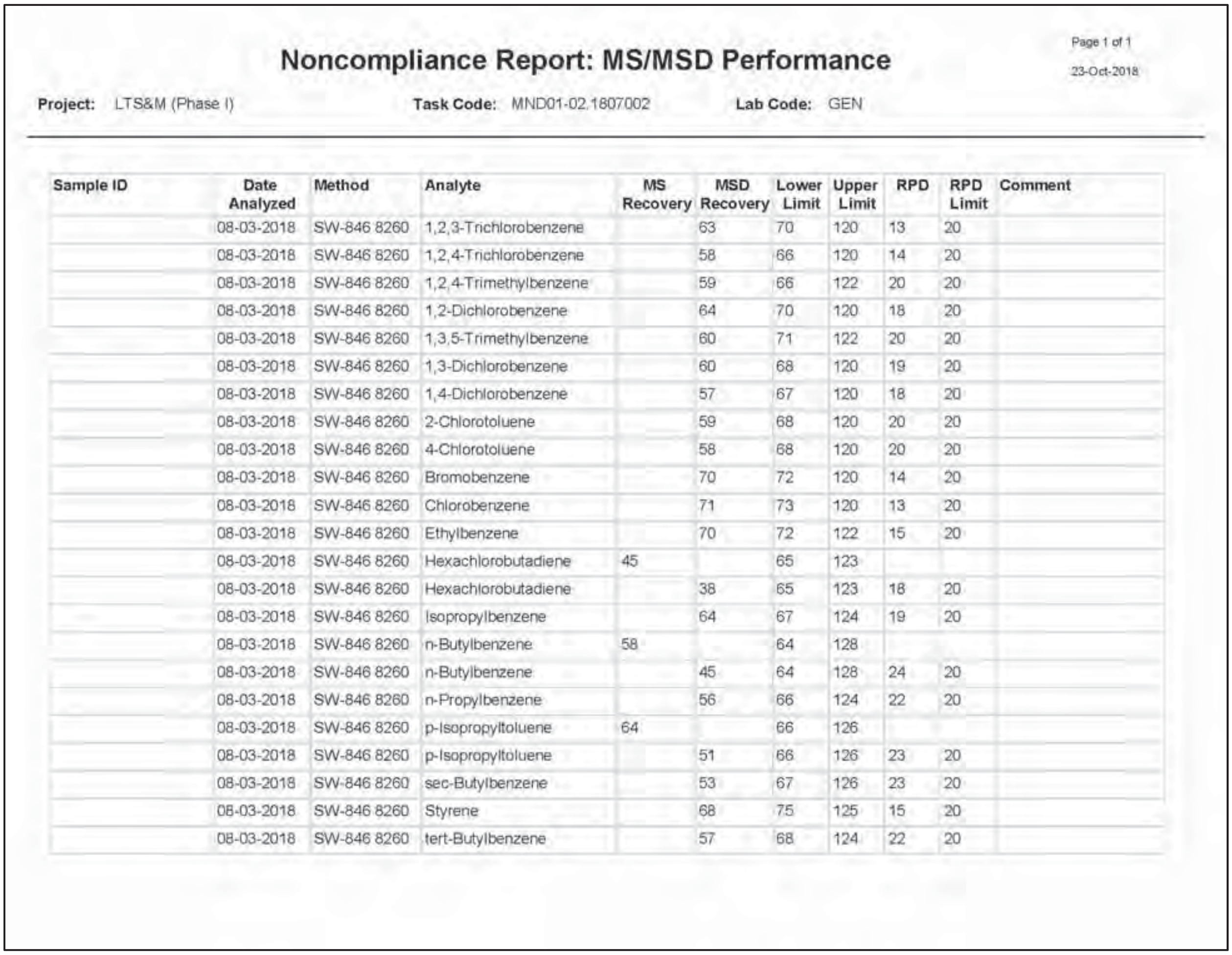
23-Oct-2018

Project: LTS&M (Phase I)

Task Code: MND01-02.1807002

Lab Code: GEN

Surrogate Recovery:	All surrogate recoveries were within the laboratory acceptance limits.
LCS/LCSD Performance:	All LCS/LCSD results were within the laboratory acceptance limits.
MS/MSD Performance:	There were 23 MS/MSD results outside the laboratory acceptance limits.
Method Blank Performance:	All method blanks were below the MDL.



