Final

January 2023

High Vacuum Dual-Phase Extraction Pilot Test Report

Operable Unit 1

Naval Base Kitsap

Keyport, Washington

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

Contract No. N39430-16-D-1802, Task Order N4425521F4225

HIGH VACUUM DUAL-PHASE EXTRACTION PILOT TEST REPORT
OPERABLE UNIT 1
NAVAL BASE KITSAP, KEYPORT, WASHINGTON

FINAL

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Navy Contract No. N39430-16-D-1802
Task Order N4425521F4225

January 26, 2023

DOCUMENT IDENTIFICATION

Document Title:	High Vacuum Dual-Phase Extraction (HVDPE) Pilot Test Report
Site Name/Location:	Operable Unit (OU) 1, Naval Base Kitsap Keyport, Washington
Delivery Order No.:	N4425521F4225
Document Control No.:	BATL-1802-4225-0001
Report Coverage:	This report documents the results of a HVDPE pilot test at OU 1, conducted in accordance with an approved sampling and analysis plan dated April 2022. This document was prepared under Navy Contract No. N39430-16-D-1802 for Naval Facilities Engineering Systems Command Northwest. These services were provided by Battelle Memorial Institute.
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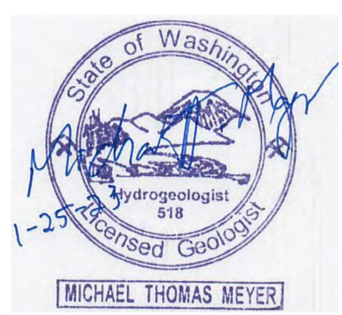

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ABBREVIATIONS AND ACRONYMS

%D	percent difference
%R	percent recovery
µg/L	microgram per liter
ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
CCV	continuing calibration verification
COC	contaminant of concern
COI	contaminant of interest
COPC	contaminant of potential concern
CSM	conceptual site model
cVOC	chlorinated volatile organic compound
DCE	dichloroethene
DO	dissolved oxygen
DoD	Department of Defense
DQO	data quality objective
DTW	depth-to-water
EPA	Environmental Protection Agency
FCR	Field Change Request
FFS	focused feasibility study
ft	feet
FYR	five-year review
GAC	granular-activated carbon
gpm	gallon per minute
GRO	gasoline range organics
Hg	mercury
HVDPE	high vacuum dual-phase extraction
IAS	Initial Assessment Study
ICV	initial calibration verification

ID	identification
LCS	laboratory control sample
LOD	limit of detection
LOQ	limit of quantitation
LUC	land use control
MS/MSD	matrix spike/matrix spike duplicate
MTCA	Model Toxics Control Act
NAPL	non-aqueous phase liquid
NAVD	North American Vertical Datum
NAVFAC NW	Naval Facilities Engineering Systems Command Northwest
NBK	Naval Base Kitsap
ORP	oxidation reduction potential
OU	Operable Unit
PAL	project action limit
PCB	polychlorinated biphenyl
PFAS	per- and polyfluoroalkyl substances
PFHxS	perfluorohexanesulfonic acid
PFTeDA	perfluorotetradecanoic acid
PFTrDA	perfluorotridecanoic acid
PID	photoionization detector
POTW	publicly-owned treatment works
ppb	part per billion
ppm-v	parts per million volume
PQL	practical quantitation limit
psi	pounds per square inch
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
RI	remedial investigation
ROD	Record of Decision
ROI	radius of influence
RPD	relative percent difference
RRO	residual range organics

SAP	sampling and analysis plan
scfm	standard cubic feet per minute
SVOC	semivolatile organic compound
TCE	trichloroethene
TPH	total petroleum hydrocarbons
VOC	volatile organic compound
WAC	Washington Administrative Code

1.0 INTRODUCTION

This report summarizes the background, scope, field activities, and results of the high vacuum dual-phase extraction (HVDPE) pilot study conducted in April through July 2022 at Operable Unit (OU) 1 of Naval Base Kitsap (NBK) Keyport in Keyport, Washington (Figures 1-1 and 1-2). OU 1 consists of the former landfill itself (Figure 1-1, historically known as “Area 1”), as well as areas adjacent to the former landfill footprint where contaminants have come to be located. The overall objective of the pilot study was to collect the data necessary to assess the effectiveness of HVDPE as a potential remedial technology to treat hot spots at OU 1 and optimize the remedy and stop off-site migration of contaminants, including to adjacent natural resources. The contaminant distribution in the pilot study area is shown on Figure 1-3, and the layout of the pilot study is shown on Figure 1-4.

The activities documented in this report were conducted in accordance with the project-specific OU 1 sampling and analysis plan (SAP) (Navy, 2022a). These activities were conducted under Navy Contract No. N39430-16-D-1802, Delivery Order N4425521F4225 for Naval Facilities Engineering Systems Command Northwest (NAVFAC NW). As the prime contractor, Battelle performed elements of the field data collection and data usability evaluation/interpretation described herein and prepared this data report. Subcontractors to Battelle performed utility locating, land surveying, sonic drilling, well installation, HVDPE system operation and monitoring, laboratory analyses, and data validation.

Responses to regulatory agency and stakeholder comments received on the draft version of this report are included in Appendix A.

1.1 SITE DESCRIPTION, BACKGROUND, AND CONCEPTUAL SITE MODEL

1.1.1 Site Description

NBK Keyport occupies 340 acres (including tidelands) adjacent to the town of Keyport in Kitsap County, Washington, on a small peninsula in the central portion of Puget Sound. The Keyport property was acquired by the Navy in 1913, with property acquisition continuing through World War II. The property was first used as a quiet-water range for torpedo testing. The first range facility was located in Port Orchard Inlet southeast of the site (Navy, 2015).

During the early 1960s, Keyport’s role was expanded to include manufacturing and fabrication, such as welding, metal plating, carpentry, and sheet metal work. Further expansion in 1966 consisted of a new torpedo shop and in 1978 the functions were broadened to include various undersea warfare weapons and systems engineering and development activities. Operations currently include engineering, fabrication, assembly, and testing of underwater weapons systems (Navy, 2015).

Marine or brackish water bodies on and near the site consist of tide flats flowing to Dogfish Bay and beyond Liberty Bay to the northwest, a marsh pond and a marsh to the west, Port Orchard Bay to the north and east, and a shallow lagoon discharging to Port Orchard Bay to the southeast (Figure 1-1). Freshwater bodies include two creeks draining into the marsh pond and two creeks that discharge into the shallow lagoon. The topography of the site rises gently from the shoreline to an average of 25 to 30 feet (ft) above mean sea level and then rises steeply at the southeast corner of the site to approximately 130 ft above mean sea level (Navy, 2015).

Area 1, the former base landfill, comprises approximately 9 acres in the western part of the base next to a wetland area and the tide flats that flow into Dogfish Bay (Figure 1-2). Most of the landfill area was formerly part of a wetland and remnants of the wetland now border the landfill to the west and south. The former shoreline is shown on Figure 1-2. This wetland area drains northward into the tide flats of Dogfish Bay through a culvert under Keys Road. A tide gate has been installed at this culvert to control tidal inundation of the wetlands and landfill. The tide flats are connected to Dogfish Bay by a narrow channel through structural fill material that forms the foundation of the Highway 308 causeway and bridge. The landfill is unlined at the bottom, and the top is covered with areas of grass, trees, asphalt, and concrete. The remaining wetlands adjacent to the landfill include most of the area bounding the landfill to the west, northwest, southwest, and south (Figure 1-2) (Navy, 2015). A small pond, referred to as "marsh pond," is located in the central part of the wetlands, west of the landfill. The pond is drained by a small creek that flows northward to the tide flats. The pond is fed by the remainder of the wetlands located south and southeast of the pond. The entire wetlands area is referred to as "the marsh," including the creeks that feed and drain the pond, and the wetland areas upstream and downstream of the pond. The wetland area upstream of the pond is fed by two small freshwater creeks (Navy et al., 1998), , stormwater drainage systems, and shallow groundwater flowing toward the marsh from all sides (Navy et al., 1998).

The surface water bodies near the former landfill constitute a complex, tidally influenced hydrologic system. Tidal fluctuations in Dogfish Bay influence the water levels in the tide flats northwest of the landfill, although the tide gate controls these effects on the Marsh Creek and marsh pond. The typical range in tide level of the tide flats at a measuring point close to the southeast side of the Highway 308 bridge is about 10 ft from higher high to lower low tide (Navy et al., 1998).

Near-surface geology in the Keyport area generally consists of both glacial and non-glacial deposits. The former landfill at OU 1 is underlain by fine- to medium-grained sands interbedded with silt and clay to depths ranging from approximately 30 to 50 ft below ground surface (bgs).

At this depth a coarse sand or gravel is commonly present overlying a peaty silt or clay that has been interpreted as a regionally significant aquitard. The surface of this aquitard is interpreted as erosional, based on the varying depth at which the peaty silt/clay is logged. Sands found beneath the peaty silt/clay have been interpreted as mud-supported fluvial channels within this geologic formation that appear to control contaminant migration.

The unconfined shallow water-bearing unit, interpreted in the Record of Decision (ROD) (Navy et al., 1998) to include two distinct aquifers, has been determined to be one aquifer through recent additional investigations, is the primary focus of this investigation and is present throughout the landfill area. The water table in this shallow water-bearing zone intersects the landfill waste material beneath much of the landfill. That is, roughly 5 ft of landfill material lies above the shallow groundwater surface in the unsaturated zone, and up to about 5 ft of material lies beneath the water table in the saturated zone (Navy et al., 1998).

Shallow groundwater has consistently been interpreted to flow through the landfill in a radial direction and discharge into the marsh northwest, west, southwest, and south of the landfill. Deeper groundwater in this same water-bearing zone (historically considered the "intermediate aquifer") has been interpreted to flow toward the northwest. The depth to first groundwater is typically 4 to 5 ft bgs in the landfill.

Groundwater/surface water tidal interaction and groundwater salinity studies were performed historically, and the results included in the 1997 summary data assessment report (Navy, 1997b). Additional assessment of tidal influence was performed during phytoremediation monitoring. The 1997 focused feasibility study (FFS) concluded that groundwater levels at OU 1 are influenced by seasonal and tidal changes. The study concluded that these influences were not enough to change the general groundwater flow patterns and that tidal influence occurs in wells close to the shore. The tidal influence rapidly attenuates with distance from the tide flats or Dogfish Bay, with a maximum tidal fluctuation in groundwater measured prior to 1997 of 2.5 ft (Navy, 1997a).

1.1.2 Background and Conceptual Site Model

This section presents a summary of the most recent conceptual site model (CSM), focused on the portion of OU 1 that was the subject of the HVDPE pilot study. This CSM incorporates a summary of the site history and is meant to be an "iterative, living representation" of the site that summarizes and helps the project team visualize and understand the available information. The organization of this CSM follows the recommendations in Environmental Protection Agency (EPA) guidance (EPA, 2011) and is adapted from the most current site-wide CSM (Navy, 2022b).

Known or Suspected Sources of Hazardous Substances

The known sources of hazardous substances at OU 1 are past disposal into the former landfill, which was constructed over the course of several decades in a tidal wetland within the historical intertidal zone of Dogfish Bay. These disposal practices were documented in the pre-ROD investigation documents and summarized in the ROD (Navy et al., 1998).

The extent of the landfill waste body is relatively clearly delimited on the west and south sides, where the waste body slopes down abruptly into what remains of the tidal wetland. The waste body extent to the north and east is less clear because of the presence of roadways, parking lots, and buildings on the apparent boundary. The northern boundary of the waste body has been commonly estimated as being within the parking lot of the Pass & ID Building, with the eastern boundary roughly beneath the adjacent north-south roadway. The most probable northern and eastern boundary of the waste body is the historical shoreline (Figure 1-2). The eastern boundary of the waste body near the south end of the landfill appears to be confirmed by borings drilled in this area in 2017 and 2019, which did not identify waste. Additionally supporting this boundary is the historical shoreline in this area and the abrupt decline in chlorinated volatile organic compound (cVOC) concentrations moving from west to east from the area of highest concentrations on the east side of the South Plantation, to non-detectable concentrations east of the adjacent north-south road in this area.

The landfill was the primary disposal area for domestic and industrial wastes generated by the base from the 1930s until 1973, when the landfill was closed. A burn pile for trash and demolition debris was located at the north end of the landfill from the 1930s to the 1960s. Unburned or partially burned materials from this pile were buried in the landfill or pushed into the marsh as it existed at the time, slowly expanding the landfill footprint. A trash incinerator was operated at the north end of the landfill from the 1930s to the 1960s, and incinerator ash was disposed of in the landfill. Burning continued at the landfill until the early 1970s.

Based on interviews of base personnel, the Initial Assessment Study (IAS; Navy, 1984) identified the following types of industrial wastes that were likely disposed in the landfill:

- Paints, lacquers, thinners, ketones, enamel, and deflocculant from the paint shop;
- Paint residues and solvents such as TURCO, methyl ethyl ketone, trichloroethene (TCE);
- TCE, alcohol, and toluene from the paint stripping shop;
- Residue from burning torpedo fuel (Otto fuel) and solids contaminated with torpedo fuel;
- Cutting oils, acids, caustics, and lead slag from metal shops;

- Dried bacterial sludge from the industrial wastewater treatment plant; and
- Pesticide rinsate from pest control shops.

The IAS also states that liquid plating bath wastes from the on-base plating shop (located on the eastern side of the base) were treated at the landfill from 1962 to 1984. From 1962 to 1972, the plating bath wastes were treated in tanks at former Building 439, which was located along northern edge of the pilot study area (Figure 1-4) and where various building foundations remain. After treatment, the effluent was discharged to the marsh via a drain. Discharge of the treated effluent to the marsh was discontinued in 1972, at which time the base began sending the treated effluent to an off-site disposal facility. This was approximately the same time that the landfill was closed. In the 1980s, treatment was conducted in former Building 884 located along northern edge of the pilot study area (Figure 1-4). Treatment at the landfill was discontinued in 1984.

The IAS also identified general locations at the landfill where these aforementioned activities took place; these locations are noted on figures provided in the CSM (Navy, 2022b), using the terminology of the IAS. The "acid treatment area" coincides with the location of former Building 439. The "waste paint disposal area" in the southern part of the landfill within the pilot study area is a location where the IAS indicated painting-related wastes and solvents were disposed of from the 1930s until the 1970s. This location also coincides with some of the higher concentrations of solvent-type contaminants detected in groundwater at OU 1.

The IAS also describes management and disposal of drummed wastes at the base. It states that barrels of painting wastes and stripping solutions were disposed of at the landfill, and that "most of the waste was reportedly poured out of the barrels and the barrels were reused or recycled."

Empty barrels were stored, managed, and recycled at Area 2, the former drum storage area, (located in the southwestern part of the base) from the 1940s through the 1960s. The IAS states that drums that were not completely empty were reportedly drained onto the ground at the former drum storage area. Since February 1994, the Navy interviewed over 50 former and current employees to learn whether intact drums of liquid wastes were placed in the landfill. Eight of these people had been directly involved in landfill operations. One person remembered that 12 or 14 pallets of 5-gallon cans of paint and some 55-gallon drums were buried whole. The remaining people believe that whole drums were not buried intact. Some of them said that drums were emptied into the landfill or crushed before burial. Emptied drums were stored for reuse at Area 2. Overall, the interviews indicated that disposal of liquids in drums was not a common practice and substantial amounts of drummed liquid wastes are unlikely to be in the landfill.

Discussions in 2017 with one individual who worked in former Building 884 in the 1980s indicated that wastes were still being discharged in this timeframe to a trench oriented north-south along the west side of the north-south road adjacent to the landfill and south of former Building 884, in the area of the pilot study. This location coincides with the highest concentrations of solvent-type contaminants detected in groundwater at OU 1.

Types and Concentrations of Hazardous Substances

Contaminants of interest (COIs) and contaminants of potential concern (COPCs) were originally identified during the remedial investigation (RI) and risk assessments conducted in 1993 and assessed for risks to human health and the environment to develop the list of contaminants of concern (COCs) carried into the ROD. The CSM memorandum (Navy, 2022b) tabulates and describes the evolution of the risk assessment for this site. Table 1-1 shows the list of COCs resulting from the 1993 risk assessment. As of the date of the CSM memorandum, updated risk assessments are underway, and may result in revisions to the list of COIs, COPCs, and COCs, and a subsequent revision of the CSM described in the subsections that follow. The maximum concentrations of each COC identified to date in each environmental medium are shown in Table 1-1. Although not listed as a COC in the ROD, 1,4-dioxane was identified as a chemical of emerging concern during the five-year review (FYR) process for the site and has been added to subsequent investigations and monitoring.

In 2021, the Navy performed a site-wide sampling of all available groundwater monitoring wells for the family of chemicals of emerging concern, per- and polyfluoroalkyl substances (PFAS). The results showed PFAS is not of primary concern at OU 1, with concentrations well below screening levels available at the time of sampling in all but one well sampled. A PFAS site investigation is underway for all of NBK Keyport and will provide a more rigorous assessment of these chemicals of emerging concern.

Contaminated Media

Contaminated environmental media are those media in which the OU 1 ROD concluded that COCs are present at concentrations representing an unacceptable risk to human health or the environment, as defined by the cleanup levels established in the ROD (Table 1-1). Contaminated environmental media consist of those media described in the subsections below. The COCs for the site, and therefore the contaminated media at the site, are currently being reevaluated. This memorandum presents what is known regarding contaminated media based on the ROD and recent investigations, with some hypotheses presented regarding the potential outcome of the updated risk assessment, as recommended by EPA guidance (EPA, 2011).

Soil. Soil exhibiting COCs at concentrations exceeding the cleanup levels established in the ROD are present within the landfill footprint from near ground surface to at least 62 ft bgs. The depth to groundwater beneath the site is very shallow (typically 2 to 8 ft bgs), and as a result many of the soil samples exhibiting COCs at concentrations exceeding the cleanup levels were collected from the saturated zone. These samples do not represent direct discharge of contaminants to soil, but rather provide information regarding contaminant partitioning between soil and groundwater.

No soil exhibiting COCs at concentrations exceeding the current cleanup levels has been identified outside the landfill footprint or off of Navy property.

Based on the nature of the COCs and their primary transport mechanism via groundwater, the extent of contaminated soil is unlikely to change substantially based on upcoming future investigation or risk assessment.

Groundwater on Navy Property. Groundwater exhibiting COCs at concentrations exceeding the cleanup levels established in the ROD are present throughout the landfill footprint and northwest of the landfill footprint, as measured in wells on the base perimeter road, at mid-screen depths of approximately 42 to 43 ft bgs in each well. Groundwater exhibiting COCs at concentrations exceeding the cleanup levels is present beneath the landfill to a depth of at least 64 ft bgs (based on the screened intervals of wells in the northern portion of the landfill). Beneath the southern portion of the landfill where the pilot study was conducted, groundwater exhibiting COCs at concentrations exceeding the cleanup levels has been documented in well MW1-68 (Figure 1-4), which has a screened interval of 37 to 47 ft bgs. As of the date of this report, no deeper wells within the landfill footprint demonstrate groundwater exhibiting COCs at concentrations below the cleanup levels, except in one upgradient well located south of the pilot study area. Therefore, the vertical extent of COCs in groundwater at concentrations exceeding cleanup levels has not yet been delimited. The Navy is currently engaged in additional investigation to fill this data gap.

Groundwater off Navy Property. The COC vinyl chloride and the chemical of emerging concern 1,4-dioxane are consistently detected in monitoring wells on the Highway 308 causeway (the causeway), northwest of Navy property (see site-wide figures in Navy 2022b). The vinyl chloride concentration frequently exceeds the cleanup level established in the ROD in groundwater samples from 33 ft bgs. The 1,4-dioxane concentration in wells screened at 46 ft bgs and 33 ft bgs frequently exceeds the groundwater cleanup level promulgated in the State of Washington’s Model Toxics Control Act (MTCA), which is an applicable or relevant and appropriate requirement (ARAR) for the site under the ROD.

Beyond the causeway, no wells are present to establish the downgradient extent of COCs in groundwater, because groundwater flows to the northwest beneath Dogfish Bay. The wells on the causeway do not conclusively delimit the vertical extent of COCs in groundwater off of Navy property. The Navy is currently engaged in additional investigation to fill this data gap.

Indoor air. The land use controls (LUCs) remedy element implemented in accordance with the OU 1 ROD and inspected annually prevents exposure via the indoor air/vapor intrusion pathway within the landfill footprint. In 2018, the Navy performed a vapor intrusion study of buildings adjacent to the landfill, which concluded that there is no unacceptable risk from landfill COCs via the vapor intrusion pathway (Navy, 2019a).

Surface water. cVOCs and polychlorinated biphenyls (PCBs) continue to be detected in surface water samples in the wetland adjacent to the landfill (Navy, 2018; Navy, 2019b) and were historically detected in marine surface water in the Tide Flats and Dogfish Bay (Navy, 2019b). The measured concentrations of these COCs in surface water within the wetland are consistently above the cleanup levels established by the ROD or current ARAR values at sampling stations throughout these water bodies. COC concentrations in marine water in the Tide Flats and Dogfish Bay declined since initial sampling in 1995 and were not detected in the most recent sampling event in 2014 (with the exception of an estimated detection of cis-1,2-dichloroethene [DCE] at location DB14 in June of 2014) (see site-wide figures in Navy, 2022b).

Within the wetland, PCBs are consistently detected in seep water at seep SP1-1 located at the northwest corner of the North Plantation, which is not within the area of the pilot study described in this report.

Sediment. The RI concluded that volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), PCBs, and metals were COPCs in sediment within the marsh, tide flats, and Dogfish Bay, and sampling for this suite of chemicals was performed periodically beginning in 1996. One element of the selected remedy was removal of PCB-impacted sediment in the reach of Marsh Creek from seep SP1-1 to the tide gate. Contaminants in sediment were not a focus of this pilot study and therefore this medium is not discussed further in this report. Similarly, marine biota are not discussed in this report, but a discussion is available in the CSM technical memorandum (Navy, 2022b).

Non-aqueous Phase Liquid (NAPL). The presence of NAPL within the landfill waste body was inferred during the pre-ROD investigations (Navy et al.,1998), based on the measured dissolved concentrations of cVOCs in groundwater. Direct observation of NAPL was reported in borings drilled in the Central Landfill and South Plantation (where this pilot study was performed). Reports of NAPL were from shallow depths (6 to 18 ft bgs) at the base of the waste body and consisted of oily substances in soil cores. Laboratory analysis of soil samples with these oily substances indicated that the NAPL consisted primarily of a mixture of petroleum fuels with cVOCs and PCBs, which is consistent with the disposal practices in the landfill (Navy, 2018). This disposal history, in combination with the analytical results that show the presence of chlorinated solvents, fuel-range hydrocarbons, and PCBs indicate that the oily substances are likely “mixed NAPLs” (EPA, 2009). Neither dense (heavier than water) nor light (lighter than water) NAPLs have been observed to accumulate in wells at the site, including wells installed where oily substances were observed in soil cores.

Extent and Potential Migration of Hazardous Substances in the Pilot Study Area

cVOCs, a subset of which were identified as COCs in the ROD, are ubiquitous in groundwater within the landfill waste body and beneath the waste body to a depth of at least 64 ft bgs (see Attachment A of Navy, 2022b). The Navy is currently conducting an additional investigation to confirm the maximum vertical extent of cVOC contamination beneath the landfill.

The landfill waste body is elevated relative to the wetland adjacent to the waste body on the south and west, and groundwater is very shallow within the waste body (roughly 4 ft bgs). This geometry leads to localized shallow groundwater flow and contaminant transport from the waste body to the south, west, and northwest into adjacent wetland surface water. cVOCs are then detected in sediment porewater and surface water in the ephemeral creek and Marsh Creek and were historically detected in marine water in the Tide Flats (Navy, 2019b).

Regional groundwater flow drives contaminant transport to the northwest, beneath Dogfish Bay. Erosional paleo topography in the surface of the Olympia Formation (as identified using environmental sequence stratigraphy [Navy, 2022c]) along with fluvial paleochannels within this formation, provide preferential flow pathways along this northwest flow direction. Transport of cVOCs in groundwater at a depth of 55 ft bgs is documented in a well located at the northwest corner of the North Plantation, with cVOCs then detected in wells on the Highway 308 causeway to the northwest.

The cVOC transport pathways most relevant to the pilot study are discharge to adjacent surface water along the southern and southwestern landfill boundary, along with deeper transport to the northwest along the regional groundwater flow pathway.

Exposure Pathways and Receptors in the Pilot Study Area

Human exposure to cVOCs in groundwater directly beneath OU 1 is controlled by the LUCs established in the ROD. The ROD concluded that known off-site transport of cVOCs in groundwater would not result in human exposure because of daylighting of the cVOCs into a marine embayment. However, this conclusion is being verified with additional investigations in

Dogfish Bay based on the more recent understanding of the geology and contaminant distribution and migration at depth beneath the landfill.

cVOCs in shallow groundwater discharge to wetland surface water immediately adjacent to the landfill and result in cVOC concentrations in surface water exceeding the ROD remedial goals and current ARAR values. Ecological receptors are exposed to cVOCs in this surface water and site workers could potentially be exposed. The surface water on site is not currently used for recreation or as a drinking water source.

1.2 PILOT TEST APPROACH

This section describes the approach used for the HVDPE pilot test. The work areas, including equipment layout and extraction and observation wells used in the test, are shown on Figure 1-4.

1.2.1 Well Location Selection and Installation Approach

In April 2022, sonic drilling was utilized to install two extraction wells and one air sparge well. Additionally, one existing monitoring well was selected as an extraction well. The locations of the extraction wells were selected based on the locations of the hotspots shown on Figure 1-3, the broader understanding of contaminant distribution based on historical site data, and past experience at similar sites.

During extraction well and air sparge well installation, continuous soil cores were retrieved at each direct-push drilling location, the soil lithology was logged, and the cores were screened using a hand-held photoionization detector (PID). Based on these observations, grab soil samples were preferentially collected at the depths exhibiting the highest readings on the hand-held PID, as well as from the screened intervals of each well. These samples were collected to provide cVOC concentrations in soil at the time of well installation. Once the new wells had been developed to ensure connectivity with the aquifer and had been allowed to rest, groundwater samples were collected on April 29, 2022.

1.2.2 HVDPE Testing and Monitoring Approach

The HVDPE system was operated without air sparging for 44 days, followed by operation with air sparging for an additional 35 days. During HVDPE system operation, field data collection included system vacuum and air flow rate, influent VOC vapor concentrations with a PID, depths of down-well stinger tubes, water meter readings, and groundwater level measurements in extraction wells and observation points. As discussed in the SAP and detailed below, laboratory analytical samples were collected for vapor and process water during system operation.

Fifteen existing monitoring wells and three existing surface water monitoring points were utilized as observation points in the pilot test. These observation points were selected based on the locations of the extraction wells and the anticipated radius of influence of the HVDPE system. Pressure transducers were placed in 10 observation wells to record groundwater drawdown during the test.

1.3 OBJECTIVE AND SCOPE OF WORK

The overall objective of the pilot test described in this report was to test the effectiveness of HVDPE as a potential remedial technology to treat hot spots at OU 1, optimize the remedy and stop off-site migration of contaminants, including to adjacent natural resources. HVDPE pilot testing under this SAP broadly included:

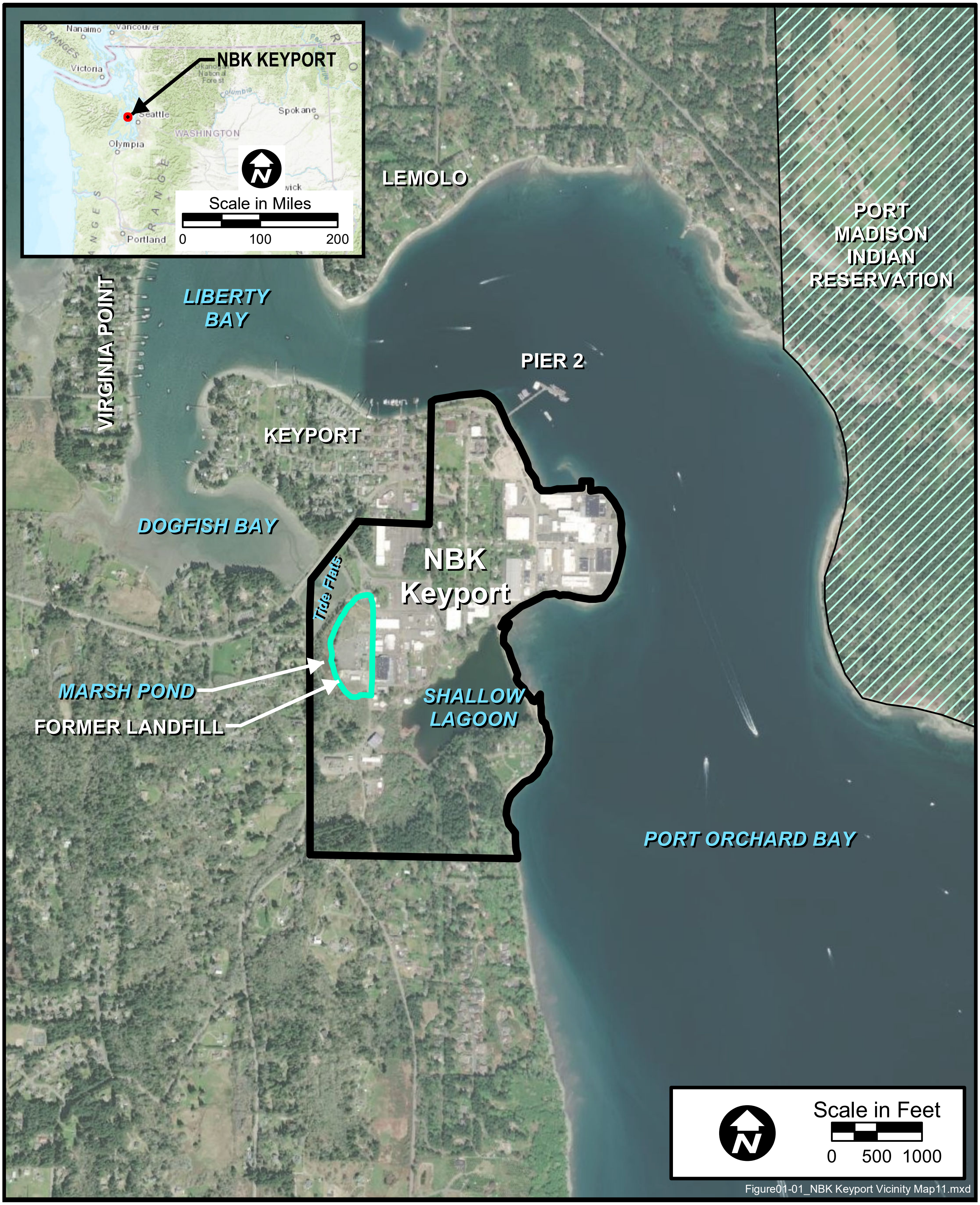
1. Installation and sampling of two additional extraction wells
2. Installation of one air sparge point
3. Performance of HVDPE pilot testing with and without air sparging.

These data will be used during a future FFS to assess the potential effectiveness of HVDPE as a remedial technology to treat hot spots at OU 1.

1.4 DECISION RULES

The decision rules established in the SAP (Navy, 2022a) for evaluating the pilot study data were as follows:

- **Decision 1** - Decide the best estimate of the expected contaminant mass that could be removed using full-scale HVDPE technology, both alone and when combined with air sparging, in high contaminant concentration areas of the former landfill.
- **Decision 2** - Decide the best estimate of vacuum radius of influence, groundwater drawdown, expected capture zone, expected contaminant rebound, and resultant well design and distribution for evaluation of full-scale implementation of HVDPE to be evaluated under the future FFS.
- **Decision 3** - Assess whether this technology could be used to prevent, or substantially reduce, high-concentration VOC migration in groundwater to surface water adjacent to the former landfill by integrating the results of the HVDPE pilot study into the fate and transport groundwater modeling (scoped separately in support of the supplemental RI).



