DATE:	March 9, 2017
TO:	Peter Hugh/U.S. Army Corps of Engineers New England District
FROM:	Jessica Tenzar/Battelle
SUBJECT:	Final Technical Memorandum, Sawyer Street 2016 Groundwater Monitoring Results

Introduction

This Technical Memorandum summarizes the groundwater monitoring activities conducted at the Sawyer Street Confined Disposal Facility (CDF) in New Bedford, Massachusetts during the 2016 monitoring period. The 2016 survey is a continuation of a multi-year program to monitor six groundwater monitoring wells located around the perimeter of the CDF. Results from the monitoring survey are used to evaluate the integrity of the CDF and assess potential trends in concentrations of polychlorinated biphenyls (PCBs) as Aroclors, selected metals (cadmium, chromium, copper, and lead), and volatile organic compounds (VOCs). Total suspended solids (TSS) concentrations are also measured.

Field Activity Summary

Groundwater samples were collected from the following six wells located around the perimeter of the CDF in the fall of 2016: MW-1, MW-3, MW-4A, MW-5, MW-6, and MW-7A (Figure 1). All field activities were conducted according to the field sampling plan (FSP) developed for this investigation (AECOM, 2016). All field activities were performed by AECOM. Battelle's Site Safety and Health Officer (SSHO) was present during all well development and sampling activities.

The wells were developed on September 13, 2016 (two weeks prior to sampling); well development logs are provided in Appendix A. The field team pumped between 2.25 to 6.5 gallons of water from each well. The wells were pumped until the turbidity was less than 10 nephelometric turbidity units (NTUs), except MW-3 which had a turbidity of approximately 15 NTU at the end of development. Some of the wells were observed to be in poor condition (e.g., exterior casing for MW-3 did not have a protective cover and was not fitted with a cap, the well screen for MW-7A appeared to be dislodged from its upper casing, the well casing for MW-1 appeared loose, several wells were missing J-plugs, wells were poorly marked and not secured by locks). On September 14, 2016 Battelle placed a J-plug in the wells that were missing a plug which included MW-1, MW-3, MW-5, and MW-6.

Groundwater sampling was performed on September 28-29, 2016 according to the United States Environmental Protection Agency (EPA) Region 1 Low Stress (flow) Purging and Sampling Groundwater Procedure for the Collection of Groundwater Samples from Monitoring Wells, Rev. 3 (EPA, 2010). A bladder pump (equipped with dedicated Teflon® bladders) was used for sampling all wells except MW-3. A peristaltic pump was used to sample groundwater at well MW-3 (this well was also sampled in 2014 and 2015 using a peristaltic pump because a bladder pump could not be lowered into the well due to an obstruction in the well casing). Dedicated sample tubing and bladder pumps were used at each well to minimize the risk of cross contamination between wells. Upon arrival for sample collection, the water level in each well was measured with a cleaned water level tape and the well volume was calculated. The well was purged and in situ water quality parameters (i.e., temperature, specific conductivity, dissolved oxygen [DO], pH, oxidation reduction potential [ORP], and turbidity) were monitored until they achieved a steady state. All measurements were recorded on field log sheets. After purging, groundwater samples were collected for PCBs (as Aroclors), metals, VOC, and TSS analysis.

Field-based quality assurance/quality control (QA/QC) samples included one field replicate sample (from MW-6), two equipment blanks (one for the bladder pump and one for the peristaltic pump tubing), and one trip blank (the trip blank was analyzed for VOCs only). Additional groundwater was collected from one well (MW-4A) for the preparation of laboratory-based QC samples (i.e., matrix spike and matrix spike duplicate). Field measurements and sample collection details were recorded on field logs sheets, which are provided in Appendix A.

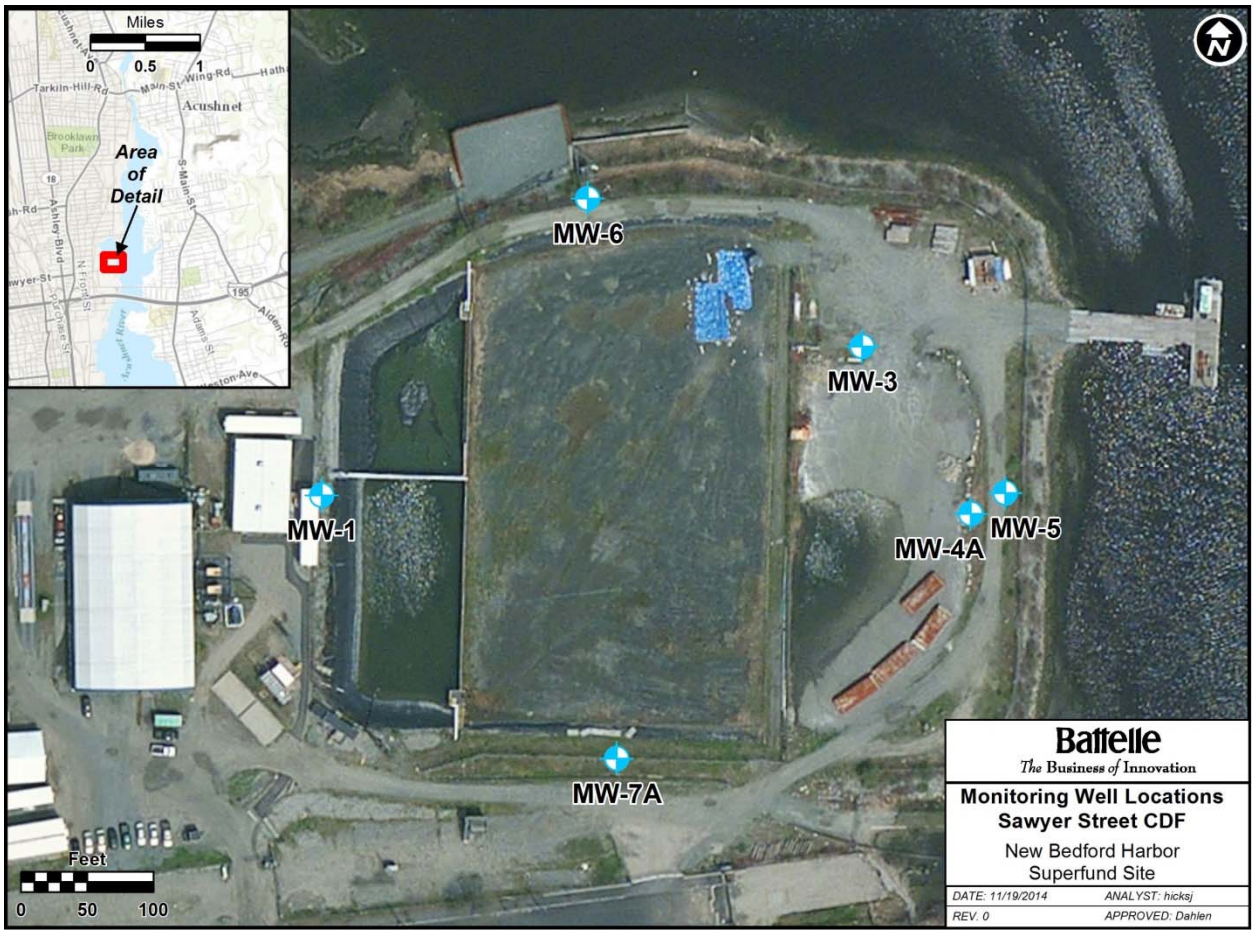

Figure 1. Sawyer Street CDF Monitoring Well Locations

In Situ Water Quality Summary

Water quality parameters were measured during the initial pumping of groundwater from the wells before groundwater sample collection. In situ measurements were made using a Yellow Springs Instruments (YSI®) multi-meter sonde and a flow-through cell. The YSI® sonde was calibrated and used according to the manufacturer's specifications. Once the diagnostic parameters had stabilized, sample collection was initiated. In situ measurements are summarized in Table 1.

Table 1. Summary of In Situ Groundwater Data Collected Immediately Prior to Sampling

Parameter	Units	Well ID					
		MW-1	MW-3	MW-4A	MW-5	MW-6	MW-7A
September 2016 Event							
Sample Date/ Time	—	09/29/2016 11:35	09/28/2016 15:15	09/28/2016 11:08	09/28/2016 11:55	09/28/2016 14:40	09/29/2016 10:00
Depth to Water	ft	16.8	14.35	10.57	10.19	13.25	10.47
pH	—	6.85	7.27	7.18	7.38	7.39	6.66
Specific Conductivity	µS/cm	541	8363	4433	4134	907	535
Temperature	°C	16.23	13.18	14.84	16.3	15.51	16.59
DO	mg/L	1.06	1.30	22.93 (a)	0.36	0.28	0.46
Turbidity	NTU	5.63	9.32	3.65	1.88	1.21	0.61
ORP	mV	81.10	-124	-245.3	-324.7	-201.0	120.2
Purge Volume	gal	1.0	1.25	1.0	~1.9	~2.6	2.5
Flow Rate	mL/min	120	140	160	90	240	240
Color/Odor	—	Clear, no odor	Slightly brown, no odor	Clear, Sulphur odor	Clear, no odor	Clear, no odor	Clear, no odor

Note:
(a) Above 100% saturation; the DO probe, solution and membrane were replaced after sampling this well.

Key:
ft: feet; µS/cm: microsiemens per centimeter; mg/L: milligrams per liter; NTU: nephelometric turbidity unit; mV: millivolts; gal: gallons; mL/min: milliliter per minute

Chemistry Water Quality Summary

Chemical analyses were performed according to the project Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) Addendum (Battelle, 2016). Groundwater samples were analyzed for PCBs (as Aroclors), metals, VOCs, and TSS. PCB Aroclor and VOC analyses were performed by Katahdin Analytical in Scarborough, Maine. Metals and TSS analyses were performed by Alpha Analytical in Mansfield, Massachusetts.

Sample results are summarized in Table 2, and are compared to the Massachusetts Contingency Plan (MCP) Method 1 Category GW-3 criteria for groundwater that has a potential to discharge to a surface water body (Massachusetts Department of Environmental Protection [MADEP], 2014). Complete laboratory data packages with test results are provided in Appendix B.

Total PCB and metals concentrations in all groundwater samples collected in September 2016 were below the applicable MCP GW-3 criteria (Table 2). Individual PCB Aroclors, cadmium and lead were undetected in all groundwater samples (Appendix B). Copper was detected in the samples from all wells, and chromium was detected in samples from four of the six wells. Target VOCs were not detected in the groundwater samples

(Appendix B) except for cis-1,2-dichloroethene, which was detected in sample MW-3 (Table 2) but at a level below the MCP GW-3 criteria.

Table 2. PCB, Metal, VOC and TSS Groundwater Results with Final Qualifiers, September 2016 Sampling Event

Parameter	Units	Well ID						MCP GW-3 Criteria (b)	Equipment Blank		Trip Blank
		MW-1	MW-3	MW-4A	MW-5	MW-6	MW-7A		Peri-staltic	Bladder Pump	
Total PCB (a)	µg/L	0.025 U (a)	0.026 UJ (a)	0.025 UJ (a)	0.024 U (a)	0.024 U (a)	0.024 U (a)	10	0.024 U (a)	0.024 U (a)	NA
Cadmium	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	4	0.5 U	0.5 U	NA
Chromium	µg/L	1.34 U	2.23 J	1.11 J	5.59 J	2.27 J	1 U	300	1 U	2.87	NA
Copper	µg/L	1.68	19.5 J	15.1 J	7.01 J	1.79 J	2.33	NA	1 U	1 U	NA
Lead	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	10	1 U	1 U	NA
TSS	mg/L	5.6	24.4	2.6	1 U	7.9	1 U	NA	NA	NA	NA
Cis-1,2-dichloroethene (c)	µg/L	0.5 U	0.31 J	0.5 U	0.5 U	0.5 U	0.5 U	50,000	0.5 U	0.5 U	0.5 U

Notes:
(a) Total PCB calculated as the sum of Aroclors 1016, 1221, 1232, 1242, 1248, 1254 and 1260; all individual Aroclors were non-detects and the maximum reporting limit for the individual Aroclors is reported.
(b) MCP: Massachusetts Contingency Plan, Method 1 MCP GW-3 standard from 310 CMR 40.0974(2).
(c) VOCs undetected in the groundwater samples, except cis-1,2-Dichloroethene (MW-3) and Acetone (equipment blank)

Key:
µg/L: micrograms per liter; mg/L: milligrams per liter; U: Chemical not detected at concentration above the laboratory reporting limit; J: Estimated value; NA: Not applicable

Quality Control

Field and laboratory QC results for the 2016 groundwater survey are summarized below. The types of QC samples used to assess data quality are summarized in Table 3. Data quality was assessed in terms of accuracy/bias and precision using third-party validation conducted by Environmental Data Validation Inc. The project QAPP defined the validation levels as Tier 1 Stage 2A (PCB Aroclors, metals and VOC) or Tier 1 Stage 1 (TSS). Validation followed the EPA New England, Environmental Data Review Supplement for Regional Data Review Elements and Superfund Specific Guidance Procedures (EQADR-Supplement, April 2013). Results of the third-party validation are summarized in Table 4, and complete data validation reports are provided in Appendix C.