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23-Oct-2018

Noncompliance Report: MS/MSD Performance

Project: LTS&M (Phase I) **Task Code:** MND01-02.1807002 **Lab Code:** GEN

Sample ID	Date Analyzed	Method	Analyte	MS Recovery	MSD Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	Comment
	08-03-2018	SW-846 8260	1,2,3-Trichlorobenzene		63	70	120	13	20	
	08-03-2018	SW-846 8260	1,2,4-Trichlorobenzene		58	66	120	14	20	
	08-03-2018	SW-846 8260	1,2,4-Trimethylbenzene		59	66	122	20	20	
	08-03-2018	SW-846 8260	1,2-Dichlorobenzene		64	70	120	18	20	
	08-03-2018	SW-846 8260	1,3,5-Trimethylbenzene		60	71	122	20	20	
	08-03-2018	SW-846 8260	1,3-Dichlorobenzene		60	68	120	19	20	
	08-03-2018	SW-846 8260	1,4-Dichlorobenzene		57	67	120	18	20	
	08-03-2018	SW-846 8260	2-Chlorotoluene		59	68	120	20	20	
	08-03-2018	SW-846 8260	4-Chlorotoluene		58	68	120	20	20	
	08-03-2018	SW-846 8260	Bromobenzene		70	72	120	14	20	
	08-03-2018	SW-846 8260	Chlorobenzene		71	73	120	13	20	
	08-03-2018	SW-846 8260	Ethylbenzene		70	72	122	15	20	
	08-03-2018	SW-846 8260	Hexachlorobutadiene	45		65	123			
	08-03-2018	SW-846 8260	Hexachlorobutadiene		38	65	123	18	20	
	08-03-2018	SW-846 8260	Isopropylbenzene		64	67	124	19	20	
	08-03-2018	SW-846 8260	n-Butylbenzene	58		64	128			
	08-03-2018	SW-846 8260	n-Butylbenzene		45	64	128	24	20	
	08-03-2018	SW-846 8260	n-Propylbenzene		56	66	124	22	20	
	08-03-2018	SW-846 8260	p-Isopropyltoluene	64		66	126			
	08-03-2018	SW-846 8260	p-Isopropyltoluene		51	66	126	23	20	
	08-03-2018	SW-846 8260	sec-Butylbenzene		53	67	126	23	20	
	08-03-2018	SW-846 8260	Styrene		68	75	125	15	20	
	08-03-2018	SW-846 8260	tert-Butylbenzene		57	68	124	22	20	

NAVARRO

Contractor to the U.S. Department of Energy Office of Legacy Management

Data Review and Validation Report

General Information

Task ID:	MND01-02.1808003
Sample Event:	August 9, 2018
Site(s):	Mound LTS&M (Phase 1)
Laboratory:	GEL Laboratories, Charleston, South Carolina
Work Order No.:	456932
Analysis:	Organics
Validator:	Samantha Tigar
Review Date:	October 23, 2018

This validation was performed according to *Environmental Data Validation Procedure* (LMS/PRO/S15870), which is available athttp://sp.lm.doe.gov/Contractor/ControlledDocuments/Controlled%20Documents/S15870_Env_DV_Procedure.pdf. The procedure was applied at Level 3, Data Validation.

All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 1.

Table 1. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Volatile Organics, VOA	VOA-A-007	SW-846 5030B	SW-846 8260 LL

Data Qualifier Summary

None of the analytical results required qualification.

Sample Shipping/Receiving

GEL Laboratories in Charleston, South Carolina, received 3 water samples on August 10, 2018, accompanied by a Chain of Custody (COC) form. The air waybill number was listed on the Sample Receipt and Review Form. The COC form was checked to confirm that all of the samples were listed with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The COC forms were complete with no errors or omissions.

Preservation and Holding Times

The sample shipments were received intact with the temperature inside the iced cooler at 3 °C, which complies with requirements. All samples were received in the correct container types and had been preserved correctly for the requested analyses. All samples were analyzed within the applicable holding times.

Detection and Quantitation Limits

The method detection limit (MDL) was reported for all organic analytes as required. The MDL, as defined in 40 CFR 136, is the minimum concentration of an analyte that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. The practical quantitation limit (PQL) for these analytes is the lowest concentration that can be reliably measured, and is defined as 5 times the MDL. The reported MDLs demonstrate compliance with contractual requirements.

Laboratory Instrument Calibration

Method requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for the analytes of interest. Initial calibration verification demonstrates that the instrument is capable of acceptable performance at the beginning of the analytical run. Continuing calibration verification demonstrates that the initial calibration is still valid by checking the performance of the instrument on a continuing basis. Initial and continuing calibration standards must be prepared from independent sources to ensure the validity of the calibration. All laboratory instrument calibrations and calibration verifications were performed correctly in accordance with the cited methods.

Method SW-846 8260 LL, Volatile Organics

Initial calibration of instrument VOA2 was performed on August 13, 2018 using nine calibration standards. Calibration curves are established using linear regression, quadratic regression, or the average response factor approach. Calibrations using average response factors had relative standard deviations of less than 15 percent. Linear or higher order regression calibrations had correlation coefficient values greater than 0.99 and intercepts less than 3 times the MDL. Initial and continuing calibration verification checks were made at the required frequency. Some target compounds had percent drift values less than 20 percent but were not detected at concentrations greater than the MDL. The mass spectrometer calibration and resolution was checked at the beginning of each analytical run in accordance with the procedure.

Volatiles Internal Standards and Surrogates

The volatile internal standard recoveries and surrogate recoveries were within the acceptance ranges for all samples.

Method Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. All method blank results associated with the samples were below the PQL for all analytes. In cases where a blank concentration exceeds or equals the MDL, the associated sample results are qualified with a “U” flag (not detected) when the sample result is greater than the MDL but less than 5 times the blank concentration.

Trip Blank

Trip blanks were prepared and analyzed to document contamination attributable to shipping and field handling procedures. This type of blank is useful in documenting contamination of volatile organic samples. One trip blank was submitted with these samples. Acetone was detected in the trip blank but was not detected at concentrations greater than the MDL in the associated samples.