U.S. NAVY	**Figure 1-1** **NBK Keyport Vicinity Map**	CTO F4225 NBK Keyport HVDPE Pilot Test Report

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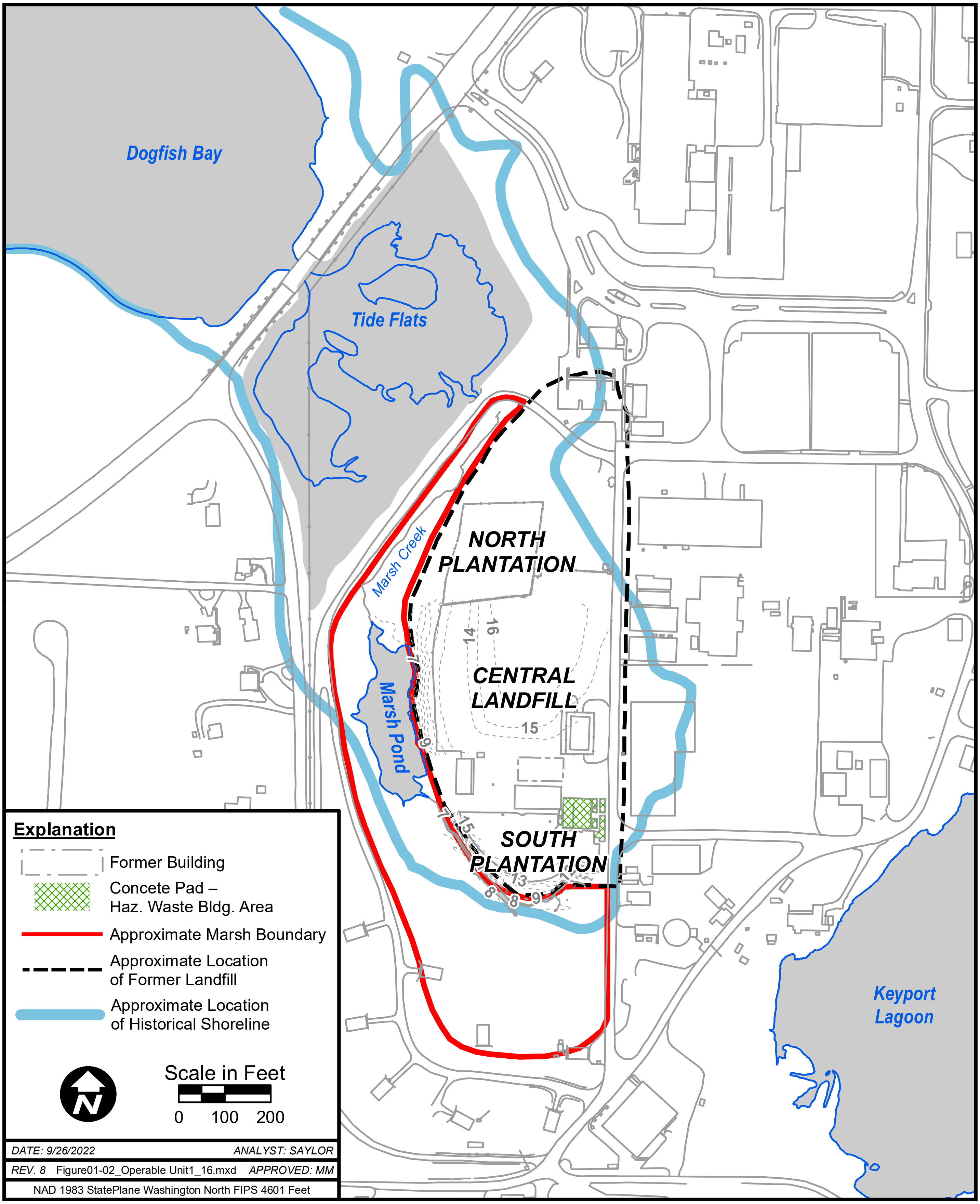

U.S. NAVY	**Figure 1-2** **Operable Unit 1**	CTO F4225 NBK Keyport HVDPE Pilot Test Report

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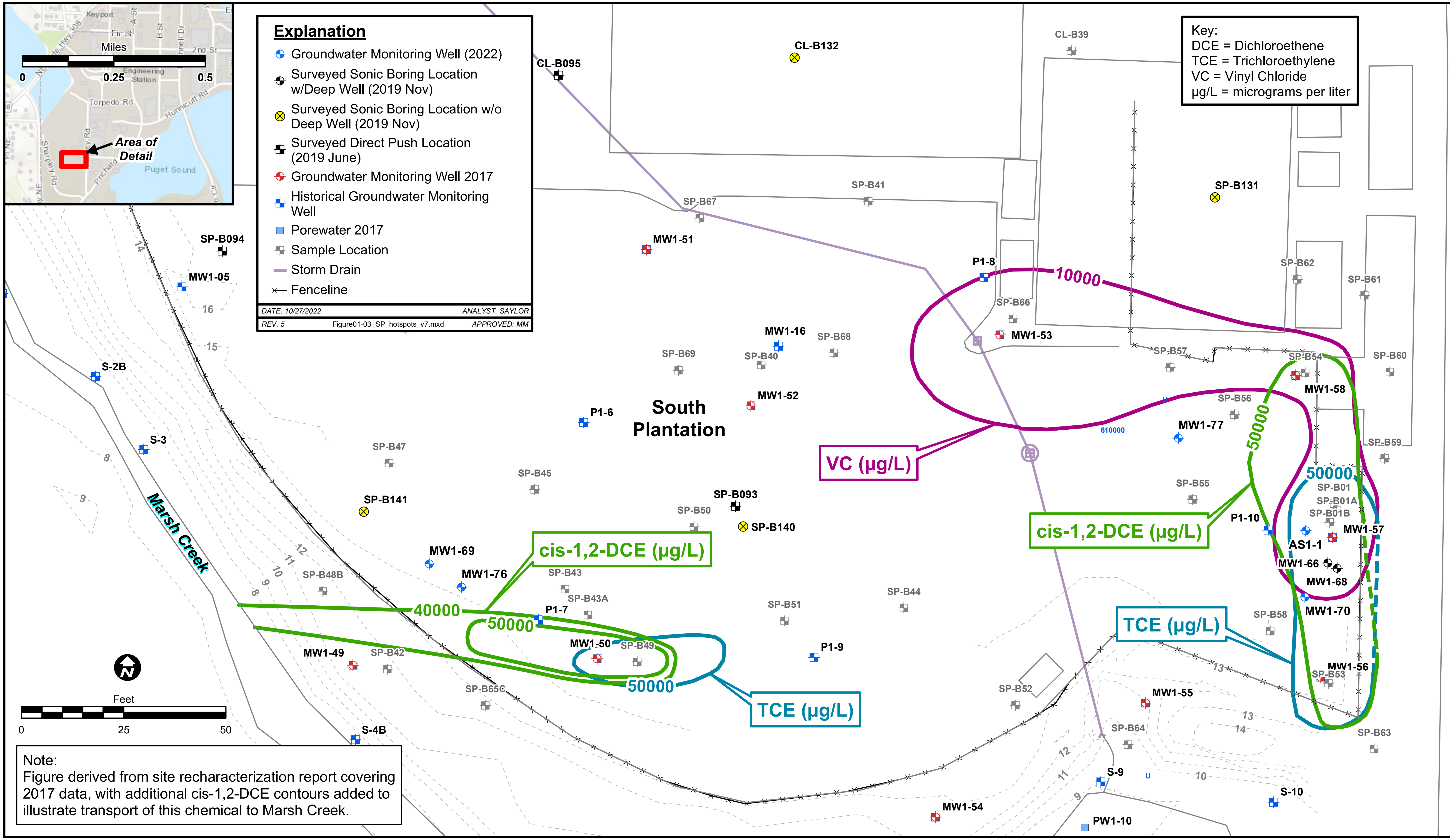

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Figure 1-3
South Plantation Hotspots

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Figure 1-4
Pilot Test Equipment Layout

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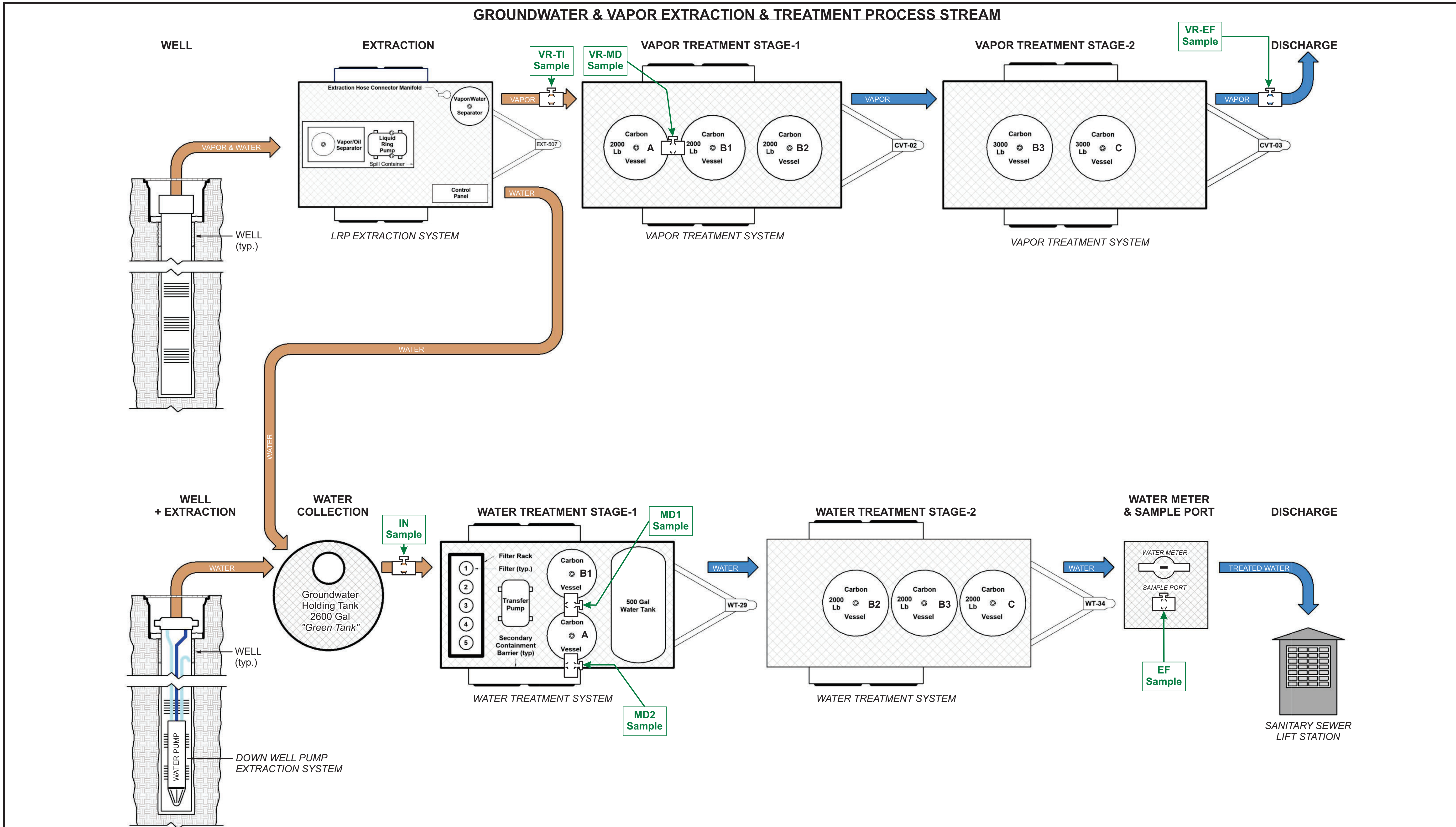

U.S. NAVY	**Figure 1-5** **Pilot Test Process Flow Diagram**	CTO F4225 NBK Keyport HVDPE Pilot Test Report

Table 1-1. COCs Established in OU 1 ROD

Chemical of Concern	Remediation Goals in ROD [a, b]		Maximum Concentrations Detected in Environmental Media			
Groundwater and Soil	**Groundwater (µg/L)**	**Surface Water (µg/L)**	**Groundwater, Porewater and Seeps (µg/L)**	**Sediment (mg/kg)**	**Surface Water (µg/L)**	**Shellfish Tissue (mg/kg)**
Tetrachloroethene (PCE)	5	4.2	110	NA	ND	NA
Trichloroethene (TCE)	5	56	590,000	NA	2,580	NA
1,1-Dichloroethene	0.5	1.9	305	NA	13.3	NA
cis-1,2-Dichloroethene	70	NE	350,000	NA	10,600	NA
trans-1,2-Dichloroethene	100	33,000	4,100	NA	53.7	NA
Vinyl chloride	0.5	2.9	32,000	NA	4,330	NA
1,1,1-Trichloroethane	200	41,700	5,810	NA	ND	NA
1,1-Dichloroethane	800	NE	30,000[e]	NA	11[e]	NA
1,2-Dichloroethane	5	59	53	NA	ND	NA
Total PCB Aroclors	0.04	0.04	1.8[d]	48.67[c]	0.13[e]	0.013[e]

Notes:
NA - not applicable; ND - not detected above laboratory reporting limit; NE - not established
[a] Values shown are the lowest for either the drinking water or protection of surface water pathways.
[b] Many of these RGs frozen at the time of the ROD would be different if established based on current ARARs and are being re-evaluated based on a revised risk assessment.
[c] carbon-normalized value from station SP1-1, June 2019
[d] data from seep water, SP1-1, spring 1990
[e] maximum value from ROD, all others from 2017 and 2019 data.

2.0 PILOT TEST ACTIVITIES

2.1 EXTRACTION WELL INSTALLATION AND SAMPLING

Sonic drilling, groundwater monitoring, well installation and development, and monitoring well sampling were performed in accordance with the approved SAP, except where deviations from the SAP are identified in this section and Table 2-1. Approved Field Change Request (FCR) forms are included in Appendix B. Daily reports of the field work performed are included in Appendix C.

Utility locating was performed in advance of sonic drilling on April 4, 2022, and the Navy issued excavation permit 22-EP058 on April 18, 2022. Sonic drilling was performed from April 20 through April 22, 2022. Holt Services, of Edgewood, Washington, provided a TerraSonic TSi 150 Compact Crawler rubber track-mounted sonic drilling rig operated by a driller licensed in Washington State.

2.1.1 Sonic Drilling

The rotosonic drilling method, also known as vibratory drilling or sonic drilling, uses an eccentrically oscillating drill head to produce high-frequency vibratory energy that is then transmitted down a drill string to a core barrel to quickly advance through the subsurface. Water was utilized during drilling to control heave. Additionally, conductor casing was driven in conjunction with the sampling rods to limit cross contamination of deeper lithologic layers from shallow contamination.

Three sonic borings were installed in the South Plantation. Two borings were drilled for the installation of pilot test extraction wells (in combination with one previously installed extraction well), and one boring was drilled for the installation of an air sparge point (Section 2.2).

2.1.2 Soil Sampling

Continuous soil cores were collected during sonic drilling and immediately logged upon retrieval using the following procedure. A tubular plastic sleeve with a sealed bottom was placed beneath the core barrel. The core barrel was then vibrated, causing the soil sample to be extruded into the plastic sleeve. Each plastic sleeve was filled with no more than 3 ft of soil core. The plastic sleeve was then marked with the sample interval using indelible ink. The 4-inch core barrel yielded recovered core samples approximately 4 inches in diameter; the recovered core was typically slightly narrower (i.e., stretched clay) or wider (i.e., sand and gravel) based on the recovered material in the plastic sleeve.

Soil from the sonic cores was visually examined for contamination and classified in accordance with the Unified Soil Classification System. Soils were field screened, at 1-foot intervals, with a PID equipped with a part per billion (ppb) detector. PID screening and subsequent sampling were conducted at the middle of the rotosonic core to minimize soil disturbance and temperature effects of the rotosonic drilling. The following procedures were adhered to during PID screening activities:

- Screening took place as soon as possible after each core tube was opened. If screening could not take place immediately after the core was retrieved, the plastic sleeve was left unopened until screening could be conducted.
- At each screening interval, fresh soil was exposed using a sample spoon and a small headspace was created.
- The PID tip was inserted into the headspace above the soil core.
- The highest value measured on the PID for each measurement interval was recorded.

Grab soil samples were collected from the sonic borings at intervals based on PID field screening results and within the planned screened interval for each monitoring well. Table 2-2 summarizes the grab soil samples collected from each sonic boring, along with the laboratory analyses performed on each sample. Soil samples were analyzed for the target cVOCs as listed in the SAP.

2.1.3 Extraction Well Installation

Figure 2-1 shows the locations of historical groundwater monitoring wells and monitoring points across the South Plantation and surrounding area. The new extraction wells installed in 2022 continued the historical naming conventions for OU 1 wells, beginning with the next well numbers in series (MW1-76 and MW1-77).

Screened intervals were selected based on the desired depths to be tested with HVDPE, real-time observations made in the field (i.e., lithology, PID screening results), and in consultation with the Navy.

The wells were constructed of 4-inch diameter flush-threaded Schedule 40 polyvinyl chloride (PVC), 15 ft of 0.010-slot screened well casing, blank well casing to the ground surface and sealed with a lockable compression cap. The filter pack around the screen consisted of #12/20 grade silica sand, and the well seal consisted of hydrated bentonite chips.

Wells were completed with above-ground steel "stick-up" protective casings surrounded by three bollards. Table 2-3 summarizes the well construction details for the new extraction wells and the boring and well logs are included in Appendix D.

Both newly installed extraction wells were found to produce sufficient groundwater flow for purging and sampling and extraction purposes.

Boring logs and well construction diagrams that include the driller's license number and are signed by the licensed driller and uploaded to the Washington State Department of Ecology's database, as required. The Washington State Well identification (ID) for each installed well was be provided by the well drilling contractor and attached to each well as required by Ecology's *Minimum Standards for Construction and Maintenance of Wells* (Chapter 173-160 Washington Administrative Code [WAC]).

2.1.4 Monitoring Well Development

The newly installed wells were allowed to rest for five days following installation, with well development completed on April 26, 2022. Well development was performed in accordance with the SAP using surging followed by high flow pumping while monitoring water quality parameters. As expected, water quality parameters (especially turbidity) did not fully stabilize during development, likely due to the presence of fine-grained sediments in the formation. However, development achieved substantial reductions in turbidity at all wells. Well development logs are included in Appendix E.

2.1.5 Groundwater Sampling

Groundwater sampling was performed 72 hours after well development of the newly installed wells, using low-flow techniques in accordance with the SAP and NAVFAC NW SOPs I-C-2 and I-C-5 (Navy, 2022a). Samples for PFAS were collected according to the procedures listed in the SAP (Navy, 2022a).

Groundwater samples were analyzed for the nine target cVOCs plus chloroethane, and PFAS. Field parameters, including dissolved oxygen (DO), oxidation reduction potential (ORP), pH, specific conductivity, temperature, and turbidity, were collected during well purging and immediately prior to sampling of both wells. Table 2-2 summarizes the groundwater samples collected from each new extraction well, along with the laboratory analyses performed on each sample. The well purge logs are included in Appendix E.

2.2 AIR SPARGE POINT INSTALLATION

The air sparge point was installed on April 22, 2022, and was designated AS1-1. Continuous soil cores were collected during drilling and PID measurements were recorded using the procedures described in Section 2.1.2. Soil and groundwater samples were not collected for laboratory analysis at AS1-1.

The air sparge point was constructed of a porous high density polyethylene micro tip and blank PVC well casing to the ground surface and sealed with a lockable compression cap. The filter pack around the screen consisted of #12/20 grade silica sand, and the well seal consisted of hydrated bentonite chips.

The air sparge point was completed with above-ground steel "stick-up" protective casings surrounded by three bollards. Table 2-3 summarizes the well construction details for the air sparge point and the boring and well log is included in Appendix D.

2.3 HVDPE STARTUP AND OPERATION

CalClean, Inc. (CalClean), the HVDPE contractor, mobilized to the site on April 28, 2022 to begin HVDPE system setup. The HVDPE system consisted of a trailer-mounted mobile 25-horsepower liquid ring pump extraction system. The extraction system is an oil-based Dekker system with a capacity of up to 450 cubic feet per minute and a maximum vacuum of 29 inches of mercury (Hg). Electrical power supplied by a generator was used to operate the system.

The three extraction wells connected to the HVDPE system included existing extraction well MW1-66 and the two new extraction wells, MW1-76 and MW1-77. The locations of the three extraction wells, along with the air sparge point (AS1-1), are shown on Figure 1-4. Each extraction well was equipped with a 1-inch flexible stinger tube for recovery of vapor and entrained water. Additionally, submersible pumps were placed in the extraction wells to further lower the water table, with flow meters provided for each well to measure flow rate and total pumped water volume. The extraction wells, as well as other wells in the vicinity of the pilot test, were properly sealed and periodically checked to ensure a proper seal to prevent loss of vacuum through piping and wells.

The HVDPE system consisted of separate vapor and water treatment processes. For vapor treatment, three 2,000-pound followed by two 3,000-pound granular-activated carbon (GAC) vessels were installed in series. Groundwater extracted during system operation was separated out in the system. Initially, VOCs were removed from the extracted groundwater while under high vacuum in the Inlet Knockout Tank of the system. The process water was then transferred to a secondary groundwater treatment system, consisting of two 1,000-pound and three 2,000-pound GAC vessels in series. A water flow meter was placed in line to measure discharge rate and quantity, which included water pumped from each well and water entrained in the vapor stream and then separated for treatment. Sample ports were installed for periodic water sampling, as described in Section 2.4.3. Groundwater was ultimately discharged directly to the sewer system, as described in Sections 2.4.3 and 4.6.

The HVDPE system operating parameters are summarized in Table 2-4 and shown on Figures 2-2 and 2-3, and the HVDPE system field data collected during the pilot test are included in Appendix F.

2.3.1 HVDPE-Only Operation

The HVDPE system was set up and started on May 3, 2022, and following initial optimization, became fully operational on the afternoon of May 4, 2022. As planned in the SAP, the HVDPE system was initially run with no air sparging. The HVDPE system operated with no air sparging for 44 days, until June 17, 2022. During system operation, operational data were routinely collected, which is described in Section 2.4.

HVDPE systems can sometimes operate without down-well pumps. In these cases, the vacuum and air flows achieved through the stinger tubes are sufficient to entrain groundwater at the rate that it enters the extraction wells and allow for complete dewatering of the extraction wells during system operation. To maximize recovering via the stinger tubes, on May 6, 2022, stinger tubes were lowered in each extraction well to 10 ft bgs, then subsequently gradually lowered to 13 ft bgs on May 11, 2022. The system operator then fluctuated the stinger depths between 12 and 13 ft bgs until June 14, 2022. On June 14, 2022, the stinger tube in well MW1-77 was gradually lowered, reaching 17 ft bgs by June 16, 2022, to assess any effects of using stinger tubes only, without submersible pumps. The submersible pump in this well had been previously turned off on May 8, 2022.

For this initial phase of the pilot test, groundwater was extracted at an average rate of 10.9 gallons per minute (gpm). Vapor extraction flow rates ranged from 30 to 40 standard cubic feet per minute (scfm) with vacuum ranging from 24 to 27 inches of Hg.

For the majority of the pilot testing, vapor was extracted from all three wells at the same time, with some brief variations in the number of wells operating based on maintenance needs. Daily vapor flow rates measured at the total inlet port did not vary by more than 7 scfm during HVDPE-only operations and no more than 3 scfm once air sparge started on June 18 (Section 2.3.2), indicating that the overall vapor flow rate was relatively consistent throughout the testing despite some operational variations in the number of extraction wells operating at any one time. The VOC concentrations in the inlet samples were also relatively consistent.

2.3.2 HVDPE with Air Sparging Operation

Air sparging began on June 17, 2022. At the start of air sparging, vapor extraction was turned off at MW1-76 and MW1-77, with extraction only from MW1-66 located immediately adjacent to the sparge point. For the initial 4.5 hours of air sparging, the air sparge pressure was gradually increased to 18 pounds per square inch (psi) and the air sparge air flow increased to 6 scfm, and then increased to 9.5 scfm by the morning of June 18, 2022.

On June 18, 2022, air bubbles were noted in ponded rainwater in the street immediately 50 feet east of sparge point AS1-1. As a result, the air sparge pressure was decreased to 15 psi and the air sparge air flow remained between 3 and 4 scfm for the duration of the test. Additionally, vapor extraction was turned on at all three wells immediately following the observation of air bubbles in the street.

From June 28 to 30, 2022, the stinger tube in MW1-66 was gradually lowered to 16 ft bgs.

2.4 MONITORING DURING HVDPE PILOT TESTING

HVDPE system monitoring was conducted for the duration of the pilot test. This included monitoring of the HVDPE system operating parameters and of the surrounding area via observation points, as described in this section.

2.4.1 HVDPE System Field Data

CalClean personnel manually collected and recorded HVDPE system parameters, including vacuum, vapor flow rate, air sparge pressure, air sparge air flow, stinger tube depth, and water meter readings. Additionally, field measurements of influent VOC vapor concentrations were collected with a PID and depth-to-water (DTW) measurements were collected from observation points until the start of air sparging. The aforementioned data were recorded on field data sheets, which are included in Appendix F, along with specification sheets for the instruments used.

Vapor flow rate was measured through a DS-300-3 Dwyer Flow Sensor pitot tube. The differential pressure was measured within a Dwyer Model 477-1 manometer 0-20-inch water column. The differential pressure was compared to a flow chart of a third-party certified DS-300-3 pitot tube.

Treated groundwater daily flow in gallons was measured through a 1-inch Sensus SR II totalizer water meter and recorded three times per day. The flow rate was calculated using these totalizer readings. Air sparge flow rate was field measured through a Dwyer RMC-121 (0-10 scfm air) Rate-Master Polycarbonate Flowmeter and recorded at least once per day during air sparging.

2.4.2 Observation Points

During system operation, groundwater levels were measured and recorded in observation wells and surface water gauging stations. In addition to ensuring groundwater levels were conducive to vapor extraction across the target treatment area, these data were also used to analyze the radius of influence of the system, and to estimate hydrogeological parameters of the aquifer (see Section 4.5).

Pressure transducers with data loggers were placed in 10 observation wells to record drawdown; seven of which were installed for the full duration of the test and the recovery period, and three of which were installed for the last three days of the test and the recovery period. The data loggers were set to record DTW at five-minute intervals. All other wells in the vicinity of the pilot test were capped and periodically checked to ensure a proper seal to prevent loss of vacuum through wells.

A summary of the data collected from the observation points, including static water levels at the start of the pilot test and maximum drawdown observed at each point, is included in Table 2-5. The raw data from the data loggers are included in Appendix G.

2.4.3 HVDPE System Analytical Samples

Water and vapor samples were collected from the HVDPE system during the pilot test to evaluate system performance. In advance of the full-scale pilot test, pre-characterization sampling was conducted to validate the treatment process and to obtain discharge approval.

<u>Pre-Characterization Water Sampling</u>
The pre-characterization water sampling activities and results are presented in Worksheet #17 of the SAP (Navy, 2022a). The analytical results from the test batch of treated water showed that the water met the publicly-owned treatment works (POTW) discharge permit requirements, and the POTW approved the treatment process for direct discharge of pilot test water following treatment without containerization or batch testing.

Process Water Sampling

Periodic testing of the process water flow stream was conducted to assess contaminant mass removal rates, verify effective treatment of the process water, and to ensure no contaminants broke through treatment during the remainder of the pilot test. Water samples were collected from influent (before treatment), mid-carbon (between carbon vessels), and effluent (after treatment and prior to discharge) locations by CalClean personnel. The mid-carbon samples were collected at two locations – after the first 1,000-pound carbon vessel and after the second 1,000-pound carbon vessel. Samples were not collected from between the downstream 2,000-pound polishing vessels. This periodic water testing was conducted weekly throughout the duration of the pilot test. Split water samples were collected to validate the more extensive data set generated by the laboratory subcontracted to CalClean, as described in the SAP (Navy, 2022a).

Vapor Sampling

For the duration of the pilot test, field measurements of influent VOC vapor concentrations were collected with a PID by CalClean personnel. Vapor samples were also collected from each of the three extraction wells and from the total inlet to the system, which were sent to the laboratory to be analyzed for VOCs via EPA Method TO-15. During each vapor sampling event, total inlet vapor flow rates and individual vapor flow rates from each extraction location were measured.

Vapor samples for laboratory analysis were also periodically collected from between the vapor-phase carbon canisters and from the vapor effluent following treatment to assess when carbon change-outs are needed and to document that discharge vapors meet air quality standards.

Vapor sampling and analysis was conducted by CalClean daily for the first week of HVDPE system operation and weekly thereafter. Split vapor samples were collected to validate the more extensive data set generated by the laboratory subcontracted to CalClean, as described in the SAP (Navy, 2022a).

2.5 LAND SURVEY

A survey of the new extraction wells and air sparge point was conducted on July 28, 2022, by a State of Washington-licensed surveyor under the supervision of Battelle. The locations were tied into the existing base map developed for the site. The elevation of the top of the PVC casing for each well was surveyed to a reference point determined in the field and reported to within 0.01 foot. All elevations were referenced to the North American Vertical Datum (NAVD) 1988. The horizontal locations of each point were documented in North American Datum (1983/91) Washington State Plane North Zone with and accuracy of up to 0.1 foot. The survey map is included in Appendix H and the elevations and horizontal locations are included in Table 2-3.

