Naval Facilities Engineering Systems Command Northwest

Final

Soil and Groundwater Supplemental Investigation Report, Operable Unit 2 Area 2, Van Meter Road Spill/Drum Storage Site

NAVAL BASE KITSAP KEYPORT
KEYPORT, WASHINGTON

April 2023

APPROVED FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

This page intentionally left blank

Final
Soil and Groundwater Supplemental Investigation Report
Operable Unit 2 Area 2,
Van Meter Road Spill/Drum Storage Area
Naval Base Kitsap Keyport
Keyport, Washington

5 April 2023

Prepared for:

Department of the Navy
Naval Facilities Engineering Systems Command Northwest
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

Prepared by:
EA Engineering, Science, and Technology, Inc., PBC
2200 6th Avenue, Suite 707
Seattle, WA 98121

Prepared under:
N44255-20-D-6006, Contract Task Order N44255-21-F-4076
DCIN: EA-LTM/OM-6006-23-0027

Preparer Signature:

Hannah Dennis — 5 April 2023

Hannah Dennis, EA Report Preparer — Date

Reviewer Signature:

5 April 2023

Dana Ramquist, EA Task Order Manager — Date

Reviewer Signature:

5-April-2023

Brenda Nuding, EA Program Quality Assurance Manager — Date

This page intentionally left blank

Table of Contents

List of Appendices

List of Figures

List of Tables

Acronyms and Abbreviations

µg/L ..... *microgram(s) per liter*

bgs ..... *below ground surface*

COC ..... *chemical of concern*

cVOC..... chlorinated *volatile organic compound*

DoD ..... *Department of Defense*

DON .....*Department of the Navy*

EA ..... *EA Engineering, Science, and Technology, Inc., PBC*

LOD..... *limit of detection*

LTM ..... *long-term monitoring*

MCL.....*maximum contaminant level*

mg/kg .....*milligram(s) per kilogram*

MTCA .....*Model Toxics Control Act*

NAVFAC NW.....*Naval Facilities Engineering Systems Command Northwest*

NBK.....*Naval Base Kitsap*

NTU.....*nephelometric turbidity units*

OU..... *Operable Unit*

PAL .....*project action level*

PVC.....*polyvinyl chloride*

QC..... *quality control*

RG.....*remediation goal*

ROD .....*Record of Decision*

SAP .....*Sampling and Analysis Plan*

SOP..... *standard operating procedure*

TCE.....*trichloroethene*

1 Introduction

This report summarizes and evaluates the soil and groundwater investigation results for Operable Unit (OU) 2 Area 2 at Naval Base Kitsap (NBK) Keyport, Washington. The purpose of the investigation is to determine whether chlorinated volatile organic compounds (cVOCs) in soil and groundwater extend beyond the existing monitoring well network and to establish current site conditions.

Field activities were performed by EA Engineering, Science, and Technology, Inc., PBC (EA) in June and July 2022 and included well installation and soil and groundwater sampling in accordance with the Tier I Sampling and Analysis Plan (SAP; Department of the Navy [DON] 2022). EA conducted this work for Naval Facilities Engineering Systems Command Northwest (NAVFAC NW) under Contract No. N44255-20-D-6006, Task Order N44255-21-F-4076.

1.1 Site Description and Background

NBK Keyport occupies 340 acres (including tidelands) adjacent to Keyport in Kitsap County, Washington, on a small peninsula in the central portion of the west side of the Puget Sound. The peninsula is bordered by Dogfish Bay to the west, Liberty Bay to the northwest and north, and by Port Orchard Inlet to the northeast, east, and southeast (Figure 1-1). Marine and brackish water bodies on and near the site consist of tide flats, a marsh pond, and a marsh discharging into Dogfish Bay and subsequently Liberty Bay, and a shallow lagoon discharging into Port Orchard Inlet. Freshwater bodies include two creeks discharging into the marsh pond and two creeks discharging into the lagoon. The topography of the site rises gently from the shoreline to an average of 25 to 30 feet above mean sea level, and then rises steeply at the southeast corner of the site to approximately 130 feet above mean sea level.

OU 2 Area 2 is located in the southwest corner of NBK Keyport (Figure 1-2). Area 2 is composed of three distinct sites: Van Meter Road Spill Area and Former Building 734 Drum Storage Area (a small shed that was used for drum storage), both located immediately west of Van Meter Road, and the Former Building 957 Drum Storage Area (a large drum storage facility) located immediately east of Van Meter Road (Figure 1-3). Van Meter Road bisects the site in a generally north/south direction. The western area of the site (Van Meter Road Spill Area and Former Building 734 Drum Storage Area) is bounded by an unnamed creek to the south, the Building 95 parking area to the north and west, and Van Meter Road to the east. The eastern area of the site (Former Building 957 Drum Storage Area) is bound by the same unnamed creek to the north, undeveloped land to the east, Van Meter Road to the west, and an undeveloped, sharp topographic rise to the south that extends to the southern boundary of the installation.

The NBK Keyport property was acquired by the DON in 1913 and first used as a quiet-water range for torpedo testing. The base was expanded during World Wars I and II. During the early 1960s, manufacturing and fabrication operations such as welding, metal plating, carpentry, and sheet metal work were added. In 1978, the facility's function broadened to include various undersea warfare weapons and systems engineering and development activities. Operations currently include test and evaluation, in-service engineering, maintenance and repair, and fleet readiness and industrial base support for undersea weapons systems, countermeasures, and sonar systems.

At OU 2 Area 2, two unpaved drum storage areas were active from the 1940s through the 1960s. These two areas were reportedly used to store the chemicals (including solvents, fuel/oil) used at NBK Keyport during this time period. In 1976, approximately 2,000 to 5,000 gallons of plating shop wastes spilled from a tank truck onto the pavement near Van Meter Road, then into a nearby stream. It was also estimated that between 4,000 and 8,000 gallons of these chemicals were discharged to the two unpaved areas as a result of spills and leaks.

1.2 Environmental Setting

At OU 2 Area 2 the upper aquifer is 30 to 50 feet thick, with the more permeable units near the top and the base of the aquifer (DON 1995). The depth to the water table is 4 to 8 feet below ground surface (bgs). Contours plotted from previous investigations indicate that groundwater flows in a northeasterly direction toward the marsh and shallow lagoon (DON 1995). Groundwater flow direction based on recent July 2022 data corroborates the historical flow direction. There is no current use of groundwater as drinking water at the site. The site is predominantly flat with areas of asphalt pavement and structures covering most of the site. Adjacent to the site to the east is a heavily vegetated potential wetland area with seasonal fluctuations of standing water; however, the area is not currently categorized as wetlands by the installation. The previously mentioned unnamed creek is located north of the Former Building 957 Drum Storage Area.

LEGEND

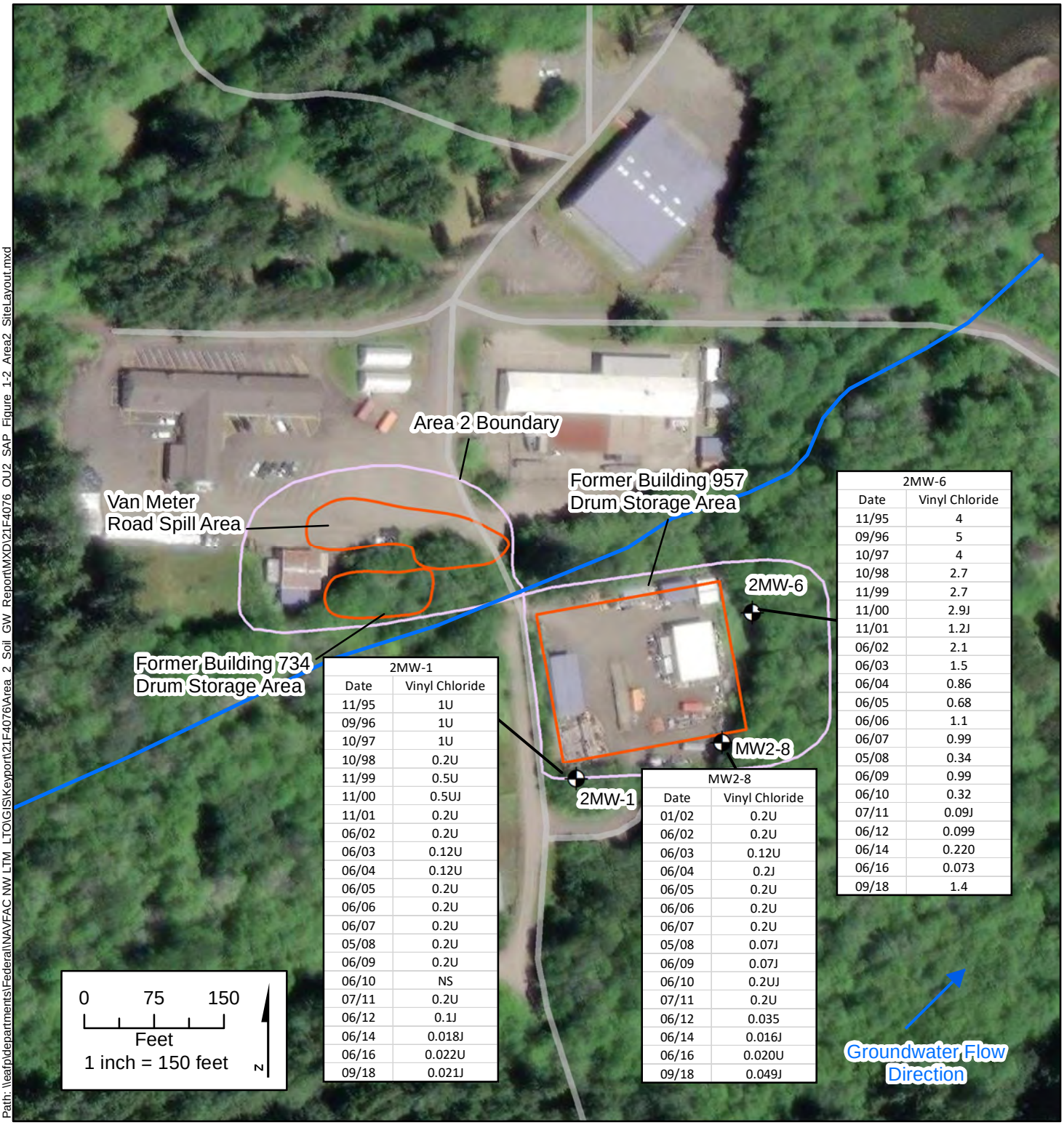
NUWC Keyport Boundary

FIGURE 1-1
KEYPORT SITE LAYOUT
SOIL AND GROUNDWATER
SUPPLEMENTAL INVESTIGATION REPORT,
AREA 2 VAN METER ROAD
SPILL/DRUM STORAGE SITE, OPERABLE UNIT 2
NAVAL BASE KITSAP KEYPORT
KEYPORT, WA

Source: Sealaska 2019 Map Date: 11/17/2022

Path: \\eafp\departments\Federal\NAVFAC NW LTM LTOIGIS\Keyport\21F4076\Area 2 Soil GW Report\MXD\21F4076 OU2 SAP Figure 1-1 Keyport Site Layout.mxd

This page intentionally left blank



2MW-1	
Date	Vinyl Chloride
11/95	1U
09/96	1U
10/97	1U
10/98	0.2U
11/99	0.5U
11/00	0.5UJ
11/01	0.2U
06/02	0.2U
06/03	0.12U
06/04	0.12U
06/05	0.2U
06/06	0.2U
06/07	0.2U
05/08	0.2U
06/09	0.2U
06/10	NS
07/11	0.2U
06/12	0.1J
06/14	0.018J
06/16	0.022U
09/18	0.021J

MW2-8	
Date	Vinyl Chloride
01/02	0.2U
06/02	0.2U
06/03	0.12U
06/04	0.2J
06/05	0.2U
06/06	0.2U
06/07	0.2U
05/08	0.07J
06/09	0.07J
06/10	0.2UJ
07/11	0.2U
06/12	0.035
06/14	0.016J
06/16	0.020U
09/18	0.049J

2MW-6	
Date	Vinyl Chloride
11/95	4
09/96	5
10/97	4
10/98	2.7
11/99	2.7
11/00	2.9J
11/01	1.2J
06/02	2.1
06/03	1.5
06/04	0.86
06/05	0.68
06/06	1.1
06/07	0.99
05/08	0.34
06/09	0.99
06/10	0.32
07/11	0.09J
06/12	0.099
06/14	0.220
06/16	0.073
09/18	1.4

Path: \\eafp\departments\Federal\NAVFAC NW LTM LTOI\GIS\Keyport\21F4076\Area_2_Soil_GW_Report\MXD\21F4076_OU2_SAP_Figure_1-2_Area2_SiteLayout.mxd

LEGEND

Stream

Monitoring Well

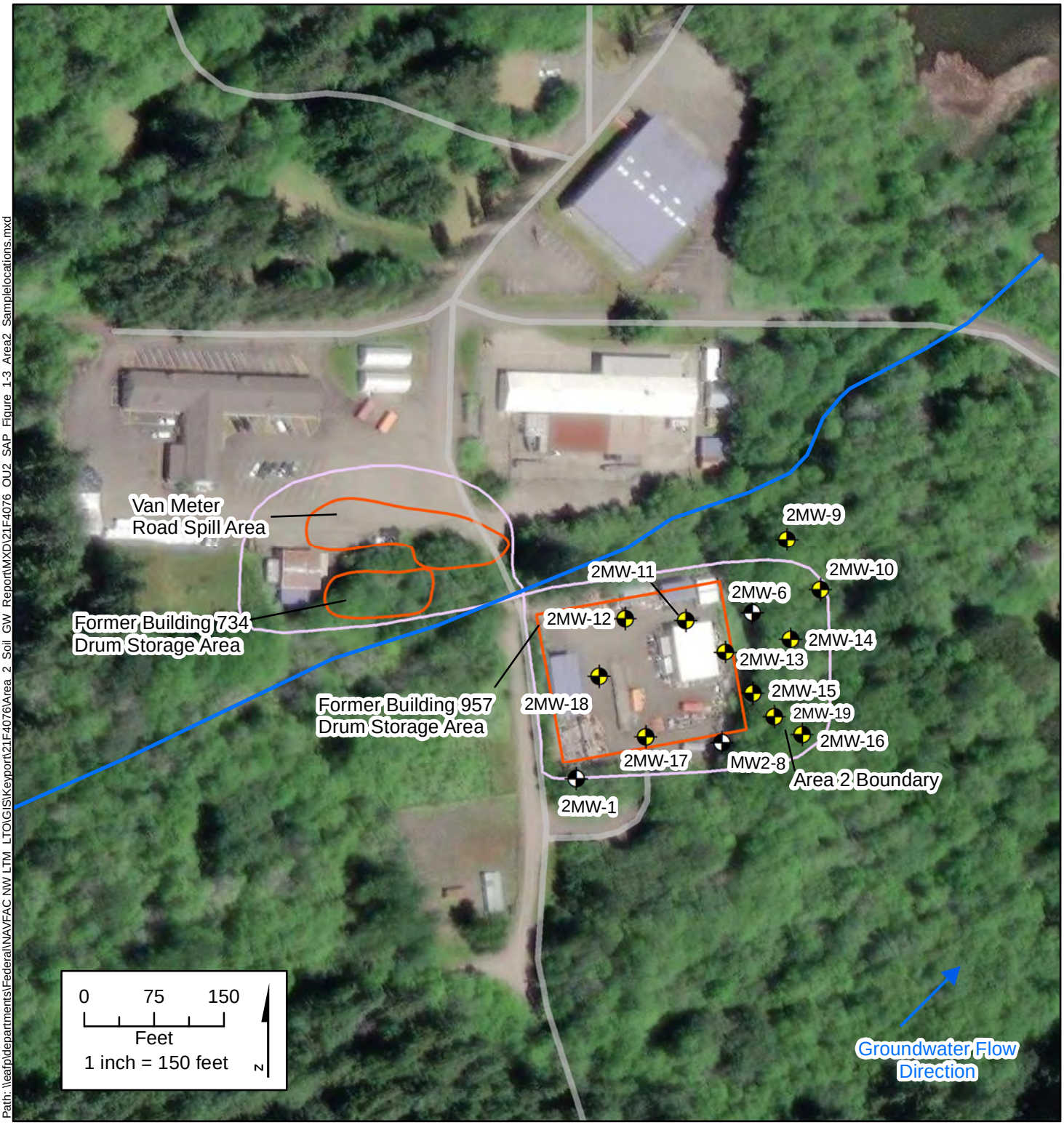
Notes:
Vinyl concentrations are in micrograms per liter. Tables present available vinyl chloride data from groundwater samples collected from 1995 to 2018.
The remediation goal for vinyl chloride is 0.029 micrograms per liter.
J = The result is an estimated concentration.
U = The compound was not detected at or above the stated limit.

Source: Sealaska 2019

FIGURE 1-2
AREA 2 SITE LAYOUT
SOIL AND GROUNDWATER
SUPPLEMENTAL INVESTIGATION REPORT,
AREA 2 VAN METER ROAD
SPILL/DRUM STORAGE SITE, OPERABLE UNIT 2
NAVAL BASE KITSAP KEYPORT
KEYPORT, WA

Map Date: 11/17/2022

This page intentionally left blank



Path: \\eafp\departments\Federal\NAVFAC NW LTM LTO\GIS\Keyport\21F4076\Area_2_Soil_GW_Report\MXD\21F4076_OU2_SAP_Figure_1-3_Area2_Samplelocations.mxd

LEGEND

- Stream
- Existing Monitoring Well
- New Monitoring Well (Installed in 2022)

FIGURE 1-3
OU 2 SAMPLE LOCATIONS
SOIL AND GROUNDWATER
SUPPLEMENTAL INVESTIGATION REPORT,
AREA 2 VAN METER ROAD
SPILL/DRUM STORAGE SITE, OPERABLE UNIT 2
NAVAL BASE KITSAP KEYPORT
KEYPORT, WA

Note:
Soil and groundwater samples were collected at each new monitoring well location.

Source: Sealaska 2019

Map Date: 11/17/2022

This page intentionally left blank

1.3 Summary of Previous Investigations

In September 1984, the DON conducted an Initial Assessment Study, performed under the Navy Assessment and Control of Installation Pollutants program, to identify areas of possible environmental contamination resulting from past methods of storage, handling, and disposal of hazardous substances at NBK Keyport (SCS Engineers 1984). The remedial investigation/feasibility study process and human health and ecological risk assessments for OU 2 were completed in 1993. No human health or ecological risks were identified in association with the site at that time (DON 1993).

Selected remedies for the site included the long-term monitoring (LTM) of groundwater for cVOCs, implemented in 1995 to track potential migration of contaminants and progression of natural attenuation. Institutional controls for land use controls and groundwater use restrictions were implemented at the site in 2000. Due to the ongoing supplemental investigations at Area 1 and Area 8 and this soil and groundwater investigation at Area 2, LTM has been postponed by consensus of the Keyport Project Team until site characterization activities have been completed and the LTM monitoring well network can be reassessed.

1.4 Project Objective

The soil and groundwater investigation is being performed to determine the current magnitude and extent of the cVOC plume. The principal source of cVOCs in Area 2 groundwater is believed to be due to releases from the former drum storage facilities, located at Van Meter Road Spill Area, the Former Building 734 Drum Storage Area, and the Former Building 957 Drum Storage Area. These areas were used to store chemicals (including solvents, fuel/oil) used at NBK Keyport during the 1940s through the 1960s. An estimated 4,000 to 8,000 gallons of these chemicals were discharged in these areas. Trichloroethene (TCE) and vinyl chloride were identified as the remaining chemicals of concern (COCs) in groundwater based on the risk analyses; however, only vinyl chloride remains above the remediation goal (RG), based on the Fifth Five-Year Review (DON 2020).

1.5 Scope of Work

The soil and groundwater investigation included the following scope of work:

- Borehole drilling and well installation
- Well development
- Soil sampling from boreholes

- Groundwater sampling, including collection of water level measurements, field parameter measurements, and collection of samples for offsite laboratory analysis
- Investigation derived waste management
- Laboratory analysis and validation of cVOCs in soil and groundwater
- Reporting

1.6 Remediation Goals and Project Action Levels

The groundwater RGs for Area 2 are based on the human health risk for unrestricted use. The established RGs for COCs in groundwater at Area 2 for cVOCs identified in the Record of Decision (ROD) (DON 1994) are listed in Table 1. No RGs for soil are established in the ROD. The RG for each chemical (i.e., TCE and vinyl chloride) was selected in the ROD as the lowest value included in the applicable or relevant and appropriate regulatory criteria. The RG for TCE was established as 5.0 micrograms per liter (µg/L), and there has been no change since it was established in the ROD (DON 1994). For vinyl chloride, the RG was established in the ROD (DON 1994) as the Model Toxics Control Act (MTCA) cleanup level of 0.023 µg/L, which at the time was below the practical quantitation limit of standard analytical methodology. In such a case, an expected practical quantitation limit of 0.1 µg/L was applied. In 2012, the RG for vinyl chloride was updated to 0.029 µg/L based on the calculated MTCA B cleanup level using the current oral slope factor. Improved analytical techniques have achieved a practical quantitation limit below 0.029 µg/L since June 2012.

Table 1. Remediation Goals for Area 2 Groundwater

Chemical of Concern	Regulatory Criteria and Remediation Goals (µg/L)			
	Drinking Water Pathway			
	Established in ROD (DON 1994)			
	Drinking Water MCL		MTCA Method B	Remediation Goal
	Federal MCL	State MCL		
Trichloroethene	5.0	5.0	5.0	5.0
Vinyl chloride	2.0	2.0	0.023[1/]	0.029[1/]

Notes:
[1/] The MTCA Method B cleanup level was 0.023 µg/L at the time the ROD was established (DON 1994). Since this value was below the practical quantitation limit of standard analytical methods for drinking water at the time of the ROD, the ROD stipulated that the remediation goal would be based on the practical quantitation limit. This approach was in accordance with WAC-173-340-700(6) and Washington State Department of Ecology's Implementation Memorandum No. 3 (1993). The MTCA Method B cleanup level has since been revised to 0.029 µg/L, which is used as the remediation goal for long-term monitoring, since laboratories can now detect this concentration.
DON = Department of the Navy
MCL = Maximum Contaminant Level
µg/L = microgram(s) per liter
MTCA = Model Toxics Control Act
ROD = Record of Decision
WAC = Washington Administrative Code

During the scoping meeting on 13 July 2021, it was determined that cVOCs in soil and water will be compared to project action levels (PALs) presented in Table 2 and Table 3, which reflect the most stringent, current criteria based on the groundwater and soil to surface water pathways.

Table 2. Project Action Levels for Chlorinated Volatile Organic Compounds in Groundwater

Analyte	Project Action Level (µg/L)	Project Action Level Reference
Volatile Organic Compounds (EPA SW-846 Method 8260D)		
1,1,1,2-Tetrachloroethane	1.7	MTCA Method B protective of potable groundwater
1,1,1-Trichloroethane	200	EPA MCL, MTCA MCL, MTCA Method A protective of groundwater and Method B protective of potable groundwater
1,1,2,2-Tetrachloroethane	0.10	EPA protective of surface water (fresh water, human health)
1,1,2-Trichloroethane	0.35	EPA protective of surface water (fresh water, human health)
1,1-Dichloroethane	7.7	MTCA Method B protective of potable groundwater
1,1-Dichloroethene	7.0	EPA MCL, MTCA MCL, MTCA Method B protective of groundwater
1,1-Dichloropropene	NC	NC
1,2,3-Trichlorobenzene	6.4	MTCA Method B protective of groundwater (noncancerous) and potable groundwater
1,2,3-Trichloropropane	0.00038	MTCA Method B protective of groundwater (cancerous)
1,2,4-Trichlorobenzene	0.036	EPA protective of surface water (fresh water, human health)
1,2-Dichlorobenzene	600	EPA MCL, MTCA MCL, MTCA Method B protective of potable groundwater
1,2-Dichloroethane	0.48	MTCA Method B protective of groundwater (cancerous)
1,2-Dichloropropane	0.71	MTCA protective of surface water (fresh water, human health)
1,3-Dichlorobenzene	2.0	EPA protective of surface water (fresh and marine water, human health)
1,3-Dichloropropane	160	MTCA Method B protective of groundwater (noncancerous) and potable groundwater
1,4-Dichlorobenzene	8.1	MTCA Method B protective of groundwater (cancerous)
2,2-Dichloropropane	NC	NC
2-Chlorotoluene	160	MTCA Method B protective of groundwater (noncancerous) and potable groundwater
4-Chlorotoluene	NC	NC
Carbon tetrachloride	0.20	MTCA protective of surface water (fresh water, human health)
Chlorobenzene	100	EPA MCL, MTCA MCL, MTCA Method B protective of potable groundwater
Chloroethane	NC	NC

Analyte	Project Action Level (µg/L)	Project Action Level Reference
Chloroform	1.4	MTCA Method B protective of groundwater (cancerous)
Chloromethane	NC	NC
1,2-Dichloroethene (cis)	16	MTCA Method B protective of groundwater (noncancerous) and potable groundwater
1,2-Dichloroethene (trans)	100	EPA MCL, MTCA MCL, MTCA Method B protective of potable groundwater, EPA protective of surface water (fresh water, human health)
Hexachlorobutadiene	0.01	EPA protective of surface water (fresh and marine water, human health)
Methylene chloride	5.0	EPA MCL, MTCA MCL, MTCA Method A protective of groundwater, MTCA Method B protective of potable groundwater
Tetrachloroethene	2.4	EPA protective of surface water (fresh water, human health)
1,3-Dichloropropene (cis)	0.22 [1/]	EPA protective of surface water (fresh water, human health)
1,3-Dichloropropene (trans)	0.22 [1/]	EPA protective of surface water (fresh water, human health)
Trichloroethene	0.30 [2/]	EPA protective of surface water (fresh water, human health)
Vinyl chloride	0.020 [3/]	MTCA protective of surface water (fresh water, human health)

Notes:
[1/] The project action level is for 1,3-dichloropropene (total) but will be applied to the cis- and trans-isomers.
[2/] The remediation goal for trichloroethene per the Record of Decision (Department of the Navy 1994) is 5.0 µg/L.
[3/] The remediation goal for vinyl chloride is 0.029 µg/L as discussed in Section 1.6.
µg/L = microgram(s) per liter
EPA = U.S. Environmental Protection Agency
MCL = maximum contaminant level
MTCA = Model Toxics Control Act
NC = no criterion

Table 3. Project Action Levels for Chlorinated Volatile Organic Compounds in Soil

Analyte	Project Action Level (mg/kg)	Project Action Level Reference
Volatile Organic Compounds (EPA SW-846 Method 8260D)		
1,1,1,2-Tetrachloroethane	0.00063	MTCA protective of groundwater, saturated
1,1,1-Trichloroethane	0.084	MTCA protective of groundwater, saturated
1,1,2,2-Tetrachloroethane	0.000037	MTCA protective of surface water saturated (fresh water)
1,1,2-Trichloroethane	0.00013	MTCA protective of surface water saturated (fresh water)
1,1-Dichloroethane	0.0026	MTCA protective of groundwater, saturated
1,1-Dichloroethene	0.0025	MTCA protective of groundwater, saturated
1,1-Dichloropropene	NC	NC
1,2,3-Trichlorobenzene	0.011	MTCA protective of groundwater, saturated
1,2,3-Trichloropropane	0.00000015	MTCA protective of groundwater, saturated
1,2,4-Trichlorobenzene	0.00007	MTCA protective of surface water saturated (fresh water)
1,2-Dichlorobenzene	0.4	MTCA protective of groundwater, saturated
1,2-Dichloroethane	0.0016	MTCA protective of groundwater, saturated
1,2-Dichloropropane	0.00024	MTCA protective of surface water saturated (fresh water)
1,3-Dichlorobenzene	0.0013	MTCA protective of surface water saturated (fresh water)
1,3-Dichloropropane	0.057	MTCA protective of groundwater, saturated
1,4-Dichlorobenzene	0.068	MTCA protective of groundwater, saturated
2,2-Dichloropropane	NC	NC
2-Chlorotoluene	0.11	MTCA protective of groundwater, saturated
4-Chlorotoluene	NC	NC
Carbon tetrachloride	0.000088	MTCA protective of surface water saturated (fresh water)
Chlorobenzene	0.051	MTCA protective of groundwater, saturated and surface water, saturated (fresh water)
Chloroethane	NC	NC
Chloroform	0.0048	MTCA protective of groundwater, saturated
Chloromethane	NC	NC
1,2-Dichloroethene (cis)	0.0052	MTCA protective of groundwater, saturated
1,2-Dichloroethene (trans)	0.023 [1/]	MTCA protective of groundwater, saturated
Hexachlorobutadiene	0.000011	MTCA protective of surface water saturated (fresh water)
Methylene chloride	0.0015	MTCA protective of groundwater, saturated
Tetrachloroethene	0.0013	MTCA protective of surface water saturated (fresh water)
1,3-Dichloropropene (cis)	0.000069 [2/]	MTCA protective of surface water saturated (fresh water)
1,3-Dichloropropene (trans)	0.000069 [2/]	MTCA protective of surface water saturated (fresh water)
Trichloroethene	0.00011	MTCA protective of surface water saturated (fresh water)
Vinyl chloride	0.0000062	MTCA protective of surface water saturated (fresh water)

Analyte	Project Action Level (mg/kg)	Project Action Level Reference
Notes: [1/] The project action level for 1,2-dichloroethene (mixed isomers) is slightly lower than the value for the trans- isomer (0.032 mg/kg) and is listed in this table. [2/] The project action level is for 1,3-dichloropropene (total) but will be applied to the cis- and trans-isomers. EPA = U.S. Environmental Protection Agency mg/kg = milligram(s) per kilogram MTCA = Model Toxics Control Act NC = no criterion		

This page intentionally left blank

2 Field Activities

The field activities completed for the soil and groundwater investigation included borehole drilling and well installation, well development, soil sampling from boreholes, groundwater sampling, and investigation derived waste management. Field activities were conducted in accordance with the procedures established in the Tier I SAP (DON 2022) and *Environmental Restoration Program Standard Operating Procedures* (NAVFAC NW 2019). Field forms and logbooks documenting field activities are provided in Appendix A.

2.1 Borehole Drilling, Well Installation, and Soil Sampling

Borehole drilling and well installation were performed in accordance with standard operating procedure (SOP) I-C-1 and FP-11 presented in the Tier I SAP (DON 2022). Eleven soil borings were advanced by a licensed driller using a rotary-sonic drilling method. The borings were logged according to the Unified Soil Classification System standards. Soils encountered during drilling and monitoring well installation generally consisted of sands and silts. Boring logs are included in Appendix A. Soil samples were collected from five depths at each borehole in accordance with SOP I-B-1 and FP-9 presented in the SAP (DON 2022), except as discussed in Section 2.5, Deviations. Soil samples were analyzed for cVOCs by Method 8260D.

New groundwater monitoring wells were installed in each of the soil boring locations. Monitoring wells were constructed using flush joint threaded 2-inch diameter schedule 40 polyvinyl chloride (PVC) casing and 2-inch diameter 0.020-inch slotted well screen. The borehole annulus was filled with #10-20 sand pack across the screened interval and to 2 to 3 feet above the top of screen, with hydrated bentonite chips to just below ground surface. Wells were completed with either traffic rated flush monuments or above ground monuments. Well construction details are presented in Table 4.

2.2 Well Development

Well development was performed in accordance with SOP I-C-2 and FP-12 presented in the Tier I SAP (DON 2022). Newly installed groundwater monitoring wells were developed using mechanical surging, bailing, and pumping methods. Bailers were used to remove sediment from the well to the extent feasible, prior to use of the pump, and as a final step in development to ensure the sump was free of sediment accumulation at the bottom of the well. Development of wells was considered complete when the removal of fines in the filter pack and nearby formation occurred so that turbidity does not affect the groundwater samples, and so that silting of the well will not occur.

This page intentionally left blank

Table 4. Well Construction Details

Well ID	Surface Monument Type	Well Casing Diameter (inches)	Well Casing Material	Northing (feet)	Easting (feet)	Top of Well Casing Elevation (feet-MLLW)	Well Depth (feet-btoc)	Depth to Top of Well Screen (feet-btoc)	Well Screen Length (feet)
2MW-9	Stick-up	2	PVC	258054.05	1199369.98	21.41	35	25	10
2MW-10	Stick-up	2	PVC	258011.04	1199370.64	22.63	40	30	10
2MW-11	Flush	2	PVC	257980.98	1199292.21	22.81	20	10	10
2MW-12	Flush	2	PVC	257987.23	1199239.16	23.13	20	10	10
2MW-13	Flush	2	PVC	257952.13	1199330.72	22.13	20	10	10
2MW-14	Stick-up	2	PVC	257968.21	1199361.66	23.75	20	10	10
2MW-15	Stick-up	2	PVC	257918.21	1199369.11	23.84	18	8	10
2MW-16	Stick-up	2	PVC	257829.20	1199373.13	23.00	18	8	10
2MW-17	Flush	2	PVC	257831.61	1199246.10	24.40	20	10	10
2MW-18	Flush	2	PVC	257924.17	1199181.59	24.93	18	8	10
2MW-19	Stick-up	2	PVC	257873.19	1199396.37	22.16	18	8	10

Notes:
btoc = below top of casing
MLLW = mean lower low water
PVC = polyvinyl chloride

This page intentionally left blank

Wells were developed between 48 hours to 7 days after cement grout emplacement, except as indicated in Section 2.5, Deviations. Each newly installed well was surged at various depths within the screened interval followed by evacuation of water until a minimum of three well casings of water had been purged, pH and specific conductance met stabilization criteria, and turbidity at or below 20 nephelometric turbidity units (NTU) was achieved.

2.3 Groundwater Sampling

Prior to purging, depth to water was taken at each well using an electronic water level measuring device, in accordance with SOP I-D-5 and FP-2 presented in the Tier I SAP (DON 2022).

Monitoring wells were purged, measured for field parameters, and sampled using a peristaltic pump using the low-flow technique in accordance with SOP I-C-5 and FP-4 presented in the Tier I SAP (DON 2022). Water quality parameters including temperature, specific conductance, pH, turbidity, oxidation reduction potential, salinity, and dissolved oxygen were monitored during purging. Field parameters met stabilization requirements except as indicated in Section 2.5, Deviations. After purging was completed and final water quality measurements were recorded, groundwater samples were collected immediately. Groundwater samples were taken directly from the outlet of the dedicated tubing and placed into laboratory-supplied containers.

2.4 Investigation Derived Waste Handling and Disposal

Investigation-derived waste generated during field activities included purge water, soil cuttings, and general sampling waste (used sample tubing, disposable gloves, and paper towels). The general sampling waste, such as used tubing and gloves, was placed in a designated onsite commercial waste dumpster. The purge water and soil cuttings were contained in 55-gallon drums and staged at the designated Keyport waste transportation and disposal location. Waste characterization sampling was conducted by a separate contractor and the DON managed waste in accordance with existing DON waste management practices.

2.5 Deviations

This section discusses deviations from the SAP (DON 2022).

The SAP (DON 2022) indicated up to 12 soil borings would be advanced for well installation, with eight wells installed to a maximum depth of 20 feet bgs and four wells to a maximum depth of 40 feet bgs. Two of the 12 soil borings, SB-19 and SB-20, were considered to be “contingency” locations for wells with a maximum depth of 40 feet bgs

in case more locations were needed based on field observations. The eight borings designated to be advanced to a maximum depth of 20 feet bgs include SB-9 through SB-16; the four borings designated for a maximum depth of 40 feet bgs include SB-17 through SB-20 (if SB-19 and/or SB-20 were drilled). A maximum of 60 soil samples were to be collected from the borings; the planned and "contingency" soil sample depths are summarized in Table 5. New monitoring wells were to be installed in each soil boring location and groundwater samples to be collected from each monitoring well. The following are deviations from the planned maximum depths and samples.

- SB-9 and SB-10: The SAP (DON 2022) indicated soil borings SB-9 and B-10 would be advanced to a maximum depth of 20 feet bgs and samples collected at the following depths in feet bgs: 0.0 to 0.5, 5.0 to 5.5, 10.0 to 10.5, 15.0 to 15.5, and 19.5 to 20. However, at the request of the Remedial Project Manager and as discussed in Field Change Request Number 21F4076-02 included in Appendix A, soil borings SB-9 and B-10 were advanced to 40 feet bgs in order to capture the potential vertical extent of contaminant migration rather than the planned 20-feet bgs. SB-9 and SB-10 are the most downgradient soil boring locations. Monitoring wells were installed in these borings at a total depth of 40 feet bgs. Soil samples were collected at the following depths in feet bgs: 0.5, 10, 20, 30, and 40.
- SB-12: The boring was advanced to 25 feet bgs instead of the planned maximum 20 feet bgs due to visual evidence of soil staining and elevated PID readings.
- SB-17, SB-18, SB-19, and SB-20: The SAP (DON 2022) indicated these four soil borings be advanced to a maximum depth of 40 feet bgs and samples collected at the following depths in feet bgs: 0.0 to 0.5, 10.0 to 10.5, 20.0 to 20.5, 30.0 to 30.5, and 39.5 to 40.0. However, due to the Remedial Project Manager request discussed above, it was decided in the field that SB-17 through SB-19 being advanced to 20 feet bgs would be sufficient and that SB-20 was not necessary. Samples were collected at the depths indicated in Table 5.
- A maximum of 60 soil samples and 12 groundwater samples (excluding field quality control [QC] samples) were indicated in the SAP (DON 2022). While not necessarily a deviation from the planned quantities, 51 soil samples and 11 groundwater samples were collected rather than 60 and 12, respectively. For each soil boring, samples were planned and collected at five depths, with the following exceptions: soil samples from only three depths were collected at SB-17 and SB-18; SB-20 was not drilled so no soil or groundwater samples were collected and no well was installed.

Table 5. Soil Boring Sampling Details

Boring	Planned Sampling Depths (ft bgs)	Actual Sampling Depths (ft bgs)
SB-9	0.0 to 0.5 5.0 to 5.5 10.0 to 10.5 15.0 to 15.5 19.5 to 20.0	0.5 10.0 20.0 30.0 40.0
SB-10	0.0 to 0.5 5.0 to 5.5 10.0 to 10.5 15.0 to 15.5 19.5 to 20.0	0.5 10.0 20.0 30.0 40.0
SB-11	0.0 to 0.5 5.0 to 5.5 10.0 to 10.5 15.0 to 15.5 19.5 to 20.0	0.5 5.0 10.0 15.0 20.0
SB-12	0.0 to 0.5 5.0 to 5.5 10.0 to 10.5 15.0 to 15.5 19.5 to 20.0	0.5 5.0 10.0 20.0 25.0
SB-13	0.0 to 0.5 5.0 to 5.5 10.0 to 10.5 15.0 to 15.5 19.5 to 20.0	0.5 5.0 10.0 15.0 20.0
SB-14	0.0 to 0.5 5.0 to 5.5 10.0 to 10.5 15.0 to 15.5 19.5 to 20.0	0.5 5.0 10.0 15.0 20.0
SB-15	0.0 to 0.5 5.0 to 5.5 10.0 to 10.5 15.0 to 15.5 19.5 to 20.0	0.5 5.0 10.0 15.0 20.0
SB-16	0.0 to 0.5 5.0 to 5.5 10.0 to 10.5 15.0 to 15.5 19.5 to 20.0	0.5 5.0 10.0 15.0 20.0
SB-17	0.0 to 0.5 10.0 to 10.5 20.0 to 20.5 30.0 to 30.5 39.5 to 40.0	0.5 10.0 20.0
SB-18	0.0 to 0.5 10.0 to 10.5 20.0 to 20.5 30.0 to 30.5 39.5 to 40.0	0.5 10.0 20.0

Boring	Planned Sampling Depths (ft bgs)	Actual Sampling Depths (ft bgs)
SB-19[1]	0.0 to 0.5 10.0 to 10.5 20.0 to 20.5 30.0 to 30.5 39.5 to 40.0	0.5 5.0 -5.5 10.0 15.0 20.0
SB-20[1]	0.0 to 0.5 10.0 to 10.5 20.0 to 20.5 30.0 to 30.5 39.5 to 40.0	None

Notes:
[1] Locations SB-19 and SB-20 were considered "contingency" locations, with drilling to be performed only as deemed necessary based on field observations.
ft = feet (foot)
bgs = below ground surface

The SAP (DON 2022) specifies stabilization criterion for purging of wells prior to groundwater sample collection. These are presented in Field Procedure 4 Step 11 and in the applicable field form (Well Inspection, Purging, and Field Measurement Form) presented in Appendix D of that document. The field form used in the field was not the same as the one presented in SAP Appendix D and is not consistent with the field procedure in some cases. The following parameters did not meet stabilization requirements listed in the field procedure:

- Dissolved oxygen: criteria per the field procedure is ± 10 percent or less than 0.1 milligrams per liter vs. no applicable criteria for the form used. Several wells did not explicitly meet the stabilization criteria per the field procedure, but the measurements are very low, ranging from 0.56 to 0.87 milligrams per liter. This was judged to have no significant impact on collecting a sample representative of groundwater.
- Oxidation reduction potential: criteria per the field form is a difference of less than or equal to 10 millivolts vs. no applicable criteria on the form used. Wells 2MW-12, 2MW-13, 2MW-14, 2MW-17, and 2MW-18 did not meet the stabilization criteria per the field procedure. This discrepancy was judged to have no significant impact on collecting a sample representative of groundwater since the stabilization criteria for other field parameters was demonstrated except as indicated in the above bullet.

The SAP (DON 2022) requires samples to be cooled to ≤ 6 degrees Celsius. Due to an oversight in shipping samples to the designated laboratory, two coolers containing soil samples were shipped by ground transportation instead of air. The temperatures of these two coolers arrived at the laboratory above 20 degrees Celsius. As discussed in

Section 3.5 and Appendix B, detected results were qualified “J” as estimated and non-detected results were rejected (qualified “R”) on this basis.

The SAP (DON 2022) requires field blanks to be collected for the groundwater sampling event; however, none were collected due to an oversight. Although field blanks were not collected during two days of groundwater sampling, no detections were reported in the daily field blanks collected during soil sampling. The field blanks collected during soil sampling appear to be representative of site conditions in the general timeframe that soil and groundwater sampling occurred. Therefore, reported detections for soil and groundwater samples are considered representative of the locations sampled rather than artifacts of ambient conditions.

Completeness is a measure of the amount of valid, usable data obtained from a measurement system compared with the amount that was expective to be obtained. The SAP (DON 2022) specifies 90 percent as the minimal acceptance criteria for completeness of laboratory data for this project. Due to four planned soil samples not being collected at SB-17 and SB-18 (discussed above) and data from four borings (SB-11, SB-12, SB-17, and SB-18) being rejected due to temperatures of two coolers containing soil samples that arrived at the laboratory above 20 degrees Celsius (discussed in Section 3.5), the percent completeness for laboratory data was 70 percent (further detailed in Appendix B). The lack of valid, usable data for several planned soil samples results in a data gap. However, it was judged that sufficient data were collected to generally achieve project objectives and conclude that cVOCs at concentrations above PALs are present in the soil at some locations and depths.

This page intentionally left blank

3 Soil and Groundwater Sampling Results

This section summarizes the distribution of contaminants detected in the samples collected during the soil and groundwater investigation and compares the reported concentrations to the PALs defined in the SAP (DON 2022) and summarized in Tables 2 and 3.

3.1 Soil Analytical Results

The results for the June/July 2022 soil sampling are provided in Table 6. Analytical results were compared to the PALs. Soil boring numbers correspond with well numbers for newly installed wells (e.g., SB-10 is in the location of 2MW-10, SB-11 is in the location of 2MW-11, etc.). Exceedances of the PAL occurred for the following analytes:

- TCE exceeded the PAL of 0.00011 milligrams per kilogram (mg/kg) in the samples from soil borings SB-13 (15 feet bgs) and SB-17 (10 feet bgs, 20 feet bgs). TCE was not detected in samples from other soil borings; however, the laboratory limit of detection (LOD) exceeded the PAL.
- Vinyl chloride exceeded the PAL of 0.0000062 mg/kg in the samples from soil borings SB-13 (15 feet bgs, 20 feet bgs), SB-14 (20 feet bgs), and SB-19 (15 feet bgs and 20 feet bgs). Vinyl chloride was not detected in samples from other soil borings; however, the laboratory LOD exceeded the PAL. Vinyl chloride exceedances in soil borings are shown in Figure 3-1.
- Cis-1,2-dichlorothene exceeded the PAL of 0.0052 mg/kg in the samples from soil borings SB-13 (15 feet bgs) and SB-14 (15 feet bgs, 20 feet bgs). Cis-1,2-dichlorothene was not detected at concentrations above the PAL in the other samples; however, in two instances the laboratory LOD exceeded the PAL when this analyte was not detected.
- The following analytes were not detected; however, the laboratory LODs exceeded PALs: 1,1,1,2-tetrachloroethane, 1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane, 1,2,3-trichloropropane, 1,2,4-trichlorobenzene, 1,2-dichloropropane, carbon tetrachloride, cis-1,3-dichloropropene, hexachlorobutadiene, methylene chloride, and trans-1,3-dichloropropene.