Matrix Spike Analysis

Matrix spikes are aliquots of environmental samples to which a known concentration of analyte has been added before analysis. Matrix spike and matrix-spike duplicate (MS/MSD) analysis is used to assess the performance of the method by measuring the effects of interferences caused by the sample matrix and reflects the bias of the method for the particular matrix in question. The MS/MSD data are not evaluated when the concentration of the unspiked sample is greater than 4 times the spike. The spike recoveries met the acceptance criteria for all analytes evaluated.

Laboratory Replicate Analysis

Laboratory replicate analyses are used to determine laboratory precision for each sample matrix. The relative percent difference for results that are greater than 5 times the PQL should be less than 20 percent (or less than the laboratory-derived control limits for organics). For results that are less than 5 times the PQL, the range should be no greater than the PQL. The replicate results met these criteria.

Laboratory Control Sample

Laboratory control samples were analyzed at the correct frequency to provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. All control sample results were acceptable.

Field Duplicate

Field duplicate samples are collected and analyzed as an indication of overall precision of the measurement process. The precision observed includes both field and laboratory precision and has more variability than laboratory duplicates, which measure only laboratory performance. The relative percent difference for duplicate results that are greater than 5 times the PQL should be less than 20 percent. For results that are less than 5 times the PQL, the range should be no greater than the PQL. A duplicate sample was collected from location 0411.The duplicate results met the criteria.

Completeness

Results were reported in the correct units for all analytes requested using contract-required laboratory qualifiers. The analytical report included the MDL and PQL for all analytes and all required supporting documentation.

Electronic Data Deliverable (EDD) File

A revised EDD file arrived on October 26, 2018. The EDD was examined to verify that the file was complete and in compliance with requirements. The contents of the file were compared to the requested analyses to ensure all and only the requested data are delivered. The contents of the EDD were manually examined to verify that the sample results accurately reflect the data contained in the sample data package.

Field Measurements

The pre-sampling purge criteria were met for all wells.

Potential Outliers

Potential outliers are results that lie outside the historical range, possibly due to transcription errors, data calculation errors, or measurement system problems. However, outliers can also represent true values outside the historical range. Potential outliers are identified by generating the Data Validation Outliers Report from data in the environmental database. The new data are compared to historical values and data that fall outside the historical data range are listed on the report along with the historical minimum and maximum values. The potential outliers are further reviewed and may be subject to statistical evaluation using the ProUCL application developed by the EPA (https://www.epa.gov/land-research/proucl-software). The review also includes an evaluation of any notable trends in the data that may indicate the outliers represent true extreme values. There were no outliers identified and the data for this task are acceptable as qualified.

Samantha Tigar

Digitally signed by
SAMANTHA TIGAR (Affiliate)
Date: 2018.10.30 15:34:26
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Report Prepared By: ______________________________

Samantha Tigar
Data Validator

Data Validation Outliers Report - No Field Parameters **Report Date: 10/23/2018**

Comparison to Historical Data Since: 10/23/2007 12:00:00 AM Fraction: Any

Task: MND01-02.1808003

Analyte	Location	Analysis Location	Units	Fraction	Result	Lab Qualifier(s)	Type	HistMIN	HistMAX	HistSetSize	Potential Outlier?
Trichloroethene	0411	LB	ug/L	N	8.87		< HistMIN	9.01	14.1	28	No

FRACTION: D = Dissolved N = NA T = Total

General Data Validation Report

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Task Code: MND01-02.1808003 **Lab Code:** GEN **Validator:** Samantha Tigar **Validation Date:** 10-23-2018