U.S. NAVY	Figure 2-1 Maximum Drawdown at Observation Wells During HVDPE Pilot Test	CTO F4225 NBK Keyport HVDPE Pilot Test Report

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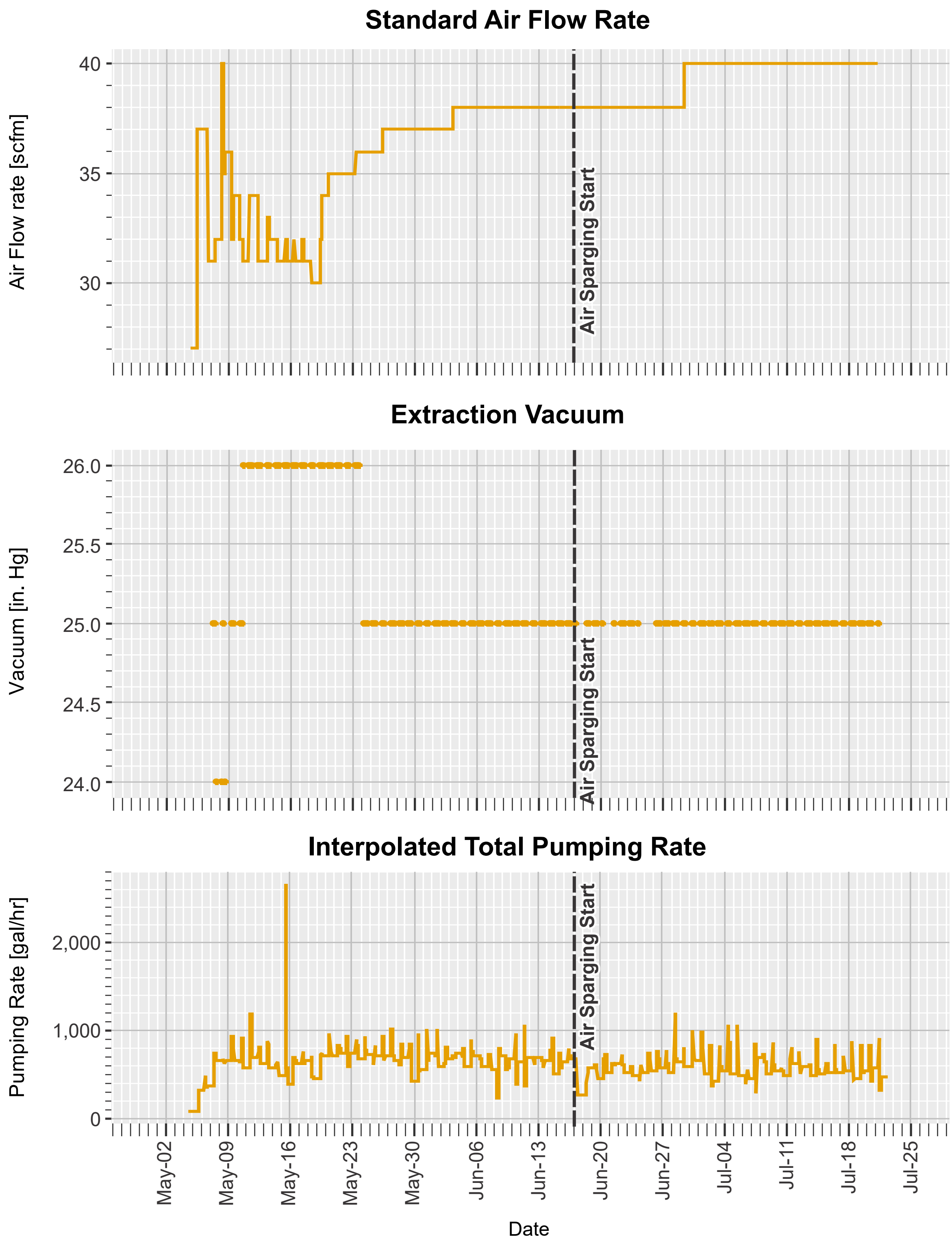
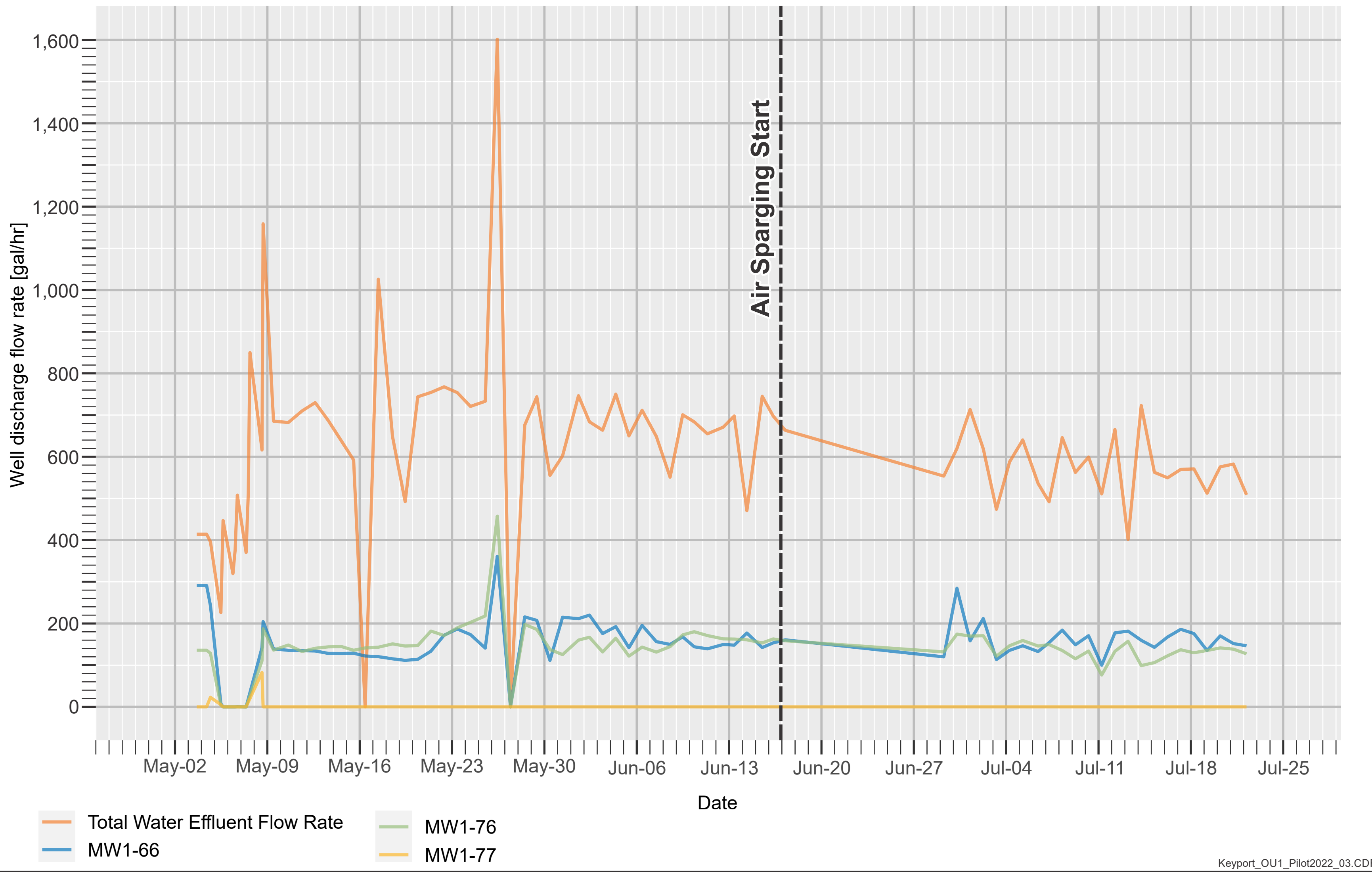


Keyport_OU1_Pilot2022_03.CDR

U.S. NAVY	**Figure 2-2** **Extraction System Operating Parameters**	CTO F4225 NBK Keyport HVDPE Pilot Test Report



Keyport_OU1_Pilot2022_03.CDR

U.S. NAVY	**Figure 2-3** **Groundwater Pumping Rates by Well and Total Water Effluent Flow Rate**	CTO F4225 NBK Keyport HVDPE Pilot Test Report

Table 2-1. Deviations from the Sampling and Analysis Plan

Deviation	Description	Rationale	Effective Date	Samples Affected	FCR No.	SAP Section(s) Affected
Addition of Field Site Manager and SSHO	Hunter Butler added as Field Site Manager and SSHO.	Due to relatively long duration of field work, this provided additional staffing flexibility.	4/27/2022	None	1	N/A
Addition of Field Site Manager and SSHO	Kevin Kaiser added as Field Site Manager and SSHO for operations performed by CalClean only.	CalClean operated their equipment on site 24/7, therefore CalClean needed staff to oversee safety of their work.	5/6/2022	None	2	N/A
Surface water monitoring points	SAP specified surface water gauging at historical points SW1-03, S-4b, and S-10. Actual surface water monitoring points used: S-4b, S-9, and S-10.	SW1-03 switched to S-9 due to visual observation of gauging points and proximity to extraction wells.	5/3/2022	None	None	Worksheet #17
Length of HVDPE test with no air sparging	SAP specified HVDPE test would be run for 90 days total: 60 days with no air sparging, and for 30 days with air sparging. In reality, the HVDPE test was run for 79 days total: 44 days with no air sparging and for 35 days with air sparging.	Due to contractual obligations, the pilot test was limited to 79 days; therefore, the times for non-air sparging and air sparging were adjusted accordingly. Based on real-time data analysis, it was determined that sufficient data were collected in the 44 days of non-air sparging.	5/3/2022	None	None	Worksheets #11, #14, #17

Table 2-2. Sampling Performed during Sonic Drilling and from New Extraction Wells

Location ID	Soil Sample ID	Soil Analyses	GW Sample ID	GW Sample Analyses
SP-B181/MW1-76	SP-B181-S-7.0-220420	cVOC COCs + chloroethane	MW1-76-220429	cVOC COCs + chloroethane, PFAS
	SP-B181-S-12.0-220420	cVOC COCs + chloroethane		
	SP-B181-S-18.0-220420	cVOC COCs + chloroethane		
SP-B182MW1-77	SP-B182-S-7.5-220421	cVOC COCs + chloroethane	MW1-77-220429	cVOC COCs + chloroethane, PFAS
	SP-B182-S-11.0-220421	cVOC COCs + chloroethane		
	SP-B182-S-16.0-220421	cVOC COCs + chloroethane		
AS1-1	*No samples were collected at AS1-1*			

Notes:
Target VOCs - Samples analyzed using EPA Method 8260D for 10 VOCs: 1,2-dichloroethane, tetrachloroethylene (PCE), cis-1,2-dichloroethylene, trans-1,2-dichloroethylene, 1,1,1-trichloroethane, ethyl chloride (chloroethane), vinyl chloride, 1,1-dichloroethane, 1,1-dichloroethylene, and trichloroethylene (TCE).
PFAS - Samples analyzed for PFAS by LC-MS/MS Method by QSM Table B-15

Table 2-3. Well Construction Details for New Extraction and Sparge Wells

Well Name	Ground Elevation (ft, NAVD 88)	TOC Elevation (ft, NAVD 88)	Easting	Northing	Static Depth to Water (ft BTOC)	Groundwater Elevation	Well Screen Information				
							Top (ft bgs)	Bottom (ft bgs)	ID (in)	OD (in)	Slot Size (in)
MW1-76	16.57	14.50	1198934.17	259006.0342	9.00	5.50	5	20	4	4.5	0.01
MW1-77	15.21	17.36	1199109.475	259042.4659	5.20	12.16	5	20	4	4.5	0.01
AS1-1	13.5	15.74	1199140.499	259019.7935	-	-	25	27.2	1	1.315	micro-pore tip

Notes:
Static depth to water measured prior to sampling on April 29, 2022.
Northing and easting coordinates based on Washington State Plan Coordinate System, North Zone, US Survey Feet.
BTOC - below top of casing
ft - feet
ID - inside diameter
in - inches
NAVD 88 - North American Vertical Datum of 1988
OD - outside diameter
TOC - top of casing

Table 2-4. Summary of HVDPE System Operating Parameters

Parameter	Value	Details
HVDPE Pilot Test Start Date	5/4/2022	System set up and started on 5/3/2022; following initial optimization, system fully operational afternoon of 5/4/2022
HVDPE System Operation (No Air Sparge)	44 days	
HVDPE System Operation (Air Sparge)	35 days	Air sparging turned on: 6/17/2022 @ 1100
HVDPE System Operation (Total)	79 days	
HVDPE Pilot Test End Date	7/22/2022	
HVDPE Only (No Air Sparge)		
Air Flow Rate Range	30 to 40	As the extraction system was tuned, air flow rate steadily increased for the first month and then stabilized at 38 scfm from 6/3/22 to 6/29/22
Vacuum Range	24 to 27 in-Hg	Vacuum stabilized at 25 in-Hg from 5/24/22 to 7/22/22
Total Vapor Inlet Concentration Range (PID)	130.6 to 579.7 ppm	PID values (ppm) steadily decreased until air sparge start (see Figure 4-1 in Section 4)
Total Vapor Inlet Concentration Average (PID)	294.8 ppm	
Groundwater Discharge Flow Rate	10.9 gpm	Combination of stinger tubes and submersible pumps
HVDPE with Air Sparge		
Air Flow Rate Range	38 to 40 scfm	Air flow rate stabilized at 40 scfm from 6/29/22 to 7/22/22
Vacuum Range	25 in-Hg	Steady at 25 in-Hg for duration of air sparging
Total Vapor Inlet Concentration Range (PID)	148.9 to 736 ppm	PID values (ppm) spiked at start of air sparging, then steadily decreased until HVDPE system shutdown (see Figure 4-1 in Section 4)
Total Vapor Inlet Concentration Average (PID)	359.2 ppm	

Table 2-4 (continued). Summary of HVDPE System Operating Parameters

Parameter	Value	Details
Air Sparge Pressure Range	15 to 18 psi	Air sparge pressure began at 18 psi and was lowered to 15 psi on 6/18/22, which was maintained through end of pilot test
Air Sparge Air Flow Range	0.5 to 9.5 scfm	Air flow range due to optimization period; air flow range 3 to 4 scfm from 6/19/22 through end of pilot test
Groundwater Discharge Flow Rate	9.8 gpm	Combination of stinger tubes and submersible pumps
Pilot Test Totals		
Average Groundwater Discharge Flow Rate	10.4 gpm	Combination of stinger tubes and submersible pumps
Total Groundwater Discharge	1,173,180 gallons	Combination of stinger tubes and submersible pumps
Estimated Carbon Usage	20,000 pounds	See Section 4.7.5

Notes:
See Appendix F for HVDPE system operation raw data

Table 2-5. Summary of Observation Point Data

Well ID	Static Water Level at Start of HVDPE Test (ft bgs)	Water Level at System Shutdown (ft bgs)	New Static Water Level After Recovery (ft bgs)	Maximum Drawdown [a, b] (ft)
Data Loggers [a]				
MW1-04	6.45	6.29	5.34	0.95
MW1-20	3.59	6.28	4.36	1.92
MW1-49	6.22	NM [b]	NM [b]	0.99
MW1-50	8.25	NM [b]	NM [b]	1.16
MW1-53	3.88	NM [b]	NM [b]	1.66
MW1-55	5.65	8.36	6.48	1.88
MW1-68	2.94	4.70	4.06	0.64
P1-6	7.23	9.04	7.93	1.11
P1-7	6.68	8.58	7.24	1.34
P1-10	4.92	7.44	4.47	2.97
Manual Measurements Only				
IW1-S	4.21	NM	NM	1.6 [c]
MW1-61	5.17	NM	NM	0.54 [c]
MW1-56-1	6.75	NM	NM	1.95 [c, d]
MW1-56-2	6.64	NM	NM	1.81 [c, d]
MW1-57-1	7.68	NM	NM	2.02 [c, d]
MW1-57-2	7.03	NM	NM	3.51 [c, d]
MW1-58-0	6.63	NM	NM	1.57 [c, d]
MW1-58-1	7.64	NM	NM	1.93 [c, d]
MW1-58-2	7.65	NM	NM	1.65[c, d]

Table 2-5 (continued). Summary of Observation Point Data

Well ID	Static Water Level at Start of HVDPE Test (ft bgs)	Water Level at System Shutdown (ft bgs)	New Static Water Level After Recovery (ft bgs)	Maximum Drawdown [a, b] (ft)
S-4B [e]	1.92	NM	NM	0.91 [c]
S-9 [e]	2.55	NM	NM	2.29 [c]
S-10 [e]	2.76	NM	NM	0.67 [c]

Notes:

[a] Maximum drawdown defined as difference of final DTW reading prior to HVDPE system shutoff and DTW following 6 days of recovery.

[b] Data logger started data collection on 7/19/2022 and no manual groundwater measurement was collected at this time. Therefore, maximum drawdown was able to be calculated using relative difference of data logger levels from system shutdown and following 6 days of recovery.

[c] Maximum drawdown calculated based on static water level at beginning of test and final DTW measurements collected prior to air sparge start on 6/17/2022 (not at system shutdown).

[d] Static water level collected after start of test, on 5/65/2022.

[e] Surface water gauging station

NM - not measured

3.0 LABORATORY AND FIELD VERIFICATION SAMPLES

3.1 EXTRACTION WELL SAMPLING

The laboratory analytical results of grab soil samples collected during drilling and the groundwater samples collected from the newly installed extraction wells are summarized in Tables 3-1 and 3-2, respectively. Additionally, a summary of field duplicate samples collected from the new extraction wells is included in Table 3-3.

Soil and groundwater sample results from the extraction wells serve as baseline results for evaluation against post pilot study results and to verify that the starting contaminant types and concentrations match expectations. Consistent with results throughout OU 1, the most consistently detected cVOCs in soil and groundwater were TCE, cis-1,2-DCE, and vinyl chloride. The highest concentrations of cVOCs in soil samples were found in both well bores in the depth range of 11 to 12 ft bgs. This is in contrast to the highest field PID readings, which were associated with the shallower soil sample depth range of 7 to 8 ft bgs (close to the bottom of the waste body). This may indicate that the field PID was responding more strongly to other volatile chemicals in the waste body (such as petroleum). Nearly all of the cVOC concentrations detected in soil exceeded the soil project action limits (PALs) established in the SAP.

In groundwater samples, the concentrations of TCE, cis-1,2-DCE, and vinyl chloride in both wells exceeded the PALs established in the SAP, as did the concentrations of 1,1-DCE and trans-1,2-DCE in well MW1-76. Additional evaluation of the results of the groundwater samples collected from the two new extraction wells is included in Section 4.2.

In groundwater samples, three PFAS compounds (perfluorooctanoic acid [PFOA], perfluorohexanesulfonic acid [PFHxS], and perfluorooctanesulfonic acid [PFOS]) were detected in MW1-76 and four PFAS compounds (PFOA, perfluorononanoic acid [PFNA], PFHxS, and PFOS) were detected in MW1-77. These compounds were detected at concentrations below their respective PALs established in the SAP. Regulatory standards for PFAS compounds are evolving rapidly, and at the time of the SAP, standards were not established for some PFAS compounds where such standards are now available. An in-progress remedial investigation for PFAS at OU 1 will consider all available PFAS data and the most recent regulatory standards.

3.2 HVDPE SYSTEM SAMPLE RESULTS

Figure 3-1 demonstrates that the concentration sum of the three primary COCs (TCE, cis-1,2-DCE, and vinyl chloride) correlates well with the sum of all detected VOC compounds, indicating that analyses in this report can reasonably be based on the sum of the three primary COCs as representative of total VOCs.

During HVDPE system operation, influent vapor concentrations for the sum of the three primary COCs (TCE, cis-1,2-DCE, and vinyl chloride) ranged from 27,140 micrograms per cubic meter ($\mu g/m^3$) to 4,466,000 $\mu g/m^3$. During system operation, influent groundwater concentrations for the sum of these COCs ranged from 21,360 micrograms per liter (µg/L) to 107,100 µg/L (initial sample, collected on May 4, 2022). Following the initial sample, collected on May 4, 2022, influent groundwater concentrations were relatively steady, ranging from 21,360 µg/L to 37,200 µg/L. The laboratory analytical results for vapor and groundwater collected from the HVDPE system (influent, mid-carbon treatment, and effluent) are summarized in Table 3-4. A significant number of sample results analyzed by CalScience were flagged "H - Sample was prepped or analyzed beyond the specified holding time" and "H 3 - Sample was received and analyzed past holding time." Although these H-flagged data introduce additional uncertainty into the absolute values of the reported results, the overall total VOC values track well with the field PID, and individual key VOC values track well with the independent verification laboratory results when considered as concentration trends over time. The uncertainty in these values primarily impacts the already uncertain estimates of potential future absolute mass removal (which are more strongly affected by the difficulty of predicting the response of the subsurface to long-term HVDPE – see Section 4.4). Conclusions regarding the potential future effectiveness of full-scale HVDPE at the site, likely extraction and sparge well configurations, and impact on overall site cleanup are not substantively impacted by these uncertainties.

Overall trends of influent vapor and groundwater concentrations during HVDPE system operation are presented in Section 4.3, and trends and implications of mid-carbon and effluent vapor and groundwater concentrations are described in Section 4.7.5.

VOC concentrations in vapor from the three extractions wells (MW1-66, MW1-76, MW1-77) and the HVDPE system inlet were characterized using both field PID measurements of total VOCs and vapor samples analyzed by the laboratory for individual VOCs. Field staff collected vapor samples for laboratory analyses of VOC compounds daily for the first week and weekly thereafter, with concurrent field PID measurements. These concurrent results were used to develop a linear regression relationship between laboratory total VOC results (in $\mu g/m^3$) and field PID measurements of total VOCs (in parts per million volume [ppm-v]). The laboratory-reported VOC concentrations of each individual compound were summed to establish a total VOC value comparable to the PID measurement. The summation included the concentrations of every compound detected by the laboratory, concentrations of all compounds were negligible in comparison to the sum of vinyl chloride, cis-1,2 DCE, and TCE. Linear regression was used to relate the summed total VOC for each sample to the concurrent field PID readings ($n=77$, $r^2 = 0.49$; Figure 3-2). This regression model was then applied to estimate VOC mass export using PID data, and compare those estimates against VOC mass export using the laboratory-analyzed samples collected at a lower frequency (see Section 4.4).

3.3 VERIFICATION SAMPLE RESULTS AND ANALYSIS

As described in Section 2.4, split samples were collected from a subset of the process water and vapor samples to verify the more extensive data set generated by the laboratory subcontracted to CalClean (Calscience, located in Tustin, California), in accordance with the SAP (Navy, 2022a). Verification was necessary because the Calscience laboratory is not accredited by the Department of Defense (DoD, but is accredited by the State of Washington). Split samples were analyzed by Pace Laboratories located in Mount Juliet, Tennessee, a DoD and Washington State accredited laboratory.

In accordance with the SAP (Navy, 2022a) replicated sample pairs analyzed by both Calscience and Pace were evaluated by assessing the relative percent difference (RPD) between the results (Table 3-5). The evaluation was based on the conclusions and recommendations in Grant et al. (1996). Based on this reference and the SAP, VOCs have an acceptable RPD range of 25 to 400% in soil and 50 to 200% in water. For the purposes of this evaluation, the acceptable RPD range for water is used for air samples, using the more conservative criteria. As noted in Section 3.2 this assessment focused on the three primary COCs at the site in VOCs for both water and vapor (air): TCE, cis-1,2-DCE, and vinyl chloride.

For cis-1,2-DCE in groundwater influent, RPDs ranged from 1.7% to 16.7%. The TCE RPD ranged from 4.7% to 14.4% RPD, and the vinyl chloride RPD ranged from 3.7% to 117%. For two of the samples sets, vinyl chloride was detected by one laboratory and reported as not detected by the other laboratory, resulting in the RPDs of 43.9% and 117.5% for these two sample sets. All of the RPDs are within the acceptable range listed in the SAP.

For the vapor samples the RPDs for cis-1,2-DCE ranged from 3.1% to 193.6%; the TCE RPDs ranged from 4.2% to 185.4%; and the vinyl chloride RPDs ranged from 8.8% to 200%. Thus, the RPDs are acceptable for comparison data per the SAP requirements.

The larger RPDs for vapor samples compared to water samples likely reflect inherent small-scale temporal variations in concentrations, which tend to be higher in vapor than in water process streams. For both water and vapor, the verification samples collected were replicate samples, collected immediately following collection of the parent sample. Lower RPDs would likely have been achieved if duplicate samples were collected, which would have required plumbing changes at the sample port to allow simultaneous filling of parent and duplicate sample containers.

3.4 DATA VALIDATION

All samples were collected and analyzed in accordance with the EPA methods stated in the SAP (Navy, 2022a). Soil and groundwater samples associated with the new extraction wells (Section 2.1) and the verification samples analyzed by the DoD accredited laboratory (Pace, Section 3.3), were subject to third-party data validation (Laboratory Data Consultants [LDC]). Validation results are described in this subsection.

Samples were shipped via overnight courier under chain-of-custody documentation to the designated analytical laboratories for analysis. Pace analyzed soil and groundwater samples for cVOCs. HVDPE aqueous influent samples were analyzed for VOCs, HVDPE vapor influent samples were analyzed for VOCs, gasoline range organics (GRO), and total petroleum hydrocarbons (TPH). Groundwater samples were also analyzed for PFAS by Battelle's Norwell, Massachusetts laboratory. The analytical laboratories were required to maintain certification from the DoD Environmental Laboratory Accreditation Program for the analytical methods performed on the samples, where applicable.

Three HVDPE vapor influent samples (VR-MW1-76-220601, VR-MW1-77-220601, and VR-MW1-76-220719) were collected but not analyzed due to broken sample containers upon receipt.

Laboratory quality assurance (QA) oversight involved the performance of a first-level screening of the data and an indication of any deviations from their precision, accuracy, detection limit, or laboratory QA/quality control (QC) criteria. A representative from each laboratory signed the data sheets, ensuring that the screening described above had been completed. Subsequently, Battelle completed a completeness review of the data by comparing the analyses requested for each sample on the chain-of-custody form with the database results for that sample. Then the analytical data and the associated laboratory QC information were forwarded to an independent, third-party data validation service, LDC. A Stage 4 data validation was performed on all analyses (cVOCs, GRO, TPH, and PFAS). The completeness review noted that n-butylbenzene and xylenes are listed in the SAP, however the analytical laboratory did not report results for these analytes. Because these analytes are not primary COCs (see Section 3.2) there is no impact on the conclusions of this study. The analytical laboratory reported results for several analytes not listed in the SAP. These additional analytes have no bearing on this study and are not discussed further.

The reported analytical results generally met the data validation criteria established in the SAP. Exceptions documented in the data validation reports are detailed in the sections below by matrix (e.g., soil, groundwater, aqueous influent, or vapor) and analytical group.

Exceptions to the analytical criteria resulted in the assignment of "J" or "U" qualifiers to the data. The "J" qualifier indicates that the result is considered an estimated value. The "U" qualifier indicates that the result was not detected above the limit of quantitation (LOQ). No data were rejected in this dataset.

During sampling, field duplicate QC samples were collected for cVOCs and PFAS in groundwater samples, and cVOCs in soil samples, to evaluate reproducibility and ensure that a meaningful and representative dataset was generated for the Keyport OU 1 HVDPE pilot study.

Per the SAP, the goal was to collect field duplicate samples for groundwater and soil cVOCs analyses and one set of field duplicates for PFAS in groundwater. Field duplicates were collected at MW1-77 (labeled as FD-220429-01) for groundwater cVOC and PFAS analyses, and at SP-B182-S-7.5-220421 for soil cVOC analysis (labeled as SP-B182-S-8.0-220421).

Field duplicate RPD criteria for soil samples was less than or equal to (≤) 50% for cVOCs. All field duplicates for all analytes met this criterion except for cis-1,2-DCE and vinyl chloride in the duplicate pair SP-B182-S-7.5-220421/SP-B182-S-8.0-220421 in soil. Additional details are given below. Results for these analytes and samples are considered as estimates. Field duplicate RPD criteria for groundwater samples is ≤ 35%. All groundwater field duplicates for PFAS and cVOCs met these criteria.

Review of the laboratory data and data validation confirmed that the measurement quality objectives were achieved, and data are acceptable for use. Data validation qualifiers used in the data set are:

- J – Estimated: The analyte was analyzed for and positively identified by the laboratory; however, the reported concentration is estimated due to non-conformance discovered during data validation.
- U – Non-detected and reported as less than the limit of detection (LOD). If the analyte was analyzed for and positively identified by the laboratory; but due to laboratory contamination in associated blanks, the result may be considered non-detected at the reported concentration through validation.
- 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.

Except where otherwise stated, the data associated with all of the issues identified below were qualified as estimated using either the qualifier "J" where the analyte was detected above the laboratory LOQ, which is equivalent to the practical quantitation limit (PQL), or "UJ" where the analyte was not detected above the laboratory LOD.

3.4.1 Soil

Chlorinated VOCs

- The matrix spike/matrix spike duplicate (MS/MSD) RPDs were outside of acceptable range for four cVOCs (1,1-DCE, trans-1,2-DCE, TCE, and vinyl chloride) for SP-B182-S-16.0-220421. These detected analytes were estimated (J) in this one sample.
- The MS/MSD percent recoveries (%R) for nine cVOCs (chloroethane, 1,1-dichloroethane, 1, 2-dichloroethane, trans-1,2-DCE, tetrachloroethene, 1,1,1-

trichlorethane, trichloroethane, vinyl chloride, and 1,1-DCE) were outside of the acceptable range for SP-B182-S-16.0-220421. These detected and undetected analytes were estimated (J/UJ) in this one sample.

- The continuing calibration verification (CCV) standard percent difference (%D) criteria was exceeded for chloroethane, affecting five samples (SP-B181-S-7.0-220420, SP-B181-S-12.0-220420, SP-B181-S-18.0-220420, SP-B182-S-11.0-220421, and SP-B182-S-16.0-220421). Samples were qualified "UJ".
- The CCV standard percent %D criteria was exceeded for vinyl chloride, affecting one sample, SP-B181-S-18.0-220420. The sample was qualified "UJ".
- cis-1,2-DCE and vinyl chloride were outside acceptance RPD of ≤50% for field duplicate pairs (SP-B182-S-7.5-220421 and SP-B182-S-8.0-220421) resulting in estimated sample results (J) for these analytes in the two samples.

3.4.2 Groundwater

Chlorinated VOCs

- No qualification was required.

Per- and Polyfluoroalkyl Substances

- Labeled compound recoveries were outside acceptance criteria in three groundwater samples (MW1-77-220429, MW1-76-220429, and FD-220429-01) resulting in estimating non-detects of perfluorotridecanoic acid (PFTrDA) and perfluorotetradecanoic acid (PFTeDA) in the three samples.
- The ion abundance ratios for perfluorohexanesulfonic acid (PFHxS) were outside acceptance criteria in two samples (MW1-77-220429 and FD-220429-01). Associated results were qualified as estimated.

3.4.3 Aqueous Influent – PACE Confirmation Samples Only

Chlorinated VOCs

- The holding time requirement of 14 days for cVOC analysis was exceeded in sample IN-12-220719, for four analytes (bromoform, 2-chloroethylvinyl ether, chloromethane, and vinyl chloride). The non-detected results were all "UJ" where the analyte was not detected above the laboratory LOD.
- Laboratory control sample (LCS) RPD for vinyl chloride was outside of the acceptable range biased high affecting one aqueous influent sample (IN-11-220712).

- The initial calibration verification (ICV) standard %D criteria were exceeded for two analytes (dichlorodifluoromethane and bromomethane), affecting two samples (IN-12-220719 and TB-220719).
- The CCV standard %D was exceeded for chloromethane, affecting two samples (IN-05-220601 and TB-220601). Associated non-detect results are qualified as estimates (UJ).
- The CCV standard %D was exceeded for bromodichloromethane, bromoform, chloroethane, 2-chlorethylvinyl ether, and dichlorodifluoromethane in TB-220719. Associated non-detect results are qualified as estimates (UJ).
- The CCV standard %D was exceeded for chloroethane and dichlorodifluoromethane. Associated non-detect results are qualified as estimates (UJ).
- Benzene was detected in a trip blank (TB-220712) at a level below the LOD. Sample concentrations were compared to concentrations detected in the field and laboratory blanks. If sample concentrations were not significantly greater than five times (>5X) the blank concentrations, the sample concentrations were considered to be non-detect or estimated. Benzene was identified in one associated aqueous influent sample, which resulted in reporting the result as non-detect at the sample's reported concentration.