This page intentionally left blank

Table 6. Soil Sampling Analytical Data

Location ID / Sample Depth (bgs) / Sample Collection Date			SB-9 0.5 ft 29-Jun-2022		SB-9 10 ft 29-Jun-2022		SB-9 10 ft (DUP) 29-Jun-2022		SB-9 20 ft 29-Jun-2022		SB-9 30 ft 29-Jun-2022		SB-9 40 ft 29-Jun-2022		SB-10 0.5 ft 29-Jun-2022		SB-10 10 ft 29-Jun-2022	
Analyte	**Project Action Level**	**Units**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
1,1,1,2-Tetrachloroethane	0.00063	mg/kg	0.0012	U	0.0011	U	0.0011	U	0.0013	UJ	0.16	UJ	0.0012	U	0.0014	U	0.0012	UJ
1,1,1-Trichloroethane	0.084	mg/kg	0.0012	U	0.0011	U	0.0011	U	0.0013	U	0.079	UJ	0.0012	U	0.0014	U	0.0012	UJ
1,1,2,2-Tetrachloroethane	0.000037	mg/kg	0.00061	U	0.00054	U	0.00055	U	0.00063	UJ	0.039	UJ	0.00061	U	0.00068	U	0.00061	UJ
1,1,2-Trichloroethane	0.00013	mg/kg	0.0012	U	0.0011	U	0.0011	U	0.0013	UJ	0.079	UJ	0.0012	U	0.0014	U	0.0012	UJ
1,1-Dichloroethane	0.0026	mg/kg	0.0012	U	0.0011	U	0.0011	U	0.0013	U	0.079	UJ	0.0012	U	0.0014	U	0.0012	UJ
1,1-Dichloroethene	0.0025	mg/kg	0.0012	U	0.0011	U	0.0011	U	0.0013	U	0.079	UJ	0.0012	U	0.0014	U	0.0012	UJ
1,1-Dichloropropene	NC	mg/kg	0.0012	U	0.0011	UJ	0.0011	UJ	0.0013	UJ	0.079	UJ	0.0012	U	0.0014	U	0.0012	UJ
1,2,3-Trichlorobenzene	0.011	mg/kg	0.0049	U	0.0043	U	0.0044	U	0.005	UJ	0.32	UJ	0.0049	U	0.0055	U	0.42	UJ
1,2,3-Trichloropropane	0.00000015	mg/kg	0.0012	U	0.0011	U	0.0011	U	0.0013	UJ	0.079	UJ	0.0012	U	0.0014	U	0.0012	UJ
1,2,4-Trichlorobenzene	0.000070	mg/kg	0.0049	U	0.0043	U	0.0044	U	0.005	UJ	0.32	UJ	0.0049	U	0.0055	U	0.42	UJ
1,2-Dichlorobenzene	0.40	mg/kg	0.0012	U	0.0011	U	0.0011	U	0.0013	UJ	0.079	UJ	0.0012	U	0.0014	U	0.0012	UJ
1,2-Dichloroethane	0.0016	mg/kg	0.0012	U	0.0011	U	0.0011	U	0.0013	U	0.079	UJ	0.0012	U	0.0014	U	0.0012	UJ
1,2-Dichloropropane	0.00024	mg/kg	0.0012	U	0.0011	UJ	0.0011	UJ	0.0013	UJ	0.079	UJ	0.0012	U	0.0014	U	0.0012	UJ
1,3-Dichlorobenzene	0.0013	mg/kg	0.0012	U	0.0011	U	0.0011	U	0.0013	UJ	0.079	UJ	0.0012	U	0.0014	U	0.0012	UJ
1,3-Dichloropropane	0.057	mg/kg	0.00061	U	0.00054	U	0.00055	U	0.00063	UJ	0.039	UJ	0.00061	U	0.00068	U	0.00061	UJ
1,4-Dichlorobenzene	0.068	mg/kg	0.00061	U	0.00054	U	0.00055	U	0.00063	UJ	0.039	UJ	0.00061	U	0.00068	U	0.00061	UJ
2,2-Dichloropropane	NC	mg/kg	0.0012	U	0.0011	U	0.0011	U	0.0013	U	0.079	UJ	0.0012	U	0.0014	U	0.0012	UJ
2-Chlorotoluene	0.11	mg/kg	0.00061	U	0.00054	U	0.00055	U	0.00063	UJ	0.039	UJ	0.00061	U	0.00068	U	0.00061	UJ
4-Chlorotoluene	NC	mg/kg	0.00061	U	0.00054	U	0.00055	U	0.00063	UJ	0.039	UJ	0.00061	U	0.00068	U	0.052	UJ
Carbon tetrachloride	0.000088	mg/kg	0.0012	U	0.0011	U	0.0011	U	0.0013	U	0.16	UJ	0.0012	U	0.0014	U	0.0012	UJ
Chlorobenzene	0.051	mg/kg	0.0012	U	0.0011	U	0.0011	U	0.0013	UJ	0.079	UJ	0.0012	U	0.0014	U	0.0012	UJ
Chloroethane	NC	mg/kg	0.0024	U	0.0022	U	0.0022	U	0.0025	U	0.16	UJ	0.0024	U	0.0027	U	0.0025	UJ
Chloroform	0.0048	mg/kg	0.0012	U	0.0011	U	0.0011	U	0.0013	U	0.079	UJ	0.0012	U	0.0014	U	0.0012	UJ
Chloromethane	NC	mg/kg	0.0012	U	0.0011	U	0.0011	U	0.0013	U	0.079	UJ	0.0012	U	0.0014	U	0.0012	UJ
cis-1,2-Dichloroethene	0.0052	mg/kg	0.0012	U	0.0011	U	0.0011	U	0.0013	U	0.079	UJ	0.0012	U	0.0014	U	0.0012	UJ
cis-1,3-Dichloropropene	0.000069 [1/]	mg/kg	0.00061	U	0.00054	U	0.00055	U	0.00063	U	0.039	UJ	0.00061	U	0.00068	U	0.00061	UJ
Hexachlorobutadiene	0.000011	mg/kg	0.0049	U	0.0043	U	0.0044	U	0.005	UJ	0.32	UJ	0.0049	U	0.0055	U	0.42	UJ
Methylene chloride	0.0015	mg/kg	0.0024	U	0.0022	U	0.0022	U	0.0025	U	0.16	UJ	0.0024	U	0.0027	U	0.0025	UJ
Tetrachloroethene	0.0013	mg/kg	0.0012	U	0.0011	U	0.0011	U	0.0013	UJ	0.079	UJ	0.0012	U	0.0014	U	0.0012	UJ
trans-1,2-Dichloroethene	0.023 [2/]	mg/kg	0.0012	U	0.0011	U	0.0011	U	0.0013	U	0.079	UJ	0.0012	U	0.0014	U	0.0012	UJ
trans-1,3-Dichloropropene	0.000069 [1/]	mg/kg	0.00061	U	0.00054	U	0.00055	U	0.00063	UJ	0.039	UJ	0.00061	U	0.00068	U	0.00061	UJ
Trichloroethene	0.00011	mg/kg	0.0012	U	0.0011	U	0.0011	U	0.0013	U	0.079	UJ	0.0012	U	0.0014	U	0.0012	UJ
Vinyl chloride	0.0000062	mg/kg	0.0012	U	0.0011	U	0.0011	U	0.0013	U	0.079	UJ	0.0012	U	0.0014	U	0.0012	UJ

	Location ID	SB-10		SB-10		SB-10		SB-11		SB-11		SB-11		SB-11		SB-11		SB-11	
	Sample Depth (bgs)	20 ft		30 ft		40 ft		0.5 ft		5 ft		5 ft (DUP)		10 ft		15 ft			
	Sample Collection Date	29-Jun-2022		29-Jun-2022		29-Jun-2022		28-Jun-2022		28-Jun-2022		28-Jun-2022		28-Jun-2022		28-Jun-2022			
Analyte	Project Action Level	Units	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q		
1,1,1,2-Tetrachloroethane	0.00063	mg/kg	0.0013	U	0.0012	U	0.0011	U		R		R		R		R		R		
1,1,1-Trichloroethane	0.084	mg/kg	0.0013	U	0.0012	U	0.0011	U		R		R		R		R		R		
1,1,2,2-Tetrachloroethane	0.000037	mg/kg	0.00066	U	0.00059	U	0.00057	U		R		R		R		R		R		
1,1,2-Trichloroethane	0.00013	mg/kg	0.0013	U	0.0012	U	0.0011	U		R		R		R		R		R		
1,1-Dichloroethane	0.0026	mg/kg	0.0013	U	0.0012	U	0.0011	U		R		R		R		R		R		
1,1-Dichloroethene	0.0025	mg/kg	0.0013	U	0.0012	U	0.0011	U		R		R		R		R		R		
1,1-Dichloropropene	NC	mg/kg	0.0013	U	0.0012	U	0.0011	U		R		R		R		R		R		
1,2,3-Trichlorobenzene	0.011	mg/kg	0.0053	U	0.0047	U	0.0045	U		R		R		R		R		R		
1,2,3-Trichloropropane	0.00000015	mg/kg	0.0013	U	0.0012	U	0.0011	U		R		R		R		R		R		
1,2,4-Trichlorobenzene	0.000070	mg/kg	0.0053	U	0.0047	U	0.0045	U		R		R		R		R		R		
1,2-Dichlorobenzene	0.40	mg/kg	0.0013	U	0.0012	U	0.0011	U		R		R		R		R		R		
1,2-Dichloroethane	0.0016	mg/kg	0.0013	U	0.0012	U	0.0011	U		R		R		R		R		R		
1,2-Dichloropropane	0.00024	mg/kg	0.0013	U	0.0012	U	0.0011	U		R		R		R		R		R		
1,3-Dichlorobenzene	0.0013	mg/kg	0.0013	U	0.0012	U	0.0011	U		R		R		R		R		R		
1,3-Dichloropropane	0.057	mg/kg	0.00066	U	0.00059	U	0.00057	U		R		R		R		R		R		
1,4-Dichlorobenzene	0.068	mg/kg	0.00066	U	0.00059	U	0.00057	U		R		R		R		R		R		
2,2-Dichloropropane	NC	mg/kg	0.0013	U	0.0012	U	0.0011	U		R		R		R		R		R		
2-Chlorotoluene	0.11	mg/kg	0.00066	U	0.00059	U	0.00057	U		R		R		R		R		R		
4-Chlorotoluene	NC	mg/kg	0.00066	U	0.00059	U	0.00057	U		R		R		R		R		R		
Carbon tetrachloride	0.000088	mg/kg	0.0013	U	0.0012	U	0.0011	U		R		R		R		R		R		
Chlorobenzene	0.051	mg/kg	0.0013	U	0.0012	U	0.0011	U		R		R		R		R		R		
Chloroethane	NC	mg/kg	0.0026	U	0.0024	U	0.0023	U		R		R		R		R		R		
Chloroform	0.0048	mg/kg	0.0013	U	0.0012	U	0.0011	U		R		R		R		R		R		
Chloromethane	NC	mg/kg	0.0013	U	0.0012	U	0.0011	U		R		R		R		R		R		
cis-1,2-Dichloroethene	0.0052	mg/kg	0.0013	U	0.0012	U	0.0011	U		R		R		R		R	0.0011	J		
cis-1,3-Dichloropropene	0.000069 [1/]	mg/kg	0.00066	U	0.00059	U	0.00057	U		R		R		R		R		R		
Hexachlorobutadiene	0.000011	mg/kg	0.0053	U	0.0047	U	0.0045	U		R		R		R		R		R		
Methylene chloride	0.0015	mg/kg	0.0026	U	0.0024	U	0.0023	U		R		R		R		R		R		
Tetrachloroethene	0.0013	mg/kg	0.0013	U	0.0012	U	0.0011	U		R		R		R		R		R		
trans-1,2-Dichloroethene	0.023 [2/]	mg/kg	0.0013	U	0.0012	U	0.0011	U		R		R		R		R		R		
trans-1,3-Dichloropropene	0.000069 [1/]	mg/kg	0.00066	U	0.00059	U	0.00057	U		R		R		R		R		R		
Trichloroethene	0.00011	mg/kg	0.0013	U	0.0012	U	0.0011	U		R		R		R		R		R		
Vinyl chloride	0.0000062	mg/kg	0.0013	U	0.0012	U	0.0011	U		R		R		R		R		R		

	Location ID	SB-11		SB-12		SB-12		SB-12		SB-12		SB-12		SB-12		SB-13	
	Sample Depth (bgs)	20 ft		0.5 ft		5 ft		10 ft		20 ft		20 ft (DUP)		25 ft		0.5 ft	
	Sample Collection Date	28-Jun-2022		28-Jun-2022		28-Jun-2022		28-Jun-2022		28-Jun-2022		28-Jun-2022		28-Jun-2022		28-Jun-2022	
Analyte	Project Action Level	Units	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
1,1,1,2-Tetrachloroethane	0.00063	mg/kg		R		R		R		R		R		R		R	0.001	U
1,1,1-Trichloroethane	0.084	mg/kg		R		R		R		R		R		R		R	0.001	U
1,1,2,2-Tetrachloroethane	0.000037	mg/kg		R		R		R		R		R		R		R	0.00051	U
1,1,2-Trichloroethane	0.00013	mg/kg		R		R		R		R		R		R		R	0.001	U
1,1-Dichloroethane	0.0026	mg/kg		R		R		R		R		R		R		R	0.001	U
1,1-Dichloroethene	0.0025	mg/kg		R		R		R		R		R		R		R	0.001	U
1,1-Dichloropropene	NC	mg/kg		R		R		R		R		R		R		R	0.001	UJ
1,2,3-Trichlorobenzene	0.011	mg/kg		R		R		R		R		R		R		R	0.0041	U
1,2,3-Trichloropropane	0.00000015	mg/kg		R		R		R		R		R		R		R	0.001	U
1,2,4-Trichlorobenzene	0.000070	mg/kg		R		R		R		R		R		R		R	0.0041	U
1,2-Dichlorobenzene	0.40	mg/kg		R		R		R		R		R		R		R	0.001	U
1,2-Dichloroethane	0.0016	mg/kg		R		R		R		R		R		R		R	0.001	U
1,2-Dichloropropane	0.00024	mg/kg		R		R		R		R		R		R		R	0.001	UJ
1,3-Dichlorobenzene	0.0013	mg/kg		R		R		R		R		R		R		R	0.001	U
1,3-Dichloropropane	0.057	mg/kg		R		R		R		R		R		R		R	0.00051	U
1,4-Dichlorobenzene	0.068	mg/kg		R		R		R		R		R		R		R	0.00051	U
2,2-Dichloropropane	NC	mg/kg		R		R		R		R		R		R		R	0.001	U
2-Chlorotoluene	0.11	mg/kg		R		R		R		R		R		R		R	0.00051	U
4-Chlorotoluene	NC	mg/kg		R		R		R		R		R		R		R	0.00051	U
Carbon tetrachloride	0.000088	mg/kg		R		R		R		R		R		R		R	0.001	U
Chlorobenzene	0.051	mg/kg		R		R		R		R		R		R		R	0.001	U
Chloroethane	NC	mg/kg		R		R		R		R		R		R		R	0.002	U
Chloroform	0.0048	mg/kg		R		R		R		R		R		R		R	0.001	U
Chloromethane	NC	mg/kg		R		R		R		R		R		R		R	0.001	U
cis-1,2-Dichloroethene	0.0052	mg/kg		R		R		R		R		R		R		R	0.001	U
cis-1,3-Dichloropropene	0.000069 [1/]	mg/kg		R		R		R		R		R		R		R	0.00051	U
Hexachlorobutadiene	0.000011	mg/kg		R		R		R		R		R		R		R	0.0041	U
Methylene chloride	0.0015	mg/kg		R		R		R		R		R		R		R	0.002	U
Tetrachloroethene	0.0013	mg/kg		R		R		R		R		R		R		R	0.001	U
trans-1,2-Dichloroethene	0.023 [2/]	mg/kg		R		R		R		R		R		R		R	0.001	U
trans-1,3-Dichloropropene	0.000069 [1/]	mg/kg		R		R		R		R		R		R		R	0.00051	U
Trichloroethene	0.00011	mg/kg		R		R		R		R		R		R		R	0.001	U
Vinyl chloride	0.0000062	mg/kg		R		R		R		R		R		R		R	0.001	U

	Location ID	SB-13		SB-13		SB-13		SB-13		SB-14		SB-14		SB-14		SB-14	
	Sample Depth (bgs)	5 ft		10 ft		15 ft		20 ft		0.5 ft		5 ft		10 ft		15 ft	
	Sample Collection Date	28-Jun-2022		28-Jun-2022		28-Jun-2022		28-Jun-2022		30-Jun-2022		30-Jun-2022		30-Jun-2022		30-Jun-2022	
Analyte	**Project Action Level**	**Units**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
1,1,1,2-Tetrachloroethane	0.00063	mg/kg	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0014	U	0.0013	U	0.0012	U	0.0011	U
1,1,1-Trichloroethane	0.084	mg/kg	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0014	U	0.0013	U	0.0012	U	0.0011	U
1,1,2,2-Tetrachloroethane	0.000037	mg/kg	0.00056	U	0.00053	U	0.00059	U	0.00053	U	0.00069	U	0.00067	U	0.00058	U	0.00054	U
1,1,2-Trichloroethane	0.00013	mg/kg	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0014	U	0.0013	U	0.0012	U	0.0011	U
1,1-Dichloroethane	0.0026	mg/kg	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0014	U	0.0013	U	0.0012	U	0.0011	U
1,1-Dichloroethene	0.0025	mg/kg	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0014	U	0.0013	U	0.0012	U	0.0011	U
1,1-Dichloropropene	NC	mg/kg	0.0011	UJ	0.0011	UJ	0.0012	UJ	0.0011	UJ	0.0014	U	0.0013	U	0.0012	U	0.0011	U
1,2,3-Trichlorobenzene	0.011	mg/kg	0.0045	UJ	0.0042	U	0.0047	U	0.0043	U	0.0055	U	0.0053	U	0.0047	U	0.0043	U
1,2,3-Trichloropropane	0.00000015	mg/kg	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0014	U	0.0013	U	0.0012	U	0.0011	U
1,2,4-Trichlorobenzene	0.000070	mg/kg	0.0045	UJ	0.0042	U	0.0047	U	0.0043	U	0.0055	U	0.0053	U	0.0047	U	0.0043	U
1,2-Dichlorobenzene	0.40	mg/kg	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0014	U	0.0013	U	0.0012	U	0.0011	U
1,2-Dichloroethane	0.0016	mg/kg	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0014	U	0.0013	U	0.0012	U	0.0011	U
1,2-Dichloropropane	0.00024	mg/kg	0.0011	UJ	0.0011	UJ	0.0012	UJ	0.0011	UJ	0.0014	U	0.0013	U	0.0012	U	0.0011	U
1,3-Dichlorobenzene	0.0013	mg/kg	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0014	U	0.0013	U	0.0012	U	0.0011	U
1,3-Dichloropropane	0.057	mg/kg	0.00056	U	0.00053	U	0.00059	U	0.00053	U	0.00069	U	0.00067	U	0.00058	U	0.00054	U
1,4-Dichlorobenzene	0.068	mg/kg	0.00056	U	0.00053	U	0.00059	U	0.00053	U	0.00069	U	0.00067	U	0.00058	U	0.00054	U
2,2-Dichloropropane	NC	mg/kg	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0014	U	0.0013	U	0.0012	U	0.0011	U
2-Chlorotoluene	0.11	mg/kg	0.00056	U	0.00053	U	0.00059	U	0.00053	U	0.00069	U	0.00067	U	0.00058	U	0.00054	U
4-Chlorotoluene	NC	mg/kg	0.00056	U	0.00053	U	0.00059	U	0.00053	U	0.00069	U	0.00067	U	0.00058	U	0.00054	U
Carbon tetrachloride	0.000088	mg/kg	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0014	U	0.0013	U	0.0012	U	0.0011	U
Chlorobenzene	0.051	mg/kg	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0014	U	0.0013	U	0.0012	U	0.0011	U
Chloroethane	NC	mg/kg	0.0022	U	0.0021	U	0.0023	U	0.0021	U	0.0027	U	0.0027	U	0.0023	U	0.0022	U
Chloroform	0.0048	mg/kg	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0014	U	0.0013	U	0.0012	U	0.0011	U
Chloromethane	NC	mg/kg	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0014	U	0.0013	U	0.0012	U	0.0011	U
cis-1,2-Dichloroethene	0.0052	mg/kg	0.0011	U	0.0011	U	**0.0083**		0.0024	J	0.0014	U	0.0013	U	0.0013	J	**0.0063**	
cis-1,3-Dichloropropene	0.000069 [1/]	mg/kg	0.00056	U	0.00053	U	0.00059	U	0.00053	U	0.00069	U	0.00067	U	0.00058	U	0.00054	U
Hexachlorobutadiene	0.000011	mg/kg	0.0045	U	0.0042	U	0.0047	U	0.0043	U	0.0055	U	0.0053	U	0.0047	U	0.0043	U
Methylene chloride	0.0015	mg/kg	0.0022	U	0.0021	U	0.0023	U	0.0021	U	0.0027	U	0.0027	U	0.0023	U	0.0022	U
Tetrachloroethene	0.0013	mg/kg	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0014	U	0.0013	U	0.0012	U	0.0011	U
trans-1,2-Dichloroethene	0.023 [2/]	mg/kg	0.0011	U	0.0011	U	0.00052	J	0.0011	U	0.0014	U	0.0013	U	0.0012	U	0.0011	U
trans-1,3-Dichloropropene	0.000069 [1/]	mg/kg	0.00056	U	0.00053	U	0.00059	U	0.00053	U	0.00069	U	0.00067	U	0.00058	U	0.00054	U
Trichloroethene	0.00011	mg/kg	0.0011	U	0.0011	U	**0.013**		0.0011	U	0.0014	U	0.0013	U	0.0012	U	0.0011	U
Vinyl chloride	0.0000062	mg/kg	0.0011	U	0.0011	U	**0.00062**	J	**0.00091**	J	0.0014	U	0.0013	U	0.0012	U	0.0011	U

	Location ID		SB-14		SB-15		SB-15		SB-15		SB-15		SB-15		SB-15		SB-16	
	Sample Depth (bgs)		20 ft		0.5 ft		0.5 ft (DUP)		5 ft		10 ft		15 ft		20 ft		0.5 ft	
	Sample Collection Date		30-Jun-2022		1-Jul-2022		1-Jul-2022		1-Jul-2022		1-Jul-2022		1-Jul-2022		1-Jul-2022		1-Jul-2022	
Analyte	**Project Action Level**	**Units**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
1,1,1,2-Tetrachloroethane	0.00063	mg/kg	0.0012	U	0.0015	U	0.0013	U	0.0012	U	0.0014	U	0.00099	U	0.0012	U	0.0011	U
1,1,1-Trichloroethane	0.084	mg/kg	0.0012	U	0.0015	U	0.0013	U	0.0012	U	0.0014	U	0.00099	U	0.0012	U	0.0011	U
1,1,2,2-Tetrachloroethane	0.000037	mg/kg	0.0006	U	0.00075	U	0.00064	U	0.00062	U	0.00072	U	0.0005	U	0.00058	U	0.00053	U
1,1,2-Trichloroethane	0.00013	mg/kg	0.0012	U	0.0015	U	0.0013	U	0.0012	U	0.0014	U	0.00099	U	0.0012	U	0.0011	U
1,1-Dichloroethane	0.0026	mg/kg	0.0012	U	0.0015	U	0.0013	U	0.0012	U	0.0014	U	0.00099	U	0.0012	U	0.0011	U
1,1-Dichloroethene	0.0025	mg/kg	0.00051	J	0.0015	U	0.0013	U	0.0012	U	0.0014	U	0.00099	U	0.0012	U	0.0011	U
1,1-Dichloropropene	NC	mg/kg	0.0012	U	0.0015	U	0.0013	U	0.0012	U	0.0014	U	0.00099	U	0.0012	U	0.0011	U
1,2,3-Trichlorobenzene	0.011	mg/kg	0.0048	U	0.006	U	0.0051	U	0.005	U	0.0057	U	0.004	U	0.0046	U	0.0042	U
1,2,3-Trichloropropane	0.00000015	mg/kg	0.0012	U	0.0015	U	0.0013	U	0.0012	U	0.0014	U	0.00099	U	0.0012	U	0.0011	U
1,2,4-Trichlorobenzene	0.000070	mg/kg	0.0048	U	0.006	U	0.0051	U	0.005	U	0.0057	U	0.004	U	0.0046	U	0.0042	U
1,2-Dichlorobenzene	0.40	mg/kg	0.0012	U	0.0015	U	0.0013	U	0.0012	U	0.0014	U	0.00099	U	0.0012	U	0.0011	U
1,2-Dichloroethane	0.0016	mg/kg	0.0012	U	0.0015	U	0.0013	U	0.0012	U	0.0014	U	0.00099	U	0.0012	U	0.0011	U
1,2-Dichloropropane	0.00024	mg/kg	0.0012	U	0.0015	U	0.0013	U	0.0012	U	0.0014	U	0.00099	U	0.0012	U	0.0011	U
1,3-Dichlorobenzene	0.0013	mg/kg	0.0012	U	0.0015	U	0.0013	U	0.0012	U	0.0014	U	0.00099	U	0.0012	U	0.0011	U
1,3-Dichloropropane	0.057	mg/kg	0.0006	U	0.00075	U	0.00064	U	0.00062	U	0.00072	U	0.0005	U	0.00058	U	0.00053	U
1,4-Dichlorobenzene	0.068	mg/kg	0.0006	U	0.00075	U	0.00064	U	0.00062	U	0.00072	U	0.0005	U	0.00058	U	0.00053	U
2,2-Dichloropropane	NC	mg/kg	0.0012	U	0.0015	U	0.0013	U	0.0012	U	0.0014	U	0.00099	U	0.0012	U	0.0011	U
2-Chlorotoluene	0.11	mg/kg	0.0006	U	0.00075	U	0.00064	U	0.00062	U	0.00072	U	0.0005	U	0.00058	U	0.00053	U
4-Chlorotoluene	NC	mg/kg	0.0006	U	0.00075	U	0.00064	U	0.00062	U	0.00072	U	0.0005	U	0.00058	U	0.00053	U
Carbon tetrachloride	0.000088	mg/kg	0.0012	U	0.0015	U	0.0013	U	0.0012	U	0.0014	U	0.00099	U	0.0012	U	0.0011	U
Chlorobenzene	0.051	mg/kg	0.0012	U	0.0015	U	0.0013	U	0.0012	U	0.0014	U	0.00099	U	0.0012	U	0.0011	U
Chloroethane	NC	mg/kg	0.0024	U	0.003	U	0.0026	U	0.0025	U	0.0029	U	0.002	U	0.0023	U	0.0021	U
Chloroform	0.0048	mg/kg	0.0012	U	0.0015	U	0.0013	U	0.0012	U	0.0014	U	0.00099	U	0.0012	U	0.0011	U
Chloromethane	NC	mg/kg	0.0012	U	0.0015	U	0.0013	U	0.0012	U	0.0014	U	0.00099	U	0.0012	U	0.0011	U
cis-1,2-Dichloroethene	0.0052	mg/kg	**0.071**		0.0015	U	0.0013	U	0.0012	U	0.0014	U	0.00099	U	0.0012	U	0.0011	U
cis-1,3-Dichloropropene	0.000069 [1/]	mg/kg	0.0006	U	0.00075	U	0.00064	U	0.00062	U	0.00072	U	0.0005	U	0.00058	U	0.00053	U
Hexachlorobutadiene	0.000011	mg/kg	0.0048	U	0.006	U	0.0051	U	0.005	U	0.0057	U	0.004	U	0.0046	U	0.0042	U
Methylene chloride	0.0015	mg/kg	0.0024	U	0.003	U	0.0026	U	0.0025	U	0.0029	U	0.002	U	0.0023	U	0.0021	U
Tetrachloroethene	0.0013	mg/kg	0.0012	U	0.0015	U	0.0013	U	0.0012	U	0.0014	U	0.00099	U	0.0012	U	0.0011	U
trans-1,2-Dichloroethene	0.023 [2/]	mg/kg	0.0012	U	0.0015	U	0.0013	U	0.0012	U	0.0014	U	0.00099	U	0.0012	U	0.0011	U
trans-1,3-Dichloropropene	0.000069 [1/]	mg/kg	0.0006	U	0.00075	U	0.00064	U	0.00062	U	0.00072	U	0.0005	U	0.00058	U	0.00053	U
Trichloroethene	0.00011	mg/kg	0.0012	U	0.0015	U	0.0013	U	0.0012	U	0.0014	U	0.00099	U	0.0012	U	0.0011	U
Vinyl chloride	0.0000062	mg/kg	**0.00099**	J	0.0015	U	0.0013	U	0.0012	U	0.0014	U	0.00099	U	0.0012	U	0.0011	U

	Location ID	SB-16		SB-16		SB-16		SB-16		SB-17		SB-17		SB-17		SB-17	
	Sample Depth (bgs)	5 ft		10 ft		15 ft		20 ft		0.5 ft		10 ft		10 ft (DUP)		20 ft	
	Sample Collection Date	1-Jul-2022		1-Jul-2022		1-Jul-2022		1-Jul-2022		27-Jun-2022		27-Jun-2022		27-Jun-2022		27-Jun-2022	
Analyte	Project Action Level	Units	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
1,1,1,2-Tetrachloroethane	0.00063	mg/kg	0.001	U	0.0011	U	0.0012	U	0.0013	U		R		R		R		R
1,1,1-Trichloroethane	0.084	mg/kg	0.001	U	0.0011	U	0.0012	U	0.0013	U		R		R		R		R
1,1,2,2-Tetrachloroethane	0.000037	mg/kg	0.00052	U	0.00053	U	0.00059	U	0.00064	U		R		R		R		R
1,1,2-Trichloroethane	0.00013	mg/kg	0.001	U	0.0011	U	0.0012	U	0.0013	U		R		R		R		R
1,1-Dichloroethane	0.0026	mg/kg	0.001	U	0.0011	U	0.0012	U	0.0013	U		R		R		R		R
1,1-Dichloroethene	0.0025	mg/kg	0.001	U	0.0011	U	0.0012	U	0.0013	U		R		R		R		R
1,1-Dichloropropene	NC	mg/kg	0.001	U	0.0011	U	0.0012	U	0.0013	U		R		R		R		R
1,2,3-Trichlorobenzene	0.011	mg/kg	0.0042	U	0.0043	U	0.0048	U	0.0051	U		R		R		R		R
1,2,3-Trichloropropane	0.00000015	mg/kg	0.001	U	0.0011	U	0.0012	U	0.0013	U		R		R		R		R
1,2,4-Trichlorobenzene	0.000070	mg/kg	0.0042	U	0.0043	U	0.0048	U	0.0051	U		R		R		R		R
1,2-Dichlorobenzene	0.40	mg/kg	0.001	U	0.0011	U	0.0012	U	0.0013	U		R		R		R		R
1,2-Dichloroethane	0.0016	mg/kg	0.001	U	0.0011	U	0.0012	U	0.0013	U		R		R		R		R
1,2-Dichloropropane	0.00024	mg/kg	0.001	U	0.0011	U	0.0012	U	0.0013	U		R		R		R		R
1,3-Dichlorobenzene	0.0013	mg/kg	0.001	U	0.0011	U	0.0012	U	0.0013	U		R		R		R		R
1,3-Dichloropropane	0.057	mg/kg	0.00052	U	0.00053	U	0.00059	U	0.00064	U		R		R		R		R
1,4-Dichlorobenzene	0.068	mg/kg	0.00052	U	0.00053	U	0.00059	U	0.00064	U		R		R		R		R
2,2-Dichloropropane	NC	mg/kg	0.001	U	0.0011	U	0.0012	U	0.0013	U		R		R		R		R
2-Chlorotoluene	0.11	mg/kg	0.00052	U	0.00053	U	0.00059	U	0.00064	U		R		R		R		R
4-Chlorotoluene	NC	mg/kg	0.00052	U	0.00053	U	0.00059	U	0.00064	U		R		R		R		R
Carbon tetrachloride	0.000088	mg/kg	0.001	U	0.0011	U	0.0012	U	0.0013	U		R		R		R		R
Chlorobenzene	0.051	mg/kg	0.001	U	0.0011	U	0.0012	U	0.0013	U		R		R		R		R
Chloroethane	NC	mg/kg	0.0021	U	0.0021	U	0.0024	U	0.0026	U		R		R		R		R
Chloroform	0.0048	mg/kg	0.001	U	0.0011	U	0.0012	U	0.0013	U		R		R		R		R
Chloromethane	NC	mg/kg	0.001	U	0.0011	U	0.0012	U	0.0013	U		R		R		R		R
cis-1,2-Dichloroethene	0.0052	mg/kg	0.001	U	0.0011	U	0.0012	U	0.0013	U		R		R	0.0011	J		R
cis-1,3-Dichloropropene	0.000069 [1/]	mg/kg	0.00052	U	0.00053	U	0.00059	U	0.00064	U		R		R		R		R
Hexachlorobutadiene	0.000011	mg/kg	0.0042	U	0.0043	U	0.0048	U	0.0051	U		R		R		R		R
Methylene chloride	0.0015	mg/kg	0.0021	U	0.0021	U	0.0024	U	0.0026	U		R		R		R		R
Tetrachloroethene	0.0013	mg/kg	0.001	U	0.0011	U	0.0012	U	0.0013	U		R		R		R		R
trans-1,2-Dichloroethene	0.023 [2/]	mg/kg	0.001	U	0.0011	U	0.0012	U	0.0013	U		R		R		R		R
trans-1,3-Dichloropropene	0.000069 [1/]	mg/kg	0.00052	U	0.00053	U	0.00059	U	0.00064	U		R		R		R		R
Trichloroethene	0.00011	mg/kg	0.001	U	0.0011	U	0.0012	U	0.0013	U		R	**0.13**	J	**0.17**	J	**0.50**	J
Vinyl chloride	0.0000062	mg/kg	0.001	U	0.0011	U	0.0012	U	0.0013	U		R		R		R		R

Location ID			SB-18		SB-18		SB-18		SB-19		SB-19		SB-19		SB-19		SB-19	
Sample Depth (bgs)			0.5 ft		10 ft		20 ft		0.5 ft		5 ft		10 ft		15 ft		20 ft	
Sample Collection Date			28-Jun-2022		28-Jun-2022		28-Jun-2022		1-Jul-2022		1-Jul-2022		1-Jul-2022		1-Jul-2022		1-Jul-2022	
Analyte	Project Action Level	Units	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
1,1,1,2-Tetrachloroethane	0.00063	mg/kg		R		R		R	0.0022	U	0.0022	U	0.40	U	0.00098	U	0.001	U
1,1,1-Trichloroethane	0.084	mg/kg		R		R		R	0.0022	U	0.0022	U	0.20	U	0.00098	U	0.001	U
1,1,2,2-Tetrachloroethane	0.000037	mg/kg		R		R		R	0.0011	U	0.0011	U	0.10	U	0.00049	U	0.0005	U
1,1,2-Trichloroethane	0.00013	mg/kg		R		R		R	0.0022	U	0.0022	U	0.20	U	0.00098	U	0.001	U
1,1-Dichloroethane	0.0026	mg/kg		R		R		R	0.0022	U	0.0022	U	0.20	U	0.00098	U	0.001	U
1,1-Dichloroethene	0.0025	mg/kg		R		R		R	0.0022	U	0.0022	U	0.20	U	0.00098	U	0.001	U
1,1-Dichloropropene	NC	mg/kg		R		R		R	0.0022	U	0.0022	U	0.20	U	0.00098	U	0.001	U
1,2,3-Trichlorobenzene	0.011	mg/kg		R		R		R	0.0089	U	0.0087	U	0.80	U	0.0039	U	0.004	U
1,2,3-Trichloropropane	0.00000015	mg/kg		R		R		R	0.0022	U	0.0022	U	0.20	U	0.00098	U	0.001	U
1,2,4-Trichlorobenzene	0.000070	mg/kg		R		R		R	0.0089	U	0.0087	U	0.80	U	0.0039	U	0.004	U
1,2-Dichlorobenzene	0.40	mg/kg		R		R		R	0.0022	U	0.0022	U	0.20	U	0.00098	U	0.001	U
1,2-Dichloroethane	0.0016	mg/kg		R		R		R	0.0022	U	0.0022	U	0.20	U	0.00098	U	0.001	U
1,2-Dichloropropane	0.00024	mg/kg		R		R		R	0.0022	U	0.0022	U	0.20	U	0.00098	U	0.001	U
1,3-Dichlorobenzene	0.0013	mg/kg		R		R		R	0.0022	U	0.0022	U	0.20	U	0.00098	U	0.001	U
1,3-Dichloropropane	0.057	mg/kg		R		R		R	0.0011	U	0.0011	U	0.10	U	0.00049	U	0.0005	U
1,4-Dichlorobenzene	0.068	mg/kg		R		R		R	0.0011	U	0.0011	U	0.10	U	0.00049	U	0.0005	U
2,2-Dichloropropane	NC	mg/kg		R		R		R	0.0022	U	0.0022	U	0.20	U	0.00098	U	0.001	U
2-Chlorotoluene	0.11	mg/kg		R		R		R	0.0011	U	0.0011	U	0.10	U	0.00049	U	0.0005	U
4-Chlorotoluene	NC	mg/kg		R		R		R	0.0011	U	0.0011	U	0.10	U	0.00049	U	0.0005	U
Carbon tetrachloride	0.000088	mg/kg		R		R		R	0.0022	U	0.0022	U	0.40	U	0.00098	U	0.001	U
Chlorobenzene	0.051	mg/kg		R		R		R	0.0022	U	0.0022	U	0.20	U	0.00098	U	0.001	U
Chloroethane	NC	mg/kg		R		R		R	0.0045	U	0.0044	U	0.40	UJ	0.002	U	0.002	U
Chloroform	0.0048	mg/kg		R		R		R	0.0022	U	0.0022	U	0.20	U	0.00098	U	0.001	U
Chloromethane	NC	mg/kg		R		R		R	0.0022	U	0.0022	U	0.20	U	0.00098	U	0.001	U
cis-1,2-Dichloroethene	0.0052	mg/kg		R		R		R	0.0022	U	0.0022	U	0.20	U	0.00098	U	0.001	U
cis-1,3-Dichloropropene	0.000069 [1/]	mg/kg		R		R		R	0.0011	U	0.0011	U	0.10	U	0.00049	U	0.0005	U
Hexachlorobutadiene	0.000011	mg/kg		R		R		R	0.0089	U	0.0087	U	0.80	U	0.0039	U	0.004	U
Methylene chloride	0.0015	mg/kg		R		R		R	0.0045	U	0.0044	U	0.40	U	0.002	U	0.002	U
Tetrachloroethene	0.0013	mg/kg		R		R		R	0.0022	U	0.0022	U	0.20	U	0.00098	U	0.001	U
trans-1,2-Dichloroethene	0.023 [2/]	mg/kg		R		R		R	0.0022	U	0.0022	U	0.20	U	0.00098	U	0.001	U
trans-1,3-Dichloropropene	0.000069 [1/]	mg/kg		R		R		R	0.0011	U	0.0011	U	0.10	U	0.00049	U	0.0005	U
Trichloroethene	0.00011	mg/kg		R		R		R	0.0022	U	0.0022	U	0.20	U	0.00098	U	0.001	U
Vinyl chloride	0.0000062	mg/kg		R		R		R	0.0022	U	0.0022	U	0.20	U	**0.00081**	J	**0.00048**	J

Notes:

Detected results exceeding the Project Action Level are boldfaced and shaded grey.
Limits of detection for non-detected results exceeding the Project Action Level are shaded grey.

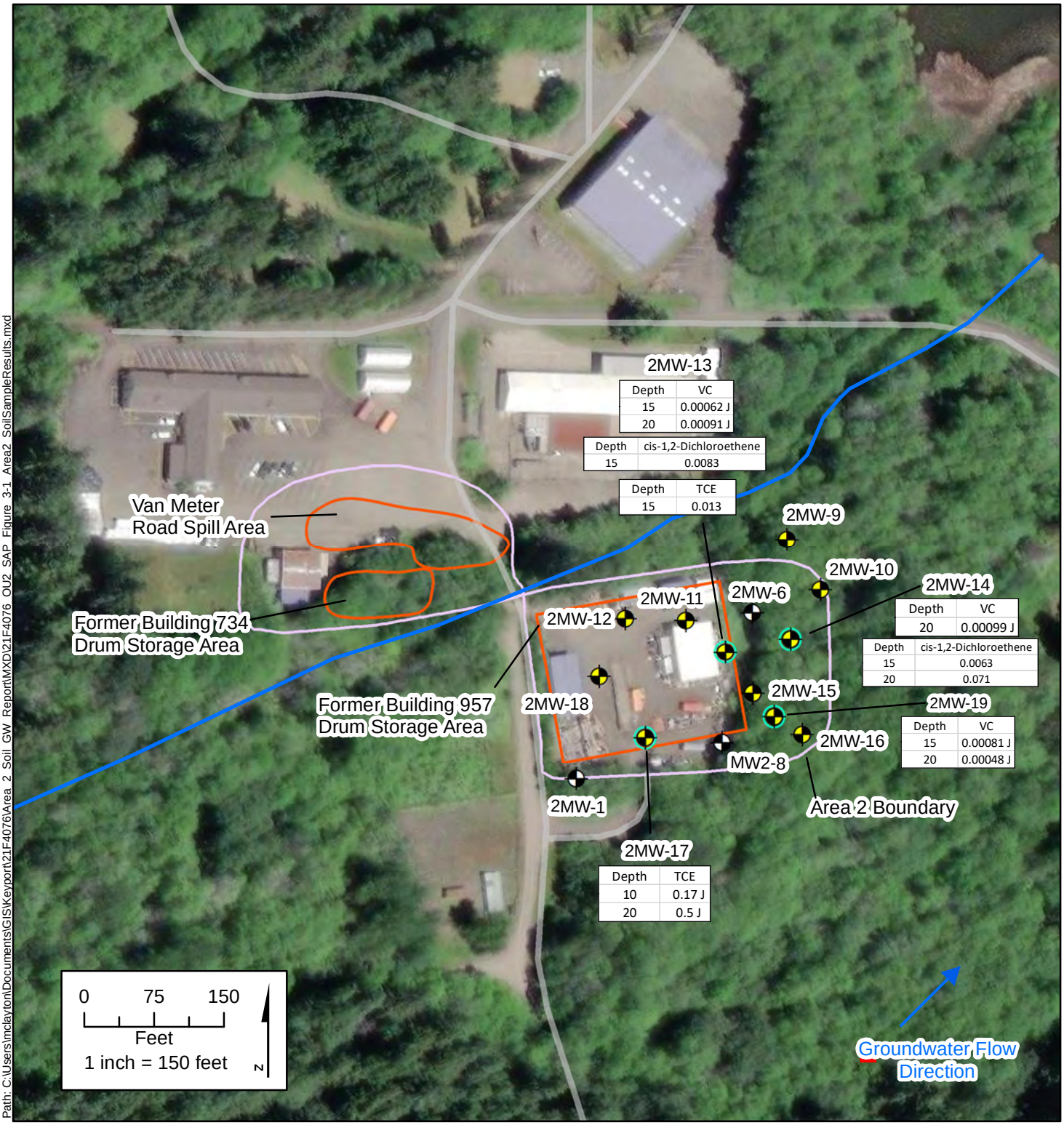
[1/] The screening level is for 1,3-dichloropropene (total) but will be applied to the cis- and trans- isomers.

[2/] The screening level is for 1,2-dichloroethene (mixed isomers) is slightly lower than the value for the trans- isomer (0.032 mg/kg) and is listed in this table.

bgs = below ground surface
DUP = field duplicate
ft = feet
mg/kg = milligrams per kilogram
NC = no criterion
Q = qualifier

Data Qualifiers:

J = The reported result is an estimated value.
R = The result is rejected.
U = The analyte is not detected at the associated numerical value.
UJ = The analyte is not detected; the associated numerical value is approximate.



Path: C:\Users\mclayton\Documents\GIS\Keyport\21F4076\Area 2 Soil GW Report\MXD\21F4076 OU2 SAP Figure 3-1 Area2 SoilSampleResults.mxd

LEGEND

- Existing Monitoring Well (not sampled)
- New Monitoring Well (sampled)
- Vinyl Chloride Exceeds 0.0000062 mg/kg PAL, cis-1,2-Dichloroethene Exceeds 0.0052 mg/kg PAL, TCE Exceeds 0.0013 mg/kg PAL

Notes:
Vinyl concentrations (VC) are presented in micrograms per liter where detected above the laboratory limit of detection. Depth is presented in feet below ground surface.
J = The result is an estimated concentration.

FIGURE 3-1
OU 2 SOIL ANALYTICAL RESULTS
SOIL AND GROUNDWATER
SUPPLEMENTAL INVESTIGATION REPORT,
AREA 2 VAN METER ROAD
SPILL/DRUM STORAGE SITE, OPERABLE UNIT 2
NAVAL BASE KITSAP KEYPORT
KEYPORT, WA

Source: Sealaska 2019

Map Date: 3/9/2023

This page intentionally left blank

3.2 Groundwater Elevations and Field Parameters

The depth to water was measured between 8 and 11 July 2022 prior to groundwater purging and sample collection. The groundwater level measurements and calculated elevation are provided in Table 7. Field forms with depth to water and total well-depth measurements are provided in Appendix A.

Field parameters were measured during purging of monitoring wells prior to sampling and are summarized in Table 7. Field forms for groundwater purging and sampling are provided in Appendix A.

3.3 Groundwater Analytical Results

The analytical results for the July 2022 groundwater monitoring event are provided in Table 8. Analytical results were compared to the PALs defined in the SAP (DON 2022). Exceedances of the PAL occurred for the following analytes:

- TCE exceeded the PAL of 0.30 µg/L in the samples from wells 2MW-11, 2MW-12, and 2MW-13.
- Vinyl chloride exceeded the PAL of 0.020 µg/L in the samples from wells 2MW-11, 2MW-12, 2MW-13, 2MW-14, 2MW-19. Vinyl chloride exceedances in groundwater samples are shown in Figure 3-2.
- Chloroform exceeded the PAL of 1.4 µg/L in the sample from 2MW-14.
- The following analytes were not detected; however, the laboratory LODs exceeded PALs: 1,1,2,2-tetrachloroethane, 1,2,3-trichloropropane, 1,2,4-trichlorobenzene, and hexachlorobutadiene were not detected above the laboratory LOD.
- The following analytes were not detected in the sample from well 2MW-12; however, the laboratory LODs for this sample exceeded PALs: 1,1,2-trichloroethane, 1,2-dichloroethane, 1,2-dichloropropane, carbon tetrachloride, cis-1,3-dichloropropene, methylene chloride, tetrachloroethene, and trans-1,3-dichloropropene.

This page intentionally left blank

Table 7. Groundwater Elevation and Field Parameter Measurements

Well ID	Date	Top of Well Casing Elevation (feet-MLLW)	Depth to Top of Screen (feet-BTOC)	Depth to Groundwater (feet-BTOC)	Groundwater Elevation (feet-MLLW)	pH (s.u.)	Specific Conductance (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Temperature (ºC)	Salinity (ppt)	ORP (mV)
2MW-9	7/11/2022	21.41	25.0	6.73	14.68	7.18	0.280	29.84	0.49	12.6	0.13	-499.6
2MW-10	7/11/2022	22.63	30.0	7.70	14.93	7.60	0.292	70.89	0.58	13.4	0.14	-501.8
2MW-11	7/8/2022	22.81	10.0	6.54	16.27	6.43	0.289	6.39	0.50	13.8	0.14	8.1
2MW-12	7/8/2022	23.13	10.0	5.70	17.43	6.53	0.647	15.12	0.40	15.4	0.32	-325.9
2MW-13	7/11/2022	22.13	10.0	6.43	15.7	6.37	0.941	4.78	0.62	13.2	0.47	77.4
2MW-14	7/11/2022	23.75	10.0	8.60	15.15	6.45	0.862	8.62	0.54	13.4	0.43	-354.3
2MW-15	7/11/2022	23.84	8.0	6.65	17.19	6.48	0.376	3.14	0.76	11.7	0.18	42.4
2MW-16	7/11/2022	23.00	8.0	6.30	16.70	6.45	0.360	66.87	0.63	12.1	0.17	36.3
2MW-17	7/8/2022	24.40	10.0	2.39	22.01	6.91	0.419	32.80	0.56	13.9	0.20	-389.8
2MW-18	7/8/2022	24.93	8.0	5.28	19.65	6.91	0.214	23.43	0.76	14.6	0.10	-248.6
2MW-19	7/11/2022	22.16	8.0	8.30	13.86	6.45	0.519	21.32	4.60	12.6	0.25	131.5

Notes:
BTOC = below top of casing
°C = degrees Celsius
mg/L = milligram(s) per liter
MLLW = mean low lower water
mS/cm = milliSiemens(s) per centimeter
mV = millivolt(s)
NTU = nephelometric turbidity units
ORP = oxidation/reduction potential
pH = potentiometric hydrogen ion concentration
ppt = parts per trillion
s.u. = standard units

This page intentionally left blank

Table 8. Groundwater Sampling Analytical Data

Analyte	Project Action Level	Units	Location ID / Sample Collection Date	2MW-9 7/11/2022	2MW-9 (DUP) 7/11/2022	2MW-10 7/11/2022	2MW-11 7/8/2022	2MW-12 7/8/2022	2MW-13 7/11/2022	2MW-14 7/11/2022	2MW-15 7/11/2022	2MW-16 7/11/2022	2MW-17 7/8/2022	2MW-18 7/8/2022	2MW-18 (DUP) 7/8/2022	2MW-19 7/11/2022
1,1,1,2-Tetrachloroethane	1.7	µg/L		0.15 U	0.15 U	0.15 U	0.15 U	1.5 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
1,1,1-Trichloroethane	200	µg/L		0.070 U	0.070 U	0.070 U	0.070 U	0.7 U	0.070 U	0.070 U	0.070 U	0.070 U	0.070 U	0.070 U	0.070 U	0.070 U
1,1,2,2-Tetrachloroethane	0.10	µg/L		0.15 U	0.15 U	0.15 U	0.15 U	1.5 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
1,1,2-Trichloroethane	0.35	µg/L		0.15 U	0.15 U	0.15 U	0.15 U	1.5 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
1,1-Dichloroethane	7.7	µg/L		0.070 U	0.070 U	0.070 U	0.078 J	0.7 U	0.028 J	0.044 J	0.070 U	0.070 U	0.070 U	0.070 U	0.070 U	0.070 U
1,1-Dichloroethene	7.0	µg/L		0.070 U	0.070 U	0.070 U	0.096 J	0.7 U	0.070 U	0.098 J	0.070 U	0.070 U	0.27	0.070 U	0.070 U	0.070 U
1,1-Dichloropropene	NC	µg/L		0.15 U	0.15 U	0.15 U	0.15 U	1.5 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
1,2,3-Trichlorobenzene	6.4	µg/L		0.35 UJ	0.35 UJ	0.35 UJ	0.35 UJ	3.5 UJ	0.35 UJ	0.35 UJ	0.35 UJ	0.35 U	0.35 UJ	0.35 U J	0.35 U J	0.35 UJ
1,2,3-Trichloropropane	0.00038	µg/L		0.15 U	0.15 U	0.15 U	0.15 U	1.5 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
1,2,4-Trichlorobenzene	0.036	µg/L		0.35 U	0.35 U	0.35 U	0.35 U	3.5 U	0.35 UJ	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
1,2-Dichlorobenzene	600	µg/L		0.15 U	0.15 U	0.15 U	0.15 U	1.5 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
1,2-Dichloroethane	0.48	µg/L		0.15 U	0.15 U	0.15 U	0.15 U	1.5 U	0.15 U	0.044 J	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
1,2-Dichloropropane	0.71	µg/L		0.15 U	0.15 U	0.15 U	0.15 U	1.5 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
1,3-Dichlorobenzene	2.0	µg/L		0.18 J	0.16 J	0.065 J	0.15 J	1.5 U	0.12 J	0.13 J	0.082 J	0.068 J	0.18 J	0.14 J	0.15 J	0.21 J
1,3-Dichloropropane	160	µg/L		0.070 U	0.070 U	0.070 U	0.070 U	0.7 U	0.070 U	0.070 U	0.070 U	0.070 U	0.070 U	0.070 U	0.070 U	0.070 U
1,4-Dichlorobenzene	8.1	µg/L		0.15 U	0.15 U	0.15 U	0.15 U	1.5 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
2,2-Dichloropropane	NC	µg/L		0.15 U	0.15 U	0.15 U	0.15 U	1.5 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
2-Chlorotoluene	160	µg/L		0.35 U	0.35 U	0.35 U	0.35 U	3.5 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
4-Chlorotoluene	NC	µg/L		0.25 U	0.25 U	0.25 U	0.25 U	2.5 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Carbon tetrachloride	0.20	µg/L		0.070 U	0.070 U	0.070 U	0.070 U	0.7 U	0.070 U	0.070 U	0.070 U	0.070 U	0.070 U	0.070 U	0.070 U	0.070 U
Chlorobenzene	100	µg/L		0.15 U	0.15 U	0.15 U	0.15 U	1.5 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Chloroethane	NC	µg/L		0.25 U	0.25 U	0.25 U	0.53	2.5 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Chloroform	1.4	µg/L		0.22	0.18 J	0.47	0.070 U	0.7 U	0.070 U	**1.9**	0.6	0.22	0.070 U	0.070 U	0.070 U	0.93
Chloromethane	NC	µg/L		0.35 U	0.35 U	0.35 U	0.35 U	3.5 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
cis-1,2-Dichloroethene	16	µg/L		0.15 U	0.15 U	0.15 U	10	1.2 J	1.3	13	0.15 U	0.15 U	1.9	0.071 J	0.083 J	0.15 U
cis-1,3-Dichloropropene	0.22 [1]	µg/L		0.15 U	0.15 U	0.15 U	0.15 U	1.5 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Hexachlorobutadiene	0.010	µg/L		0.15 U	0.15 U	0.15 U	0.15 U	1.5 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Methylene chloride	5.0	µg/L		3.5 U	3.5 U	3.5 U	3.5 U	35 U	3.5 UJ	3.5 U	3.5 U	3.5 UJ	3.5 U	3.5 U	3.5 U	3.5 U
Tetrachloroethene	2.4	µg/L		0.25 U	0.25 U	0.25 U	0.25 U	2.5 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
trans-1,2-Dichloroethene	100	µg/L		0.070 U	0.070 U	0.070 U	0.095 J	0.41 J	0.039 J	0.048 J	0.070 U	0.070 U	0.18 J	0.070 U	0.070 U	0.070 U
trans-1,3-Dichloropropene	0.22 [1]	µg/L		0.15 U	0.15 U	0.15 U	0.15 U	1.5 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Trichloroethene	0.30 [2]	µg/L		0.15 U	0.15 U	0.15 U	**4.7**	**7.6**	**0.40**	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U J	0.24 J	0.15 U
Vinyl chloride	0.020 [3]	µg/L		0.015 U	0.015 U	0.015 U	**2.0**	**0.7**	**0.090**	**0.47** J	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	**0.34**

Notes:

Detected results exceeding the Project Action Level are boldfaced and shaded grey.

Limits of detection for non-detected results exceeding the Project Action Level are shaded grey.

[1/] The project action level is for 1,3-dichloropropene (total) but will be applied to the cis- and trans-isomers.

[2/] The remediation goal for trichloroethene is 5.0 µg/L.

[3/] The remediation goal for vinyl chloride is 0.029 µg/L.

µg/L = micrograms per liter

DUP = field duplicate

NC = no criterion

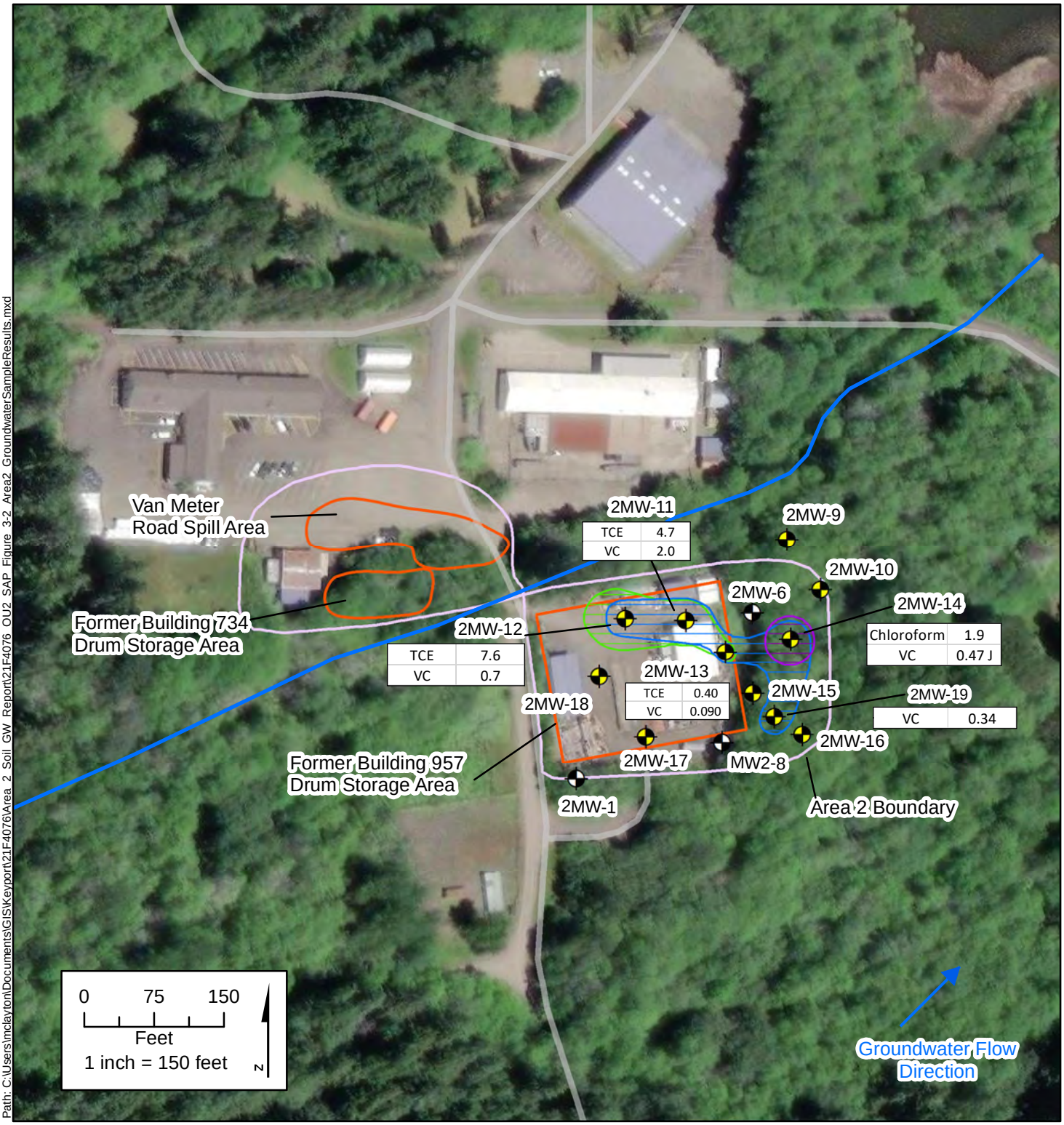
Q = qualifier

Data Qualifiers:

J = The reported result is an estimated value.