Field Quality Control Results

Three types of field QC samples were collected for the 2016 groundwater survey: equipment blank, trip blank (VOC only) and field duplicate (Table 3). The equipment and trip blank results met the QAPP criteria (less than the reporting limit [RL]) for all parameters except chromium (Table 4). Chromium was detected above the RL in one of the equipment blanks (EB-001-092916, bladder pump equipment blank), and the chromium result for sample MW-1 was qualified as non-detect ("U" qualifier) as a result. One field replicate was collected at well MW-6 for the survey. The relative percent difference (RPD) was achieved for all parameters except chromium and copper (Table 5), but chromium and copper replicates were measured near corresponding reporting limits, where small absolute differences calculate relatively high RPD values. Overall, the field QC sample results indicate that the data are useable.

Laboratory Quality Control Results

A full suite of laboratory-based QC samples was processed and analyzed in the laboratory with the 2016 groundwater survey samples (Table 3). Data validation results indicate that sample data are useable except PCB Aroclor 1016, which was rejected in samples MW-1, MW-3, MW-4A, MW-6 (including replicate), MW-7A and the equipment blanks due to laboratory-based QC exceedances (Table 4). The rejected Aroclor 1016 results for 2016 samples do not impact data evaluations conducted to assess the integrity of the CDF or potential trends in PCB concentrations because 1) useable data are available for the other target PCBs (i.e., PCB Aroclors 1221, 1232, 1242, 1248, 1254 and 1260) and 2) the long-term monitoring data indicate that PCB Aroclor 1016 has never been detected in groundwater sampled from the Sawyer Street CDF monitoring wells.

Selected VOC, PCB and metals results were J qualified (estimated) due to laboratory-based QC exceedances (Table 4), as follows:

- VOCs
  - Non-detect results were qualified for five of the 71 target compounds in all samples due to low recoveries of the five analytes in the Laboratory Control Sample (LCS).
- PCB Aroclors
  - Non-detect results were qualified for PCB Aroclors 1221, 1232, 1242, 1248, 1254 and 1260 in MW-4A due to low surrogate and LCS recoveries;
  - The non-detect result was qualified for PCB Aroclor 1016 in MW-5 due to a precision exceedance between the LCS and LCSD recoveries; and
  - Non-detect results were qualified for PCB Aroclors 1221, 1232, 1242, 1248, 1254 and 1260 in MW-3 due to a low surrogate recovery.
- Metals
  - Copper and chromium results were qualified in five samples (i.e., MW-3, MW-4A, MW-5, MW-6 and MW-6 REP) due to field replicate imprecision (although concentrations were measured near corresponding reporting limits where small absolute differences result in relatively high calculated RPD values);
  - Copper results were qualified in five samples (i.e., MW-3, MW-4A, MW-5, MW-6 and MW-6 REP) due to serial dilution percent difference exceedances; and
  - Chromium result was qualified in MW-1 due to equipment blank contamination.

Table 3. Summary of Quality Control Samples, September 2016 Survey

Quality Control Sample Type	Test Parameter			
	PCB Aroclors	Metals	VOC	TSS
Field Quality Control Samples				
Equipment Blank	✓	✓	✓	
Trip Blank			✓	
Field Replicate	✓	✓	✓	✓
Laboratory Quality Control Samples				
Method Blank	✓	✓	✓	✓
Laboratory Duplicate		✓[a]		✓
Laboratory Control Sample	✓[b]	✓	✓	✓
Laboratory Control Sample Duplicate	✓[b]		✓	
Matrix Spike	✓[b]	✓	✓	
Matrix Spike Duplicate	✓[b]	✓	✓	

Notes:
[a] Not required by the QAPP but processed and analyzed by the laboratory. Not included in data validation.
[b] Aroclors 1016 and 1260 only.

Table 4. PCB Aroclors, Metals, VOC and TSS Validation Summary, September 2016 Sampling Event

Quality Control Element	QAPP Requirements by Test Parameter				Sample Results
	PCB Aroclors	Metals	VOC	TSS	
Sample Receipt Conditions; Holding Time	Ice, 4°C ± 2°C; 30 days to extraction; 40 days to analysis	Ice, 4°C ± 2°C pH<2; 6 months to analysis	Ice, 4°C ± 2°C pH ≤ 2 at receipt; 14 days to analysis	Ice, 4°C ± 2°C; 7 days to analysis	Achieved for all samples; COC seal absent from coolers, but samples were hand-transferred directly to the lab (i.e., lab courier picked up samples)
Field Equipment Blank	<RL	<RL	<RL	NA	Achieved for all PCB and VOC samples; Cr results > RL in one of the equipment blanks
Field Trip Blank	NA	NA	<RL	NA	Achieved for VOC samples
Field Replicates	RPD ≤ 30%	RPD ≤30%	RPD ≤30%	RPD ≤30%	Achieved for all parameters except Copper and Chromium; the field duplicate pair is MW-6-0928I6 and MW-6-0928I6-REP (see Table 5)
Laboratory Method/Reagent Blank	<RL	<RL	Acetone, 2-Butanone, & Methylene Chloride ≤ 2x RL; all other analytes < RL	<RL	Achieved for all samples
Laboratory Duplicate	NA	NA	NA	RPD ≤ 5% for results >5x RL	RPD for the TSS laboratory duplicate was 48%, but the RPD met the contingency criteria because sample values were <5x the RL
Laboratory Control Sample	Aroclor 1016 and Aroclor 1260 %R within lab limits	80-120 %R	%R is within lab limits	80-120 %R	Achieved for all metals Achieved for Aroclor 1260, but not Aroclor 1016: • Aroclor 1016 59.8%R vs. lower QC limit of 65% Not achieved for 5 VOC compounds: • Bromomethane 38.8%R vs. lower QC limit of 57% • Ethyl tertiary-butyl ether 79.4%R vs. lower QC limit of 85% • Di-isopropyl ether 76.8%R vs. lower QC limit of 81% • Tertiary-amyl methyl ether 78.4%R vs. lower QC limit of 80% • Isopropylbenzene 91.2%R vs. lower QC limit of 96%. VOC samples re-analyzed due to low LCS recoveries; however, some of the analyses were outside holding times and the data validator reported results from the initial analyses (consistent with lab preference).

Table 4. continued

Quality Control Element	QAPP Requirements by Test Parameter				Sample Results
	PCB Aroclors	Metals	VOC	TSS	
Laboratory Control Sample Duplicate	RPD ≤30%	NA	RPD ≤ 20%	NA	Achieved for Aroclor 1260, but not Aroclor 1016: • RPD = 48% for one of the LCS/LCSD pairs Achieved for all VOCs except: • RPD = 23% for Bromomethane in one of the LCS/LCSD pairs
Matrix Spike/Matrix Spike Duplicate	Aroclor 1016 and Aroclor 1260 %R within lab limits; RPD ≤ 30%	75-125 %R; RPD ≤ 20% for metals >5x background	%R is within lab limits; RPD ≤ 20%	NA	PCBs recovery > QC limit, RPD >QC limit Some VOC samples reported low recoveries Achieved for all metals samples
Surrogate Recovery	%R within lab limits	NA	%R is within lab limits	NA	Achieved for VOC samples Low recoveries for two PCB samples: • Decachlorobiphenyl 40.8%R in MW-3 vs. lower QC limit of 44% and • Tetrachloro-m-xylene 59.7%R in MW-4A vs. lower QC limit of 62%)
Internal Standards	NA	70-120 %R	-50% to +100% of area counts at ICAL	NA	Achieved for all metals and VOC samples
Serial Dilution Sample	NA	±10% agreement between 1:5 dilution and undiluted sample for results >50xMDL	NA	NA	Copper: %D was greater than 10%

Key:
ICAL: Initial Calibration; MDL: Method detection limit; NA: Not applicable (either not required by the QAPP or not required for QAPP validation level); %D: Percent difference; %R: Percent recovery; RL: Reporting limit; RPD: Relative percent difference; QAPP: Quality Assurance Project Plan; TSS: Total suspended solids; µg/L: micrograms per liter

Table 5. Field Replicate Results, September 2016 Sampling Event

Well ID	Parameter	Units	Result		RPD
			Sample	Replicate	
Well MW-6	Total PCB (a)	µg/L	0.024 U (a)	0.024 U (a)	NA
	Cadmium		0.5 U	0.5 U	NA
	Chromium		2.27 J	1.24 J	59%
	Copper		1.79 J	2.74 J	42%
	Lead		1 U	1 U	NA
	TSS	mg/L	7.9	8.5	7%

Notes:
(a) Total PCB calculated as the sum of Aroclors 1016, 1221, 1232, 1242, 1248, 1254 and 1260; all individual Aroclors were non-detects and the maximum reporting limit for the individual Aroclors is reported

Key:
µg/L: micrograms per liter; mg/L: milligrams per liter; U: Chemical not detected at concentration above the laboratory reporting limit; J: Estimated value; NA: Not applicable; RPD: relative percent difference

Summary

Monitoring was performed in September 2016 at the Sawyer Street CDF as part of an ongoing groundwater monitoring program. Groundwater levels, water quality parameters, organic contaminants, and metals were monitored in all six wells at the facility. Analysis of groundwater samples collected in September 2016 indicates that PCB Aroclors, metals, and VOCs, where detected, were measured at concentrations below the applicable MCP GW-3 criteria. Overall, the groundwater data collected during the 2016 monitoring suggest that the integrity of the CDF is currently maintained.

References

AECOM. 2016. Draft Final 2016 Addendum #1 to the 2015 Field Sampling Plan, Sawyer Street CDF Groundwater Monitoring, New Bedford Harbor Superfund Site, New Bedford, Massachusetts. Prepared under Contract No. W912WJ-12-D-0004 Task Order No. 10 for the U.S. Army Corps of Engineers New England District, Concord, Massachusetts. September.

Battelle. 2016. Draft Quality Assurance Project Plan Addendum Revision 9.0, Environmental Monitoring, Sampling, and Analysis, New Bedford Harbor Superfund Site, New Bedford, Massachusetts. Prepared under Contract No. W912WJ-12-D-0004 Task Order No. 10 for the U.S. Army Corps of Engineers New England District, Concord, Massachusetts. September.

Massachusetts Department of Environmental Protection (MADEP). 2014. MCP Method 1 Groundwater Standards. 310 CMR 40.0974(2). http://www.mass.gov/eea/agencies/massdep/cleanup/regulations/mcp-method-1-groundwater-standards.html

U.S. Environmental Protection Agency (EPA) New England. 2013. Environmental Data Review Supplement for Regional Data Review Elements and Superfund Specific Guidance/Procedures. EQADR-Supplement 0. Quality Assurance Unit, Office of Environmental Measurement and Evaluation, April 22.

United States Environmental Protection Agency (EPA). 2010. EPA Region 1 Low Stress (flow) Purging and Sampling Groundwater Procedure for the Collection of Groundwater Samples from Monitoring Wells, Rev. 3, January 19.

Appendices

Appendix A, Field Summary and Log Sheets
Appendix B, Laboratory Data Packages (electronic only)
Appendix C, Data Validation Reports

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Appendix A
Field Summary and Log Sheets

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Memorandum

To	Deirdre Dahlen, Jessica Tenzar	Page 1
Project No.	60336540	
Subject	New Bedford Harbor Groundwater Monitoring – September 2016 Summary	
From	Maura Surprenant	
Date	11/30/16; revised 12/7/16	

This Technical Report presents a summary of the groundwater monitoring activities conducted at the Sawyer Street Confined Disposal Facility (CDF) at the New Bedford Harbor Superfund Site (Site) in New Bedford, Massachusetts during the Fall 2016 monitoring period. The six groundwater wells that are located around the perimeter of the CDF were sampled in September 2016, continuing the monitoring program that has been ongoing since 2001.

The objective of the monitoring program is to provide data that can be used to evaluate the integrity of the Sawyer Street CDF, as well as assess trends in groundwater concentrations of polychlorinated biphenyls (PCBs) as Aroclors, selected metals (cadmium, chromium, copper, and lead), volatile organic compounds (VOCs), and total suspended solids (TSS). Results from the sampling will be used to support compliance of ongoing remediation activities at the Site.

Prior to the sampling, the CDF wells were developed on September 13, 2016. All wells were successfully developed and no issues were noted. Well development records are presented in Attachment A. The Fall groundwater sampling took place on 28 and 29 September, 2016 at the six monitoring well locations around the perimeter of the CDF, including MW-1, MW-3, MW-4A, MW-5, MW-6, and MW-7A (Figure 1). Groundwater was removed from each monitoring well except MW-3 using a bladder pump system and dedicated bladders/ tubing. Groundwater samples were removed via peristaltic pump from MW-3. Groundwater was slowly purged from each of the wells prior to sampling until it was representative of groundwater within the aquifer. This determination was made by taking successive measurements of water quality parameters (dissolved oxygen [DO], temperature, conductivity, ORP, pH, and turbidity) to ensure that the groundwater had reached a steady state condition prior to sampling. Groundwater levels were measured throughout the purging of the wells to ensure that drawdown was minimized during the pumping and water was withdrawn from approximately the middle of the well screen or the middle of the water column (if the screened interval was not identifiable). Sampling logs are included as Attachment B.