TPH-Ranges

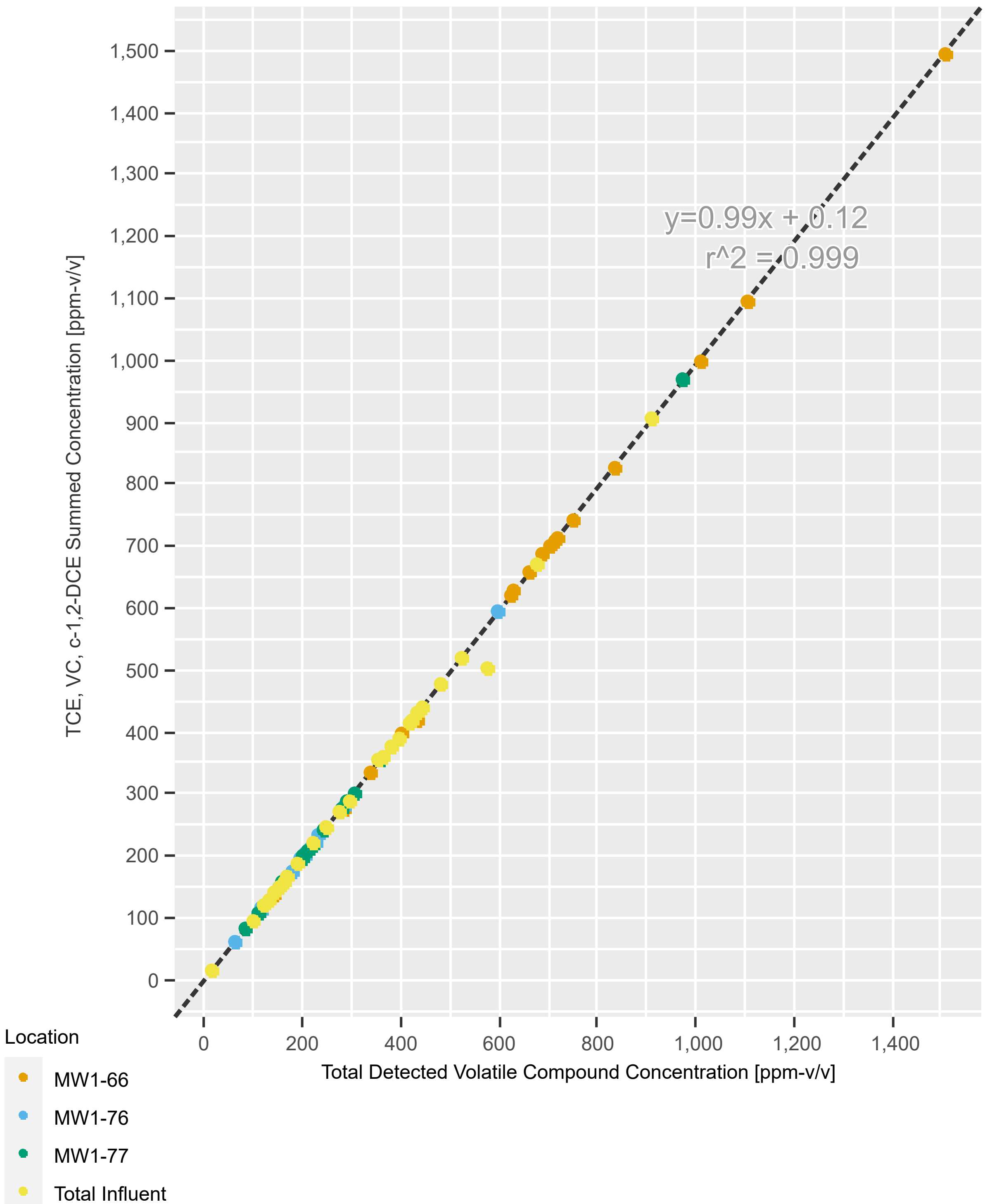
- Residual range organics (RRO) were detected in two different laboratory blanks. Sample concentrations were compared to concentrations detected in the laboratory blanks. If sample concentrations were not significantly greater than five times (>5X) the blank concentrations, the sample concentrations were considered to be non-detect or estimated. RRO was identified in from one aqueous influent sample (IN-08-220621) at <10X blank concentration, which resulted in reporting results as non-detect at the reported concentrations. RRO was identified in one aqueous influent sample (IN-12-220719) which was reported as estimated.
- GRO were detected in a laboratory blank. Sample concentrations were compared to concentrations detected in the laboratory blanks. If sample concentrations were not significantly greater than five times (>5X) the blank concentrations, the sample concentrations were considered to be non-detect or estimated. GRO was identified in one aqueous influent related sample (TB-220712) at <10X blank concentration, which resulted in reporting results as non-detect at the reported concentrations.

3.4.4 Vapor – PACE Confirmation Samples Only

VOCs

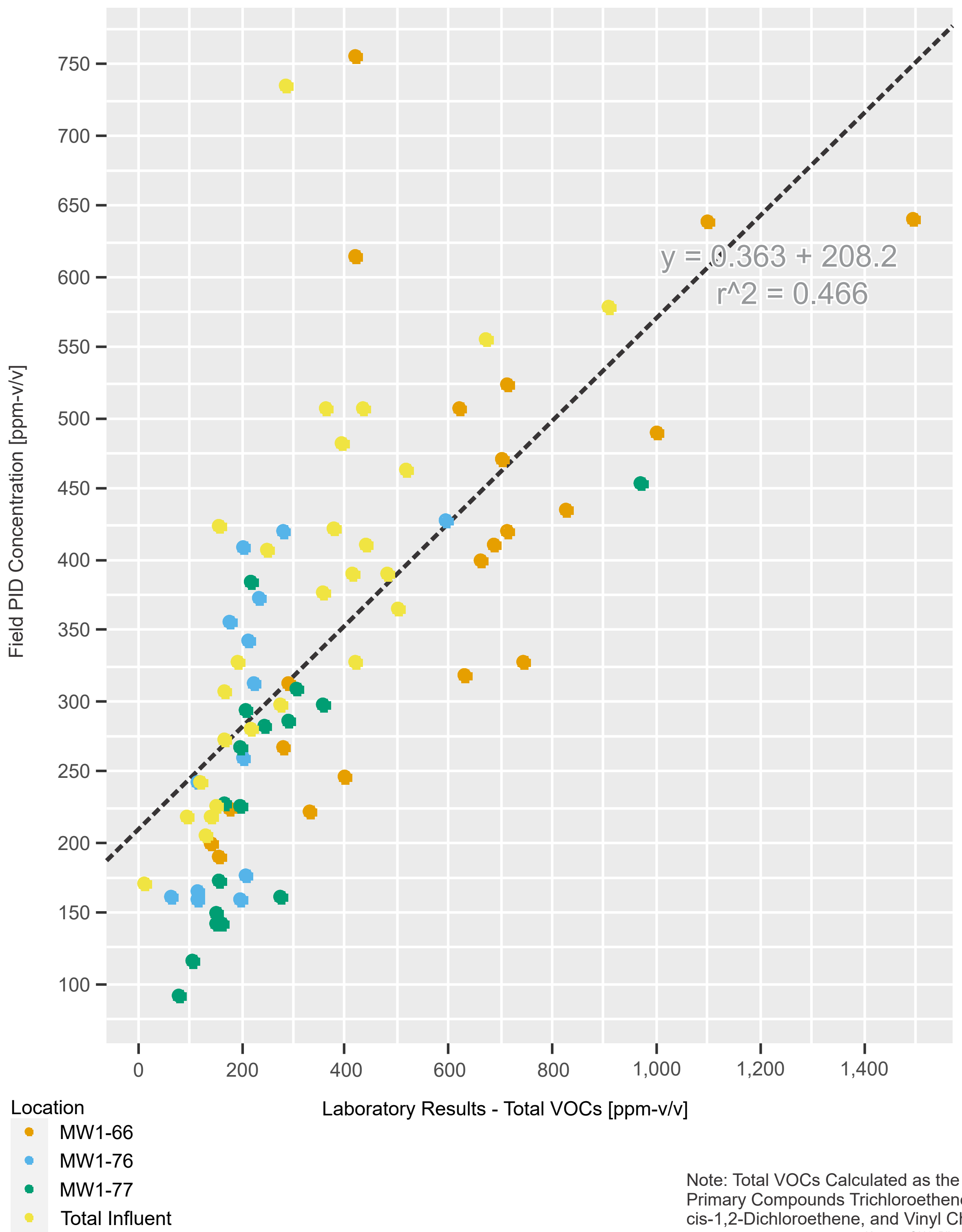
- LCS %R for cis-1,2-DCE was outside of the acceptable range affecting two vapor samples (VR-TI-07-220510 and VR-MW1-66-220510).
- LCS %R for TCE was outside of the acceptable range affecting eight vapor samples (VR-Tl-07-220510, VR-MW1-66-220510, VR-MW1-76-220510, VR-MW1-77-220510, VR-Tl-08-220512, VR-MW1-66-220512, VR-MW1-76-220512, and VR-MW1-77-220512).
- The CCV standard %D criteria were exceeded for 1,1-dichloroethane, 1,1-DCE, 1,2-dichloroethane, 1,2-dichloropropane, 1,3,5-trimethylbenzene, 1,1,2,2-tetrachloroethane, 4-methyl-2-pentanone, chloromethane, and trichlorofluoromethane affecting two samples (VR-IN-01-220505 and VR-TI-03-220506). Associated non-detect results are qualified as estimated (UJ).
- The CCV standard %D criteria were exceeded for vinyl chloride affecting two samples (VR-IN-01-220505 and VR-TI-03-220506). Associated detected results are qualified as estimated (J).
- The CCV standard %D was exceeded for cis-1,2-DCE affecting two samples (VR-TI-07-220510 and VR-MW1-66-220510). Associated detected results are qualified as estimated (J).
- The CCV standard %D was exceeded for TCE affecting eight samples (VR-TI-07-220510, VR-MW1-66-220510, VR-MW1-76-220510, VR-MW1-77-220510, VR-TI-08-220512, VR-MW-66-220512, VR-MW-7-220512, and VR-MW-77-220512). Associated detected results are qualified as estimated (J).

As indicated above, no data were rejected. Only estimations of data were made for holding time exceedances, laboratory and trip blank contamination, calibration uncertainty, ion ratio exceedances, laboratory control sample %R and %RPD exceedances, MS/MSD %R and/or RPD exceedances, labeled compound recovery exceedances, and field duplicate imprecision. All other data met criteria. All data were acceptable and meet data quality objectives (DQOs) for this project.



Keyport_OU1_Pilot2022_05.CDR

U.S. NAVY	**Figure 3-1** **Sum of Three Primary Contaminants** **Compared to Total VOCs**	CTO F4225 NBK Keyport HVDPE Pilot Test Report



Note: Total VOCs Calculated as the Sum of Primary Compounds Trichloroethene, cis-1,2-Dichloroethene, and Vinyl Chloride.

Keyport_OU1_Pilot2022_05.CDR

U.S. NAVY	**Figure 3-2** **Field PID Readings** **Compared to Laboratory Results**	CTO F4225 NBK Keyport HVDPE Pilot Test Report

Table 3-1. Soil Sampling Results from Sonic Drilling

		Location Name	SP-B181						SP-B182							
		Sample Name	SP-B181-S-7.0-220420		SP-B181-S-12.0-220420		SP-B181-S-18.0-220420		SP-B182-S-7.5-220420		SP-B182-S-8.0-220420		SP-B182-S-11.0-220420		SP-B182-S-16.0-220420	
		Sample type	Normal		Normal		Normal		Parent		Duplicate		Normal		Normal	
Analyte	**Units**	**PAL (mg/kg)**	**Result**		**Result**		**Result**		**Result**		**Result**		**Result**		**Result**	
Vinyl chloride	mg/kg	0.0000062	**0.488**		**0.167**		<u>0.00466</u>	<u>UJ</u>	**0.217**		**0.430**		**0.341**		**0.127**	J
Chloroethane	mg/kg	0.0026	<u>0.00793</u>	<u>UJ</u>	<u>0.00781</u>	<u>UJ</u>	<u>0.00931</u>	<u>UJ</u>	<u>0.0729</u>	<u>U</u>	<u>0.0680</u>	<u>U</u>	<u>0.00848</u>	<u>UJ</u>	<u>0.00739</u>	<u>UJ</u>
1,1-Dichloroethene	mg/kg	0.0025	0.00199	U	**0.00656**		0.00233	U	<u>0.0182</u>	<u>U</u>	<u>0.0170</u>	<u>U</u>	**0.0373**		**0.0158**	**J**
trans-1,2-Dichloroethene	mg/kg	0.032	0.0107		**0.0456**		0.00466	U	<u>0.0365</u>	<u>U</u>	0.0170	J	**0.167**		**0.0759**	**J**
1,1-Dichloroethane	mg/kg	0.0026	0.00199	U	0.00195	U	0.00233	U	<u>0.0182</u>	<u>U</u>	<u>0.0170</u>	<u>U</u>	0.00212	U	0.00185	UJ
cis-1,2-Dichloroethene	mg/kg	0.0052	**1.12**		**2.80**		**0.0219**		**0.113**	**J**	**1.68**	**J**	**9.22**		**1.77**	
1,1,1-Trichloroethane	mg/kg	0.084	0.00317	U	0.00313	U	0.00372	U	0.0292	U	0.0271	U	0.00339	U	0.00296	UJ
1,2-Dichloroethane	mg/kg	0.0016	<u>0.00317</u>	<u>U</u>	<u>0.00313</u>	<u>U</u>	<u>0.00372</u>	<u>U</u>	<u>0.0292</u>	<u>U</u>	<u>0.0271</u>	<u>U</u>	<u>0.00339</u>	<u>U</u>	<u>0.00296</u>	<u>UJ</u>
Trichloroethene	mg/kg	0.00011	<u>0.00239</u>	<u>U</u>	**5.88**		**0.0474**		<u>0.0218</u>	<u>U</u>	<u>0.0204</u>	<u>U</u>	**3.95**		**0.160**	**J**
Tetrachloroethene	mg/kg	0.0013	<u>0.00317</u>	<u>U</u>	<u>0.00313</u>	<u>U</u>	<u>0.00372</u>	<u>U</u>	<u>0.0292</u>	<u>U</u>	<u>0.0271</u>	<u>U</u>	<u>0.00339</u>	<u>U</u>	<u>0.00296</u>	<u>UJ</u>

Notes:
Samples analyzed using EPA Method 8260D
J - Estimated: The analyte was positively identified; the quantitation is an estimation
mg/kg - milligrams per kilogram
PAL - Project Action Limit
U - Undetected at the Limit of Detection
Bolded values indicate that the reported concentration exceeds the PAL
<u>Underlined</u> values represent analytes not detected at or above the stated limit, which exceeds the PAL

Table 3-2. Groundwater Sampling Results from New Extraction Wells

		Location Name	MW1-76		MW1-77		FD	
		Sample Name	MW1-76-220429		MW1-77-220429		FD-220429-01	
		Sample type	Normal		Parent		Duplicate	
Analyte	**Units**	**PAL (µg/L)**	**Result**		**Result**		**Result**	
cVOCs								
Vinyl chloride	µg/L	0.02	**924**		**130**		**136**	
Chloroethane	µg/L	7.7	2	U	0.64	J	1.45	J
1,1-Dichloroethene	µg/L	7	**16**		6.07		6.51	
trans-1,2-Dichloroethene	µg/L	100	**147**		42.3		43.7	
1,1-Dichloroethane	µg/L	7.7	0.537	J	0.5	U	0.5	U
cis-1,2-Dichloroethene	µg/L	16	**8820**		**581**		**571**	
1,1,1-Trichloroethane	µg/L	200	0.5	U	0.5	U	0.5	U
1,2-Dichloroethane	µg/L	0.48	<u>0.5</u>	<u>U</u>	<u>0.5</u>	<u>U</u>	<u>0.5</u>	<u>U</u>
Trichloroethene	µg/L	0.3	**4280**		**42.5**		**47.4**	
Tetrachloroethene	µg/L	2.4	0.6	U	0.6	U	0.6	U
PFAS								
Perfluorohexanoic acid (PFHxA)	ng/L	NE	2.52	U	2.42	U	2.68	U
Perfluoroheptanoic acid (PFHpA)	ng/L	NE	2.52	U	2.42	U	2.68	U
Perfluorooctanoic acid (PFOA)	ng/L	70	7.44		9.67		10.4	
Perfluorononanoic acid (PFNA)	ng/L	NE	2.52	U	1.67	J	2.68	U
Perfluorodecanoic acid (PFDA)	ng/L	NE	2.52	U	2.42	U	2.68	U
Perfluoroundecanoic acid (PFUnA)	ng/L	NE	2.52	U	2.42	U	2.68	U
Perfluorododecanoic acid (PFDoA)	ng/L	NE	2.52	U	2.42	U	2.68	U
Perfluorotridecanoic acid (PFTrDA)	ng/L	NE	2.52	UJ	2.42	UJ	2.68	UJ
Perfluorotetradecanoic acid (PFTeDA)	ng/L	NE	2.52	UJ	2.42	UJ	2.68	UJ
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ng/L	NE	2.52	U	2.42	U	2.68	U
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ng/L	NE	2.52	U	2.42	U	2.68	U
Perfluorobutanesulfonic acid (PFBS)	ng/L	6.0	2.52	U	2.42	U	2.68	U
Perfluorohexanesulfonic acid (PFHxS)	ng/L	NE	15.5		5.02	J	5.61	J

Table 3-2 (continued). Groundwater Sampling Results from New Extraction Wells

		Location Name	MW1-76		MW1-77		FD	
		Sample Name	MW1-76-220429		MW1-77-220429		FD-220429-01	
		Sample type	Normal		Parent		Duplicate	
Analyte	**Units**	**PAL (µg/L)**	**Result**		**Result**		**Result**	
Perfluorooctanesulfonic acid (PFOS)	ng/L	70	37.5		9.95		9.38	
PFOA + PFOS	ng/L	70	44.94		19.62		19.78	

Notes:
Samples analyzed using EPA Method 8260D
J - Estimated: The analyte was positively identified; the quantitation is an estimation
PAL - Project Action Limit

U - Undetected at the Limit of Detection

ng/L - nanograms per liter
µg/L - micrograms per liter
Bolded values indicate that the reported concentration exceeds the PAL
Underlined values represent analytes not detected at or above the stated limit, which exceeds the PAL

Table 3-3. Field Duplicate Summary

Compound	Units	Groundwater		RPD (Limits)	Flag
		MW1-77-220429	FD-220429-01		
1,1-Dichloroethene	µg/L	6.07	6.51	7 (≤35)	-
Chloroethane	µg/L	0.64	2 U	**77 (≤35)**	NQ
trans-1,2-Dichloroethene	µg/L	42.3	43.7	3 (≤35)	-
cis-1,2-Dichloroethene	µg/L	581	571	2 (≤35)	-
Trichloroethene	µg/L	42.5	47.4	11 (≤35)	-
Vinyl chloride	µg/L	130	136	5 (≤35)	-
PFOA	ng/L	9.67	10.40	7 (≤35)	
PFNA	ng/L	1.67	2.68 U	**46 (≤35)**	NQ
PFHxS	ng/L	5.02	5.61	11 (≤35)	
PFOS	ng/L	9.95	9.38	6 (≤35)	
Compound	**Units**	**Soil**		**RPD (Limits)**	**Flag**
		SP-B182-S-7.5-220421	**SP-B182-S-8.0-220421**		
cis-1,2-Dichloroethene	mg/kg	0.113	1.68	**175 (≤50)**	**J**
vinyl chloride	mg/kg	0.217	0.43	**66 (≤50)**	**J**

Notes:
mg/kg - milligrams per kilogram
NQ - one or both results were less than the limit of quantitation (LOQ), therefore no data were qualified
RPD - relative percent difference
ng/L - nanograms per liter
µg/L - micrograms per liter
Bold - field duplicates exceeds RPD limits
J - estimate for precision exceedance

Table 3-4. Results of HVDPE System Laboratory Analytical Samples

Sample ID	Date Collected	Trichloroethene	cis-1,2-Dichloroethene	Vinyl Chloride
Water (µg/L)				
IN-01-220504	5/4/2022	69,000	37,000	1,100
IN-02-220511	5/11/2022	25,000	9,800	240
IN-03-220518	5/18/2022	25,000	7,500	160
IN-04-220525	5/25/2022	16,000	5,100	260 H
IN-05-220601	6/1/2022	24,000	5,900	160
IN-06-220608	6/8/2022	27,000	6,900	310
IN-07-220615	6/15/2022	31,000	5,900	300
IN-08-220621	6/21/2022	30,000	6,300	200
IN-09-220628	6/28/2022	22,000	4,400	130
IN-10-220705	7/5/2022	19,000	3,800	140
IN-11-220712	7/12/2022	24,000	3,600	100
IN-12-220719	7/19/2022	23,000	3,600	130
MD1-01-220504	5/4/2022	9,300	12,000	790
MD1-02-220511	5/11/2022	15,000	12,000	380
MD1-03-220518	5/18/2022	17,000	19,000	410
MD1-04-220525	5/25/2022	20,000 H	7,200 H	250 H
MD1-05-220601	6/1/2022	23,000	6,700	200
MD1-06-220608	6/8/2022	20,000	6,100	230
MD1-07-220615	6/15/2022	24,000	5,100	230
MD1-08-220621	6/21/2022	25,000	6,100	180
MD1-09-220628	6/28/2022	20,000	4,600	110
MD1-10-220705	7/5/2022	20,000	4,200	140
MD1-11-220712	7/12/2022	23,000 J	3,700	84
MD1-12-220719	7/19/2022	22,000	3,700	90 J
MD2-01-220504	5/4/2022	1 U	2.3	7.2
MD2-02-220511	5/11/2022	120	10,000	830
MD2-03-220518	5/18/2022	910	9,300	250
MD2-04-220525	5/25/2022	4,000	9,200	200
MD2-05-220601	6/1/2022	10,000	8,800	200
MD2-06-220608	6/8/2022	12,000	6,500	130
MD2-07-220615	6/15/2022	18,000	5,100 H	130 H
MD2-08-220621	6/21/2022	20,000	5,800	170
MD2-09-220628	6/28/2022	15,000	4,800	91

Table 3-4 (continued). Results of HVDPE System Laboratory Analytical Samples

Sample ID	Date Collected	Trichloroethene		cis-1,2-Dichloroethene		Vinyl Chloride	
MD2-10-220705	7/5/2022	20,000		5,400		110	
MD2-11-220712	7/12/2022	22,000		3,900		83	J
MD2-12-220719	7/19/2022	20,000		3,600		100	
EF-01-220504	5/4/2022	1	U	1	U	0.5	U
EF-02-220511	5/11/2022	1	U	1	U	0.5	U
EF-03-220518	5/18/2022	1	U	1	U	0.5	U
EF-04-220525	5/25/2022	1	H	1	U	0.5	U
EF-05-220601	6/1/2022	1	U	1	U	0.5	U
EF-06-220608	6/8/2022	1	U	1	U	0.5	U
EF-07-220615	6/15/2022	1	U	1	U	0.5	U
EF-08-220621	6/21/2022	1	U	1	U	0.5	U
EF-09-220628	6/28/2022	1	U	1	U	0.5	U
EF-10-220705	7/5/2022	1	U	1	U	0.5	U
EF-11-220712	7/12/2022	1	U	1	U	0.5	U
Vapor (μg/m^3)							
VR-TI-01-220504	5/4/2022	880,000	H	970,000	H	49,000	
VR-TI-02-220505	5/5/2022	1,300,000		640,000		40,000	
VR-TI-03-220506	5/6/2022	1,300,000		720,000		47,000	
VR-TI-04-220507	5/7/2022	450,000		290,000		29,000	
VR-TI-05-220508	5/8/2022	1,200,000		500,000		28,000	
VR-TI-06-220509	5/9/2022	3,200,000		1,200,000		66,000	
VR-TI-07-220510	5/10/2022	1,800,000		670,000		46,000	
VR-TI-08-220512	5/12/2022	750,000		350,000		50,000	
VR-TI-09-220515	5/15/2022	1,700,000		570,000		48,000	
VR-TI-11-220518	5/18/2022	1,600,000		510,000		47,000	
VR-TI-12-220521	5/21/2022	1,900,000	H H3	510,000	H H3	30,000	H H3
VR-TI-13-220523	5/23/2022	600,000	H H3	160,000	H H3	16,000	H H3
VR-TI-14-220525	5/25/2022	850,000	H	210,000	H	18,000	H
VR-TI-15-220528	5/28/2022	470,000	H H3	270,000	H H3	27,000	H H3
VR-TI-16-220601	6/1/2022	350,000	H	250,000	H	29,000	H
VR-TI-17-220604	6/4/2022	450,000	H H3	130,000	H H3	15,000	H H3
VR-TI-18-220608	6/8/2022	140,000	H	240,000	H	27,000	H
VR-TI-19-220611	6/11/2022	530,000	H H3	160,000	H H3	26,000	H H3
VR-TI-20-220615	6/15/2022	410,000	H	180,000	H	20,000	H

Table 3-4 (continued). Results of HVDPE System Laboratory Analytical Samples

Sample ID	Date Collected	Trichloroethene		cis-1,2-Dichloroethene		Vinyl Chloride	
VR-TI-21-220618	6/18/2022	1,000,000		280,000		65,000	
VR-TI-22-220618	6/18/2022	2,200,000		650,000		270,000	
VR-TI-23-220619	6/19/2022	1,500,000		330,000		95,000	H H3
VR-TI-24-220621	6/21/2022	2,300,000	H	530,000		110,000	H
VR-TI-25-220625	6/25/2022	1,600,000	H H3	440,000	H H3	85,000	H H3
VR-TI-26-220628	6/28/2022	1,800,000	H	300,000	H	42,000	H
VR-TI-27-220702	7/2/2022	1,700,000	H H3	180,000	H H3	34,000	H H3
VR-TI-28-220705	7/5/2022	1,600,000	H	170,000	H	30,000	H
VR-TI-29-220709	7/9/2022	800,000	H H3	120,000	H H3	25,000	H H3
VR-TI-30-220712	7/12/2022	1,200,000	H	140,000	H	25,000	H
VR-TI-31-220716	7/16/2022	24,000	H H3	2,800	H H3	340	H H3
VR-TI-32-220719	7/19/2022	47,000	H	13,000	H	4,600	H
VR-TI-33-220722	7/22/2022	1,600,000	H H3	500,000	H H3	200,000	H H3
VR-MD-01-220504	5/4/2022	17	U	12	U	8	U
VR-MD-02-220505	5/5/2022	2..7	U	2	U	240	
VR-MD-03-220506	5/6/2022	17		16		240	
VR-MD-04-220507	5/7/2022	3.7		2.7		360	
VR-MD-05-220508	5/8/2022	33		15		980	
VR-MD-06-220509	5/9/2022	10		8.6		1,000	
VR-MD-07-220510	5/10/2022	17	U	12	U	930	
VR-MD-08-220512	5/12/2022	120		52		1,300	
VR-MD-09-220518	5/18/2022	17	U	100		1,400	
VR-MD-10-220525	5/25/2022	9,300	H	75,000		4,100	
VR-MD-11-220601	6/1/2022	180,000	H	300,000	H	19,000	
VR-MD-12-220608	6/8/2022	38,000	H	22,000	H	790	
VR-MD-13-220615	6/15/2022	82,000	H	39,000	H	2,700	
VR-MD-14-220621	6/21/2022	240,000	H	87,000	H	14,000	

Table 3-4 (continued). Results of HVDPE System Laboratory Analytical Samples

Sample ID	Date Collected	Trichloroethene		cis-1,2-Dichloroethene		Vinyl Chloride	
VR-MD-15-220628	6/28/2022	78,000	H	19,000	H	1,600	U H
VR-MD-16-220705	7/5/2022	90,000	H	16,000	H	1,500	
VR-MD-17-220712	7/12/2022	80,000	H	11,000	H	830	
VR-MD-18-220719	7/19/2022	77,000	H	9,200	H	960	
VR-EF-01-220504	5/4/2022	17	U	12	U	8	U
VR-EF-02-220505	5/5/2022	2.7	U	2	U	1.3	U
VR-EF-03-220506	5/6/2022	220		180		34	
VR-EF-04-220507	5/7/2022	3.8		2.3		5.2	
VR-EF-05-220508	5/8/2022	8.6		3.1		5.1	
VR-EF-06-220509	5/9/2022	2.7		2	U	2.2	
VR-EF-07-220510	5/10/2022	10		4.1		13	
VR-EF-08-220512	5/12/2022	3.7		2	U	2.2	
VR-EF-09-220518	5/18/2022	6.7	U	5	U	3.2	U
VR-EF-10-220525	5/25/2022	110	H	90		140	H
VR-EF-11-220601	6/1/2022	2.7	U H	2	U	16,000	H
VR-EF-12-220608	6/8/2022	48	H	16		1,400	H
VR-EF-13-220615	6/15/2022	290	H	120	H	420	H
VR-EF-14-220621	6/21/2022	25	H	12	H	980	H
VR-EF-15-220628	6/28/2022	86	H	19	H	1,300	H
VR-EF-16-220705	7/5/2022	130	H	56	H	1,400	H
VR-EF-17-220712	7/12/2022	260	H	1,300	H	1,500	H
VR-EF-18-220719	7/19/2022	120	H	3,700	H	550	H
VR-MW1-66-220503	5/3/2022	550,000	H	1,600,000	H	370,000	H
VR-MW1-66-220503	5/3/2022	460,000	H	1,400,000	H	360,000	H
VR-MW1-66-220504	5/4/2022	2,100,000	H	2,000,000	H	280,000	H
VR-MW1-66-220505	5/5/2022	1,800,000		1,600,000		200,000	
VR-MW1-66-220506	5/6/2022	1,800,000		1,200,000		210,000	
VR-MW1-66-220507	5/7/2022	1,800,000		1,300,000		240,000	
VR-MW1-66-220508	5/8/2022	2,400,000		790,000		160,000	

Table 3-4 (continued). Results of HVDPE System Laboratory Analytical Samples

Sample ID	Date Collected	Trichloroethene		cis-1,2-Dichloroethene		Vinyl Chloride	
VR-MW1-66-220509	5/9/2022	4,700,000		2,000,000		250,000	
VR-MW1-66-220510	5/10/2022	620,000		270,000		84,000	
VR-MW1-66-220512	5/12/2022	2,700,000		1,200,000		170,000	
VR-MW1-66-220518	5/18/2022	2,100,000		790,000		180,000	
VR-MW1-66-220525	5/25/2022	340,000	H	180,000	H	76,000	H
VR-MW1-66-220601	6/1/2022	840,000	H	450,000	H	160,000	H
VR-MW1-66-220608	6/8/2022	140,000	H	310,000	H	140,000	H
VR-MW1-66-220615	6/15/2022	1,200,000	H	390,000	H	180,000	H
VR-MW1-66-220617	6/17/2022	650,000		160,000	H H3	42,000	H H3
VR-MW1-66-220617	6/17/2022	1,100,000		230,000	H H3	53,000	H H3
VR-MW1-66-220617	6/17/2022	1,200,000		230,000	H H3	51,000	H H3
VR-MW1-66-220618	6/18/2022	1,200,000		470,000		180,000	
VR-MW1-66-220619	6/19/2022	2,000,000		670,000		410,000	
VR-MW1-66-220621	6/21/2022	2,200,000	H	840,000	H	150,000	H
VR-MW1-66-220628	6/28/2022	1,200,000	H	340,000	H	290,000	H
VR-MW1-66-220705	7/5/2022	2,100,000	H	540,000	H	230,000	H
VR-MW1-66-220712	7/12/2022	2,600,000	H	530,000	H	200,000	H
VR-MW1-66-220719	7/19/2022	2,000,000	H	590,000	H	250,000	H
VR-MW1-76-220504	5/4/2022	650,000	H	320,000	H	4,500	
VR-MW1-76-220505	5/5/2022	680,000		320,000		5,400	
VR-MW1-76-220506	5/6/2022	480,000	H H3	210,000		7,900	
VR-MW1-76-220507	5/7/2022	460,000		430,000		35,000	