U = The analyte is not detected at the associated numerical value.

UJ = The analyte is not detected; the associated numerical value is approximate.



Path: C:\Users\mclayton\Documents\GIS\Keyport\21F4076\Area 2 Soil GW Report\21F4076 OU2 SAP Figure 3-2 Area2 GroundwaterSampleResults.mxd

LEGEND

- Stream
- Existing Monitoring Well (not sampled)
- New Monitoring Well (sampled)
- Chloroform Plume
- Vinyl Chloride Plume
- TCE Plume

Notes:
Concentrations are presented in micrograms per liter where exceedances occurred.
J = The result is an estimated concentration.

FIGURE 3-2
OU 2 GROUNDWATER ANALYTICAL RESULTS
SOIL AND GROUNDWATER
SUPPLEMENTAL INVESTIGATION REPORT,
AREA 2 VAN METER ROAD
SPILL/DRUM STORAGE SITE, OPERABLE UNIT 2
NAVAL BASE KITSAP KEYPORT
KEYPORT, WA

Source: Sealaska 2019

Map Date: 3/23/2023

This page intentionally left blank

3.4 Laboratory Analysis

Soil samples were submitted to an off-site laboratory, Eurofins Lancaster Laboratories Environmental, in Lancaster, Pennsylvania. Groundwater samples were submitted to an off-site laboratory, Eurofins Seattle Laboratory, in Tacoma, Washington. These laboratories hold current accreditation for the scope of testing through the Department of Defense (DoD) and Washington Department of Ecology Environmental Laboratory Accreditation Programs. Groundwater samples and soil samples were analyzed for cVOCs by Method 8260D in accordance with the SAP (DON 2022).

3.5 Data Quality

Data validation was performed by a third-party data validator, Laboratory Data Consultants, Inc., in Carlsbad, California on the analytical results associated with samples using the guidelines presented in the SAP (DON 2022). The data validation was performed at a minimum frequency of 10 percent at Stage 4 and the remainder at Stage 2B, as defined in the General Data Validation Guidelines (DoD 2019) and Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by Gas Chromatograph/Mass Spectrometer (DoD 2020). The results of the validation were reviewed, and a data quality assessment report was prepared by the Contractor's Project Chemist. The data quality assessment report is presented in Appendix B and includes the data validation reports prepared by the third-party data validator.

The following significant issues were identified during data validation and/or assessment:

- As discussed in Section 2.5, only three of five planned soil samples were collected at SB-17 and SB-18.
- The temperatures of two coolers containing soil samples were above 20 degrees Celsius upon arrival at the laboratory. Due to the elevated temperatures, detected results for impacted samples were qualified "J" as estimated and non-detected results were rejected (qualified "R") on this basis. The soil samples from four borings (SB-11, SB-12, SB-17, and SB-18) and associated field QC samples were impacted by this issue. This includes the following samples and field QC samples: Area-2-22-SB-11-0.5, Area-2-22-SB-11-5, Area-2-22-SB-11-1-5 (field duplicate of prior sample), Area-2-22-SB-11-10, Area-2-22-SB-11-15, Area-2-22-SB-11-20, Area-2-22-SB-12-0.5, Area-2-22-SB-12-5, Area-2-22-SB-12-10, Area-2-22-SB-12-20, Area-2-22-SB-12-1-20 (field duplicate of prior sample), Area-2-22-SB-12-25, Area-2-22-SB-17-0.5, Area-2-22-SB-17-10, Area-2-22-SB-17-1-10 (field duplicate of prior sample), Area-2-22-SB-17-20,

Area-2-22-SB-18-0.5, Area-2-22-SB-18-10, Area-2-22-SB-18-20, two field blanks (FB-62722 and FB-62822), and two trip blanks (TB-62722 and TB-62822)

- Due to the issues discussed in the two bullets above, the percent completeness for the data set is 70 percent, which is significantly below the 90 percent minimal acceptance criteria for completeness specified in the Tier I SAP (DON 2022).

Otherwise, the results of data verification and validation processes indicate that the data generated from the samples collected during the field activities are generally of sufficient quality and quantity to accomplish project objectives. Unless rejected during data assessment, sample results accurately indicate the presence and/or absence of target analyte concentrations at sampled locations. Sample results are representative of site conditions at the time of collection. Results obtained are comparable to industry standards, in that collection and analytical techniques followed approved, documented procedures. Results are reported in industry standard units. As indicated in the SAP (DON 2022) in Worksheet #15, it was known that several LODs would be above the PALs. Non-detected sample results with LODs above PALs are indicated in grey highlight (no bolding) in Tables 6 and 8.

4 Conclusions and Recommendations

This section presents conclusions and recommendations related to the soil and groundwater investigation at OU 2.

4.1 Conclusions

Work performed during the investigation included soil sampling for cVOCs at 11 soil borings, installation and development of eleven new monitoring wells, and groundwater sampling for cVOCs at each new monitoring well. Soil and groundwater analytical results were compared to PALS defined in the SAP (DON 2022). Most soil and groundwater samples had no detected exceedances of PALs in soil or groundwater samples. In soil samples, TCE was detected above the PAL in 3 of 51 samples, vinyl chloride was detected above the PAL in 5 of 51 samples, and cis-1,2-dichloroethene was detected above the PAL in 3 of 51 samples. In groundwater samples, TCE was detected above the PAL in three samples, vinyl chloride was detected above the PAL in five samples, and chloroform was detected above the PAL in one sample. Additionally, the LODs for several non-detected sample results are above PALs, as indicated in grey highlight (no bolding) in Tables 6 and 8.

As indicated in Section 3.5 and Appendix B, several soil and groundwater sample results presented in Tables 6 and 8, respectively, are considered usable but are qualified as estimated (with “J” or “UJ”). Notably, the detected cVOCs for soil samples from four borings (SB-11, SB-12, SB-17, and SB-18) may be biased low due to temperature above 20 degrees Celsius during shipment to the laboratory. Additionally, soil sample results not considered usable are rejected (qualified as “R”), with no numerical value presented in Table 6.

4.2 Recommendations

The soil and groundwater analytical results indicate that TCE and vinyl chloride concentrations exist outside of the previously installed point of compliance groundwater monitoring wells (2MW-1, 2MW-6, and MW2-8). It is recommended that the newly installed monitoring wells (2MW-9 through 2MW-19) are added to the long-term monitoring network for comparison to PALs.

This page intentionally left blank

5 References

Department of Defense (DoD). 2019. *General Data Validation Guidelines. Revision 1. Environmental Data Quality Workgroup*. November.

DoD. 2020. *Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS. Environmental Data Quality Workgroup*. May.

Department of the Navy (DON). 1993. *Remedial Investigation, Comprehensive Long-Term Environmental Action Navy Northwest Area. Naval Undersea Warfare Center Division Keyport, Washington*. Prepared by URS Consultants, Seattle, Washington. October.

DON. 1994. *Record of Decision for Operable Unit 2. Comprehensive Long-Term Environmental Action Navy (CLEAN) Northwest Area. Naval Undersea Warfare Center, Division Keyport. Contract Task Order Number 0010*. Prepared by URS Consultants, Seattle, Washington and Science Applications International Corporation, Bothell, Washington for Engineering Field Activity Northwest. September.

DON. 1995. *Long-Term Monitoring Plan for Operable Unit 2, Area 2 Van Meter Road Spill Site, Naval Undersea Warfare Center Division Keyport, Washington*. Prepared by EA Engineering, Science, and Technology for U.S. Navy Engineering Field Activity Northwest. July.

DON. 2019. Long-Term Monitoring Report, Van Meter Road Spill/Drum storage Area, Operable Unit 2, Area 2. Prepared by Sealaska Environmental Service,s LLC. December.

DON. 2020. *Fifth Five-Year Review, Naval Base Kitsap Keyport. Operational Units 1 and 2, Keyport, Washington*. December.

DON. 2022. *Tier I Sampling and Analysis Plan, Soil and Groundwater Investigation, Operable Unit 2 Area 2, Van Meter Road Spill/Drum Storage Site. Naval Base Kitsap, Keyport, Washington*. April.

Naval Facilities Engineering Systems Command Northwest (NAVFAC NW). 2019. Environmental Restoration Program Standard Operating Procedures. Version 6.1. February.

SCS Engineers. 1984. NEESA 13-054. *International Assessment Study of Naval Undersea Warfare Engineering Station, Keyport, Washington*.

Washington Department of Ecology. 1993. *Implementation Memo No. 3: Practical Quantitation Limits as Cleanup Standards.* August.

Appendix A
Field Forms and Logbooks

This page intentionally left blank

EA Engineering, Science, and Technology, Inc., PBC
2200 Sixth Avenue, Suite 707
Seattle, WA 98121

FIELD CHANGE REQUEST (FCR)

TASK ORDER	FCR #	DATE
N44255-21F-4076	21F4076-02	30 June 2022
CONTRACTOR	**LOCATION**	**NTR/RPM**
EA Engineering, Science, and Technology, Inc., PBC	Naval Base Kitsap Keyport – Operable Unit 2, Area 2	Carlotta Cellucci & Amanda Rohrbaugh

1. Document to be changed. (Identify version #, date, section, drawing, etc. to be changed)

Final Tier I Sampling and Analysis Plan, Soil and Groundwater Investigation, Operable Unit 2, Area 2, Van Meter Road Spill/Drum Storage Site, Naval Base Kitsap Keyport (issued 29 April 2021); herein referred to as the SAP

2. Description of existing requirement and reason for the change (attach additional sheets/figures as needed)

Worksheet (WS) #17 Table 17-1 of the SAP indicates a maximum depth of 20 feet (ft) below ground surface (bgs) for monitoring wells 2MW-9 and 2MW-10 and a maximum depth of 40 ft bgs for 2MW-17, 2MW-18, New Well 11 (at location SB-19 and now identified as 2MW-19), and New Well 12. The proposed changes identified in Section 3 (below) will be implemented to achieve deeper borings and wells at down gradient locations 2MW-9 and 2MW-10. Additionally, the RPM determined that project objectives will be satisfied without digging SB-20 or installing New Well 12 and that the planned coverage or footage may be better suited to being applied to an increased depth at another location if evidence of contamination is observed in the field. A portion of this extra footage was utilized at SB-12 which was advanced to 25 ft bgs (due to contamination observed in that boring at approximately 10 ft bgs).

WS #18 states that soil samples will be collected from locations SB-17, SB-18, and SB-19 at the following depths (ft bgs): 20 to 20.5, 30 to 30.5, and 39.5 to 40.0. Because of the changes/switches in soil boring depths at these locations, the proposed changes identified in Section 3 (below) will be implemented.

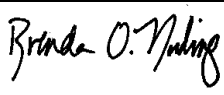
WS #18 states that soil samples will be collected from SB-20 at the following depths (ft bgs): 0.0 to 0.5, 10.0 to 10.5, 20.0 to 20.5, 30.0 to 30.5, and 39.5 to 40.0. WS#18 also states that a groundwater sample will be collected from corresponding New Well 12. No soil or groundwater samples will be collected at SB-20 or New Well 12 because no boring or well will be completed at this location.

WS #18 Footnote 4 states that five samples will be collected from each borehole from depths spread out relatively evenly (e.g., approximately every 5 feet for a 20-foot well, approximately every 10 feet for a 40-foot well).

3. Proposed change(s). (Attach additional sheets/figures as needed)

Monitoring wells 2MW-9 and 2MW-10 will have a maximum depth of 40 ft bgs; monitoring wells 2MW-17, 2MW-18, and 2MW-19 will have a maximum depth of 20 ft bgs. The monitoring well identified in the SAP as New Well 12 (associated with SB 20) will not be installed; however, the planned footage at this location may be applied to increase the depth at another well(s) if determined necessary by the RPM.

Instead of collecting soil samples from locations SB-17 and SB-18 at depths (ft bgs) of 30 to 30.5 and 39.5 to 40.0, soil samples will be collected at 30 ft bgs and 40 ft bgs at SB-9 and SB-10. Soil samples will not be collected beyond 20 ft bgs from SB-17, SB-18, and SB-19. No soil samples will be collected at location SB-20; no groundwater samples will be collected from New Well 12.

4. Originator (Print)	Signature	Title	Date
Dana Ramquist		Task Order Manager	30 June 2022
5. Reviewed by (Print)	**Signature**	**Title**	**Date**
Camille Warren		Project Quality Control Manager	5 July 2022
Brenda Nuding		Program QA Manager	30 June 2022
Carlotta Cellucci		NAVFAC NW NTR/RPM	

This page intentionally left blank

Table 17-1. Annual Sample Locations, Analytical Parameters, and Well Construction Data

Location	Matrix Type	VOCs (9)[1/] (SW8260D)	PFAS (LC/MS/MS compliant with 2019 QSM Version 5.3 Table B-15)	Vinyl chloride (SW8260D)	Salinity, Temperature, and Dissolved Oxygen	Collect Water Level	Screened Interval of Well (feet below toc)	Total Well Depth (feet below toc)
OU 1 Area 1 Monitoring Wells								
1MW-1	GW	X	X	--	X	X	5.5-15.5	17.45
1MW-4	GW	X	X	--	X	X	15-25	26.59
MW1-2	GW	X	X	--	X	X	12.5-17.5	20.5
MW1-3	GW	X	X	--	X	X	5.5-10.5	11.21
MW1-4	GW	X	X	--	X	X	7-12	15.41
MW1-5	GW	X	X	--	X	X	6-11	14.26
MW1-6	GW	X	X	--	X	X	8-13	16.04
MW1-9	GW	X	X	--	X	X	48.5-58.5	61.2
MW1-10	GW	X	X	--	X	X	4-14	16.78
MW1-11	GW	X	X	--	X	X	54.5-59.5	63.5
MW1-14	GW	X	X	--	X	X	9-14	15.61
MW1-15	GW	X	X	--	X	X	6 - 11	11.99
MW1-17	GW	X	X	--	X	X	7.5-12.5	16.22
MW1-18	GW	X	X	--	X	X	12-17	20.55
~~MW1-19~~	~~GW~~	~~X~~	~~X~~	~~--~~	~~X~~	~~X~~	~~7.5-12.5~~	~~16.42~~
MW1-20	GW	X	X	--	X	X	10-15	16.06
MW1-23	GW	X	X	--	X	X	21-26	29.99
MW1-24	GW	X	X	--	X	X	23-28	28.97
MW1-25	GW	X	X	--	X	X	38-48	51.62

Location	Matrix Type	VOCs (9)[1/] (SW8260D)	PFAS (LC/MS/MS compliant with 2019 QSM Version 5.3 Table B-15)	Vinyl chloride (SW8260D)	Salinity, Temperature, and Dissolved Oxygen	Collect Water Level	Screened Interval of Well (feet below toc)	Total Well Depth (feet below toc)
MW1-27	GW	X	X	--	X	X	24-29	30
MW1-28	GW	X	X	--	X	X	39-44	48.78
MW1-29	GW	X	X	--	X	X	31.5-36.5	39.63
MW1-31	GW	X	X	--	X	X	17-22	23.12
MW1-38	GW	X	X	--	X	X	44-49	50.23
MW1-39	GW	X	X	--	X	X	27.7-32.7	33.45
MW1-41	GW	X	X	--	X	X	5-15	17.74
MW1-42	GW	X	X	--	X	X	14.5-24.5	25
MW1-43	GW	X	X	--	X	X	14.5-24.5	25
MW1-44	GW	X	X	--	X	X	17.5-27.5	28
MW1-45	GW	X	X	--	X	X	14.5-24.5	25
MW1-46	GW	X	X	--	X	X	23.5-33.5	34
MW1-47	GW	X	X	--	X	X	14.5-24.5	25
MW1-48	GW	X	X	--	X	X	14.5-24.5	25
MW1-49	GW	X	X	--	X	X	4.5-14.5	15
MW1-50	GW	X	X	--	X	X	4.5-14.5	15
MW1-51	GW	X	X	--	X	X	9.5-19.5	20
MW1-52	GW	X	X	--	X	X	6.5-16.5	17
MW1-53	GW	X	X	--	X	X	4.5-14.5	15
MW1-54	GW	X	X	--	X	X	28.5-38.5	39
MW1-55	GW	X	X	--	X	X	26-36	36.5
MW1-56, Channel 2	GW	X	X	--	X	X	9.75-10.25	14

Location	Matrix Type	VOCs (9)[1/] (SW8260D)	PFAS (LC/MS/MS compliant with 2019 QSM Version 5.3 Table B-15)	Vinyl chloride (SW8260D)	Salinity, Temperature, and Dissolved Oxygen	Collect Water Level	Screened Interval of Well (feet below toc)	Total Well Depth (feet below toc)
MW1-56, Channel 1	GW	X	X	--	X	X	21.75-22.25	26
MW1-56, Channel 0	GW	X	X	--	X	X	33.75-34.25	41
MW1-58, Channel 2	GW	X	X	--	X	X	6.75-7.25	11
MW1-58, Channel 1	GW	X	X	--	X	X	16.75-17.25	21
MW1-58, Channel 0	GW	X	X	--	X	X	35.75-36.25	39.5
MW1-59	GW	X	X	--	X	X	61.8-71.8	75
MW1-60	GW	X	X	--	X	X	14.5-24.5	25
MW1-61	GW	X	X	--	X	X	2.64-12.64	60
MW1-62	GW	X	X	--	X	X	33.6-43.6	90
MW1-63	GW	X	X	--	X	X	32.71-42.71	75
MW1-64	GW	X	X	--	X	X	47.88-57.88	60
MW1-65	GW	X	X	--	X	X	55.88-65.88	85
MW1-67	GW	X	X	--	X	X	4.5-14.5	15
MW1-68	GW	X	X	--	X	X	38.95-48.95	80
P1-01	GW	X	X	--	X	X	10-15	17.51
P1-02	GW	X	X	--	X	X	10-15	17.61
P1-03	GW	X	X	--	X	X	10-15	18.03
P1-04	GW	X	X	--	X	X	10-15	16.86
P1-09	GW	X	X	--	X	X	10-15	15
OU 2 Area 2 Monitoring Wells								
2MW-1	GW	--	--	X	X	X	3-18	17.69

Location	Matrix Type	VOCs (9)[1/] (SW8260D)	PFAS (LC/MS/MS compliant with 2019 QSM Version 5.3 Table B-15)	Vinyl chloride (SW8260D)	Salinity, Temperature, and Dissolved Oxygen	Collect Water Level	Screened Interval of Well (feet below toc)	Total Well Depth (feet below toc)
2MW-6	GW	--	--	X	X	X	Unknown	21.11
MW2-8	GW	--	--	X	X	X	7-12	13

[1/] VOCs include 1-1, DCA, 1,2-DCA, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, PCE, 1,1,1-TCA, TCE, vinyl chloride.
btoc = below top of casing
GW = groundwater
LC/MS/MS = liquid chromatography with tandem mass spectrometry
OU = operable unit
PFAS = per- and polyfluoroalkyl substances
QSM = Quality Systems Manual for Environmental Laboratories
VOC = volatile organic compound

SAP Worksheet #20: Field Quality Control Sample Summary Table

Analysis	No. of Sampling Locations	No. of Field Duplicates	No. of MS/MSDs	No. of Field Blanks	No. of Equipment Blanks	No. of VOA Trip Blanks
Area 1						
VOCs[1/]	60	1 for every 10 primary samples	1 set for every ~~10~~ 20 primary samples	1 per day assuming samples are collected in the same area of the site	1 per day samples are collected using non-dedicated equipment	With each cooler containing samples for volatile analysis
PFAS	60	1 for every 10 primary samples	1 set for every ~~10~~ 20 primary samples	1 per day assuming samples are collected in the same area of the site	1 set for every 20 primary samples, per day, samples are collected using non-dedicated equipment	none
Area 2						
Vinyl chloride	3	1 for every 10 primary samples	1 set for every ~~10~~ 20 primary samples	1 per day assuming samples are collected in the same area of the site	1 for every 20 primary samples per day collected using non-dedicated equipment	With each cooler containing samples for volatile analysis

Notes:
[1/] VOCs include 1-1, DCA, 1,2-DCA, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, PCE, 1,1,1-TCA, TCE, and vinyl chloride.
MS – matrix spike
MSD – matric spike duplicate
PFAS – per- and polyfluoroalkyl substances
VOA – volatile organic analysis
VOC – volatile organic compound

This page intentionally left blank

EA Engineering, Science, and Technology, Inc.

2200 6th Ave, Suite 707
Seattle, WA 98121

Well Inspection, Purging, and Field Measurement Form

Contract Number: N44255-20-D-6006 | Task Order: N4425521F4076 | Naval Installation: Keyport | Site Name: OU2

Well Data

Well ID: 2MW-9 | Depth to Water (ft btoc): 6.73 | Well Volume (liters): 5.0

Total Well Depth (ft btoc): 37.60 | Depth to Product (ft btoc): NA | Volume Pre-Purged (liters): 0.0

Mid Screen Depth (ft btoc): _____ | Product Thickness (ft): NA | Well Volume Purged (liters): 5.0

Purge Method: ~~Peristaltic~~/Submersible/Bladder/Other: _____ | Purge Rate (liters/min): 0.2

Well Inspection

Well Locked: Y:__ N: ✓ | Dedicated Pump: Y:__ N: ✓ | Pooled Water in Monument: Y:__ N: ✓

Exterior Seal Good: Y: ✓ N:__ | Dedicated Discharge Tubing: Y: ✓ N:__ | Maintenance/Repairs Needed: Y:__ N: ✓

Remarks: NA

Water Sample Data

Sample ID: Area2-22-2MW-9 | Type: ENV | Date: 7/11/22 | Time: 1455 | # Containers: 3

QC Sample ID: Area2-22-2MW-9B | Type: FD | Date: 7/11/22 | Time: 1500 | # Containers: 3

Sampling Personnel: BH, DR

Remarks (color, odor, etc.): clear, no odor

Time	Purge Vol. (liters)	Depth to Water (ft btoc)	pH	Spec. Cond. (ms/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (°C)	Salinity (%)	ORP (mv)	Comments
Stabilization Requirements			(± 10%)	(± 10%)	(± 10% or <10)	NA	(± 10%)	NA	NA	
1420	—	6.73	Initial Depth to Water							
1425	Begin	purge, set flow to 0.2 L/min								NA
1430	1.0	6.82	7.17	0.281	34.99	0.70	12.8	0.13	-486.8	
1435	2.0	6.82	7.17	0.281	36.66	0.59	12.8	0.13	-500.0	
1440	3.0	6.83	7.18	0.281	29.22	0.53	12.7	0.13	-504.4	
1445	4.0	6.83	7.18	0.282	29.07	0.51	12.7	0.14	-504.3	
1450	5.0	6.83	7.18	0.280	29.84	0.49	12.6	0.13	-499.6	
1455	collect sample									
									BH	

Volume Calculations for Well Casings or Discharge Tubing

Volume (liters) = [Casing/tubing volume (liters/ft)] x [Length of water column (ft)]

Well casing diameter (in) → Well casing volume (liters/ft)	Discharge tubing diameter (in) → Discharge tubing volume (liters/ft)
(2") → 0.6 4" → 2.5 6" → 5.6	1/4" → 0.010 3/8" → 0.022 1/2" → 0.039

Recorded by: B. Haines Date: 7/11/22

Reviewed by: H. Hajek Date: 7/11/2022

Meter Model: YSI PRO DSS

EA Engineering, Science, and Technology, Inc.

2200 6th Ave, Suite 707
Seattle, WA 98121

Well Inspection, Purging, and Field Measurement Form

Contract Number: N44255-20-D-6006 | Task Order: N4425521F4076 | Naval Installation: Keyport | Site Name: OU2

Well Data

Well ID: 2MW-10 | Depth to Water (ft btoc): 7.70 | Well Volume (liters): 4.0
Total Well Depth (ft btoc): 41.51 | Depth to Product (ft btoc): NA | Volume Pre-Purged (liters): 0.0
Mid Screen Depth (ft btoc): _____ | Product Thickness (ft): NA | Well Volume Purged (liters): 4.0
Purge Method: Peristaltic/Submersible/Bladder/Other: _____ | Purge Rate (liters/min): 0.2

Well Inspection

Well Locked: Y:__ N:✓ | Dedicated Pump: Y:__ N:✓ | Pooled Water in Monument: Y:__ N:✓
Exterior Seal Good: Y:✓ N:__ | Dedicated Discharge Tubing: Y:✓ N:__ | Maintenance/Repairs Needed: Y:__ N:✓
Remarks: NA

Water Sample Data

Sample ID: Area2-22-2mw-10 | Type: Env | Date: 7/11/22 | Time: 1410 | # Containers: 3
QC Sample ID: — | Type: — | Date: — | Time: — | # Containers: —
Sampling Personnel: BH, DT
Remarks (color, odor, etc.): clear, no odor, partly cloudy

Time	Purge Vol. (liters)	Depth to Water (ft btoc)	pH	Spec. Cond. (ms/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (°C)	Salinity (%)	ORP (mv)	Comments
Stabilization Requirements			(± 10%)	(± 10%)	(± 10% or <10)	NA	(± 10%)	NA	NA	
1341	—	7.70	Initial Depth to Water							
1345	Begin	Purge	, set	flow	to 0.2 L/min					NA
1350	1.0	8.13	7.62	0.295	81.67	0.82	13.5	0.14	-484.1	
1355	2.0	8.18	7.60	0.293	71.05	0.66	13.5	0.14	-501.1	
1400	3.0	8.18	7.60	0.293	71.51	0.64	13.5	0.14	-500.8	
1405	4.0	8.18	7.60	0.292	70.89	0.58	13.4	0.14	-501.8	
1410	Collect sample									
									BH	

Volume Calculations for Well Casings or Discharge Tubing

Volume (liters) = [Casing/tubing volume (liters/ft)] x [Length of water column (ft)]

Well casing diameter (in) → Well casing volume (liters/ft)
(2") → 0.6 | 4" → 2.5 | 6" → 5.6

Discharge tubing diameter (in) → Discharge tubing volume (liters/ft)
1/4" → 0.010 | 3/8" → 0.022 | 1/2" → 0.039

Recorded by: B. Haines Date: 7/11/22
Reviewed by: H. Hajek Date: 7/11/2022

Meter Model: YSI PRO DSS

EA Engineering, Science, and Technology, Inc.

2200 6th Ave, Suite 707
Seattle, WA 98121

Well Inspection, Purging, and Field Measurement Form

Contract Number: N44255-20-D-6006
Task Order: N4425521F4076
Naval Installation: Keyport
Site Name: OU2

Well Data

Well ID: 2MW-11
Depth to Water (ft btoc): 6.54
Well Volume (liters): 7.962
Total Well Depth (ft btoc): 19.81
Depth to Product (ft btoc): NP
Volume Pre-Purged (liters): 1.0
Mid Screen Depth (ft btoc): _____
Product Thickness (ft): —
Well Volume Purged (liters): 6.0
Purge Method: Peristaltic/Submersible/Bladder/Other: _____
Purge Rate (liters/min): 0.2

Well Inspection

Well Locked: Y: ___ N: ✓
Exterior Seal Good: Y: ✓ N: ___
Dedicated Pump: Y: ___ N: ✓
Pooled Water in Monument: Y: ___ N: ✓
Dedicated Discharge Tubing: Y: ✓ N: ___
Maintenance/Repairs Needed: Y: ___ N: ✓
Remarks: None

Water Sample Data

Sample ID: AREA2-22-2MW-11 Type: ENV Date: 7/8/2022 Time: 1459 # Containers: 3
QC Sample ID: — Type: — Date: — Time: — # Containers: —
Sampling Personnel: H. Hajek, B. Haines
Remarks (color, odor, etc.): cloudy, odorless

Time	Purge Vol. (liters)	Depth to Water (ft btoc)	pH	Spec. Cond. (ms/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (°C)	Salinity (‰)	ORP (mv)	Comments
Stabilization Requirements			(± 10%)	(± 10%)	(± 10% or <10)	NA	(± 10%)	ppt NA	NA	
1420		6.54	Initial Depth to Water 0.2 L/min							
1424	Begin	Purge								NA
1429	1.0	7.01	6.43	0.290	61.88	0.58	13.9	0.14	22.8	
1434	2.0	7.19	6.42	0.289	25.77	0.56	14.1	0.14	19.4	
1439	3.0	7.24	6.42	0.289	15.86	0.55	14.0	0.14	17.1	
1444	4.0	7.27	6.43	0.289	9.79	0.54	13.9	0.14	13.0	
1449	5.0	7.30	6.43	0.289	7.59	0.51	13.9	0.14	10.0	
1454	6.0	7.33	6.43	0.289	6.39	0.50	13.8	0.14	8.1	
STABILIZED										
				7/8/2022						

Volume Calculations for Well Casings or Discharge Tubing

Volume (liters) = [Casing/tubing volume (liters/ft)] x [Length of water column (ft)]

Well casing diameter (in) → Well casing volume (liters/ft): 2" → 0.6 (circled) 4" → 2.5 6" → 5.6

Discharge tubing diameter (in) → Discharge tubing volume (liters/ft): 1/4" → 0.010 3/8" → 0.022 1/2" → 0.039

Recorded by: H. Hajek Date: 7/8/2022
Reviewed by: B. Haines Date: 7/13/22

Meter Model: YSI PRO DSS

EA Engineering, Science, and Technology, Inc.

2200 6th Ave, Suite 707
Seattle, WA 98121

Well Inspection, Purging, and Field Measurement Form

Contract Number: N44255-20-D-6006 | Task Order: N4425521F4076 | Naval Installation: Keyport | Site Name: OU2

Well Data

Well ID: 2MW-12 | Depth to Water (ft btoc): 5.70 | Well Volume (liters): 8.592
Total Well Depth (ft btoc): 20.02 | Depth to Product (ft btoc): NP | Volume Pre-Purged (liters): 1.0
Mid Screen Depth (ft btoc): _____ | Product Thickness (ft): — | Well Volume Purged (liters): 7.0
Purge Method: Peristaltic/Submersible/Bladder/Other: _____ | Purge Rate (liters/min): 0.2

Well Inspection

Well Locked: Y: __ N: ✓ | Dedicated Pump: Y: __ N: ✓ | Pooled Water in Monument: Y: __ N: ✓
Exterior Seal Good: Y: ✓ N: __ | Dedicated Discharge Tubing: Y: ✓ N: __ | Maintenance/Repairs Needed: Y: __ N: ✓
Remarks: _____

Water Sample Data

Sample ID: AREA2-22-2MW-12 | Type: ENV | Date: 7/8/2022 | Time: 1416 | # Containers: 3
QC Sample ID: — | Type: — | Date: — | Time: — | # Containers: —
Sampling Personnel: B. Haines, H. Hajek
Remarks (color, odor, etc.): bubbles in flow cell, clear, colorless, odorless

Time	Purge Vol. (liters)	Depth to Water (ft btoc)	pH	Spec. Cond. (ms/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (°C)	Salinity (%) ppt	ORP (mv)	Comments
Stabilization Requirements			(± 10%)	(± 10%)	(± 10% or <10)	NA	(± 10%)	NA	NA	
1333		5.70	Initial Depth to Water							
1336	Begin Purge									
1341	1.0	6.41	6.49	0.800	20.66	0.50	16.0	0.39	-311.2	
1346	2.0	6.46	6.50	0.756	19.88	0.45	15.7	0.37	-309.0	
1351	3.0	6.49	6.51	0.691	37.98	0.41	15.5	0.34	-307.6	Bubbles in
1356	4.0	6.53	6.52	0.685	43.30	0.41	15.5	0.33	-308.6	flow cell
1401	5.0	6.55	6.52	0.665	13.84	0.40	15.5	0.33	-314.6	
1406	6.0	6.56	6.52	0.657	13.96	0.40	15.4	0.32	-322.8	
1411	7.0	6.58	6.53	0.647	15.12	0.40	15.4	0.32	-325.9	
STABILIZED										
					7/8/2022					

Volume Calculations for Well Casings or Discharge Tubing

Volume (liters) = [Casing/tubing volume (liters/ft)] x [Length of water column (ft)]

Well casing diameter (in) → Well casing volume (liters/ft)	Discharge tubing diameter (in) → Discharge tubing volume (liters/ft)
2" → 0.6	1/4" → 0.010
4" → 2.5	3/8" → 0.022
6" → 5.6	1/2" → 0.039

Recorded by: H. Hajek Date: 7/8/2022 | Page 1 of 1 | Meter Model: YSI PRO DSS
Reviewed by: B. Haines Date: 7/13/22

EA Engineering, Science, and Technology, Inc.

2200 6th Ave, Suite 707
Seattle, WA 98121

Well Inspection, Purging, and Field Measurement Form

Contract Number: N44255-20-D-6006 | Task Order: N4425521F4076 | Naval Installation: Keyport | Site Name: OU2

Well Data

Well ID: 2MW-13 | Depth to Water (ft btoc): 6.43 | Well Volume (liters): 8.016
Total Well Depth (ft btoc): 19.79 | Depth to Product (ft btoc): NP | Volume Pre-Purged (liters): 1.0
Mid Screen Depth (ft btoc): _____ | Product Thickness (ft): — | Well Volume Purged (liters): 6.0
Purge Method: (Peristaltic)/Submersible/Bladder/Other: _____ | Purge Rate (liters/min): 0.2

Well Inspection

Well Locked: Y: ___ N: ✓ | Dedicated Pump: Y: ___ N: ✓ | Pooled Water in Monument: Y: ___ N: ✓
Exterior Seal Good: Y: ✓ N: ___ | Dedicated Discharge Tubing: Y: ✓ N: ___ | Maintenance/Repairs Needed: Y: ___ N: ✓
Remarks: None

Water Sample Data

Sample ID: AREA2-22-2MW-13 | Type: ENV | Date: 7/11/2022 | Time: 0948 | # Containers: 3
QC Sample ID: — | Type: — | Date: — | Time: — | # Containers: —
Sampling Personnel: H. Hajek, S. Stamper
Remarks (color, odor, etc.): cloudy, odorless

Time	Purge Vol. (liters)	Depth to Water (ft btoc)	pH	Spec. Cond. (ms/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (°C)	Salinity (%)	ORP (mv)	Comments
Stabilization Requirements			(± 10%)	(± 10%)	(± 10% or <10)	NA	(± 10%)	pH + NA	NA	
0914		6.43	Initial Depth to Water							
0916	Begin Purge									NA
0921	1.0	7.26	6.37	0.942	24.64	1.08	13.2	0.47	202.1	
0926	2.0	7.31	6.37	0.943	20.28	0.83	13.2	0.47	185.5	
0931	3.0	7.38	6.37	0.943	10.41	0.79	13.2	0.47	150.1	
0936	4.0	7.40	6.37	0.943	7.00	0.73	13.3	0.47	120.1	
0941	5.0	7.42	6.37	0.942	5.51	0.62	13.3	0.47	105.9	
0946	6.0	7.45	6.37	0.941	4.78	0.62	13.2	0.47	77.4	
STABILIZED										
				7/11/2022						

Volume Calculations for Well Casings or Discharge Tubing

Volume (liters) = [Casing/tubing volume (liters/ft)] x [Length of water column (ft)]

Well casing diameter (in) → Well casing volume (liters/ft)	Discharge tubing diameter (in) → Discharge tubing volume (liters/ft)
(2" → 0.6) 4" → 2.5 6" → 5.6	1/4" → 0.010 3/8" → 0.022 1/2" → 0.039

Recorded by: H. Hajek Date: 7/11/2022
Reviewed by: B. Haines Date: 7/13/22

Meter Model: YSI PRO DSS

EA Engineering, Science, and Technology, Inc.

2200 6th Ave, Suite 707
Seattle, WA 98121

Well Inspection, Purging, and Field Measurement Form

Contract Number: N44255-20-D-6006 | Task Order: N4425521F4076 | Naval Installation: Keyport | Site Name: OU2

Well Data

Well ID: 2MW-14 | Depth to Water (ft btoc): 8.60 | Well Volume (liters): 7.0

Total Well Depth (ft btoc): 22.38 | Depth to Product (ft btoc): NA | Volume Pre-Purged (liters): 0.0

Mid Screen Depth (ft btoc): _____ | Product Thickness (ft): NA | Well Volume Purged (liters): 7.0

Purge Method: ~~Peristaltic~~/Submersible/Bladder/Other: _____ | Purge Rate (liters/min): 0.2

Well Inspection

Well Locked: Y:__ N:✓ | Dedicated Pump: Y:__ N:✓ | Pooled Water in Monument: Y:__ N:✓

Exterior Seal Good: Y:✓ N:__ | Dedicated Discharge Tubing: Y:✓ N:__ | Maintenance/Repairs Needed: Y:__ N:✓

Remarks: None

Water Sample Data

Sample ID: Area22-2mw-14 | Type: MS/MSD | Date: 7/11/22 | Time: 1326 | # Containers: 9

QC Sample ID: — | Type: — | Date: — | Time: — | # Containers: —

Sampling Personnel: BH, DR

Remarks (color, odor, etc.): NA

Time	Purge Vol. (liters)	Depth to Water (ft btoc)	pH	Spec. Cond. (ms/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (°C)	Salinity (%)	ORP (mv)	Comments
Stabilization Requirements			(± 10%)	(± 10%)	(± 10% or <10)	NA	(± 10%)	NA	NA	
1240	—	8.60	Initial Depth to Water							
1246	Begin	purge, set flow to				0.2 L/min				NA
1251	1.0	11.32	6.42	0.923	17.00	0.65	12.0°C	0.46	56.0	
1256	2.0	11.61	6.43	0.919	16.60	0.61	12.6°C	0.46	19.1	
1301	3.0	11.5	6.45	0.905	14.82	0.56	12.5	0.45	-36.5	
1306	4.0	11.5	6.47	0.866	12.83	0.54	12.7	0.43	-125.8	
1311	5.0	11.5	6.45	0.859	10.92	0.55	12.8	0.42	-341.2	
1316	6.0	11.3	6.45	0.863	9.52	0.56	13.1	0.43	-358.7	
1321	7.0	11.2	6.45	0.862	8.62	0.54	13.4	0.43	-354.3	
1326	Collected Sample									

Volume Calculations for Well Casings or Discharge Tubing

Volume (liters) = [Casing/tubing volume (liters/ft)] x [Length of water column (ft)]

Well casing diameter (in) → Well casing volume (liters/ft)	Discharge tubing diameter (in) → Discharge tubing volume (liters/ft)
(2") → 0.6 4" → 2.5 6" → 5.6	1/4" → 0.010 3/8" → 0.022 1/2" → 0.039

Recorded by: B. Hawes Date: 7/11/22

Reviewed by: H. Hajek Date: 7/11/2022

Meter Model: YSI PRO DSS

EA Engineering, Science, and Technology, Inc.

2200 6th Ave, Suite 707
Seattle, WA 98121

Well Inspection, Purging, and Field Measurement Form

Contract Number: N44255-20-D-6006 | Task Order: N4425521F4076 | Naval Installation: Keyport | Site Name: OU2

Well Data

Well ID: 2MW-15 | Depth to Water (ft btoc): 6.65 | Well Volume (liters): 4.0

Total Well Depth (ft btoc): 22.11 | Depth to Product (ft btoc): NP | Volume Pre-Purged (liters): 0.0

Mid Screen Depth (ft btoc): _____ | Product Thickness (ft): — | Well Volume Purged (liters): 4.0

Purge Method: (Peristaltic)/Submersible/Bladder/Other: _____ | Purge Rate (liters/min): 0.2

Well Inspection

Well Locked: Y:__ N:✓ | Dedicated Pump: Y:__ N:✓ | Pooled Water in Monument: Y:__ N:✓

Exterior Seal Good: Y:✓ N:__ | Dedicated Discharge Tubing: Y:✓ N:__ | Maintenance/Repairs Needed: Y:__ N:✓

Remarks: NA

Water Sample Data

Sample ID: Area2-22-2MW15 | Type: ENV | Date: 7/11/22 | Time: 1144 | # Containers: 3

QC Sample ID: — | Type: — | Date: — | Time: — | # Containers: —

Sampling Personnel: DH, DR

Remarks (color, odor, etc.): clear, no odor

Time	Purge Vol. (liters)	Depth to Water (ft btoc)	pH	Spec. Cond. (ms/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (°C)	Salinity (%)	ORP (mv)	Comments
Stabilization Requirements			(± 10%)	(± 10%)	(± 10% or <10)	NA	(± 10%)	NA	NA	
1100	—	6.65	Initial Depth to Water							
1119	—	—								NA
1124	1.0	5.31	6.51	0.372	11.80	1.34	11.7	0.18	43.4	
1129	2.0	5.70	6.48	0.371	6.18	0.87	11.7	0.18	45.5	
1134	3.0	5.70	6.48	0.373	4.60	0.76	11.7	0.18	41.0	
1139	4.0	5.71	6.48	0.376	3.14	0.76	11.7	0.18	42.4	
1144	collect Sample									BH

BH

Volume Calculations for Well Casings or Discharge Tubing

Volume (liters) = [Casing/tubing volume (liters/ft)] x [Length of water column (ft)]

Well casing diameter (in) → Well casing volume (liters/ft)	Discharge tubing diameter (in) → Discharge tubing volume (liters/ft)
(2") → 0.6 4" → 2.5 6" → 5.6	1/4" → 0.010 3/8" → 0.022 1/2" → 0.039

Recorded by: B. Haines Date: 7/11/22

Reviewed by: H. Hajek Date: 7/11/2022

Meter Model: YSI PRO DSS

EA Engineering, Science, and Technology, Inc.

2200 6th Ave, Suite 707
Seattle, WA 98121

Well Inspection, Purging, and Field Measurement Form

Contract Number: N44255-20-D-6006 | Task Order: N4425521F4076 | Naval Installation: Keyport | Site Name: OU2

Well Data

Well ID: 2MW-16 | Depth to Water (ft btoc): 6.30 | Well Volume (liters): 9.216
Total Well Depth (ft btoc): 21.66 | Depth to Product (ft btoc): NP | Volume Pre-Purged (liters): 1.0
Mid Screen Depth (ft btoc): — | Product Thickness (ft): — | Well Volume Purged (liters): 3.0
Purge Method: Peristaltic/Submersible/Bladder/Other: | Purge Rate (liters/min): 0.2

Well Inspection

Well Locked: Y: N:✓ | Dedicated Pump: Y: N:✓ | Pooled Water in Monument: Y: N:✓
Exterior Seal Good: Y:✓ N: | Dedicated Discharge Tubing: Y:✓ N: | Maintenance/Repairs Needed: Y: N:✓
Remarks: None

Water Sample Data

Sample ID: AREA2-22-2MW-16 Type: ENV Date: 7/11/2022 Time: 1029 # Containers: 3
QC Sample ID: — Type: — Date: — Time: — # Containers: —
Sampling Personnel: H. Hajek, S. Stamper
Remarks (color, odor, etc.): cloudy & brown initially

Time	Purge Vol. (liters)	Depth to Water (ft btoc)	pH	Spec. Cond. (ms/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (°C)	Salinity (%)	ORP (mv)	Comments
Stabilization Requirements			(± 10%)	(± 10%)	(± 10% or <10)	NA	(± 10%)	ppt NA	NA	
1008		6.30	Initial Depth to Water							
1011	Begin Purge		@	0.2 L/min						NA
1016	1.8	7.55	6.47	0.365	67.69	0.78	12.1	0.18	35.6	
1021	2.6	8.01	6.45	0.362	69.13	0.71	12.1	0.17	36.0	
1026	3.0	8.35	6.45	0.360	66.87	0.63	12.1	0.17	36.3	
STABILIZED										
										7/11/2022

Volume Calculations for Well Casings or Discharge Tubing

Volume (liters) = [Casing/tubing volume (liters/ft)] x [Length of water column (ft)]

Well casing diameter (in) → Well casing volume (liters/ft): 2" → 0.6 | 4" → 2.5 | 6" → 5.6

Discharge tubing diameter (in) → Discharge tubing volume (liters/ft): 1/4" → 0.010 | 3/8" → 0.022 | 1/2" → 0.039

Recorded by: H. Hajek Date: 7/11/2022 Page 1 of 1 Meter Model: YSI PRO DSS
Reviewed by: B. Haines Date: 7/13/22

EA Engineering, Science, and Technology, Inc.

2200 6th Ave, Suite 707
Seattle, WA 98121

Well Inspection, Purging, and Field Measurement Form

Contract Number: N44255-20-D-6006 | Task Order: N4425521F4076 | Naval Installation: Keyport | Site Name: OU2

Well Data

Well ID: 2MW-17 | Depth to Water (ft btoc): 2.39 | Well Volume (liters): 10.506
Total Well Depth (ft btoc): 19.9 | Depth to Product (ft btoc): — | Volume Pre-Purged (liters): 1.0
Mid Screen Depth (ft btoc): _____ | Product Thickness (ft): — | Well Volume Purged (liters): 5.0
Purge Method: (Peristaltic)/Submersible/Bladder/Other: _____ | Purge Rate (liters/min): 0.2

Well Inspection

Well Locked: Y: ___ N: ✓ | Dedicated Pump: Y: ___ N: ✓ | Pooled Water in Monument: Y: ___ N: ✓
Exterior Seal Good: Y: ✓ N: ___ | Dedicated Discharge Tubing: Y: ✓ N: ___ | Maintenance/Repairs Needed: Y: ___ N: ✓
Remarks: None

Water Sample Data

Sample ID: AREA2-22-2MW-17 | Type: ENV | Date: 7/8/2022 | Time: 1226 | # Containers: 3
QC Sample ID: — | Type: — | Date: — | Time: — | # Containers: —
Sampling Personnel: B. Haines, H. Hajek
Remarks (color, odor, etc.): cloudy, brown initially, odorless

Time	Purge Vol. (liters)	Depth to Water (ft btoc)	pH	Spec. Cond. (ms/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (°C)	Salinity (%) ppt	ORP (mv)	Comments
Stabilization Requirements			(± 10%)	(± 10%)	(± 10% or <10)	NA	(± 10%)	NA	NA	
1196		2.39	Initial Depth to Water							
1156	Begin Purge		Set purge rate @ 0.2 L/m							
1201	1.0	2.61	6.83	0.487	35.69	0.72	14.0	0.24	-362.3	
1206	2.0	2.62	6.89	0.472	29.12	2.05	14.0	0.23	-306.9	
1211	3.0	2.64	6.89	0.453	32.86	0.69	13.8	0.22	~~-365.2~~	MH 7/8/22
1216	4.0	2.66	6.90	0.442	33.60	0.62	13.8	0.21	-371.1	
1221	5.0	2.68	6.91	0.419	32.80	0.56	13.9	0.20	-389.8	
STABILIZED										

Volume Calculations for Well Casings or Discharge Tubing

Volume (liters) = [Casing/tubing volume (liters/ft)] x [Length of water column (ft)]

Well casing diameter (in) → Well casing volume (liters/ft): (2" → 0.6) 4" → 2.5 6" → 5.6

Discharge tubing diameter (in) → Discharge tubing volume (liters/ft): 1/4" → 0.010 3/8" → 0.022 1/2" → 0.039

Recorded by: H. Hajek Date: 7/8/2022 Page 1 of 1
Reviewed by: B. Haines Date: 7/13/22 Meter Model: YSI PRO DSS

EA Engineering, Science, and Technology, Inc.

2200 6th Ave, Suite 707
Seattle, WA 98121

Well Inspection, Purging, and Field Measurement Form

Contract Number: N44255-20-D-6006 | Task Order: N4425521F4076 | Naval Installation: Keyport | Site Name: OU2

Well Data

Well ID: 2MW-18 | Depth to Water (ft btoc): 5.28 | Well Volume (liters): 7.644
Total Well Depth (ft btoc): 18.02 | Depth to Product (ft btoc): — | Volume Pre-Purged (liters): 1.0
Mid Screen Depth (ft btoc): _____ | Product Thickness (ft): — | Well Volume Purged (liters): 8.0
Purge Method: (Peristaltic)/Submersible/Bladder/Other: _____ | Purge Rate (liters/min): 0.2

Well Inspection

Well Locked: Y:__ N:✓ | Dedicated Pump: Y:__ N:✓ | Pooled Water in Monument: Y:__ N:✓
Exterior Seal Good: Y:✓ N:__ | Dedicated Discharge Tubing: Y:✓ N:__ | Maintenance/Repairs Needed: Y:__ N:✓
Remarks: None

Water Sample Data

Sample ID: AREA2-22-2MW-18 Type: ENV Date: 7/8/2022 Time: 1325 # Containers: 3
QC Sample ID: AREA2-22-2MW-18B Type: DUP Date: 7/8/2022 Time: 1328 # Containers: 3
Sampling Personnel: H. Hajek, B. Hajek
Remarks (color, odor, etc.): clear, colorless, odorless

Time	Purge Vol. (liters)	Depth to Water (ft btoc)	pH	Spec. Cond. (ms/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (°C)	Salinity (‰)	ORP (mv)	Comments
Stabilization Requirements			(± 10%)	(± 10%)	(± 10% or <10)	NA	(± 10%)	NA	NA	
1235		5.28	Initial Depth to Water							
1240	Begin Purge			@ 0.2 L/min						NA
1245	1.0	6.93	6.89	0.199	21.01	0.60	14.4	0.09	-339.6	
1250	2.0	7.62	6.89	0.202	29.38	0.56	14.4	0.10	-346.3	
1255	3.0	7.65	6.90	0.203	34.49	0.55	14.6	0.10	-341.1	
1300	4.0	7.70	6.90	0.206	29.24	0.53	14.6	0.10	-335.1	
1305	5.0	7.74	6.91	0.209	25.52	0.52	14.5	0.10	-309.9	
1310	6.0	7.79	6.91	0.211	25.16	0.56	14.6	0.10	-286.1	
1315	7.0	7.80	6.91	0.213	22.95	0.69	14.5	0.10	-255.7	
1320	8.0	7.82	6.91	0.214	23.43	0.76	14.6	0.10	-248.6	
STABILIZED										
				7/8/22						

Volume Calculations for Well Casings or Discharge Tubing

Volume (liters) = [Casing/tubing volume (liters/ft)] x [Length of water column (ft)]

Well casing diameter (in) → Well casing volume (liters/ft): (2" → 0.6) 4" → 2.5 6" → 5.6

Discharge tubing diameter (in) → Discharge tubing volume (liters/ft): 1/4" → 0.010 3/8" → 0.022 1/2" → 0.039

Recorded by: H. Hajek Date: 7/8/2022 Page 1 of 1 Meter Model: YSI PRO DSS
Reviewed by: B. Haines Date: 7/13/22

EA Engineering, Science, and Technology, Inc.