Project: LTS&M (Phase I) **# Samples:** 3

Analysis Type: ☐ General Chemistry ☐ Metals ☒ Organics ☐ Radiochemistry

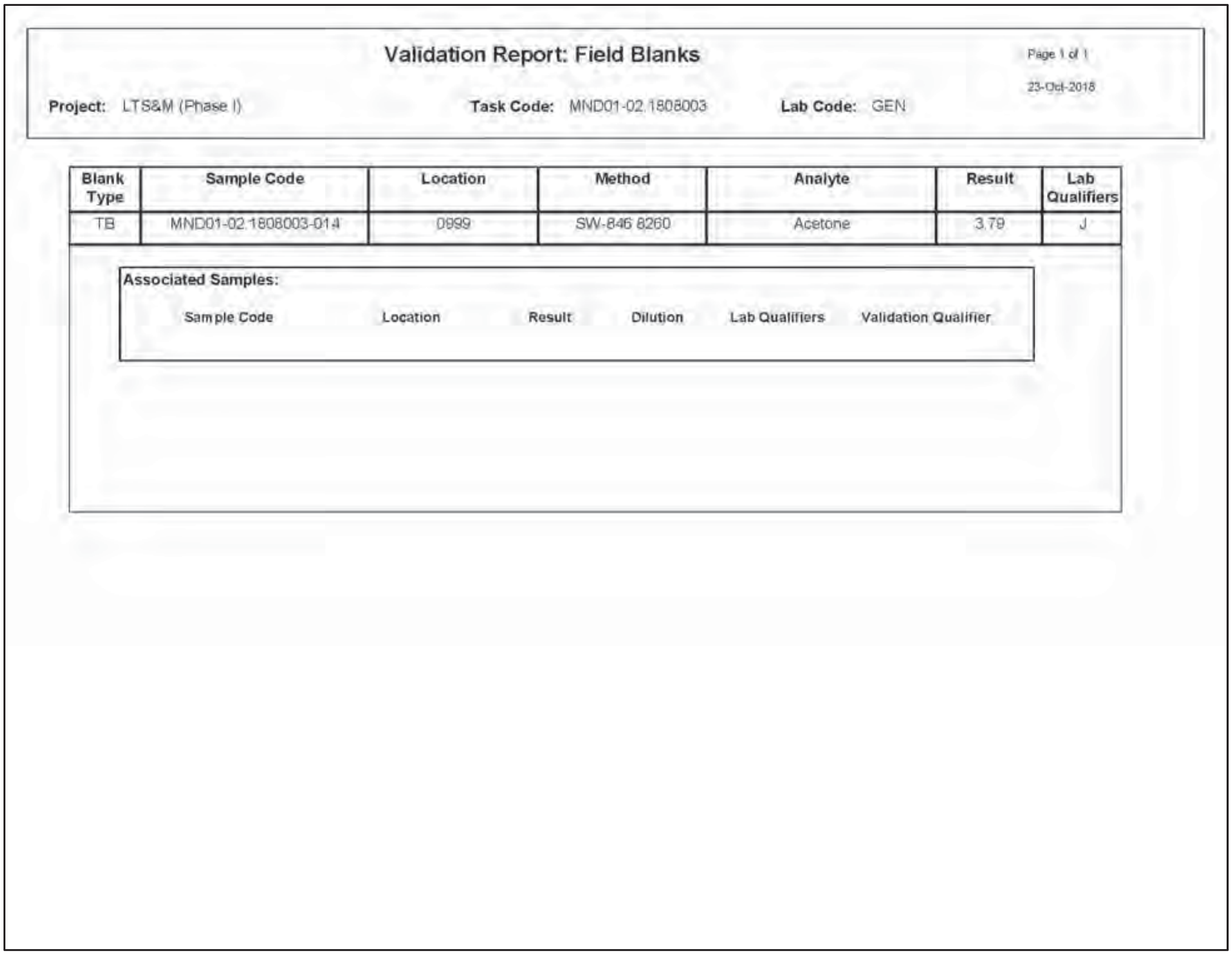
Chain of Custody

Present: OK Signed: OK Dated: OK

Sample

Integrity: OK Preservation: OK Temperature: OK

Check	Summary
Holding Times:	All analyses were completed within the applicable holding times.
Detection Limits:	The reported detection limits are equal to or below the contract required limits.
Field Blanks:	There was 1 field blank associated with this task.
Field Duplicates:	There was 1 duplicate evaluated.



Validation Report: Field Blanks

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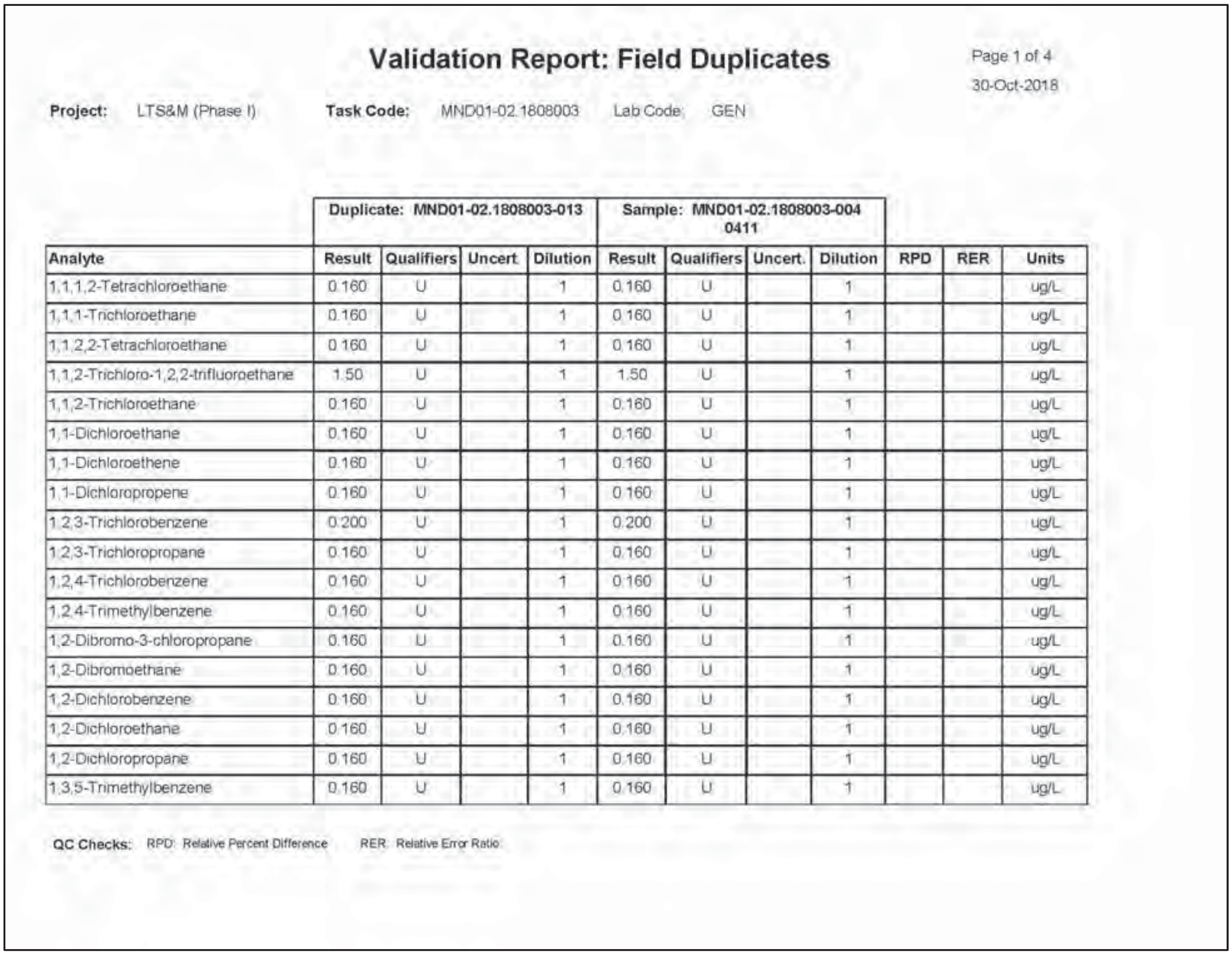
23-Oct-2018