Table 3-4 (continued). Results of HVDPE System Laboratory Analytical Samples

Sample ID	Date Collected	Trichloroethene		cis-1,2-Dichloroethene		Vinyl Chloride	
VR-MW1-76-220508	5/8/2022	800,000		200,000		11,000	
VR-MW1-76-220509	5/9/2022	750,000		110,000		20,000	
VR-MW1-76-220510	5/10/2022	1,400,000		310,000		13,000	
VR-MW1-76-220512	5/12/2022	850,000		340,000		13,000	
VR-MW1-76-220518	5/18/2022	940,000		200,000		7,500	
VR-MW1-76-220525	5/25/2022	280,000		30,000	H	400	H
VR-MW1-76-220601	6/1/2022	510,000	H	81,000	H	3,700	H
VR-MW1-76-220608	6/8/2022	510,000	H	62,000	H	3,500	H
VR-MW1-76-220615	6/15/2022	530,000	H	56,000	H	2,700	
VR-MW1-76-220619	6/19/2022	1,200,000		200,000	H H3	4,200	H H3
VR-MW1-76-220621	6/21/2022	1,700,000		160,000	H	3,500	H
VR-MW1-76-220628	6/28/2022	1,100,000	H	50,000	H	1,600	U H
VR-MW1-76-220705	7/5/2022	580,000	H	21,000	H	1,600	U H
VR-MW1-76-220712	7/12/2022	1,000,000	H	23,000	H	3,200	U H
VR-MW1-76-220719	7/19/2022	250,000	H	9,300	H	260	
VR-MW1-77-220504	5/4/2022	610,000	H	320,000		16,000	
VR-MW1-77-220505	5/5/2022	730,000		340,000		40,000	
VR-MW1-77-220506	5/6/2022	560,000		180,000		28,000	
VR-MW1-77-220507	5/7/2022	480,000		400,000		51,000	
VR-MW1-77-220508	5/8/2022	780,000		220,000		35,000	
VR-MW1-77-220509	5/9/2022	1,200,000		210,000		52,000	
VR-MW1-77-220510	5/10/2022	2,000,000		490,000		67,000	

Table 3-4 (continued). Results of HVDPE System Laboratory Analytical Samples

Sample ID	Date Collected	Trichloroethene		cis-1,2-Dichloroethene		Vinyl Chloride	
VR-MW1-77-220512	5/12/2022	1,600,000		420,000		85,000	
VR-MW1-77-220518	5/18/2022	1,000,000		260,000		85,000	
VR-MW1-77-220525	5/25/2022	340,000	H	87,000	H	5,4000	H
VR-MW1-77-220601	6/1/2022	490,000	H	130,000	H	91,000	H
VR-MW1-77-220608	6/8/2022	490,000	H	110,000	H	78,000	H
VR-MW1-77-220615	6/15/2022	520,000	H	100,000	H	72,000	H
VR-MW1-77-220619	6/19/2022	1,200,000		250,000	H H3	160,000	H H3
VR-MW1-77-220621	6/21/2022	1,800,000	H	360,000	H	220,000	H
VR-MW1-77-220628	6/28/2022	660,000	H	150,000	H	99,000	H
VR-MW1-77-220705	7/5/2022	550,000	H	120,000	H	93,000	H
VR-MW1-77-220712	7/12/2022	1,100,000	H	130,000	H	87,000	H
VR-MW1-77-220719	7/19/2022	240,000	H	53,000	H	60,000	H

Notes:
Samples in this table were analyzed by CalScience and were not subject to third-party data validation in favor of statistically comparing these results to the split sample results analyzed by a DoD and Washington State accredited lab, the results of which were subject to validation.
H - Sample was prepped or analyzed beyond the specified holding time
H 3 - Sample was received and analyzed past holding time
J - Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value
U - Undetected at the Limit of Detection
μg/L - micrograms per liter
μg/m^3 - micrograms per cubic meter

Table 3-5. Verification Sampling - Comparison Results

Sample ID	Date Collected	Compound	CalClean Result	Pace Result	RPD
Vapor (µg/m^3)					
VR-MW1-66-220510	5/10/2022	cis-1,2-Dichloroethene	1,200,000	4,080,000 J	109.09%
		Trichloroethylene	2,700,000	9,910,000 J	114.35%
		Vinyl chloride	170,000	575,000	108.72%
VR-MW1-66-220512	5/12/2022	cis-1,2-Dichloroethene	270,000	2,770,000	164.5%
		Trichloroethylene	620,000	584,000 J	161.6%
		Vinyl chloride	84,000	573,000	148.9%
VR-MW1-66-220601	6/1/2022	cis-1,2-Dichloroethene	450,000	464,000	3.06%
		Trichloroethylene	840,000	1,110,000	27.69%
		Vinyl chloride	160,000	125,000	24.56%
VR-MW1-66-220621	6/21/2022	cis-1,2-Dichloroethene	840,000	4,320,000	134.88%
		Trichloroethylene	2,200,000	11,400,000	135.29%
		Vinyl chloride	150,000	621,000	122.18%
VR-MW1-66-220712	7/12/2022	cis-1,2-Dichloroethene	530,000	195,000	92.41%
		Trichloroethylene	2,600,000	1,060,000	84.15%
		Vinyl chloride	200,000	156,000	24.72%
VR-MW1-66-220719	7/19/2022	cis-1,2-Dichloroethene	590,000	460,000	24.76%
		Trichloroethylene	2,000,000	1,140,000	54.78%
		Vinyl chloride	250,000	229,000	8.77%
VR-MW1-76-220510	5/10/2022	cis-1,2-Dichloroethene	310,000	947,000	101.35%
		Trichloroethylene	1,400,000	4,020,000 J	96.68%
VR-MW1-76-220512	5/12/2022	cis-1,2-Dichloroethene	340,000	975,000	96.58%
		Trichloroethylene	850,000	3,870,000 J	127.97%

Table 3-5 (continued). Verification Sampling - Comparison Results

Sample ID	Date Collected	Compound	CalClean Result	Pace Result	RPD
		Vinyl chloride	13,000	52,700	120.85%
VR-MW1-76-220621	6/21/2022	cis-1,2-Dichloroethene	160,000	319,000	66.39%
		Trichloroethylene	1,700,000	3,650,000	72.90%
		Vinyl chloride	3,500	4,060	14.81%
VR-MW1-76-220712	7/12/2022	cis-1,2-Dichloroethene	23,000	29,000	23.08%
		Trichloroethylene	1,000,000	1,150,000	13.95%
VR-MW1-77-220510	5/10/2022	cis-1,2-Dichloroethene	490,000	1,220,000	85.38%
		Trichloroethylene	2,000,000	4,470,000 J	76.35%
		Vinyl chloride	67,000	177,000	90.16%
VR-MW1-77-220512	5/12/2022	cis-1,2-Dichloroethene	420,000	1,200,000	96.30%
		Trichloroethylene	1,600,000	4,400,000 J	93.33%
		Vinyl chloride	85,000	263,000	102.30%
VR-MW1-77-220621	6/21/2022	cis-1,2-Dichloroethene	360,000	801,000	75.97%
		Trichloroethylene	1,800,000	3,590,000	66.42%
		Vinyl chloride	220,000	394,000	56.68%
VR-MW1-77-220712	7/12/2022	cis-1,2-Dichloroethene	130,000	908,000	149.90%
		Trichloroethylene	1,100,000	4,180,000	116.67%
		Vinyl chloride	87,000	353,000	120.91%
VR-MW1-77-220719	7/19/2022	cis-1,2-Dichloroethene	53,000	93,500	55.29%
		Trichloroethylene	240,000	323,000	29.48%
		Vinyl chloride	60,000	101,000	50.93%
VR-TI-02-220505	5/5/2022	cis-1,2-Dichloroethene	640,000	2,020,000	103.76%

Table 3-5 (continued). Verification Sampling - Comparison Results

Sample ID	Date Collected	Compound	CalClean Result	Pace Result	RPD
		Trichloroethylene	1,300,000	3,450,000	90.53%
		Vinyl chloride	40,000	101,000 J	86.52%
VR-TI-03-220506	5/6/2022	cis-1,2-Dichloroethene	720,000	2,430,000	108.57%
		Trichloroethylene	1,300,000	3,960,000	101.14%
		Vinyl chloride	47,000	124,000 J	90.06%
VR-TI-07-220510	5/10/2022	cis-1,2-Dichloroethene	670,000	3,010,000 J	127.17%
		Trichloroethylene	1,800,000	8,140,000 J	127.57%
		Vinyl chloride	46,000	279,000	143.38%
VR-TI-08-220512	5/12/2022	cis-1,2-Dichloroethene	350,000	1,610,000	128.57%
		Trichloroethylene	750,000	3,800,000 J	134.07%
		Vinyl chloride	50,000	132,000	90.11%
VR-MW1-66-220518	5/18/2022	cis-1,2-Dichloroethene	790,000	698,000	12.37%
		Trichloroethylene	2,100,000	2,190,000	4.20%
		Vinyl chloride	180,000	212,000	16.33%
VR-MW1-76-220518	5/18/2022	cis-1,2-Dichloroethene	200,000	535,000	91.16%
		Trichloroethylene	940,000	2,260,000	82.50%
		Vinyl chloride	7,500	20,400	92.47%
VR-MW1-77-220518	5/18/2022	cis-1,2-Dichloroethene	260,000	523,000	67.18%
		Trichloroethylene	1,000,000	2,000,000	66.67%
		Vinyl chloride	85,000	74,600	13.03%
VR-TI-11-220518	5/18/2022	cis-1,2-Dichloroethene	510,000	709,000	32.65%
		Trichloroethylene	1,600,000	938,000	52.17%

Table 3-5 (continued). Verification Sampling - Comparison Results

Sample ID	Date Collected	Compound	CalClean Result	Pace Result	RPD
		Vinyl chloride	47,000	71,100	40.81%
VR-TI-16-220601	6/1/2022	cis-1,2-Dichloroethene	250,000	4,040	193.64%
		Trichloroethylene	350,000	13,300	185.36%
		Vinyl chloride	29,000	70.3	199.03%
VR-TI-24-220621	6/21/2022	cis-1,2-Dichloroethene	530,000	1,360,000	87.83%
		Trichloroethylene	2,300,000	5,470,000	81.60%
		Vinyl chloride	110,000	138,000	22.58%
VR-TI-30-220712	7/12/2022	cis-1,2-Dichloroethene	140,000	306,000	74%
		Trichloroethylene	1,200,000	2,920,000	83%
		Vinyl chloride	25,000	52,100	70%
VR-TI-32-220719	7/19/2022	cis-1,2-Dichloroethene	13,000	210,000	177%
		Trichloroethylene	47,000	964,000	181%
		Vinyl chloride	4,600	32,000	150%
Groundwater (µg/L)					
IN-01-220504	5/4/2022	cis-1,2-Dichloroethene	37,000	41,900	12.42%
		Trichloroethene	69,000	79,700	14.39%
		Vinyl chloride	1,100	1,060	3.70%
IN-05-220601	6/1/2022	cis-1,2-Dichloroethene	5,900	6,000	1.68%
		Trichloroethene	24,000	22,500	6.45%
IN-08-220621	6/21/2022	cis-1,2-Dichloroethene	6,300	7,450	16.73%
		Trichloroethene	30,000	26,200	13.52%
		Vinyl chloride	200	247	21.03%

Table 3-5 (continued). Verification Sampling - Comparison Results

Sample ID	Date Collected	Compound	CalClean Result	Pace Result	RPD
IN-11-220712	7/12/2022	cis-1,2-Dichloroethene	3,600	3,350	7.19%
		Trichloroethene	24,000	22,900	4.69%
		Vinyl chloride	100	124 J	21.43%
IN-12-220719	7/19/2022	cis-1,2-Dichloroethene	3,600	4,160	14.43%
		Trichloroethene	23,000	24,400	5.91%

Notes:
Only results with detections are shown
RPD - relative percent difference
µg/L - micrograms per liter
µg/m^3 - micrograms per cubic meter

4.0 DATA EVALUATION

4.1 EVALUATION PROCESS

This subsection describes how the data generated during this pilot test were evaluated.

Some data evaluation called for in the SAP can only be completed following additional data collection and analysis under separate contract. These evaluations will be discussed in the pending supplemental RI for OU 1 and include:

- Evaluation of rebound based on post-test groundwater sample analyses.
- Evaluation of source strength reduction scenarios using the numeric fate and transport model being developed under separate contract.

Pilot test data evaluations included in this report consist of:

- Assessment of the location of the three extraction wells relative to the highest concentration source areas. This evaluation was conducted by:
  - ➢ Comparing the results of soil and groundwater samples collected from the extractions wells prior to HVDPE operation to existing data from other sample locations at the site.
  - ➢ Examining concentration trend plots over the life of the pilot test.
- Based on verification data (Section 3.3), the evaluation process utilized CalScience laboratory results and field PID results to assess concentration trends during the test. These data were also used in combination with flow measurements to estimate the mass removal achieved during test and to forecast potential future mass removal using regression analysis.
- Manual and automated depth-to-groundwater measurements and vacuum measurements from observation wells were plotted versus time, and maximum drawdown/vacuum was plotted on a plan-view map to evaluate the radius of influence of the pilot test system, and any observed effects on deeper groundwater. Groundwater recovery following cessation of extraction were analyzed using standard hydrogeologic formulae to estimate aquifer parameters.
- The laboratory data for samples collected between carbon canisters in series, and in final treated effluent, were compared to the PALs established in the SAP and in the discharge permit to conclude that effluent discharge requirements were met during the test and to estimate carbon usage.

- Based on the elements of the evaluation listed above, conclusions were drawn regarding a conceptual full-scale implementation of this technology at the site.

4.2 EXTRACTION WELL SOURCE STARTING CONCENTRATIONS

The starting concentrations of key cVOCs (TCE, cis-1,2-DCE, and vinyl chloride) in soil and groundwater samples collected prior to HVDPE operation from the two new extraction wells installed as part of this pilot test indicate the following:

- MW1-76, installed in the western portion of the plume, was placed within an area exhibiting the highest cVOC concentrations in this portion of the plume.
- MW1-77, installed in the eastern portion of the plume but west of the known highest concentration area (as represented by MW1-66), was placed within an area exhibiting expected high concentrations of TCE, but lower than expected concentrations of cis-1,2-DCE and vinyl chloride.

MW1-66 was installed under separate contract in 2019 within the highest concentration source area as established by the 2017 investigation (Navy, 2018). In the boring for MW1-66 a soil sample was collected from 9 ft bgs (within the depth range exhibiting the highest cVOC concentrations), and exhibited TCE at a concentration of 3,200 mg/kg, cis-1,2-DCE at 47 mg/kg, and vinyl chloride at 0.23 mg/kg. In comparison, soil samples from MW1-76 and MW1-77 exhibited overall lower maximum cVOC concentrations. TCE was measured three orders of magnitude lower in these two well bores compared to MW1-66, cis-1,2-DCE one order of magnitude lower, and vinyl chloride at similar concentrations to MW1-66.

Comparing the results of groundwater samples collected from the three extraction wells, TCE was measured in the same order of magnitude in the three wells but at lower concentrations in MW1-76 and MW1-77 compared to MW1-66. cis-1,2-DCE and vinyl chloride were measured at one order of magnitude lower in the two new extraction wells, MW1-76 and MW1-77.

Compared to concentration contour maps prepared based on grab groundwater samples collected during the 2017 investigation (Navy, 2018), TCE, cis-1,2-DCE, and vinyl chloride concentrations in MW1-76 groundwater are slightly lower but similar to what would be predicted based on the concentration contours. At MW1-77, TCE concentrations in groundwater are slightly lower than predicted based on the concentration contours, but cis-1,2-DCE and vinyl chloride are two orders of magnitude lower than predicted.

4.3 CONCENTRATION TREND ANALYSIS

Total VOC concentrations in vapor measured using a field PID are shown on Figures 4-1 and 4-2, with data for VOCs in the combined vapor influent to the treatment system, as well as VOCs in the individual vapor streams from each extraction wells. These figures plot VOC concentration versus time during the HVDPE-only portion of the test as well as the portion of the test that included air sparging. Visual examination of these plots reveals the following:

- VOC concentrations in vapor quickly rise to a peak value upon system startup and initial extraction optimization, then decline slowly over the following weeks until air sparging is initiated.
- Upon initiation of air sparging, VOC concentrations in vapor quickly rise to new peak that exceeds the initial peak observed with HVDPE alone. Concentrations then exhibit a similar slow decline over the subsequent weeks. The higher peak VOC concentrations observed indicate that air sparging is effective at increasing VOC recovery compared to HVDPE alone.
- Air sparging caused a rapid rise in VOC concentrations at all three extraction wells, even though the extraction wells are located at substantially different distances from the air sparge point (roughly 10 ft, 40 ft, 210 ft).
- VOC concentrations in the combined vapor stream and in the individual wells exhibit very similar trends over time, with and without air sparging. This indicates that the soils and contaminants in the vicinity of each of the three extraction wells respond similarly to extraction, and that each well is placed in a similar location relative to the highest VOC concentrations in the vicinity of each well.
- The slow decline in VOC concentration over time indicates that each extraction well is located near the highest VOC concentrations, and that substantial recoverable VOC mass is available. Increasing concentrations would indicate that a distant VOC source was being pulled towards an extraction well. Rapidly decreasing concentrations would indicate that relatively little additional recoverable mass was available near an extraction well.

Total VOC concentrations in extracted groundwater (prior to treatment by the system) are plotted on Figure 4-3 versus time. These concentrations are representative of the total groundwater influent – groundwater pumped by downwell pumps as well as groundwater entrained in the vapor stream and then separated in the knock-out tank. As shown on Figure 4-3, VOC concentrations in extracted groundwater declined by an order of magnitude between the first and second samples (one week apart) and then remained within a relatively narrow range of 20 to 40 mg/L total VOCs. This relatively steady concentration trend over the three months of the test implies that any groundwater extraction system used at the site as part of a remedy would be reasonably expected to exhibit steady VOC concentrations for a prolonged period – perhaps years or decades based on pumped systems at similar sites. Careful inspection of Figure 4-3 shows that the cis-1,2-DCE concentration appears to be more stable over time compared to the TCE concentration, perhaps indicating a more uniform source strength for cis-1,2-DCE. This breakdown product is more ubiquitous at the site compared to TCE.

4.4 MASS FLUX / MASS REMOVAL ANALYSIS

This section evaluates the estimated mass removal rate (flux) and total mass removed during the pilot test and provides a forecast of potential mass removal during full-scale implementation of this technology.

4.4.1 Mass Removed During the Pilot Test

The VOC mass removed in the vapor process stream was estimated based on the HVDPE system standard airflow rate multiplied by the total VOC vapor concentration. Total VOC concentration was estimated using two different methods:

1. Summing all VOC concentrations from laboratory-analyzed vapor grab samples that field staff collected daily during the first week of operations and weekly afterwards.
2. Linearly regressing PID readings and total VOC concentrations to estimate total VOC concentration from PID readings, with PID readings taken approximately three times per day (see also Section 3.3).

In both cases, the total VOC concentration was linearly interpolated at hourly intervals, and the HVDPE system airflow values were back-filled to hourly intervals to create a gap-filled, regularized hourly time series. Uncertainty in the laboratory-based mass removal estimate compared to the PID-based estimate primarily results from a lower sample frequency resulting in more interpolation between results. Uncertainty in the PID-based mass removal estimate results primarily from the PID-total VOC linear regression relationship.

Mass removal in the water process stream was estimated using the average groundwater flow rate through the system multiplied by the total VOC concentration in the combined groundwater influent. The total VOC concentration was estimated for each week (approximately) of operation as the arithmetic mean value of the groundwater sample at the beginning of each week and the beginning of the next week. Although the extraction wells were cycled on and off during an approximately 10-minute window per day to obtain individual well vapor concentration readings, the data set indicates that this cycling had a minimal effect on overall mass removal rates during the event.

A summary of total VOC mass removed by HVDPE in vapor and groundwater, including as calculated by laboratory data and PID data (for the vapor process stream), is presented in Table 4-1.

Mass removal on a per-day basis in the vapor stream (Figure 4-4) mirrors the vapor inlet concentration graph. Overall, just under 200 kg of VOC mass was removed, with the bulk being TCE (Figures 4-5 and 4-6).

The estimated mass removed in the water process stream was approximately 145 kg. In comparison to the mass removed via vapor extraction, this mass is higher than typical for this type of system, as discussed further in Section 4.7.3.

4.4.2 Forecast of Future Mass Removal

This subsection presents two approaches to forecasting potential VOC removal by a hypothetical future HVDPE system. The first approach predicts removal rate based on transforming cumulative mass removed versus time to create a linear regression model. The second approach predicts removal rate based on transforming removal rate [kg/hr] versus time to create a linear regression model. The rate-based approach produces a much noisier regression relationship than the cumulative-based approach. The cumulative-based forecast suggests steadily increasing removal of VOC with time, whereas the rate-based forecast suggests a declining removal rate, leading to an asymptotic cumulative removal rate that effectively results in a maximum total mass removed in two to five months (beyond the three months of pilot test operation) depending on the mass export dataset considered (PID-based VOC concentrations or laboratory-based VOC concentration, and sparging or non-sparging system operation). This second approach results in a forecast that is more typical of long-term operation of HVDPE systems – declining mass removal to an asymptotic value.

The best regression model found for estimating cumulative mass removed using the first approach described above linearizes the cumulative mass removed curve by squaring cumulative mass removed and taking the log of numeric time. This results in a reasonably good coefficient of determination (otherwise known as the R-squared value) of 0.9968 in the case of the PID-based sparging mass export estimate. R-squared is a statistical measure of how close the data are to the fitted regression line, with an R-squared value closer to one indicating a better "fit." Figure 4-7 provides an example, showing the regression for the PID-estimated cumulative mass export during sparging. The resulting best fit regression analysis forecast is shown on Figure 4-8, with color coding to distinguish measured data and forecast results for approximately one year of operation. This analysis implies that if the system continued to operate for the next year as it did during the three-month test, approximately three times the mass removal (a total of 600 kg) could be achieved. The forecast estimates that use of air sparging would result in at least twice as much mass removal during a one-year operational period compared to HVDPE without air sparging.

The core assumption underpinning this forecast model is that the cumulative mass removal curves during 1) pre-sparging and 2) sparging pilot studies would remain approximately constant into the future had those pilot studies continued. Depletion in the source VOC concentration, and/or volatilization characteristics of subsurface VOCs are likely to change from observed pilot study conditions as the system operates in the long run.

The second approach uses an alternative forecast model based on removal rate (i.e., change in mass removed versus change in time). Similar to the cumulative model, data values versus time do not plot linearly, so transformations need to be applied in order to generate a linear relationship that can be used for a simple regression model. An example of transforming data and time to approximate a linear relationship is demonstrated by the PID-estimated removal rates plotted as semi-logarithmic on the y-axis versus time, as shown on Figure 4-9. In this case, the vapor mass removal rate data (e.g., VOC removal in kg/hr) is transformed into an approximately linear form, while also disallowing the occurrence of negative rates (because that would be physically impossible). A reasonably good fit resulted from the natural logarithm of removal rate versus time, with an R-squared value of 0.45 (Figure 4-9). Figure 4-10 shows predicted future removal rates when using this linear regression model. Note the relative noisy ‘measured’ VOC extraction rates are based on mass-balance estimates using airflow rates with PID-derived data for VOC concentration, or lab-analyzed VOC concentrations (Figure 4-10). Converting the predicted removal rates from Figure 4-10 into cumulative removal rate yields Figure 4-11.

In summary, the regression model based on cumulative mass removed is less sensitive to fluctuations in removal rate, and may represent an optimistic VOC extraction scenario. The regression model based on removal rate is noisier as a result of the high variability in the rate of removal; however, the data in both the non-sparging and sparging scenarios both indicated declining removal rates with time. As a result, the removal rates approach zero (Figure 4-10), and the cumulative removal becomes asymptotic (Figure 4-11). The removal rate-based regression forecast may represent the low-end scenario of future HVDPE system operation, whereas the cumulative-based regression forecast may represent the high-end scenario of total mass removal potential.

4.5 RADIUS OF INFLUENCE ANALYSIS

This section evaluates the apparent radius of influence (ROI) of the HVDPE system with and without air sparging based on depth to groundwater measurements and vacuum measurements. The ROI is a description of the area of the site that exhibited a substantive effect on groundwater level or subsurface vacuum during the pilot test. The ROI evaluation is complicated by the fact that three extraction points were operated simultaneously, using a combination of submersible pump groundwater extraction and HVPDE stinger tubes extracting both vapor and groundwater. The ROI was evaluated semi-quantitatively based primarily on depth to groundwater measurements collected both manually and using 10 dataloggers recording groundwater head on a 5-minute interval.

Vacuum measurements in observation wells at the site were few in number, with equivocal results, because most wells at the site are installed with fully submerged screens (see the cross section presented in Figure 4-12). The installation of wells with fully submerged screens, rather than screens that cross the water table, is common practice at sites like NBK Keyport OU 1 that exhibit very shallow groundwater and primarily cVOCs as COCs. Wells with no open screen interval above the water table will not show a response to a vacuum applied in the vadose zone of a site.

4.5.1 ROI – HVDPE Only

Figure 2-1 presents a plan view of the test area with the maximum groundwater drawdown and maximum observed vacuum posted next to each observation point. Overall, 1 to 3.5 ft of groundwater drawdown was observed in wells across the highest concentration plume area. For wells with dataloggers installed, the maximum drawdown was calculated based on the recovery of the water table after shutdown of the extraction system on July 22, 2022. That is, the groundwater head measured just before system shutdown was subtracted from the groundwater head after approximately six days of recovery to static conditions. The drawdown observed is representative of operating down-well pumps in wells MW1-66 and MW1-76 and vacuum extraction in all three HVDPE extraction wells. The down-well pump in well MW1-77 was shut down early in the test to focus groundwater recovery on MW1-66 and MW1-76 with the available system water treatment capacity.

The plots of groundwater drawdown (Appendix I), as recorded by the dataloggers measuring on 5-minute intervals, show a high degree of fluctuation in drawdown. This fluctuation is the result of numerous brief system shutdowns needed for regular system maintenance.

Because the test duration was 3 months and spanned a period of variable seasonal precipitation, maximum drawdown and recovery cannot be meaningfully defined based on the starting water level pre-test to the final water level post-test. Natural water level variations over this period obscure the effects of dewatering and recovery based on operation of the HVDPE system. For the analysis in this report recovery is measured from a known pumped/vacuum extraction condition and flow rate just before shutdown to the point where the recovery curve becomes asymptotic. This is similar to how recovery is measured and defined for both traditional pumping tests and slug tests. In this case, 6 days of recovery monitoring post shutdown documents an initial steep recovery followed by flattening to an asymptote.

The datalogger installed in well MW1-68, located within 10 ft of extraction well MW1-66 but beneath a 16-ft-thick clay, documented 0.6 ft of drawdown. This observation appears to validate the current geologic CSM that interprets the subsurface in this area as a system of Olympia-age braided paleotidal channels.

At wells IW1-S, MW1-53, and MW1-61, initial drawdown measurements implied that portions of the well screen may have been exposed above the water table and could therefore be influenced by vacuum from the HVDPE system. These wells were therefore sealed and periodic vacuum measurements were collected. Although vacuums were sometimes recorded at these wells, the measurements were not consistent and do not allow for meaningful estimation of a vacuum ROI within the vadose zone.

Manual DTW measurements were collected at surface water stations S-4B, S-9, and S-10 (Figure 2-1), and some apparent drawdown can be inferred based on some of the measurements at these locations. However, field observations during the test indicate that surface water level was strongly influenced by rainfall events, and these weather influences appear to obscure any potential influence of the HVDPE system on surface water.

4.5.2 ROI – HVDPE with Air Sparging

As expected, the addition of air sparging did not substantively change the extraction ROI; however, the lateral and vertical effects of the single sparge point (AS1-1, Figure 2-1) were widespread. As noted in Section 2.3.2, during initial operation of the air sparging point at 18 psi and 9.5 scfm, bubbling was observed in ponded rainwater 50 ft east of the sparge point. The dataloggers in all observation wells also recorded a dramatic increase in water level at the start of air sparging, even in wells located as far away as 200 ft (P1-7), and in the well near the sparge well but screened beneath 16 ft of clay and below the sparge point (MW1-68). The observed bubbling subsided following both a decrease in the system air sparge pressure, and turning on vacuum for all extraction wells (MW1-66 was the only well turned on at the beginning of air sparging). This result indicates that the sparge system increased subsurface pressures substantially over a wide area. These groundwater measurements comport with the increase in extracted vapor concentrations in all extraction wells during sparging, including in well MW1-76 located 210 ft to the west (see also Section 4.3).

4.5.3 Aquifer Parameter Estimates

Water level data and groundwater extraction discharge/flow rates collected during the pilot test were utilized in analytical solutions to calculate transmissivity/hydraulic conductivity of the shallow aquifer. To complete these analyses, the aquifer testing analytical software AQTESOLV was used. Two solutions were applied using the water level and discharge/flow rate data: a constant-rate extraction test with a multiple pumping well solution, and a distance-drawdown analysis (Cooper, et al., 1946). The results of the aquifer parameter calculations are summarized in Table 4-2, along with previously calculated aquifer parameters.

For the constant-rate extraction test, the groundwater discharge/flow rates for the three extraction wells (MW1-66, MW1-76, and MW1-77) were used in a multiple pumping well analytical solution (Neuman solution; Neuman, et al., 1974) to calculate transmissivity/hydraulic conductivity using MW1-55 as an observation well. MW1-55 was chosen as the observation well due to its proximity to the three extraction wells. With this method, the calculated transmissivity for the aquifer was equal to 2.633 centimeters squared per second (cm^2/sec), and the hydraulic conductivity was equal to 0.00216 centimeters per second (cm/sec) (assuming a 40-foot aquifer thickness based on average depth to the fine-grained base of the aquifer).

For the distance-drawdown analysis, the groundwater discharge/flow rate from MW1-76 was used, along with MW1-49, MW1-50, P1-6, and P1-7 as observation wells. The Cooper-Jacob solution was utilized to calculate transmissivity/hydraulic conductivity. With this method, the calculated transmissivity for the aquifer was equal to 3.456 cm^2/sec, and the hydraulic conductivity was equal to 0.00283 cm/sec (assuming a 40-foot aquifer thickness).

The transmissivity/hydraulic conductivity values calculated from HVDPE test well extraction data are comparable to results from slug tests previously performed at MW1-49, MW1-50, and MW1-66 in this area, as shown in Table 4-2. These results are approximately one order of magnitude higher than hydraulic conductivity values measured from laboratory soil testing at newly installed monitoring wells in the South Plantation (Table 4-2). For the purposes of future remedy evaluation, the mean values of the slug test analyses and distance drawdown analysis are probably most representative of in situ site conditions, compared to the laboratory value.

Data collected by the dataloggers placed in monitoring wells at the site during the pilot test are provided in Appendix G. Appendix I provides graphs of drawdown versus time in each well monitored throughout the life of the test using a datalogger, as well as the constant-rate extraction test and distance-drawdown analysis results (graphs and calculation results) from the AQTESOLV software.

4.6 EFFLUENT STANDARDS

Table 4-3 summarizes the results of treated process water effluent samples collected approximately weekly from treated process water prior to discharge to the on-site sanitary sewer lift station. As shown, concentrations of analytes required for analysis by the POTW were either not detected above the LOD or were detected at concentrations substantially lower than the limits allowed by the POTW for this approved discharge.

No permit was required for discharge of treated vapor, and therefore no specific discharge limits are applicable to vapor effluent samples. However, Table 4-4 shows that near the beginning of the pilot test concentrations of the three primary VOCs in treated vapor were typically several orders of magnitude lower than the influent concentrations shown in Table 3-4. Beginning in late May 2022, concentrations of the three primary VOCs in treated vapor appear to have risen compared to earlier in the test, implying that some breakthrough of the carbon vessels was beginning (see Figures 4-13, 4-14, and 4-15). Overall, TCE concentrations in treated vapor ranged from not detected at 2.7 $\mu g/m^3$ to 290 $\mu g/m^3$. Concentrations of cis-1,2-DCE in effluent vapor ranged from not detected at 2.0 $\mu g/m^3$ to 3,700 $\mu g/m^3$, and vinyl chloride concentrations ranged from not detected at 1.3 $\mu g/m^3$ to 16,000 $\mu g/m^3$.

4.7 SYSTEM DESIGN PARAMETERS

This section summarizes the expected ranges of key parameters for conceptual design of a full-scale system using HVDPE with or without air sparging based on field observations and measurements made during the pilot system operation. Where data collected during this pilot study are relevant to other potential remediation technologies, such applicability is also discussed.