2200 6th Ave, Suite 707
Seattle, WA 98121

Well Inspection, Purging, and Field Measurement Form

Contract Number: N44255-20-D-6006 | Task Order: N4425521F4076 | Naval Installation: Keyport | Site Name: OU2

Well Data

Well ID: 2MW-19 | Depth to Water (ft btoc): 8.30 | Well Volume (liters): 4.0
Total Well Depth (ft btoc): 21.44 | Depth to Product (ft btoc): NA | Volume Pre-Purged (liters): 0.0
Mid Screen Depth (ft btoc): _____ | Product Thickness (ft): NA | Well Volume Purged (liters): 4.0
Purge Method: Peristaltic/Submersible/Bladder/Other: _____ | Purge Rate (liters/min): 0.2

Well Inspection

Well Locked: Y:__ N:✓ | Dedicated Pump: Y:__ N:✓ | Pooled Water in Monument: Y:__ N:✓
Exterior Seal Good: Y:✓ N:__ | Dedicated Discharge Tubing: Y:✓ N:__ | Maintenance/Repairs Needed: Y:__ N:✓
Remarks: NA

Water Sample Data

Sample ID: Area2-22-2mw19 | Type: Env | Date: 7/11/22 | Time: 1227 | # Containers: 3
QC Sample ID: — | Type: — | Date: — | Time: — | # Containers: —
Sampling Personnel: BH, DR
Remarks (color, odor, etc.): clear, no odor

Time	Purge Vol. (liters)	Depth to Water (ft btoc)	pH	Spec. Cond. (ms/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (°C)	Salinity (%)	ORP (mv)	Comments
Stabilization Requirements			(± 10%)	(± 10%)	(± 10% or <10)	NA	(± 10%)	NA	NA	
1155	—	8.30	Initial Depth to Water							
1202	—	8.30								NA
1207	1.0	10.50	6.45	0.521	21.62	4.75	12.6	0.25	126.3	
1212	2.0	10.51	6.44	0.517	21.12	4.80	12.6	0.25	128.1	
1217	3.0	10.51	6.45	0.517	21.00	4.66	12.6	0.25	130.7	
1222	4.0	10.52	6.45	0.519	21.32	4.60	12.6	0.25	131.5	
1227	collect	sample								
									BH	

Volume Calculations for Well Casings or Discharge Tubing

Volume (liters) = [Casing/tubing volume (liters/ft)] x [Length of water column (ft)]

Well casing diameter (in) → Well casing volume (liters/ft)
(2") → 0.6 4" → 2.5 6" → 5.6

Discharge tubing diameter (in) → Discharge tubing volume (liters/ft)
1/4" → 0.010 3/8" → 0.022 1/2" → 0.039

Recorded by: B. Haines Date: 7/11/22
Reviewed by: H. Mayek Date: 7/11/2022

Meter Model: YSI PRO DSS

This page intentionally left blank

EA Engineering, Science, and Technology, Inc., PBC

LOG OF SOIL BORING

Job. No. 6354426	**Client:** NAVFAC NW				**Location:** NBK Keyport	
	Project: OU2 Soil and GW Investigation					
Drilling Method: Sonic					**Soil Boring/Well Number:** 2MW-9	
Sampling Method: Continuous					**Sheet 1 of 1**	
					Drilling	
Water Level:	7.0				**Start**	**Finish**
Time:					DATE: 6/29/22	6/29/2022
Date:	6/29/2022				TIME: 11:20	TIME: 12:45

Coordinates: Northing: ____ **TOC Elevation:** N/A **Surface Elevation:** N/A **Reference Elevation:** N/A **Reference Description:** N/A

Surface Conditions: vegetation
Weather: Partly sunny
Temperature: 60s°F

USCS Class.	In. Recvrd/ In. Driven	Boring Diagram	PID (ppm) 10.6 eV with isobutylene as reference gas	Depth in Feet	
SP			0.2	0.2	0.5 Fft: brown moist fine to medium sand w/silt, organics.
				5	
				6	6 ft: grayish-brown moist, silt w/ fery fine sand, moteling; lenses of fine wet grey sand. Transitions to wet gray very fine silty sand.
				8	
			0.1	10	
ML				15	15 ft: gray, wet silty sand.
			0.1	20	20 ft: as above.
				25	
SM			0.1	30	30 ft: gray wet fine sand w/ silt, increasuing to very fine sand.
				35	32-35 ft: brownish-gray wet, very fine to medium samd w/silt.
CL			0.2	40	38-40 ft: clay, moist, dense.

End of boring at 40 ft bgs. Monitoring well installed 25-35 ft. Ecology ID tag:

Monitoring Well Construction Information

Monitoring Well Diameter:	2	in		
Bottom of Monitoring Well:	40	ft bgs		
Stick Up or Flush Mount:	Flush			
Screen Interval:	25	To	35	ft bgs
Riser Interval:	0	To	25	ft bgs
Sand Pack Interval:	23	To	35	ft bgs
Bentonite Seal:	.5	To	23	ft bgs
Surface Completion:	0	To	.5	ft bgs

Soil Vapor Point Installation Information

Depth of Soil Vapor Point:	N/A	ft
Bottom of Tubing:	--	ft
Top of Sand Pack:	--	ft
Top of Bentonite Seal:	--	ft

Concrete
Bentonite Seal
Sand Pack

Logged by: Dana Ramquist Date: 6/29/22
Drilling Contractor: AEC Envirinmental Driller: J. Wright

EA Engineering, Science, and Technology, Inc., PBC

LOG OF SOIL BORING

Job. No. 6354426	**Client:** NAVFAC NW				**Location:** NBK Keyport	
	Project: OU2 Soil and GW Investigation					
Drilling Method: Sonic					**Soil Boring/Well Number:** e 2MW-10	
Sampling Method: Continuous					**Sheet 1 of 1**	
					Drilling	
Water Level:	7.0				**Start**	**Finish**
Time:					DATE: 6/29/22	6/29/2022
Date:	6/29/2022				TIME: 16:40	TIME: 14:40

Coordinates: Northing:
TOC Elevation: N/A
Surface Elevation: N/A
Reference Elevation: N/A
Reference Description: N/A

Surface Conditions: vegetation
Weather: Partly sunny
Temperature: 60s°F

USCS Class.	In. Recvrd/ In. Driven	Boring Diagram	PID (ppm) 10.6 eV with isobutylene as reference gas	Depth in Feet	
SM			0.2	0	0.5 Fft: brown moist silt w/ fine to medium sand, organics.
SM				2	2 - 10 ft: wet, gray w/very fine sand, motteling.
				5	
				7	
			0.1	10	
ML				12	12 - 18 ft: wet dark gray silt w/ very fine to fine sand.
				15	
SP			0.1	20	20 ft: as above.
				25	
			0.1	30	30 ft_ as above.
				35	
			0.2	40	40 ft: as above w/ occasional rounded gravel.

End of boring at 40 ft bgs. Monitoring well installed 40-30 ft. Ecology ID tag:

Monitoring Well Construction Information

Monitoring Well Diameter:	2	in		
Bottom of Monitoring Well:	40	ft bgs		
Stick Up or Flush Mount:	Flush			
Screen Interval:	30	To	40	ft bgs
Riser Interval:	0	To	10	ft bgs
Sand Pack Interval:	28	To	40	ft bgs
Bentonite Seal:	.5	To	28	ft bgs
Surface Completion:	0	To	.5	ft bgs

Soil Vapor Point Installation Information

Depth of Soil Vapor Point:	N/A	ft
Bottom of Tubing:	--	ft
Top of Sand Pack:	--	ft
Top of Bentonite Seal:	--	ft

Concrete
Bentonite Seal
Sand Pack

Logged by: Dana Ramquist
Date: 6/29/22
Drilling Contractor: AEC Envirinmental
Driller: J. Wright

EA Engineering, Science, and Technology, Inc., PBC

LOG OF SOIL BORING

Job. No. 6354426	**Client:** NAVFAC NW				**Location:** NBK Keyport	
	Project: OU2 Soil and GW Investigation					
Drilling Method: Sonic					**Soil Boring/Well Number:** 2MW-11	
Sampling Method: Continuous					**Sheet 1 of 1**	
					Drilling	
Water Level:	10.5				**Start**	**Finish**
Time:					DATE: 6/28/22	6/28/2022
Date:	6/28/2022				TIME: 13:20	TIME: 14:40

Coordinates: Northing:
TOC Elevation: N/A
Surface Elevation: N/A
Reference Elevation: N/A
Reference Description: N/A

Surface Conditions: vegetation
Weather: Sun
Temperature: 60s°F

USCS Class.	In. Recvrd/ In. Driven	Boring Diagram	PID (ppm) 10.6 eV with isobutylene as reference gas	Depth in Feet	
SM			2.6	0	0.5 ft Asphalt 0.5 ft: dry, gray fine sand w/silt, organics.
				2	
			5.1	5	5 ft: Moist, brownish-gray, silt w/ very fine sand, motteling.
SM					
			2.3	10	
SW			4.6	15	12 ft: wet brownish gray, fine silty sand w/ occasional subrounded gravel, motteling.
					15 ft: wet, grey very fine to medium sand with silt, ocassional rounded gravel.
			1.5	20	20 ft: wet, gray, very fine sand w/silt.
SW					
					End of boring at 20 ft bgs. Monitoring well installed 20-10 ft. Ecology ID tag:

Monitoring Well Construction Information

Monitoring Well Diameter:	2	in		
Bottom of Monitoring Well:	20	ft bgs		
Stick Up or Flush Mount:	Flush			
Screen Interval:	10	To	20	ft bgs
Riser Interval:	0	To	10	ft bgs
Sand Pack Interval:	8	To	20	ft bgs
Bentonite Seal:	.5	To	8	ft bgs
Surface Completion:	0	To	.5	ft bgs

Soil Vapor Point Installation Information

Depth of Soil Vapor Point:	N/A	ft
Bottom of Tubing:	--	ft
Top of Sand Pack:	--	ft
Top of Bentonite Seal:	--	ft

Concrete
Bentonite Seal
Sand Pack

Logged by: Dana Ramquist
Date: 6/28/22
Drilling Contractor: AEC Envirinmental
Driller: J. Wright

EA Engineering, Science, and Technology, Inc., PBC

LOG OF SOIL BORING

Job. No. 6354426	**Client:** NAVFAC NW				**Location:** NBK Keyport	
	Project: OU2 Soil and GW Investigation					
Drilling Method: Sonic					**Soil Boring/Well Number:** e2MW-12	
Sampling Method: Continuous					**Sheet 1 of 1**	
					Drilling	
Water Level:	10.5				**Start** DATE: 6/28/22	**Finish** 6/28/2022
Time:					TIME: 16:45	TIME: 12:30
Date:	6/28/2022					

Coordinates: Northing: ____ **TOC Elevation:** N/A **Surface Elevation:** N/A **Reference Elevation:** N/A **Reference Description:** N/A

Surface Conditions: vegetation
Weather: Sun
Temperature: 60s°F

USCS Class.	In. Recvrd/ In. Driven	Boring Diagram	PID (ppm) 10.6 eV with isobutylene as reference gas	Depth in Feet	
GW			4.6	0	0.5 ft Asphalt 1 ft: dry, dark gray sandy with subrounded to sub angular gravel.
				2	
			39.2	5	5 ft: Moist, dark grey fine silty sand, some silt and subrounded gravel, trace organics, wood debris.
SM					10 ft: Moist, dark grey fine silty sand, some silt and subrounded gravel, grades to fine sand, trace silt, organics. TPH odor.
			34.7	10	
SW			0.1	15	15 ft: wet, brownish gray very fine to fine sand, trace silt.
			4.2	20	20 ft: wet, grayish brown, very fine silty sand.
SW				25	25 ft: wet, grey silt with fine sand, ocassional subrounded gravel, motteling.
					End of boring at 25 ft bgs. Monitoring well installed 20-10 ft. Ecology ID tag:

Monitoring Well Construction Information

Monitoring Well Diameter:	2	in		
Bottom of Monitoring Well:	20	ft bgs		
Stick Up or Flush Mount:	Flush			
Screen Interval:	10	To	20	ft bgs
Riser Interval:	0	To	10	ft bgs
Sand Pack Interval:	8	To	20	ft bgs
Bentonite Seal:	.5	To	8	ft bgs
Surface Completion:	0	To	.5	ft bgs

Soil Vapor Point Installation Information

Depth of Soil Vapor Point:	N/A	ft
Bottom of Tubing:	--	ft
Top of Sand Pack:	--	ft
Top of Bentonite Seal:	--	ft

Concrete
Bentonite Seal
Sand Pack

Logged by: Dana Ramquist Date: 6/28/22
Drilling Contractor: AEC Envirinmental Driller: J. Wright

EA Engineering, Science, and Technology, Inc., PBC

LOG OF SOIL BORING

Job. No. 6354426	**Client:** NAVFAC NW				**Location:** NBK Keyport	
	Project: OU2 Soil and GW Investigation					
Drilling Method: Sonic					**Soil Boring/Well Number:** 2MW-13	
Sampling Method: Continuous					**Sheet 1 of 1**	
					Drilling	
Water Level:	10.0				**Start**	**Finish**
Time:					DATE: 6/28/22	6/28/2022
Date:	6/30/2022				TIME: 16:45	TIME: 12:30

Coordinates: Northing: ____ Easting: ____
TOC Elevation: N/A
Surface Elevation: N/A
Reference Elevation: N/A
Reference Description: N/A

Surface Conditions: vegetation
Weather: Sun
Temperature: 60s°F

USCS Class.	In. Recvrd/ In. Driven	Boring Diagram	PID (ppm) 10.6 eV with isobutylene as reference gas	Depth in Feet	
ML			0.1	0	0.5 ft dry, sandy gravel.
					2 ft: dry, dark brown fine sandy gravel, trace silt, organisc.
				2	
					3-5 ft: wet, brownish-gray silt w/ very fine sand, motteling, grades to greyish-brown very fine sand.
			0.1	5	
SM					5 ft: Moist, brownm fine to medium sand w/silt, mottleing.
			0.3	10	
SM					5-8 ft: wet, gray, very fine to medium sand, trace silt.
			0.1	15	
					18 ft - 20 ft: wet, gray, very fine to medium sand.
				18	
			4.2	20	
					End of boring at 20 ft bgs. Monitoring well installed 20-10 ft. Ecology ID tag:

Monitoring Well Construction Information

Monitoring Well Diameter:	2	in		
Bottom of Monitoring Well:	20	ft bgs		
Stick Up or Flush Mount:	Flush			
Screen Interval:	10	To	20	ft bgs
Riser Interval:	0	To	10	ft bgs
Sand Pack Interval:	8	To	20	ft bgs
Bentonite Seal:	.5	To	8	ft bgs
Surface Completion:	0	To	.5	ft bgs

Soil Vapor Point Installation Information

Depth of Soil Vapor Point:	N/A	ft
Bottom of Tubing:	--	ft
Top of Sand Pack:	--	ft
Top of Bentonite Seal:	--	ft

Concrete
Bentonite Seal
Sand Pack

Logged by: Dana Ramquist Date: 6/28/22
Drilling Contractor: AEC Envirinmental Driller: J. Wright

EA Engineering, Science, and Technology, Inc., PBC

LOG OF SOIL BORING

Job. No. 6354426	**Client:** NAVFAC NW				**Location:** NBK Keyport
	Project: OU2 Soil and GW Investigation				
Drilling Method: Sonic					**Soil Boring/Well Number:** 2MW-14
Sampling Method: Continuous					**Sheet 1 of 1**
					Drilling
Water Level:	5.0				**Start** DATE: 6/30/22
Time:					**Finish** 6/30/2022
Date:	6/30/2022				TIME: 9:30 / TIME: 12:30

Coordinates: Northing: _____
TOC Elevation: N/A
Surface Elevation: N/A
Reference Elevation: N/A
Reference Description: N/A

Surface Conditions: vegetation
Weather: Sun
Temperature: 60s°F

USCS Class.	In. Recvrd/ In. Driven	PID (ppm) 10.6 eV with isobutylene as reference gas	Depth in Feet	
SM		0.1	0	0.5 ft moist, dark brown fine to medium sand w/silt.
		0.1	5	3-5 ft: wet, brownish-gray silt w/ very fine sand, motteling, grades to greyish-brown very fine sand.
SM			8	5-8 ft: wet, gray, very fine to medium sand, trace silt.
		0.3	10	
SM		0.1	15	As above.
			18	
		4.2	20	18 ft - 20 ft: wet, gray, very fine to medium sand.
				End of boring at 20 ft bgs. Monitoring well installed 20-10 ft. Ecology ID tag:

Monitoring Well Construction Information

Monitoring Well Diameter:	2	in		
Bottom of Monitoring Well:	20	ft bgs		
Stick Up or Flush Mount:	Flush			
Screen Interval:	10	To	20	ft bgs
Riser Interval:	0	To	10	ft bgs
Sand Pack Interval:	8	To	20	ft bgs
Bentonite Seal:	.5	To	8	ft bgs
Surface Completion:	0	To	.5	ft bgs

Soil Vapor Point Installation Information

Depth of Soil Vapor Point:	N/A	ft
Bottom of Tubing:	--	ft
Top of Sand Pack:	--	ft
Top of Bentonite Seal:	--	ft

Concrete
Bentonite Seal
Sand Pack

Logged by: Dana Ramquist — Date: 6/30/22
Drilling Contractor: AEC Envirinmental — Driller: J. Wright

EA Engineering, Science, and Technology, Inc., PBC

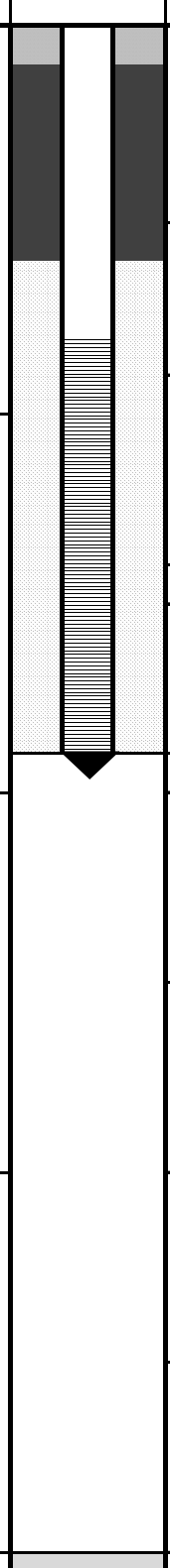
LOG OF SOIL BORING

Job. No. 6354426	**Client:** NAVFAC NW				**Location:** NBK Keyport	
	Project: OU2 Soil and GW Investigation					
Drilling Method: Sonic					**Soil Boring/Well Number:** 2MW-15	
Sampling Method: Continuous					**Sheet 1 of 1**	
					Drilling	
Water Level:	5.0				**Start**	**Finish**
Time:					DATE: 7/1/22	7/1/2022
Date:	7/1/2022				TIME: 10:00	TIME: 12:00

Coordinates: Northing: N/A
TOC Elevation: N/A
Surface Elevation: N/A
Reference Elevation: N/A
Reference Description: N/A

Surface Conditions: vegetation
Weather: Sun
Temperature: 60s°F

USCS Class.	In. Recvrd/ In. Driven	PID (ppm) 10.6 eV with isobutylene as reference gas	Depth in Feet	
ML		0.4	0	0.5 ft - 5 ft: wet, dark brown silt w/ fine sand, motteling, organics.
		0.5		
		0	5	
SM			8	8 ft: wet, gray, very fine to medium sand, trace silt.
		0.1	10	
ML				As above.
		0.1	15	
				18 ft - 20 ft: moist, grey, silt
			18	
		0.1	20	
				End of boring at 20 ft bgs. Monitoring well installed 18-8 ft. Ecology ID tag:



Monitoring Well Construction Information

Monitoring Well Diameter:	2	in		
Bottom of Monitoring Well:	18	ft bgs		
Stick Up or Flush Mount:	Flush			
Screen Interval:	8	To	18	ft bgs
Riser Interval:	0	To	8	ft bgs
Sand Pack Interval:	6	To	18	ft bgs
Bentonite Seal:	.5	To	8	ft bgs
Surface Completion:	0	To	.5	ft bgs

Soil Vapor Point Installation Information

Depth of Soil Vapor Point:	N/A	ft
Bottom of Tubing:	--	ft
Top of Sand Pack:	--	ft
Top of Bentonite Seal:	--	ft

Concrete
Bentonite Seal
Sand Pack

Logged by: Dana Ramquist
Date: 7/1/22
Drilling Contractor: AEC Envirinmental
Driller: J. Wright

EA Engineering, Science, and Technology, Inc., PBC

LOG OF SOIL BORING

Coordinates: Northing:	
TOC Elevation:	N/A
Surface Elevation:	N/A
Reference Elevation:	N/A
Reference Description:	N/A

Job. No. 6354426	**Client:** NAVFAC NW				**Location:** NBK Keyport	
	Project: OU2 Soil and GW Investigation					
Drilling Method: Sonic					**Soil Boring/Well Number:** 2MW-16	
Sampling Method: Continuous					**Sheet 1 of 1**	
					Drilling	
Water Level:	5.0				**Start** DATE: 7/1/22	**Finish** 7/1/2022
Time:						
Date:	7/1/2022				TIME: 12:30	TIME: 14:30

Surface Conditions: vegetation
Weather: Sun
Temperature: 60s°F

USCS Class.	In. Recvrd/ In. Driven	Boring Diagram	PID (ppm) 10.6 eV with isobutylene as reference gas	Depth in Feet	
ML			0.9	0	0.5 ft - 5 ft: moist, dark brown silt w/ fine sand, motteling, organics.
			1.3	5	
SM					5 ft: wet, as above increasing fine to medium sand.
SM				8	8 - 10 ft: wet, gray, very fine to medium sand, trace silt.
			0.8	10	10 - 11 ft: moist, dark grey clay, dense.
SM					12-18 ft: Wet, dark grey, very fine to medium sand, trace silt.
			1	15	
				18	18 ft - 20 ft: dark grey, very fine silty sand, dense.
			0.1	20	
					End of boring at 20 ft bgs. Monitoring well installed 18-8 ft. Ecology ID tag:

Monitoring Well Construction Information

Monitoring Well Diameter:	2	in		
Bottom of Monitoring Well:	18	ft bgs		
Stick Up or Flush Mount:	Flush			
Screen Interval:	8	To	18	ft bgs
Riser Interval:	0	To	8	ft bgs
Sand Pack Interval:	6	To	18	ft bgs
Bentonite Seal:	.5	To	8	ft bgs
Surface Completion:	0	To	.5	ft bgs

Soil Vapor Point Installation Information

Depth of Soil Vapor Point:	N/A	ft
Bottom of Tubing:	--	ft
Top of Sand Pack:	--	ft
Top of Bentonite Seal:	--	ft

Concrete
Bentonite Seal
Sand Pack

Logged by: Dana Ramquist
Date: 7/1/22
Drilling Contractor: AEC Envirinmental
Driller: J. Wright

EA Engineering, Science, and Technology, Inc., PBC

LOG OF SOIL BORING

Job. No. 6354426	**Client:** NAVFAC NW				**Location:** NBK Keyport	
	Project: OU2 Soil and GW Investigation					
Drilling Method: Sonic					**Soil Boring/Well Number:** 2MW-17	
Sampling Method: Continuous					**Sheet 1 of 1**	
					Drilling	
Water Level:	10.0				**Start** DATE: 6/27/22	**Finish** 6/27/2022
Time:						
Date:	6/27/2022				TIME: 10:00	TIME: 15:30

Coordinates: Northing: ____ N/A
TOC Elevation: N/A
Surface Elevation: N/A
Reference Elevation: N/A
Reference Description: N/A

Surface Conditions: Asphalt
Weather: Sun
Temperature: 98°F

USCS Class.	In. Recvrd/ In. Driven	Boring Diagram	PID (ppm) 10.6 eV with isobutylene as reference gas	Depth in Feet	
GW			0.1	0	0.5 ft - 5 ft: moist, brown coarce sandy gravel, wood debris, organics
			0.1	5	
SW-SM			0.2	8	5 ft: moist, brown fine to mdium sand w/silt.
SM				10	8 ft: moist, brown coarse sand w/silt. 10 ft: wet, brownish-grey fine silty sand, subrounded gravel
SM			0.2	15	15 ft: Wet, greyish-brown fine silty sand
			0.4	18	18 ft - 20 ft: wet, very fine sand with silt, reddish-brown motteling
				20	
					End of boring at 20 ft bgs. Monitoring well installed. Ecology ID tag: BNW273

Monitoring Well Construction Information

Monitoring Well Diameter:	2	in		
Bottom of Monitoring Well:	20	ft bgs		
Stick Up or Flush Mount:	Flush			
Screen Interval:	10	To	20	ft bgs
Riser Interval:	0	To	10	ft bgs
Sand Pack Interval:	8	To	20	ft bgs
Bentonite Seal:	.5	To	8	ft bgs
Surface Completion:	0	To	.5	ft bgs

Soil Vapor Point Installation Information

Depth of Soil Vapor Point:	N/A	ft
Bottom of Tubing:	--	ft
Top of Sand Pack:	--	ft
Top of Bentonite Seal:	--	ft

Concrete
Bentonite Seal
Sand Pack

Logged by: Dana Ramquist
Date: 6/27/22
Drilling Contractor: AEC Envirinmental
Driller: J. Wright

EA Engineering, Science, and Technology, Inc., PBC

LOG OF SOIL BORING

Coordinates: Northing:	
TOC Elevation:	N/A
Surface Elevation:	N/A
Reference Elevation:	N/A
Reference Description:	N/A

Job. No. 6354426	**Client:** NAVFAC NW	**Project:** OU2 Soil and GW Investigation	**Location:** NBK Keyport
Drilling Method: Sonic			**Soil Boring/Well Number:** 2MW-18
Sampling Method: Continuous			**Sheet 1 of 1**

					Drilling	
Water Level:	10.0				**Start**	**Finish**
Time:					DATE: 6/28/22	6/28/2022
Date:	6/27/2022				TIME: 10:00	TIME: 15:30

Surface Conditions: Asphalt
Weather: Sun
Temperature: 98°F

USCS Class.	In. Recvrd/ In. Driven	Boring Diagram	PID (ppm) 10.6 eV with isobutylene as reference gas	Depth in Feet	
GW			0.2	0	0.5 ft - 5 ft: moist, dark grey fine to medium sand, subrounded gravel.
			4	5	
					5 ft: moist, brownish-gray, fine to medium sand w/motteling.
SW				8	6-8 ft: moist, grey sitly sand, motteling.
			2.3	10	10 ft: wet, dark grey very fine sand with silt.
SM			0	15	15 ft: Wet, dark very fine silty sand.
				18	18 ft - 20 ft: wet, as above, some rounded gravel.
			0.1	20	
					End of boring at 20 ft bgs. Monitoring well installed 18-8. Ecology ID tag:

Monitoring Well Construction Information

Monitoring Well Diameter:	2	in		
Bottom of Monitoring Well:	18	ft bgs		
Stick Up or Flush Mount:	Flush			
Screen Interval:	8	To	18	ft bgs
Riser Interval:	0	To	8	ft bgs
Sand Pack Interval:	6	To	18	ft bgs
Bentonite Seal:	.5	To	6	ft bgs
Surface Completion:	0	To	.5	ft bgs

Soil Vapor Point Installation Information

Depth of Soil Vapor Point:	N/A	ft
Bottom of Tubing:	--	ft
Top of Sand Pack:	--	ft
Top of Bentonite Seal:	--	ft

Concrete
Bentonite Seal
Sand Pack

Logged by: Dana Ramquist
Date: 6/28/22
Drilling Contractor: AEC Envirinmental
Driller: J. Wright

EA Engineering, Science, and Technology, Inc., PBC

LOG OF SOIL BORING

Job. No. 6354426	**Client:** NAVFAC NW				**Location:** NBK Keyport	
	Project: OU2 Soil and GW Investigation					
Drilling Method: Sonic					**Soil Boring/Well Number:** 2MW-19	
Sampling Method: Continuous					**Sheet 1 of 1**	
					Drilling	
Water Level:	7.0				**Start**	**Finish**
Time:					DATE: 7/1/22	7/1/2022
Date:	7/1/2022				TIME: 8:40	TIME: 9:50

Coordinates: Northing:
TOC Elevation: N/A
Surface Elevation: N/A
Reference Elevation: N/A
Reference Description: N/A

Surface Conditions: vegitation
Weather: Sunny
Temperature: 60s°F

USCS Class.	In. Recvrd/ In. Driven	Boring Diagram	PID (ppm) 10.6 eV with isobutylene as reference gas	Depth in Feet	
			2.4	0.5	0.5 Fft: brown dry fine silty sand, organics.
SM			2.7	5	5 ft: brownish-gray, wet, very fine silty sand, motteling.
				7	
				10	10 ft: gray, wet, very fine to fine sand, trace silt, loose.
SP			1.5	15	
ML			1.3	18	18 -20: dark gray wet silt, medium dense.
			1.3	20	

End of boring at 20ft bgs. Monitoring well installed 18-20 ft. Ecology ID tag:

Monitoring Well Construction Information

Monitoring Well Diameter:	2	in		
Bottom of Monitoring Well:	18	ft bgs		
Stick Up or Flush Mount:	Flush			
Screen Interval:	8	To	18	ft bgs
Riser Interval:	0	To	18	ft bgs
Sand Pack Interval:	6	To	18	ft bgs
Bentonite Seal:	.5	To	6	ft bgs
Surface Completion:	0	To	.5	ft bgs

Soil Vapor Point Installation Information

Depth of Soil Vapor Point:	N/A	ft
Bottom of Tubing:	--	ft
Top of Sand Pack:	--	ft
Top of Bentonite Seal:	--	ft

Concrete
Bentonite Seal
Sand Pack

Logged by: Dana Ramquist
Drilling Contractor: AEC Envirinmental
Date: 7/1/22
Driller: J. Wright

This page intentionally left blank

Rite in the Rain.
ALL-WEATHER
UNIVERSAL
№ 373N

NBK - Kemper

N44255-20-D-6006

TO: 44255 21 F4076

OU2 - Soil + GW Investigations

6/27/22 through

OU Shed Code: 0237

CONTENTS

PAGE | REFERENCE | DATE

OU Shed Code 3

Stephen — Build 957

360, 440, 808

Keyport — U-2722

OU 2 - Soil Investigation

Sunny 70 - 90 F

D Ranquist, B Haines

AEC - Drilling

C. Cellucci, A. Rohrbaugh (NAVFAC)

0730 on site, waiting on drillers + RPM

delay w/ gate security, traffic backup due to add'l security checks

0815 review WP/SSHP

Pre con w/ RPMs

discussion of well depth / location

RPM decisions SB-9 + SB-10 to 40 ft, other (8) 20 ft wells same footage from add't TBD wells as optional if impacts observed → 20 ft

FCR to document well depths

Scale: 1 square = _____

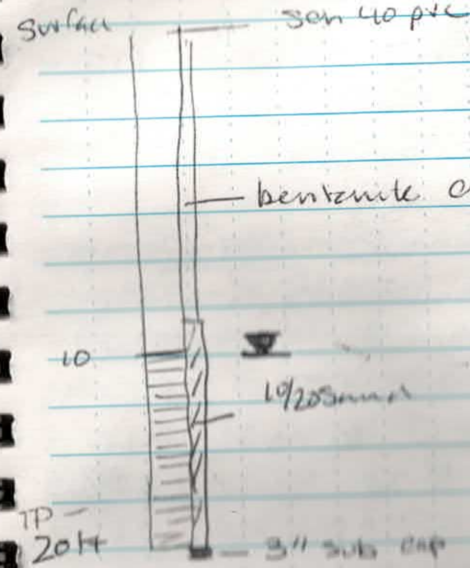
Rite in the Rain

10:00 begin drilling @ SB-17
1015 rig down fixing jaws
clear brush along back
side of fence.
1100 review boring locations
w/ RPM, 20ft height
clearance for rig mast
1200 rig jaws repaired, crew on lunch
Walk locations outside fence w/ RPM
1300 Begin drilling SB-17
Ambient PID - 0.1 FB-062722 (Field Blank)
1310 Area 2-22-SB-17-0.5
1326 wet Area 2-22-SB-17-10
1330 ~~Area 2-22-SB-17-10~~ Dup
→ Area 2-22-SB-17-1-10
1335 Area 2-22-SB-17-20
set well @ 20'
pulled well while pulling casing
redrill boring + set well 2MW-17

DL 62722

Scale: 1 square = ______

2MW-17



Set up on SB-18
prep for decon, drillers return
to shop for decon equip.
1530 end of day temps
98F unload sample supplies
@ shed OU1
gave summary of progress to RPM

D 62722

Scale: 1 square = ______

Rite in the Rain

Keyport OU2 Drilling 6-28-22

Mostly sunny, breezy 55F –
D Ramquist, B Hawks
AEC: Jenn Wright, Brandon Rich

0715 on site, prep samples,
0800 Drillers on site, tailgate
decon tooling,
Set monument @ 2MW-17
0900 Begin drilling SB-18

	Sample ID	PID
0920	Area-2-22-SB-18-0.5	2.0
0925	Area-2-22-SB-18-10	2.3
0945	Area-2-22-SB-18-20	0.1 ppm
	FB-062822 - Field Blank	

1000 Set well @ 18' 2MW-18
screen 18-8'

1040 Set up @ SB-12
lunch
~~1155~~ begin drilling SB 12
issues w/ head casing, resolved
1205 begin drilling
1210 Area-2-22-SB-12-0.5 PID [illegible]
1220 Area-2-22-SB-12-5 PID [illegible]
1230 Area-2-22-SB-12-10 PID [illegible]
1235 Area-2-22-SB-12-20 PID 2.1
1240 Area-2-22-SB-12-1-20 dup
~~1240~~ BR

BR 62822

Keyport OU2 Drilling 6-28-22

Drum Log

Date	ID	Contents
6/27/22	DRUM-01	SB-17 Soil
6/28/22	DRUM-02	SB-18 Soil
6/28/22	DRUM-03	SB-12 Soil
6/28/22	DRUM-04	SB-11 Soil
6/29/22	DRUM-05	SB-9, SB-10 Soil
6/29/22	DRUM-06	SB-14, SB-10 Soil
6/29/22	DRUM-07	SB-13 Soil
6/30/22	DRUM-08	SB-19, SB-15, SB-16 Soil
7/6/22	DRUM-09	purge water 2MW-17
7/6/22	DRUM-10	2MW-17, 2MW-18, 2MW-12
7/6/22	DRUM-11	2MW-11, 2MW-13, 2MW-16, 2MW-15
7/7/22	DRUM-12	2MW-19, 2MW-14, 2MW-10
7/7/22	DRUM-13	2MW-10, 2MW-9, 2MW-16,
7/8/22	DRUM-14	2MW-16, 2MW-9, 2MW-17, 2MW-18

1250 Area-2-22-SB-12-25 PID 0.3
1300 Set 2MW-12 @ 20ft
screen 20-10 ft, sand to 8.

BR 62822

Rite in the Rain.

Keyport OU2 Drilling 6-28-22

1320 Set up ⊙ SB-11
1340 Begin drilling SB-11

1350	Area-2-22-SB-11-0.5	PID-2.3	
~~1400~~ 1400	Area-2-22-SB-11-5	PID-5.1	
~~1405~~ 1405	Area-2-22-SB-11-1-5 (Dup)	PID-5.1	
1410	Area-2-22-SB11--10	PID-3.8	
1415	Area-2-22-SB-11-15	PID-4.6	
1420	Area-2-22-SB-11-20	PID-1.5	

Begin Setting Well 2MW-11 ⊙ 20ft
Screened 20-10

1445 Set up ⊙ SB-13
1500 Begin drilling SB-13

		PID	
1515	Area-2-22-SB-13-0.5	0.1	
1525	Area-2-22-SB-13-5	0.5	MW/MW
1530	Area-2-22-SB-13-10	0.5	
1540	Area-2-22-SB-13-15	0.4	
1545	Area-2-22-SB-13-20	0.4	

begin setting well ⊙ 20' screen 20-10'
cleanup & begin SB

DZ 6/29/22

Scale: 1 square =

Keyport OU2 Drilling 6-29-22
DRamquist, B. Haines
AEC's John

pt Sunny 60's,

0730 onsite, prep samples await drillers, mark well locations w/ stakes + flagging
0800 tailgate
0830 buried drums partially exposed discovered on east side of fence near proposed 2MW-15 location
call to RPM to notify

Set up on SB-9
Amended onsite, looked ⊙ drum location, reviewed next boring locations,
SB-9 + SB-10 to 40',
added SB-19 between SB-15 + SB-16 (20')
reserve x 35ft if needed footage based on field observations

DZ 6/29/22

Scale: 1 square =

Rite in the Rain

 Keyport OU2 Drilling 62922

1020 Begin drilling SB-9

		PID	
1020	Area-2-22-SB-9-0.5	0.2	
1030	Area-2-22-SB-9-10	0.3	
1035	Area-2-22-SB-9-1-10 (Dup)	0.2	
1040	Area-2-22-SB-9-20	0.2	Heave lose hole
1100	Area-2-22-SB-9-30	0.1	
1130	Area-2-22-SB-9-40	DR ~~0.2~~ 0.2	

RPM off site @ 1045

1145 Set well @ 35' screen 25-35'

1245 Well set 2MW-9

driller off site to get trailer

@ Bangor

1400 Set up @ SB-10

1430 begin drilling SB-10

1435 TB-62922

		PID	
1440	Area-2-22-SB-10-0.5	0.2	
1445	Area-2-22-SB-10-10	0.1	MS/MSD
1450	Area-2-22-SB-10-20	0.1	
1515	Area-2-22-SB-10-30	0.1	
1530	Area-2-22-SB-10-40	0.2	

Notes: 5' soft, wet ... heave @ 30', lose hole

1545 Set well 40'-30

BL 62922

Keyport OU2 Drilling 6-29-22

heaving sands, need water to hold bore hole open, will cleanout + set well next day.

Cleanup + secure site

1700 off site

BL 62922

Scale: 1 square = ______

Rite in the Rain

 Keyport OU2 Drilling 6-30-22
mostly sunny, 65F
D Ramquist, B Haines
AEC, John Wright, Brandon Rich

0730 - onsite, repack samples w/ ice
0800 drillers onsite tailgate
0830 Fill water tote & resume setting
ZMW-10 40 ft water used
0900 ZMW-10 Set
Screen 40-30'
Sand ~~[illegible]~~ to 28'
pack coolers
0930 set up @ SB-14
0935 FB-63022

Time	Sample	PID
1100	Area-2-22-SB-14-0.5	1.0
~~1105~~ 1010	Area-2-22-SB-14-10	0.3
1115	Area-2-22-SB-14-15	0.2
1120	Area-2-22-SB-14-20	4.2
1005	~~Area-2-22-SB-5~~ Area-2-22-SB-14-5	PID-1.4

1000 [Rig tower pin moves, send helper to get part]
1005 TB-63022 (SB-14/SB-11)
DR 63022

Keyport OU2 Drilling 63022

1125 Begin setting well ZMW-14
@ 20' Screen 20-10'
Sand to 8'

1235 Ship 2-coolers Fed Ex
(SB-17, SB-18, SB-11, SB-12)
Rig down, AEC Fixing rig
no further drilling for the day
clean up, ice samples

1630 off-site

SKIP
DR
6-30-22

SKIP
DR 6-30-22

Rite in the Rain

Keyport OU2 Drilling 7-1-22

Sunny 60's

D. Ramquist, B Haines

AEC: John Wright

0730 onsite, pick up, COCs

0800 tailgate, mob to SB-19

0840 Begin drilling SB-19

TIME	Sample ID	PID
0845	Area-2-22-SB-19-0.5	2.4
~~0855~~	Area-2-22-SB-19-5	2.7
0910	Area-2-22-SB-19-10	1.5
925	Area-2-22-SB-19-15	1.3
930	Area-2-22-SB-19-20	1.3

0900 Set Well (4) 18" screen 18-8 Chip to 6

Scale: 1 square = _____

Keyport OU2 Drilling 7-1-22

Set up on SB-15

begin drilling SB-15

	Sample ID	PID
1010	Area-2-22-SB-15-0.5	0.4
1015	Area-2-22-SB-15-1-0.5 (dup)	0.4
1020	Area-2-22-SB-15-5	0.0
1030	Area-2-22-SB-15-10	1.5
1035	Area-2-22-SB-15 (MS/MSD)	0.1
1040	Area-2-22-SB-15-20	0.1
1050	TB-7122	

1030 Set 2mw-15 (1) 18-8

1040 FB-7122

1100 Set up (4) SB-16, Lunch

1230 Begin drilling

TIME	Sample ID	PID
1240	Area-2-22-SB-16-0.5	0.9
1245	Area-2-22-SB-16-5	1.3
1250	Area-2-22-SB-16-10	0.8
1255	Area-2-22-SB-16-15	1.0
1300	Area-2-22-SB-16-20	0.1

1310 pack samples for FedEx

finish drilling & decon

take samples to FedEx

off site

Scale: 1 square = _____

Rite in the Rain

Keyport OU2 - well Dev. 7-6-22

Cloudy mid 60s

A. Ramquist, H. Hayek AEC: John Wright

0730 onsite,

0900 Drillers onsite, tailgate
demob drilling equipment

950 begin development ZMW-17
DTW - 2.41, TD - 19.85
bail well (poly bailer)
4 bailers removed

1010 Surge well

1020 bail (5 bailers)

1035 pump well ~ 3gpm

1115 development complete
~65 gal purged
Final DTW - 3.26' TD - 19.9

1130 ZMW-18 (fka BNM611)
DTW - 5.22 TD - 17.65

1140 bail well +

~~1155~~ surge well, bail well (4 bailers)

1155 pump well (?)

1204 pump stopped DTW - 9.75

Scale: 1 square = ______

Keyport OU2 9-6-22

Well Development

1208 pump well, stop recharge
reduce pump rate .5Lt/min

1220 call from RPM, 20 NTU okay
for development w/ stabilization

1230 surge well & bail

1248 recharge

1255 DTW 11.4
pump,

1326 development complete ~ 25 gal purged
Final DTW - ~~14.19~~ 12.96
DTB - 18.02

Set up @ ZMW-12 (fka BNM 612)

1330 DTW 5.78 - TD - 19.12

bail well, surge, bail
8 bailers removed

1350 pump well @ 2gpm

1420 development complete
52 gal purged
Final DTW 9.19, DTB - 20.02

Scale: 1 square = ______

Rite in the Rain

Keyport OU2 Well Development 9-6-22

0805 pt sunny showers

1440 Set up @ 2MW-11
DTW-6.77 DTB-19.08'

1443 bail well, 3 bailers

1455 pump well @ 1.25 gpm

1458 pumped dry 3 gal purged
let recharge, pump

1515 development complete
~ 14.5 gal purged

prep for drum moving,
palatize drums → tent
clean up

Well tag BNM 613

Final DTW - 8.82, DTB - 19.81

Scale: 1 square =

Keyport OU2 Well Dev 07/7/2022

0800 H. Hajek onsite

0830 AEC: John Wright HH 7/7/22 onsite, to drillers HH 7/7/22

Weather: cloudy, 61°F, 52mph

Tasks: redevelopment of 7 remaining wells

0840 H&S briefing - Topics: ppe, strain, weather

0900 Begin development 2MW-13
DTW=6.28'BTOC, DTB=19.19'BTOC HH 7/7

0902 bail well (metal bailer)
3 bailers removed

Surge well, 2 bailers removed

0908 Surge well, bail well (1 bailer)

0912 Pump well ~ 2 GPM

0942 Development complete
~ 36 Gal purged

Final DTW=10.91'BTOC, TD=19.79'BTOC

Tag: BNM 614

1000 Begin Development 2MW-16
DTW=6.06'BTOC, DTB=21.44'

1013 Bail Well (metal Bailer)
1 bailers removed

1015 Surge well

1026 Pump well ~ 2 GPM

1047 Recharging well - water level very low

1054 Resume purge

Scale: 1 square = [redacted] 7/7/22

Rite in the Rain

7/7/2022 Keyport OU2 Well Dev

1130 Development Complete
~25 gal purged
Final DTW = 16.83' BTOC DTB = 21.66'
Tag: BNM 620

1146 Begin Development 2MW-15
DTW = 6.57' BTOC DTB = 21.97'

1148 Bail well (metal bailer)
2 bailers removed

1151 Surge well, 1 bailer removed

1157 Pump well

1225 Development Complete
~17 gal purged
Final DTW = ~~22.11~~ 16.66', Final DTB = 22.11'
Tag: BNM 619

1237 Begin Development 2MW-19
DTW = 8.37' BTOC DTB = 21.26'

1246 Bail well (metal bailer)
2 bailers removed

1250 Surge well, 1 bailer removed

1255 Pump well

1355 Development complete
~19 gal purged
Final DTW = 19.11' BTOC, DTB = 21.44'
Tag: BNM 618

1411 Begin Development 2MW-14

Scale: 1 square = _____ 7/7/2022

DTW = 8.59' BTOC, DTB = 20.61'

1419 Bail well (metal bailer)
3 bailers removed

1424 Surge well,

1428 Pump well

1505 Development complete
~18 gal purged
Final DTW = 13.28' BTOC, DTB = 22.38'
Tag: BNM 617

1520 Begin Development 2MW-10
DTW = 7.74' BTOC, DTB = 41.28'

1522 Bail well (metal bailer)
1 bailer removed

1527 Surge well, 2 bailer removed

1534 Pump well

1609 Development Complete
Final DTW = 10.48' BTOC DTB = 41.51'
Tag: BNM 616
~43 gal purged

1630 End of day supplies put away
Crew offsite

7/7/22

Scale: 1 square = _____

Rite in the Rain

7/18/22 Keyport OU2 Well Dev & Sampling

1000 H. Hajek onsite to mob supplies
weather: cloudy, 63°-73°F, wind E 1 mph
~~1100 AEC John Wright onsite, B. Haines onsite~~
~~1115 H&S briefing Topics: ppe, preservatives, strain~~
~~Ar 7/8/22~~
~~Begin Development 2MW-9~~
1015 YSI Calibration
parameters Barometer: 766.0
pH 7: 6.98 → 7.03 specCond: 1.326 $\frac{mS}{cm}$ → 1.331 $\frac{mS}{cm}$
pH 4: 4.05 → 4.00 Turb: 0.39 NTU → 0.00
pH 10: 10.02 → 10.07 DO: 100.6% → 100.8%
ORP: 248.9 mV → 231.5 mV Temp: 19.0°F
1040 AEC John Wright onsite & Adam
1045 H&S Briefing by H. Hajek
Topics: ppe, preservatives, strain
1050 Begin Development 2MW-9
DTW = 6.65' BTOC, DTB = 36.84'
1053 Bail well (metal bailer)
2 bailers removed
1056 Surge well 2 bailers
1100 Pump well
1128 Development Complete
Final DTW = 21.46' BTOC, DTB = 37.60

Scale: 1 square =

Keyport OU2 Well Dev & Sampling
well tag BNM615
1146 Arrive 2MW-17
DTW = 2.39' BTOC
1156 Begin Purge
1221 Parameters Stabilized
pH = 6.91 Temp = 13.9°C
specCond = 0.419 $\frac{mS}{cm}$ Sal = 0.20 ppt
Turb = 32.80 NTU ORP = -389.8 mV
DO = 0.56 $\frac{mg}{L}$
1226 Collect Sample Area2-22-2MW-17
• x3 VOAs for cVOCs by 8260D
1228 Decon ysi
1235 Arrive 2MW-18
DTW = 5.28' BTOC
1240 Begin Purge
1320 Parameters Stabilized
pH = 6.91 Temp = 14.6°C
specCond = 0.214 $\frac{mS}{cm}$ Sal = 0.10 ppt
Turb = 23.43 NTU ORP = -248.6 mV
DO = 0.76 $\frac{mg}{L}$
1325 Collect Sample Area2-22-2MW-18
• x3 VOAs for VOCs per 8260D
1328 Collect Dup Area2-22-2MW-18B
• x3 VOAs for VOCs per 8260D
1330 Decon YSI

Scale: 1 square = 7/8/22 Rite in the Rain

7/8/2022

Keyport well DEU4 Sampling

1333 Arrive 2MW-12
DTW = 5.70' BTOC
1336 Begin Purge
1411 Parameters Stabilized
pH = 6.53 Temp: 15.4°C
SpecCond: 0.047 mS/cm Sal: 0.3
Turb = 15.12 NTU ORP = -325.9 mV
DO: 0.40 mg/L
1416 Collect Sample AREA2-22-2MW-12
• x3 VOAs for cVOCs 8260D
1418 Decon YSI
1420 Arrive 2MW-11
DTW = 6.54' BTOC
1424 Begin Purge
1454 Parameters Stabilized
pH = 6.43 Temp: 13.8°C
SpecCond = 0.289 mS/cm Sal = 0.14 ppt
Turb = 6.39 NTU ORP = 8.1 mV
DO = 0.50 mg/L
1459 Collect Sample AREA2-22-2MW-11
• x3 VOAs for cVOCs 8260D
1504 Dump all purge water in DRUM #14 Sampling water 2MW9, 2MW17, 2MW18, 2MW-11
1600 Demob, crew offsite end of day

Scale: 1 square = 7/8/2022

7/11/2022

Keyport Well DEU4 Sampling

0830 H. Hajek, S. Stamper onsite Keyport OU2
Weather 66°-80°F, wind NNE 2mph
Task: sampling redeveloped wells
Decon: spray w/ alconox & DI & wipe
Bottles: x3 VOAs w/HCL for cVOCs by 8260D
0910 H&S Briefing by H. Hajek
Topics: ppe, weather, fatigue
0914 Arrive 2MW-13
DTW: 6.43' BTOC
0916 Begin Purge
0946 Parameters Stabilized
pH = 6.37 Temp: 13.2°C
SpecCond = 0.941 mS/cm Sal = 0.47 ppt
Turb = 4.78 NTU ORP = 77.4 mV
DO = 0.62 mg/L
0948 Collect Sample AREA2-22-2MW-13
• VOCs per SAP
0955 Purge water dumped in Drum #14
1008 Arrive 2MW-16
DTW = 6.30' BTOC
1011 Begin Purge
1026 Parameters Stabilized
pH = 6.45 Temp: 12.1°C

Scale: 1 square = 7/11/2022 Rite in the Rain

 7/11/2022 Keyport Well Dev & Sampling

specCond = 0.360 mS/cm Sal = 0.17 ppt

Turb = 66.87 NTU ORP = 36.3 mV

DO = 0.63 mg/L

1029 Collect Sample AREA2-22-2MW-16

• VOCs per SAP

1035 Dump purge water in DRUM #14

1039 Mob to pick up sample

1039 [1/11 7/11/22] bottles at shed, B.Haines, D. Robertson site

1100 Arrive 2MW-15

DTW = 6.65' BTOC

1119 Begin purge, H.Hajek, S Stamper offsite

parmeters stabilized

PH - 6.48 , Temp - 11.7 °C

SPC = 0.76 mS/cm , Sal = 0.18 %

Turb = 3.14 NTU , ORP 42.4 mV

DO = 0.76 mg/L

1144 collect sample Area2-22-2mw-15

• VOCs per SAP

Dump purge water in (Drum #14)

1155 Arrive 2mw-19

DTW = 8.36

1207 Begin purge

Parameters Stabilized

PH = 6.45 , Temp - 12.6°C

SPC = 0.514 mS/cm , Sal = 0.25 %

BH

7/11/22

Keyport well Dev. + Sampling

Turb - 21.32 NTU , ORP - 131.5 mV

DO - 4.60 mg/L

1227 collect sample Area2-22-2mw-19

• VOCs per SAP

Dump per water in barrel #121

1240 Arrive 2mw-14

DTW = 8.60

1246 Begin purge

Parameters stabilized

PH - 6.45 , Temp - 13.4 C°

SPC - 0.862 mS/cm , Sal - 0.4 [illegible]

Turb - 8.62 NTU , ORP - -352.3 mV

DO - 0.54 mg/L

1326 collect Sample Area2-22-2mw-14

• VOC's per SAP

Dump purge water in barrel #14

1341 Arrive 2mw-10

DTW = 7.70

1345 Begin purge

Parameters Stabalized

PH - 7.60 , Temp - 13.4 C°

SPC - 0.292 mS/cm , Sal - 0.14%

Turb - 70.89 NTU , ORP - -501.8 mV

DO - 2.58 mg/L

1410 collect sample Area2-22-2mw-10

 Rite in the Rain BH

7/11/22 Keyport well Dev. + Sampling

- VOCs per SAP
- Dump purge water in barrel #14

1420 Arrive 2mw-9

DTW = 6.73

1425 Begin Purge

Parameters Stabilized

pH - 7.16 , SPC - 0.280 ms/cm

TURB - 24.84 NTU , DO - 0.49 mg/L

Temp 12.6 c° , sal - 0.13 %

ORP - 499.6 mV

1455 collect Sample Area2-22-2mw-9

- VOC's per SAP

1500 collect sample Area2-22-2mw-9B

- VOCs per SAP
- Dump purge water in barrel #14

1530 H. Hajek & S. Stamper on site to assist with packing & cleanup

1600 Crew offsite, end of day

7/11/2022

Scale: 1 square = _____

Scale: 1 square = _____

Rite in the Rain

EA Engineering, Science, and Technology, Inc.