Project: LTS&M (Phase I) **Task Code:** MND01-02.1808003 **Lab Code:** GEN

Blank Type	Sample Code	Location	Method	Analyte	Result	Lab Qualifiers
TB	MND01-02.1808003-014	0999	SW-846 8260	Acetone	3.79	J

Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier



Validation Report: Field Duplicates

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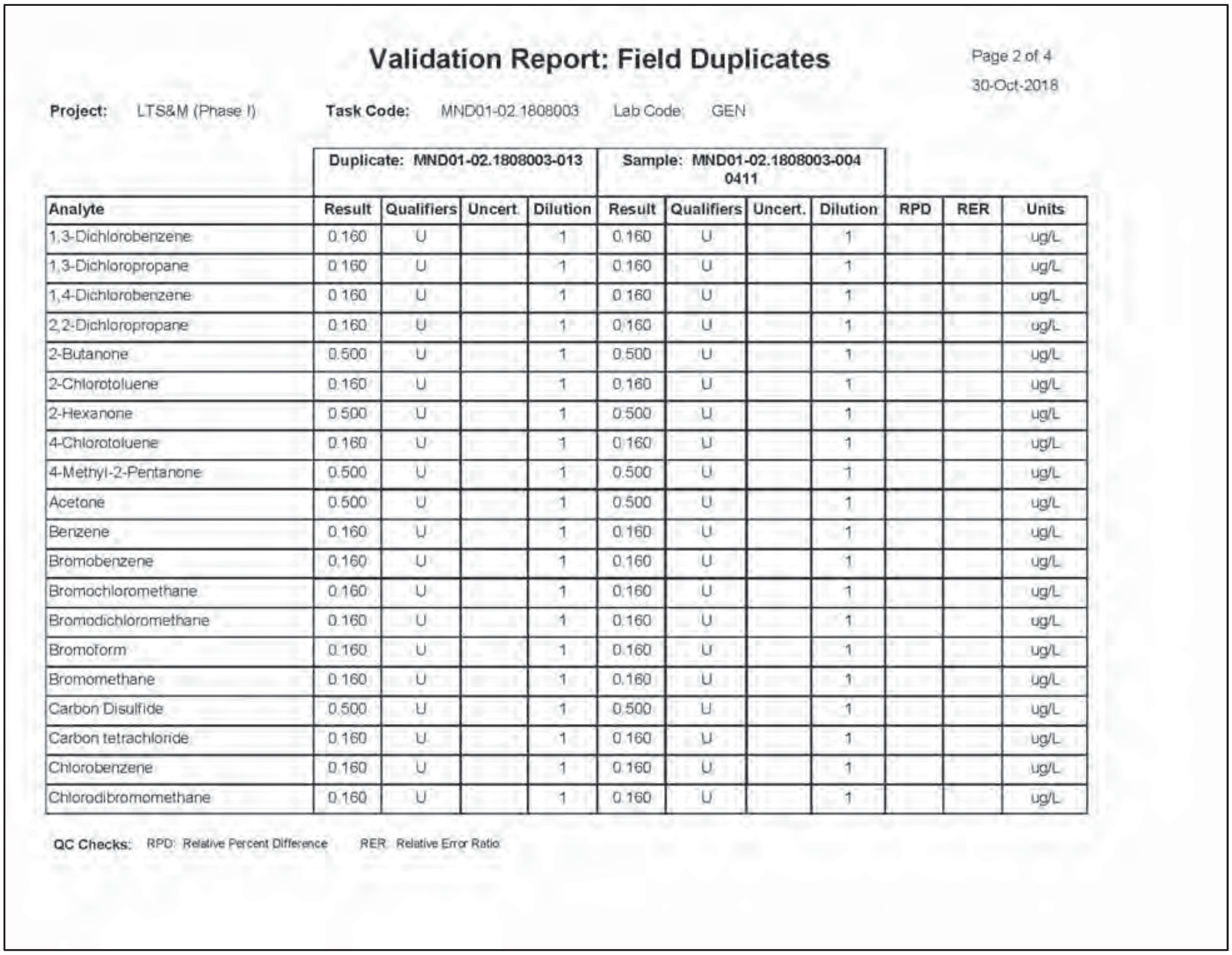
30-Oct-2018