Upon arrival for sample collection, the water level in each well was measured with a decontaminated water level tape and the well volume was calculated. Decontamination procedures were followed for the water level tape which was used on more than one well to remove any potential contaminants. The dedicated bladder pump was then connected to the dedicated tubing, placed in the well, and activated for pumping at a low rate. The pumping rate was adjusted intermittently when required to ensure that the drawdown in the well was minimized. In-situ

measurements were made using a calibrated YSI® multi-meter with a flow-thru cell, used in accordance with the manufacturer's specifications. The flow-thru cell was disconnected from the discharge line during sample collection. Certified clean sample containers were provided by the analytical laboratories. Sample bottles were pre-preserved by the analytical lab using a preservative type and volume suitable to the analysis performed. Cross-contamination was avoided by using dedicated bladders and tubing in each of the wells. In this way, the water samples never came in contact with a bladder or piece of tubing that had contact with water from any other well.

Representative water samples were collected from each of the wells, and sample integrity was maintained until the samples were received by the analytical laboratories. A Field Replicate plus extra volume for a laboratory duplicate of total suspended solids was collected from MW-6. A MS/MSD sample was collected from MW-4A. VOC and PCB Aroclor samples were sent via courier to Katahdin Analytical in Scarborough, ME. Metals and TSS samples were sent via courier to Alpha Analytical in Mansfield, MA. All field activities were conducted in accordance with the FSP (AECOM, 2016) and Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) Addendum (Battelle, 2016). No deviations from the FSP were noted.

References

AECOM, 2016 (September). Addendum #1 to the Draft Final 2015 Field Sampling Plan, Sawyer Street CDF Groundwater Monitoring, New Bedford Harbor Superfund Site, New Bedford, MA. Prepared under Contract No. W912WJ-12-D-0004 Task Order No.10 for the U.S. Army Corps of Engineers New England District, Concord, MA.

Battelle, 2016 (September). Draft Quality Assurance Project Plan Addendum Revision 9.0, Environmental Monitoring, Sampling, and Analysis, New Bedford Harbor Superfund Site, New Bedford, MA. Prepared under Contract W912WJ-12-D-0004 Task Order 0010 for the U.S. Army Corps of Engineers New England District, Concord, MA.

Figure 1

N
W E
S

0 50 100 200 Feet

Well Locations

New Bedford Harbor
Sawyer Street CDF
Groundwater Well Locations

SCALE	DATE	PROJECT NO.
1:1300	12/15	60317716

AECOM

Figure Number

1

Attachment A

Well Development Logs

Well ID: MW-1

Low Flow Ground Water Sample Collection Record

Client: USACE Date: 9/13/16 Time: Start 1310 am/pm
Project No: 60338540 Finish 1410 am/pm
Site Location: MW-1
Weather Conds: Sunny 80°F Collector(s): H. Jones / T. Fellion

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 23.96 c. Length of Water Column 7.18 (a-b) Casing Diameter/Material 2in PVC

b. Water Table Depth 16.78 d. Calculated System Volume (see back) N/A

2. WELL PURGE DATA

a. Purge Method: Well Pump / Surge

b. Acceptance Criteria defined (see workplan)

- Temperature	3%	-D.O.	10%
- pH	± 1.0 unit	- ORP	± 10mV
- Sp. Cond.	3%	- Drawdown	< 0.3'

c. Field Testing Equipment used:

	Make	Model	Serial Number
	MiniRAE	2000	110-003829
	HACH	2100Q	13100C28862
	Proactive	Waterspout	

Time (24hr)	Volume Removed (Liters) gal	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
1314	0.75						109	N/A	16.22 - dry	slightly brown
1323	1.0						83.5		21.4	slightly brown
1335	1.5		N/A		N/A		32.5		21.20	slightly brown
1345	1.75						19.0		21.17	clear
1355	2.0						13.9		21.08	clear
1405	2.25						5.29		21.02	clear

(continued on back)

d. Acceptance criteria pass/fail

	Yes	No	N/A
Has required volume been removed	☐	☐	☒
Has required turbidity been reached	☐	☐	☒
Have parameters stabilized	☐	☐	☒

If no or N/A - Explain below.

3. SAMPLE COLLECTION: Method: N/A

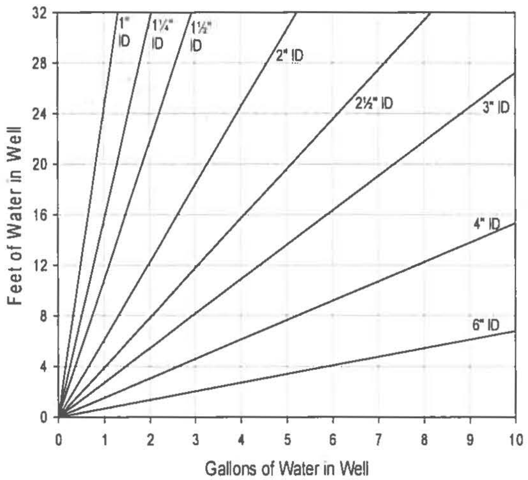
Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
		N/A			

Comments PID - 0.0 ppm
Well cap has cover but no j-plug

Signature [signature] Date 9/13/16

MW-1

Purge Volume Calculation



Volume / Linear Ft. of Pipe		
ID (in)	Gallon	Liter
0.25	0.0025	0.0097
0.375	0.0057	0.0217
0.5	0.0102	0.0386
0.75	0.0229	0.0869
1	0.0408	0.1544
1.25	0.0637	0.2413
1.5	0.0918	0.3475
2	0.1632	0.6178
2.5	0.2550	0.9653
3	0.3672	1.3900
4	0.6528	2.4711
6	1.4688	5.5600

(continued from front)

Time (24 hr)	Volume Removed (Liters)	Temp (°C)	pH	Spec. Cond (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (ft)	Color/Odor

N/A

Well ID: MW 3

Low Flow Ground Water Sample Collection Record

Client: USACE | Date: 9/13/16 | Time: Start 0845 am/pm | Finish 1130 am/pm
Project No: 60334540
Site Location: New Bedford, MA
Weather Conds: sunny 75°F | Collector(s): H. Jones, P. Fellion

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 23.94 c. Length of Water Column 9.45 (a-b) Casing Diameter/Material 2" PVC

b. Water Table Depth 14.49 d. Calculated System Volume (see back) N/A

2. WELL PURGE DATA

a. Purge Method: whale pump / surge

b. Acceptance Criteria defined (see workplan)

- Temperature	3%	-D.O.	10%
- pH	± 1.0 unit	- ORP	± 10mV
- Sp. Cond.	3%	- Drawdown	< 0.3'

c. Field Testing Equipment used:

	Make	Model	Serial Number
	Hach	2100Q	13100C028862
	Proactive	Waterspout 1	
	MiniRAE	2000	110-003829

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
0850	1.5						104.1	N/A	22.69-dry	slightly cloudy
0900	1.6						33.7		22.6-dry	cloudy
0915	1.75			N/A			26.7		21.4 -dry	cloudy
0944	2.2	—	—		N/A	—	15.4	↓	19.7 -dry	slightly cloudy
0957	2.5						76.2		20.9 -dry	slightly cloudy
1010	2.7						45.2	↓	21.67	clear
1015	2.8						25.5		21.65	clear

(continued on back)

d. Acceptance criteria pass/fail

	Yes	No	N/A
Has required volume been removed	☐	☐	☒
Has required turbidity been reached	☐	☐	☒
Have parameters stabilized	☐	☐	☒

If no or N/A - Explain below.

3. SAMPLE COLLECTION: Method: N/A

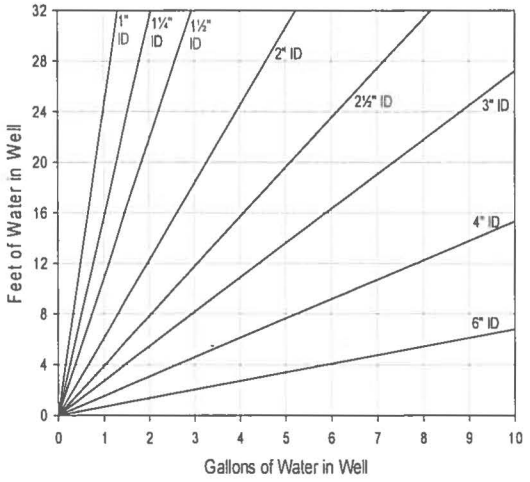
Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
N/A					

Comments: Small amounts of vegetative debris in water - small leaves
PID headspace ~0.0 ppm
Groundwater turbidity not decreasing after 16 NTU so stop

Signature: Helen A. J | Date: 9/13/16

MW-3

Purge Volume Calculation



Volume / Linear Ft. of Pipe		
ID (in)	Gallon	Liter
0.25	0.0025	0.0097
0.375	0.0057	0.0217
0.5	0.0102	0.0386
0.75	0.0229	0.0869
1	0.0408	0.1544
1.25	0.0637	0.2413
1.5	0.0918	0.3475
2	0.1632	0.6178
2.5	0.2550	0.9653
3	0.3672	1.3900
4	0.6528	2.4711
6	1.4688	5.5600

(continued from front)

Time (24 hr)	Volume Removed (~~Liters~~ gal)	Temp (°C)	pH	Spec. Cond (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (ft)	Color/Odor
1025	2.9						22.5	N/A	21.7 dry	clear
1035	3.2						19.4		21.8 dry	clear
1055	3.6						12.9		19.8 dry	clear
1115	3.8	—	N/A		N/A	—	16.1	↓	20.62 dry	clear
1120	3.8						13.6		22.1 dry	clear
1125	3.9						14.9		21.63 dry	clear

Well ID: MW-4A

Low Flow Ground Water Sample Collection Record

Client: USACE Date: 9/13/16 Time: Start 1145 am/pm
Project No: 60335540 Finish 1225 am/pm
Site Location: New Bedford, MA
Weather Conds: sunny 80°F Collector(s): H. Jones

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 23.5 c. Length of Water Column 12.17 (a-b) Casing Diameter/Material 2" PVC

b. Water Table Depth 11.33 d. Calculated System Volume (see back) N/A

2. WELL PURGE DATA

a. Purge Method: whale pump / surge

b. Acceptance Criteria defined (see workplan)

- Temperature	3%	-D.O.	10%
- pH	± 1.0 unit	- ORP	± 10mV
- Sp. Cond.	3%	- Drawdown	< 0.3'

c. Field Testing Equipment used:

	Make	Model	Serial Number
	Proactive	Waterspout I	#
	MiniRAE	2000	110-003829
	Hach	2100Q	13100C88612

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
1155	1.5						14.8	N/A	10.8	clear
1200	4						5.52		23 - dry	clear
1205	4.7			N/A			2.78		23 - dry	clear
1210	5.5						1.15		23 - dry	clear
1215	5.8						1.13		23 - dry	clear

d. Acceptance criteria pass/fail

	Yes	No	N/A
Has required volume been removed	☐	☐	☒
Has required turbidity been reached	☐	☐	☒
Have parameters stabilized	☐	☐	☒

(continued on back)

If no or N/A - Explain below.