2200 6th Ave, Suite 707
Seattle, WA 98121

WELL DEVELOPMENT FORM

Contract Number: N44255-20-D-6006 Task Order: N4425521F4076 Naval Installation: Keyport Site Name: 042

Well ID: 2MW-9
Start Date/Time: 7/8/2022 / 1050
End Date/Time: 7/8/2022 / 1128
Logged By: H. Hajek
Driller: AEC
Development Method:
(Bailer), Brush, (Pump), Other: surge block
Remarks:

Well Casing Diameter (in): 2
Water Column Height (ft): 30.19
Well Casing Volume[1] (liters/ft): 0.6
Well Volume (liters): 18.114
Well Volume = Water Column Height x Well Casing Volume

Initial Total Well Depth (ft btoc): 36.84
Final Total Well Depth (ft btoc): 37.60
Initial Depth to Water (ft btoc): 6.65
Final Depth to Water (ft btoc): 21.46
Total Volume Removed (liters): 30 gal

Circle One: (Stabilization Criteria Met) / 3 Hours Elapsed / 3x Well Volume Removed and Turbidity <10 NTUs

Time	Purge Rate (liters/min) gal	Total Purge (liters) gal	Depth to Water (ft btoc)	Temp. (°C)	pH	ORP (mV)	Spec. Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Comments
	Stabilization Requirements			NA	(± 0.5)	NA	(± 10%)	(± 10% or <10)	NA	
1100	Begin Purge									Well Tag BNM615
1116	2 gal	15	32.26	13.6	6.93	-317.0	0.284	75.59	5.29	
1122	2 gal	20	32.81	13.1	7.08	-334.1	0.281	40.15	4.85	
1128	2 gal	30	32.94	12.7	7.09	-341.0	0.278	17.57	4.52	

Notes: [1] Common well casing volumes include: 2" diameter → 0.6 liters/foot 4" diameter → 2.5 liters/foot 6" diameter → 5.6 liters/foot 8" diameter → 9.9 liters/foot

Recorded by: H. Hajek Date: 7/8/2022
Reviewed by: _____ Date: _____

Meter Model: YSI Pro DSS

Filename: Well Devel Form-JPHC NEX_Jul-20

EA Engineering, Science, and Technology, Inc.

2200 6th Ave, Suite 707
Seattle, WA 98121

WELL DEVELOPMENT FORM

Contract Number: N44255-20-D-6006 Task Order: N4425521F4076 Naval Installation: Keyport Site Name: 042

Well ID: 2MW-10
Start Date/Time: 7/7/2022 / 1520
End Date/Time: 7/7/2022 / 1609
Logged By: H. Hajek
Driller: AEC
Development Method: (Bailer, Brush, (Pump), Other: surgeblock
Remarks:

Well Casing Diameter (in): ~~33.54~~ 2
Water Column Height (ft): 33.54
Well Casing Volume[1] (liters/ft): 0.6
Well Volume (liters): 20.124
Well Volume = Water Column Height x Well Casing Volume

Initial Total Well Depth (ft btoc): 41.28
Final Total Well Depth (ft btoc): 41.51
Initial Depth to Water (ft btoc): 7.74
Final Depth to Water (ft btoc): 10.48
Total Volume Removed (~~liters~~ gal): 43 gal

Circle One: Stabilization Criteria Met / 2 Hours Elapsed / 3x Well Volume Removed and Turbidity <10 NTUs

Time	Purge Rate (~~liters~~/min) gal	Total Purge (~~liters~~) gal	Depth to Water (ft btoc)	Temp. (°C)	pH	ORP (mV)	Spec. Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Comments
	Stabilization Requirements			NA	(± 0.5)	NA	(± 10%)	(± 10% or <10)	NA	
1534	Begin Purge									Well Tag
1546	2 gpm	15 gal	23.72	14.0	7.64	-268.4	0.284	140.07	2.36	
1552	2 gpm	27 gal	24.08	13.9	7.32	-260.4	0.271	65.77	3.01	
1559	2 gpm	37 gal	24.39	13.4	7.20	-288.1	0.263	36.66	2.30	
1609	2 gpm	43 gal	24.59	13.9	7.04	-313.3	0.266	13.54	5.40	

Notes: [1] Common well casing volumes include: 2" diameter → 0.6 liters/foot 4" diameter → 2.5 liters/foot 6" diameter → 5.6 liters/foot 8" diameter → 9.9 liters/foot

Recorded by: H. Hajek Date: 7/7/2022
Reviewed by: _____ Date: _____

Meter Model: YSI PRO DSS

Filename: Well Devel Form-JPHC NEX_Jul-20

EA Engineering, Science, and Technology, Inc.

2200 6th Ave, Suite 707
Seattle, WA 98121

WELL DEVELOPMENT FORM

Contract Number: N44255-20-D-6004 | Task Order: N4425521F4076 | Naval Installation: Kwpar | Site Name: OU2

Well ID: 2MW-11
Start Date/Time: 7/22/ 1440
End Date/Time: 7/22/ 1315
Logged By: DRamquist
Driller: AEC
Development Method:
Bailer, Brush, Pump, Other: Surge block
Remarks:

Well Casing Diameter (in): 2"
Water Column Height (ft): 12.29
Well Casing Volume[1/] (liters/ft): .6
Well Volume (liters): 7.34
Well Volume = Water Column Height x Well Casing Volume

Initial Total Well Depth (ft btoc): 19.08
Final Total Well Depth (ft btoc): 19.81
Initial Depth to Water (ft btoc): 6.79
Final Depth to Water (ft btoc): 8.82
Total Volume Removed (liters): 14.5 gal

Circle One: Stabilization Criteria Met / 2 Hours Elapsed / 3x Well Volume Removed and Turbidity <10 NTUs

Time	Purge Rate (liters/min)	Total Purge (liters)	Depth to Water (ft btoc)	Temp. (°C)	pH	ORP (mV)	Spec. Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Comments
Stabilization Requirements				NA	(± 0.5)	NA	(± 10%)	(± 10% or <10)	NA	
1505	.5	10 gal	18.01	16.8	6.69	27.0	.347	109	8.38	
1310	.5	12.5	18.11	16.5	6.64	32.9	.343	28	8.75	
1314	.5	14.5	17.41	15.8	6.66	23.1	.345	17.8	9.00	
										Well tag BNM 013

Notes: [1/] Common well casing volumes include: 2" diameter → 0.6 liters/foot; 4" diameter → 2.5 liters/foot; 6" diameter → 5.6 liters/foot; 8" diameter → 9.9 liters/foot

Recorded by: _____ Date: _____
Reviewed by: _____ Date: _____

Meter Model: _____

Filename: Well Devel Form-JPHC NEX_Jul-20

EA Engineering, Science, and Technology, Inc.
2200 6th Ave, Suite 707
Seattle, WA 98121

WELL DEVELOPMENT FORM

Contract Number: N44255-20-D-6006 | Task Order: N4425521F4076 | Naval Installation: Keyport | Site Name: OU2

Well ID: 2MW-12
Start Date/Time: 7/6/22 / 1330
End Date/Time: 7/6/22 / 1420
Logged By: D Zamquist
Driller: ACE

Well Casing Diameter (in): 2"
Water Column Height (ft): 13.34
Well Casing Volume[1] (liters/ft): .6
Well Volume (liters): 8.00
Well Volume = Water Column Height x Well Casing Volume

Initial Total Well Depth (ft btoc): 19.12
Final Total Well Depth (ft btoc): 20.02
Initial Depth to Water (ft btoc): 5.78
Final Depth to Water (ft btoc): 9.19
Total Volume Removed (liters): 52gal

Development Method:
Bailer, Brush, Pump, Other: Surge block

Circle One: Stabilization Criteria Met | 2 Hours Elapsed | 3x Well Volume Removed and Turbidity <10 NTUs

Remarks:

Time	Purge Rate (liters/min)	Total Purge (liters)	Depth to Water (ft btoc)	Temp. (°C)	pH	ORP (mV)	Spec. Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Comments
Stabilization Requirements				NA	(± 0.5)	NA	(± 10%)	(± 10% or <10)	NA	
1400	2gpm	17gal	11.72	15.6	6.66	-112	.537	62	5.59	
1406	2gpm	28gal	14.39	15.7	6.64	-80.7	.529	56.56	6.30	
1415	2gpm	46	13.94	15.8	6.64	-67.6	.514	31.8	6.66	
1418	2gpm	52	17.71	15.5	6.48	-59.1	.508	15.65	6.92	
										Well tag 3NM612

Notes: [1] Common well casing volumes include: 2" diameter → 0.6 liters/foot 4" diameter → 2.5 liters/foot 6" diameter → 5.6 liters/foot 8" diameter → 9.9 liters/foot

Recorded by: ______ Date: ______
Reviewed by: ______ Date: ______

Page 1 of 1

Meter Model: ______

Filename: Well Devel Form-JPHC NEX_Jul-20

EA Engineering, Science, and Technology, Inc.

2200 6th Ave, Suite 707
Seattle, WA 98121

WELL DEVELOPMENT FORM

Contract Number: N44255-20-D-6006 Task Order: N4425521F4076 Naval Installation: Keyport Site Name: 042

Well ID: 2MW-13
Start Date/Time: 7/7/2022 / 0900
End Date/Time: 7/7/2022 / 0942
Logged By: H. Hajek
Driller: AEC
Development Method: (Bailer), Brush, (Pump), Other: surgeblock
Remarks:

Well Casing Diameter (in): 2
Water Column Height (ft): 12.91
Well Casing Volume[1] (liters/ft): 0.6
Well Volume (liters): 7.746
Well Volume = Water Column Height x Well Casing Volume

Initial Total Well Depth (ft btoc): 19.19
Final Total Well Depth (ft btoc): 19.79
Initial Depth to Water (ft btoc): 6.28
Final Depth to Water (ft btoc): 10.91
Total Volume Removed (liters): 36gal, (~136L)

Circle One: (Stabilization Criteria Met) 2 Hours Elapsed 3x Well Volume Removed and Turbidity <10 NTUs

Time	Purge Rate (liters/min)	Total Purge (liters)	Depth to Water (ft btoc)	Temp. (°C)	pH	ORP (mV)	Spec. Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Comments
Stabilization Requirements				NA	(± 0.5)	NA	(± 10%)	(± 10% or <10)	NA	
0912	Begin Purge									
0922	~2gpm	20gal	17.42	14.9	6.47	-47.9	0.926	98.60	6.25	Well tag BNM 614
0932	~2gpm	27gal	17.59	14.4	6.50	-36.3	0.880	32.16	7.32	
0942	~2gpm	36gal	17.42	13.9	6.52	-27.3	0855	19.25	8.03	

Notes: [1] Common well casing volumes include: 2" diameter → 0.6 liters/foot 4" diameter → 2.5 liters/foot 6" diameter → 5.6 liters/foot 8" diameter → 9.9 liters/foot

Recorded by: H. Hajek Date: 7/7/2022
Reviewed by: _____ Date: _____

Meter Model: YSI PRO DSS

Filename: Well Devel Form-JPHC NEX_Jul-20

EA Engineering, Science, and Technology, Inc.

2200 6th Ave, Suite 707
Seattle, WA 98121

WELL DEVELOPMENT FORM

Contract Number: N44255-20-D-6006 Task Order: N4425521F4076 Naval Installation: Keyport Site Name: OU2

Well ID: 2MW-14
Start Date/Time: 7/7/2022/1411
End Date/Time: 7/7/2022/1505
Logged By: H. Hajek
Driller: AEC
Development Method: Bailer, Brush, Pump, Other: Surgeblock
Remarks:

Well Casing Diameter (in): 2
Water Column Height (ft): 12.02
Well Casing Volume[1] (liters/ft): 0.6
Well Volume (liters): 7.212
Well Volume = Water Column Height x Well Casing Volume

Initial Total Well Depth (ft btoc): 20.61
Final Total Well Depth (ft btoc): 22.38
Initial Depth to Water (ft btoc): 8.59
Final Depth to Water (ft btoc): 13.28
Total Volume Removed (liters): 18 gal

Circle One: (Stabilization Criteria Met) 2 Hours Elapsed 3x Well Volume Removed and Turbidity <10 NTUs

Time	Purge Rate (liters/min) gal	Total Purge (liters) gal	Depth to Water (ft btoc)	Temp. (°C)	pH	ORP (mV)	Spec. Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Comments
	Stabilization Requirements			NA	(± 0.5)	NA	(± 10%)	(± 10% or <10)	NA	
1428	Begin Purge									Well Tag BNM 617
1444	0.5gal	8gal	19.92	22.4	7.00	-55.3	0.664	135.27	8.79	
1450	0.5gal	11gal	19.95	21.1	6.85	-70.9	0.703	220.40	10.01	large clump of stuck sand/mud moved through tubing
1505	0.5gal	18gal	19.99	20.4	6.72	-72.7	0.723	16.35	8.51	Ton of sand pulled from well

Notes: [1] Common well casing volumes include: 2" diameter → 0.6 liters/foot 4" diameter → 2.5 liters/foot 6" diameter → 5.6 liters/foot 8" diameter → 9.9 liters/foot

Recorded by: H. Hajek Date: 7/7/2022

Reviewed by: Date:

Meter Model: YSI PRO DSS

Filename: Well Devel Form-JPHC NEX_Jul-20

EA Engineering, Science, and Technology, Inc.

2200 6th Ave, Suite 707
Seattle, WA 98121

WELL DEVELOPMENT FORM

Contract Number: N44255-20-D-6006 Task Order: N4425521F4076 Naval Installation: Keyport Site Name: 042

Well ID: 2MW-15
Start Date/Time: 7/7/2022 / 1146
End Date/Time: 7/7/2022 / 1225
Logged By: H. Hajek
Driller: AEC
Development Method:
~~Bailer~~, Brush, ~~Pump~~, Other: Surgeblock
Remarks:

Well Casing Diameter (in): 2
Water Column Height (ft): 15.4
Well Casing Volume[1] (liters/ft): 0.6
Well Volume (liters): 9.24
Well Volume = Water Column Height x Well Casing Volume

Initial Total Well Depth (ft btoc): 21.97
Final Total Well Depth (ft btoc): 22.11
Initial Depth to Water (ft btoc): 6.57
Final Depth to Water (ft btoc): 16.66
Total Volume Removed (liters): 17 gal

Circle One: (Stabilization Criteria Met) 2 Hours Elapsed 3x Well Volume Removed and Turbidity <10 NTUs

Time	Purge Rate (~~liters~~ gal/min)	Total Purge (~~liters~~ gal)	Depth to Water (ft btoc)	Temp. (°C)	pH	ORP (mV)	Spec. Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Comments
Stabilization Requirements				NA	(± 0.5)	NA	(± 10%)	(± 10% or <10)	NA	
1157	Begin Purge									Well Tag
1207	1 gal	10 ~~gal~~	20.80	14.1	6.83	-60.8	0.467	131.99	8.78	
1217	1	14	20.74	12.8	6.93	-61.3	0.457	29.02	8.99	
1225	1	17	20.78	13.4	6.79	-43.9	0.441	8.64	9.37	

Notes: [1] Common well casing volumes include: 2" diameter → 0.6 liters/foot 4" diameter → 2.5 liters/foot 6" diameter → 5.6 liters/foot 8" diameter → 9.9 liters/foot

Recorded by: H. Hajek Date: 7/7/2022 Page 1 of 1 Meter Model: YSI PRODSS

Reviewed by: _____ Date: _____

Filename: Well Devel Form-JPHC NEX_Jul-20

EA Engineering, Science, and Technology, Inc.

2200 6th Ave, Suite 707
Seattle, WA 98121

WELL DEVELOPMENT FORM

Contract Number: N44255-20-D-6006 Task Order: N4425521F4076 Naval Installation: Keyport Site Name: 042

Well ID: 2MW-16
Start Date/Time: 7/7/2022 / 1000
End Date/Time: 7/7/2022 / 1130
Logged By: H. Hajek
Driller: AEC
Development Method: Bailer, Brush, (Pump), Other: Surgeblock
Remarks:

Well Casing Diameter (in): 2
Water Column Height (ft): 15.38
Well Casing Volume[1] (liters/ft): 0.6
Well Volume (liters): 9.228
Well Volume = Water Column Height x Well Casing Volume

Initial Total Well Depth (ft btoc): 21.44
Final Total Well Depth (ft btoc): 21.66
Initial Depth to Water (ft btoc): 6.06
Final Depth to Water (ft btoc): 16.88
Total Volume Removed (liters): 25 gal (~94L)

Circle One: (Stabilization Criteria Met) 2 Hours Elapsed 3x Well Volume Removed and Turbidity <10 NTUs

Time	Purge Rate ~~(liters/min)~~ gallon	Total Purge ~~(liters)~~ gallon	Depth to Water (ft btoc)	Temp. (°C)	pH	ORP (mV)	Spec. Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Comments
Stabilization Requirements				NA	(± 0.5)	NA	(± 10%)	(± 10% or <10)	NA	
1026	Begin Purge									Well Tag BNM
1041	2.0	15 10	20.47	14.3	7.36	-83.9	0.550	1670.35	9.43	
1109	2.0	23 14	20.53	14.2	6.99	-52.6	0.485	555.96	9.66	purge rate fell as water depth lowered
1116	2.0	33 18	20.60	14.2	6.97	-53.2	0.466	209.52	10.87	
1121	2.0	21	20.63	14.6	6.93	-49.2	0.451	102.32	10.67	
1130	2.0	25	20.65	14.6	6.99	-54.2	0.445	15.78	10.37	

Notes: [1] Common well casing volumes include: 2" diameter → 0.6 liters/foot 4" diameter → 2.5 liters/foot 6" diameter → 5.6 liters/foot 8" diameter → 9.9 liters/foot

Recorded by: H. Hajek Date: 7/7/2022
Reviewed by: _____ Date: _____

Meter Model: YSI PRO DSS

Filename: Well Devel Form-JPHC NEX_Jul-20

EA Engineering, Science, and Technology, Inc.

2200 6th Ave, Suite 707
Seattle, WA 98121

WELL DEVELOPMENT FORM

Contract Number: N44255-20-D-6006 Task Order: N4425521F4076 Naval Installation: Kingsport Site Name: OU2

Well ID: 2MW-17
Start Date/Time: 7/22/ 1010
End Date/Time: 7/22/ 1115
Logged By: D Danquist
Driller: AEC
Development Method:
Bailer, Brush, Pump, Other: Surge block
Remarks:

Well Casing Diameter (in): 2"
Water Column Height (ft): 17.44
Well Casing Volume[1] (liters/ft): 0.6
Well Volume (liters): 10.46
Well Volume = Water Column Height x Well Casing Volume

Initial Total Well Depth (ft btoc): 19.85 +4=
Final Total Well Depth (ft btoc): 19.9
Initial Depth to Water (ft btoc): 2.41
Final Depth to Water (ft btoc): 3.26
Total Volume Removed (~~liters~~ gal): Illegal

Circle One: Stabilization Criteria Met / 2 Hours Elapsed / 3x Well Volume Removed and Turbidity <10 NTUs

Time	Purge Rate (~~liters~~/min)	Total Purge (~~liters~~ Gal)	Depth to Water (ft btoc)	Temp. (°C)	pH	ORP (mV)	Spec. Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Comments
Stabilization Requirements				NA	(± 0.5)	NA	(± 10%)	(± 10% or <10)	NA	
1045	3	20	9.58	13.8	7.10	-274	.380	44	2.56	
1058	3	39	9.52	14.1	6.98	-325	.354	75.	2.76	
1108	3	57	9.73	13.5	7.02	-284	.337	24	3.30	
1111	3	66	9.79	13.6	6.97	-276	.332	20.	3.37	

1 2/3

Notes: [1] Common well casing volumes include: 2" diameter → 0.6 liters/foot 4" diameter → 2.5 liters/foot 6" diameter → 5.6 liters/foot 8" diameter → 9.9 liters/foot

Recorded by: _____ Date: _____ Page 1 of 1 Meter Model: _____

Reviewed by: _____ Date: _____ Filename: Well Devel Form-JPHC NEX_Jul-20

EA Engineering, Science, and Technology, Inc.

2200 6th Ave, Suite 707
Seattle, WA 98121

WELL DEVELOPMENT FORM

Contract Number: N44255-20-D-6006 Task Order: N4425521F4076 Naval Installation: Keyport Site Name: 042

Well ID: 2MW-18
Start Date/Time: 7/22/ 1130
End Date/Time: 7/22/ 1326
Logged By: DRamquist
Driller: AEC
Development Method:
Bailer, Brush, Pump, Other: Surge block
Remarks:

Well Casing Diameter (in): 2"
Water Column Height (ft): 12.43
Well Casing Volume[1] (liters/ft): 0.6
Well Volume (liters): ~~7.48~~ 7.458 HH 7/26
Well Volume = Water Column Height x Well Casing Volume

Initial Total Well Depth (ft btoc): 17.65
Final Total Well Depth (ft btoc): 18.02
Initial Depth to Water (ft btoc): 5.22
Final Depth to Water (ft btoc): 12.96
Total Volume Removed (liters): 25gal

Circle One: Stabilization Criteria Met / 2 Hours Elapsed / 3x Well Volume Removed and Turbidity <10 NTUs

Time	Purge Rate (liters/min)	Total Purge (liters)	Depth to Water (ft btoc)	Temp. (°C)	pH	ORP (mV)	Spec. Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Comments
Stabilization Requirements				NA	(± 0.5)	NA	(± 10%)	(± 10% or <10)	NA	
1228	.5 (.13gal)	13	15.42	18.9	7.22	-29.4	.322	363	8.25	
1310	.5	20gal	15.53	17.8	7.21	-31.7	.300	400	8.74	
1320	.5		15.48	18.0	7.20	-36.0	.293	39.	8.67	
1324		25	15.54	17.9	7.13	-28.5	.289	18	8.51	

Notes: [1] Common well casing volumes include: 2" diameter → 0.6 liters/foot; 4" diameter → 2.5 liters/foot; 6" diameter → 5.6 liters/foot; 8" diameter → 9.9 liters/foot

Recorded by: _____ Date: _____
Reviewed by: _____ Date: _____

Meter Model: _____

Filename: Well Devel Form-JPHC NEX_Jul-20

EA Engineering, Science, and Technology, Inc.

2200 6th Ave, Suite 707
Seattle, WA 98121

WELL DEVELOPMENT FORM

Contract Number: N44255-20-D-6006 Task Order: N4425521F4076 Naval Installation: Keyport Site Name: OU2

Well ID: 2MW-19
Start Date/Time: 7/7/2022 / 1237
End Date/Time: 7/7/2022 / 1355
Logged By: H. Hajek
Driller: AEC
Development Method:
(Bailer), Brush, (Pump), Other: Surgeblocks
Remarks:

Well Casing Diameter (in): 2
Water Column Height (ft): 12.89
Well Casing Volume[1] (liters/ft): 0.6
Well Volume (liters): 7.734
Well Volume = Water Column Height x Well Casing Volume

Initial Total Well Depth (ft btoc): 21.26
Final Total Well Depth (ft btoc): 21.44
Initial Depth to Water (ft btoc): 8.37
Final Depth to Water (ft btoc): 19.11
Total Volume Removed (liters): 19 gal

Circle One: (Stabilization Criteria Met) 2 Hours Elapsed 3x Well Volume Removed and Turbidity <10 NTUs

Time	Purge Rate (~~liters~~/min) gal	Total Purge (~~liters~~) gal	Depth to Water (ft btoc)	Temp. (°C)	pH	ORP (mV)	Spec. Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Comments
	Stabilization Requirements			NA	(± 0.5)	NA	(± 10%)	(± 10% or <10)	NA	
1255	Begin Purge			~~16.~~ HH 7/7						Well Tag HH 7/7/2022 BWM 6/7
1330	0.5	9 gal	20.39	16.7	6.73	1.1	0.608	870.58	9.26	
1340	0.5	13 gal	20.42	17.0	6.69	-12.2	0.594	229.19	9.73	water very murky, flow slowed as
1350	0.5	17 gal	20.45	17.6	6.72	-18.3	0.610	63.21	9.73	well ran out of water
1355	0.5	19 gal	20.45	18.4	6.66	-23.5	0.608	15.98	9.48	

Notes: [1] Common well casing volumes include: 2" diameter → 0.6 liters/foot 4" diameter → 2.5 liters/foot 6" diameter → 5.6 liters/foot 8" diameter → 9.9 liters/foot

Recorded by: H. Hajek Date: 7/7/2022
Reviewed by: _____ Date: _____

Meter Model: YSI PRODSS

Filename: Well Devel Form-JPHC NEX_Jul-20

This page intentionally left blank

Appendix B
Data Quality Assessment Report

This page intentionally left blank

APPENDIX B. DATA QUALITY ASSESSMENT REPORT

The purpose of this Data Quality Assessment Report, presented as an appendix to the Soil and Groundwater Investigation Report, Operable Unit 2 Area 2, Van Meter Road Spill/Drum Storage Site (herein referred to as the Soil and Groundwater Investigation Report, is to determine whether the data set collected in Summer 2022 at Naval Base Kitsap Keyport, Washington, meets the data quality objectives outlined in the Tier I Uniform Federal Policy Sampling and Analysis Plan (SAP) (Department of the Navy [DON] 2022).[1]

A quality assurance (QA)/quality control (QC) program was implemented during the field investigation to ensure the generation of data of adequate and defensible quality. The specifications for the QA/QC program are outlined in the SAP (DON 2022).[1] The QA/QC program was designed to minimize error, provide early identification and correction of potential problems, control the data acquisition process, and evaluate the performance of the sampling program. The QA/QC procedures were followed in the field as well as at the offsite laboratories.

Field Change Request (FCR) number 21F4135, which is presented in Appendix A to the Soil and Groundwater Investigation Report, was issued to address the following changes from the SAP (DON 2022)[1]:

- Drilling, collecting soil samples, and installing monitoring wells at a maximum depth of 40 feet below ground surface (bgs) at SB-9 (well 2MW-9) and SB-10 (well 2MW-10), 25 feet bgs for SB-12, and 20 feet bgs for SB-17 (well 2MW-17), SB-18 (well 2MW-18), and SB-19 (well 2MW-19)
- No drilling, well installing, or sample collecting at SB-20.
- Collecting soil samples from only three depths at SB-17 and SB-18.

Field data (including measurements of water quality parameters in water) were collected using standard operating procedures and manufacturer-recommended procedures to provide reliable results.

The data evaluation in this report focuses on environmental samples collected for offsite laboratory analysis.

[1] *Tier I Sampling and Analysis Plan for Soil and Groundwater Investigation at Operable Unit 2, Area 2, Van Meter Road Spill/Drum Storage Site at Naval Base Kitsap Keyport, Keyport, Washington.* Prepared by EA Engineering, Science, and Technology, Inc., PBC. Final. April 2022.

B.1 TEST METHODS AND LABORATORY QUALIFICATIONS

Soil and associated QC samples were collected from 27 June 2022 through 1 July 2022 and analyzed by Eurofins Lancaster Laboratories Environmental, LLC (ELLE) in Lancaster, Pennsylvania for chlorinated volatile organic compounds (cVOCs) by EPA SW-846 Method 8260D. Groundwater and associated QC samples were collected on 8 July 2022 and 11 July 2022 and analyzed for cVOCs by EPA SW-846 Method 8260D. The samples collected are presented in Table B-1.

The laboratories hold current accreditation for the scope of testing through the Department of Defense and Washington Department of Ecology Environmental Laboratory Accreditation Programs.

B.2 FIELD QUALITY CONTROL SAMPLES

In accordance with the SAP (DON 2022),[1] applicable field QC samples include field duplicates, field blanks, and trip blanks. Equipment rinsate blanks are also required in association with groundwater sampling if non-dedicated sampling equipment (e.g., a submersible pump) is used for sample collection. However, a peristaltic pump and dedicated tubing were used for the Summer 2022 event. Thus, an equipment rinsate blank was not required or collected.

A description and evaluation of each field QC sample type is presented in the following sections. The required field QC samples were collected except as indicated. Additional volumes for the preparation of matrix spike (MS)/matrix spike duplicate (MSD) samples were also collected and are discussed in Section B.3.

B.2.1 Field Duplicates

A field duplicate set consists of two samples (an original and duplicate) of the same matrix collected at the same time and location, to the extent possible, using the same sampling technique. The purpose is to evaluate the precision of the overall sample collection and analysis process by comparing the results for the two samples, including the calculation of the relative percent differences (RPDs) for detected analytes. For the Summer 2022 sampling event, the following field duplicate sets were collected:

- Primary soil sample Area-2-22-SB-9-10 and field duplicate sample Area-2-22-SB-9-1-10
- Primary soil sample Area-2-22-SB-11-5 and field duplicate sample Area-2-22-SB-11-1-5
- Primary soil sample Area-2-22-SB-12-20 and field duplicate sample Area-2-22-SB-12-1-20

- Primary soil sample Area-2-22-SB-15-0.5 and field duplicate sample Area-2-22-SB-15-1-0.5
- Primary soil sample Area-2-22-SB-17-10 and field duplicate sample Area-2-22-SB-17-1-10
- Primary groundwater sample AREA2-22-2MW-9 and field duplicate sample AREA2-22-2MW-9B
- Primary groundwater sample AREA2-22-2MW-18 and field duplicate sample AREA2-22-2MW-18B

Soil field duplicate sets were collected at a frequency of 9.8 percent, which rounds up to meet the minimum frequency of 10 percent specified in the SAP (DON 2022).[1] However, it is noted that the non-detected results for three soil field duplicate sets were rejected (qualified as "R") as discussed in Section B.4. Relatively few detections were reported for the soil samples for this project; thus, the lower than anticipated quantity of unrejected soil field duplicate results is not a significant concern.

Groundwater field duplicate sets were collected at a frequency of 18.1 percent, which meets the minimum frequency of 10 percent specified in the SAP (DON 2022).[1]

The results for the field duplicate set are summarized in Table B-2 for soil and Table B-3 for groundwater. When target analytes were detected at concentrations greater than the limits of quantitation (LOQs), the RPDs for the results of the field duplicate set are within QC limits. For the field duplicate set consisting of groundwater samples AREA2-22-2MW-18 and AREA2-22-2MW-18B, trichloroethene was detected slightly above the LOQ in sample AREA2-22-2MW-18B but was not detected in AREA2-22-2MW-18. The results were qualified as estimated ("J" and "UJ", respectively). The detected result is below the project action limit and remediation goal. The variance in results is attributed to results near the LOQ (more specifically, within a factor of two of the LOQ), where higher RPDs are common.

B.2.2 Field Blanks

Field blanks are samples of analyte-free water opened at the site and exposed to ambient conditions, collected each day and associated with samples collected the same day. Five field blank samples (one per day) were collected during the 5-day soil sampling event, which meets the frequency specified in the SAP (DON 2022)[1]. However, it is noted that the results for two of these field blanks were rejected (qualified as "R") as discussed in Section B.4. Field blank samples were also specified in the SAP (DON 2022)[1] for the groundwater sampling event; however, none were collected due to an oversight.

The field blank results are summarized in Table B-4. No target analytes were detected in the three reportable field blanks; thus, no associated sample results were qualified on the basis of field blank results. Although field blanks were not collected on for the days of groundwater sampling and results for two field blanks associated with soil sampling collection were rejected (qualified as "R"), the results of the three field blanks appear to be representative of site conditions in the timeframe that soil and groundwater sampling occurred. Therefore, reported detections for soil and groundwater samples are considered representative of the locations sampled rather than artifacts of ambient conditions.

B.2.3 Trip Blanks

Trip blanks are used to evaluate the potential for sample cross-contamination or introduction of ambient contamination with volatile contaminants during sample handling, transportation, or storage onsite or at the laboratory. Seven trip blanks were analyzed with project samples for cVOCs. The trip blank results are summarized in Tables B-5 (associated with soil samples) and B-6 (associated with groundwater samples). As discussed in Section B.4, the results for two trip blanks and associated samples were rejected (qualified as "R"). Review of the validated results for the remaining trip blanks indicates the target analytes were not detected in the trip blanks. No qualification of sample results was necessary based on trip blank results.

B.3 LABORATORY QUALITY ASSURANCE/QUALITY CONTROL

The chemical analyses were generally performed in accordance with the SAP (DON 2022)[1] by ELLE and Eurofins Seattle.

MS/MSD sample pairs were prepared by the analytical laboratory using samples designated on the chain-of-custody records at an appropriate frequency and for each preparatory batch. At the laboratory, known concentrations of target analytes were added to the sample material to prepare the MS/MSD samples. The MS/MSD samples were carried through the preparation and analytical procedures in the same manner as the associated field samples. The percent recoveries (%Rs) and RPDs of the spiked analytes in the MS/MSD samples were used to evaluate the effect of the sample matrix on accuracy and precision.

Additional laboratory QC samples (method blanks and laboratory control samples [LCSs]) were prepared alongside samples and each sample and QC sample was spiked with internal standards during sample preparation and analyzed as specified within the SAP (DON 2022).[1] These samples and spikes were used to perform the internal laboratory QC prior to the delivery of data. The laboratory's evaluation of the QC results includes comparison to the internal statistically generated control charts as well as the

project limits presented in the SAP (DON 2022) [1] to allow detections of trends or bias in the generated results.

B.4 DATA VALIDATION AND APPLIED DATA QUALIFIERS

Data validation was performed in accordance with the SAP (DON 2022) [1] by a third-party, Laboratory Data Consultants in Carlsbad, California, as described in the data validation reports presented in Attachment B-1. A minimum of 10 percent of sample data were validated at Stage 4 and the remaining data were validated at Stage 2B, as defined in the General Data Validation Guidelines (Department of Defense Environmental Data Quality Workgroup, 2019) and Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS Analysis (Department of Defense Environmental Data Quality Workgroup, 2020).

Associated sample results may be qualified when QC requirements are not achieved to determine the impact to associated sample results. Data were qualified during validation and assessment, as described below.

- The temperatures of two coolers were above 20 degrees Celsius upon arrival at ELLE. Detected results were qualified “J” and non-detected results were rejected (qualified “R”) on this basis for the soil samples from four borings (SB-11, SB-12, SB-17, and SB-18) and associated field QC samples. This includes the following samples: Area-2-22-SB-11-0.5, Area-2-22-SB-11-5, Area-2-22-SB-11-1-5, Area-2-22-SB-11-10, Area-2-22-SB-11-15, Area-2-22-SB-11-20, Area-2-22-SB-12-0.5, Area-2-22-SB-12-5, Area-2-22-SB-12-10, Area-2-22-SB-12-20, Area-2-22-SB-12-1-20, Area-2-22-SB-12-25, Area-2-22-SB-17-0.5, Area-2-22-SB-17-10, Area-2-22-SB-17-1-10, Area-2-22-SB-17-20, Area-2-22-SB-18-0.5, Area-2-22-SB-18-10, Area-2-22-SB-18-20, FB-62722, FB-62811, TB-62722, and TB-62822.
- Headspace was observed in the sample containers for three field blanks (FB-62922, FB-63022, and FB-7122). No detections were reported in these field blanks. Non-detected results were qualified “UJ”.
- The 14-day holding time specified in the SAP (DON 2022) [1] was exceeded for the following samples: Area-2-22-SB-9-30 (re-analysis), Area-2-22-SB-10-10 (re-analysis), and Area-2-22-SB-11-15 (original analysis). Detected and non-detected results reported from these analyses have been qualified “J” and “UJ,” respectively.
- The percent difference (%D) values for a continuing calibration verification was outside control limits in a few instances. The impacted analytes were not detected in any associated sample; the non-detected results were qualified “UJ”. This occurred for 1,1-dichloropropene (nine sample results), 1,2,3-trichlorobenene (13 sample results), 1,2,4-trichlorobenene (one sample result),

1,2-dichloropropane (nine sample results), chloroethane (two sample results), and methylene chloride (2 sample results).

- The %R was outside QC limits for one or more surrogate compounds for four samples (Area-2-22-SB-9-30, Area-2-22-SB-10-10, Area-2-22-SB-17-10, and Area-2-22-SB-17-20). The “J” qualifier was applied to detected results reported from an analysis when the %R was outside the control limit. The “UJ” qualifier was applied to non-detected results reported from an analysis when the %R was below the control limit.
- The area count was outside QC limits for one or more internal standards for two samples (Area-2-22-SB-9-20 and Area-2-22-SB-10-10). The “UJ” qualifier was applied to non-detected results associated with the impacted internal standard.
- Groundwater samples AREA2-22-2MW-18 and AREA2-22-2MW-18B were submitted as a primary and field duplicate pair. Trichloroethene was detected slightly above the LOQ in sample AREA2-22-2MW-18B but was not detected in AREA2-22-2MW-18. The results were qualified as “J” and “UJ”, respectively.
- Sample Area-2-22-SB-10-10 was used to prepare MS/MSD samples for cVOCs. The %Rs for 26 analytes were below the lower QC limit in the MS and/or MSD; these %Rs ranged from 14 percent to 74 percent. The non-detected results for these analytes in the primary sample have been qualified “UJ” on this basis.
- Sample Area-2-22-SB-13-5 was used to prepare MS/MSD samples for cVOCs. The %Rs for two analytes (1,2,3-trichlorobenzene and 1,2,4-trichlorobenzene) were below the lower control limit in the MS and MSD; these %Rs ranged from 54 percent to 65 percent. The non-detected results for these analytes in the primary sample have been qualified “UJ” on this basis.
- Sample AREA2-22-2MW-14 was used to prepare MS/MSD samples for cVOCs. The %R for one analyte (1,1-dichloroethene) was slightly above the upper control limit in the MS; the %R was 132 percent. Additionally, the RPD for one analyte (vinyl chloride) was slightly above the upper control limit; the RPD was 21 percent. The detected results for these analytes in the primary sample have been qualified “J” on this basis.

In addition, more than one analysis was performed and reported by the laboratory for several samples. In these cases, the data validator selected a “best” result for each target analyte based on professional judgement. The results not selected as the “best” results in these cases are not discussed in the above bullets and are not presented in the Soil and Groundwater Investigation Report.

No other qualifiers were added to the analytical results for project samples during validation or assessment. The qualifiers added to project data during data validation are summarized below.

- The “J” qualifier indicates that the reported result is an estimated value.
- The “R” qualifier indicates that the result is rejected.
- The “U” qualifier indicates that the analyte is not detected; the associated numerical value is the limit of detection or as qualified during data validation.
- The “UJ” qualifier indicates that the analyte is not detected; the associated numerical value is approximate.

Sample results as qualified are presented in the Soil and Groundwater Investigation Report.

B.5 DATA QUALITY INDICATORS

A discussion of data quality indicators for this project in terms of precision, accuracy, representativeness, completeness, comparability, and sensitivity is provided in the following sections.

B.5.1 Precision

Precision is defined as the degree of agreement among repeated measurement of the same parameter. Precision also characterizes the natural variation of the matrix. Precision is evaluated through the use of field duplicate samples and MS/MSD sets to assess the potential bias of field and laboratory conditions on the results. The quantitative indicator of precision is the RPD between the results of field duplicates and the associated primary samples and the MS/MSD pairs.

Field sample duplicate RPDs are within the SAP (DON 2022)[1] QC limits and in general agreement, unless otherwise noted in Section B.2.1 and Section B.4. Two sample results were qualified on the basis of field sample duplicate results. Overall the field duplicate sample results demonstrate that representative samples were adequately collected during field activities and that the laboratories were capable of evaluating the matrix consistently.

MS/MSD RPDs are within the SAP (DON 2022)[1] QC limits, unless otherwise noted in Attachment B-1 or Section B.4. One sample result was qualified on the basis of MS/MSD RPD.

B.5.2 Accuracy

An evaluation of accuracy monitors the agreement of measured results with “true values” established by spiking applicable samples with a known quantity of analyte, surrogate compound, or internal standard. Accuracy is measured by the %R for spiked samples (LCS, MS/MSD), surrogate compounds, and internal standards. LCS and MS/MSD samples were analyzed in accordance with the SAP (DON 2022)[1]

specifications. LCS, MS/MSD, surrogate compound, and internal standard %Rs were within acceptable project-specified QC limits, unless otherwise noted in Attachment B-1 or in Section B.4. In most cases, the project goal for accuracy was met.

B.5.3 Representativeness

Representativeness is a qualitative parameter that expresses the degree to which the sample data are characteristic of a population, parameter, or environmental condition. Representativeness is most concerned with the proper design of a sampling system and careful selection of sampling locations. Representative data were obtained through selection of sampling locations, sampling procedure collection, handling of samples, and the use of established field and laboratory procedures as described in the SAP (DON 2022)[1] except as discussed in the first bullet in Section B.4. Non-detected results for several samples were rejected (qualified "R") due to elevated temperatures incurred during sample shipment to the laboratory.

B.5.4 Completeness

Completeness is a measure of the amount of usable data obtained versus the total possible planned data. The evaluation includes a comparison of the number of valid results divided by the possible number of individual results, expressed in a percentage.

The data completeness is defined as the percentage of usable data (usable data divided by the total possible data):

$$\% \text{ completeness} = \frac{100 * \text{number of valid results (i.e., non-R flagged)}}{\text{number of planned results}}$$

Completeness for the data set is less than 100 percent due to the following:

- Borehole SB-20 was not drilled and a well at this location was not installed; therefore, no soil or groundwater samples were collected at this location. This location was considered a "contingency" location, with samples to be collected only if a boring and well were deemed necessary in the event another location was needed based on field observations. The samples at this location are not considered "planned" samples and are not used in the calculation of percent completeness.
- Soil samples were collected from three depths at SB-17 and SB-18, instead of five depths as planned.
- Presumably due to the above bullets, five soil field duplicates were collected instead of six planned soil field duplicates.

- Two field blanks associated with groundwater sampling were planned but not collected.
- As discussed in the first bullet in Section B.4, non-detected results for several samples were rejected (qualified "R") due to elevated temperatures incurred during sample shipment to the laboratory. This includes non-detected results for soil samples from four borings, SB-11 (five samples and one field duplicate), SB-12 (five samples and one field duplicate), SB-17 (three samples and one field duplicate), and SB-18 (three samples), two field blanks, and two trip blanks. (Note: a total of 5 detections were reported for these samples and qualified as "J". The remaining 754 non-detected results were rejected (qualified "R").

Excluding field QC samples, there was a total of 2,178 planned results for 33 cVOC target analytes for samples to be collected from 66 samples from 11 wells and 55 soil borehole locations and depths. As induced from the bullets above, 132 data points were not collected, and 524 results were rejected (qualified "R). Thus, there were 1,522 valid results. The % completeness for this data set is 70%, which is significantly below the 90% minimal acceptance criteria for completeness specified in the SAP (DON 2022).[1]

B.5.5 Comparability

Comparability is a qualitative parameter expressing the confidence with which one dataset can be compared with another. Sample results should be comparable with other measurements for similar samples and sample conditions. Comparability for the project was achieved by using standard protocols for sampling and analysis.

B.5.6 Sensitivity

Sensitivity was evaluated by comparing the project action levels (PALs) with the limits of detection (LODs) for each sample result. Non-detected sample results with LODs above PALs are indicated in grey highlight in Tables 6 and 7 of the Soil and Groundwater Investigation Report. As presented in the SAP (DON 2022)[1] in Worksheet #15, it was known that several LODs would be above the PALs. Other instances of LODs above PALs are as follows:

- Soil sample from SB-9 at 30 feet (ft) below ground surface (bgs), with results selected from the methanol dilution because the original results (from an aliquot preserved with sodium bisulfate) were associated with internal standard areas outside QC limits
- Soil sample from SB-19 at 10 ft bgs, with results reported from a methanol dilution; the laboratory indicated they originally performed analysis from an aliquot preserved with sodium bisulfate but didn't report results due to analytical issues with non-target analytes or interferences.

- Groundwater sample from well 2MW12, which was analyzed at a 10-fold dilution using the laboratory's low-level implementation of Method 8260D due to the sample matrix, as narrated by the laboratory.

B.6 OVERALL ASSESSMENT OF DATA

As indicated in FCR number 21F4135, which is presented in Appendix A to the Soil and Groundwater Investigation Report, and Section B.5.4, several planned samples and QC samples were not collected. Additionally, 754 results were rejected during data validation and assessment and should not be used for any purpose. The remaining results are acceptable for use as qualified.