Project: LTS&M (Phase I) **Task Code:** MND01-02.1808003 Lab Code: GEN

	Duplicate: MND01-02.1808003-013				**Sample: MND01-02.1808003-004 0411**						
Analyte	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**RPD**	**RER**	**Units**
1,1,1,2-Tetrachloroethane	0.160	U		1	0.160	U		1			ug/L
1,1,1-Trichloroethane	0.160	U		1	0.160	U		1			ug/L
1,1,2,2-Tetrachloroethane	0.160	U		1	0.160	U		1			ug/L
1,1,2-Trichloro-1,2,2-trifluoroethane	1.50	U		1	1.50	U		1			ug/L
1,1,2-Trichloroethane	0.160	U		1	0.160	U		1			ug/L
1,1-Dichloroethane	0.160	U		1	0.160	U		1			ug/L
1,1-Dichloroethene	0.160	U		1	0.160	U		1			ug/L
1,1-Dichloropropene	0.160	U		1	0.160	U		1			ug/L
1,2,3-Trichlorobenzene	0.200	U		1	0.200	U		1			ug/L
1,2,3-Trichloropropane	0.160	U		1	0.160	U		1			ug/L
1,2,4-Trichlorobenzene	0.160	U		1	0.160	U		1			ug/L
1,2,4-Trimethylbenzene	0.160	U		1	0.160	U		1			ug/L
1,2-Dibromo-3-chloropropane	0.160	U		1	0.160	U		1			ug/L
1,2-Dibromoethane	0.160	U		1	0.160	U		1			ug/L
1,2-Dichlorobenzene	0.160	U		1	0.160	U		1			ug/L
1,2-Dichloroethane	0.160	U		1	0.160	U		1			ug/L
1,2-Dichloropropane	0.160	U		1	0.160	U		1			ug/L
1,3,5-Trimethylbenzene	0.160	U		1	0.160	U		1			ug/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio



Validation Report: Field Duplicates

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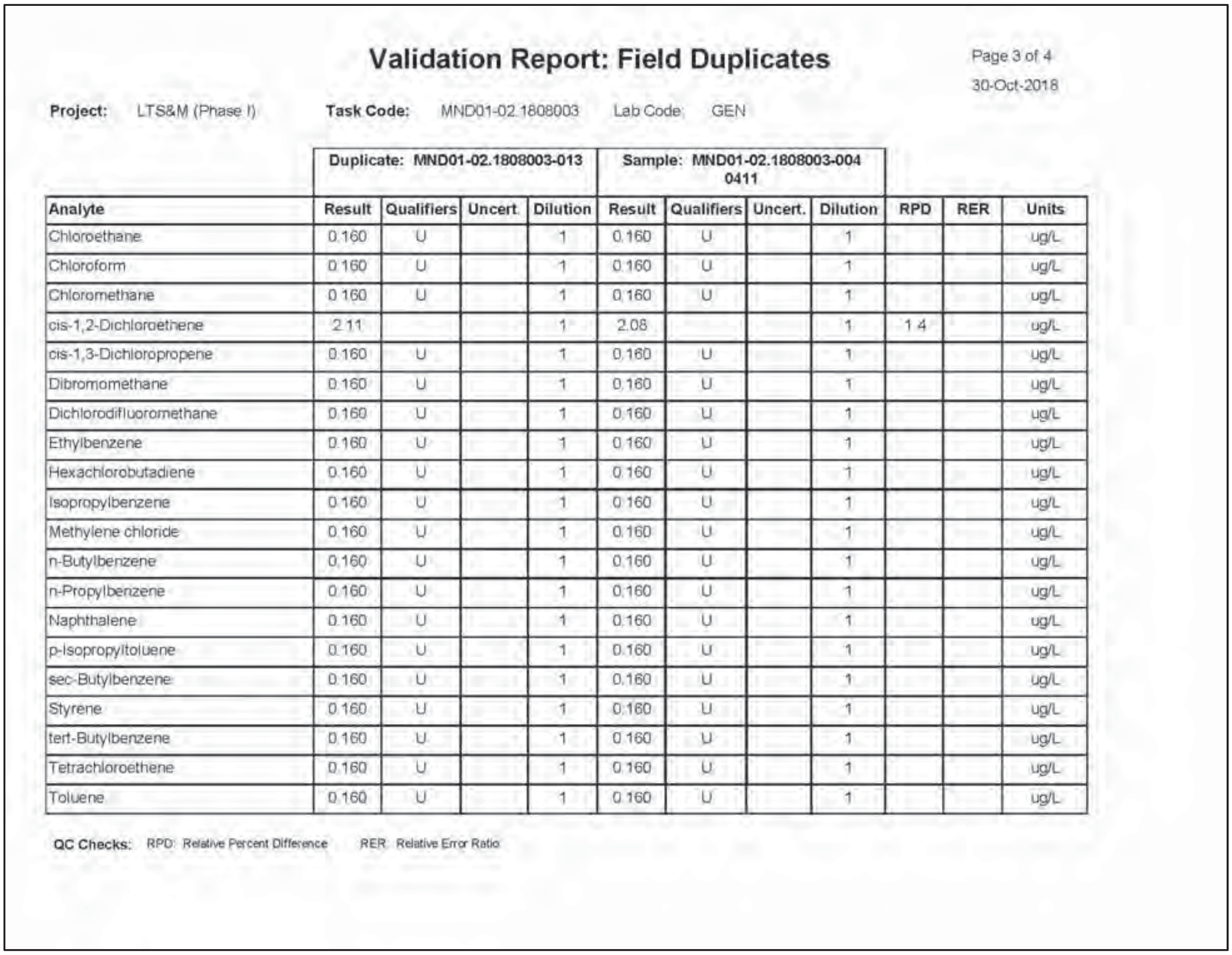
30-Oct-2018