3. SAMPLE COLLECTION: Method: N/A

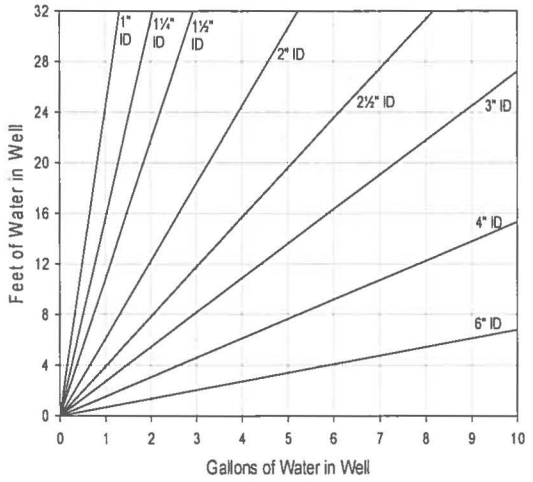
Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
N/A					

Comments: Well has j-plug + cover
Well headspace = 0.0 ppm
Sulphur odor from water

Signature [signature] Date 9/13/16

MW-4A

Purge Volume Calculation



Volume / Linear Ft. of Pipe		
ID (in)	Gallon	Liter
0.25	0.0025	0.0097
0.375	0.0057	0.0217
0.5	0.0102	0.0386
0.75	0.0229	0.0869
1	0.0408	0.1544
1.25	0.0637	0.2413
1.5	0.0918	0.3475
2	0.1632	0.6178
2.5	0.2550	0.9653
3	0.3672	1.3900
4	0.6528	2.4711
6	1.4688	5.5600

(continued from front)

Time (24 hr)	Volume Removed (Liters)	Temp (°C)	pH	Spec. Cond (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (ft)	Color/Odor

Well ID: MW-5

Low Flow Ground Water Sample Collection Record

Client: USACE	Date: 9/12/2016 13 (PQ?) Time: Start 1158 am/pm Finish 1246 am/pm
Project No: 00336540	
Site Location: New Bedford, MA	
Weather Conds: Sunny 75°	Collector(s): P. Fallon

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 18.60 c. Length of Water Column 8.22 (a-b) Casing Diameter/Material 2in PVC

b. Water Table Depth 10.38 d. Calculated System Volume (see back) N/A

2. WELL PURGE DATA

a. Purge Method: Well pump/surge

b. Acceptance Criteria defined (see workplan)

- Temperature	3%	-D.O.	10%
- pH	± 1.0 unit	- ORP	± 10mV
- Sp. Cond.	3%	- Drawdown	< 0.3'

c. Field Testing Equipment used:

Make	Model	Serial Number
MiniRAE	2000 PID	110-003829
HACH	2100Q Turbidimeter	11090C012300
ProActive	Waterspout I	

Time (24hr)	Volume Removed (Liters) gal	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
1158	1.5	—	—	N/A	N/A	—	107	N/A	10.38 Dry	Black particulates/sulfur
1206	2.5						111		15.68 Dry	Black particulates/sulfur
1216	2.75						24.7		15.58 Dry	"
1226	3.1						9.18		15.62 Dry	Clear/sulfur
1236	2.5						13.0		15.63	Clear w/particulates/sulfur
1246	3.75						8.26	↓	15.87	Clear w/part./sulfur

d. Acceptance criteria pass/fail

	Yes	No	N/A
Has required volume been removed	☐	☐	☒
Has required turbidity been reached	☐	☐	☒
Have parameters stabilized	☐	☐	☒

If no or N/A - Explain below.

(continued on back)

3. SAMPLE COLLECTION: Method: N/A

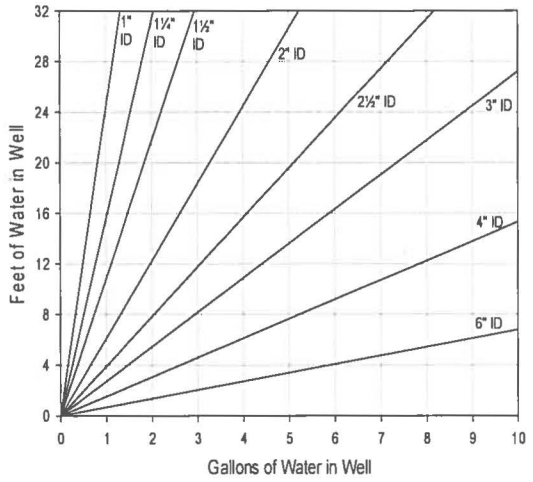
Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
N/A					

Comments: No cap on well casing (inner).
PID headspace reading 0.0 ppm

Signature: Peter Fallon Date 9-13-16

MW-5

Purge Volume Calculation



Volume / Linear Ft. of Pipe		
ID (in)	Gallon	Liter
0.25	0.0025	0.0097
0.375	0.0057	0.0217
0.5	0.0102	0.0386
0.75	0.0229	0.0869
1	0.0408	0.1544
1.25	0.0637	0.2413
1.5	0.0918	0.3475
2	0.1632	0.6178
2.5	0.2550	0.9653
3	0.3672	1.3900
4	0.6528	2.4711
6	1.4688	5.5600

(continued from front)

Time (24 hr)	Volume Removed (Liters)	Temp (°C)	pH	Spec. Cond (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (ft)	Color/Odor

Well ID: MW 6

Low Flow Ground Water Sample Collection Record

Client: USACE Date: 9/13/16 Time: Start 0939 am/pm
Project No: 60336540 Finish 1030 am/pm
Site Location: New Bedford, MA
Weather Conds: Sunny 75°F Collector(s): P. Fellon

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 18.90 c. Length of Water Column 6.03 (a-b)

Casing Diameter/Material 2in PVC

b. Water Table Depth 12.87 d. Calculated System Volume (see back) N/A

2. WELL PURGE DATA

a. Purge Method: WATER PUMP & SURGE

b. Acceptance Criteria defined (see workplan)

- Temperature	3%	-D.O.	10%
- pH	± 1.0 unit	- ORP	± 10mV
- Sp. Cond.	3%	- Drawdown	< 0.3'

c. Field Testing Equipment used:

	Make	Model	Serial Number
	MiniRAE	2000 PID	110-003829
	HACH	2100Q turbidimeter	110900012300
	PROACTIVE	WATERSPOUT	

Time (24hr)	Volume Removed (liters) (gal)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
0939	1.6						321	N/A	12.87 - Dry	ORANGE/MUDDY
0950	~~1.3~~ 3.0						197		13.5 dry	ORANGE/MUDDY
1000	4.5			N/A			4.58		13-14.75 dry	clear
1010	5.5						1.37		13.65 dry	clear
1020	6.5						2.17		13.65 dry	clear

d. Acceptance criteria pass/fail

	Yes	No	N/A
Has required volume been removed	☐	☐	☒
Has required turbidity been reached	☐	☐	☒
Have parameters stabilized	☐	☐	☒

If no or N/A - Explain below.

(continued on back)

3. SAMPLE COLLECTION: Method: N/A

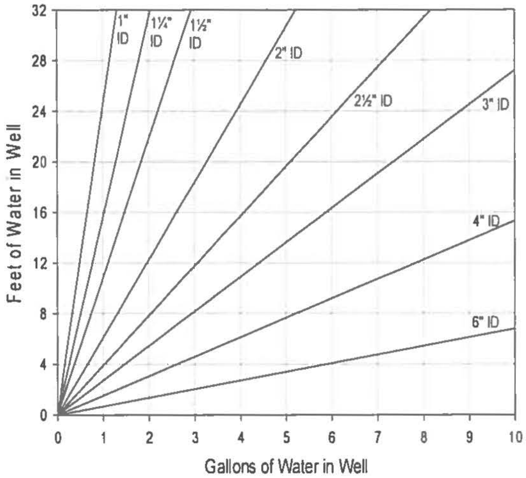
Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
N/A					

Comments PID HEADSPACE READING 0.00 ppm
WELL CAP & CASING HAVE COVER/PLUG

Signature Patrick Fellon Date 9/13/2016

MW-6

Purge Volume Calculation



Volume / Linear Ft. of Pipe		
ID (in)	Gallon	Liter
0.25	0.0025	0.0097
0.375	0.0057	0.0217
0.5	0.0102	0.0386
0.75	0.0229	0.0869
1	0.0408	0.1544
1.25	0.0637	0.2413
1.5	0.0918	0.3475
2	0.1632	0.6178
2.5	0.2550	0.9653
3	0.3672	1.3900
4	0.6528	2.4711
6	1.4688	5.5600

(continued from front)

Time (24 hr)	Volume Removed (Liters)	Temp (°C)	pH	Spec. Cond (μS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (ft)	Color/Odor

N/A

Well ID: MW-7A

Low Flow Ground Water Sample Collection Record

Client: USACE Date: 9/13/16 Time: Start 1100 am/pm
Project No: 60336540 Finish 1130 am/pm
Site Location: New Bedford, MA
Weather Conds: sunny 75°F Collector(s): P. Fallon

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 14.25 c. Length of Water Column 2.8 (a-b) Casing Diameter/Material 2in PVC

b. Water Table Depth 11.45 d. Calculated System Volume (see back) N/A

2. WELL PURGE DATA

a. Purge Method: WALE Pump & Surge

b. Acceptance Criteria defined (see workplan)

- Temperature	3%	-D.O.	10%
- pH	± 1.0 unit	- ORP	± 10mV
- Sp. Cond.	3%	- Drawdown	< 0.3'

c. Field Testing Equipment used:

	Make	Model	Serial Number
	MiniRAE	2000 PID Meter	110-003829
	HACH	2100Q Turbidimeter	11090C012300
	PROACTIVE	WATERSPOUT I	

Time (24hr)	Volume Removed (Gal)(Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
1100	1.25						14.3	N/A	11.45 DRY	CLEAR / slight fishy
1110	2.0						8.68		11.38 DRY	CLEAR / slight fishy
1120	2.75						1.34		11.37 DRY	CLEAR / slight fishy
N/A							N/A		N/A	N/A

(continued on back)

d. Acceptance criteria pass/fail

	Yes	No	N/A
Has required volume been removed	☐	☐	☒
Has required turbidity been reached	☐	☐	☒
Have parameters stabilized	☐	☐	☒

If no or N/A - Explain below.

3. SAMPLE COLLECTION: Method: N/A

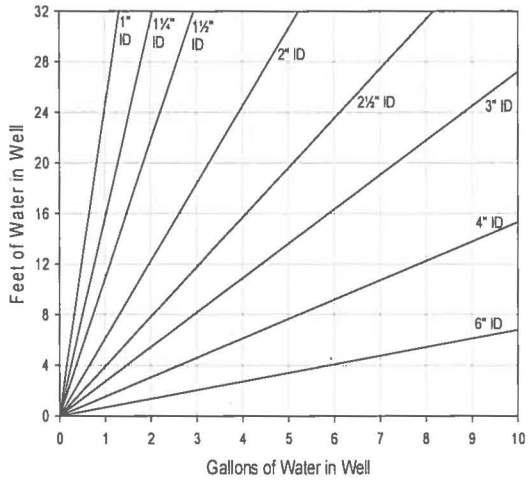
Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
N/A					

Comments: WELL HEADSPACE 0 ppm
Well cover has hole and no j plug

Signature: Peter Fallon Date: 9/13/2016

MW-7A

Purge Volume Calculation



Volume / Linear Ft. of Pipe		
ID (in)	Gallon	Liter
0.25	0.0025	0.0097
0.375	0.0057	0.0217
0.5	0.0102	0.0386
0.75	0.0229	0.0869
1	0.0408	0.1544
1.25	0.0637	0.2413
1.5	0.0918	0.3475
2	0.1632	0.6178
2.5	0.2550	0.9653
3	0.3672	1.3900
4	0.6528	2.4711
6	1.4688	5.5600

(continued from front)

Time (24 hr)	Volume Removed (Liters)	Temp (°C)	pH	Spec. Cond (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (ft)	Color/Odor

Attachment B

Monitoring Well Sampling Logs

Well ID: MW-1

Low Flow Ground Water Sample Collection Record

Client: USACE Date: 9/29/16 Time: Start 1100 am/pm
Project No: 60326540 Finish 1215 am/pm
Site Location: New Bedford Harbor
Weather Conds: overcast, 60°F Collector(s): H. Jones

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 23.9 c. Length of Water Column 7.1 (a-b) Casing Diameter/Material 2" PVC

b. Water Table Depth 16.8 d. Calculated System Volume (see back) 1.1 gal

2. WELL PURGE DATA

a. Purge Method: low flow bladder w/ compressed gas

b. Acceptance Criteria defined (see workplan)

- Temperature	3%	-D.O.	10%
- pH	±1.0 unit	- ORP	±10mV
- Sp. Cond.	3%	- Drawdown	< 0.3'

c. Field Testing Equipment used:

	Make	Model	Serial Number
PID	mini RAE 2000		110-012180
	LaMotte 2020we		2068-1212
	YSI	600XL	07F100535

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
1105		16.22	6.29	575	4.22	50.2	15.6	120	17.10	clear
1110		15.93	6.70	572	1.04	56.1	11.6	120	17.63	clear
1115		15.88	6.75	552	1.05	72.2	8.41	120	17.91	clear
1120		16.01	6.77	542	0.82	86.7	6.00	120	18.10	clear
1125		16.10	6.79	539	0.96	90.5	7.78	120	18.37	clear
1130		16.19	6.82	538	1.01	89.3	6.47	120	18.50	clear
1135	1 gal	16.23	6.85	541	1.06	81.1	5.63	120	18.71	clear

d. Acceptance criteria pass/fail

	Yes	No	N/A
Has required volume been removed	☒	☐	☐
Has required turbidity been reached	☒	☐	☐
Have parameters stabilized	☒	☐	☐

If no or N/A - Explain below.