4.7.1 Number and Distribution of Extraction and Sparge Wells

The wide lateral and vertical influence of a single sparge point during active extraction from three extraction wells can be used to infer that any remedial technology using air sparging would need relatively few air sparge points to affect a large area. For the area of the South Plantation, three evenly spaced air sparge points, each operating at no more than 15 psi and 4 scfm, should be sufficient to provide even and broad coverage.

In contrast, effective extraction coverage over the same area as air sparging would likely require substantially more extraction wells than air sparge points. Extraction well distribution would need to be sufficient to ensure that all sparged air is recovered such that air sparging does not result in unexpected movement of contaminants to less contaminated portions of the aquifer. The challenges encountered during the pilot study with achieving a substantial drawdown over the entire area of interest using three extractions wells implies that lowering the water table sufficiently to expose the most contaminated depths of the aquifer to vapor extraction could require a much more densely distributed network of extraction wells – on the order of nine to 15 extraction wells distributed across an area the size of the South Plantation.

4.7.2 Well Screen Intervals for Extraction and Sparging

In general, sparge points are best installed below the elevation of extraction well screens, such that sparge air strips VOCs from groundwater as it moves up through the water column towards the extraction wells. In the area of the South Plantation, the construction of sparge point AS1-1 appears to have been optimal, with the point set just above the clay aquitard within a coarse sand/fine gravel (bottom depth of sparge point 27.5 ft bgs). The high permeability of this coarse unit probably accounts for the wide lateral distribution of air observed from sparging during the pilot test.

As designed for the pilot test, extraction well screens were set above the depth of the air sparge point and across the interval of highest VOC concentrations in the aquifer (bottom depth of screens 20 ft bgs). The disadvantage of not screening to the depth of the aquitard is that a shorter water column is available within the well for placement of a pump and creating drawdown. Any future extraction wells would benefit from a bottom screen depth at the aquitard, and long screen lengths allowing exposure of the entire portion of the aquifer with high VOC concentrations.

4.7.3 Extraction Rates

HVDPE systems can sometimes operate without down-well pumps. In these cases, the vacuum and air flows achieved through the stinger tubes are sufficient to entrain groundwater at the rate that it enters the extraction wells and allow for complete dewatering of the extraction wells during system operation. These operating conditions are ideal, because the entire screened aquifer section in the extraction well is exposed to vapor extraction. For VOCs, higher mass loads are typically observed in the vapor process stream compared to the water process stream. For the South Plantation area, even the high vacuums and air flow rates applied were not sufficient to dewater the extraction wells without the down-well pumps in place. Even with pumping, the water table was only lowered 1 to 3 ft across the area of interest, which was not sufficient to expose the most highly contaminated portions of the aquifer to vapor extraction. As a result, nearly the same mass of cVOCs was removed in the vapor process stream as was removed in the water process stream. Cross section A-A’, shown on Figure 4-12, illustrates the relationship between contaminant distribution and the drawdown achieved during the pilot test.

Any full-scale remedial technology that includes vapor extraction should be designed to also extract substantial volumes of groundwater in order to achieve the necessary drawdown. If hypothetical future extraction wells are also installed with deeper well screens (see Section 4.7.2), such wells are likely to intersect the coarse unit immediately above the aquitard and may produce significantly more water than was produced during pilot testing because the pilot test extraction wells were not screened across this coarse-grained unit. A working estimate for conceptual planning purposes is 7 gpm per extraction well.

Extracted air flow rates for the site can reasonably be estimated at 30 to 40 scfm, the air flow rate range achieved during the pilot study.

4.7.4 Expected Extracted cVOC Ranges

For a system operated in a manner similar to the pilot system, an initial peak vapor concentration of 500 ppmv total cVOCs could be expected, with a longer-term concentration of 100 to 200 ppmv. In groundwater, total cVOC concentrations of 20 to 40 mg/L could be expected over the longer term.

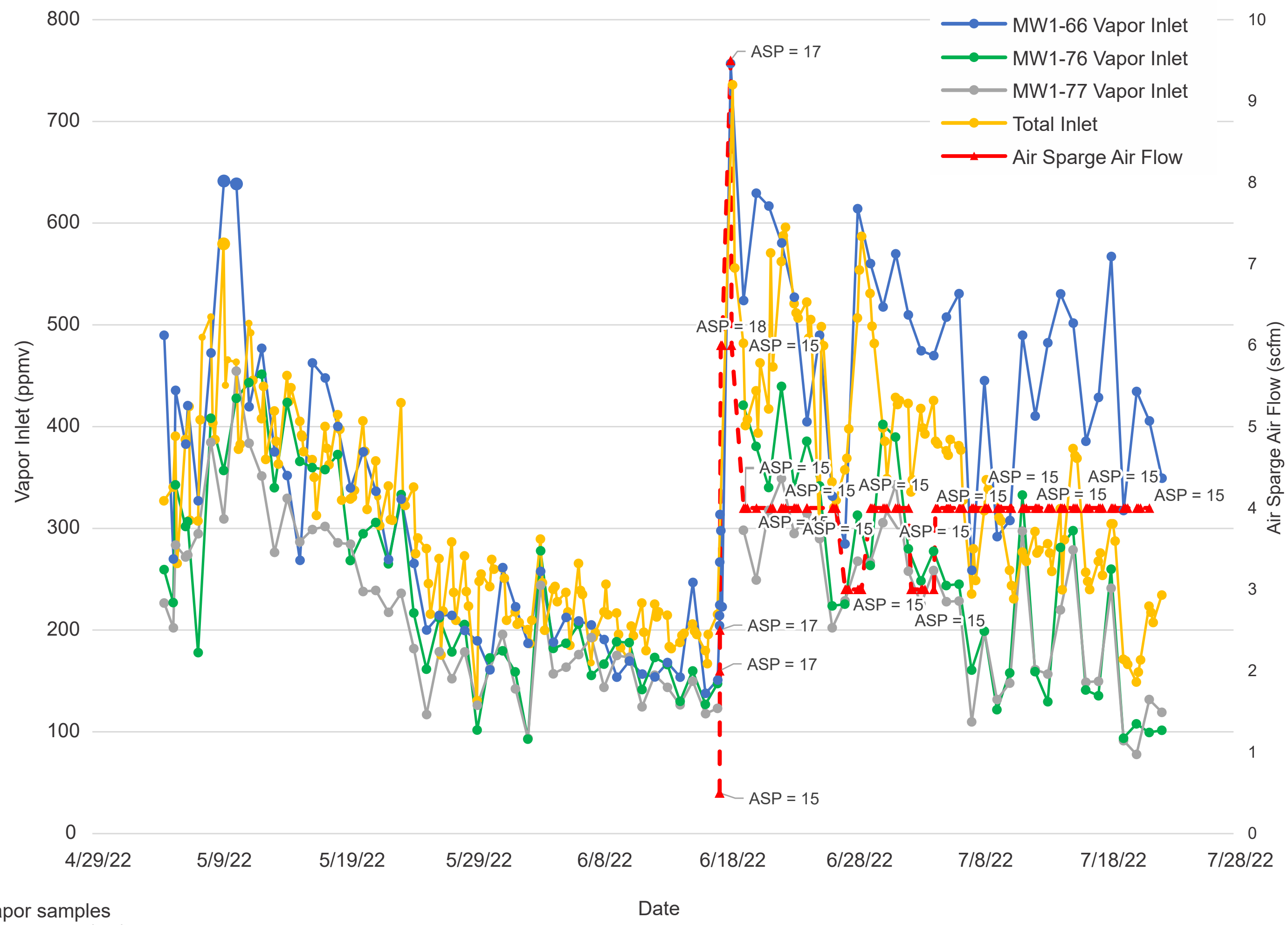
A system that generated more groundwater in order to lower the water table and expose more contaminated aquifer material to vapor extraction would be expected to exhibit substantially higher concentrations in the vapor phase, with similar concentrations in groundwater to those observed during the pilot study, at least initially.

4.7.5 Expected Carbon Usage

For vapor, mid-carbon sample results document a substantial increase in cVOCs, with effluent results showing a more moderate increase, starting with the May 25, 2022 sample (see Table 3-4 and Figures 4-13, 4-14, and 4-15). Both mid-carbon and effluent results for cis-1,2-DCE and vinyl chloride are similar to influent results by the end of the pilot test, indicating near breakthrough of all vapor-phase carbon vessels by the end of the test. The results appear to show that the breakthrough was observed at the first carbon vessel around May 25, 2022 and at the second carbon vessel around July 12, 2022.

In contrast, as discussed in Section 4.6, concentrations of analytes required for analysis by the POTW in treated process water were either not detected above the LOD or were detected at concentrations substantially lower than the limits allowed by the POTW throughout the test.

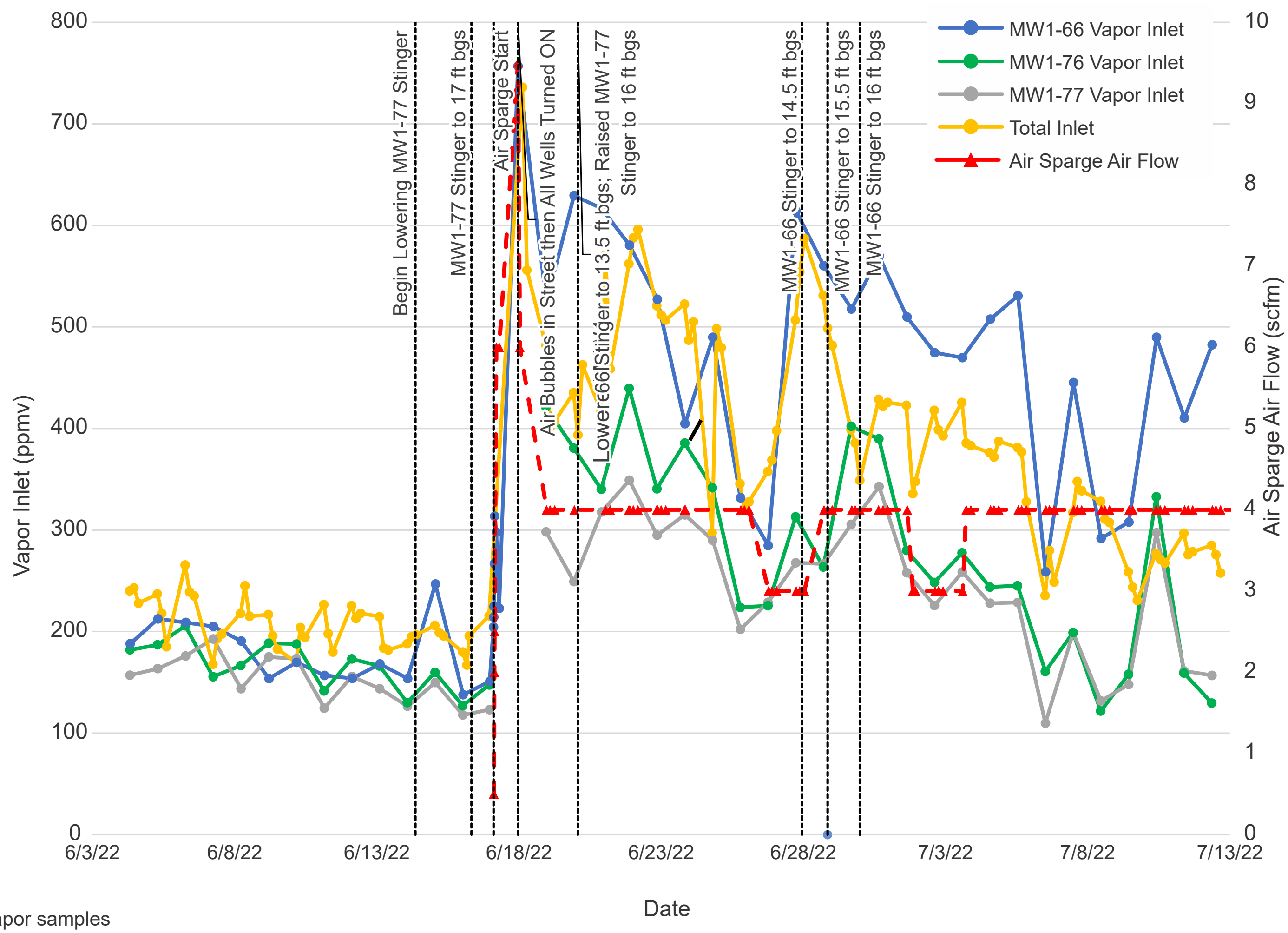
The carbon vendor, Pacific Coast Carbon, provided an evaluation of the vapor- and water-phase carbon usage under the conditions of the pilot test (Appendix J). Liquid-phase carbon consumption was estimated at 13.9 to 31.5 pounds of carbon consumed per 1,000 gallons of water treated, assuming average and maximum influent concentrations, respectively. Vapor-phase carbon consumption was estimated at 661 to 943 pounds of carbon consumed per 24 hours of operation, assuming average and maximum influent concentrations, respectively. A full-scale HVDPE system could conceivably consume a 1,000-pound vapor phase carbon canister almost daily.



NOTES
1) Dots represent vapor samples
2) ASP = Air Sparge pressure (psi)
3) Each well temporarily turned off (≈ 20 min.) during sampling of other wells
4) MW1-77 pump off from 5/8/2022 through end of test

Figures4-1_4-2_Air_Sparge_DPW_Plots.CDR

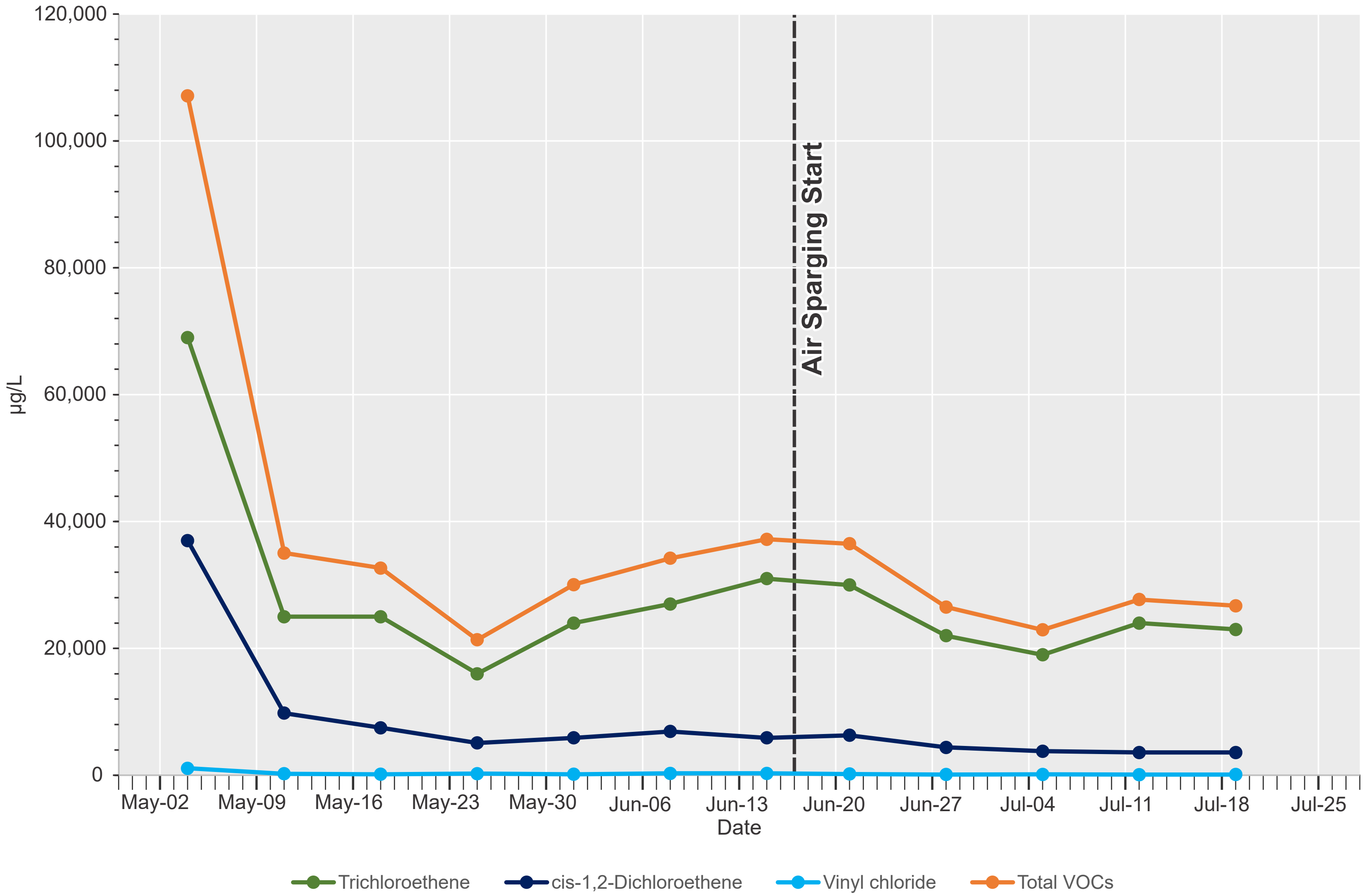
U.S. NAVY	**Figure 4-1** **Vapor Inlet Concentrations and Air Sparge Flow Rates**	CTO F4225 NBK Keyport HVDPE Pilot Test Report



NOTES
1) Dots represent vapor samples
2) ASP = Air Sparge pressure (psi)
3) Each well temporarily turned off (≈ 20 min.) during sampling of other wells
4) MW1-77 pump off from 5/8/2022 through end of test

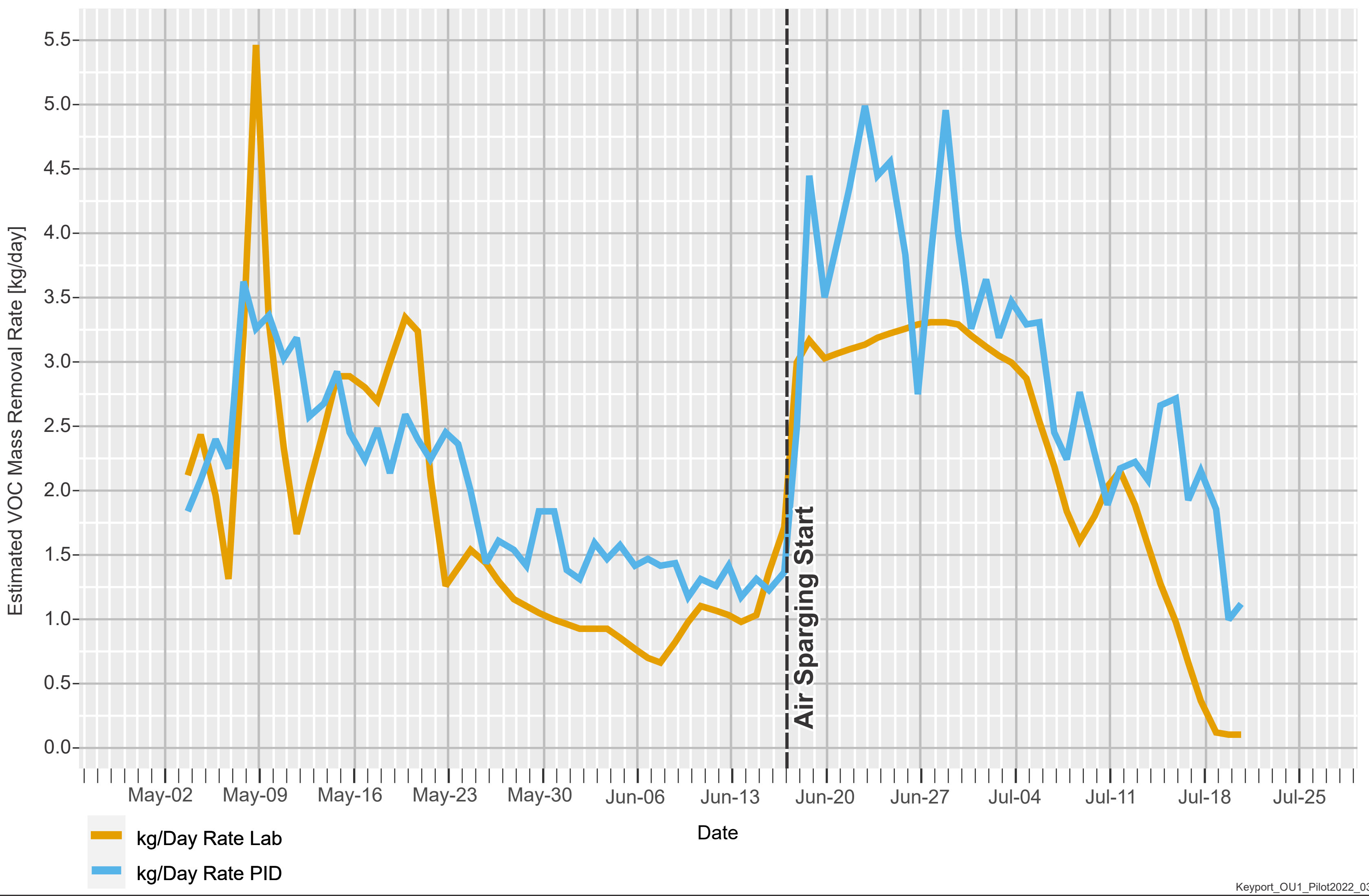
Figures4-1_4-2_Air_Sparge_DPW_Plots.CDR

U.S. NAVY	**Figure 4-2** **Key Pilot Test Events and Effects on Vapor Inlet Concentrations**	CTO F4225 NBK Keyport HVDPE Pilot Test Report



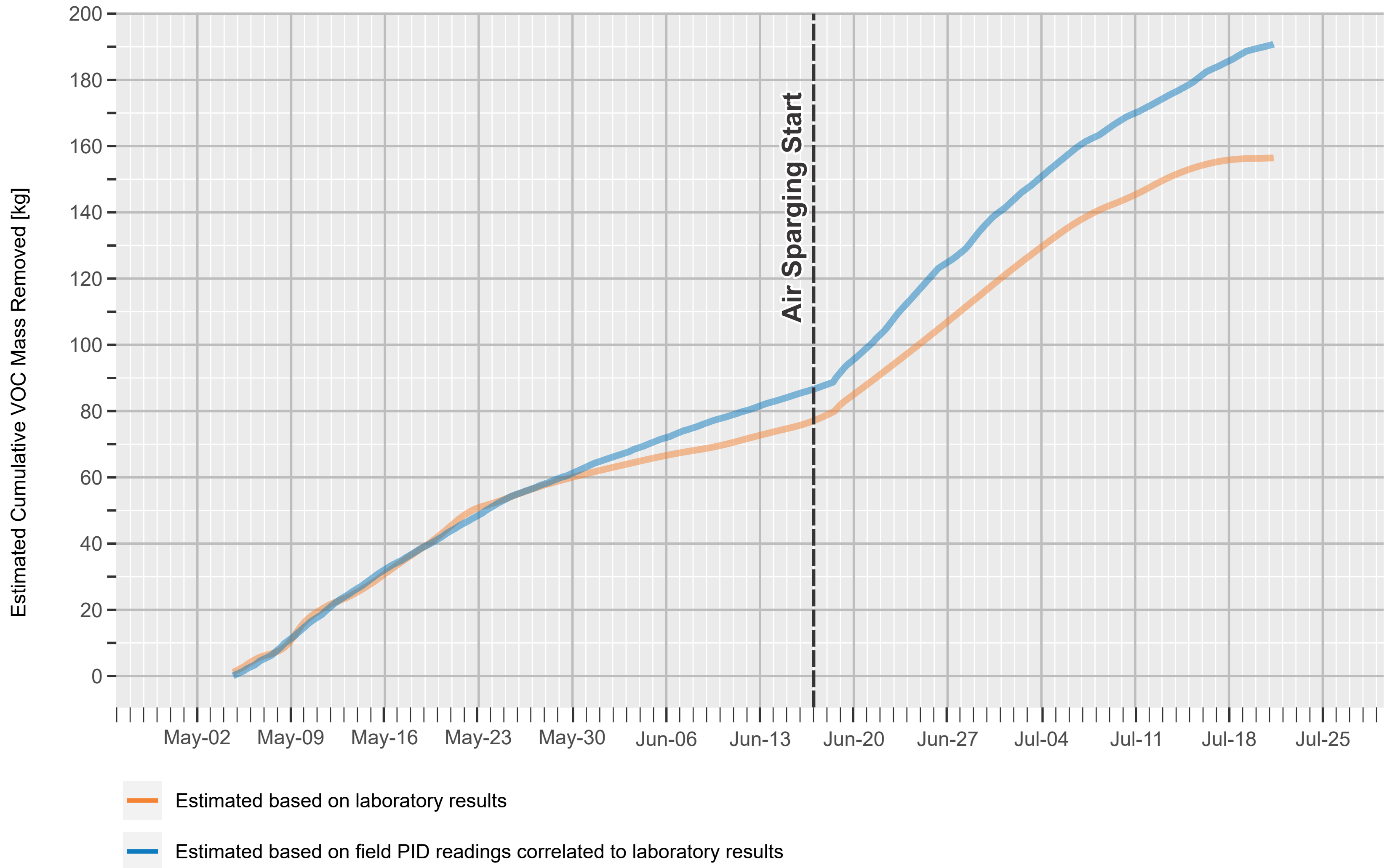
Keyport_OU1_Pilot2022_03.CDR

U.S. NAVY	**Figure 4-3** **Total VOC Concentrations in Extracted Groundwater**	CTO F4225 NBK Keyport HVDPE Pilot Test Report



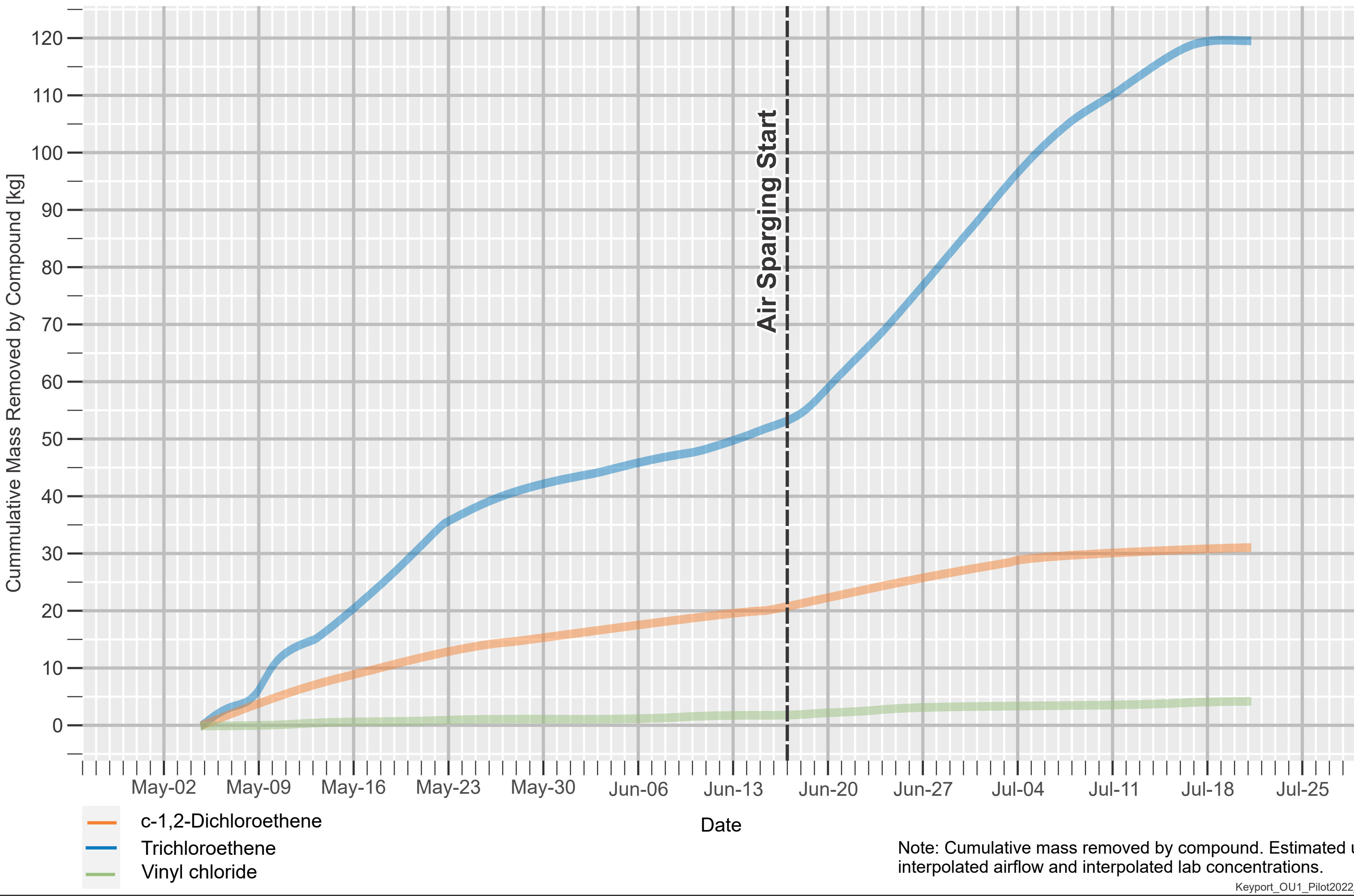
Keyport_OU1_Pilot2022_03.CDR

U.S. NAVY	**Figure 4-4** **Daily Mass Removal Rate** **Lab-Analyzed Grab Samples Compared to PID Readings** **Correlated to Lab Samples**	CTO F4225 NBK Keyport HVDPE Pilot Test Report



Keyport_OU1_Pilot2022_03.CDR

U.S. NAVY	**Figure 4-5** **Cumulative Mass Removal - Total VOCs in Vapor**	CTO F4225 NBK Keyport HVDPE Pilot Test Report



Note: Cumulative mass removed by compound. Estimated using interpolated airflow and interpolated lab concentrations.