Project: LTS&M (Phase I) **Task Code:** MND01-02.1808003 Lab Code: GEN

	Duplicate: MND01-02.1808003-013				**Sample: MND01-02.1808003-004 0411**						
Analyte	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**RPD**	**RER**	**Units**
1,3-Dichlorobenzene	0.160	U		1	0.160	U		1			ug/L
1,3-Dichloropropane	0.160	U		1	0.160	U		1			ug/L
1,4-Dichlorobenzene	0.160	U		1	0.160	U		1			ug/L
2,2-Dichloropropane	0.160	U		1	0.160	U		1			ug/L
2-Butanone	0.500	U		1	0.500	U		1			ug/L
2-Chlorotoluene	0.160	U		1	0.160	U		1			ug/L
2-Hexanone	0.500	U		1	0.500	U		1			ug/L
4-Chlorotoluene	0.160	U		1	0.160	U		1			ug/L
4-Methyl-2-Pentanone	0.500	U		1	0.500	U		1			ug/L
Acetone	0.500	U		1	0.500	U		1			ug/L
Benzene	0.160	U		1	0.160	U		1			ug/L
Bromobenzene	0.160	U		1	0.160	U		1			ug/L
Bromochloromethane	0.160	U		1	0.160	U		1			ug/L
Bromodichloromethane	0.160	U		1	0.160	U		1			ug/L
Bromoform	0.160	U		1	0.160	U		1			ug/L
Bromomethane	0.160	U		1	0.160	U		1			ug/L
Carbon Disulfide	0.500	U		1	0.500	U		1			ug/L
Carbon tetrachloride	0.160	U		1	0.160	U		1			ug/L
Chlorobenzene	0.160	U		1	0.160	U		1			ug/L
Chlorodibromomethane	0.160	U		1	0.160	U		1			ug/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio



