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

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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

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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.

Figure 1-1. Keyport Site Layout

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Figure 1-2. Area 2 Site Layout

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Figure 1-3. OU 2 Sample Locations

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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		

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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.

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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

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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.

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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.

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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.

Figure 3-1. OU 2 Soil Analytical Results
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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.

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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

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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.

Figure 3-2. OU 2 Groundwater Analytical Results
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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.

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Appendix A
Field Forms and Logbooks

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Appendix B
Data Quality Assessment Report

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