(continued on back)

3. SAMPLE COLLECTION: Method: low flow bladder w/ compressed gas

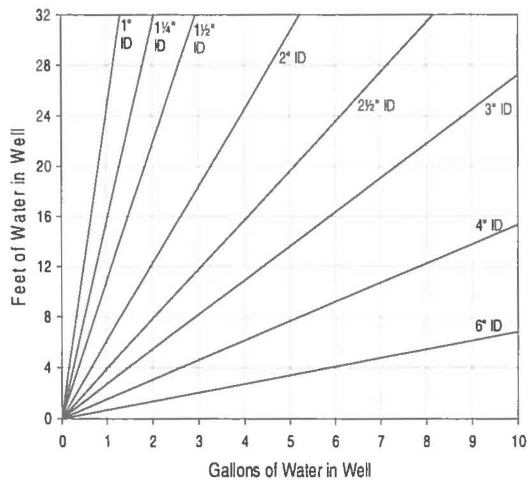
Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
MW-1-092916			VOCs, PCBs, metals, TSS		1140

Comments well headspace PID = 0.0 ppm
End depth to water - 20.68 ft

Signature Helen A. Lee Date 9/29/16

MW-1

Purge Volume Calculation



Volume / Linear Ft. of Pipe		
ID (in)	Gallon	Liter
0.25	0.0025	0.0097
0.375	0.0057	0.0217
0.5	0.0102	0.0386
0.75	0.0229	0.0869
1	0.0408	0.1544
1.25	0.0637	0.2413
1.5	0.0918	0.3475
2	0.1632	0.6178
2.5	0.2550	0.9653
3	0.3672	1.3900
4	0.6528	2.4711
6	1.4688	5.5600

(continued from front)

Time (24 hr)	Volume Removed (Liters)	Temp (°C)	pH	Spec. Cond (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (ft)	Color/Odor

N/A

Well ID: MW-3

Low Flow Ground Water Sample Collection Record

Client: USACE Date: 9/28/16 Time: Start 1350 am/pm
Project No: (0032.(6540 Finish 1550 am/pm
Site Location: New Bedford
Weather Conds: overcast 60°F Collector(s): H. Jones

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 23.86 c. Length of Water Column 9.51 (a-b) Casing Diameter/Material 2" PVC

b. Water Table Depth 14.35 d. Calculated System Volume (see back) 1.55gal

2. WELL PURGE DATA

a. Purge Method: low flow - peristaltic pump

b. Acceptance Criteria defined (see workplan)

- Temperature	3%	-D.O.	10%
- pH	± 1.0 unit	- ORP	± 10mV
- Sp. Cond.	3%	- Drawdown	< 0.3'

c. Field Testing Equipment used: Make / Model / Serial Number

YSI 600XL 04C3884AA
LaMotte 2020we 3084-1213
Geopump peristaltic pump 520

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
1355		14.24	7.54	7828	20.47	-123.5	40.11	200	15.55	slightly brown
1400		14.44	7.34	7803	12.65	-126.3		180	17.05	
1430		15.67	7.88	7749	4.14	-82.7	32.50	160	16.95	
1435		13.85	7.45	8061	1.36	-121.6	22.63	160	17.59	
1440		13.97	7.36	7792	1.32	-107.8	16.26	160	17.94	
1445		14.01	7.29	7204	1.61	-98.4	11.16	160	18.68	
1450	1.8gal	13.96	7.24	6435	2.71	-89.1	12.51	160	19.25	

d. Acceptance criteria pass/fail

	Yes	No	N/A
Has required volume been removed	☒	☐	☐
Has required turbidity been reached	☒	☐	☐
Have parameters stabilized	☒	☐	☐

If no or N/A - Explain below.

(continued on back)

3. SAMPLE COLLECTION: Method: low flow - peristaltic

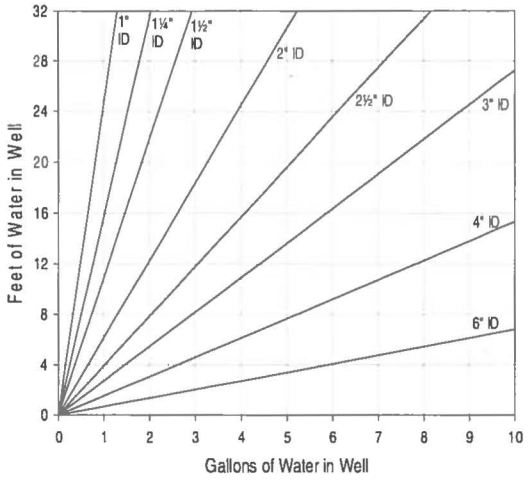
Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
MW-3-092816			VOC, PCBs, Metals, TSS		1520

Comments PID = 0.0 ppm
After 1400, replaced DO membrane + checked saturated @ 126%
End depth to water - 21.98 ft

Signature Helen A. Jones Date 9/28/16

MW-3

Purge Volume Calculation



Volume / Linear Ft. of Pipe		
ID (in)	Gallon	Liter
0.25	0.0025	0.0097
0.375	0.0057	0.0217
0.5	0.0102	0.0386
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1	0.0408	0.1544
1.25	0.0637	0.2413
1.5	0.0918	0.3475
2	0.1632	0.6178
2.5	0.2550	0.9653
3	0.3672	1.3900
4	0.6528	2.4711
6	1.4688	5.5600

(continued from front)

Time (24 hr)	Volume Removed (Liters)	Temp (°C)	pH	Spec. Cond (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (ft)	Color/Odor
1455		14.10	7.15	8177	4.89	-99.5	16.69	140	19.73	slightly brown
1500		13.24	7.20	8209	1.46	-115.1	15.92	140	19.95	
1505		13.21	7.24	8295	1.28	-126.7	13.31	140	20.29	
1510		13.20	7.27	8322	1.23	-128.8	10.29	140	20.61	
1515	1.85gal	13.18	7.27	8363	1.30	-128.0	9.32	140	20.96	

Well ID: MW-4A

Low Flow Ground Water Sample Collection Record

Client: ~~Neeft~~ USACE Date: 9/28/16 Time: Start 1015 am/pm
Project No: 60336540 Finish 1315 am/pm
Site Location: New Bedford Harbor
Weather Conds: overcast, 60°F Collector(s): H. Jones

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 23.50 c. Length of Water Column 12.93 (a-b) Casing Diameter/Material 2" PVC

b. Water Table Depth 10.57 d. Calculated System Volume (see back) 2.11 gal

2. WELL PURGE DATA

a. Purge Method: low flow, bladder w/ compressed gas & QED controller

b. Acceptance Criteria defined (see workplan)

- Temperature	3%	-D.O.	10%
- pH	± 1.0 unit	- ORP	± 10mV
- Sp. Cond.	3%	- Drawdown	< 0.3'

c. Field Testing Equipment used: Make / Model / Serial Number

miniRAE 2000
YSI 600XL
LaMotte 2020 we

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
1018		15.31	6.71	5474	4.58	-142.5	4.57	160	10.70	clear, sulphur odor
1023		14.86	6.92	5800	9.63	-220.0	3.29	160	11.41	clear, sulphur odor
1028		14.83	7.06	5365	16.05	-236.6	2.92	160	11.81	clear, sulphur odor
1033		14.81	7.11	5076	22.40	-241.6	3.71	160	12.08	clear, sulphur odor
1038		14.75	7.13	4845	25.11	-243.4	2.74	160	12.25	clear, sulphur odor
1043	↓	14.75	7.14	4725	21.92	-245.6	2.76	160	12.38	clear, sulphur odor
1048		14.74	7.15	4644	14.96	-244.4	2.80	160	12.53	clear, sulphur odor

d. Acceptance criteria pass/fail

	Yes	No	N/A
Has required volume been removed	☒	☐	☐
Has required turbidity been reached	☒	☐	☐
Have parameters stabilized	☒	☐	☐

If no or N/A - Explain below.

(continued on back)

3. SAMPLE COLLECTION: Method: low flow - bladder

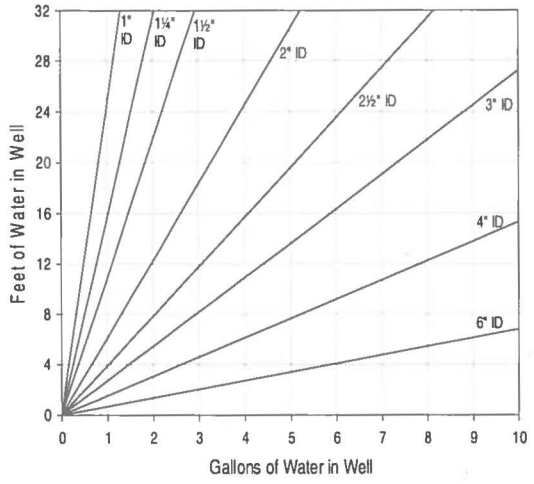
Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
MW-4A-092816				VOCs, PCBs, metals, TSS	1115

Comments: Collected ms/msD
PID = 0.0 ppm for headspace
End depth w water = 13.98 ft

Signature: [signature] Date: 9/28/16

MW-4A

Purge Volume Calculation



Volume / Linear Ft. of Pipe		
ID (in)	Gallon	Liter
0.25	0.0025	0.0097
0.375	0.0057	0.0217
0.5	0.0102	0.0386
0.75	0.0229	0.0869
1	0.0408	0.1544
1.25	0.0637	0.2413
1.5	0.0918	0.3475
2	0.1632	0.6178
2.5	0.2550	0.9653
3	0.3672	1.3900
4	0.6528	2.4711
6	1.4688	5.5600

(continued from front)

Time (24 hr)	Volume Removed (Liters)	Temp (°C)	pH	Spec. Cond (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (ft)	Color/Odor
1053		14.62	7.17	4509	21.98	-246.3	3.11	160	12.74	clear, sulphur odor
1058		14.75	7.17	4452	22.50	-246.3	3.05	160	12.88	clear, sulphur odor
1103		14.81	7.18	4442	22.73	-245.6	3.16	160	12.98	clear, sulphur odor
1108	3 gal	14.84	7.18	4433	22.93	-245.3	3.65	160	13.08	clear sulphur odor

Well ID: MW-5

Low Flow Ground Water Sample Collection Record

Client: USACE Date: 9-28-16 Time: Start 1050 am/pm
Project No: 100336540 Finish 1245 am/pm
Site Location: NEW BEDFORD HARBOR
Weather Conds: OVERCAST ~60°F Collector(s): PURDY

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 18.58 c. Length of Water Column 8.39 (a-b) Casing Diameter/Material 2" PVC

b. Water Table Depth 10.19 d. Calculated System Volume (see back) 1.36 gal

2. WELL PURGE DATA

a. Purge Method: BLADDER (LOW FLOW) Rinsate

b. Acceptance Criteria defined (see workplan)

- Temperature	3%	-D.O.	10%
- pH	± 1.0 unit	- ORP	± 10mV
- Sp. Cond.	3%	- Drawdown	< 0.3'

c. Field Testing Equipment used:

	Make	Model	Serial Number
	MINIRAE	2000	-003093
	LAMOTTE	2020	-1213
	YSI	600 XL	-535

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
1105		16.6	7.34	3943	2.36	-279	1.74	125	12.60	CLEAR / NONE
1120		16.3	7.36	4065	1.24	-304.8	2.12	125	12.85	
1130		16.5	7.36	4170	0.71	-316.3	2.09	90	12.87	
1145		16.4	7.38	4156	0.56	-323.8	2.10	90	12.89	
1155	~7.5L	16.3	7.38	4134	0.36	-329.7	1.88	90	12.25	
@	1205									

Rinsate

d. Acceptance criteria pass/fail

	Yes	No	N/A
Has required volume been removed	☑	☐	☐
Has required turbidity been reached	☑	☐	☐
Have parameters stabilized	☑	☐	☐

If no or N/A - Explain below.