Validation Report: Field Duplicates

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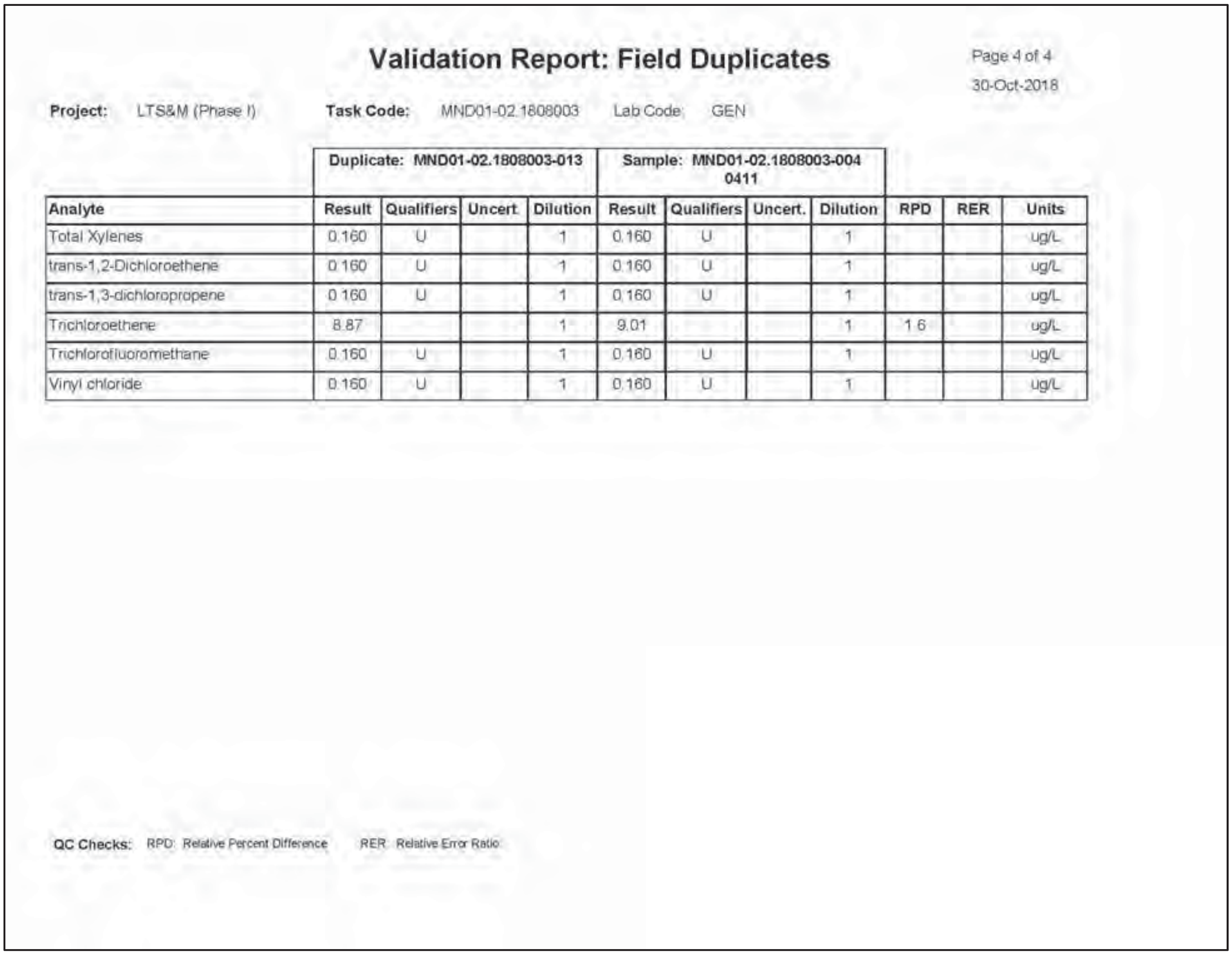
30-Oct-2018

Project: LTS&M (Phase I) **Task Code:** MND01-02.1808003 Lab Code: GEN

	Duplicate: MND01-02.1808003-013				Sample: MND01-02.1808003-004 0411						
Analyte	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**RPD**	**RER**	**Units**
Chloroethane	0.160	U		1	0.160	U		1			ug/L
Chloroform	0.160	U		1	0.160	U		1			ug/L
Chloromethane	0.160	U		1	0.160	U		1			ug/L
cis-1,2-Dichloroethene	2.11			1	2.08			1	1.4		ug/L
cis-1,3-Dichloropropene	0.160	U		1	0.160	U		1			ug/L
Dibromomethane	0.160	U		1	0.160	U		1			ug/L
Dichlorodifluoromethane	0.160	U		1	0.160	U		1			ug/L
Ethylbenzene	0.160	U		1	0.160	U		1			ug/L
Hexachlorobutadiene	0.160	U		1	0.160	U		1			ug/L
Isopropylbenzene	0.160	U		1	0.160	U		1			ug/L
Methylene chloride	0.160	U		1	0.160	U		1			ug/L
n-Butylbenzene	0.160	U		1	0.160	U		1			ug/L
n-Propylbenzene	0.160	U		1	0.160	U		1			ug/L
Naphthalene	0.160	U		1	0.160	U		1			ug/L
p-Isopropyltoluene	0.160	U		1	0.160	U		1			ug/L
sec-Butylbenzene	0.160	U		1	0.160	U		1			ug/L
Styrene	0.160	U		1	0.160	U		1			ug/L
tert-Butylbenzene	0.160	U		1	0.160	U		1			ug/L
Tetrachloroethene	0.160	U		1	0.160	U		1			ug/L
Toluene	0.160	U		1	0.160	U		1			ug/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio



Validation Report: Field Duplicates

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30-Oct-2018

Project: LTS&M (Phase I) **Task Code:** MND01-02.1808003 Lab Code: GEN

	Duplicate: MND01-02.1808003-013				Sample: MND01-02.1808003-004 0411						
Analyte	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**Result**	**Qualifiers**	**Uncert.**	**Dilution**	**RPD**	**RER**	**Units**
Total Xylenes	0.160	U		1	0.160	U		1			ug/L
trans-1,2-Dichloroethene	0.160	U		1	0.160	U		1			ug/L
trans-1,3-dichloropropene	0.160	U		1	0.160	U		1			ug/L
Trichloroethene	8.87			1	9.01			1	1.6		ug/L
Trichlorofluoromethane	0.160	U		1	0.160	U		1			ug/L
Vinyl chloride	0.160	U		1	0.160	U		1			ug/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio

23-Oct-2018

Organics Data Validation Summary

Project: LTS&M (Phase I)

Task Code: MND01-02.1808003

Lab Code: GEN

Surrogate Recovery:	All surrogate recoveries were within the laboratory acceptance limits.
LCS/LCSD Performance:	All LCS/LCSD results were within the laboratory acceptance limits.
MS/MSD Performance:	All MS/MSD results were within the laboratory acceptance limits.
Method Blank Performance:	All method blanks were below the MDL.