Tables

This page intentionally left blank

Table B-1. Sample Summary

Location ID	Field Sample ID	Collected Date	QC Type	Primary Sample ID	Depth (ft bgs)	Matrix	Laboratory Sample ID	Laboratory
SB-9	Area-2-22-SB-9-0.5	29-Jun-2022	N		0.5	Soil	410-89884-7	ELLE
SB-9	Area-2-22-SB-9-10	29-Jun-2022	N		10	Soil	410-89884-8	ELLE
SB-9	Area-2-22-SB-9-1-10	29-Jun-2022	FD	Area-2-22-SB-9-10	10	Soil	410-89884-9	ELLE
SB-9	Area-2-22-SB-9-20	29-Jun-2022	N		20	Soil	410-89884-10	ELLE
SB-9	Area-2-22-SB-9-30	29-Jun-2022	N		30	Soil	410-89884-11	ELLE
SB-9	Area-2-22-SB-9-40	29-Jun-2022	N		40	Soil	410-89884-12	ELLE
SB-10	Area-2-22-SB-10-0.5	29-Jun-2022	N		0.5	Soil	410-89884-14	ELLE
SB-10	Area-2-22-SB-10-10	29-Jun-2022	N		10	Soil	410-89884-15	ELLE
SB-10	Area-2-22-SB-10-20	29-Jun-2022	N		20	Soil	410-89884-16	ELLE
SB-10	Area-2-22-SB-10-30	29-Jun-2022	N		30	Soil	410-89884-17	ELLE
SB-10	Area-2-22-SB-10-40	29-Jun-2022	N		40	Soil	410-89884-18	ELLE
SB-11	Area-2-22-SB-11-0.5	28-Jun-2022	N		0.5	Soil	410-90316-16	ELLE
SB-11	Area-2-22-SB-11-5	28-Jun-2022	N		5	Soil	410-90316-17	ELLE
SB-11	Area-2-22-SB-11-1-5	28-Jun-2022	FD	Area-2-22-SB-11-5	5	Soil	410-90316-18	ELLE
SB-11	Area-2-22-SB-11-10	28-Jun-2022	N		10	Soil	410-90316-19	ELLE
SB-11	Area-2-22-SB-11-15	28-Jun-2022	N		15	Soil	410-90316-20	ELLE
SB-11	Area-2-22-SB-11-20	28-Jun-2022	N		20	Soil	410-90316-21	ELLE
SB-12	Area-2-22-SB-12-0.5	28-Jun-2022	N		0.5	Soil	410-90316-11	ELLE
SB-12	Area-2-22-SB-12-5	28-Jun-2022	N		5	Soil	410-90316-12	ELLE
SB-12	Area-2-22-SB-12-10	28-Jun-2022	N		10	Soil	410-90316-13	ELLE
SB-12	Area-2-22-SB-12-20	28-Jun-2022	N		20	Soil	410-90316-14	ELLE
SB-12	Area-2-22-SB-12-1-20	28-Jun-2022	FD	Area-2-22-SB-12-20	20	Soil	410-90316-15	ELLE
SB-12	Area-2-22-SB-12-25	28-Jun-2022	N		25	Soil	410-90316-22	ELLE
SB-13	Area-2-22-SB-13-0.5	28-Jun-2022	N		0.5	Soil	410-89884-1	ELLE
SB-13	Area-2-22-SB-13-5	28-Jun-2022	N		5	Soil	410-89884-2	ELLE
SB-13	Area-2-22-SB-13-10	28-Jun-2022	N		10	Soil	410-89884-3	ELLE
SB-13	Area-2-22-SB-13-15	28-Jun-2022	N		15	Soil	410-89884-4	ELLE
SB-13	Area-2-22-SB-13-20	28-Jun-2022	N		20	Soil	410-89884-5	ELLE
SB-14	Area-2-22-SB-14-0.5	30-Jun-2022	N		0.5	Soil	410-89884-19	ELLE
SB-14	Area-2-22-SB-14-5	30-Jun-2022	N		5	Soil	410-89884-20	ELLE
SB-14	Area-2-22-SB-14-10	30-Jun-2022	N		10	Soil	410-89884-21	ELLE
SB-14	Area-2-22-SB-14-15	30-Jun-2022	N		15	Soil	410-89884-22	ELLE
SB-14	Area-2-22-SB-14-20	30-Jun-2022	N		20	Soil	410-89884-23	ELLE
SB-15	Area-2-22-SB-15-0.5	1-Jul-2022	N		0.5	Soil	410-89884-31	ELLE
SB-15	Area-2-22-SB-15-1-0.5	1-Jul-2022	FD	Area-2-22-SB-15-0.5	0.5	Soil	410-89884-32	ELLE

Table B-1. Sample Summary

Location ID	Field Sample ID	Collected Date	QC Type	Primary Sample ID	Depth (ft bgs)	Matrix	Laboratory Sample ID	Laboratory
SB-15	Area-2-22-SB-15-5	1-Jul-2022	N		5	Soil	410-89884-33	ELLE
SB-15	Area-2-22-SB-15-10	1-Jul-2022	N		10	Soil	410-89884-34	ELLE
SB-15	Area-2-22-SB-15-15	1-Jul-2022	N		15	Soil	410-89884-35	ELLE
SB-15	Area-2-22-SB-15-20	1-Jul-2022	N		20	Soil	410-89884-36	ELLE
SB-16	Area-2-22-SB-16-0.5	1-Jul-2022	N		0.5	Soil	410-89884-38	ELLE
SB-16	Area-2-22-SB-16-5	1-Jul-2022	N		5	Soil	410-89884-39	ELLE
SB-16	Area-2-22-SB-16-10	1-Jul-2022	N		10	Soil	410-89884-40	ELLE
SB-16	Area-2-22-SB-16-15	1-Jul-2022	N		15	Soil	410-89884-41	ELLE
SB-16	Area-2-22-SB-16-20	1-Jul-2022	N		20	Soil	410-89884-42	ELLE
SB-17	Area-2-22-SB-17-0.5	27-Jun-2022	N		0.5	Soil	410-90316-1	ELLE
SB-17	Area-2-22-SB-17-10	27-Jun-2022	N		10	Soil	410-90316-2	ELLE
SB-17	Area-2-22-SB-17-1-10	27-Jun-2022	FD	Area-2-22-SB-17-10	10	Soil	410-90316-3	ELLE
SB-17	Area-2-22-SB-17-20	27-Jun-2022	N		20	Soil	410-90316-4	ELLE
SB-18	Area-2-22-SB-18-0.5	28-Jun-2022	N		0.5	Soil	410-90316-5	ELLE
SB-18	Area-2-22-SB-18-10	28-Jun-2022	N		10	Soil	410-90316-6	ELLE
SB-18	Area-2-22-SB-18-20	28-Jun-2022	N		20	Soil	410-90316-7	ELLE
SB-19	Area-2-22-SB-19-0.5	1-Jul-2022	N		0.5	Soil	410-89884-26	ELLE
SB-19	Area-2-22-SB-19-5	1-Jul-2022	N		5	Soil	410-89884-27	ELLE
SB-19	Area-2-22-SB-19-10	1-Jul-2022	N		10	Soil	410-89884-28	ELLE
SB-19	Area-2-22-SB-19-15	1-Jul-2022	N		15	Soil	410-89884-29	ELLE
SB-19	Area-2-22-SB-19-20	1-Jul-2022	N		20	Soil	410-89884-30	ELLE
--	FB-62722	27-Jun-2022	FB	--	--	Field QC	410-90316-8	ELLE
--	FB-62822	28-Jun-2022	FB	--	--	Field QC	410-90316-9	ELLE
--	FB-62922	29-Jun-2022	FB	--	--	Field QC	410-89884-44	ELLE
--	FB-63022	30-Jun-2022	FB	--	--	Field QC	410-89884-24	ELLE
--	FB-7122	1-Jul-2022	FB	--	--	Field QC	410-89884-37	ELLE
--	TB-62722	27-Jun-2022	TB	--	--	Field QC	410-90316-10	ELLE
--	TB-62822	28-Jun-2022	TB	--	--	Field QC	410-90316-23	ELLE
--	TB-62822-1	28-Jun-2022	TB	--	--	Field QC	410-89884-6	ELLE
--	TB-62922	29-Jun-2022	TB	--	--	Field QC	410-89884-13	ELLE
--	TB-63022	30-Jun-2022	TB	--	--	Field QC	410-89884-25	ELLE
--	TB-7122	1-Jul-2022	TB	--	--	Field QC	410-89884-43	ELLE

Table B-1. Sample Summary

Location ID	Field Sample ID	Collected Date	QC Type	Primary Sample ID	Depth (ft bgs)	Matrix	Laboratory Sample ID	Laboratory
2MW-9	AREA2-22-2MW-9	11-Jul-2022	N		--	Groundwater	580-115786-5	Eurofins Seattle
2MW-9	AREA2-22-2MW-9B	11-Jul-2022	FD	AREA2-22-2MW-9	--	Groundwater	580-115786-6	Eurofins Seattle
2MW-10	AREA2-22-2MW-10	11-Jul-2022	N		--	Groundwater	580-115786-4	Eurofins Seattle
2MW-11	AREA2-22-2MW-11	8-Jul-2022	N		--	Groundwater	580-115786-7	Eurofins Seattle
2MW-12	AREA2-22-2MW-12	8-Jul-2022	N		--	Groundwater	580-115786-13	Eurofins Seattle
2MW-13	AREA2-22-2MW-13	11-Jul-2022	N		--	Groundwater	580-115786-8	Eurofins Seattle
2MW-14	AREA2-22-2MW-14	11-Jul-2022	N		--	Groundwater	580-115786-2	Eurofins Seattle
2MW-15	AREA2-22-2MW-15	11-Jul-2022	N		--	Groundwater	580-115786-3	Eurofins Seattle
2MW-16	AREA2-22-2MW-16	11-Jul-2022	N		--	Groundwater	580-115786-10	Eurofins Seattle
2MW-17	AREA2-22-2MW-17	8-Jul-2022	N		--	Groundwater	580-115786-11	Eurofins Seattle
2MW-18	AREA2-22-2MW-18	8-Jul-2022	N		--	Groundwater	580-115786-9	Eurofins Seattle
2MW-18	AREA2-22-2MW-18B	8-Jul-2022	FD	AREA2-22-2MW-18	--	Groundwater	580-115786-12	Eurofins Seattle
2MW-19	AREA2-22-2MW-19	11-Jul-2022	N		--	Groundwater	580-115786-1	Eurofins Seattle
--	TB-070822	8-Jul-2022	TB		--	Field QC	580-115786-14	Eurofins Seattle

Notes:

ft bgs = feet below ground surface

ELLE = Eurofins Lancaster Laboratories Environmental, LLC

FD = field duplicate

ID = identification

N = normal (primary sample)

QC = quality control

This page intentionally left blank

Table B-2. Results and Relative Percent Differences for Primary Samples and Field Duplicate Pairs - Soil

Location			SB-9 at 10 feet bgs				RPD	SB-11 at 5 feet bgs				RPD	SB-12 at 20 feet bgs				RPD
Field Sample ID			Area-2-22-SB-9-10		Area-2-22-SB-9-1-10			Area-2-22-SB-11-5		Area-2-22-SB-11-1-5			Area-2-22-SB-12-20		Area-2-22-SB-12-1-20		
Analyte	Analytical Method	Units	Result	Q	Result	Q		Result	Q	Result	Q		Result	Q	Result	Q	
1,1,1,2-Tetrachloroethane	8260D	mg/kg	0.0011	U	0.0011	U	NC		R		R	NC		R		R	NC
1,1,1-Trichloroethane	8260D	mg/kg	0.0011	U	0.0011	U	NC		R		R	NC		R		R	NC
1,1,2,2-Tetrachloroethane	8260D	mg/kg	0.00054	U	0.00055	U	NC		R		R	NC		R		R	NC
1,1,2-Trichloroethane	8260D	mg/kg	0.0011	U	0.0011	U	NC		R		R	NC		R		R	NC
1,1-Dichloroethane	8260D	mg/kg	0.0011	U	0.0011	U	NC		R		R	NC		R		R	NC
1,1-Dichloroethene	8260D	mg/kg	0.0011	U	0.0011	U	NC		R		R	NC		R		R	NC
1,1-Dichloropropene	8260D	mg/kg	0.0011	UJ	0.0011	UJ	NC		R		R	NC		R		R	NC
1,2,3-Trichlorobenzene	8260D	mg/kg	0.0043	U	0.0044	U	NC		R		R	NC		R		R	NC
1,2,3-Trichloropropane	8260D	mg/kg	0.0011	U	0.0011	U	NC		R		R	NC		R		R	NC
1,2,4-Trichlorobenzene	8260D	mg/kg	0.0043	U	0.0044	U	NC		R		R	NC		R		R	NC
1,2-Dichlorobenzene	8260D	mg/kg	0.0011	U	0.0011	U	NC		R		R	NC		R		R	NC
1,2-Dichloroethane	8260D	mg/kg	0.0011	U	0.0011	U	NC		R		R	NC		R		R	NC
1,2-Dichloropropane	8260D	mg/kg	0.0011	UJ	0.0011	UJ	NC		R		R	NC		R		R	NC
1,3-Dichlorobenzene	8260D	mg/kg	0.0011	U	0.0011	U	NC		R		R	NC		R		R	NC
1,3-Dichloropropane	8260D	mg/kg	0.00054	U	0.00055	U	NC		R		R	NC		R		R	NC
1,4-Dichlorobenzene	8260D	mg/kg	0.00054	U	0.00055	U	NC		R		R	NC		R		R	NC
2,2-Dichloropropane	8260D	mg/kg	0.0011	U	0.0011	U	NC		R		R	NC		R		R	NC
2-Chlorotoluene	8260D	mg/kg	0.00054	U	0.00055	U	NC		R		R	NC		R		R	NC
4-Chlorotoluene	8260D	mg/kg	0.00054	U	0.00055	U	NC		R		R	NC		R		R	NC
Carbon tetrachloride	8260D	mg/kg	0.0011	U	0.0011	U	NC		R		R	NC		R		R	NC
Chlorobenzene	8260D	mg/kg	0.0011	U	0.0011	U	NC		R		R	NC		R		R	NC
Chloroethane	8260D	mg/kg	0.0022	U	0.0022	U	NC		R		R	NC		R		R	NC
Chloroform	8260D	mg/kg	0.0011	U	0.0011	U	NC		R		R	NC		R		R	NC
Chloromethane	8260D	mg/kg	0.0011	U	0.0011	U	NC		R		R	NC		R		R	NC
cis-1,2-Dichloroethene	8260D	mg/kg	0.0011	U	0.0011	U	NC		R		R	NC		R		R	NC
cis-1,3-Dichloropropene	8260D	mg/kg	0.00054	U	0.00055	U	NC		R		R	NC		R		R	NC
Hexachlorobutadiene	8260D	mg/kg	0.0043	U	0.0044	U	NC		R		R	NC		R		R	NC
Methylene chloride	8260D	mg/kg	0.0022	U	0.0022	U	NC		R		R	NC		R		R	NC
Tetrachloroethene	8260D	mg/kg	0.0011	U	0.0011	U	NC		R		R	NC		R		R	NC
trans-1,2-Dichloroethene	8260D	mg/kg	0.0011	U	0.0011	U	NC		R		R	NC		R		R	NC
trans-1,3-Dichloropropene	8260D	mg/kg	0.00054	U	0.00055	U	NC		R		R	NC		R		R	NC
Trichloroethene	8260D	mg/kg	0.0011	U	0.0011	U	NC		R		R	NC		R		R	NC
Vinyl chloride	8260D	mg/kg	0.0011	U	0.0011	U	NC		R		R	NC		R		R	NC

Notes:

bgs = below ground surface

mg/kg = milligrams per kilogram

NC - not calculated; one or more of the sample pair results are “U” or "UJ" qualified.

Q = qualifier

RPD - relative percent difference

Data Qualifiers:

J = The reported result is an estimated value.

R = The result is rejected.

U = The analyte is not detected; the associated numerical value is the limit of detection or as qualified during data validation.

UJ = The analyte is not detected; the associated numerical value is approximate.

Table B-2. Results and Relative Percent Differences for Primary Samples and Field Duplicate Pairs - Soil

Location			SB-15 at 0.5 feet bgs				RPD		SB-17 at 10 feet bgs				RPD
Field Sample ID			Area-2-22-SB-15-0.5		Area-2-22-SB-15-1-0.5				Area-2-22-SB-17-10		Area-2-22-SB-17-1-10		
Analyte	Analytical Method	Units	Result	Q	Result	Q			Result	Q	Result	Q	
1,1,1,2-Tetrachloroethane	8260D	mg/kg	0.0015	U	0.0013	U	NC			R		R	NC
1,1,1-Trichloroethane	8260D	mg/kg	0.0015	U	0.0013	U	NC			R		R	NC
1,1,2,2-Tetrachloroethane	8260D	mg/kg	0.00075	U	0.00064	U	NC			R		R	NC
1,1,2-Trichloroethane	8260D	mg/kg	0.0015	U	0.0013	U	NC			R		R	NC
1,1-Dichloroethane	8260D	mg/kg	0.0015	U	0.0013	U	NC			R		R	NC
1,1-Dichloroethene	8260D	mg/kg	0.0015	U	0.0013	U	NC			R		R	NC
1,1-Dichloropropene	8260D	mg/kg	0.0015	U	0.0013	U	NC			R		R	NC
1,2,3-Trichlorobenzene	8260D	mg/kg	0.0060	U	0.0051	U	NC			R		R	NC
1,2,3-Trichloropropane	8260D	mg/kg	0.0015	U	0.0013	U	NC			R		R	NC
1,2,4-Trichlorobenzene	8260D	mg/kg	0.0060	U	0.0051	U	NC			R		R	NC
1,2-Dichlorobenzene	8260D	mg/kg	0.0015	U	0.0013	U	NC			R		R	NC
1,2-Dichloroethane	8260D	mg/kg	0.0015	U	0.0013	U	NC			R		R	NC
1,2-Dichloropropane	8260D	mg/kg	0.0015	U	0.0013	U	NC			R		R	NC
1,3-Dichlorobenzene	8260D	mg/kg	0.0015	U	0.0013	U	NC			R		R	NC
1,3-Dichloropropane	8260D	mg/kg	0.00075	U	0.00064	U	NC			R		R	NC
1,4-Dichlorobenzene	8260D	mg/kg	0.00075	U	0.00064	U	NC			R		R	NC
2,2-Dichloropropane	8260D	mg/kg	0.0015	U	0.0013	U	NC			R		R	NC
2-Chlorotoluene	8260D	mg/kg	0.00075	U	0.00064	U	NC			R		R	NC
4-Chlorotoluene	8260D	mg/kg	0.00075	U	0.00064	U	NC			R		R	NC
Carbon tetrachloride	8260D	mg/kg	0.0015	U	0.0013	U	NC			R		R	NC
Chlorobenzene	8260D	mg/kg	0.0015	U	0.0013	U	NC			R		R	NC
Chloroethane	8260D	mg/kg	0.0030	U	0.0026	U	NC			R		R	NC
Chloroform	8260D	mg/kg	0.0015	U	0.0013	U	NC			R		R	NC
Chloromethane	8260D	mg/kg	0.0015	U	0.0013	U	NC			R		R	NC
cis-1,2-Dichloroethene	8260D	mg/kg	0.0015	U	0.0013	U	NC			R	0.0011	J	NC
cis-1,3-Dichloropropene	8260D	mg/kg	0.00075	U	0.00064	U	NC			R		R	NC
Hexachlorobutadiene	8260D	mg/kg	0.0060	U	0.0051	U	NC			R		R	NC
Methylene chloride	8260D	mg/kg	0.0030	U	0.0026	U	NC			R		R	NC
Tetrachloroethene	8260D	mg/kg	0.0015	U	0.0013	U	NC			R		R	NC
trans-1,2-Dichloroethene	8260D	mg/kg	0.0015	U	0.0013	U	NC			R		R	NC
trans-1,3-Dichloropropene	8260D	mg/kg	0.00075	U	0.00064	U	NC			R		R	NC
Trichloroethene	8260D	mg/kg	0.0015	U	0.0013	U	NC		0.13	J	0.17	J	27%
Vinyl chloride	8260D	mg/kg	0.0015	U	0.0013	U	NC			R		R	NC

Notes:
bgs = below ground surface
mg/kg = milligrams per kilogram
NC - not calculated; one or more of the sample pair results are “U” or "UJ"
Q = qualifier
RPD - relative percent difference
Data Qualifiers:
J = The reported result is an estimated value.
R = The result is rejected.
U = The analyte is not detected; the associated numerical value is the limi
UJ = The analyte is not detected; the associated numerical value is appro

Table B-3. Results and Relative Percent Differences for Primary Samples and Field Duplicate Pairs - Groundwater

Location			2MW-9				RPD	2-MW18				RPD
Field Sample ID			AREA2-22-2MW-9		AREA2-22-2MW-9B			AREA2-22-2MW-18		AREA2-22-2MW-18B		
Analyte	Analytical Method	Units	Result	Q	Result	Q		Result	Q	Result	Q	
1,1,1,2-Tetrachloroethane	8260D	µg/L	0.15	U	0.15	U	NC	0.15	U	0.15	U	NC
1,1,1-Trichloroethane	8260D	µg/L	0.070	U	0.070	U	NC	0.070	U	0.070	U	NC
1,1,2,2-Tetrachloroethane	8260D	µg/L	0.15	U	0.15	U	NC	0.15	U	0.15	U	NC
1,1,2-Trichloroethane	8260D	µg/L	0.15	U	0.15	U	NC	0.15	U	0.15	U	NC
1,1-Dichloroethane	8260D	µg/L	0.070	U	0.070	U	NC	0.070	U	0.070	U	NC
1,1-Dichloroethene	8260D	µg/L	0.070	U	0.070	U	NC	0.070	U	0.070	U	NC
1,1-Dichloropropene	8260D	µg/L	0.15	U	0.15	U	NC	0.15	U	0.15	U	NC
1,2,3-Trichlorobenzene	8260D	µg/L	0.35	UJ	0.35	UJ	NC	0.35	UJ	0.35	UJ	NC
1,2,3-Trichloropropane	8260D	µg/L	0.15	U	0.15	U	NC	0.15	U	0.15	U	NC
1,2,4-Trichlorobenzene	8260D	µg/L	0.35	U	0.35	U	NC	0.35	U	0.35	U	NC
1,2-Dichlorobenzene	8260D	µg/L	0.15	U	0.15	U	NC	0.15	U	0.15	U	NC
1,2-Dichloroethane	8260D	µg/L	0.15	U	0.15	U	NC	0.15	U	0.15	U	NC
1,2-Dichloropropane	8260D	µg/L	0.15	U	0.15	U	NC	0.15	U	0.15	U	NC
1,3-Dichlorobenzene	8260D	µg/L	0.18	J	0.16	J	12%	0.14	J	0.15	J	7%
1,3-Dichloropropane	8260D	µg/L	0.070	U	0.070	U	NC	0.070	U	0.070	U	NC
1,4-Dichlorobenzene	8260D	µg/L	0.15	U	0.15	U	NC	0.15	U	0.15	U	NC
2,2-Dichloropropane	8260D	µg/L	0.15	U	0.15	U	NC	0.15	U	0.15	U	NC
2-Chlorotoluene	8260D	µg/L	0.35	U	0.35	U	NC	0.35	U	0.35	U	NC
4-Chlorotoluene	8260D	µg/L	0.25	U	0.25	U	NC	0.25	U	0.25	U	NC
Carbon tetrachloride	8260D	µg/L	0.070	U	0.070	U	NC	0.070	U	0.070	U	NC
Chlorobenzene	8260D	µg/L	0.15	U	0.15	U	NC	0.15	U	0.15	U	NC
Chloroethane	8260D	µg/L	0.25	U	0.25	U	NC	0.25	U	0.25	U	NC
Chloroform	8260D	µg/L	0.22		0.18	J	20%	0.070	U	0.070	U	NC
Chloromethane	8260D	µg/L	0.35	U	0.35	U	NC	0.35	U	0.35	U	NC
cis-1,2-Dichloroethene	8260D	µg/L	0.15	U	0.15	U	NC	0.071	J	0.083	J	16%
cis-1,3-Dichloropropene	8260D	µg/L	0.15	U	0.15	U	NC	0.15	U	0.15	U	NC
Hexachlorobutadiene	8260D	µg/L	0.15	U	0.15	U	NC	0.15	U	0.15	U	NC
Methylene chloride	8260D	µg/L	3.5	U	3.5	U	NC	3.5	U	3.5	U	NC
Tetrachloroethene	8260D	µg/L	0.25	U	0.25	U	NC	0.25	U	0.25	U	NC
trans-1,2-Dichloroethene	8260D	µg/L	0.070	U	0.070	U	NC	0.070	U	0.070	U	NC
trans-1,3-Dichloropropene	8260D	µg/L	0.15	U	0.15	U	NC	0.15	U	0.15	U	NC
Trichloroethene	8260D	µg/L	0.15	U	0.15	U	NC	0.15	UJ	0.24	J	NC
Vinyl chloride	8260D	µg/L	0.015	U	0.015	U	NC	0.015	U	0.015	U	NC

Notes:

µg/L = microgram(s) per liter

NC - not calculated; one or more of the sample pair results are “U” or "UJ" qualified.

Q = qualifier

RPD - relative percent difference

Data Qualifiers:

J = The reported result is an estimated value.

U = The analyte is not detected; the associated numerical value is the limit of detection or as qualified during data validation.

UJ = The analyte is not detected; the associated numerical value is approximate.

This page intentionally left blank

Table B-4. Summary of Field Blank Results

Field Sample ID			FB-62722		FB-62822		FB-62922		FB-63022		FB-7122	
Sample Collection Date			27-Jun-2022		28-Jun-2022		29-Jun-2022		30-Jun-2022		1-Jul-2022	
Analyte	Analytical Method	Units	Result	Q					Result	Q	Result	Q
1,1,1,2-Tetrachloroethane	8260D	µg/L		R		R	0.60	UJ	0.60	UJ	0.60	UJ
1,1,1-Trichloroethane	8260D	µg/L		R		R	0.60	UJ	0.60	UJ	0.60	UJ
1,1,2,2-Tetrachloroethane	8260D	µg/L		R		R	0.60	UJ	0.60	UJ	0.60	UJ
1,1,2-Trichloroethane	8260D	µg/L		R		R	0.60	UJ	0.60	UJ	0.60	UJ
1,1-Dichloroethane	8260D	µg/L		R		R	0.60	UJ	0.60	UJ	0.60	UJ
1,1-Dichloroethene	8260D	µg/L		R		R	0.60	UJ	0.60	UJ	0.60	UJ
1,1-Dichloropropene	8260D	µg/L		R		R	0.60	UJ	0.60	UJ	0.60	UJ
1,2,3-Trichlorobenzene	8260D	µg/L		R		R	1.0	UJ	1.0	UJ	1.0	UJ
1,2,3-Trichloropropane	8260D	µg/L		R		R	0.60	UJ	0.60	UJ	0.60	UJ
1,2,4-Trichlorobenzene	8260D	µg/L		R		R	1.0	UJ	1.0	UJ	1.0	UJ
1,2-Dichlorobenzene	8260D	µg/L		R		R	0.50	UJ	0.50	UJ	0.50	UJ
1,2-Dichloroethane	8260D	µg/L		R		R	0.60	UJ	0.60	UJ	0.60	UJ
1,2-Dichloropropane	8260D	µg/L		R		R	0.60	UJ	0.60	UJ	0.60	UJ
1,3-Dichlorobenzene	8260D	µg/L		R		R	0.60	UJ	0.60	UJ	0.60	UJ
1,3-Dichloropropane	8260D	µg/L		R		R	0.60	UJ	0.60	UJ	0.60	UJ
1,4-Dichlorobenzene	8260D	µg/L		R		R	0.60	UJ	0.60	UJ	0.60	UJ
2,2-Dichloropropane	8260D	µg/L		R		R	0.50	UJ	0.50	UJ	0.50	UJ
2-Chlorotoluene	8260D	µg/L		R		R	0.60	UJ	0.60	UJ	0.60	UJ
4-Chlorotoluene	8260D	µg/L		R		R	0.60	UJ	0.60	UJ	0.60	UJ
Carbon tetrachloride	8260D	µg/L		R		R	0.60	UJ	0.60	UJ	0.60	UJ
Chlorobenzene	8260D	µg/L		R		R	0.60	UJ	0.60	UJ	0.60	UJ
Chloroethane	8260D	µg/L		R		R	0.50	UJ	0.50	UJ	0.50	UJ
Chloroform	8260D	µg/L		R		R	0.60	UJ	0.60	UJ	0.60	UJ
Chloromethane	8260D	µg/L		R		R	0.50	UJ	0.50	UJ	0.50	UJ
cis-1,2-Dichloroethene	8260D	µg/L		R		R	0.60	UJ	0.60	UJ	0.60	UJ
cis-1,3-Dichloropropene	8260D	µg/L		R		R	0.50	UJ	0.50	UJ	0.50	UJ
Hexachlorobutadiene	8260D	µg/L		R		R	4.0	UJ	4.0	UJ	4.0	UJ
Methylene chloride	8260D	µg/L		R		R	0.60	UJ	0.60	UJ	0.60	UJ
Tetrachloroethene	8260D	µg/L		R		R	0.60	UJ	0.60	UJ	0.60	UJ

Table B-4. Summary of Field Blank Results

Field Sample ID			FB-62722		FB-62822		FB-62922		FB-63022		FB-7122	
Sample Collection Date			27-Jun-2022		28-Jun-2022		29-Jun-2022		30-Jun-2022		1-Jul-2022	
Analyte	Analytical Method	Units	Result	Q					Result	Q	Result	Q
trans-1,2-Dichloroethene	8260D	µg/L		R		R	0.60	UJ	0.60	UJ	0.60	UJ
trans-1,3-Dichloropropene	8260D	µg/L		R		R	0.50	UJ	0.50	UJ	0.50	UJ
Trichloroethene	8260D	µg/L		R		R	0.60	UJ	0.60	UJ	0.60	UJ
Vinyl chloride	8260D	µg/L		R		R	0.50	UJ	0.50	UJ	0.50	UJ

Notes:

µg/L = microgram(s) per liter

Q = qualifier

Data Qualifiers:

UJ = The analyte is not detected; the associated numerical value is approximate.

Table B-5. Summary of Trip Blank Results - Soil

		Location	TB-062722		TB-062822		TB-062822-1		TB-062922		TB-063022		TB-7122	
		Field Sample ID	27-Jun-2022		28-Jun-2022		28-Jun-2022		29-Jun-2022		30-Jun-2022		1-Jul-2022	
Analyte	Analytical Method	Units	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
1,1,1,2-Tetrachloroethane	8260D	mg/kg		R		R	0.0020	U	0.0020	U	0.0020	U	0.0020	U
1,1,1-Trichloroethane	8260D	mg/kg		R		R	0.0020	U	0.0020	U	0.0020	U	0.0020	U
1,1,2,2-Tetrachloroethane	8260D	mg/kg		R		R	0.0010	U	0.0010	U	0.0010	U	0.0010	U
1,1,2-Trichloroethane	8260D	mg/kg		R		R	0.0020	U	0.0020	U	0.0020	U	0.0020	U
1,1-Dichloroethane	8260D	mg/kg		R		R	0.0020	U	0.0020	U	0.0020	U	0.0020	U
1,1-Dichloroethene	8260D	mg/kg		R		R	0.0020	U	0.0020	U	0.0020	U	0.0020	U
1,1-Dichloropropene	8260D	mg/kg		R		R	0.0020	UJ	0.0020	U	0.0020	U	0.0020	U
1,2,3-Trichlorobenzene	8260D	mg/kg		R		R	0.0080	U	0.0080	U	0.0080	U	0.0080	U
1,2,3-Trichloropropane	8260D	mg/kg		R		R	0.0020	U	0.0020	U	0.0020	U	0.0020	U
1,2,4-Trichlorobenzene	8260D	mg/kg		R		R	0.0080	U	0.0080	U	0.0080	U	0.0080	U
1,2-Dichlorobenzene	8260D	mg/kg		R		R	0.0020	U	0.0020	U	0.0020	U	0.0020	U
1,2-Dichloroethane	8260D	mg/kg		R		R	0.0020	U	0.0020	U	0.0020	U	0.0020	U
1,2-Dichloropropane	8260D	mg/kg		R		R	0.0020	UJ	0.0020	U	0.0020	U	0.0020	U
1,3-Dichlorobenzene	8260D	mg/kg		R		R	0.0020	U	0.0020	U	0.0020	U	0.0020	U
1,3-Dichloropropane	8260D	mg/kg		R		R	0.0010	U	0.0010	U	0.0010	U	0.0010	U
1,4-Dichlorobenzene	8260D	mg/kg		R		R	0.0010	U	0.0010	U	0.0010	U	0.0010	U
2,2-Dichloropropane	8260D	mg/kg		R		R	0.0020	U	0.0020	U	0.0020	U	0.0020	U
2-Chlorotoluene	8260D	mg/kg		R		R	0.0010	U	0.0010	U	0.0010	U	0.0010	U
4-Chlorotoluene	8260D	mg/kg		R		R	0.0010	U	0.0010	U	0.0010	U	0.0010	U
Carbon tetrachloride	8260D	mg/kg		R		R	0.0020	U	0.0020	U	0.0020	U	0.0020	U
Chlorobenzene	8260D	mg/kg		R		R	0.0020	U	0.0020	U	0.0020	U	0.0020	U
Chloroethane	8260D	mg/kg		R		R	0.0040	U	0.0040	U	0.0040	U	0.0040	U
Chloroform	8260D	mg/kg		R		R	0.0020	U	0.0020	U	0.0020	U	0.0020	U
Chloromethane	8260D	mg/kg		R		R	0.0020	U	0.0020	U	0.0020	U	0.0020	U
cis-1,2-Dichloroethene	8260D	mg/kg		R		R	0.0020	U	0.0020	U	0.0020	U	0.0020	U
cis-1,3-Dichloropropene	8260D	mg/kg		R		R	0.0010	U	0.0010	U	0.0010	U	0.0010	U
Hexachlorobutadiene	8260D	mg/kg		R		R	0.0080	U	0.0080	U	0.0080	U	0.0080	U
Methylene chloride	8260D	mg/kg		R		R	0.0040	U	0.0040	U	0.0040	U	0.0040	U
Tetrachloroethene	8260D	mg/kg		R		R	0.0020	U	0.0020	U	0.0020	U	0.0020	U
trans-1,2-Dichloroethene	8260D	mg/kg		R		R	0.0020	U	0.0020	U	0.0020	U	0.0020	U
trans-1,3-Dichloropropene	8260D	mg/kg		R		R	0.0010	U	0.0010	U	0.0010	U	0.0010	U
Trichloroethene	8260D	mg/kg		R		R	0.0020	U	0.0020	U	0.0020	U	0.0020	U
Vinyl chloride	8260D	mg/kg		R		R	0.0020	U	0.0020	U	0.0020	U	0.0020	U

Notes:

mg/kg = milligrams per kilogram

Q = qualifier

Data Qualifiers:

R = The result is rejected.

U = The analyte is not detected; the associated numerical value is the limit of detection or as qualified during data validation.

UJ = The analyte is not detected; the associated numerical value is approximate.

This page intentionally left blank

Table B-6. Summary of Trip Blank Results - Water

	Field Sample ID		TB-070822	
	Sample Collection Date		8-Jul-2022	
Analyte	Analytical Method	Units	Result	Q
1,1,1,2-Tetrachloroethane	8260D	µg/L	0.15	U
1,1,1-Trichloroethane	8260D	µg/L	0.070	U
1,1,2,2-Tetrachloroethane	8260D	µg/L	0.15	U
1,1,2-Trichloroethane	8260D	µg/L	0.15	U
1,1-Dichloroethane	8260D	µg/L	0.070	U
1,1-Dichloroethene	8260D	µg/L	0.070	U
1,1-Dichloropropene	8260D	µg/L	0.15	U
1,2,3-Trichlorobenzene	8260D	µg/L	0.35	UJ
1,2,3-Trichloropropane	8260D	µg/L	0.15	U
1,2,4-Trichlorobenzene	8260D	µg/L	0.35	U
1,2-Dichlorobenzene	8260D	µg/L	0.15	U
1,2-Dichloroethane	8260D	µg/L	0.15	U
1,2-Dichloropropane	8260D	µg/L	0.15	U
1,3-Dichlorobenzene	8260D	µg/L	0.15	U
1,3-Dichloropropane	8260D	µg/L	0.070	U
1,4-Dichlorobenzene	8260D	µg/L	0.15	U
2,2-Dichloropropane	8260D	µg/L	0.15	U
2-Chlorotoluene	8260D	µg/L	0.35	U
4-Chlorotoluene	8260D	µg/L	0.25	U
Carbon tetrachloride	8260D	µg/L	0.070	U
Chlorobenzene	8260D	µg/L	0.15	U
Chloroethane	8260D	µg/L	0.25	U
Chloroform	8260D	µg/L	0.070	U
Chloromethane	8260D	µg/L	0.35	U
cis-1,2-Dichloroethene	8260D	µg/L	0.15	U
cis-1,3-Dichloropropene	8260D	µg/L	0.15	U
Hexachlorobutadiene	8260D	µg/L	0.15	U
Methylene chloride	8260D	µg/L	3.5	U
Tetrachloroethene	8260D	µg/L	0.25	U
trans-1,2-Dichloroethene	8260D	µg/L	0.070	U
trans-1,3-Dichloropropene	8260D	µg/L	0.15	U
Trichloroethene	8260D	µg/L	0.15	U
Vinyl chloride	8260D	µg/L	0.015	U

Notes:

µg/L = microgram(s) per liter

Q = qualifier

Data Qualifiers:

U = The analyte is not detected; the associated numerical value is the limit of detection or as qualified during data validation.

UJ = The analyte is not detected; the associated numerical value is approximate.

This page intentionally left blank

Attachment B-1

Data Validation Reports

This page intentionally left blank

LABORATORY DATA CONSULTANTS, INC.
2701 Loker Ave. West, Suite 220, Carlsbad, CA 92010 Bus: 760-827-1100 Fax: 760-827-1099

EA Engineering, Science, & Technology, Inc.
2200 Sixth Ave., Suite 707
Seattle, WA 98121
ATTN: Ms. Sherri Wunderlich
swunderlich@eaest.com

August 25, 2022

SUBJECT: NBK Keyport OU2 - Data Validation

Dear Ms. Wunderlich,

Enclosed is the final validation report for the fraction listed below. This SDG was received on July 29, 2022. Attachment 1 is a summary of the samples that were reviewed for the analysis.

LDC Project #54603_RV1:

SDG #	Fraction
580-115786-1	Volatiles

The data validation was performed under Stage 2B & 4 validation guidelines. The analysis was validated using the following documents and variances, as applicable to the method:

- Final Tier I Sampling and Analysis Plan, Soil and Groundwater Investigation at Operable Unit 2 Area 2, Van Meter Road Spill/Drum Storage Site, Naval Base Kitsap Keyport, Keyport, Washington (April 2022)
- U.S. Department of Defense (DoD) General Validation Guidelines (November 2019)
- DoD Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020)
- EPA SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998; IIIB, November 2004; update IV, February 2007; update V, July 2014; update VI, July 2018

Please feel free to contact us if you have any questions.

Sincerely,

Pei Geng
Project Manager/Senior Chemist
pgeng@lab-data.com

LABORATORY DATA CONSULTANTS, INC.
2701 Loker Ave. West, Suite 220, Carlsbad, CA 92010 Bus: 760-827-1100 Fax: 760-827-1099

EA Engineering, Science, & Technology, Inc.
2200 Sixth Ave., Suite 707
Seattle, WA 98121
ATTN: Ms. Sherri Wunderlich
swunderlich@eaest.com

August 19, 2022

SUBJECT: NBK Keyport OU2 - Data Validation

Dear Ms. Wunderlich,

Enclosed is the final validation report for the fraction listed below. This SDG was received on July 29, 2022. Attachment 1 is a summary of the samples that were reviewed for the analysis.

LDC Project #54603:

SDG #	**Fraction**
580-115786-1	Volatiles

The data validation was performed under Stage 2B & 4 validation guidelines. The analysis was validated using the following documents and variances, as applicable to the method:

- Final Tier I Sampling and Analysis Plan, Soil and Groundwater Investigation at Operable Unit 2 Area 2, Van Meter Road Spill/Drum Storage Site, Naval Base Kitsap Keyport, Keyport, Washington (April 2022)
- U.S. Department of Defense (DoD) General Validation Guidelines (November 2019)
- DoD Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020)
- EPA SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998; IIIB, November 2004; update IV, February 2007; update V, July 2014; update VI, July 2018

Please feel free to contact us if you have any questions.

Sincerely,

Pei Geng
Project Manager/Senior Chemist
pgeng@lab-data.com

43 pages-ADV 3 WEEK TAT Attachment 1

90/10 2B/4 EDD **LDC# 54603 (EA Engineering - Seattle, WA / NBK Keyport, OU2)** **PO# 23092**

LDC	SDG#	DATE REC'D	(2) DATE DUE	VOA (8260D)																															
Matrix:	Water/Soil			W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S
A	580-115786-1	07/29/22	08/19/22	12	0																														
A	580-115786-1	07/29/22	08/19/22	2	0																														
Total	T/PG			14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14

Shaded cells indicate Stage 4 validation (all other cells are Stage 2B validation). Sample counts do not include RE, DL, MS, MSD, and DUP's.

V:\LOGIN\EA\Keyport\54603ST-OU2.wpd

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NBK Keyport OU2

LDC Report Date: August 25, 2022

Parameters: Volatiles

Validation Level: Stage 2B & 4

Laboratory: Eurofins, Tacoma, WA

Sample Delivery Group (SDG): 580-115786-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
AREA2-22-2MW-19	580-115786-1	Water	07/11/22
AREA2-22-2MW-14**	580-115786-2**	Water	07/11/22
AREA2-22-2MW-15	580-115786-3	Water	07/11/22
AREA2-22-2MW-10	580-115786-4	Water	07/11/22
AREA2-22-2MW-9	580-115786-5	Water	07/11/22
AREA2-22-2MW-9B	580-115786-6	Water	07/11/22
AREA2-22-2MW-11**	580-115786-7**	Water	07/08/22
AREA2-22-2MW-13	580-115786-8	Water	07/11/22
AREA2-22-2MW-18	580-115786-9	Water	07/08/22
AREA2-22-2MW-16	580-115786-10	Water	07/11/22
AREA2-22-2MW-17	580-115786-11	Water	07/08/22
AREA2-22-2MW-18B	580-115786-12	Water	07/08/22
AREA2-22-2MW-12	580-115786-13	Water	07/08/22
TB-070822	580-115786-14	Water	07/08/22
AREA2-22-2MW-14MS	580-115786-2MS	Water	07/11/22
AREA2-22-2MW-14MSD	580-115786-2MSD	Water	07/11/22

**Indicates sample underwent Stage 4 validation

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Tier I Sampling and Analysis Plan, Soil and Groundwater Investigation at Operable Unit 2 Area 2, Van Meter Road Spill/Drum Storage Site, Naval Base Kitsap Keyport, Keyport, Washington (April 2022), the U.S. Department of Defense (DoD) General Validation Guidelines (November 2019), and the DoD Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260D

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results. Samples appended with a double asterisk on the cover page were subjected to Stage 4 data validation, which is comprised of the QC summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J (Estimated): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered not detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Codes

1	Holding Times Exceeded
2	Sample Preservation / Cooler Temperature Exceeded Acceptance Criteria
3	Sample Custody Potentially Compromised Sample Integrity
4	Missing/Incomplete Deliverables
5	Calibration Did Not Meet Method Criteria
6	Equipment/Field Blank Contamination
7	Laboratory Method or Calibration Blank Contamination
8	Matrix Spike % Recovery Exceeded Acceptance Criteria
9	Matrix Spike Duplicate (RPD or Duplicate Sample Analysis) Exceeded Acceptance Criteria
10A	Laboratory Control Sample % Recovery Exceeded Acceptance Criteria
10B	Laboratory Control Sample Duplicate (RPD) Exceeded Acceptance Criteria
11	ICP Interference Check Analysis Exceeded Method Criteria
12	RPD Between Two Columns (Pesticides/PCBs only)
13	Surrogate Recoveries Exceeded Acceptance Criteria
14	Field Duplicates RPD Exceeded Project Criteria
15	Peak Resolution did not meet method criteria
16	Serial Dilution Analysis Exceeded Method Criteria
17	Chemical Recoveries Exceeded Acceptance Criteria
18	Trip Blank Contamination
19	Internal Standards Did Not Meet Method Criteria
20	Calibration Range exceeded Method Criteria
21	Potential False Positives
22	Do not use, other result more technically sound (overall assessment)
23	Estimated Maximum Possible Concentration
24	Trace Detection Below the LOQ (RL) and Above the DL (MDL)
25	Other

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For analytes where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 15.0%.

In the case where the laboratory used a calibration curve to evaluate the analytes, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all analytes were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes with the following exceptions:

Date	Analyte	%D	Associated Samples	Flag	A or P
07/17/22	1,2,3-Trichlorobenzene	20.1	AREA2-22-2MW-19 AREA2-22-2MW-14** AREA2-22-2MW-15 AREA2-22-2MW-10 AREA2-22-2MW-9 AREA2-22-2MW-9B AREA2-22-2MW-11** AREA2-22-2MW-18 AREA2-22-2MW-17 AREA2-22-2MW-18B AREA2-22-2MW-12 TB-070822	UJ (all non-detects)	A
07/18/22	Methylene chloride	28.1	AREA2-22-2MW-16	UJ (all non-detects)	A

Date	Analyte	%D	Associated Samples	Flag	A or P
07/20/22	1,2,4-Trichlorobenzene 1,2,3-Trichlorobenzene	22.5 32.8	AREA2-22-2MW-13	UJ (all non-detects) UJ (all non-detects)	A

The percent differences (%D) were less than or equal to 50.0% for all analytes with the following exceptions:

Date	Analyte	%D	Associated Samples	Flag	A or P
07/21/22	Methylene chloride	139.3	AREA2-22-2MW-13	UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Analysis Date	Analyte	Concentration	Associated Samples
MB 580-397668/6	07/20/22	1,2,3-Trichlorobenzene Hexachlorobutadiene	0.170 ug/L 0.0912 ug/L	AREA2-22-2MW-13
MB 580-397301/6	07/17/22	1,2,3-Trichlorobenzene Hexachlorobutadiene	0.184 ug/L 0.104 ug/L	AREA2-22-2MW-19 AREA2-22-2MW-14** AREA2-22-2MW-15 AREA2-22-2MW-10 AREA2-22-2MW-9 AREA2-22-2MW-9B AREA2-22-2MW-11** AREA2-22-2MW-18 AREA2-22-2MW-17 AREA2-22-2MW-18B AREA2-22-2MW-12 TB-070822
MB 580-397384/6	07/18/22	1,2,3-Trichlorobenzene Hexachlorobutadiene	0.196 ug/L 0.105 ug/L	AREA2-22-2MW-16

Sample concentrations were compared to concentrations detected in the laboratory blanks. The sample concentrations were either not detected or were significantly greater (>10X for common contaminants, >5X for other contaminants) than the concentrations found in the associated laboratory blanks.

VI. Field Blanks

Sample TB-070822 was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
AREA2-22-2MW-14MS/MSD (AREA2-22-2MW-14**)	1,1-Dichloroethene	132 (71-131)	-	J (all detects)	A
AREA2-22-2MW-14MS/MSD (AREA2-22-2MW-14**)	1,1-Dichloropropene 1,2,3-Trichlorobenzene	127 (79-125) 138 (69-129)	- 133 (69-129)	NA	-

Relative percent differences (RPD) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	RPD (Limits)	Flag	A or P
AREA2-22-2MW-14MS/MSD (AREA2-22-2MW-14**)	Vinyl chloride	21 (≤20)	J (all detects)	A

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Analyte	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/LCSD 580-397301 (AREA2-22-2MW-19 AREA2-22-2MW-14** AREA2-22-2MW-15 AREA2-22-2MW-10 AREA2-22-2MW-9 AREA2-22-2MW-9B AREA2-22-2MW-11** AREA2-22-2MW-18 AREA2-22-2MW-17 AREA2-22-2MW-18B AREA2-22-2MW-12 TB-070822)	1,2,3-Trichlorobenzene	146 (69-129)	137 (69-129)	NA	-
LCS/LCSD 580-397384 (AREA2-22-2MW-16)	1,2,3-Trichlorobenzene Methylene chloride	152 (69-129) 138 (74-124)	143 (69-129) 150 (74-124)	NA	-
LCS/LCSD 580-397668 (AREA2-22-2MW-13)	1,2,3-Trichlorobenzene	156 (69-129)	150 (69-129)	NA	-

Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

Samples AREA2-22-2MW-9 and AREA2-22-2MW-9B and samples AREA2-22-2MW-18 and AREA2-22-2MW-18B were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

	Concentration (ug/L)				
Analyte	AREA2-22-2MW-9	AREA2-22-2MW-9B	RPD (Limits)	Flag	A or P
1,3-Dichlorobenzene	0.18	0.16	12 (≤30)	-	-
Chloroform	0.22	0.18	20 (≤30)	-	-

	Concentration (ug/L)				
Analyte	AREA2-22-2MW-18	AREA2-22-2MW-18B	RPD (Limits)	Flag	A or P
1,3-Dichlorobenzene	0.14	0.15	7 (≤30)	-	-
cis-1,2-Dichloroethene	0.071	0.083	16 (≤30)	-	-
Trichloroethene	0.15U	0.24	46 (≤30)	J (all detects) UJ (all non-detects)	A

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Target Analyte Quantitation

All target analyte quantitations met validation criteria for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

XIII. Target Analyte Identification

All target analyte identifications met validation criteria for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

Manual integrations were reviewed and were considered acceptable. The laboratory provided before and after integration printouts.

XIV. System Performance

The system performance was acceptable for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Due to continuing calibration %D and ending CCV %D, MS/MSD %R and RPD, and field duplicate RPD, data were qualified as estimated in fourteen samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

NBK Keyport OU2
Volatiles - Data Qualification Summary - SDG 580-115786-1

Sample	Analyte	Flag	A or P	Reason (Code)
AREA2-22-2MW-19 AREA2-22-2MW-14** AREA2-22-2MW-15 AREA2-22-2MW-10 AREA2-22-2MW-9 AREA2-22-2MW-9B AREA2-22-2MW-11** AREA2-22-2MW-18 AREA2-22-2MW-17 AREA2-22-2MW-18B AREA2-22-2MW-12 TB-070822	1,2,3-Trichlorobenzene	UJ (all non-detects)	A	Continuing calibration (%D) (5)
AREA2-22-2MW-16	Methylene chloride	UJ (all non-detects)	A	Continuing calibration (%D) (5)
AREA2-22-2MW-13	1,2,4-Trichlorobenzene 1,2,3-Trichlorobenzene	UJ (all non-detects)	A	Continuing calibration (%D) (5)
AREA2-22-2MW-13	Methylene chloride	UJ (all non-detects)	A	Continuing calibration (ending CCV %D) (5)
AREA2-22-2MW-14**	1,1-Dichloroethene	J (all detects)	A	Matrix spike/Matrix spike duplicate (%R) (8)
AREA2-22-2MW-14**	Vinyl chloride	J (all detects)	A	Matrix spike/Matrix spike duplicate (RPD) (9)
AREA2-22-2MW-18 AREA2-22-2MW-18B	Trichloroethene	J (all detects) UJ (all non-detects)	A	Field duplicates (RPD) (14)

NBK Keyport OU2
Volatiles - Laboratory Blank Data Qualification Summary - SDG 580-115786-1

No Sample Data Qualified in this SDG

NBK Keyport OU2
Volatiles - Field Blank Data Qualification Summary - SDG 580-115786-1

No Sample Data Qualified in this SDG

LDC #: 54603A1a **VALIDATION COMPLETENESS WORKSHEET** Date: 8/7/22
SDG #: 580-115786-1 Stage 2B/4 Page: 1 of 2
Laboratory: Eurofins, Tacoma, WA Reviewer: Q
2nd Reviewer: RG

METHOD: GC/MS Volatiles (EPA SW-846 Method 8260D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A/SW	~~RSD~~ ≤ 15% or r^2 ≥ 0.990 ~~RF~~ ≤ 20%
IV.	Continuing calibration	SW	~~%D~~ ≤ 20/50%
V.	Laboratory Blanks	SW	
VI.	Field blanks	ND	TB = 4
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	SW	
IX.	Laboratory control samples	SW	LCS/D
X.	Field duplicates	SW	D = 5+6 9+12
XI.	Internal standards	A	
XII.	Target analyte quantitation	A	Not reviewed for Stage 2B validation.
XIII.	Target analyte identification	A	Not reviewed for Stage 2B validation. MI
XIV.	System performance	A	Not reviewed for Stage 2B validation.
XV.	Overall assessment of data	A	

Note: A = Acceptable ND = No compounds detected D = Duplicate SB=Source blank
N = Not provided/applicable R = Rinsate TB = Trip blank OTHER:
SW = See worksheet FB = Field blank EB = Equipment blank
** Indicates sample underwent Stage 4 validation

	Client ID	Lab ID	Matrix	Date
1	AREA2-22-2MW-19	580-115786-1	Water	07/11/22
2	AREA2-22-2MW-14**	580-115786-2**	Water	07/11/22
3	AREA2-22-2MW-15	580-115786-3	Water	07/11/22
4	AREA2-22-2MW-10	580-115786-4	Water	07/11/22
5	AREA2-22-2MW-9	580-115786-5	Water	07/11/22
6	AREA2-22-2MW-9B	580-115786-6	Water	07/11/22
7	AREA2-22-2MW-11**	580-115786-7**	Water	07/08/22
8	AREA2-22-2MW-13	580-115786-8	Water	07/11/22
9	AREA2-22-2MW-18	580-115786-9	Water	07/08/22
10	AREA2-22-2MW-16	580-115786-10	Water	07/11/22
11	AREA2-22-2MW-17	580-115786-11	Water	07/08/22
12	AREA2-22-2MW-18B	580-115786-12	Water	07/08/22
13	AREA2-22-2MW-12	580-115786-13	Water	07/08/22
14	TB-070822	580-115786-14	Water	07/08/22

LDC #: 54603A1a **VALIDATION COMPLETENESS WORKSHEET** Date: 5/17/23
SDG #: 580-115786-1 Stage 2B/4 Page: 2 of 3
Laboratory: Eurofins, Tacoma, WA Reviewer:
2nd Reviewer: JVG

METHOD: GC/MS Volatiles (EPA SW-846 Method 8260D)

	Client ID	Lab ID	Matrix	Date
15	AREA2-22-2MW-14MS	580-115786-2MS	Water	07/11/22
16	AREA2-22-2MW-14MSD	580-115786-2MSD	Water	07/11/22
17				
18				
19				

Notes:

1	39T301						
3	39T384						
2	39T668						

LDC #: 54603A/9 **VALIDATION FINDINGS CHECKLIST** Page: 1 of 2
Reviewer: 9

Method: Volatiles (EPA SW 846 Method 8260C)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12-hour clock criteria?	✓			
III. Initial calibration and Initial Calibration Verification				
Did the laboratory perform a 5-point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% (15) and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Was an initial calibration verification (ICV) standard analyzed after each initial calibration for each instrument?	✓			
Were all ICV percent differences (%D) ≤ 30% (20)?	✓	✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks?	✓			
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	
VIII. Matrix spike/Matrix spike duplicates				
Were matrix spike (MS) and matrix spike duplicate (MSD) analyzed in this SDG?	✓			

Validation Area	Yes	No	NA	Findings/Comments
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?		✓		
IX. Laboratory control samples				
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?	✓			
Were target compounds detected in the field duplicates?	✓			
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Did the laboratory LOQs/RLs meet the QAPP LOQs/RLs?	✓			
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data	✓			
Overall assessment of data was found to be acceptable.				

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 54603A/9

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: 9

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications (5)
	7/17/22	0717220Z	NNN	20.1		1-T.9.11-16.MB (ND)	J/UN/A
	7/18/22	0718220Z	E	28.1		10.MB (ND)	J/UN/A
	7/20/22	0720220Z	KK	22.5		8.MB (ND)	J/UN/A
			NNN	32.8			
	7/21/22	0721222Y (closing)	E	139.3		8.MB (ND)	J/UN/A

CONCAL.1SB

LDC #: 54623A/a

VALIDATION FINDINGS WORKSHEET
Blanks

Page: 1 of 1
Reviewer: 9

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a method blank associated with every sample in this SDG?
Y N N/A Was a method blank analyzed at least once every 12 hours for each matrix and concentration?
Y N N/A Was there contamination in the method blanks? If yes, please see the qualifications below.

Blank analysis date: 7/20/22
Conc. units: ug/L Associated Samples: 8

Compound	Blank ID	Sample Identification								
MB 580-397668/6										
Methylene chloride										
Acetone										
NNN	0.170									
LLL	0.092									

Blank analysis date:
Conc. units: Associated Samples:

Compound	Blank ID	Sample Identification								
Methylene chloride										
Acetone										

All results were qualified using the criteria stated below except those circled.

Note: Common contaminants such as Methylene chloride, Acetone, 2-Butanone, Carbon disulfide and TICs that were detected in samples within ten times the associated method blank concentration were qualified as not detected, "U". Other contaminants within five times the method blank concentration were also qualified as not detected, "U".

LDC #: 54603A/9

VALIDATION FINDINGS WORKSHEET
Blanks

Page: 1 of 1
Reviewer: Q

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a method blank associated with every sample in this SDG?
Y N N/A Was a method blank analyzed at least once every 12 hours for each matrix and concentration?
Y N N/A Was there contamination in the method blanks? If yes, please see the qualifications below.

Blank analysis date: 7/15/22
Conc. units: ug/L Associated Samples: 1-7. 9. 11-14

Compound	Blank ID	Sample Identification								
MB 580-39731/6										
Methylene chloride										
Acetone										
NNN	0.184									
LLL	0.104									

Blank analysis date: 7/18/22
Conc. units: ug/L Associated Samples: 10

Compound	Blank ID	Sample Identification								
MB 580-39738/4/6										
Methylene chloride										
Acetone										
NNN	0.196									
LLL	0.105									

All results were qualified using the criteria stated below except those circled.

Note: Common contaminants such as Methylene chloride, Acetone, 2-Butanone, Carbon disulfide and TICs that were detected in samples within ten times the associated method blank concentration were qualified as not detected, "U". Other contaminants within five times the method blank concentration were also qualified as not detected, "U".

LDC #: ~~54603A1~~ 01

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Reviewer: Q

METHOD : GC/MS VOA (EPA SW 846 Method 8260C)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.

(Y) N N/A Was a MS/MSD analyzed every 20 samples of each matrix?