Keyport_OU1_Pilot2022_03.CDR

U.S. NAVY	**Figure 4-6** **Cumulative Mass Removal -** **Primary Compounds in Vapor**	CTO F4225 NBK Keyport HVDPE Pilot Test Report

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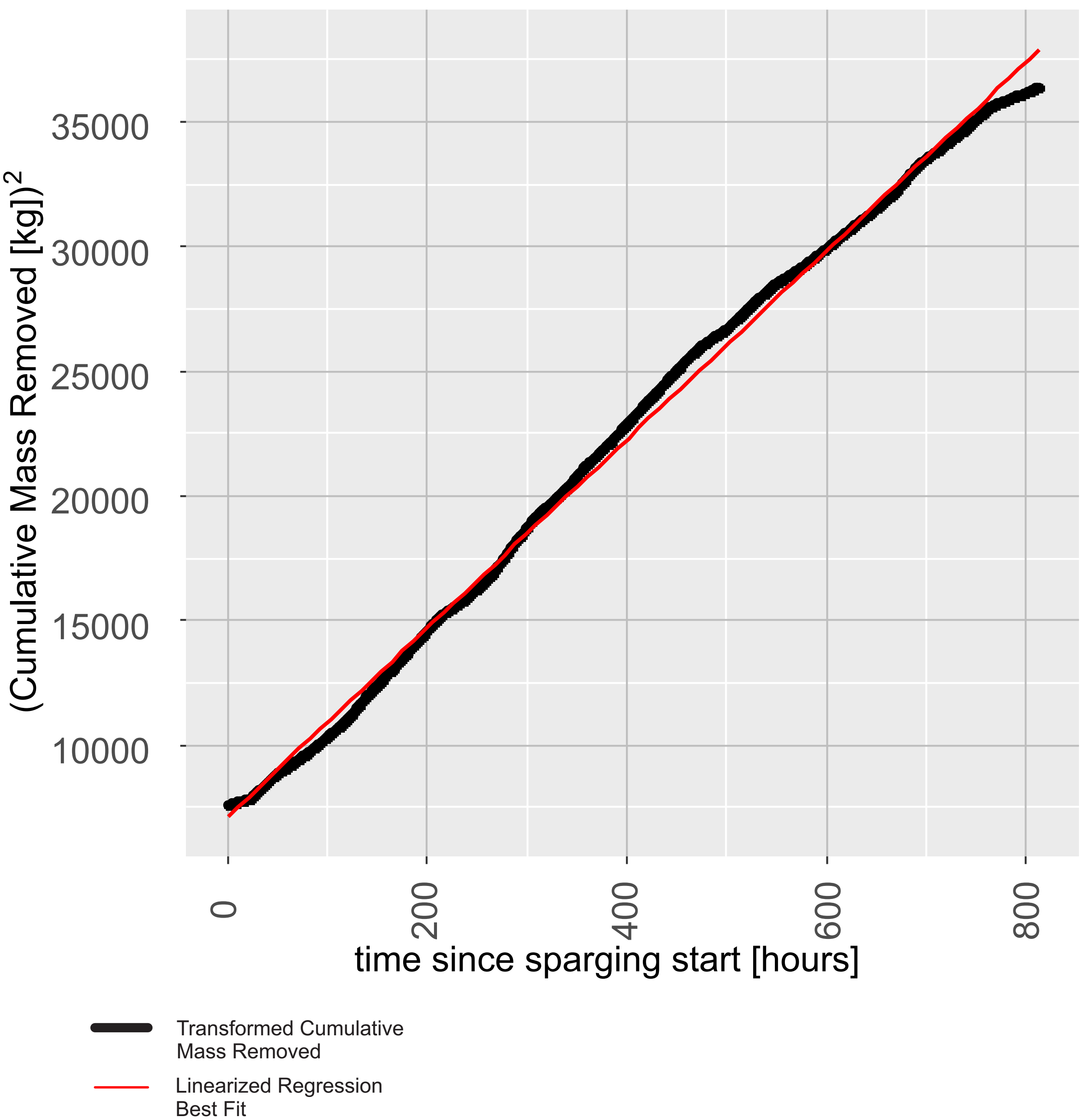
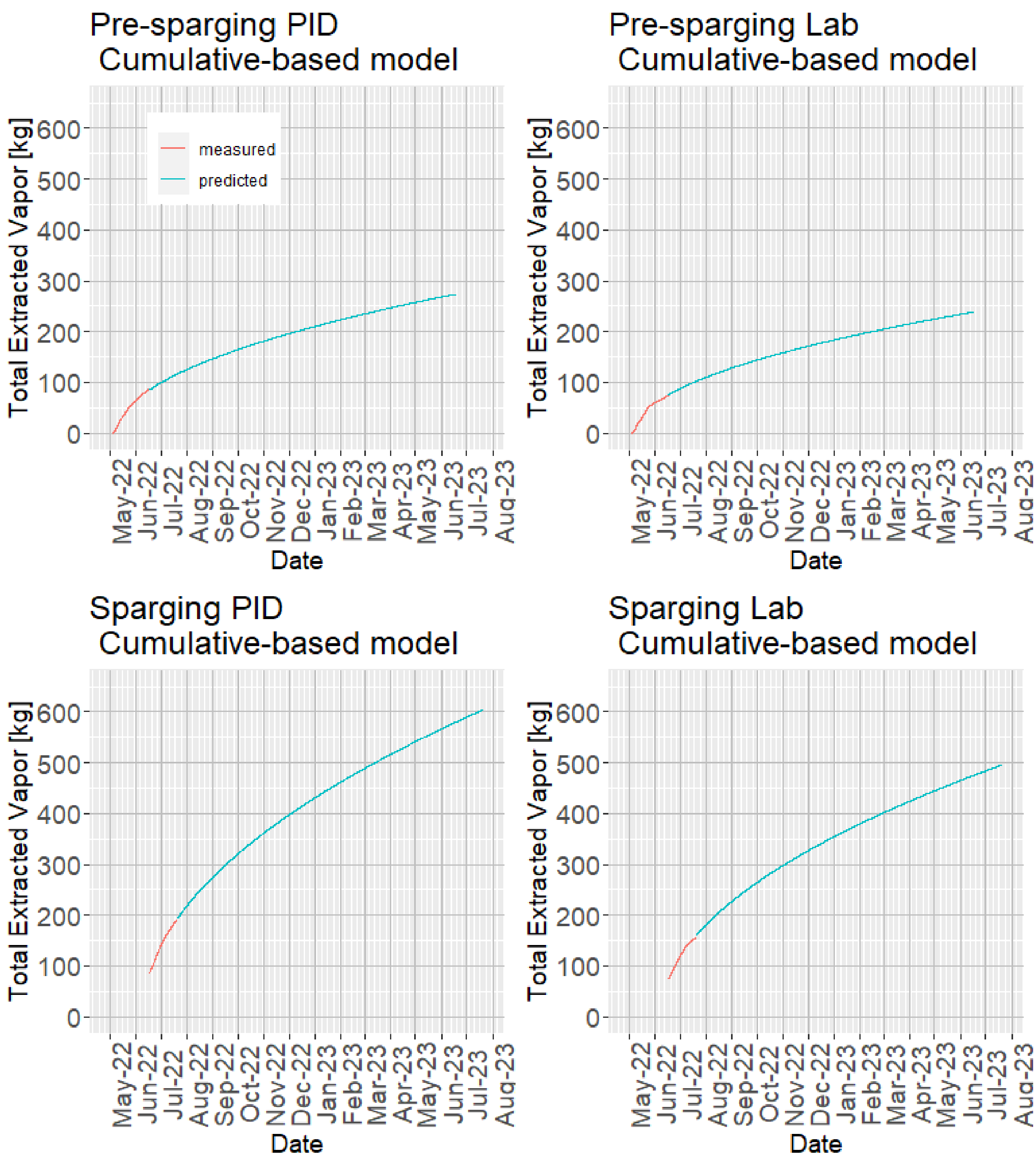
Good Curve Fit Using Sparging PID Example:
Quadratic (Cumulative Export) vs. ln(time)



Keyport_OU1_Pilot2022_05.CDR

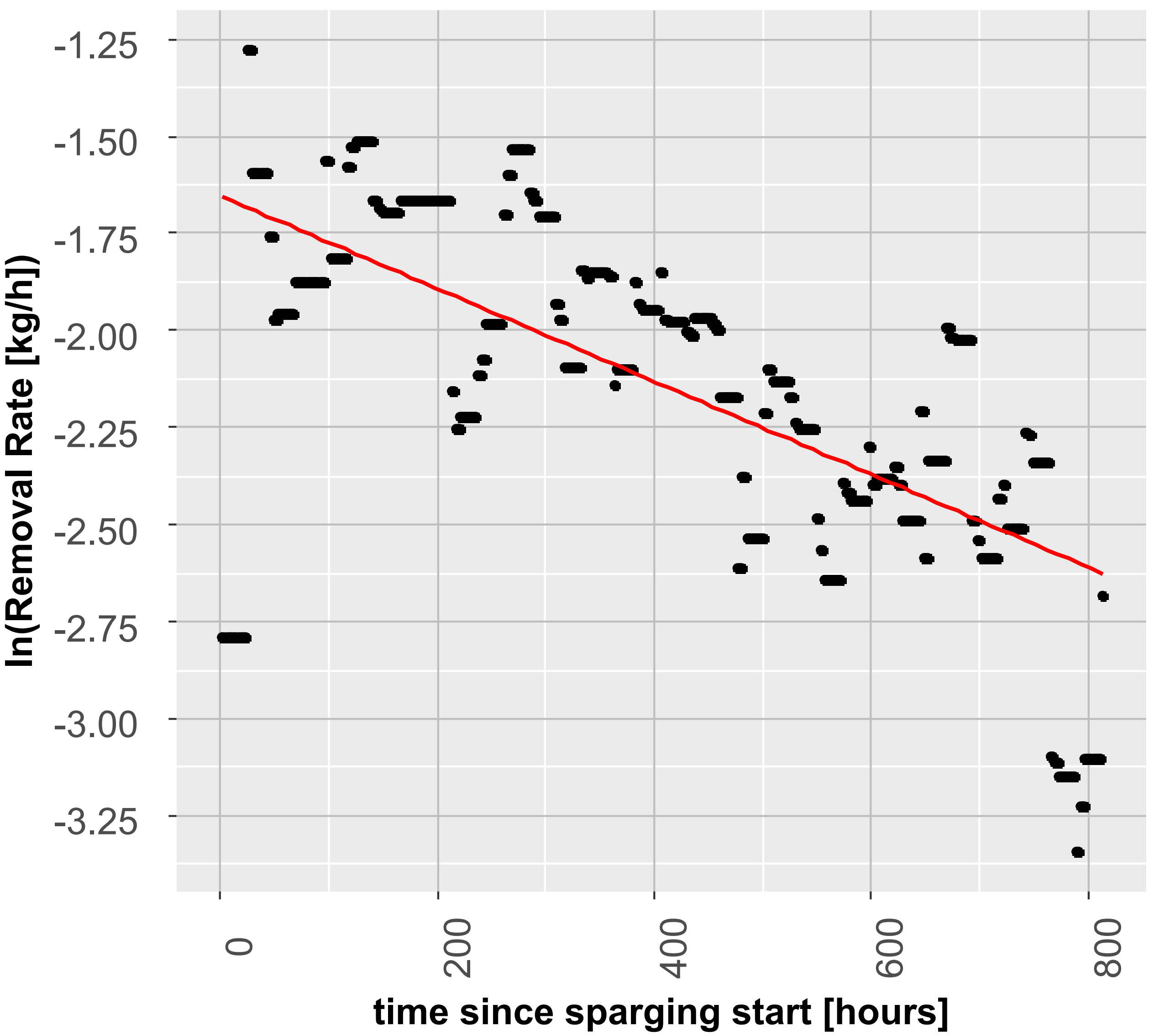
U.S. NAVY	**Figure 4-7** **Example Linearized Regression**	CTO F4225 NBK Keyport HVDPE Pilot Test Report



Note: The air sparging mass forecasts shown here start with the total extracted VOC mass in vapor prior to start of sparging (about 100 kg).

Keyport_OU1_Pilot2022_05.CDR

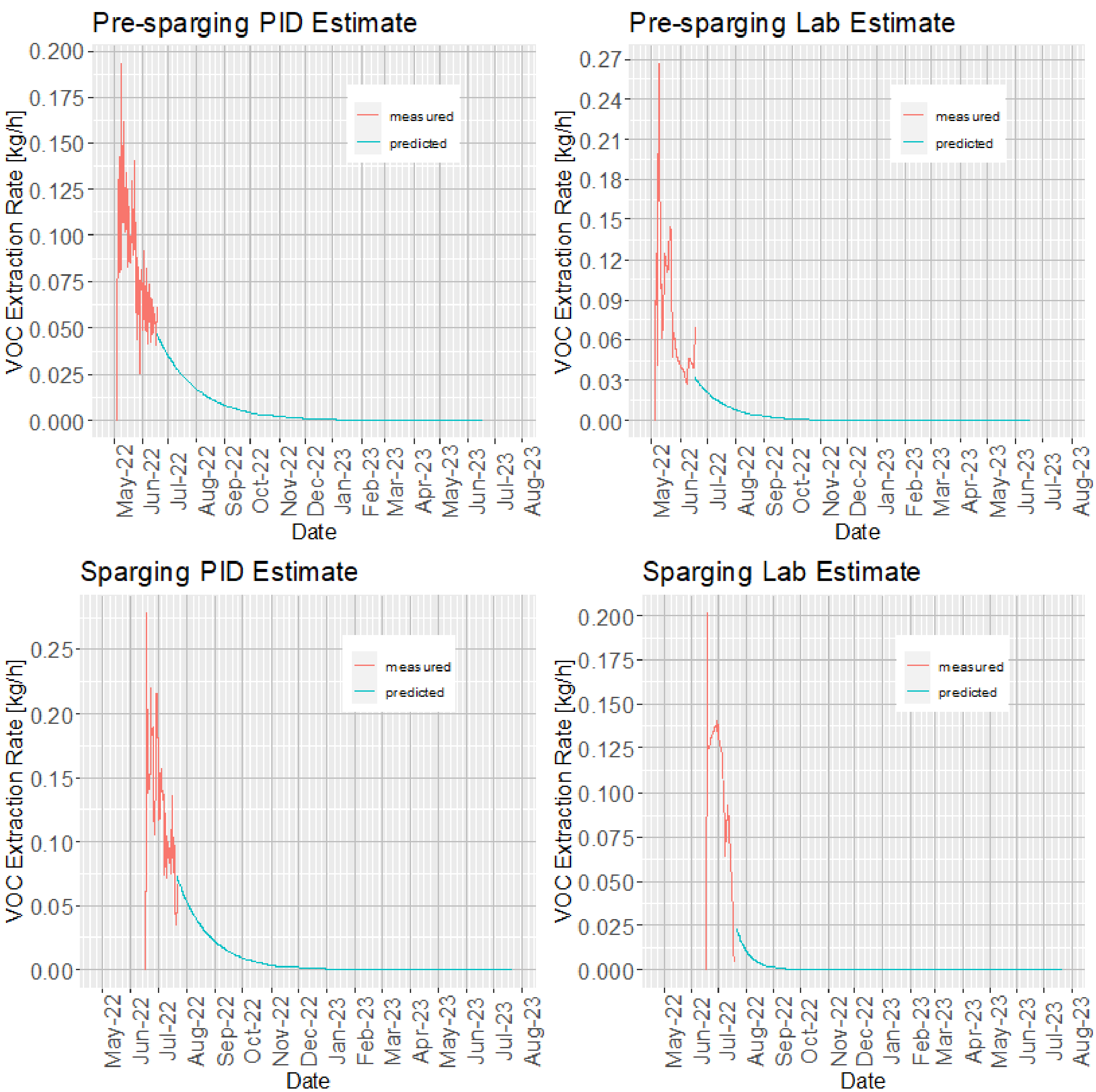
U.S. NAVY	**Figure 4-8** **Forecasted Cumulative Mass Removed** **(Based on Cumulative Model)**	CTO F4225 NBK Keyport HVDPE Pilot Test Report



Note: R-squared = 0.45

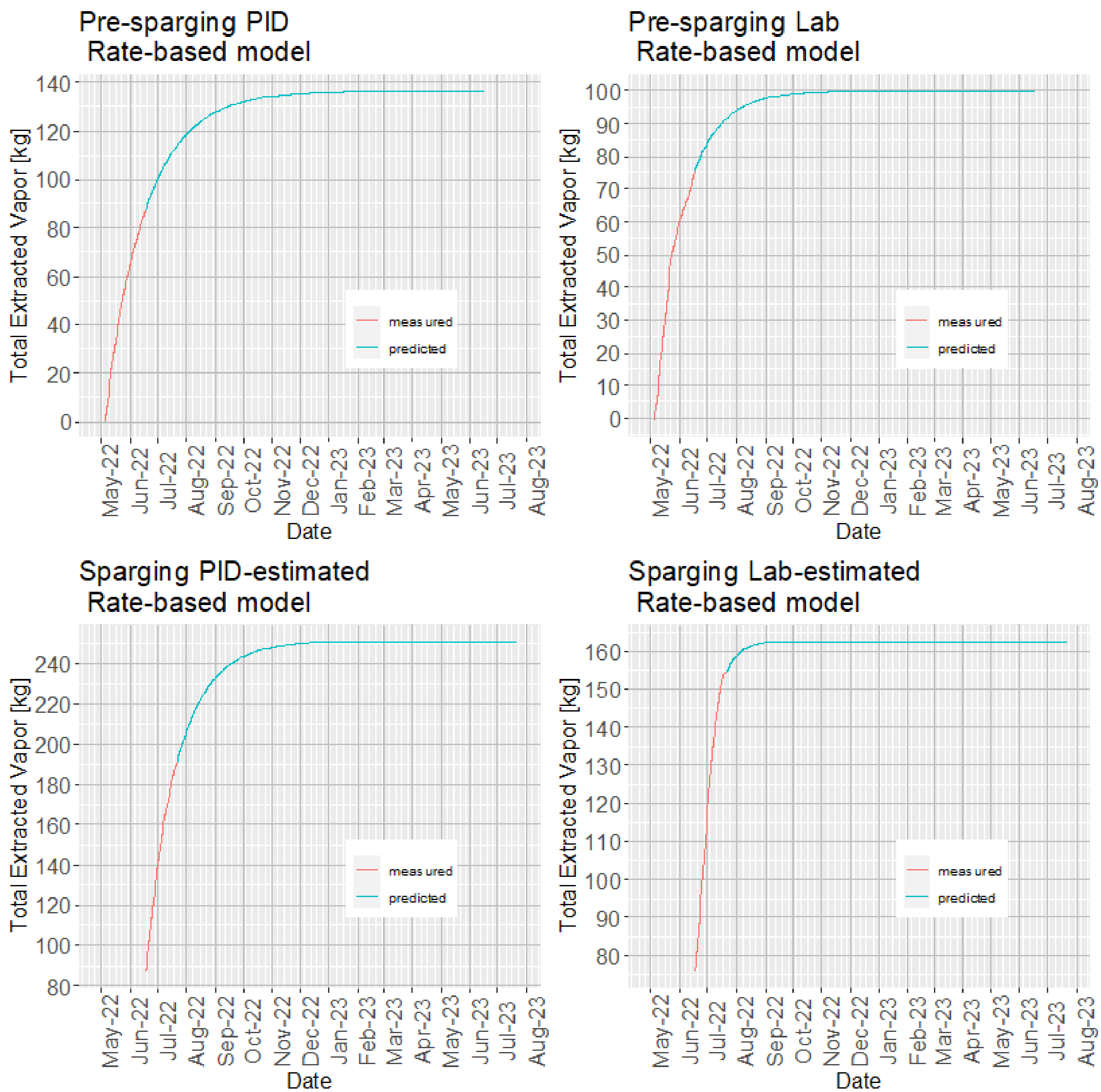
Keyport_OU1_Pilot2022_05.CDR

U.S. NAVY	**Figure 4-9** **Linearization by Transforming PID-derived VOC Removal Rate in Vapor and Time**	CTO F4225 NBK Keyport HVDPE Pilot Test Report



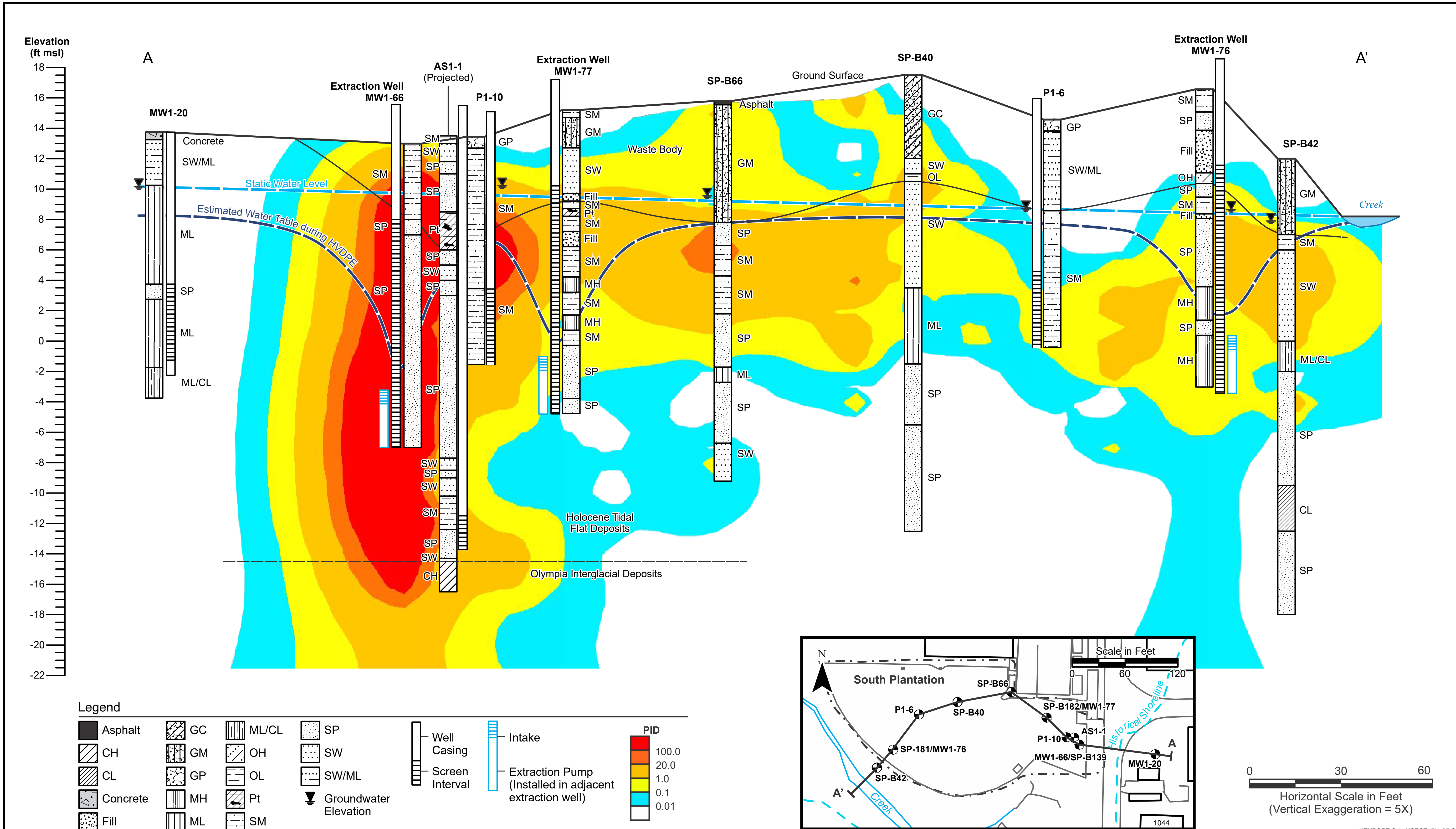
Keyport_OU1_Pilot2022_05.CDR

U.S. NAVY	**Figure 4-10** **Forecasted Cumulative Mass Removed** **(Based on Rate Model)**	CTO F4225 NBK Keyport HVDPE Pilot Test Report



Keyport_OU1_Pilot2022_05.CDR

U.S. NAVY	**Figure 4-11** **Forecasted Cumulative Mass Removed Based on the Linear Regression Model of Mass Removal Rate**	CTO F4225 NBK Keyport HVDPE Pilot Test Report



U.S. NAVY

Figure 4-12
Cross Section A-A'

CTO F4225
NBK Keyport
HVDPE Pilot Test Report

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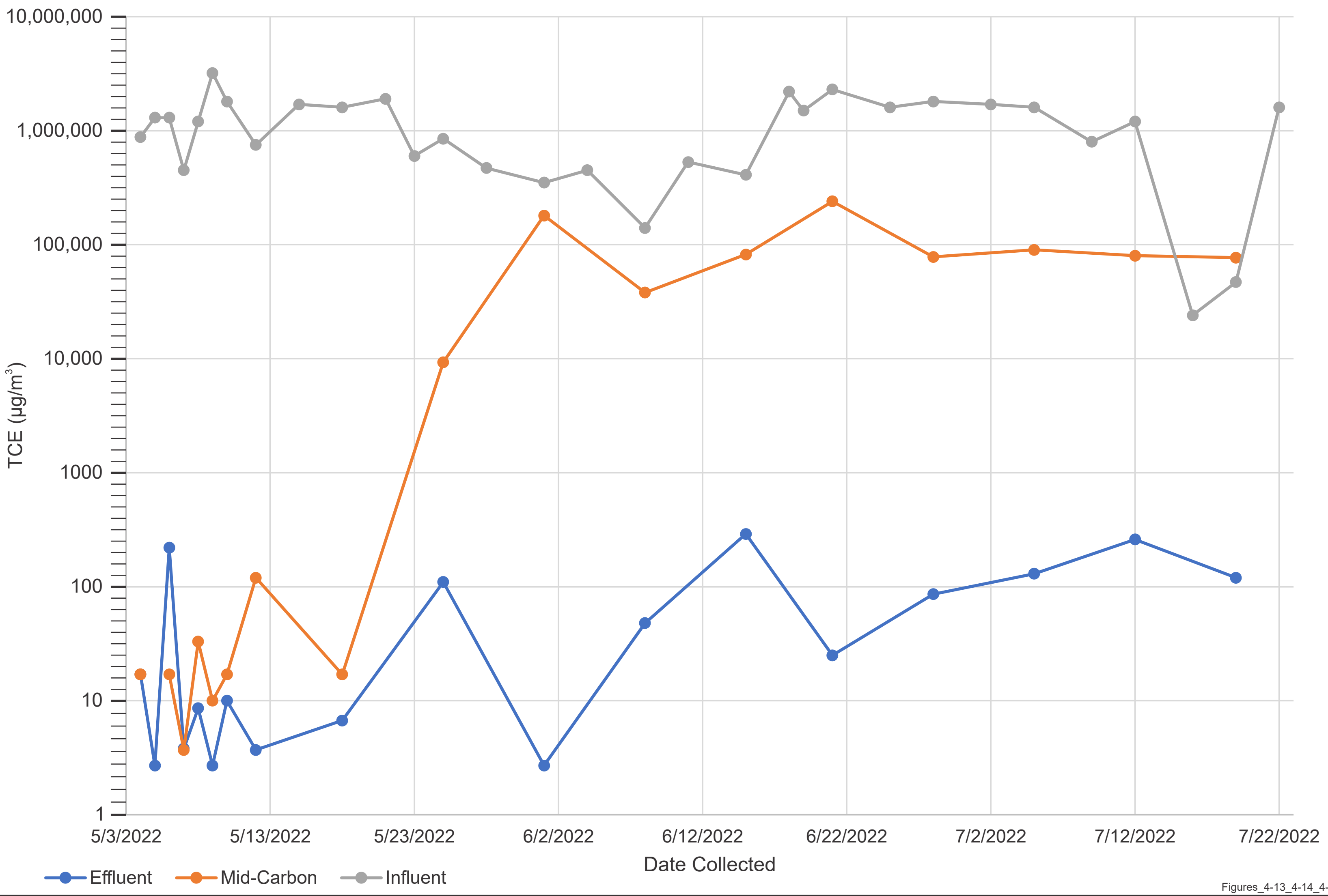
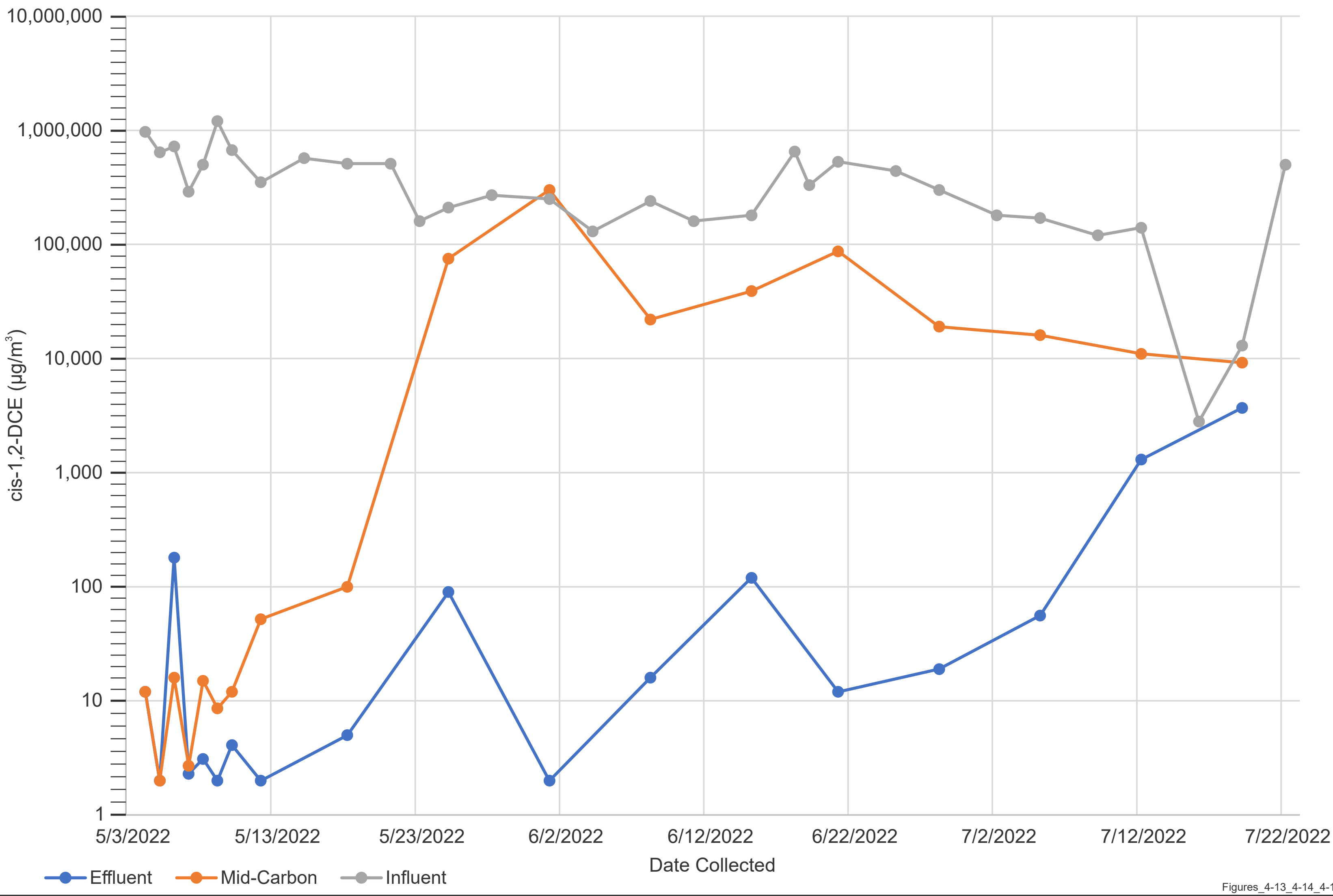