(continued on back)

3. SAMPLE COLLECTION: Method: GRAB (LOW FLOW BLADDER)

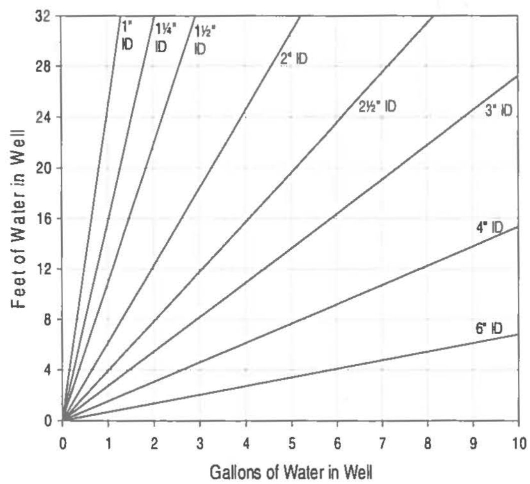
Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
MW-5-092816			VOC MET PCB TSS		@1205

Comments PID = 0
FINAL WL = 13.25

Signature [signature] Date 9-25-16

MW-5

Purge Volume Calculation



Volume / Linear Ft. of Pipe		
ID (in)	Gallon	Liter
0.25	0.0025	0.0097
0.375	0.0057	0.0217
0.5	0.0102	0.0386
0.75	0.0229	0.0869
1	0.0408	0.1544
1.25	0.0637	0.2413
1.5	0.0918	0.3475
2	0.1632	0.6178
2.5	0.2550	0.9653
3	0.3672	1.3900
4	0.6528	2.4711
6	1.4688	5.5600

(continued from front)

Time (24 hr)	Volume Removed (Liters)	Temp (°C)	pH	Spec. Cond (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (ft)	Color/Odor

N/A

Well ID: MW-6

Low Flow Ground Water Sample Collection Record

Client: USACE | Date: 9.28.16 | Time: Start 1350 am/pm, Finish 1530 am/pm
Project No: 60336540
Site Location: NEW BEDFORD HARBOR
Weather Conds: OVERCAST ~60F | Collector(s): Purdy

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 18.87 c. Length of Water Column 5.62 (a-b) Casing Diameter/Material 2" PVC

b. Water Table Depth 13.25 d. Calculated System Volume (see back) 0.917gal

2. WELL PURGE DATA

a. Purge Method: LOW FLOW - BLADDER

b. Acceptance Criteria defined (see workplan)
- Temperature 3% -D.O. 10%
- pH ± 1.0 unit - ORP ± 10mV
- Sp. Cond. 3% - Drawdown < 0.3'

c. Field Testing Equipment used: Make Model Serial Number
- MINIRAE 2000 - 008093
- LAMOTTE 2020 - 1213
- YSI 600XL ~~4A~~ -535

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
1400	↓	15.98	7.40	927	2.79	-174.3	11.24	160	13.70	CLEAR/ —
1415		15.65	7.31	916	0.82	-185.3	6.46	160	14.30	
1420		15.61	7.31	900	0.52	-196.6	2.87	240	14.30	↓
1430		15.50	7.32	903	0.23	-200.5	1.47	240	14.30	
1435		15.50	7.31	906	0.31	-202.0	1.26	240	14.25	
1440	~10L	15.51	7.31	907	0.28	-201.0	1.21	240	14.01	
	@1450									

d. Acceptance criteria pass/fail — Yes / No / N/A (continued on back)

Has required volume been removed: ☒ Yes ☐ No ☐ N/A
Has required turbidity been reached: ☒ Yes ☐ No ☐ N/A
Have parameters stabilized: ☒ Yes ☐ No ☐ N/A
If no or N/A - Explain below.

P 9/28/16

3. SAMPLE COLLECTION: Method: GRAB LOW FLOW BLADDER

P 9/28/16

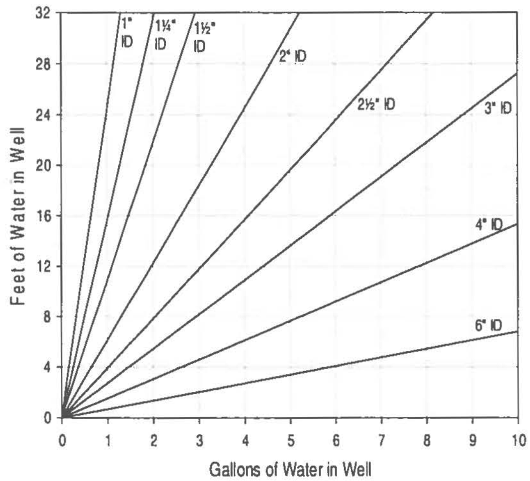
Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
MW-6-092816				VOC MET	@ 1450
				TSS PCB	

Comments FD @ 1500
TSS QC VOLUME @ 1450
PID = ∅ FINAL WL = 14.01

Signature [signature] Date 9-28-16

MW-6

Purge Volume Calculation



Volume / Linear Ft. of Pipe		
ID (in)	Gallon	Liter
0.25	0.0025	0.0097
0.375	0.0057	0.0217
0.5	0.0102	0.0386
0.75	0.0229	0.0869
1	0.0408	0.1544
1.25	0.0637	0.2413
1.5	0.0918	0.3475
2	0.1632	0.6178
2.5	0.2550	0.9653
3	0.3672	1.3900
4	0.6528	2.4711
6	1.4688	5.5600

(continued from front)

Time (24 hr)	Volume Removed (Liters)	Temp (°C)	pH	Spec. Cond (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (ft)	Color/Odor

N/A

Well ID: MW-7A

Low Flow Ground Water Sample Collection Record

Client: USACE Date: 9/29/16 Time: Start 0922 am/pm
Project No: 60336540 Finish 1020 am/pm
Site Location: New Bedford Harbor
Weather Conds: overcast 60°F Collector(s): H. Jones + R. Purdy

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 14.23 c. Length of Water Column 3.76 (a-b) Casing Diameter/Material 2" PVC

b. Water Table Depth 10.47 d. Calculated System Volume (see back) 0.6139 L

2. WELL PURGE DATA

a. Purge Method: low flow bladder w/ compressed gas

b. Acceptance Criteria defined (see workplan)

- Temperature	3%	-D.O.	10%
- pH	± 1.0 unit	- ORP	± 10mV
- Sp. Cond.	3%	- Drawdown	< 0.3'

c. Field Testing Equipment used:

	Make	Model	Serial Number
	miniRAE 2000		110-012180
	LaMotte 2020 we		2068-1212
	YSI 600XL		07F100535

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
0925	↓	16.82	6.48	532	1.59	174.1	4.63	240	10.70	clear
0930		16.76	6.59	531	1.00	121.2	0.90	240	10.73	clear
0935		16.69	6.63	532	0.66	117.9	0.78	240	10.73	clear
0940		16.66	6.64	533	0.64	117.9	0.56	240	10.72	clear
0945		16.63	6.65	534	0.53	118.6	0.81	240	10.73	clear
0950		16.62	6.65	534	0.47	119.0	0.54	240	10.74	clear
0955		16.59	6.66	535	0.41	119.4	0.60	240	10.74	clear

(continued on back)

d. Acceptance criteria pass/fail

	Yes	No	N/A
Has required volume been removed	☒	☐	☐
Has required turbidity been reached	☒	☐	☐
Have parameters stabilized	☒	☐	☐

If no or N/A - Explain below.

3. SAMPLE COLLECTION: Method: low flow - bladder w/ compressed gas

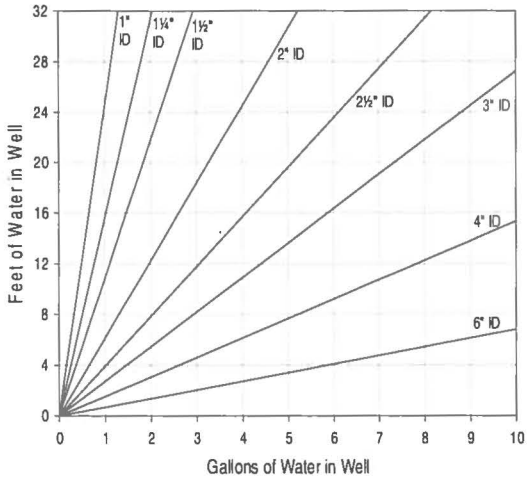
Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
MW-7A-092916				VOC, PCB, metals, TSS	1005

Comments Well headspace PID=0.0 ppm
End depth to water 10.71 ft

Signature [signature] Date 9/29/16

MW-7B

Purge Volume Calculation



Volume / Linear Ft. of Pipe		
ID (in)	Gallon	Liter
0.25	0.0025	0.0097
0.375	0.0057	0.0217
0.5	0.0102	0.0386
0.75	0.0229	0.0869
1	0.0408	0.1544
1.25	0.0637	0.2413
1.5	0.0918	0.3475
2	0.1632	0.6178
2.5	0.2550	0.9653
3	0.3672	1.3900
4	0.6528	2.4711
6	1.4688	5.5600

(continued from front)

Time (24 hr)	Volume Removed (Liters)	Temp (°C)	pH	Spec. Cond (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (ft)	Color/Odor
1600	2.5 gal	16.59	6.66	535	0.46	120.2	0.61	240	10.74	clear

Appendix B
Laboratory Data Packages

(electronic only)

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Appendix C
Data Validation Reports

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SDGL1630815 TSS
Data Validation Report

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Battelle
The Business of Innovation

November 14, 2016

Mr. Paul Dragos
Battelle
141 Longwater Drive
Suite 202
Norwell, MA 02061

Subject: NBH Data Validation

Dear Mr. Dragos;

Enclosed is the final validation report for the sample delivery groups (SDGs) listed below.

SDG #	Fraction	Date Received
L1630815	Total Suspended Solids	10/20/16

The data validation was performed at Tier I Stage I level using the following guidelines, as applicable to each method:

- EPA New England Environmental Data Review Supplement for Regional Data Review Elements and Superfund Specific Guidance/Procedures, April 2013
- EPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, June 2008

Please feel free to contact me if you have any questions at 781-681-5502 or buhl@battelle.org.

Sincerely,

Rosanna Buhl
Battelle Columbus Operations

Data Validation Report

Project Name	New Bedford Harbor
Task Order Number	10
Collection Date	September 28, 2016
Matrix	Groundwater
Parameter(s)	Total Suspended Solids
Validation Level	USEPA Region I Tier I Stage 1 Validation
Laboratory	Alpha Analytical Laboratory
Validator	K. Nichols
Report Date	November 14, 2016
Sample Delivery Group (SDG)	L1630815
Sample Identification	
Sample ID	**Lab ID**
MW-3-092816	L1630815-05
MW-4A-092816	L1630815-01
MW-5-092816	L1630815-02
MW-6-092816	L1630815-03
MW-6-092816-REP	L1630815-04

Introduction

This data review covers the SDG and parameters listed above. The data validation was performed using EPA New England Environmental Data Review Supplement for Regional Data Review Elements and Superfund Specific Guidance/Procedures (April 2013) and criteria listed in the task order QAPP. The data qualification summary details any data validation qualifiers that were assigned during the validation process.

The following data validation qualifiers are defined for the purposes of this report:

U	Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.
J	Indicates an estimated value.
UJ	Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.
R	Quality control data indicates the data is not usable.

Data Qualification Summary

Sample ID(s)	Compound(s)	Flag	Reason

__**X**__ No qualifiers were assigned during data validation.

Additional Comments:
The data packages include _5_ field samples, _0_ field blanks and _0_ media blanks.

Attachment 1: Validation checklist for SDG L1630815 Total Suspended Solids

Attachment 1

DATA VALIDATION CHECKLIST

Matrix: Groundwater

Analysis: Total Suspended Solids (TSS)

Laboratory Package ID: L1630815

Reviewed by: K. Nichols

Date: November 14, 2016

Data Validation Codes:
A = QC parameter met acceptance criteria
B = One or more QC parameters outside acceptance criteria, but data is useable
C = One or more QC parameter outside acceptance criteria and data is potentially unusable (see validation narrative)
N/A = not applicable

QC Parameter	Present Y/N	Acceptance Criteria	DV Code	Comments
TIER I Stage 1				
Data Package Complete	Y	Completeness checklist elements included	A	Analytical Case Narrative in lieu of Authorization statement and dated signature.
Sample Receipt Conditions; Holding Time	Y	Ice, 4°C ± 2°C. Protect from sunlight and atmospheric oxygen. Analyze 28 days from collection.	A	
TIER I Stage 2A (plus Tier I Stage 1) [1]				
Method Blank		<RL (0.01%)		
Laboratory (Matrix) Duplicates		RPD ≤ 25% for results >5x RL		
Solid LCS (SRM)		75-125% R		
TIER I+ (plus Tier 1 Stage 2A)				
Field Replicate		RPD <50%		
TIER II (plus Tier 1 Stage 2A)				

[1] Shaded validation tiers are not applicable for this project.

Attachment 1

DATA VALIDATION CHECKLIST

QC Parameter	Present Y/N	Acceptance Criteria	DV Code	Comments
Calibration		Daily; $r^2 \geq 0.995$ or ±10% from standard value		

QAPP Worksheet #3: Laboratory Data Completeness

Y/N	Completeness Criteria
Y	Title sheet identifying laboratory name, location, contact information
N	Authorization statement and dated signature
Y	Analytical case narrative (i.e., data quality report)
Y	Sample identification table
Y	Method summary
Y	Sample results including date and time of analysis, (metric units, dry weight basis for sediment)
Y	QC results and acceptance criteria
Y	Signed COC forms

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SDGL1630948 TSS
Data Validation Report

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Battelle
The Business of Innovation

November 14, 2016

Mr. Paul Dragos
Battelle
141 Longwater Drive
Suite 202
Norwell, MA 02061

Subject: NBH Data Validation

Dear Mr. Dragos;

Enclosed is the final validation report for the sample delivery groups (SDGs) listed below.

SDG #	Fraction	Date Received
L1630948	Total Suspended Solids	10/20/16

The data validation was performed at Tier I Stage I level using the following guidelines, as applicable to each method:

- EPA New England Environmental Data Review Supplement for Regional Data Review Elements and Superfund Specific Guidance/Procedures, April 2013
- EPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, June 2008

Please feel free to contact me if you have any questions at 781-681-5502 or buhl@battelle.org.