Y (N) N/A Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	Date	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
		15/16	H	132 (71-131)	( )	( )	2 (dets)	J dets/A (8)
			RR	127 (79-125)	( )	( )	(ND)	↓
			NNN	138 (69-129)	133 (69-129)	( )	↓	↓
			C	( )	( )	21 (≤20)	(dets)	J dets/A (9)
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

LDC #: ~~24666A1~~a

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Reviewer: 9

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was a LCS required?
Y (N) N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

#	Date	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
		LCS/D 580-39730	NNN	146 (69-129)	137 (69-129)	( )	1-7.9.11-14.MB	Dets/F
				( )	( )	( )	(ND)	
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
		LCS/D 580-39738	NNN	132 (69-129)	143 (69-129)	( )	10.MB (ND)	Dets/F
			E	138 (74-124)	150 (74-124)	( )		↓
				( )	( )	( )		
				( )	( )	( )		
		LCS/D 580-39768	NNN	156 (69-129)	150 (69-129)	( )	8.MB (ND)	Dets/F
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

LDC#: 54603A1 **VALIDATION FINDINGS WORKSHEET** Page: 1 of 1
Field Duplicates Reviewer: PG

METHOD: GCMS VOA (EPA SW 846 Method 8260D)
Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Compound	Concentration (ug/L)		RPD (≤ 30 %)	Qualifications (Parent only)
	5	6		
FFF	0.18	0.16	12	
K	0.22	0.18	20	

Compound	Concentration (ug/L)		RPD (≤ 30 %)	Qualifications (Parent only)
	9	12		
FFF	0.14	0.15	7	
QQQ	0.071	0.083	16	
S	0.15U	0.24	46	J/UJ/A (4)

V:\FIELD DUPLICATES\Field Duplicates\FD_Organics\2022\54603A1_EA_Keyport.wpd

LDC #: 54603A/01

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: Q

METHOD: GC/MS VOA (EPA SW 846 Method 8260C)

The Relative Response Factor (RRF), average RRF, and percent relative standard deviation (%RSD) were recalculated for the compounds identified below using the following calculations:

$RRF = (A_x)(C_{is})/(A_{is})(C_x)$
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

A_x = Area of compound,
C_x = Concentration of compound,
S = Standard deviation of the RRFs
X = Mean of the RRFs

A_{is} = Area of associated internal standard
C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported RRF (10 std)	Recalculated RRF (10 std)	Reported Average RRF (initial)	Recalculated Average RRF (initial)	Reported %RSD	Recalculated %RSD
1	KAZ	7/14/22	QQQ (1st internal standard)	0.3748	0.3748	0.3618	0.3618	11.4	11.4
			AA (2nd internal standard)	0.3724	0.3724	0.3711	0.3711	6.3	6.3
			FFF (3rd internal standard)	1.7910	1.7910	1.7143	1.7143	9.3	9.3
			(4th internal standard)						
2			(1st internal standard)						
			(2nd internal standard)						
			(3rd internal standard)						
			(4th internal standard)						
3			(1st internal standard)						
			(2nd internal standard)						
			(3rd internal standard)						
			(4th internal standard)						
4			(1st internal standard)						
			(2nd internal standard)						
			(3rd internal standard)						
			(4th internal standard)						

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results

LDC #: 54603A1/01

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: 2

METHOD: GC/MS VOA (EPA SW 846 Method 8260C)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
$RRF = (A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	0717202	7/17/22	RRR (1st internal standard)	0.3618	0.3773	0.3773	4.3	4.3
			AA (2nd internal standard)	0.3711	0.3692	0.3692	0.5	0.5
			FFF (3rd internal standard)	1.7143	1.841	1.841	7.4	7.4
			(4th internal standard)					
2			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
3			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
4			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

METHOD: GC/MS VOA (EPA SW 846 Method 8260C)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 2

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	10.0	11.5	115	115	
1,2-Dichloroethane-d4	↓	11.2	112	112	
Toluene-d8	↓	9.32	93	93	
Bromofluorobenzene	↓	9.83	98	98	

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 54602A19

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: 9

METHOD: GC/MS VOA (EPA SW 846 Method 8260C)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SSC - SC)/SA Where: SSC = Spiked sample concentration; SA = Spike added; SC = Sample concentration

RPD = | MSC - MSC | * 2/(MSC + MSDC) MSC = Matrix spike concentration MSDC = Matrix spike duplicate concentration

MS/MSD sample: 15/16

Compound	Spike Added (µg/L)		Sample Concentration (µg/L)	Spiked Sample Concentration (µg/L)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
1,1-Dichloroethene	5.00	5.00	0.098	6.72	5.75	132	132	113	113	16	16
Trichloroethene	↓	↓	ND	5.62	5.34	112	112	107	107	5	5
Benzene											
Toluene											
Chlorobenzene	↓	↓	ND	5.45	5.20	109	109	104	104	5	5

Comments: Refer to Matrix Spike/Matrix Spike Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 54603A/9

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

METHOD: GC/MS VOA (EPA SW 846 Method 8260C)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration; SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: 580-39730/

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	5.00	5.00	5.54	5.32	111	111	106	106	4	4
Trichloroethene	↓	↓	5.06	4.97	101	101	99	99	2	2
Benzene										
Toluene										
Chlorobenzene	↓	↓	5.22	5.12	104	104	102	103	2	2

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 54603X19

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: 9

METHOD: GC/MS VOA (EPA SW 846 Method 8260C)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x = Area of the characteristic ion (EICP) for the compound to be measured

A_{is} = Area of the characteristic ion (EICP) for the specific internal standard

I_s = Amount of internal standard added in nanograms (ng)

RRF = Relative response factor of the calibration standard.

V_o = Volume or weight of sample pruged in milliliters (ml) or grams (g).

Df = Dilution factor.

%S = Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. 2, QQQ:

Conc. = $\frac{(131657)(10.0)(1)}{(279561)(0.3818)(\quad)}$

= 13.0 ug/L

#	Sample ID	Compound	Reported Concentration (ug/L)	Calculated Concentration ( )	Qualification
	2	QQQ	13.0		

LABORATORY DATA CONSULTANTS, INC.
2701 Loker Ave. West, Suite 220, Carlsbad, CA 92010 Bus: 760-827-1100 Fax: 760-827-1099

EA Engineering, Science, & Technology, Inc.
2200 Sixth Ave., Suite 707
Seattle, WA 98121
ATTN: Ms. Sherri Wunderlich
swunderlich@eaest.com

August 19, 2022

SUBJECT: NBK Keyport OU2 - Data Validation

Dear Ms. Wunderlich,

Enclosed is the final validation report for the fraction listed below. This SDG was received on July 29, 2022. Attachment 1 is a summary of the samples that were reviewed for the analysis.

LDC Project #54604:

SDG #	**Fraction**
410-89884-1 410-90316-1	Volatiles

The data validation was performed under Stage 2B & 4 validation guidelines. The analysis was validated using the following documents and variances, as applicable to the method:

- Final Tier I Sampling and Analysis Plan, Soil and Groundwater Investigation at Operable Unit 2 Area 2, Van Meter Road Spill/Drum Storage Site, Naval Base Kitsap Keyport, Keyport, Washington (April 2022)
- U.S. Department of Defense (DoD) General Validation Guidelines (November 2019)
- DoD Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020)
- EPA SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998; IIIB, November 2004; update IV, February 2007; update V, July 2014; update VI, July 2018

Please feel free to contact us if you have any questions.

Sincerely,

Pei Geng
Project Manager/Senior Chemist
pgeng@lab-data.com

225 pages-ADV 3 WEEK TAT Attachment 1

90/10 2B/4 EDD **LDC# 54604 (EA Engineering - Seattle, WA / NBK Keyport, OU2)** **PO# 23092**

LDC	SDG#	DATE REC'D	(2) DATE DUE	VOA (8260D)																															
Matrix:	Water/Soil			W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S
A	410-89884-1	07/29/22	08/19/22	3	39																														
A	410-89884-1	07/29/22	08/19/22	0	7																														
B	410-90316-1	07/29/22	08/19/22	2	24																														
Total	T/PG			5	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	75

Shaded cells indicate Stage 4 validation (all other cells are Stage 2B validation). Sample counts do not include RE, DL, MS, MSD, and DUP's.

V:\LOGIN\EA\Keyport\54604ST-OU2.wpd

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NBK Keyport OU2

LDC Report Date: August 18, 2022

Parameters: Volatiles

Validation Level: Stage 2B & 4

Laboratory: Eurofins, Lancaster, PA

Sample Delivery Group (SDG): 410-89884-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
AREA-2-22-SB-13-0.5	410-89884-1	Soil	06/28/22
AREA-2-22-SB-13-5	410-89884-2	Soil	06/28/22
AREA-2-22-SB-13-10**	410-89884-3**	Soil	06/28/22
AREA-2-22-SB-13-15**	410-89884-4**	Soil	06/28/22
AREA-2-22-SB-13-20**	410-89884-5**	Soil	06/28/22
TB-62822-1	410-89884-6	Soil	06/28/22
AREA-2-22-SB-9-0.5	410-89884-7	Soil	06/29/22
AREA-2-22-SB-9-10	410-89884-8	Soil	06/29/22
AREA-2-22-SB-9-1-10	410-89884-9	Soil	06/29/22
AREA-2-22-SB-9-20	410-89884-10	Soil	06/29/22
AREA-2-22-SB-9-20DL	410-89884-10DL	Soil	06/29/22
AREA-2-22-SB-9-20DLRE	410-89884-10DLRE	Soil	06/29/22
AREA-2-22-SB-9-30	410-89884-11	Soil	06/29/22
AREA-2-22-SB-9-30DL	410-89884-11DL	Soil	06/29/22
AREA-2-22-SB-9-30DLRE	410-89884-11DLRE	Soil	06/29/22
AREA-2-22-SB-9-40	410-89884-12	Soil	06/29/22
TB-62922	410-89884-13	Soil	06/29/22
AREA-2-22-SB-10-0.5	410-89884-14	Soil	06/29/22
AREA-2-22-SB-10-10	410-89884-15	Soil	06/29/22
AREA-2-22-SB-10-10DL	410-89884-15DL	Soil	06/29/22
AREA-2-22-SB-10-20	410-89884-16	Soil	06/29/22
AREA-2-22-SB-10-30	410-89884-17	Soil	06/29/22
AREA-2-22-SB-10-40	410-89884-18	Soil	06/29/22
AREA-2-22-SB-14-0.5	410-89884-19	Soil	06/30/22
AREA-2-22-SB-14-5	410-89884-20	Soil	06/30/22
AREA-2-22-SB-14-10**	410-89884-21**	Soil	06/30/22

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
AREA-2-22-SB-14-15**	410-89884-22**	Soil	06/30/22
AREA-2-22-SB-14-20**	410-89884-23**	Soil	06/30/22
FB-63022	410-89884-24	Water	06/30/22
TB-63022	410-89884-25	Soil	06/30/22
AREA-2-22-SB-19-0.5	410-89884-26	Soil	07/01/22
AREA-2-22-SB-19-5	410-89884-27	Soil	07/01/22
AREA-2-22-SB-19-10	410-89884-28	Soil	07/01/22
AREA-2-22-SB-19-15	410-89884-29	Soil	07/01/22
AREA-2-22-SB-19-20**	410-89884-30**	Soil	07/01/22
AREA-2-22-SB-15-0.5	410-89884-31	Soil	07/01/22
AREA-2-22-SB-15-1-0.5	410-89884-32	Soil	07/01/22
AREA-2-22-SB-15-5	410-89884-33	Soil	07/01/22
AREA-2-22-SB-15-10	410-89884-34	Soil	07/01/22
AREA-2-22-SB-15-15	410-89884-35	Soil	07/01/22
AREA-2-22-SB-15-20	410-89884-36	Soil	07/01/22
FB-7122	410-89884-37	Water	07/01/22
AREA-2-22-SB-16-0.5	410-89884-38	Soil	07/01/22
AREA-2-22-SB-16-5	410-89884-39	Soil	07/01/22
AREA-2-22-SB-16-10	410-89884-40	Soil	07/01/22
AREA-2-22-SB-16-15	410-89884-41	Soil	07/01/22
AREA-2-22-SB-16-20	410-89884-42	Soil	07/01/22
TB-07122	410-89884-43	Soil	07/01/22
FB-062922	410-89884-44	Water	06/29/22
AREA-2-22-SB-13-5MS	410-89884-2MS	Soil	06/28/22
AREA-2-22-SB-13-5MSD	410-89884-2MSD	Soil	06/28/22
AREA-2-22-SB-10-10MS	410-89884-15MS	Soil	06/29/22
AREA-2-22-SB-10-10MSD	410-89884-15MSD	Soil	06/29/22
AREA-2-22-SB-10-10DLMS	410-89884-15DLMS	Soil	06/29/22
AREA-2-22-SB-10-10DLMSD	410-89884-15DLMSD	Soil	06/29/22
AREA-2-22-SB-15-15MS	410-89884-35MS	Soil	07/01/22
AREA-2-22-SB-15-15MSD	410-89884-35MSD	Soil	07/01/22

**Indicates sample underwent Stage 4 validation

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Tier I Sampling and Analysis Plan, Soil and Groundwater Investigation at Operable Unit 2 Area 2, Van Meter Road Spill/Drum Storage Site, Naval Base Kitsap Keyport, Keyport, Washington (April 2022), the U.S. Department of Defense (DoD) General Validation Guidelines (November 2019), and the DoD Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260D

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results. Samples appended with a double asterisk on the cover page were subjected to Stage 4 data validation, which is comprised of the QC summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J (Estimated): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered not detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Codes

1	Holding Times Exceeded
2	Sample Preservation / Cooler Temperature Exceeded Acceptance Criteria
3	Sample Custody Potentially Compromised Sample Integrity
4	Missing/Incomplete Deliverables
5	Calibration Did Not Meet Method Criteria
6	Equipment/Field Blank Contamination
7	Laboratory Method or Calibration Blank Contamination
8	Matrix Spike % Recovery Exceeded Acceptance Criteria
9	Matrix Spike Duplicate (RPD or Duplicate Sample Analysis) Exceeded Acceptance Criteria
10A	Laboratory Control Sample % Recovery Exceeded Acceptance Criteria
10B	Laboratory Control Sample Duplicate (RPD) Exceeded Acceptance Criteria
11	ICP Interference Check Analysis Exceeded Method Criteria
12	RPD Between Two Columns (Pesticides/PCBs only)
13	Surrogate Recoveries Exceeded Acceptance Criteria
14	Field Duplicates RPD Exceeded Project Criteria
15	Peak Resolution did not meet method criteria
16	Serial Dilution Analysis Exceeded Method Criteria
17	Chemical Recoveries Exceeded Acceptance Criteria
18	Trip Blank Contamination
19	Internal Standards Did Not Meet Method Criteria
20	Calibration Range exceeded Method Criteria
21	Potential False Positives
22	Do not use, other result more technically sound (overall assessment)
23	Estimated Maximum Possible Concentration
24	Trace Detection Below the LOQ (RL) and Above the DL (MDL)
25	Other

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria with the following exceptions:

Sample	Analyte	Finding	Criteria	Flag	A or P
FB-63022 FB-7122 FB-062922	All analytes	A headspace was apparent in the sample containers.	There should be no headspace in the sample containers.	UJ (all non-detects)	A

All technical holding time requirements were met with the following exceptions:

Sample	Analyte	Total Days From Sample Collection Until Analysis	Required Holding Time (in Days) From Sample Collection Until Analysis	Flag	A or P
AREA-2-22-SB-9-20DL AREA-2-22-SB-9-30DL AREA-2-22-SB-10-10DL	All analytes	22	14	UJ (all non-detects)	A
AREA-2-22-SB-9-20DLRE AREA-2-22-SB-9-30DLRE	All analytes	26	14	UJ (all non-detects)	A

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For analytes where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 15.0%.

In the case where the laboratory used a calibration curve to evaluate the analytes, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all analytes were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes with the following exceptions:

Date	Analyte	%D	Associated Samples	Flag	A or P
07/18/22	Chloroethane	69.8	AREA-2-22-SB-19-10	UJ (all non-detects)	A
07/21/22	Chloroethane	41.6	AREA-2-22-SB-9-20DL AREA-2-22-SB-9-30DL AREA-2-22-SB-10-10DL	UJ (all non-detects)	A
07/25/22	1,2,4-Trichlorobenzene Hexachlorobutadiene 1,2,3-Trichlorobenzene	21.8 36.4 23.4	AREA-2-22-SB-9-20DLRE AREA-2-22-SB-9-30DLRE	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A
07/11/22	1,1-Dichloropropene 1,2-Dichloropropane	23.5 21.1	AREA-2-22-SB-13-0.5 AREA-2-22-SB-13-5 AREA-2-22-SB-13-10** AREA-2-22-SB-13-15** AREA-2-22-SB-13-20** TB-62822-1 AREA-2-22-SB-9-10 AREA-2-22-SB-9-1-10 AREA-2-22-SB-9-20 AREA-2-22-SB-9-30	UJ (all non-detects) UJ (all non-detects)	A

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 50.0% for all analytes with the following exceptions:

Date	Analyte	%D	Associated Samples	Flag	A or P
07/13/22	Chloroethane	98.1	AREA-2-22-SB-19-10	UJ (all non-detects)	A
07/25/22	Chloroethane	65.7	AREA-2-22-SB-9-20DLRE AREA-2-22-SB-9-30DLRE	UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Samples TB-62822-1, TB-62922, TB-63022, and TB-07122 were identified as trip blanks. No contaminants were found.

Samples FB-63022, FB-7122, and FB-062922 were identified as field blanks. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits with the following exceptions:

Sample	Surrogate	%R (Limits)	Affected Analyte	Flag	A or P
AREA-2-22-SB-9-20DL	1,2-Dichloroethane-d4 Bromofluorobenzene Dibromofluoromethane Toluene-d8	56 (71-136) 78 (79-119) 53 (78-119) 49 (85-116)	All analytes	UJ (all non-detects)	A
AREA-2-22-SB-9-20DLRE	1,2-Dichloroethane-d4 Bromofluorobenzene Dibromofluoromethane Toluene-d8	50 (71-136) 76 (79-119) 46 (78-119) 44 (85-116)	All analytes	UJ (all non-detects)	A
AREA-2-22-SB-9-30DL	1,2-Dichloroethane-d4 Dibromofluoromethane Toluene-d8	45 (71-136) 43 (78-119) 43 (85-116)	All analytes	UJ (all non-detects)	A
AREA-2-22-SB-9-30DLRE	1,2-Dichloroethane-d4 Dibromofluoromethane Toluene-d8	36 (71-136) 32 (78-119) 34 (85-116)	All analytes	UJ (all non-detects)	A
AREA-2-22-SB-10-10DL	1,2-Dichloroethane-d4 Dibromofluoromethane Toluene-d8	58 (71-136) 57 (78-119) 55 (85-116)	All analytes	UJ (all non-detects)	A

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
AREA-2-22-SB-13-5MS/MSD (AREA-2-22-SB-13-5)	1,1,1,2-Tetrachloroethane	-	126 (78-125)	NA	-
	1,1,1-Trichloroethane	-	153 (73-130)		
	1,1-Dichloroethane	131 (76-125)	146 (76-125)		
	1,1-Dichloroethene	148 (70-131)	170 (70-131)		
	1,1-Dichloropropene	141 (76-125)	166 (76-125)		
	1,2,3-Trichlorobenzene	-	57 (66-130)		
	1,2,4-Trichlorobenzene	-	103 (78-121)		
	1,2-Dichloropropane	128 (76-123)	134 (76-123)		
	2,2-Dichloropropane	135 (67-133)	159 (67-133)		
	2-Chlorotoluene	-	157 (75-122)		
	4-Chlorotoluene	-	144 472-124)		
	Carbon tetrachloride	-	149 (70-135)		
	Chlorobenzene	-	129 (79-120)		
	Chloroethane	-	158 (59-139)		
	Chloroform	-	133 (78-123)		
	Chloromethane	-	157 (50-136)		
	cis-1,2-Dichloroethene	128 (77-123)	138 (77-123)		
	Tetrachloroethene	-	161 (73-128)		
	trans-1,2-Dichloroethene	134 (74-125)	150 (74-125)		
	Trichloroethene	129 (77-123)	147 (77-123)		
	Vinyl chloride	-	166 (56-135)		
AREA-2-22-SB-13-5MS/MSD (AREA-2-22-SB-13-5)	1,2,3-Trichlorobenzene	54 (66-130)	57 (66-130)	UJ (all non-detects)	A
	1,2,4-Trichlorobenzene	62 (67-129)	65 (67-129)	UJ (all non-detects)	
AREA-2-22-SB-10-10MS/MSD (AREA-2-22-SB-10-10)	1,2,3-Trichlorobenzene	0 (66-130)	27 (66-130)	X (all non-detects)	A
	1,2,4-Trichlorobenzene	0 (67-129)	0 (67-129)	X (all non-detects)	
	4-Chlorotoluene	9 (72-124)	33 (72-124)	X (all non-detects)	
	Hexachlorobutadiene	0 (61-135)	26 (61-135)	X (all non-detects)	
AREA-2-22-SB-10-10MS/MSD (AREA-2-22-SB-10-10)	1,1,1,2-Tetrachloroethane	33 (78-125)	59 (78-125)	UJ (all non-detects)	A
	1,1,1-Trichloroethane	45 (73-130)	62 (73-130)	UJ (all non-detects)	
	1,1,2-Trichloroethane	65 (78-121)	-	UJ (all non-detects)	
	1,1-Dichloroethane	51 (76-125)	67 (76-125)	UJ (all non-detects)	
	1,1-Dichloroethene	57 (70-131)	64 (70-131)	UJ (all non-detects)	
	1,1-Dichloropropene	38 (73-125)	58 (76-125)	UJ (all non-detects)	
	1,2,3-Trichloropropane	71 (73-125)	90 (73-125)	UJ (all non-detects)	
	1,2-Dichlorobenzene	19 (78-121)	37 (78-121)	UJ (all non-detects)	
	1,2-Dichloropropane	53 (73-128)	-	UJ (all non-detects)	
	1,3-Dichlorobenzene	52 (76-123)	73 (76-123)	UJ (all non-detects)	
	1,3-Dichloropropane	14 (77-121)	31 (77-121)	UJ (all non-detects)	
	1,4-Dichlorobenzene	56 (77-121)	74 (77-121)	UJ (all non-detects)	
	2,2-Dichloropropane	14 (75-120)	29 (75-120)	UJ (all non-detects)	
	2-Chlorotoluene	54 (67-133)	59 (67-133)	UJ (all non-detects)	
	Carbon tetrachloride	17 (75-122)	38 (75-122)	UJ (all non-detects)	
	Chlorobenzene	38 (70-135)	55 (70-135)	UJ (all non-detects)	
	Chloroform	22 (79-120)	46 (79-120)	UJ (all non-detects)	
	Chloromethane	46 (78-123)	65 (78-123)	UJ (all non-detects)	
	cis-1,2-Dichloroethene	45 (77-123)	69 (50-136)	UJ (all non-detects)	
	cis-1,3-Dichloropropene	33 (74-126)	71 (77-123)	UJ (all non-detects)	
	Methylene chloride	57 (70-128)	59 (74-126)	UJ (all non-detects)	
	Tetrachloroethene	21 (73-128)	47 (73-128)	UJ (all non-detects)	
	trans-1,2-Dichloroethene	38 (74-125)	58 (74-125)	UJ (all non-detects)	
	trans-1,3-Dichloropropene	36 (71-130)	61 (71-130)	UJ (all non-detects)	
	Trichloroethene	29 (77-123)	55 (77-123)	UJ (all non-detects)	
	Vinyl chloride	-	61 (56-135)	UJ (all non-detects)	
AREA-2-22-SB-10-10DLMS/MSD (AREA-2-22-SB-10-10DL)	1,1-Dichloroethene	60 (70-131)	69 (70-131)	UJ (all non-detects)	A
AREA-2-22-SB-10-10DLMS/MSD (AREA-2-22-SB-10-10DL)	Chloroethane	-	167 (59-139)	NA	-

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
AREA-2-22-SB-15-15MS/MSD (AREA-2-22-SB-15-15)	1,1,2,2-Tetrachloroethane	129 (70-124)	126 (70-124)	NA	-

Relative percent differences (RPD) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	RPD (Limits)	Flag	A or P
AREA-2-22-SB-13-5MS/MSD (AREA-2-22-SB-13-5)	1,1,2,2-Tetrachloroethane 1,1,2-Trichloroethane 1,2,3-Trichlorobenzene 1,2,3-Trichloropropane 1,2,4-Trichlorobenzene 1,2-Dichloroethane 1,2-Dichloropropane 1,3-Dichloropropane cis-1,3-Dichloropropene Methylene chloride trans-1,3-Dichloropropene	42 (≤20) 38 (≤20) 21 (≤20) 53 (≤20) 23 (≤20) 41 (≤20) 22 (≤20) 36 (≤20) 29 (≤20) 25 (≤20) 32 (≤20)	NA	-
AREA-2-22-SB-10-10MS/MSD (AREA-2-22-SB-10-10)	1,1,1,2-Tetrachloroethane 1,1-Dichloropropene 1,2,3-Trichlorobenzene 1,2-Dichlorobenzene 1,2-Dichloroethane 1,2-Dichloropropane 1,3-Dichlorobenzene 1,4-Dichlorobenzene 2-Chlorotoluene 4-Chlorotoluene Carbon tetrachloride Chlorobenzene Chloroethane Chloroform Chloromethane cis-1,2-Dichloroethene cis-1,3-Dichloropropene Hexachlorobutadiene Tetrachloroethene trans-1,2-Dichloroethene trans-1,3-Dichloropropene Trichloroethene Vinyl chloride	46 (≤20) 29 (≤20) 200 (≤20) 54 (≤20) 23 (≤20) 21 (≤20) 66 (≤20) 55 (≤20) 63 (≤20) 104 (≤20) 26 (≤20) 59 (≤20) 21 (≤20) 22 (≤20) 44 (≤20) 33 (≤20) 46 (≤20) 200 (≤20) 64 (≤20) 29 (≤20) 40 (≤20) 49 (≤20) 36 (≤20)	NA	-
AREA-2-22-SB-10-10DLMS/MSD (AREA-2-22-SB-10-10DL)	Chloroethane	23 (≤20)	NA	-

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Analyte	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/LCSD 410-274901 (AREA-2-22-SB-19-10)	Chloroethane	168 (59-139)	162 (59-139)	NA	-
LCS/LCSD 410-277983 (AREA-2-22-SB-9-20DL AREA-2-22-SB-9-30DL AREA-2-22-SB-10-10DL)	Chloroethane	173 (59-139)	160 (59-139)	NA	-

Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

Samples AREA-2-22-SB-9-10 and AREA-2-22-SB-9-1-10 and samples AREA-2-22-SB-15-0.5 and AREA-2-22-SB-15-1-0.5 were identified as field duplicates. No results were detected in any of the samples.

XI. Internal Standards

All internal standard areas and retention times were within QC limits with the following exceptions:

Sample	Internal Standards	Area (Limits)	Affected Analyte	Flag	A or P
AREA-2-22-SB-9-20	Chlorobenzene-d5 1,4-Dichlorobenzene-d4	488750 (503835-2015340) 251358 (300802-1203208)	1,1,2-Trichloroethane trans-1,3-Dichloropropene Tetrachloroethene 1,1,2,2-Tetrachloroethane Chlorobenzene 1,3-Dichloropropane 1,1,1,2-Tetrachloroethane 1,2,3-Trichloropropane 2-Chlorotoluene 4-Chlorotoluene 1,3-Dichlorobenzene 1,4-Dichlorobenzene 1,2-Dichlorobenzene 1,2,4-Trichlorobenzene Hexachlorobutadiene 1,2,3-Trichlorobenzene	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A
AREA-2-22-SB-9-30	Fluorobenzene Chlorobenzene-d5 1,4-Dichlorobenzene-d4	122042 (588604-2354414) 101746 (503835-2015340) 54911 (300802-1203208)	All analytes	X (all non-detects)	A
AREA-2-22-SB-10-10	Fluorobenzene Chlorobenzene-d5 1,4-Dichlorobenzene-d4	414071 (616598-2466390) 328938 (496003-1984010) 184726 (280860-1123440)	All analytes	UJ (all non-detects)	A

XII. Target Analyte Quantitation

All target analyte quantitations met validation criteria for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

XIII. Target Analyte Identification

All target analyte identifications met validation criteria for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

Manual integrations were reviewed and were considered acceptable. The laboratory provided before and after integration printouts.

XIV. System Performance

The system performance was acceptable for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

In the case where more than one result was reported for an individual sample, the least technically acceptable results were deemed not reportable as follows:

Sample	Analyte	Reason	Flag	A or P
AREA-2-22-SB-9-20DL AREA-2-22-SB-9-20DLRE AREA-2-22-SB-9-30DLRE	All analytes	Analyzed outside of holding time.	Not reportable	-
AREA-2-22-SB-9-30	All analytes	Internal standard out.	Not reportable	-
AREA-2-22-SB-10-10	1,2,3-Trichlorobenzene 1,2,4-Trichlorobenzene 4-Chlorotoluene Hexachlorobutadiene	Low MS recovery.	Not reportable	-
AREA-2-22-SB-10-10DL	All analytes except 1,2,3-Trichlorobenzene 1,2,4-Trichlorobenzene 4-Chlorotoluene Hexachlorobutadiene	Results from undiluted analyses were more usable.	Not reportable	-

Due to headspace, technical holding time, continuing calibration %D, surrogate %R, MS/MSD %R, and internal standard area, data were qualified as estimated in sixteen samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

NBK Keyport OU2
Volatiles - Data Qualification Summary - SDG 410-89884-1

Sample	Analyte	Flag	A or P	Reason (Code)
FB-63022 FB-7122 FB-062922	All analytes	UJ (all non-detects)	A	Sample condition (headspace) (2)
AREA-2-22-SB-9-30DL	All analytes	UJ (all non-detects)	A	Technical holding times (1)
AREA-2-22-SB-10-10DL	1,2,3-Trichlorobenzene 1,2,4-Trichlorobenzene 4-Chlorotoluene Hexachlorobutadiene	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Technical holding times (1)
AREA-2-22-SB-19-10 AREA-2-22-SB-9-30DL	Chloroethane	UJ (all non-detects)	A	Continuing calibration (%D) (5)
AREA-2-22-SB-13-0.5 AREA-2-22-SB-13-5 AREA-2-22-SB-13-10** AREA-2-22-SB-13-15** AREA-2-22-SB-13-20** TB-62822-1 AREA-2-22-SB-9-10 AREA-2-22-SB-9-1-10 AREA-2-22-SB-9-20	1,1-Dichloropropene 1,2-Dichloropropane	UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D) (5)
AREA-2-22-SB-19-10	Chloroethane	UJ (all non-detects)	A	Continuing calibration (ending CCV %D) (5)
AREA-2-22-SB-9-30DL	All analytes	UJ (all non-detects)	A	Surrogates (%R) (13)
AREA-2-22-SB-10-10DL	1,2,3-Trichlorobenzene 1,2,4-Trichlorobenzene 4-Chlorotoluene Hexachlorobutadiene	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Surrogates (%R) (13)
AREA-2-22-SB-13-5	1,2,3-Trichlorobenzene 1,2,4-Trichlorobenzene	UJ (all non-detects) UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R) (8)

Sample	Analyte	Flag	A or P	Reason (Code)
AREA-2-22-SB-10-10	1,1,1,2-Tetrachloroethane 1,1,1-Trichloroethane 1,1,2-Trichloroethane 1,1-Dichloroethane 1,1-Dichloroethene 1,1-Dichloropropene 1,2,3-Trichloropropane 1,2-Dichlorobenzene 1,2-Dichloropropane 1,3-Dichlorobenzene 1,3-Dichloropropane 1,4-Dichlorobenzene 2,2-Dichloropropane 2-Chlorotoluene Carbon tetrachloride Chlorobenzene Chloroform Chloromethane cis-1,2-Dichloroethene cis-1,3-Dichloropropene Methylene chloride Tetrachloroethene trans-1,2-Dichloroethene trans-1,3-Dichloropropene Trichloroethene Vinyl chloride	UJ (all non-detects) UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R) (8)
AREA-2-22-SB-9-20	1,1,2-Trichloroethane trans-1,3-Dichloropropene Tetrachloroethene 1,1,2,2-Tetrachloroethane Chlorobenzene 1,3-Dichloropropane 1,1,1,2-Tetrachloroethane 1,2,3-Trichloropropane 2-Chlorotoluene 4-Chlorotoluene 1,3-Dichlorobenzene 1,4-Dichlorobenzene 1,2-Dichlorobenzene 1,2,4-Trichlorobenzene Hexachlorobutadiene 1,2,3-Trichlorobenzene	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Internal standards (area) (19)
AREA-2-22-SB-10-10	All analytes except 1,2,3-Trichlorobenzene 1,2,4-Trichlorobenzene 4-Chlorotoluene Hexachlorobutadiene	UJ (all non-detects)	A	Internal standards (area) (19)
AREA-2-22-SB-9-20DL AREA-2-22-SB-9-20DLRE AREA-2-22-SB-9-30DLRE	All analytes	Not reportable	-	Overall assessment of data (22)
AREA-2-22-SB-9-30	All analytes	Not reportable	-	Overall assessment of data (22)
AREA-2-22-SB-10-10	1,2,3-Trichlorobenzene 1,2,4-Trichlorobenzene 4-Chlorotoluene Hexachlorobutadiene	Not reportable	-	Overall assessment of data (22)

Sample	Analyte	Flag	A or P	Reason (Code)
AREA-2-22-SB-10-10DL	All analytes except 1,2,3-Trichlorobenzene 1,2,4-Trichlorobenzene 4-Chlorotoluene Hexachlorobutadiene	Not reportable	-	Overall assessment of data (22)

NBK Keyport OU2
Volatiles - Laboratory Blank Data Qualification Summary - SDG 410-89884-1

No Sample Data Qualified in this SDG

NBK Keyport OU2
Volatiles - Field Blank Data Qualification Summary - SDG 410-89884-1

No Sample Data Qualified in this SDG

LDC #: 54604A1a **VALIDATION COMPLETENESS WORKSHEET** Date: 8/17/22
SDG #: 410-89884-1 Stage 2B/4 Page: 1 of 2
Laboratory: Eurofins, Lancaster, PA Reviewer: 9
2nd Reviewer: JVG

METHOD: GC/MS Volatiles (EPA SW-846 Method 8260D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	SW	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A/A	RSD ≤ 15%. r² ICV ≤ 20%
IV.	Continuing calibration	SW	CCV ≤ 20/50%
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB=6.1T.30.48 EB=29.42.49
VII.	Surrogate spikes	SW	
VIII.	Matrix spike/Matrix spike duplicates	SW	
IX.	Laboratory control samples	SW	LCS/D
X.	Field duplicates	ND	D=8+9. 36+37
XI.	Internal standards	SW	
XII.	Target analyte quantitation	A	Not reviewed for Stage 2B validation.
XIII.	Target analyte identification	A	Not reviewed for Stage 2B validation. MI
XIV.	System performance	A	Not reviewed for Stage 2B validation.
XV.	Overall assessment of data	SW	

Note: A = Acceptable ND = No compounds detected D = Duplicate SB=Source blank
N = Not provided/applicable R = Rinsate TB = Trip blank OTHER:
SW = See worksheet FB = Field blank EB = Equipment blank
** Indicates sample underwent Stage 4 validation

	Client ID	Lab ID	Matrix	Date
1 2	AREA-2-22-SB-13-0.5	410-89884-1	Soil	06/28/22
2 2	AREA-2-22-SB-13-5	410-89884-2	Soil	06/28/22
3 2	AREA-2-22-SB-13-10 ~~**~~	410-89884-3 ~~**~~	Soil	06/28/22
4 2	AREA-2-22-SB-13-15**	410-89884-4**	Soil	06/28/22
5 2	AREA-2-22-SB-13-20**	410-89884-5**	Soil	06/28/22
6 2	TB-62822-1	410-89884-6	Soil	06/28/22
7 3	AREA-2-22-SB-9-0.5	410-89884-7	Soil	06/29/22
8 2	AREA-2-22-SB-9-10	410-89884-8	Soil	06/29/22
9 2	AREA-2-22-SB-9-1-10	410-89884-9	Soil	06/29/22
10 2	AREA-2-22-SB-9-20	410-89884-10	Soil	06/29/22
11 1	AREA-2-22-SB-9-20DL	410-89884-10DL	Soil	06/29/22
12 8	AREA-2-22-SB-9-20DLRE	410-89884-10DLRE	Soil	06/29/22
13 2	AREA-2-22-SB-9-30	410-89884-11	Soil	06/29/22
14 1	AREA-2-22-SB-9-30DL	410-89884-11DL	Soil	06/29/22

LDC #: 54604A1a

SDG #: 410-89884-1

Laboratory: Eurofins, Lancaster, PA

VALIDATION COMPLETENESS WORKSHEET

Stage 2B/4

Date: 8/17/23

Page: 2 of 3

Reviewer: 9

2nd Reviewer: JVG

METHOD: GC/MS Volatiles (EPA SW-846 Method 8260D)

	Client ID	Lab ID	Matrix	Date
15	AREA-2-22-SB-9-30DLRE	410-89884-11DLRE	Soil	06/29/22
16	AREA-2-22-SB-9-40	410-89884-12	Soil	06/29/22
17	TB-62922	410-89884-13	Soil	06/29/22
18	AREA-2-22-SB-10-0.5	410-89884-14	Soil	06/29/22
19	AREA-2-22-SB-10-10	410-89884-15	Soil	06/29/22
20	AREA-2-22-SB-10-10DL	410-89884-15DL	Soil	06/29/22
21	AREA-2-22-SB-10-20	410-89884-16	Soil	06/29/22
22	AREA-2-22-SB-10-30	410-89884-17	Soil	06/29/22
23	AREA-2-22-SB-10-40	410-89884-18	Soil	06/29/22
24	AREA-2-22-SB-14-0.5	410-89884-19	Soil	06/30/22
25	AREA-2-22-SB-14-5	410-89884-20	Soil	06/30/22
26	AREA-2-22-SB-14-10**	410-89884-21**	Soil	06/30/22
27	AREA-2-22-SB-14-15**	410-89884-22**	Soil	06/30/22
28	AREA-2-22-SB-14-20**	410-89884-23**	Soil	06/30/22
29	FB-63022	410-89884-24	Water	06/30/22
30	TB-63022	410-89884-25	Soil	06/30/22
31	AREA-2-22-SB-19-0.5	410-89884-26	Soil	07/01/22
32	AREA-2-22-SB-19-5	410-89884-27	Soil	07/01/22
33	AREA-2-22-SB-19-10	410-89884-28	Soil	07/01/22
34	AREA-2-22-SB-19-15	410-89884-29	Soil	07/01/22
35	AREA-2-22-SB-19-20**	410-89884-30**	Soil	07/01/22
36	AREA-2-22-SB-15-0.5	410-89884-31	Soil	07/01/22
37	AREA-2-22-SB-15-1-0.5	410-89884-32	Soil	07/01/22
38	AREA-2-22-SB-15-5	410-89884-33	Soil	07/01/22
39	AREA-2-22-SB-15-10	410-89884-34	Soil	07/01/22
40	AREA-2-22-SB-15-15	410-89884-35	Soil	07/01/22
41	AREA-2-22-SB-15-20	410-89884-36	Soil	07/01/22
42	FB-7122	410-89884-37	Water	07/01/22
43	AREA-2-22-SB-16-0.5	410-89884-38	Soil	07/01/22
44	AREA-2-22-SB-16-5	410-89884-39	Soil	07/01/22
45	AREA-2-22-SB-16-10	410-89884-40	Soil	07/01/22
46	AREA-2-22-SB-16-15	410-89884-41	Soil	07/01/22
47	AREA-2-22-SB-16-20	410-89884-42	Soil	07/01/22
48	TB-07122	410-89884-43	Soil	07/01/22
49	FB-062922	410-89884-44	Water	06/29/22

LDC #: 54604A1a

SDG #: 410-89884-1

Laboratory: Eurofins, Lancaster, PA

VALIDATION COMPLETENESS WORKSHEET

Stage 2B/4

Date: 9/7/22

Page: 3 of 3

Reviewer: A

2nd Reviewer: JVG

METHOD: GC/MS Volatiles (EPA SW-846 Method 8260D)

	Client ID	Lab ID	Matrix	Date
502	AREA-2-22-SB-13-5MS	410-89884-2MS	Soil	06/28/22
512	AREA-2-22-SB-13-5MSD	410-89884-2MSD	Soil	06/28/22
525	AREA-2-22-SB-10-10MS	410-89884-15MS	Soil	06/29/22
535	AREA-2-22-SB-10-10MSD	410-89884-15MSD	Soil	06/29/22
547	AREA-2-22-SB-10-10DLMS	410-89884-15DLMS	Soil	06/29/22
557	AREA-2-22-SB-10-10DLMSD	410-89884-15DLMSD	Soil	06/29/22
566	AREA-2-22-SB-15-15MS	410-89884-35MS	Soil	07/01/22
576	AREA-2-22-SB-15-15MSD	410-89884-35MSD	Soil	07/01/22
58				
59				
60				

Notes:

	2T3011		2T4950 *				
	2T4095 *		2T5443				
	2T4547		2T7983				
	2T4901		2T9093				

LDC #: 54604X19

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: A

Method: Volatiles (EPA SW 846 Method 8260C)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?		✓		
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12-hour clock criteria?	✓			
III. Initial calibration and Initial Calibration Verification				
Did the laboratory perform a 5-point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Was an initial calibration verification (ICV) standard analyzed after each initial calibration for each instrument?	✓			
Were all ICV percent differences (%D) ≤ 30%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks?		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?		✓		
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?	✓			
VIII. Matrix spike/Matrix spike duplicates				
Were matrix spike (MS) and matrix spike duplicate (MSD) analyzed in this SDG?	✓			

Validation Area	Yes	No	NA	Findings/Comments
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?		✓		
IX. Laboratory control samples				
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?	✓			
Were target compounds detected in the field duplicates?		✓		
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?		✓		
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Did the laboratory LOQs/RLs meet the QAPP LOQs/RLs?	✓			
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 54604A9

VALIDATION FINDINGS WORKSHEET
Technical Holding Times

Page: 6 of 7
Reviewer: 9

All circled dates have exceeded the technical holding times.
Y N N/A Were all cooler temperatures within validation criteria?
Y N N/A Were air bubbles > 1/4 inch or was headspace present in the vials?

METHOD : GC/MS VOC (EPA SW 846 Method 8260C) (HT=14)

Sample ID	Matrix	Preserved	Sampling Date	Extraction date	Analysis date	Total # of Days	(2) Qualifier
29.42.49	Headspace						J/UJ/A
(ND)							
11, 14, 20	↓		6-29-22		7-21-22	22	J/UJ/A
12, 15	↓				7-25-22	26	
(ND)							

TECHNICAL HOLDING TIME CRITERIA

Water unpreserved:	Aromatic within 7 days, non-aromatic within 14 days of sample collection.
Water preserved:	Within 14 days of sample collection.
Soil:	Within 14 days of sample collection.

LDC #: 54604A9

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: 9

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications (5)
	7/2/22	VL13C01	D	69.8		33. MB (ND)	J/UJ/A
	7/3/22	VLBS20 (closing)	D	98.1		33. MB (ND)	J/UJ/A
	7/4/22	RL21C01	D	41.6		11, 14, 20, 54-55 MB (ND)	J/UJ/A
	7/5/22	RL25C01	KKK	21.8		12. 15. MB (ND)	J/UJ/A
			LLL	36.4			
			NNN	23.4			
	7/5/22	RL25S24 (closing)	D	65.7		12. 15. MB (ND)	J/UJ/A
	7/11/22	XL11C01	QQ	23.5		1-6. 8-10. 13, 50-51. MB (ND)	J/UJ/A
			A	21.1			

CONCAL.1SB

LDC #: 34604A9

VALIDATION FINDINGS WORKSHEET
Surrogate Spikes

Page: 1 of 1
Reviewer: 9

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were all surrogate %R within QC limits?

Y N N/A If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R out of outside of criteria?

#	Date	Sample ID	Surrogate	%Recovery (Limits)	Qualifications
		11 (ND)	DCE	56 (71-136)	V/N/A (B)
			BFB	78 (79-119)	
			DFM	53 (78-119)	
			TOL	49 (85-116)	
				( )	
		12 (ND)	DCE	50 ( )	
			BFB	76 ( )	
			DFM	46 ( )	
			TOL	44 ( )	
				( )	
		14 (ND)	DCE	45 (71-136)	
			DFM	43 (78-119)	
			TOL	43 (85-116)	
				( )	
		15 (ND)	DCE	36 ( )	
			DFM	32 ( )	
			TOL	34 ( )	
				( )	
		20 (ND)	DCE	58 ( )	
			DFM	57 ( )	
			TOL	55 ( )	
				( )	
				( )	
				( )	
				( )	

(TOL) = Toluene-d8 (DCE) = 1,2-Dichloroethane-d4
(BFB) = Bromofluorobenzene (DFM) = Dibromofluoromethane

LDC #: 54604A | 9

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Reviewer: 9

METHOD : GC/MS VOA (EPA SW 846 Method 8260C)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.

(Y) N N/A Was a MS/MSD analyzed every 20 samples of each matrix?

Y (N) N/A Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	Date	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
		50/51	see	next pages for %R out			2 (ND)	J det 3/A
			see	next pages for RPD	out			↓
			NNN	54 (66-130)	57 (66-130)			J (all) A (8)
			KKK	62 (67-129)	65 (67-129)			↓
		52/53	NNN	0 (66-130)	27 (66-130)		19 (ND)	J X/A (8)
			KKK	0 (67-129)	0 (67-129)			↓
			BBB	9 (72-124)	33 (72-124)			
			LLL	0 (61-135)	26 (61-135)			
			%R out	+ see next pages				J (all) A (8)
			RPD out	+ see next page				J det 3/A
		54/55	H	60 (70-131)	69 (70-131)		20 (ND)	J (all) A (8)
			D		167 (59-139)			J det 3/A
			D			23 (≤20)		J det 3/A (9)
		56/57	BB	129 (70-124)	126 (70-124)		40 (ND)	J det 3/A (8)

Method: 8260D - Volatile Organic Compounds (GC/MS)

Lab Sample ID: 410-89884-2 MS 50/51
Matrix: Solid
Analysis Batch: 274095

Client Sample ID: Area-2-22-SB-13-5
Prep Type: Total/NA
Prep Batch: 272368

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
1,1,1,2-Tetrachloroethane	0.0011	U FH	0.0136	0.0149		mg/Kg	☼	110	78 - 125
1,1,1-Trichloroethane	0.0011	U FH	0.0136	0.0176		mg/Kg	☼	130	73 - 130
1,1,2,2-Tetrachloroethane	0.00056	U F2	0.0136	0.0166	*3	mg/Kg	☼	123	70 - 124
1,1,2-Trichloroethane	0.0011	U F2	0.0136	0.0160		mg/Kg	☼	118	78 - 121
1,1-Dichloroethane	0.0011	U FH	0.0136	0.0177	FH	mg/Kg	☼	131	76 - 125
1,1-Dichloroethene	0.0011	U FH	0.0136	0.0200	FH	mg/Kg	☼	148	70 - 131
1,1-Dichloropropene	0.0011	U ^c FH cn	0.0136	0.0192	FH	mg/Kg	☼	141	76 - 125
1,2,3-Trichlorobenzene	0.0045	U F2 FL	0.0136	0.00735	FL *3	mg/Kg	☼	54	66 - 130
1,2,3-Trichloropropane	0.0011	U F2	0.0136	0.0160	*3	mg/Kg	☼	118	73 - 125
1,2,4-Trichlorobenzene	0.0045	U F2 FL	0.0136	0.00846	FL *3	mg/Kg	☼	62	67 - 129
1,2-Dichlorobenzene	0.0011	U	0.0136	0.0125	*3	mg/Kg	☼	92	78 - 121
1,2-Dichloroethane	0.0011	U F2	0.0136	0.0152		mg/Kg	☼	112	73 - 128
1,2-Dichloropropane	0.0011	U ^c F2 FH cn	0.0136	0.0173	FH	mg/Kg	☼	128	76 - 123
1,3-Dichlorobenzene	0.0011	U	0.0136	0.0132	*3	mg/Kg	☼	98	77 - 121
1,3-Dichloropropane	0.00056	U F2	0.0136	0.0154		mg/Kg	☼	113	77 - 121
1,4-Dichlorobenzene	0.00056	U	0.0136	0.0128	*3	mg/Kg	☼	94	75 - 120
2,2-Dichloropropane	0.0011	U FH	0.0136	0.0183	FH	mg/Kg	☼	135	67 - 133
2-Chlorotoluene	0.00056	U FH	0.0136	0.0162	*3	mg/Kg	☼	119	75 - 122
4-Chlorotoluene	0.00056	U FH	0.0136	0.0154	*3	mg/Kg	☼	114	72 - 124
Carbon tetrachloride	0.0011	U FH	0.0136	0.0172		mg/Kg	☼	127	70 - 135
Chlorobenzene	0.0011	U FH	0.0136	0.0152		mg/Kg	☼	112	79 - 120
Chloroethane	0.0022	U FH	0.0136	0.0181		mg/Kg	☼	134	59 - 139
Chloroform	0.0011	U FH	0.0136	0.0164		mg/Kg	☼	121	78 - 123
Chloromethane	0.0011	U FH	0.0136	0.0164		mg/Kg	☼	121	50 - 136
cis-1,2-Dichloroethene	0.0011	U FH	0.0136	0.0174	FH	mg/Kg	☼	128	77 - 123
cis-1,3-Dichloropropene	0.00056	U F2	0.0136	0.0150		mg/Kg	☼	111	74 - 126
Hexachlorobutadiene	0.0045	U	0.0136	0.0101	*3	mg/Kg	☼	74	61 - 135
Methylene Chloride	0.0022	U F2	0.0136	0.0168		mg/Kg	☼	124	70 - 128
Tetrachloroethene	0.0011	U FH	0.0136	0.0173		mg/Kg	☼	128	73 - 128
trans-1,2-Dichloroethene	0.0011	U FH	0.0136	0.0182	FH	mg/Kg	☼	134	74 - 125
trans-1,3-Dichloropropene	0.00056	U F2	0.0136	0.0151		mg/Kg	☼	111	71 - 130
Trichloroethene	0.0011	U FH	0.0136	0.0175	FH	mg/Kg	☼	129	77 - 123
Vinyl chloride	0.0011	U FH	0.0136	0.0174		mg/Kg	☼	128	56 - 135

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*87*		*71 - 136*
4-Bromofluorobenzene (Surr)	*92*		*79 - 119*
Dibromofluoromethane (Surr)	*88*		*78 - 119*
Toluene-d8 (Surr)	*103*		*85 - 116*

Lab Sample ID: 410-89884-2 MSD
Matrix: Solid
Analysis Batch: 274095

Client Sample ID: Area-2-22-SB-13-5
Prep Type: Total/NA
Prep Batch: 272368

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
1,1,1,2-Tetrachloroethane	0.0011	U FH	0.0104	0.0131	FH	mg/Kg	☼	126	78 - 125	13	20

Method: 8260D - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 410-89884-2 MSD 50/51
Matrix: Solid
Analysis Batch: 274095

Client Sample ID: Area-2-22-SB-13-5
Prep Type: Total/NA
Prep Batch: 272368

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
1,1,1-Trichloroethane N	0.0011	U FH	0.0104	0.0159	FH	mg/Kg	☼	153	73 - 130	10	20
1,1,2,2-Tetrachloroethane BB	0.00056	U F2	0.0104	0.0108	F2 *3	mg/Kg	☼	104	70 - 124	42	20
1,1,2-Trichloroethane U	0.0011	U F2	0.0104	0.0108	F2	mg/Kg	☼	105	78 - 121	38	20
1,1-Dichloroethane I	0.0011	U FH	0.0104	0.0151	FH	mg/Kg	☼	146	76 - 125	16	20
1,1-Dichloroethene H	0.0011	U FH	0.0104	0.0176	FH	mg/Kg	☼	170	70 - 131	13	20
1,1-Dichloropropene QQ	0.0011	U ^c FH cn	0.0104	0.0172	FH	mg/Kg	☼	166	76 - 125	11	20
1,2,3-Trichlorobenzene NNN	0.0045	U F2 FL	0.0104	0.00596	F2 *3 FL	mg/Kg	☼	57	66 - 130	21	20
1,2,3-Trichloropropane XX	0.0011	U F2	0.0104	0.00934	F2 *3	mg/Kg	☼	90	73 - 125	53	20
1,2,4-Trichlorobenzene KKK	0.0045	U F2 FL	0.0104	0.00672	F2 *3 FL	mg/Kg	☼	65	67 - 129	23	20
1,2-Dichlorobenzene	0.0011	U	0.0104	0.0107	*3	mg/Kg	☼	103	78 - 121	16	20
1,2-Dichloroethane L	0.0011	U F2	0.0104	0.0100	F2	mg/Kg	☼	97	73 - 128	41	20
1,2-Dichloropropane Q	0.0011	U ^c F2 FH cn	0.0104	0.0139	FH F2	mg/Kg	☼	134	76 - 123	22	20
1,3-Dichlorobenzene	0.0011	U	0.0104	0.0122	*3	mg/Kg	☼	118	77 - 121	8	20
1,3-Dichloropropane SS	0.00056	U F2	0.0104	0.0107	F2	mg/Kg	☼	103	77 - 121	36	20
1,4-Dichlorobenzene	0.00056	U	0.0104	0.0115	*3	mg/Kg	☼	111	75 - 120	11	20
2,2-Dichloropropane OO	0.0011	U FH	0.0104	0.0165	FH	mg/Kg	☼	159	67 - 133	10	20
2-Chlorotoluene ZZ	0.00056	U FH	0.0104	0.0163	FH *3	mg/Kg	☼	157	75 - 122	1	20
4-Chlorotoluene BBB	0.00056	U FH	0.0104	0.0150	FH *3	mg/Kg	☼	144	72 - 124	3	20
Carbon tetrachloride O	0.0011	U FH	0.0104	0.0155	FH	mg/Kg	☼	149	70 - 135	10	20
Chlorobenzene DD	0.0011	U FH	0.0104	0.0133	FH	mg/Kg	☼	129	79 - 120	13	20
Chloroethane D	0.0022	U FH	0.0104	0.0164	FH	mg/Kg	☼	158	59 - 139	10	20
Chloroform KA	0.0011	U FH	0.0104	0.0138	FH	mg/Kg	☼	133	78 - 123	17	20
Chloromethane	0.0011	U FH	0.0104	0.0163	FH	mg/Kg	☼	157	50 - 136	1	20
cis-1,2-Dichloroethene QQQ	0.0011	U FH	0.0104	0.0143	FH	mg/Kg	☼	138	77 - 123	20	20
cis-1,3-Dichloropropene R	0.00056	U F2	0.0104	0.0112	F2	mg/Kg	☼	108	74 - 126	29	20
Hexachlorobutadiene	0.0045	U	0.0104	0.0116	*3	mg/Kg	☼	111	61 - 135	14	20
Methylene Chloride E	0.0022	U F2	0.0104	0.0130	F2	mg/Kg	☼	125	70 - 128	25	20
Tetrachloroethene AA	0.0011	U FH	0.0104	0.0167	FH	mg/Kg	☼	161	73 - 128	3	20
trans-1,2-Dichloroethene PPP	0.0011	U FH	0.0104	0.0155	FH	mg/Kg	☼	150	74 - 125	16	20
trans-1,3-Dichloropropene W	0.00056	U F2	0.0104	0.0109	F2	mg/Kg	☼	105	71 - 130	32	20
Trichloroethene S	0.0011	U FH	0.0104	0.0153	FH	mg/Kg	☼	147	77 - 123	14	20
Vinyl chloride C	0.0011	U FH	0.0104	0.0173	FH	mg/Kg	☼	166	56 - 135	1	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*70*	*S1-*	*71 - 136*
4-Bromofluorobenzene (Surr)	*86*		*79 - 119*
Dibromofluoromethane (Surr)	*79*		*78 - 119*
Toluene-d8 (Surr)	*110*		*85 - 116*

Lab Sample ID: 410-89884-15 MS 52/53
Matrix: Solid
Analysis Batch: 274950

Client Sample ID: Area-2-22-SB-10-10
Prep Type: Total/NA
Prep Batch: 272436

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
1,1,1,2-Tetrachloroethane UU	0.0012	U F2 FL *3 cn	0.0135	0.00440	FL *3	mg/Kg	☼	33	78 - 125

Method: 8260D - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 410-89884-15 MS 57/57
Matrix: Solid
Analysis Batch: 274950

Client Sample ID: Area-2-22-SB-10-10
Prep Type: Total/NA
Prep Batch: 272436

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
1,1,1-Trichloroethane	0.0012	U FL *3 cn	0.0135	0.00611	FL *3	mg/Kg	☼	45	73 - 130
1,1,2,2-Tetrachloroethane	0.00061	U *3 cn	0.0135	0.0110	*3	mg/Kg	☼	82	70 - 124
1,1,2-Trichloroethane	0.0012	U FL *3 cn	0.0135	0.00873	FL *3	mg/Kg	☼	65	78 - 121
1,1-Dichloroethane	0.0012	U FL *3 cn	0.0135	0.00683	FL *3	mg/Kg	☼	51	76 - 125
1,1-Dichloroethene	0.0012	U FL *3 cn	0.0135	0.00774	FL *3	mg/Kg	☼	57	70 - 131
1,1-Dichloropropene	0.0012	U F2 FL *3 cn	0.0135	0.00519	FL *3	mg/Kg	☼	38	76 - 125
1,2,3-Trichlorobenzene	0.0049	U FL *3 cn	0.0135	0.0054	U FL *3	mg/Kg	☼	~~0~~	~~66 - 130~~
1,2,3-Trichloropropane	0.0012	U FL *3 cn	0.0135	0.00963	FL *3	mg/Kg	☼	71	73 - 125
1,2,4-Trichlorobenzene	0.0049	U FL *3 cn	0.0135	0.0054	U FL *3	mg/Kg	☼	0	67 - 129
1,2-Dichlorobenzene	0.0012	U F2 FL *3 cn	0.0135	0.00252	J FL *3	mg/Kg	☼	19	78 - 121
1,2-Dichloroethane	0.0012	U F2 FL *3 cn	0.0135	0.00712	FL *3	mg/Kg	☼	53	73 - 128
1,2-Dichloropropane	0.0012	U F2 FL *3 cn	0.0135	0.00703	FL *3	mg/Kg	☼	52	76 - 123
1,3-Dichlorobenzene	0.0012	U F2 FL *3 cn	0.0135	0.00183	J FL *3	mg/Kg	☼	14	77 - 121
1,3-Dichloropropane	0.00061	U FL *3 cn	0.0135	0.00754	FL *3	mg/Kg	☼	56	77 - 121
1,4-Dichlorobenzene	0.00061	U F2 FL *3 cn	0.0135	0.00193	J FL *3	mg/Kg	☼	14	75 - 120
2,2-Dichloropropane	0.0012	U FL *3 cn	0.0135	0.00725	FL *3 M	mg/Kg	☼	54	67 - 133
2-Chlorotoluene	0.00061	U F2 FL *3 cn	0.0135	0.00236	J FL *3	mg/Kg	☼	17	75 - 122
4-Chlorotoluene	0.00061	U F2 FL *3 cn	0.0135	0.00124	J FL *3	mg/Kg	☼	9	72 - 124
Carbon tetrachloride	0.0012	U F2 FL *3 cn	0.0135	0.00507	FL *3 M	mg/Kg	☼	38	70 - 135
Chlorobenzene	0.0012	U F2 FL *3 cn	0.0135	0.00299	J FL *3	mg/Kg	☼	22	79 - 120
Chloroethane	0.0025	U F2 *3 cn	0.0135	0.00962	*3	mg/Kg	☼	71	59 - 139
Chloroform	0.0012	U F2 FL *3 cn	0.0135	0.00625	FL *3	mg/Kg	☼	46	78 - 123
Chloromethane	0.0012	U F2 *3 cn	0.0135	0.0127	*3 M	mg/Kg	☼	94	50 - 136
cis-1,2-Dichloroethene	0.0012	U F2 FL *3 cn	0.0135	0.00608	FL *3 M	mg/Kg	☼	45	77 - 123
cis-1,3-Dichloropropene	0.00061	U F2 FL *3 cn	0.0135	0.00444	FL *3	mg/Kg	☼	33	74 - 126
Hexachlorobutadiene	0.0049	U FL *3 cn	0.0135	0.0054	U FL *3	mg/Kg	☼	~~0~~	~~61 - 135~~
Methylene Chloride	0.0025	U FL *3 cn	0.0135	0.00762	FL *3	mg/Kg	☼	57	70 - 128

Method: 8260D - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 410-89884-15 MS
Matrix: Solid
Analysis Batch: 274950

Client Sample ID: Area-2-22-SB-10-10
Prep Type: Total/NA
Prep Batch: 272436

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Tetrachloroethene	0.0012	U F2 FL *3 cn	0.0135	0.00290	J FL *3	mg/Kg	☼	21	73 - 128
trans-1,2-Dichloroethene	0.0012	U F2 FL *3 cn	0.0135	0.00510	FL *3 M	mg/Kg	☼	38	74 - 125
trans-1,3-Dichloropropene	0.00061	U F2 FL *3 cn	0.0135	0.00481	FL *3	mg/Kg	☼	36	71 - 130
Trichloroethene	0.0012	U F2 FL *3 cn	0.0135	0.00392	FL *3	mg/Kg	☼	29	77 - 123
Vinyl chloride	0.0012	U F2 *3 cn	0.0135	0.0104	*3 M	mg/Kg	☼	77	56 - 135

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*90*	**3*	*71 - 136*
4-Bromofluorobenzene (Surr)	*89*	**3*	*79 - 119*
Dibromofluoromethane (Surr)	*96*	**3*	*78 - 119*
Toluene-d8 (Surr)	*103*	**3*	*85 - 116*

Lab Sample ID: 410-89884-15 MSD
Matrix: Solid
Analysis Batch: 274950

Client Sample ID: Area-2-22-SB-10-10
Prep Type: Total/NA
Prep Batch: 272436

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
1,1,1,2-Tetrachloroethane	0.0012	U F2 FL *3 cn	0.0119	0.00705	F2 FL	mg/Kg	☼	59	78 - 125	46	20
1,1,1-Trichloroethane	0.0012	U FL *3 cn	0.0119	0.00735	FL	mg/Kg	☼	62	73 - 130	18	20
1,1,2,2-Tetrachloroethane	0.00061	U *3 cn	0.0119	0.0109		mg/Kg	☼	92	70 - 124	1	20
1,1,2-Trichloroethane	0.0012	U FL *3 cn	0.0119	0.00971		mg/Kg	☼	82	78 - 121	11	20
1,1-Dichloroethane	0.0012	U FL *3 cn	0.0119	0.00796	FL	mg/Kg	☼	67	76 - 125	15	20
1,1-Dichloroethene	0.0012	U FL *3 cn	0.0119	0.00764	M FL	mg/Kg	☼	64	70 - 131	1	20
1,1-Dichloropropene	0.0012	U F2 FL *3 cn	0.0119	0.00691	F2 FL	mg/Kg	☼	58	76 - 125	29	20
1,2,3-Trichlorobenzene	0.0049	U FL *3 cn	0.0119	0.00323	J FL	mg/Kg	☼	~~27~~	~~66 - 130~~	~~NC~~ 200	20
1,2,3-Trichloropropane	0.0012	U FL *3 cn	0.0119	0.0107		mg/Kg	☼	90	73 - 125	11	20
1,2,4-Trichlorobenzene	0.0049	U FL *3 cn	0.0119	0.0048	U FL	mg/Kg	☼	0	67 - 129	NC	20
1,2-Dichlorobenzene	0.0012	U F2 FL *3 cn	0.0119	0.00437	F2 FL	mg/Kg	☼	37	78 - 121	54	20
1,2-Dichloroethane	0.0012	U F2 FL *3 cn	0.0119	0.00894	F2	mg/Kg	☼	75	73 - 128	23	20
1,2-Dichloropropane	0.0012	U F2 FL *3 cn	0.0119	0.00866	F2 FL	mg/Kg	☼	73	76 - 123	21	20
1,3-Dichlorobenzene	0.0012	U F2 FL *3 cn	0.0119	0.00365	F2 FL	mg/Kg	☼	31	77 - 121	66	20
1,3-Dichloropropane	0.00061	U FL *3 cn	0.0119	0.00883	FL	mg/Kg	☼	74	77 - 121	16	20

Method: 8260D - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 410-89884-15 MSD
Matrix: Solid
Analysis Batch: 274950

52/57

Client Sample ID: Area-2-22-SB-10-10
Prep Type: Total/NA
Prep Batch: 272436

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
1,4-Dichlorobenzene	0.00061	U F2 FL *3 cn	0.0119	0.00341	F2 FL	mg/Kg	☼	29	75 - 120	55	20
2,2-Dichloropropane	0.0012	U FL *3 cn	0.0119	0.00702	FL	mg/Kg	☼	59	67 - 133	3	20
2-Chlorotoluene	0.00061	U F2 FL *3 cn	0.0119	0.00451	F2 FL	mg/Kg	☼	38	75 - 122	63	20
4-Chlorotoluene	0.00061	U F2 FL *3 cn	0.0119	0.00391	F2 FL	mg/Kg	☼	~~33~~	~~72 - 124~~	104	20
Carbon tetrachloride	0.0012	U F2 FL *3 cn	0.0119	0.00657	F2 FL	mg/Kg	☼	55	70 - 135	26	20
Chlorobenzene	0.0012	U F2 FL *3 cn	0.0119	0.00547	F2 FL	mg/Kg	☼	46	79 - 120	59	20
Chloroethane	0.0025	U F2 *3 cn	0.0119	0.00779	F2	mg/Kg	☼	66	59 - 139	21	20
Chloroform	0.0012	U F2 FL *3 cn	0.0119	0.00777	F2 FL	mg/Kg	☼	65	78 - 123	22	20
Chloromethane	0.0012	U F2 *3 cn	0.0119	0.00816	F2	mg/Kg	☼	69	50 - 136	44	20
cis-1,2-Dichloroethene	0.0012	U F2 FL *3 cn	0.0119	0.00849	F2 FL	mg/Kg	☼	71	77 - 123	33	20
cis-1,3-Dichloropropene	0.00061	U F2 FL *3 cn	0.0119	0.00706	F2 FL	mg/Kg	☼	59	74 - 126	46	20
Hexachlorobutadiene	0.0049	U FL *3 cn	0.0119	0.00304	J FL	mg/Kg	☼	~~26~~	~~61 - 135~~	~~NC~~ 200	20
Methylene Chloride	0.0025	U FL *3 cn	0.0119	0.00884		mg/Kg	☼	74	70 - 128	15	20
Tetrachloroethene	0.0012	U F2 FL *3 cn	0.0119	0.00560	F2 FL	mg/Kg	☼	47	73 - 128	64	20
trans-1,2-Dichloroethene	0.0012	U F2 FL *3 cn	0.0119	0.00685	F2 FL	mg/Kg	☼	58	74 - 125	29	20
trans-1,3-Dichloropropene	0.00061	U F2 FL *3 cn	0.0119	0.00720	F2 FL	mg/Kg	☼	61	71 - 130	40	20
Trichloroethene	0.0012	U F2 FL *3 cn	0.0119	0.00649	F2 FL	mg/Kg	☼	55	77 - 123	49	20
Vinyl chloride	0.0012	U F2 *3 cn	0.0119	0.00723	F2	mg/Kg	☼	61	56 - 135	36	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*90*		*71 - 136*
4-Bromofluorobenzene (Surr)	*96*		*79 - 119*
Dibromofluoromethane (Surr)	*89*		*78 - 119*
Toluene-d8 (Surr)	*101*		*85 - 116*

Lab Sample ID: 410-89884-15 MS
Matrix: Solid
Analysis Batch: 277983

Client Sample ID: Area-2-22-SB-10-10
Prep Type: Total/NA
Prep Batch: 272437

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
1,1,1,2-Tetrachloroethane	0.21	U H cn	0.925	1.03	D H cn	mg/Kg	☼	111	78 - 125
1,1,1-Trichloroethane	0.10	U H cn	0.925	0.806	D H cn	mg/Kg	☼	87	73 - 130
1,1,2,2-Tetrachloroethane	0.052	U M H cn	0.925	1.02	D H cn	mg/Kg	☼	111	70 - 124
1,1,2-Trichloroethane	0.10	U H cn	0.925	1.02	D H cn	mg/Kg	☼	110	78 - 121

LDC #: 54604A|9

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Reviewer: q

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was a LCS required?

Y (N) N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

#	Date	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
		LCS/D 410-2T4901	D	168 (59-139)	162 (59-139)	( )	33, MB (ND)	J dets/P
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
		LCS/D 410-2T7983	D	173 (59-139)	160 (59-139)	( )	11, 14, 20 MB (ND)	J dets/P
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

LDC #: 54604H1a

VALIDATION FINDINGS WORKSHEET
Internal Standards

Page: 1 of 1
Reviewer: 9

METHOD: GC/MS VOA (EPA SW 846 Method 8260C)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were all internal standard area counts within -50 to +100% of the associated calibration standard?

Y N N/A Were the retention times of the internal standards within +/- 30 seconds of the retention times of the associated calibration standard?

#	Date	Sample ID	Internal Standard	Area (Limits)	RT (Limits)	Qualifications
		10 (ND)	CBZ	~~488~~750 (503835-2015340)		√/M/A (see cpd table)
			4DCB	251358 (300802-1203208)		
		13 (ND)	FB	122042 (588604-2356414)		√/X/A (All TCL)
			CBZ	101746 (503835-2015340)		
			4DCB	54911 (300802-1203208)		
		19 (ND)	FB	414071 (616598-2466390)		√/M/A (all TCL)
			CBZ	328938 (496003-1984010)		
			4DCB	184726 (280860-1123440)		

(BCM) = Bromochloromethane
(DFB) = 1,4-Difluorobenzene
(CBZ) = Chlorobenzene-d5
(PFB) = Pentafluorobenzene
(4DCB) = 1,4-Dichlorobenzene-d4
(2DCB) = 1,2-Dichlorobenzene-d4
(FBZ) = Fluorobenzene

LDC #~~54604A~~9

VALIDATION FINDINGS WORKSHEET
Overall Assessment of Data

METHOD: GC/MS VOA (EPA SW 846 Method 8260C)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

All available information pertaining to the data were reviewed using professional judgement to compliment the determination of the overall quality of the data.

Y N N/A Was the overall quality and usability of the data acceptable?

#	Date	Sample ID	Compound	Findings	Qualifications
		11-12, 15	All	HT out	NR/A
		13	All	IS out	NR/A
		19	NNN, HHH, BBB, LLL	MS low	
		20	All except NNN, HHH, BBB, LLL - most usable		

Comments: _____

LDC #: 34604A1/a1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: Q

METHOD: GC/MS VOA (EPA SW 846 Method 8260C)

The Relative Response Factor (RRF), average RRF, and percent relative standard deviation (%RSD) were recalculated for the compounds identified below using the following calculations:

$RRF = (A_x)(C_{is})/(A_{is})(C_x)$
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

A_x = Area of compound,
C_x = Concentration of compound,
S = Standard deviation of the RRFs
X = Mean of the RRFs

A_{is} = Area of associated internal standard
C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported RRF (50 std)	Recalculated RRF (50std)	Reported Average RRF (initial)	Recalculated Average RRF (initial)	Reported %RSD	Recalculated %RSD
1	ICAL	1/11/22	C (1st internal standard)	0.3188	0.3188	0.3105	0.3105	10.4	10.4
			AA (2nd internal standard)	0.4187	0.4187	0.3844	0.3844	14.2	14.2
			FFF (3rd internal standard)	1.7242	1.7242	1.6308	1.6308	10.1	10.1
			(4th internal standard)						
2			(1st internal standard)						
			(2nd internal standard)						
			(3rd internal standard)						
			(4th internal standard)						
3			(1st internal standard)						
			(2nd internal standard)						
			(3rd internal standard)						
			(4th internal standard)						
4			(1st internal standard)						
			(2nd internal standard)						
			(3rd internal standard)						
			(4th internal standard)						

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results

LDC #: 34664A9

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Page: 1 of 1
Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260C)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
$RRF = (A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	XL11C01	7/11/22	C (1st internal standard)	0.3105	0.3062	0.3062	1.4	1.4
			AA (2nd internal standard)	0.3844	0.4299	0.4299	11.8	11.8
			FFF (3rd internal standard)	1.6308	1.625	1.6250	0.4	0.4
			(4th internal standard)					
2	XL13C01	7/12/22	C (1st internal standard)	0.3105	0.2712	0.2712	12.7	12.7
			AA (2nd internal standard)	0.3844	0.3509	0.3509	3.5	3.5
			FFF (3rd internal standard)	1.6308	1.541	1.541	5.5	5.5
			(4th internal standard)					
3			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
4			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: ~~54604A~~ 9

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: Q

METHOD: GC/MS VOA (EPA SW 846 Method 8260C)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 3

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	45.0	90	90	
1,2-Dichloroethane-d4	↓	46.4	93	93	
Toluene-d8		47.1	94	94	
Bromofluorobenzene		48.1	96	96	

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 54604A9

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Page: 1 of 1
Reviewer: 9

METHOD: GC/MS VOA (EPA SW 846 Method 8260C)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SSC - SC)/SA Where: SSC = Spiked sample concentration; SA = Spike added; SC = Sample concentration

RPD = | MSC - MSC | * 2/(MSC + MSDC) MSC = Matrix spike concentration MSDC = Matrix spike duplicate concentration

MS/MSD sample: 50/51

Compound	Spike Added (ug/kg)		Sample Concentration (ug/kg)	Spiked Sample Concentration (ug/kg)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
1,1-Dichloroethene	0.0136	0.0104	ND	0.0200	0.0176	148	147	170	169	13	13
Trichloroethene	↓	↓	↓	0.0175	0.0153	129	129	147	147	14	14
Benzene											
Toluene											
Chlorobenzene	0.0136	0.0104	ND	0.0152	0.0133	112	112	129	128	13	13

Comments: Refer to Matrix Spike/Matrix Spike Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 54604A1a

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

METHOD: GC/MS VOA (EPA SW 846 Method 8260C)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration; SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: 410-37495

Compound	Spike Added (MS/MSD)		Spiked Sample Concentration (MS/MSD)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	0.0200	0.0200	0.0234	0.0232	117	117	116	116	1	1
Trichloroethene	↓	↓	0.0232	0.0231	116	116	116	116	0	1
Benzene										
Toluene										
Chlorobenzene	0.0200	0.0200	0.0210	0.0202	105	105	101	101	4	4

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 54604A9

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: 9

METHOD: GC/MS VOA (EPA SW 846 Method 8260C)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x = Area of the characteristic ion (EICP) for the compound to be measured

A_{is} = Area of the characteristic ion (EICP) for the specific internal standard

I_s = Amount of internal standard added in nanograms (ng)

RRF = Relative response factor of the calibration standard.

V_o = Volume or weight of sample pruged in milliliters (ml) or grams (g).

Df = Dilution factor.

%S = Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. 28 , C :

Conc. = $\frac{(11122)(50.0)(5)(1)}{(108000)(0.3105)(9.984)(0.84)(1000)}$

= 0.00099 MB/KG

#	Sample ID	Compound	Reported Concentration MB/KG	Calculated Concentration ( )	Qualification
	28	C	0.00099		

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NBK Keyport OU2

LDC Report Date: August 19, 2022

Parameters: Volatiles

Validation Level: Stage 2B

Laboratory: Eurofins, Lancaster, PA

Sample Delivery Group (SDG): 410-90316-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
AREA-2-22-SB-17-0.5	410-90316-1	Soil	06/27/22
AREA-2-22-SB-17-0.5RE	410-90316-1RE	Soil	06/27/22
AREA-2-22-SB-17-10	410-90316-2	Soil	06/27/22
AREA-2-22-SB-17-10RE	410-90316-2RE	Soil	06/27/22
AREA-2-22-SB-17-1-10	410-90316-3	Soil	06/27/22
AREA-2-22-SB-17-20	410-90316-4	Soil	06/27/22
AREA-2-22-SB-17-20RE	410-90316-4RE	Soil	06/27/22
AREA-2-22-SB-18-0.5	410-90316-5	Soil	06/28/22
AREA-2-22-SB-18-10	410-90316-6	Soil	06/28/22
AREA-2-22-SB-18-20	410-90316-7	Soil	06/28/22
FB-062722	410-90316-8	Water	06/27/22
FB-062822	410-90316-9	Water	06/28/22
TB-062722	410-90316-10	Soil	06/27/22
AREA-2-22-SB-12-0.5	410-90316-11	Soil	06/28/22
AREA-2-22-SB-12-5	410-90316-12	Soil	06/28/22
AREA-2-22-SB-12-10	410-90316-13	Soil	06/28/22
AREA-2-22-SB-12-20	410-90316-14	Soil	06/28/22
AREA-2-22-SB-12-1-20	410-90316-15	Soil	06/28/22
AREA-2-22-SB-11-0.5	410-90316-16	Soil	06/28/22
AREA-2-22-SB-11-5	410-90316-17	Soil	06/28/22
AREA-2-22-SB-11-1-5	410-90316-18	Soil	06/28/22
AREA-2-22-SB-11-10	410-90316-19	Soil	06/28/22
AREA-2-22-SB-11-15	410-90316-20	Soil	06/28/22
AREA-2-22-SB-11-20	410-90316-21	Soil	06/28/22
AREA-2-22-SB-12-25	410-90316-22	Soil	06/28/22
TB-062822	410-90316-23	Soil	06/28/22

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
AREA-2-22-SB-18-20MS	410-90316-7MS	Soil	06/28/22
AREA-2-22-SB-18-20MSD	410-90316-7MSD	Soil	06/28/22

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Tier I Sampling and Analysis Plan, Soil and Groundwater Investigation at Operable Unit 2 Area 2, Van Meter Road Spill/Drum Storage Site, Naval Base Kitsap Keyport, Keyport, Washington (April 2022), the U.S. Department of Defense (DoD) General Validation Guidelines (November 2019), and the DoD Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260D

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

J (Estimated): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered not detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Codes

1 Holding Times Exceeded
2 Sample Preservation / Cooler Temperature Exceeded Acceptance Criteria
3 Sample Custody Potentially Compromised Sample Integrity
4 Missing/Incomplete Deliverables
5 Calibration Did Not Meet Method Criteria
6 Equipment/Field Blank Contamination
7 Laboratory Method or Calibration Blank Contamination
8 Matrix Spike % Recovery Exceeded Acceptance Criteria
9 Matrix Spike Duplicate (RPD or Duplicate Sample Analysis) Exceeded Acceptance Criteria
10A Laboratory Control Sample % Recovery Exceeded Acceptance Criteria
10B Laboratory Control Sample Duplicate (RPD) Exceeded Acceptance Criteria
11 ICP Interference Check Analysis Exceeded Method Criteria
12 RPD Between Two Columns (Pesticides/PCBs only)
13 Surrogate Recoveries Exceeded Acceptance Criteria
14 Field Duplicates RPD Exceeded Project Criteria
15 Peak Resolution did not meet method criteria
16 Serial Dilution Analysis Exceeded Method Criteria
17 Chemical Recoveries Exceeded Acceptance Criteria
18 Trip Blank Contamination
19 Internal Standards Did Not Meet Method Criteria
20 Calibration Range exceeded Method Criteria
21 Potential False Positives
22 Do not use, other result more technically sound (overall assessment)
23 Estimated Maximum Possible Concentration
24 Trace Detection Below the LOQ (RL) and Above the DL (MDL)
25 Other

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria with the following exceptions:

Sample	Analyte	Finding	Criteria	Flag	A or P
All samples in SDG 410-90316-1	All analytes	Cooler temperature was reported at 20.4°C and 21.6°C upon receipt by the laboratory.	Cooler temperature must be 4±2°C.	J (all detects) X (all non-detects)	A

Sample	Analyte	Finding	Criteria	Flag	A or P
FB-062722	All analytes	A headspace was apparent in the sample containers.	There should be no headspace in the sample containers.	J (all detects) UJ (all non-detects)	A

All technical holding time requirements were met with the following exceptions:

Sample	Analyte	Total Days From Sample Collection Until Analysis	Required Holding Time (in Days) From Sample Collection Until Analysis	Flag	A or P
AREA-2-22-SB-17-0.5RE AREA-2-22-SB-12-20 AREA-2-22-SB-12-1-20 AREA-2-22-SB-11-0.5 AREA-2-22-SB-11-5 AREA-2-22-SB-11-1-5 AREA-2-22-SB-11-10 AREA-2-22-SB-11-15 AREA-2-22-SB-11-20	All analytes	15	14	J (all detects) UJ (all non-detects)	A
AREA-2-22-SB-17-10RE AREA-2-22-SB-17-20RE	All analytes	16	14	J (all detects) UJ (all non-detects)	A
AREA-2-22-SB-12-25	All analytes	17	14	J (all detects) UJ (all non-detects)	A

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For analytes where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 15.0% with the following exceptions:

Date	Analyte	%RSD	Associated Samples	Flag	A or P
05/08/22	2,2-Dichloropropane Trichloroethene	15.1 15.1	AREA-2-22-SB-12-0.5 AREA-2-22-SB-12-20 AREA-2-22-SB-12-1-20 AREA-2-22-SB-11-0.5 AREA-2-22-SB-11-5 AREA-2-22-SB-11-1-5 AREA-2-22-SB-11-10 AREA-2-22-SB-11-15 AREA-2-22-SB-11-20	UJ (all non-detects) UJ (all non-detects)	A

In the case where the laboratory used a calibration curve to evaluate the analytes, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all analytes were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes with the following exceptions:

Date	Analyte	%D	Associated Samples	Flag	A or P
07/14/22	Hexachlorobutadiene	21.1	AREA-2-22-SB-12-25	UJ (all non-detects)	A
07/11/22 (VL11C01)	Chloroethane trans-1,3-Dichloropropene	146.9 20.7	AREA-2-22-SB-17-20	UJ (all non-detects) UJ (all non-detects)	A
07/13/22	Chloroethane	69.8	AREA-2-22-SB-17-10RE AREA-2-22-SB-17-20RE	UJ (all non-detects)	A
07/12/22	Chloroethane	93.0	AREA-2-22-SB-12-5 AREA-2-22-SB-12-10	UJ (all non-detects)	A
07/11/22 (XL11C01)	1,1-Dichloropropene 1,2-Dichloropropane	23.5 21.1	AREA-2-22-SB-17-0.5 AREA-2-22-SB-17-1-10 TB-062722	UJ (all non-detects) UJ (all non-detects)	A
07/11/22 (LL11C51)	1,2-Dichloropropane Tetrachloroethene Hexachlorobutadiene	23.5 27.2 22.1	FB-062722 FB-062822	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 50.0% for all analytes with the following exceptions:

Date	Analyte	%D	Associated Samples	Flag	A or P
07/11/22	Chloroethane	139.4	AREA-2-22-SB-17-20	UJ (all non-detects)	A
07/13/22	Chloroethane	98.1	AREA-2-22-SB-17-10RE AREA-2-22-SB-17-20RE	UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Samples TB-062722 and TB-062822 were identified as trip blanks. No contaminants were found.

Samples FB-062722 and FB-062822 were identified as field blanks. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits with the following exceptions:

Sample	Surrogate	%R (Limits)	Affected Analyte	Flag	A or P
AREA-2-22-SB-17-10	1,2-Dichloroethane-d4 Bromofluorobenzene Dibromofluoromethane Toluene-d8	145 (71-136) 148 (79-119) 136 (78-119) 147 (85-116)	All analytes	J (all detects)	A
AREA-2-22-SB-17-10RE	Toluene-d8	118 (85-116)	All analytes	J (all detects)	A
AREA-2-22-SB-17-20	Bromofluorobenzene Dibromofluoromethane Toluene-d8	135 (79-119) 123 (78-119) 138 (85-116)	All analytes	J (all detects)	A
AREA-2-22-SB-12-5	Bromofluorobenzene Dibromofluoromethane Toluene-d8	148 (79-119) 137 (78-119) 144 (85-116)	All analytes	NA	-

Sample	Surrogate	%R (Limits)	Affected Analyte	Flag	A or P
AREA-2-22-SB-12-10	Bromofluorobenzene Dibromofluoromethane Toluene-d8	168 (79-119) 129 (78-119) 133 (85-116)	All analytes	NA	-

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
AREA-2-22-SB-18-20MS/MSD (AREA-2-22-SB-18-20)	1,1,2,2-Tetrachloroethane 1,2,3-Trichloropropane	147 (70-124) 143 (73-125)	136 (70-124) 131 (73-125)	NA	-
AREA-2-22-SB-18-20MS/MSD (AREA-2-22-SB-18-20)	Trichlorofluoromethane	-	64 (67-129)	UJ (all non-detects)	A

Relative percent differences (RPD) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	RPD (Limits)	Flag	A or P
AREA-2-22-SB-18-20MS/MSD (AREA-2-22-SB-18-20)	Chloromethane	22 (≤20)	NA	-

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Analyte	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/LCSD 410-274040 (AREA-2-22-SB-17-10 AREA-2-22-SB-17-20)	Chloroethane	266 (59-139)	245 (59-139)	NA	-
LCS/LCSD 410-274528 (AREA-2-22-SB-12-5 AREA-2-22-SB-12-10)	Chloroethane	196 (59-139)	171 (59-139)	NA	-
LCS/LCSD 410-274656 (AREA-2-22-SB-12-0.5)	cis-1,2-Dichloroethene	-	124 (77-123)	NA	-

LCS ID (Associated Samples)	Analyte	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/LCSD 410-274901 (AREA-2-22-SB-17-10RE AREA-2-22-SB-17-20RE)	Chloroethane	168 (59-139)	162 (59-139)	NA	-

Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

Samples AREA-2-22-SB-17-10 and AREA-2-22-SB-17-1-10, samples AREA-2-22-SB-17-10RE and AREA-2-22-SB-17-1-10, samples AREA-2-22-SB-12-20 and AREA-2-22-SB-12-1-20, and samples AREA-2-22-SB-11-5 and AREA-2-22-SB-11-1-5 were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (mg/Kg)		RPD (Limits)	Flag	A or P
	AREA-2-22-SB-17-10	AREA-2-22-SB-17-1-10			
Trichloroethene	0.13	0.17	27 (≤50)	-	-
cis-1,2-Dichloroethene	0.095U	0.0011	195 (≤50)	NQ	-

Analyte	Concentration (mg/Kg)		RPD (Limits)	Flag	A or P
	AREA-2-22-SB-17-10RE	AREA-2-22-SB-17-1-10			
Trichloroethene	0.13	0.17	27 (≤50)	-	-
cis-1,2-Dichloroethene	0.095U	0.0011	195 (≤50)	NQ	-

NQ = One or both results were less than the limit of quantitation (LOQ), therefore no data were qualified.

XI. Internal Standards

All internal standard areas and retention times were within QC limits with the following exceptions:

Sample	Internal Standards	Area (Limits)	Affected Analyte	Flag	A or P
AREA-2-22-SB-17-0.5	1,4-Dichlorobenzene-d4	278825 (300802-1203208)	1,1,2,2-Tetrachloroethane 1,2,3-Trichloropropane 2-Chlorotoluene 4-Chlorotoluene 1,3-Dichlorobenzene 1,4-Dichlorobenzene 1,2-Dichlorobenzene 1,2,4-Trichlorobenzene Hexachlorobutadiene 1,2,3-Trichlorobenzene	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A

XII. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method.

Due to cooler temperature, data were qualified for recommended exclusion in twenty-three samples.

For samples AREA-2-22-SB-17-10, AREA-2-22-SB-17-10RE, AREA-2-22-SB-17-1-10, AREA-2-22-SB-12-0.5, AREA-2-22-SB-12-5, AREA-2-22-SB-12-10, AREA-2-22-SB-12-20, AREA-2-22-SB-12-1-20, AREA-2-22-SB-11-0.5, AREA-2-22-SB-11-5, AREA-2-22-SB-11-1-5, AREA-2-22-SB-11-10, AREA-2-22-SB-11-15, AREA-2-22-SB-11-20, and AREA-2-22-SB-12-25 the laboratory indicates too much soil was added to the preserved containers for low- and high-level kit. The 50mL plastic unpreserved containers were used.

In the case where more than one result was reported for an individual sample, the least technically acceptable results were deemed not reportable as follows:

Sample	Analyte	Reason	Flag	A or P
AREA-2-22-SB-17-0.5RE AREA-2-22-SB-17-10RE AREA-2-22-SB-17-20RE	All analytes	Analyzed outside of holding time.	Not reportable	-

Due to cooler temperature, headspace, technical holding time, initial calibration %RSD, continuing calibration %D, surrogate %R, MS/MSD %R, and internal standard area, data were qualified as estimated in twenty-three samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

NBK Keyport OU2
Volatiles - Data Qualification Summary - SDG 410-90316-1

Sample	Analyte	Flag	A or P	Reason (Code)
AREA-2-22-SB-17-0.5 AREA-2-22-SB-17-10 AREA-2-22-SB-17-1-10 AREA-2-22-SB-17-20 AREA-2-22-SB-18-0.5 AREA-2-22-SB-18-10 AREA-2-22-SB-18-20 FB-062722 FB-062822 TB-062722 AREA-2-22-SB-12-0.5 AREA-2-22-SB-12-5 AREA-2-22-SB-12-10 AREA-2-22-SB-12-20 AREA-2-22-SB-12-1-20 AREA-2-22-SB-11-0.5 AREA-2-22-SB-11-5 AREA-2-22-SB-11-1-5 AREA-2-22-SB-11-10 AREA-2-22-SB-11-15 AREA-2-22-SB-11-20 AREA-2-22-SB-12-25 TB-062822	All analytes	J (all detects) X (all non-detects)	A	Cooler temperature (2)
FB-062722	All analytes	J (all detects) UJ (all non-detects)	A	Sample condition (headspace) (2)
AREA-2-22-SB-12-20 AREA-2-22-SB-12-1-20 AREA-2-22-SB-11-0.5 AREA-2-22-SB-11-5 AREA-2-22-SB-11-1-5 AREA-2-22-SB-11-10 AREA-2-22-SB-11-15 AREA-2-22-SB-11-20 AREA-2-22-SB-12-25	All analytes	J (all detects) UJ (all non-detects)	A	Technical holding times (1)
AREA-2-22-SB-12-0.5 AREA-2-22-SB-12-20 AREA-2-22-SB-12-1-20 AREA-2-22-SB-11-0.5 AREA-2-22-SB-11-5 AREA-2-22-SB-11-1-5 AREA-2-22-SB-11-10 AREA-2-22-SB-11-15 AREA-2-22-SB-11-20	2,2-Dichloropropane Trichloroethene	UJ (all non-detects) UJ (all non-detects)	A	Initial calibration (%RSD) (5)
AREA-2-22-SB-12-25	Hexachlorobutadiene	UJ (all non-detects)	A	Continuing calibration (%D) (5)
AREA-2-22-SB-17-20	Chloroethane trans-1,3-Dichloropropene	UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D) (5)
AREA-2-22-SB-12-5 AREA-2-22-SB-12-10	Chloroethane	UJ (all non-detects)	A	Continuing calibration (%D) (5)

Sample	Analyte	Flag	A or P	Reason (Code)
AREA-2-22-SB-17-0.5 AREA-2-22-SB-17-1-10 TB-062722	1,1-Dichloropropene 1,2-Dichloropropane	UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D) (5)
FB-062722 FB-062822	1,2-Dichloropropane Tetrachloroethene Hexachlorobutadiene	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D) (5)
AREA-2-22-SB-17-20	Chloroethane	UJ (all non-detects)	A	Continuing calibration (ending CCV %D) (5)
AREA-2-22-SB-17-10 AREA-2-22-SB-17-20	All analytes	J (all detects)	A	Surrogates (%R) (13)
AREA-2-22-SB-18-20	Trichlorofluoromethane	UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R) (8)
AREA-2-22-SB-17-0.5	1,1,2,2-Tetrachloroethane 1,2,3-Trichloropropane 2-Chlorotoluene 4-Chlorotoluene 1,3-Dichlorobenzene 1,4-Dichlorobenzene 1,2-Dichlorobenzene 1,2,4-Trichlorobenzene Hexachlorobutadiene 1,2,3-Trichlorobenzene	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Internal standards (area) (19)
AREA-2-22-SB-17-0.5RE AREA-2-22-SB-17-10RE AREA-2-22-SB-17-20RE	All analytes	Not reportable	-	Overall assessment of data (22)

NBK Keyport OU2
Volatiles - Laboratory Blank Data Qualification Summary - SDG 410-90316-1

No Sample Data Qualified in this SDG

NBK Keyport OU2
Volatiles - Field Blank Data Qualification Summary - SDG 410-90316-1

No Sample Data Qualified in this SDG

LDC #: 54604B1a
SDG #: 410-90316-1
Laboratory: Eurofins, Lancaster, PA

VALIDATION COMPLETENESS WORKSHEET
Stage 2B

Date: 8/17/22
Page: 1 of 2
Reviewer: Q
2nd Reviewer: JC

METHOD: GC/MS Volatiles (EPA SW-846 Method 8260D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	SW	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	SW/A	RSD≤15%. r²≥0.990 ICV=70-130
IV.	Continuing calibration	SW	CCV=80-120%
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB=13,16. FB=11,12
VII.	Surrogate spikes	SW	
VIII.	Matrix spike/Matrix spike duplicates	SW	
IX.	Laboratory control samples	SW	LCS/D
X.	Field duplicates	SW	D=3+5A+5, 17+18.20+21
XI.	Internal standards	SW	
XII.	Target analyte quantitation	N	
XIII.	Target analyte identification	N	
XIV.	System performance	N	
XV.	Overall assessment of data	SW	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
12	AREA-2-22-SB-17-0.5	410-90316-1	Soil	06/27/22
25	AREA-2-22-SB-17-0.5RE	410-90316-1RE	Soil	06/27/22
31	AREA-2-22-SB-17-10	410-90316-2	Soil	06/27/22
41	AREA-2-22-SB-17-10RE	410-90316-2RE	Soil	06/27/22
52	AREA-2-22-SB-17-1-10	410-90316-3	Soil	06/27/22
61	AREA-2-22-SB-17-20	410-90316-4	Soil	06/27/22
71	AREA-2-22-SB-17-20RE	410-90316-4RE	Soil	06/27/22
85	AREA-2-22-SB-18-0.5	410-90316-5	Soil	06/28/22
95	AREA-2-22-SB-18-10	410-90316-6	Soil	06/28/22
105	AREA-2-22-SB-18-20	410-90316-7	Soil	06/28/22
113	FB-062722	410-90316-8	Water	06/27/22
123	FB-062822	410-90316-9	Water	06/28/22
132	TB-062722	410-90316-10	Soil	06/27/22
146	AREA-2-22-SB-12-0.5	410-90316-11	Soil	06/28/22

LDC #: 54604B1a

SDG #: 410-90316-1

Laboratory: Eurofins, Lancaster, PA

VALIDATION COMPLETENESS WORKSHEET

Stage 2B

Date: 8/17/22

Page: 2 of 3

Reviewer: CL

2nd Reviewer: JVG

METHOD: GC/MS Volatiles (EPA SW-846 Method 8260D)

	Client ID	Lab ID	Matrix	Date
15 4	AREA-2-22-SB-12-5	410-90316-12	Soil	06/28/22
16 4	AREA-2-22-SB-12-10	410-90316-13	Soil	06/28/22
17 8	AREA-2-22-SB-12-20	410-90316-14	Soil	06/28/22
18 8	AREA-2-22-SB-12-1-20	410-90316-15	Soil	06/28/22
19 8	AREA-2-22-SB-11-0.5	410-90316-16	Soil	06/28/22
20 8	AREA-2-22-SB-11-5	410-90316-17	Soil	06/28/22
21 8	AREA-2-22-SB-11-1-5	410-90316-18	Soil	06/28/22
22 8	AREA-2-22-SB-11-10	410-90316-19	Soil	06/28/22
23 8	AREA-2-22-SB-11-~~15~~ 15	410-90316-20	Soil	06/28/22
24 8	AREA-2-22-SB-11-20	410-90316-21	Soil	06/28/22
25 9	AREA-2-22-SB-12-25	410-90316-22	Soil	06/28/22
26 5	TB-062822	410-90316-23	Soil	06/28/22
27 5	AREA-2-22-SB-18-20MS	410-90316-7MS	Soil	06/28/22
28 5	AREA-2-22-SB-18-20MSD	410-90316-7MSD	Soil	06/28/22
29				
30				
31				

Notes:

	2T4040		2T4547		2T3692		
	2T4095		2T4656				
	2T4346		2T4790				
	2T4528		2T4964				

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl chloride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methylcyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1. 2-Propanol
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1. Ethylene Dibromide

LDC #: 54604B9

VALIDATION FINDINGS WORKSHEET
Technical Holding Times

Page: 1 of 1
Reviewer: CA

All circled dates have exceeded the technical holding times.
Y (N) N/A Were all cooler temperatures within validation criteria?
Y N (N/A) Were air bubbles > 1/4 inch or was headspace present in the vials?

METHOD : GC/MS Volatiles (EPA SW 846 Method 8260B)

Sample ID	Matrix	Preserved	Sampling Date	Extraction date	Analysis date	Total # of Days	(2) Qualifier
All	Temp (w) 20.4 and 21.6 °C						J/X/A
11	Headspace						J/N/A (2)
						(HT=14)	(1)
2	S		6-27-22		7-12-22	15	J/N/A
4,7	↓		↓		7-13-22	16	↓
17-24			6-28-22		↓	15	
25	↓		↓		7-15-22	17	↓
(Lots+ND)							

TECHNICAL HOLDING TIME CRITERIA

Water unpreserved:	Aromatic within 7 days, non-aromatic within 14 days of sample collection.
Water preserved:	Within 14 days of sample collection.
Soil:	Within 14 days of sample collection.

LDC #: 54604B19

VALIDATION FINDINGS WORKSHEET
Initial Calibration

Reviewer: 9

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Did the laboratory perform a 5 point calibration prior to sample analysis?
Y N N/A Were percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCC's and SPCC's?
Y N N/A Was a curve fit used for evaluation? If yes, what was the acceptance criteria used for evaluation?_____
Y N N/A Did the initial calibration meet the acceptance criteria?
Y N N/A Were all %RSDs and RRFs within the validation criteria of ≤30/15 %RSD and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %RSD (Limit: ≤30.0/15.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
	5/3/22	ICAL	00	15.1		14, 17-24, MB	J (all detects) A (5)
			5	15.1		(NO)	

LDC #: 54604B19

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: Q

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y (N) N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y (N) N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications (5)
	7/14/22	VL14X02	LL	21.1		25. MB	√/LL/A
	7/11/22	VL11C01	D	146.9		6. MB (ND)	√/LL/A
			W	20.7			↓
	7/11/22	VL11S17 (closing)	D	139.4		6. MB (ND)	√/LL/A
	7/13/22	VL13C01	D	69.8		4.7. MB (ND)	√/LL/A
	7/13/22	VL13S20 (closing)	D	98.1		4.7. MB (ND)	↓
	7/12/22	RL12C01	D	93.0		15-16. MB (ND)	√/LL/A
	7/11/22	XL11C01	BB	23.5		1.5, 13. MB (ND)	√/LL/A
			B	21.1			↓
	7/11/22	LL11S1	B	23.5		11-12. MB (ND)	√/LL/A
			AA	27.2			↓
			LL	22.1			
	7/12/22	BL12C01	BB	22.0		14. MB (ND)	√/LL/A-C

LDC #: 54604B19

VALIDATION FINDINGS WORKSHEET
Surrogate Spikes

Reviewer: 9

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y (N) N/A Were all surrogate %R within QC limits?

Y N N/A If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R out of outside of criteria?

#	Date	Sample ID	Surrogate	%Recovery (Limits)	Qualifications (13)
		3 (dets+ND)	DCE	145 (71-136)	dets/A
			BFB	148 (79-119)	
			DFM	136 (78-119)	
			TOL	147 (85-116)	
				( )	
		4 (dets+ND)	TOL	118 ( )	dets/A
				( )	
		6 (	BFB	135 (79-119)	
			DFM	123 (78-119)	
			TOL	138 (85-116)	
				( )	
		15 (ND)	BFB	148 ( )	
			DFM	137 ( )	
			TOL	144 ( )	
				( )	
		16 (ND)	BFB	168 ( )	
			DFM	129 ( )	
			TOL	133 ( )	
				( )	
		MB 410-374040/8	TOL	118 (85-116)	dets/P
				( )	
				( )	
				( )	
				( )	
				( )	

(TOL) = Toluene-d8 (DCE) = 1,2-Dichloroethane-d4
(BFB) = Bromofluorobenzene (DFM) = Dibromofluoromethane

LDC #: ~~54604B~~ 49

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

METHOD : GC/MS VOA (EPA SW 846 Method 8260C)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.

(Y) N N/A Was a MS/MSD analyzed every 20 samples of each matrix?

Y (N) N/A Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	Date	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
		27/28	BB	147 (70-124)	136 (70-124)	( )	10 (ND)	Jdets/A (8)
			XX	143 (73-125)	131 (73-125)	( )		
			KKK	( )	64 (67-129)	( )		J/UJ/A
			A	( )	( )	22 (≤20)		Jdets/A (9)
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

LDC #: 54604B19

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Reviewer: Q

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was a LCS required?
Y (N) N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

#	Date	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
		LCS/D410-2T4040	D	266 (59-139)	245 (59-139)	( )	3, 6. MB (ND)	J det J/P (10A)
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
		LCS/D410-2T4538	D	196 (59-139)	171 (59-139)	( )	15-16. MB (ND)	J det J/P
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
		LCS/D410-2T4656	DDD	( )	124 (77-123)	( )	14. MB (ND)	J det J/P
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
		LCS/D410-2T4901	D	168 (59-139)	162 (59-139)	( )	4. T. MB	J det J/P
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

LDC#: 54604B1

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: PG

METHOD: GCMS VOA (EPA SW 846 Method 8260D)

Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Compound	Concentration (mg/kg)		RPD (≤ 50 %)	Qualifications (Parent only)
	3	5		
S	0.13	0.17	27	
QQQ	0.095U	0.0011	195	NQ

Compound	Concentration (mg/kg)		RPD (≤ 50 %)	Qualifications (Parent only)
	4	5		
S	0.13	0.17	27	
QQQ	0.095U	0.0011	195	NQ

NQ - one or both results < LOQ

V:\FIELD DUPLICATES\Field Duplicates\FD_Organics\2022\54604B1_EA_Keyport.wpd

LDC #: 34604R1/9

VALIDATION FINDINGS WORKSHEET
Internal Standards

Page: 1 of 1
Reviewer: 9

METHOD: GC/MS VOA (EPA SW 846 Method 8260C)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y (N) N/A Were all internal standard area counts within -50 to +100% of the associated calibration standard?

Y (N) N/A Were the retention times of the internal standards within +/- 30 seconds of the retention times of the associated calibration standard?

#	Date	Sample ID	Internal Standard	Area (Limits)	RT (Limits)	Qualifications
		1 (ND)	ADCB	2T8825 (300802-1203208)		√/UN/A (see cfd Table)

(BCM) = Bromochloromethane
(DFB) = 1,4-Difluorobenzene
(CBZ) = Chlorobenzene-d5
(PFB) = Pentafluorobenzene
(4DCB) = 1,4-Dichlorobenzene-d4
(2DCB) = 1,2-Dichlorobenzene-d4
(FBZ) = Fluorobenzene

LDC #: 54604B19

VALIDATION FINDINGS WORKSHEET
Overall Assessment of Data

Page: 1 of 1
Reviewer: 9

METHOD: GC/MS VOA (EPA SW 846 Method 8260C)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

All available information pertaining to the data were reviewed using professional judgement to compliment the determination of the overall quality of the data.

(Y) N N/A Was the overall quality and usability of the data acceptable?

#	Date	Sample ID	Compound	Findings	Qualifications
		3-5.4-25	Lab indicates too much soil was added to the preserved containers for low and high level kit. The 5 ml plastic unpreserved containers were used		Text
		2,4,7	All	HT out	NR/A

Comments: _____

OVR.1SC