Sincerely,

Rosanna Buhl
Battelle Columbus Operations

Data Validation Report

Project Name	New Bedford Harbor
Task Order Number	10
Collection Date	September 28, 2016
Matrix	Groundwater
Parameter(s)	Total Suspended Solids
Validation Level	USEPA Region I Tier I Stage 1 Validation
Laboratory	Alpha Analytical Laboratory
Validator	K. Nichols
Report Date	November 14, 2016
Sample Delivery Group (SDG)	L1630948
Sample Identification	
Sample ID	**Lab ID**
MW-1-092916	L1630948-03
MW-7A-092916	L1630948-02

Introduction

This data review covers the SDG and parameters listed above. The data validation was performed using EPA New England Environmental Data Review Supplement for Regional Data Review Elements and Superfund Specific Guidance/Procedures (April 2013) and criteria listed in the task order QAPP. The data qualification summary details any data validation qualifiers that were assigned during the validation process.

The following data validation qualifiers are defined for the purposes of this report:

U	Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.
J	Indicates an estimated value.
UJ	Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.
R	Quality control data indicates the data is not usable.

Data Qualification Summary

Sample ID(s)	Compound(s)	Flag	Reason

__**X**__ No qualifiers were assigned during data validation.

Additional Comments:
The data packages include _2_ field samples, _0_ field blanks and _0_ media blanks.

Attachment 1: Validation checklist for SDG L1630948 Total Suspended Solids

Attachment 1

DATA VALIDATION CHECKLIST

Matrix: Groundwater

Analysis: Total Suspended Solids (TSS)

Laboratory Package ID: L1630948

Reviewed by: K. Nichols

Date: November 14, 2016

Data Validation Codes:
A = QC parameter met acceptance criteria
B = One or more QC parameters outside acceptance criteria, but data is useable
C = One or more QC parameter outside acceptance criteria and data is potentially unusable (see validation narrative)
N/A = not applicable

QC Parameter	Present Y/N	Acceptance Criteria	DV Code	Comments
TIER I Stage 1				
Data Package Complete	Y	Completeness checklist elements included	A	Analytical Case Narrative in lieu of Authorization statement and dated signature.
Sample Receipt Conditions; Holding Time	Y	Ice, 4°C ± 2°C. Protect from sunlight and atmospheric oxygen. Analyze 28 days from collection.	A	
TIER I Stage 2A (plus Tier I Stage 1) [1]				
Method Blank		<RL (0.01%)		
Laboratory (Matrix) Duplicates		RPD ≤ 25% for results >5x RL		
Solid LCS (SRM)		75-125% R		
TIER I+ (plus Tier 1 Stage 2A)				
Field Replicate		RPD <50%		
TIER II (plus Tier 1 Stage 2A)				

[1] Shaded validation tiers are not applicable for this project.

Attachment 1

DATA VALIDATION CHECKLIST

QC Parameter	Present Y/N	Acceptance Criteria	DV Code	Comments
Calibration		Daily; $r^2 \geq 0.995$ or ±10% from standard value		

QAPP Worksheet #3: Laboratory Data Completeness

Y/N	Completeness Criteria
Y	Title sheet identifying laboratory name, location, contact information
N	Authorization statement and dated signature
Y	Analytical case narrative (i.e., data quality report)
Y	Sample identification table
Y	Method summary
Y	Sample results including date and time of analysis, (metric units, dry weight basis for sediment)
Y	QC results and acceptance criteria
Y	Signed COC forms

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SDGL1630948 DV-156
Data Validation Report

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EDV, INC
Environmental Data Validation Incorporated

November 14, 2016

Mr. Paul Dragos
Battelle
141 Longwater Drive
Suite 202
Norwell, MA 02061

Subject: NBH Data Validation

Dear Mr. Dragos;

Enclosed is the final validation report for the sample delivery groups (SDGs) listed below.

SDG #	Fraction	Date Received
L1630948	Water –Metals via SW-846 method 6020	10/20/2016

The data validation was performed at Tier I Stage 2A level using the following guidelines, as applicable to each method:

- EPA New England Environmental Data Review Supplement for Regional Data Review Elements and Superfund Specific Guidance/Procedures, April 2013
- EPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, June 2008

Please feel free to contact me if you have any questions at 412-341-5281 or mwalters@edv-inc.com.

Sincerely,

Maxine Wright-Walters, Ph.D

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Data Validation Report

Project Name	New Bedford Harbor
Task Order Number	10
Collection Date	September 29, 2016
Matrix	Water
Parameter(s)	Metals via SW-846 Method 6020
Validation Level	USEPA Region I Tier I Stage 2A Data Validation
Laboratory	Alpha Analytical – Westborough, MA
Validator(s)	L. Wright
Report Date	November 14, 2016
Sample Delivery Group (SDG)	L1630948
Sample Identification	
Sample ID	**Lab ID**
EB-002-092916	L1630948-01
MW-7A-092916	L1630948-02
MW-1-092916	L1630948-03
EB-001-092916	L1630948-04

Introduction

This data review covers the SDG and parameters listed above. The data validation was performed using EPA New England Environmental Data Review Supplement for Regional Data Review Elements and Superfund Specific Guidance/Procedures (April 2013) and criteria listed in the task order QAPP. The data qualification summary details any data validation qualifiers that were assigned during the validation process.

The following data validation qualifiers are defined for the purposes of this report:

U	Indicates the compound or analyte was analyzed for but not detected at or above the stated limit
J	Indicates an estimated value
UJ	Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value
R	Quality control data indicates the data are not usable

Data Qualification Summary

Sample ID(s)	Compound(s)	Flag	Reason
MW-1-092916	Chromium	U	EB Contamination

Additional Comments:
The data packages include _2_ field samples, _2_ field blanks and _0_ media blanks.

Attachment 1: Validation checklist for SDG L1630948 Metals via SW-846 Method 6020

Attachment 1

DATA VALIDATION CHECKLIST

Matrix: Water

Analysis: Metals

Laboratory Package ID: L1630948

Reviewed by: L. Wright

Date: 11/14/16

Data Validation Codes:
A = QC parameter met acceptance criteria
B = One or more QC parameters outside acceptance criteria, but data is useable
C = One or more QC parameter outside acceptance criteria and data is potentially unusable (see validation narrative)
N/A = not applicable

QC Parameter	Present Y/N	Acceptance Criteria	DV Code	Comments
TIER I Stage 1				
Data Package Complete	Y	Completeness checklist elements included	B	Cooler seal absent
Sample Receipt Conditions; Holding Time	Y	Ice, 4°C±2°C; HNO3 to <2; 6 months to extraction and analysis	A	
TIER I Stage 2A (plus Tier I Stage 1)				
Laboratory Reagent Blank	Y	<Reporting limit[1]	A	
Laboratory Control Sample	Y	80-120% Recovery	A	
Internal Standards	Y	70-120% Recovery	A	
Serial Dilution Sample	N	±10% agreement between 1:5 dilution and undiluted sample for results >50xMDL	B	Lab did not report one based on in-house procedures.

[1] If confirmed and all samples are >10 times the blank, no corrective action required. If samples are <10 times the blank, the batch must be re-digested & reanalyzed.

Attachment 1

DATA VALIDATION CHECKLIST

QC Parameter	Present Y/N	Acceptance Criteria	DV Code	Comments
TIER I+ (plus Tier 1 Stage 2A) [2,3]				
Field Equipment/ Rinsate Blank	Y	<Reporting limit	C	Chromium reported above RL
Field Replicates	N	Relative Percent Difference (RPD) ≤30%	NA	Field duplicate pair is:
Matrix Spike/Matrix Spike Duplicate	Y	75-125% Recovery RPD ≤ 20% (For metals spiked at a concentration > 5x background)	A	
Serial Dilution Sample		±10% agreement between 1:5 dilution and undiluted sample for results >50xMDL		
Post Dilution Spike		80 – 120 %R		
TIER II (plus Tier 1 Stage 2A)				
Initial Calibration Standard (ICAL)		Coefficient of Determination (r) >0.998		
Independent Calibration Check (ICC)		≤10 %D		
Continuing Calibration Standard (CCV)		≤10 %D		
Reporting Limit Check (CRI)		80 – 120 %R		

[2] Shaded validation tiers are not applicable for this project.
[3] The DO#10 QAPP specifies validation of EB, FD, TB, MS/MSD, and IB results be validated as part of Tier I Stage 2A validation.

Attachment 1

DATA VALIDATION CHECKLIST

QC Parameter	Present Y/N	Acceptance Criteria	DV Code	Comments
Interference Check Samples (ICSA & ICSAB)		80 – 120 %R		

QAPP Worksheet #34: Laboratory Data Completeness

Y/N	Completeness Criteria
Y	Title sheet identifying laboratory name, location, contact information
Y	Authorization statement and dated signature
Y	Analytical case narrative (i.e., data quality report)
Y	Sample identification table
Y	Method summary
Y	Sample results including date and time of analysis, (metric units, dry weight basis for sediment)
Y	QC results and acceptance criteria
Y	Signed COC forms

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SDGL1630815 DV-157
Data Validation Report

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EDV, INC
Environmental Data Validation Incorporated

November 14, 2016

Mr. Paul Dragos
Battelle
141 Longwater Drive
Suite 202
Norwell, MA 02061

Subject: NBH Data Validation

Dear Mr. Dragos;

Enclosed is the final validation report for the sample delivery groups (SDGs) listed below.

SDG #	Fraction	Date Received
L1630815	Water –Metals via SW-846 method 6020	10/20/2016

The data validation was performed at Tier I Stage 2A level using the following guidelines, as applicable to each method:

- EPA New England Environmental Data Review Supplement for Regional Data Review Elements and Superfund Specific Guidance/Procedures, April 2013
- EPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, June 2008

Please feel free to contact me if you have any questions at 412-341-5281 or mwalters@edv-inc.com.

Sincerely,

Maxine Wright-Walters, Ph.D

Corporate: 1326 Orangewood Avenue, Pittsburgh, PA 15216 • Ph: **412-341-5281** • Fax: **412-571-1932**
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Data Validation Report

Project Name	New Bedford Harbor
Task Order Number	10
Collection Date	September 28, 2016
Matrix	Groundwater
Parameter(s)	Metals via SW-846 Method 6020
Validation Level	USEPA Region I Tier I Stage 2A Data Validation
Laboratory	Alpha Analytical – Westborough, MA
Validator(s)	L. Wright
Report Date	November 14, 2016
Sample Delivery Group (SDG)	L1630815
Sample Identification	
Sample ID	**Lab ID**
MW-4A-092816	L1630815-01
MW-5-092816	L1630815-02
MW-6-092816	L1630815-03
MW-6-092816-REP	L1630815-04
MW-3-092816	L1630815-05

Introduction

This data review covers the SDG and parameters listed above. The data validation was performed using EPA New England Environmental Data Review Supplement for Regional Data Review Elements and Superfund Specific Guidance/Procedures (April 2013) and criteria listed in the task order QAPP. The data qualification summary details any data validation qualifiers that were assigned during the validation process.

The following data validation qualifiers are defined for the purposes of this report:

U	Indicates the compound or analyte was analyzed for but not detected at or above the stated limit
J	Indicates an estimated value
UJ	Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value
R	Quality control data indicates the data are not usable

Data Qualification Summary

Sample ID(s)	Compound(s)	Flag	Reason
MW-4A-092816 MW-5-092816 MW-6-092816 MW-6-092816-REP MW-3-092816	Chromium	J	Field Replicate RPD exceedance

Sample ID(s)	Compound(s)	Flag	Reason
MW-4A-092816 MW-5-092816 MW-6-092816 MW-6-092816-REP MW-3-092816	Copper	J	Serial dilution percent difference exceedance and Field Replicate RPD exceedance

____ No qualifiers were assigned during data validation.

Additional Comments:
The data packages include _5_ field samples, _0_ field blanks and _0_ media blanks.

Attachment 1: Validation checklist for SDG L1630815 Metals via SW-846 Method 6020

Attachment 1

DATA VALIDATION CHECKLIST

Matrix: Groundwater

Analysis: Metals

Laboratory Package ID: L1630815

Reviewed by: L. Wright

Date: 11/14/16

Data Validation Codes:
A = QC parameter met acceptance criteria
B = One or more QC parameters outside acceptance criteria, but data is useable
C = One or more QC parameter outside acceptance criteria and data is potentially unusable (see validation narrative)
N/A = not applicable

QC Parameter	Present Y/N	Acceptance Criteria	DV Code	Comments
TIER I Stage 1				
Data Package Complete	Y	Completeness checklist elements included	B	Cooler seal absent
Sample Receipt Conditions; Holding Time	Y	Ice, 4°C±2°C; HNO3 to <2; 6 months to extraction and analysis	A	
TIER I Stage 2A (plus Tier I Stage 1)				
Laboratory Reagent Blank	Y	<Reporting limit[1]	A	
Laboratory Control Sample	Y	80-120% Recovery	A	
Internal Standards	Y	70-120% Recovery	A	
Serial Dilution Sample	Y	±10% agreement between 1:5 dilution and undiluted sample for results >50xMDL	C	%D>10

[1] If confirmed and all samples are >10 times the blank, no corrective action required. If samples are <10 times the blank, the batch must be re-digested & reanalyzed.

Attachment 1

DATA VALIDATION CHECKLIST

QC Parameter	Present Y/N	Acceptance Criteria	DV Code	Comments
TIER I+ (plus Tier 1 Stage 2A) [2,3]				
Field Equipment/ Rinsate Blank	N	<Reporting limit	NA	
Field Replicates	Y	Relative Percent Difference (RPD) ≤30%	C	Field duplicate pair is: MW-6-092816-REP RPD>30%
Matrix Spike/Matrix Spike Duplicate	Y	75-125% Recovery RPD ≤ 20% (For metals spiked at a concentration > 5x background)	A	
Serial Dilution Sample		±10% agreement between 1:5 dilution and undiluted sample for results >50xMDL		
Post Dilution Spike		80 – 120 %R		
TIER II (plus Tier 1 Stage 2A)				
Initial Calibration Standard (ICAL)		Coefficient of Determination (r) >0.998		
Independent Calibration Check (ICC)		≤10 %D		
Continuing Calibration Standard (CCV)		≤10 %D		
Reporting Limit Check (CRI)		80 – 120 %R		

[2] Shaded validation tiers are not applicable for this project.
[3] The DO#10 QAPP specifies validation of EB, FD, TB, MS/MSD, and IB results be validated as part of Tier I Stage 2A validation.

Attachment 1

DATA VALIDATION CHECKLIST

QC Parameter	Present Y/N	Acceptance Criteria	DV Code	Comments
Interference Check Samples (ICSA & ICSAB)		80 – 120 %R		

QAPP Worksheet #34: Laboratory Data Completeness

Y/N	Completeness Criteria
Y	Title sheet identifying laboratory name, location, contact information
Y	Authorization statement and dated signature
Y	Analytical case narrative (i.e., data quality report)
Y	Sample identification table
Y	Method summary
Y	Sample results including date and time of analysis, (metric units, dry weight basis for sediment)
Y	QC results and acceptance criteria
Y	Signed COC forms

SDGSJ8025 DV-160
Data Validation Report

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EDV, INC
Environmental Data Validation Incorporated

November 11, 2016

Mr. Paul Dragos
Battelle
141 Longwater Drive
Suite 202
Norwell, MA 02061

Subject: NBH Data Validation

Dear Mr. Dragos;

Enclosed is the final validation report for the sample delivery groups (SDGs) listed below.

SDG #	Fraction	Date Received
SJ8025	GW –VOC via SW846 8260C	10/24/2016
	GW-PCB via SW846 8082A	10/24/2016

The data validation was performed at Tier I Stage 2A level using the following guidelines, as applicable to each method:

- EPA New England Environmental Data Review Supplement for Regional Data Review Elements and Superfund Specific Guidance/Procedures, April 2013
- EPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, June 2008

Please feel free to contact me if you have any questions at 412-341-5281 or mwalters@edv-inc.com.

Sincerely,

Maxine Wright-Walters, Ph.D

Data Validation Report

Project Name	New Bedford Harbor Superfund Site
Task Order Number	10
Collection Date	September 28 & 29, 2016
Matrix	Ground Water
Parameter(s)	VOC and PCB (aroclor)
Validation Level	USEPA Region I Tier I Stage 2A Data Validation
Laboratory	Kathadin Analytical – Scarborough, ME
Validator(s)	L. Wright
Report Date	November 11, 2016
Sample Delivery Group (SDG)	SJ8025
Sample Identification	
Sample ID	**Lab ID**
MW-4A-092816	SJ8025-1
MW-5-092816	SJ8025-2
MW -6-092816	SJ8025-3
MW -6-092816-REP	SJ8025-4
MW-3-092816	SJ8025-5
EB-002-092916	SJ8025-6
MW-7A-092916	SJ8025-7
MW-1-092916	SJ8025-8
EB-001-092616	SJ8025-9
TB-092916	SJ8025-10

Introduction

This data review covers the SDG and parameters listed above. The data validation was performed using EPA New England Environmental Data Review Supplement for Regional Data Review Elements and Superfund Specific Guidance/Procedures (April 2013) and criteria listed in the task order QAPP. The data qualification summary details any data validation qualifiers that were assigned during the validation process.

The following data validation qualifiers are defined for the purposes of this report:

U	Indicates the compound or analyte was analyzed for but not detected at or above the stated limit
J	Indicates an estimated value
UJ	Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value
R	Quality control data indicates the data are not usable

Data Qualification Summary

Sample ID(s)	Compound(s)	Flag	Reason
MW-4A-092816 MW-5-092816 MW -6-092816 MW -6-092816-REP MW-3-092816 EB-002-092916 MW-7A-092916 MW-1-092916 EB-001-092616 TB-092916	Bromomethane	UJ	LCS Low recovery and LCS/LCSD RPD exceedance
MW-4A-092816 MW-5-092816 MW -6-092816 MW -6-092816-REP MW-3-092816 EB-002-092916 MW-7A-092916 MW-1-092916 EB-001-092616 TB-092916	Ethyl Tertiary-Butyl Ether Di-Isopropyl Ether Tertiary-Amyl Methyl Ether Isopropylbenzene	UJ	Low LCS recovery
MW-4A-092816	Aroclor-1221 Aroclor-1232 Aroclor-1242 Aroclor-1248 Aroclor-1254 Aroclor-1260	UJ	Low surrogate recovery and LCS recovery
MW-5-092816	Aroclor-1016	UJ	LCS RPD > QC Limits
MW-4A-092816 MW -6-092816 MW -6-092816-REP MW-7A-092916 MW-1-092916 EB-001-092616 EB-002-092916	Aroclor-1016	R	Low LCS recovery
MW-3-092816	Aroclor-1016	R	Low LCS recovery and low surrogate recoveries

Sample ID(s)	Compound(s)	Flag	Reason
MW-3-092816	Aroclor-1221 Aroclor-1232 Aroclor-1242 Aroclor-1248 Aroclor-1254 Aroclor-1260	UJ	Low surrogate recoveries

____ No qualifiers were assigned during data validation.

Additional Comments:
The data packages include _7 field samples, _2_ field blanks and _1_ trip (media) blanks.

The laboratory reported poor performance on several compounds in the LCS. All Samples were rerun due to the LCS recovery issues. For samples collected on 9/28/16 all reruns were outside holding time. For samples collected on 9/29/16 the reruns were within holding time. Cross contamination/carryover was reported for all reruns. Due to all these deficiencies, the validator did not report any analyses from the reruns. The initial analyses done by the laboratory are the reported analyses.

Attachment 1: Validation checklist for SDG SJ8025_ VOA
Attachment 2: Validation checklist for SDG SJ8025_PCB

Attachment 1

DATA VALIDATION CHECKLIST

Matrix: Groundwater

Analysis: VOCs

Laboratory Package ID: SJ8025

Reviewed by: L. Wright

Date: 11/11/16

Data Validation Codes:
A = QC parameter met acceptance criteria
B = One or more QC parameters outside acceptance criteria, but data is useable
C = One or more QC parameter outside acceptance criteria and data is potentially unusable (see validation narrative)
N/A = not applicable

QC Parameter	Present Y/N	Acceptance Criteria	DV Code	Comments
TIER I Stage 1				
Data Package Complete	Y	Completeness checklist elements included	B	No custody seals present on cooler.
Sample Receipt Conditions; Holding Time	Y	Ice, 4°C±2°C; 14 days to extraction and analysis; pH ≤ 2 at receipt	B	Reruns for samples collected on 9/28/16 were outside holding time and not presented by the validator**.**
TIER I Stage 2A (plus Tier I Stage 1)				
Method Blank	Y	Acetone, 2-Butanone, & Methylene Cl ≤ 2x RL; all other analytes < RL	A	
Laboratory Control Sample/ Laboratory Control Sample Duplicate	Y	% Recovery (R) is within lab limits; RPD ≤ 20%	C	LCS recovery outside QC limits for initial run for samples collected on 9/28/16 & 9/29/16. NFG 2008 has no criteria for LCS for VOAs. Validator used professional judgement along with technical information to apply qualifiers and presented the

Attachment 1

DATA VALIDATION CHECKLIST

QC Parameter	Present Y/N	Acceptance Criteria	DV Code	Comments
				initial runs for samples collected on 9/28/16 and 9/29/16. RPD was exceeded for one compound in this set.
Surrogate Recovery	Y	% Recovery (R) is within lab limits	A	
Internal Standards	Y	-50% to +100% of area counts at ICAL	A	
TIER I+ (plus Tier 1 Stage 2A) [1,2]				
Field Equipment/Rinsate Blank	Y	<Reporting limit	B	Acetone contamination. No samples affected-no detects
Field Trip Blank	Y	<Reporting limit	A	
Field Replicate	Y	Relative Percent Difference (RPD) ≤30%	A	Field duplicate pair is: MW -6-092816-REP
Matrix Spike/Matrix Spike Duplicate	Y	%R is within lab limits; RPD ≤ 20%	B	Some compounds reported low recoveries. The same compounds were affected in the LCS. This is indicative of poor performance by the laboratory on the analytical method particularly for these compounds.
TIER II (plus Tier 1 Stage 2A)				
Initial Calibration Standard (ICAL)		RSD ≤20% or COD or r^2 >0.99 on both GC columns		
Initial Calibration Verification (ICV)		%D ≤ ±20% on both GC columns		

[1] Shaded validation tiers are not applicable for this project.
[2] The DO#10 QAPP specifies validation of EB, FD, TB, MS/MSD, and IB results be validated as part of Tier I Stage 2A validation.

Attachment 1

DATA VALIDATION CHECKLIST

QC Parameter	Present Y/N	Acceptance Criteria	DV Code	Comments
Continuing Calibration Verification (CCV)		%D ≤ ±20% on both GC columns		

QAPP Worksheet #34: Laboratory Data Completeness

Y/N	Completeness Criteria
Y	Title sheet identifying laboratory name, location, contact information
Y	Authorization statement and dated signature
Y	Analytical case narrative (i.e., data quality report)
Y	Sample identification table
Y	Method summary
Y	Sample results including date and time of analysis, (metric units, dry weight basis for sediment)
Y	QC results and acceptance criteria
Y	Signed COC forms

Attachment 2

DATA VALIDATION CHECKLIST

Matrix: Groundwater

Analysis: PCBs - Aroclors

Laboratory Package ID: SJ8025

Reviewed by: L. Wright

Date: 11/11/16

Data Validation Codes:
A = QC parameter met acceptance criteria
B = One or more QC parameters outside acceptance criteria, but data is useable
C = One or more QC parameter outside acceptance criteria and data is potentially unusable (see validation narrative)
N/A = not applicable

QC Parameter	Present Y/N	Acceptance Criteria	DV Code	Comments
TIER I Stage 1				
Data Package Complete	Y	Completeness checklist elements included	B	No custody seal on cooler
Sample Receipt Conditions; Holding Time	Y	Ice, 4°C ± 2°C 30 days to extraction; 40 days to analysis	A	
TIER I Stage 2A (plus Tier I Stage 1)				
Method Blank	Y	<Reporting limit	A	
Laboratory Control Sample/ Laboratory Control Sample Duplicate	Y	Aroclor 1016 and Aroclor 1260 %R within lab limits; RPD ≤ 30%	C	Low recovery for Ar1016 RPD >QC limit. Affected sample is MW-5-092816.
Surrogate Recovery	Y	%R within lab limits	C	Low recoveries
TIER I+ (plus Tier 1 Stage 2A) [3,4]				
Field/Equipment Blank	Y	<Reporting Limit	A	
Field Replicates	Y	Relative Percent Difference ≤ 30%	A	Field duplicate pair is: MW - 6-092816-REP

[3] Shaded validation tiers are not applicable for this project.
[4] The DO#10 QAPP specifies validation of EB, FD, TB, MS/MSD, and IB results be validated as part of Tier I Stage 2A validation.

Attachment 2

DATA VALIDATION CHECKLIST

QC Parameter	Present Y/N	Acceptance Criteria	DV Code	Comments
Matrix Spike/Matrix Spike Duplicate	Y	Aroclor 1016 and Aroclor 1260 %R within lab limits; RPD ≤ 30%	B	Recovery > QC limit RPD>QC limit
Sulfur Cleanup (not routine for groundwater)		Sulfur clean-up performed; sulfur co-elution does not interfere with peak integration.		
TIER II (plus Tier 1 Stage 2A)				
Initial Calibration Standard (ICAL)		RSD ≤20% or COD or r^2 >0.99 on both GC columns		
Initial Calibration Verification (ICV)		%D ≤ ±20% on both GC columns		
Continuing Calibration Verification (CCV)		%D ≤ ±20% on both GC columns		

QAPP Worksheet #34: Laboratory Data Completeness

Y/N	Completeness Criteria
Y	Title sheet identifying laboratory name, location, contact information
Y	Authorization statement and dated signature
Y	Analytical case narrative (i.e., data quality report)
Y	Sample identification table
Y	Method summary
Y	Sample results including date and time of analysis, (metric units, dry weight basis for sediment)
Y	QC results and acceptance criteria
Y	Signed COC forms

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