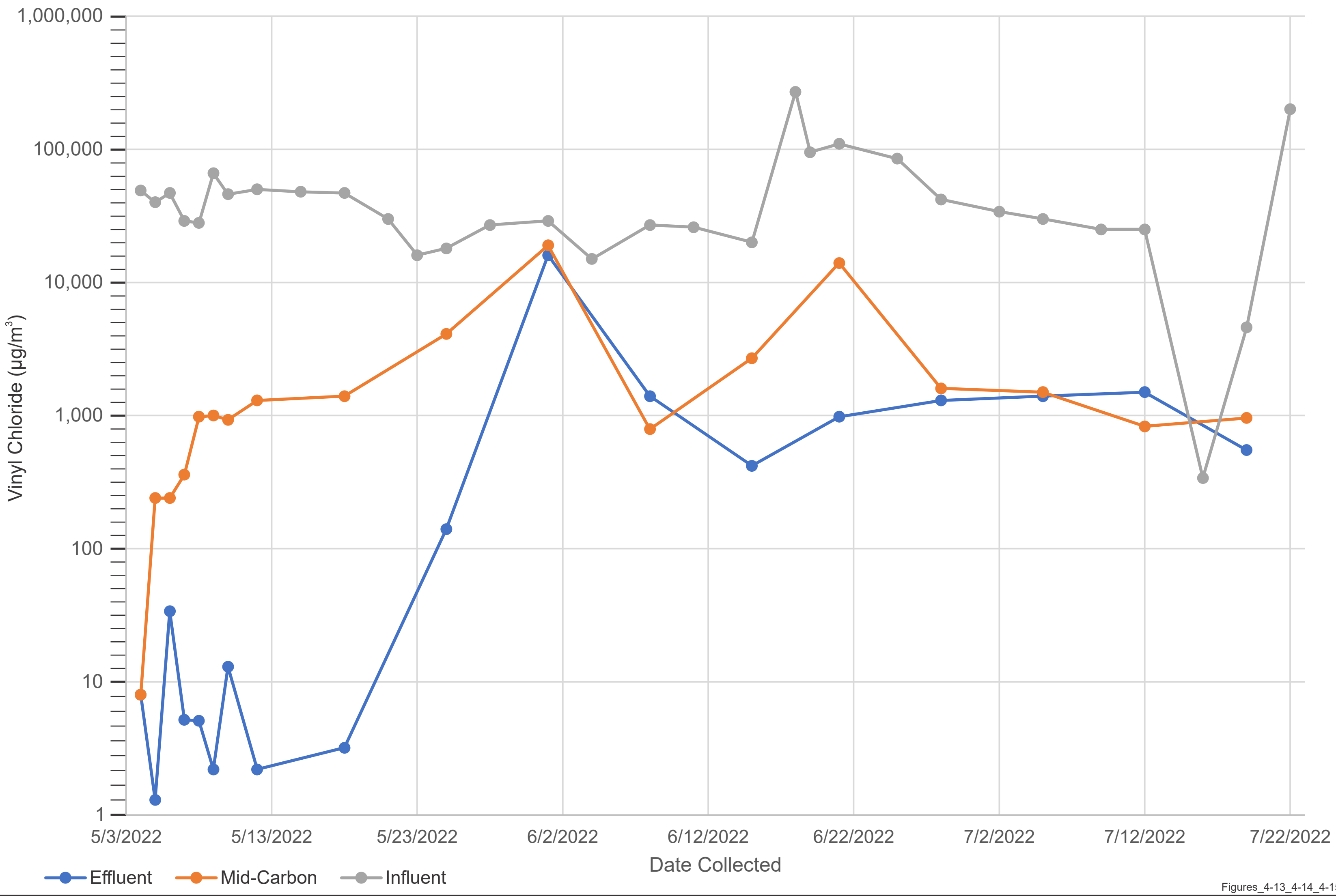
Figures_4-13_4-14_4-15.CDR

U.S. NAVY	**Figure 4-13** **TCE Vapor Concentrations from HVDPE System**	CTO F4225 NBK Keyport HVDPE Pilot Test Report



Figures_4-13_4-14_4-15.CDR

U.S. NAVY	**Figure 4-14** **cis-1,2-DCE Vapor Concentrations from HVDPE System**	CTO F4225 NBK Keyport HVDPE Pilot Test Report



Figures_4-13_4-14_4-15.CDR

U.S. NAVY	**Figure 4-15** **Vinyl Chloride Vapor Concentrations from HVDPE System**	CTO F4225 NBK Keyport HVDPE Pilot Test Report

Table 4-1. Summary of Total VOC Mass Removed

Total VOC Mass Removed (kg)	Total VOC Mass Removed - HVDPE + Air Sparging (kg)	Average Daily Removal Rate Before Air Sparge (kg/d)	Average Daily Removal Rate After Air Sparge (kg/d)
VAPOR - LAB			
155.43	76.78	1.78	1.8
VAPOR - PID			
190.78	87.19	1.99	3.05
GROUNDWATER EXTRACTION [a, b]			
145.82	53.42	-	-
COMPOUND-SPECIFIC (VAPOR - LAB)			
Location ID	**Total TCE Mass Removed (kg)**	**Total cis-1,2-DCE Mass Removed (kg)**	**Total VC Removed (kg)**
Total Per Compound:	119.83	31.46	4.13

Notes:
Total VOC mass removed calculated by using laboratory data and interpolation using a linear regression model with PID data
kg - kilograms
kg/d - kilograms per day
[a] Total VOC mass removed in Groundwater based on last groundwater sample collected on 7/19/2022
[b] Average daily removal rates not included for groundwater due to much greater rate during first week of test

Table 4-2. Summary of Aquifer Parameter Estimation

Date(s) of Test	Wells Tested	Analytical Solution	Transmissivity/Hydraulic Conductivity
Constant-Rate Extraction Test (multiple pumping wells)			
May 3, 2022 - July 28, 2022	MW1-66 (pumping[b]) MW1-76 (pumping[b]) MW1-77 (pumping[b]) MW1-55 (observation)	Neuman	T = 2.633 cm^2/sec K = 0.00216 cm/sec
Distance-Drawdown			
May 3, 2022 - June 17, 2022	MW1-76 (pumping) MW1-49 (observation) MW1-50 (observation) P1-6 (observation) P1-7 (observation)	Cooper-Jacob	T = 3.456 cm^2/sec K = 0.00283 cm/sec
Slug Tests [c]			
April 29, 2022	MW1-49	Bouwer & Rice	K = 0.00685 cm/sec
April 29, 2022	MW1-66	Bouwer & Rice	K = 0.00150 cm/sec
July 15, 2022	MW1-50	Bouwer & Rice	K = 0.00138 cm/sec
Laboratory Soil Testing			
April 25, 2022	SP-B175/MW1-70 Soil depth = 15 ft bgs	Bouwer & Rice	K = 0.000618 cm/sec
April 25, 2022	SP-B175/MW1-70 Soil depth = 25 ft bgs	Bouwer & Rice	K = 0.000632 cm/sec
April 27, 2022	SP-B174/MW1-69 Soil depth = 10 ft bgs	Bouwer & Rice	K = 0.000679 cm/sec

Notes:
K - hydraulic conductivity in centimeters per second
T - transmissivity in centimeters squared per second
[a] Aquifer depth for constant-rate extraction test and distance-drawdown test estimated as 40 feet for calculations.
[b] Pumping rates calculated as total discharge from wells during HVDPE system operation (sum of submersible pumping rates and inferred vacuum extraction flow rates from stinger tubes).
[c] Slug tests run as falling head and rising head tests in duplicate (MW1-50) and triplicate (MW1-49, MW1-66). Results shown are averages for each well.

Table 4-3. Treatment System – Process Water Effluent Results

Analyte	TTO	SVOCs	PCBs	Cadmium	Chromium	Copper	Lead	Nickel	Silver	Zinc	Cyanide	TPH-D	TPH-G
Units	ug/L	ug/L	ug/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Action Limit (mo. avg)	**N/A**	**N/A**	**N/A**	**0.26**	**1.71**	**2.07**	**0.43**	**2.38**	**0.24**	**1.48**	**0.65**	**N/A**	**N/A**
Action Limit (daily max)	**2,130**	**N/A**	**N/A**	**0.69**	**2.77**	**3.38**	**0.69**	**3.98**	**0.43**	**2.61**	**1.2**	**N/A**	**N/A**
EF-01-220504	5 U	0.28 J	0.095 U	0.001 U	0.00273	7.63E-04 J	1.65E-04 J	0.00399	0.001 U	0.72	0.005 U	0.096 U	100 U
EF-02-220511	5 U	0.34 B	0.095 U	0.001 U	9.98E-04 J	5.05E-04 J	4.21E-04 J	0.00263	0.001 U	0.488	0.005 U	0.097 U	100 U
EF-03-220518	5 U	5.3 B	0.096 U	0.005 U	0.005 U	0.005 U	5.65E-04 J	0.005 U	0.001 U	0.543	0.005 U	0.095 U	100 U
EF-04-220525	1.5 H	9.5 U	0.095 U	0.001 U	0.001 U	8.67E-04 J	9.15E-04 J	0.00232	0.001 U	0.366	0.005 U	0.093 U	100 U
EF-05-220601	0.35 J	0.46 J	0.096 U	0.001 U	8.80E-04 J	0.0013	7.46E-04 J	0.00231	0.005 U	0.266	0.005 U	0.057 J	100 U
EF-06-220608	0.91 J	9.6 U	0.097 U	0.001 U	0.00334	2.89E-04 J	3.36E-04 J	0.00189	0.005 U	0.233	0.005 U	0.098 U H	100 U
EF-07-220615	10.7	9.5 U	0.097 U	0.001 U	5.74E-04 J	4.12E-04 J	5.56E-04 J	0.00197	0.001 U	0.186	0.005 U	0.096 U	100 U
EF-08-220621	1.7	9.7 U	0.096 U	0.001 U	0.00141	0.001 U	1.72E-04 J	0.00176	0.001 U	0.173 F1	0.005 U	0.097 U	100 U
EF-09-220628	1.44	9.7 U	0.095 U	0.001 U	0.00296	3.57E-04 J	6.23E-04 J	0.00172	0.001 U	0.157	0.005 U	0.095 U	100 U
EF-10-220705	1.3	9.5 U	0.095 U	0.001 U	0.002 U	0.002 U	8.05E-04 J	0.00164 J	0.001 U	0.145	0.005 U	0.098 U	100 U
EF-11-220712	0.56 J	9.5 U	0.095 U	0.001 U	0.002 U	0.0102	0.011	0.0237	0.001 U	0.446	0.005 U	0.096 U	100 U

Notes:
TTO is the summation of the detections of the following VOCs: 1,1,1-Trichloroethane, 1,1,2,2-Tetrachloroethane, 1,1,2-Trichloroethane, 1,1-Dichloroethane, 1,1-Dichloroethene, 1,2-Dichlorobenzene, 1,2-Dichloroethane, 1,2-Dichloropropane, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 2-Chloroethyl vinyl ether, Benzene, Bromodichloromethane, Bromoform, Bromomethane, Carbon tetrachloride, Chlorobenzene, Chloroethane, Chloroform, Chloromethane, cis-1,3-Dichloropropene, Dibromochloromethane, Dichlorodifluoromethane, Ethylbenzene, Methylene Chloride, Tetrachloroethene, Toluene, trans-1,2-Dichloroethene, trans-1,3-Dichloropropene, Trichloroethene, Trichlorofluoromethane, Vinyl chloride, and Total Xylenes.
SVOCs is the summation of SVOC detections.
PCBs is the summation of PCB aroclor detections.
B - Compound was found in the blank and sample
H - Sample was prepped or analyzed beyond the specified holding time
J - Estimated: The analyte was positively identified; the quantitation is an estimation
U - Undetected at the Limit of Detection
F1 -
mg/L - milligrams per liter
ug/L - micrograms per liter
TPH-G - total petroleum hydrocarbons as gasoline
TPH-D - total petroleum hydrocarbons as diesel

Table 4-4. Treatment System – Vapor Effluent Results

Analyte	Trichloroethene		cis-1,2-Dichloroethene		Vinyl chloride	
Units	μg/m^3		μg/m^3		μg/m^3	
VR-EF-01-220504	17	U	12	U	8	U
VR-EF-02-220505	2.7	U	2	U	1.3	U
VR-EF-03-220506	220		180		34	
VR-EF-04-220507	3.8		2.3		5.2	
VR-EF-05-220508	8.6		3.1		5.1	
VR-EF-06-220509	2.7		2	U	2.2	
VR-EF-07-220510	10		4.1		13	
VR-EF-08-220512	3.7		2	U	2.2	
VR-EF-09-220518	6.7	U	5	U	3.2	U
VR-EF-10-220525	110	H	90	H	140	H
VR-EF-11-220601	2.7	U H	2	U H	16,000	H
VR-EF-12-220608	48	H	16	H	1,400	H
VR-EF-13-220615	290	H	120	H	420	H
VR-EF-14-220621	25	H	12	H	980	H
VR-EF-15-220628	86	H	19	H	1,300	H
VR-EF-16-220705	130	H	56	H	1,400	H
VR-EF-17-220712	260	H	1,300	H	1,500	H
VR-EF-18-220719	120	H	3,700	H	550	H

Notes:
H - Sample was prepped or analyzed beyond the specified holding time
U - Undetected at the Limit of Detection
μg/m^3 - micrograms per cubic meter

5.0 DECISIONS

This section presents the decisions made based on the data collected and the decision rules established in the SAP, which are restated in italic text at the beginning of each subsection below.

Some data evaluation called for in the SAP can only be completed following additional data collection and analysis under separate contract. These evaluations will be described in the pending supplemental RI for OU 1 and include:

- Evaluation of rebound based on post-test groundwater sample analyses.
- Evaluation of source strength reduction scenarios using the numeric fate and transport model being developed under separate contract.

5.1 DECISION RULE 1

Decide the best estimate of the expected contaminant mass that could be removed using full-scale HVDPE technology, both alone and when combined with air sparging, in high contaminant concentration areas of the former landfill.

The estimates of mass removal during the pilot test and regression analysis forecasting (see Section 4.4) implies that if the system continued to operate for the next year as it did during the three-month test, as much as three times the mass removal (a total of 600 kg) might be achieved. However, an alternative forecasting methodology implies that as little as an additional 60 kg of total VOC mass would be removed during continued operation, with a rapid decline in removal rate after approximately an additional two to five months of operation. The forecast estimates that use of air sparging would result in as much as twice the mass removal during a one-year operational period compared to HVDPE without air sparging. The forecast methods show a one-order-of-magnitude uncertainty in the potential future mass removal estimate. This wide range of values conveys the uncertainty in the forecast. This forecast range is a best estimate based on the data available from this study. This uncertainty will be considered during evaluation of this technology in the FFS. Also during the future FFS process the Navy will estimate the total mass of cVOCs present in the subsurface at OU 1, so that estimated mass removals possible using various technologies can be compared to the total available mass.

VOC concentrations in the combined vapor stream and in the individual extraction wells exhibit very similar trends over time, with and without air sparging, indicating that recoverable VOC mass is available throughout the South Plantation.

5.2 DECISION RULE 2

Decide the best estimate of vacuum radius of influence, groundwater drawdown, expected capture zone, expected contaminant rebound, and resultant well design and distribution for evaluation of full-scale implementation of HVDPE to be evaluated under the future FFS.

Overall, 1 to 3 ft of groundwater drawdown was observed in wells across the highest concentration plume area during the pilot test. The drawdown observed in MW1-68, installed within 10 feet of extraction well MW1-66 but beneath a 16-ft-thick clay, indicates that water-bearing zones that appear discrete during drilling are likely hydraulically connected in many cases, and any future remedial actions should account for complex migration pathways through the braided paleochannel system identified beneath the site.

For the South Plantation area, even the high vacuums and air flow rates applied were not sufficient to dewater the extraction wells without the downhole pumps in place. Even with pumping, the water table was only lowered 1 to 3 ft across the area of interest, which was not sufficient to expose the most highly contaminated portions of the aquifer to vapor extraction. Any full-scale remedial technology that includes vapor extraction should be designed to also extract substantial volumes of groundwater in order to achieve the necessary drawdown. As a working estimate, nine to 15 extraction wells might be required for sufficient dewatering across the South Plantation, extracting water at 7 gpm per extraction well, or approximately 60 to 100 gpm total.

The data obtained during this pilot study can also be used to inform evaluation of other remedial technologies that include groundwater extraction, vapor extraction, or air injection. Pumping for hydraulic control (e.g., behind a sealed containment wall) could be expected to generate water at approximately 10 gpm. Pumping at this rate could also be performed as part of a traditional pump and treat system. A pump and treat system at this site would rely on mass removal at the desorption rate of cVOCs from soil into groundwater and would likely require decades to achieve meaningful reductions in cVOC concentrations in groundwater, based on the CSM for the site and the steady cVOC concentrations observed in extracted groundwater during this pilot study.

Air sparging was found to increase subsurface pressures substantially over a wide area, with air movement through preferential pathways. These effects would need to be accounted for in the design of any future remedial technology that includes sparging. Section 4.7 presents details for consideration during full scale design of any technology similar to that used during this pilot test.

5.3 DECISION RULE 3

Assess whether this technology could be used to prevent, or substantially reduce, high-concentration VOC migration in groundwater to surface water adjacent to the former landfill by integrating the results of the HVDPE pilot study into the fate and transport groundwater modeling (scoped separately in support of the supplemental RI).

A complete assessment of this decision rule will require the results of data and analyses being performed after publication of this report. Pending data include the groundwater and surface water samples being collected following completion of the HVDPE pilot study, at 1 month, 3 months, and 6 months post-testing. These data will document any reduction in cVOC concentrations that resulted from the HVDPE pilot testing, and any rebound observed as a dynamic equilibrium is re-established in the subsurface. Pending analysis includes incorporation of the mass removal results from this study in source strength reduction scenarios under the fate and transport model. These pending results will be included in the future supplemental RI report, which is scoped separately.

The data that were generated during the pilot study and that are available for inclusion in this report indicate that the pilot study met its overall objective to the effectiveness of HVDPE as a potential remedial technology to treat hot spots at OU 1. The results available at the time of this report indicate that HVDPE with or without air sparging should be included as a remedial technology for evaluation in a future remedy optimization FFS. However, a future evaluation of this technology is likely to note that large volumes of highly contaminated water would need to be extracted and treated in order to sufficiently lower the water table and make vapor extraction effective. The results of this pilot study also provide a basis for evaluating other remedial alternatives that include the technologies of groundwater extraction, vapor extraction, or air injection.

6.0 REFERENCES

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APPENDICES

APPENDIX A

Responses to Agency and Stakeholder Comments on the Draft Report

Ecology Responses to Navy RTC (01/12/2023)

Comments from Ecology					
Comment Number	**Section/Page Number**	**Comment**	**Response**	**Ecology Response (01/11/2023)**	**Additional Navy Response (1/18/23)**
1.	General: Efficacy of the pilot test	In general, the HVDPE system was able to remove significant mass of VOCs (about 350 kg) from the landfill in a period of 3 months, which can be called a successful pilot test. However, many questions still need to be answered before this can be used as a remedial technology for the FFS. These include uncertainty in the mass removal estimates (see more specific comments below), likely interference with total petroleum hydrocarbon (TPH) VOCs (see below), reevaluation of post groundwater samples, uncertainty (unavailability) of the total VOC mass present in the landfill, uncertainty in the ROI estimates (water level and drawdown are not static), and other factors. Nonetheless, information obtained is very useful and can help remedy selection in the FFS. More evaluation can be planned based on lessons learned from this pilot test and fill in the data gaps.	Thank you for this overall assessment of the pilot study results.	Response accepted.	Thank you.
2.	General: Mass removal estimates	The report presented huge uncertainty in removing mass (additional 60 kg to 600 kg) for a one-year full scale operation. This may not justify its full-scale operation given that other technologies and cost factor is yet to be analyzed. From technical point of view, the mass removal rate based estimate makes more sense as VOC concentration continued to go down with time. Even though cumulative mass removal has a better fit, it should be noted the time period (3 month) is small and VOC extraction could go down drastically after 3 months without a new extraction well point. Also, 60 kg is more conservative estimate. The biggest issue is there is not a good estimate of how much VOC mass is remaining in the landfill. Without this estimate, restoration timeframe calculations cannot be done. Rebound groundwater concentration data after the	The Navy agrees that the forecast methods show a one-order-of-magnitude uncertainty in the potential future mass remove estimate. This wide range of values conveys the uncertainty in the forecast. A sentence will be added to this section to highlight this uncertainty and explain this is a best estimate at this time. This uncertainty should be, and will be, considered during evaluation of this technology in the FFS.	Response accepted. "Any such estimate would be part of the pending supplemental RI report." – How will the Navy follow thorough this effort, if the report does not show this as a recommendation? This response may be buried in the future and get lost. Please describe the process for following through.	We will add text to the report committing the Navy to making a mass estimate during the future FFS.

Comments from Ecology					
Comment Number	**Section/Page Number**	**Comment**	**Response**	**Ecology Response (01/11/2023)**	**Additional Navy Response (1/18/23)**
		pilot along with previous recharacterization/ groundwater levels could shed some light into this matter. Ecology recommends that the Navy make good estimates of the mass remaining in the landfill.	The Navy will consider making an estimate of the mass remaining in the landfill, which would likely require applying a phase partitioning model to the 3-dimensional interpolated isoconcentration shells to account for both dissolved and sorbed mass. Any such estimate would be part of the pending supplemental RI report.		
3.	General: TPH and its effect on the pilot test	Several boring logs log indicated heavy hydrocarbon odor (AS1-1, SP-B182/MW1-77), which indicates presence of TPH. Has TPH played any roles in the overall pilot test effectiveness? Ecology noted that TPH was also found/detected in phase 2 site characterization. As such, it appears that any VOC source removal action would be affected by TPH. Ecology also noted Vapor-PID mass removal is higher than Vapor-LAB mass removal. Has the Navy put any thoughts on this front? It should be noted that the activated carbon supply company can also provide information whether the carbon usage was higher/similar given the mass of VOCs (measured in the lab) removed.	Certainly VOCs other than that the target cVOCs, including petroleum VOCs, are present in the landfill. The nature of the HVDPE technology is to non-specifically extract all available VOCs. Petroleum VOCs were certainly ionized by the field PID and included in the total VOC value reported by the instrument, whereas the laboratory analysis focused on the target cVOCs of interest. Collateral remediation of other VOCs (beyond the target cVOCs) would occur with the use of HVDPE. The mix of VOCs extracted would affect the performance of the treatment components (carbon loading, etc.). These effects as experienced by the pilot system are incorporated into our analysis by the nature of the total VOC values used for the	It appears the project team has not considered the TPH issue, most likely because the ROD did not include TPH as a COC. While HVDPE targets all VOCs, we needed to monitor petroleum VOCs as well as part of the pilot test. As such, Vapor-PID based mass removal and Vapor-LAB based mass removal are not comparable. Ecology strongly recommends considering TPH in future evaluations. We cannot ignore this anymore as boring logs data indicate present of petroleum products. There needs to be proper characterization and risk assessment	The presence of TPH was considered, and the analysis process used in the report is that agreed to by the Project Team during review and approval of the sampling and analysis plan. If TPH is added as a contaminant of concern at the site as a result of the updated risk assessment, then the Navy will take appropriate action in accordance with the CERCLA process. The PID measurements of total VOCs correlate well with the totals of target cVOCs and meet the requirements of this project for evaluating VOC recovery trends and mass removal estimates. The project objectives do not necessitate that VOCs beyond the target VOCs (such as TPH compounds) be individually analyzed. A non-specific total VOC value is sufficient for the purposes of this study.

Comments from Ecology					
Comment Number	**Section/Page Number**	**Comment**	**Response**	**Ecology Response (01/11/2023)**	**Additional Navy Response (1/18/23)**
			overall performance calculations.	discussion in the supplemental RI.	
4.	Section 2.3 HVDPE System startup and operation	It was difficult to follow in the text when vacuum was off/on (what wells?). Apparently, vacuum was off during AS startup, and turned back on the day after when bubbles were seen. However, Figure 2-2 does not reflect that. It may be helpful to show different operating parameters in a Table or graph to visualize the operation.	The best detailed summary of operating conditions is the table at the end of Appendix F. The second sentence of Section 2.3.2 will be revised to read, "At the start of air sparging, vapor extraction was turned off at MW1-76 and MW1-77, with extraction only from MW1-66 located immediately adjacent to the sparge point."	Response accepted.	Thank you.
5.	Water level "data logger" data validation	Were there any wells that were equipped with data loggers checked with manual measurements? If not, what type of QA/QC was done to validate the data logger data?	Yes, there were some manual measurements of wells with installed dataloggers however all analysis of datalogger data was based on drawdown compared to an arbitrary zero (not tied to absolute elevation). The dataloggers are factory calibrated.	Ecology recommends adding this info to the report. It can be a Table/ paragraph how manual measurements and data logger readings were compared. The data logger readings should have been tied to absolute elevation. However, in the absence of that, there should be field verification of relative drawdown with manual measurements.	The Navy disagrees that there was any need to tie the datalogger readings to absolute elevation for the purposes of this study. Factory-calibrated pressure transducers accurately measure relative changes in groundwater head over time, and these relative changes are the data needed to draw the conclusions for this study. The overall data set consisting of manual measurements is consistent with the overall data set of transducer-measured drawdowns.
6.	Tidal influence on drawdown	Drawdown curves presented in appendix I show daily variations. What is the reason for these fluctuations? How much was the tidal fluctuations in groundwater, if any, when there were no pumping in south plantation? Has tidal influence played any roles in drawdown calculations or aquifer parameter estimation?	The reason for these fluctuations is stated on Page 4-8, "The plots of groundwater drawdown (Appendix I), as recorded by the dataloggers measuring on 5-minute intervals, show a high degree of fluctuation in drawdown. This fluctuation is the result of	Response accepted.	Thank you.

Comments from Ecology					
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		In addition, what is the blue line on drawdown Vs. time curve for P1-6?	numerous brief system shutdowns needed for regular system maintenance." Although there may be an overlay of tidal influence, past tidal studies have shown that any such influence at this inland portion of OU 1 would be very small (a few inches of variation) compared to the variation documented (several feet). A steady diurnal pattern is not apart in the groundwater fluctuations. The blue line represents raw data, uncorrected for barometric pressure and will be removed from this graph.		
7.	Figure 2.2 and 2.3	The pumping rate for MW1-66 and MW1-76 showed quite a bit variation (and therefore total pumping rate) whereas vacuum remained constant. Any explanations? Also, MW1-77 was shut off couple of days later as mentioned in Figure 4-1 and 4-2 but was not discussed in the text. Please explain. show any variation.	Managing water flow rates to balance against the treatment capacity is more sensitive than for vapor flow. At the beginning of the study more tuning of groundwater pumping rate was required to maximize drawdown with treatment capacity available. Later pumping rate variations are primarily an artifact of the frequency of totalizer readings and the brief periodic maintenance shut-downs. Additional text will be added to Section 2.3.1 regarding MW1-77 in response to comments	Response accepted. Please follow up with the additional text.	Thank you. The additional text is included in the final report.

Comments from Ecology					
Comment Number	**Section/Page Number**	**Comment**	**Response**	**Ecology Response (01/11/2023)**	**Additional Navy Response (1/18/23)**
			from EPA and the Suquamish Tribe.		
8.	Table 2-5. Maximum Drawdown	It appears the water level was not fully recovered after 6 days of recovery. For example, MW1-68 recovered about 60% from the static water level at start of HVDPE test. Yet "Maximum Drawdown" was defined as "difference of final DTW reading prior to HVDPE system shutoff and DTW following 6 days of recovery". Explain the rationale for this definition specially when recovery is less than 90%.	Because the test duration was 3 months and spanned a period of variable seasonal precipitation, recovery cannot be meaningfully defined based on the starting water level pre-test to the final water level post-test. Natural water level variations over this period obscure the effects of dewatering and recovery based on operation of the HVDPE system. A better definition is the recovery from a known pumped condition and flow rate just before shut down to the point where the recovery curve becomes asymptotic. This is similar to how recovery is measured and defined for both traditional pumping tests and slug tests. In this case, 6 days of recovery monitoring post shut down documents an initial steep recovery followed by flattening to an asymptote.	This should be explained in the report. Historical data can be analyzed to determine seasonal water level variation and account for in the calculation.	This explanation will be included in the report. The Navy disagrees that historical data could be used to account for the specific seasonal water level variation observed during this testing period in any meaningful way.
9.	Table 2-5. Footnote "d"	If static water level was collected after start of test (on 5/6/2022), then how maximum drawdown was calculated (manual measurements).	In Table 2-5, we will change static water level values to the ones collected on 5/3/22, and delete footnote "d". These values are at the bottom of the field data sheets for 5/3/22.	The Table 2-5 is still unclear and fails to convey clearly how drawdown was calculated. Too many footnotes are presented to do several different types of calculations to	One mistake was caught – footnote "d" now correctly shows these static water levels were taken on 5/5/22, after system start up. This was due to an equipment issue. Therefore the maximum drawdown calculated for these wells is slightly less than the actual drawdown that would have been evident if static levels were collected before system start

Comments from Ecology					
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				fit in a Table which is confusing.	up. Any difference between actual maximum drawdown with how it was calculated would likely be negligible and would have no impact on the findings and conclusions of this study. The table clearly states how drawdown was calculated for each well. Based on the nature of data collection, different methods for calculating maximum drawdown had to be used.
10.	Section 3.4 Data Validation	What percent of data were usable (# of usable results/# of expected sample results in SAP). In addition, Include the third-party data validation report as an appendix to the report.	No data were rejected (i.e., 100% of the validated data were usable) as stated in the last paragraph of 3.4. The laboratory reports and data validation reports will be added to the report as appendices.	The basis of this comment is to present percent of data that is usable compared to number of results expected. While no data were qualified as "R", some data were not analyzed due to broken sample container. In addition, this should include: if one/more samples were not collected during sampling due to field conditions, but they were called for in the SAP/QAPP. That would reduce the percentage (# of usable results/# of expected sample results in SAP). Hope the comment is clearer now.	An analysis of sample quantity expected in the SAP compared to actual samples collected will be included in the final report.
11.	Section 3.4 Data	The report stated, "Field duplicate RPD criteria for soil samples was less than or equal to (≤)	The vinyl chloride was erroneously not estimated J.	Response accepted.	Thank you. The edits are shown in the final report.

Comments from Ecology					
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	Validation Table 3-3	50% for cVOCs.". This seems incorrect. RPD for vinyl chloride in the duplicate pair SPB182-S-7.5-220421/SP-B182-S-8.0-220421 in soil is 66% (Table 3-3). RPD for cis-1,2-DCE in the duplicate pair SPB182-S-7.5-220421/SP-B182-S-8.0-220421 is 175%. The report provided explanation for cis-1,2-DCE. it stated, "Results for these analytes and samples should be considered estimates." Are these results flagged "J"? These results are about 50 to 700 times the quantitation level (QL) in the SAP. Also, why use the term "should be"?	This has been corrected in the final report. Thank you for identifying this error. Other corrections have been made as you suggested.	Please follow up with the corrections.	
12.	Table 3-4. Flag H, H3 of CalClean results and data interpretation	A significant number of samples were flagged "H - Sample was prepped or analyzed beyond the specified holding time" and "H 3 - Sample was received and analyzed past holding time". What is the reason for this delay? Were any of these results were used in the data analysis that would influence decision making? It appears trend analysis and mass removal estimates were performed with these data that did not go through a third-party data validation. As such, data interpretation needs to be qualified in the report (uncertainty is high).	Although these H-flagged data do introduce additional uncertainty into the absolute values of the reported results, the overall total VOC values track well with the field PID and individual key VOC values track well with the independent verification laboratory results when considered as concentration trends over time. The uncertainty in these values primarily impacts the already uncertain estimates of potential future absolute mass removal (which are more strongly affected by the difficulty of predicting the response of the subsurface to long-term HVDPE). Conclusions regarding the potential future effectiveness of full-scale HVDPE at the site, likely extraction and sparge well configurations, and impact on overall site cleanup are not	Please include this explanation in the report that this additional uncertainty does not influence decision making.	This text will be included in the final report.

Comments from Ecology					
Comment Number	**Section/Page Number**	**Comment**	**Response**	**Ecology Response (01/11/2023)**	**Additional Navy Response (1/18/23)**
			substantively impacted by these uncertainties.		
13.	Table 3-5. RPD between CalClean and Pace	The RPD between CalClean and Pace results for vapor samples are beyond normally accepted RPD values. The Navy used a 1996 reference and extrapolated soil to vapor. The report stated, "Based on this reference and the SAP, VOCs have an acceptable RPD range of 25 to 400% in soil and 50 to 200% in water." The SAP has 35% for groundwater 50% for soil. Extending these values to 200% in water and 400% in soil (and vapor) through a very old reference makes the data quality questionable. Note that the homogeneity of contaminants in water is greater than soil and through that logic homogeneity of contaminants in air should be greater than water (and soil definitely). As such, data interpretation needs to be qualified in the report (uncertainty is high).	The RPD targets and the reference for those targets were accepted as part of the approved SAP. The following additional explanation will be added, "The larger RPDs for vapor samples compared to water samples likely reflects inherent small-scale temporal variations in concentrations, which tend to be higher in vapor than in water process streams. For both water and vapor, the verification samples collected were replicate samples, collected immediately following collection of the parent sample. Lower RPDs would likely have been achieved if duplicate samples were collected, which would have required plumbing changes at the sample port to allow simultaneous filling of parent and duplicate sample containers."	Response accepted. Please follow up with the additional text.	Thank you. The additional text will be included in the final report.
14.	Figure 3-1 and 3-2	Figure 3-1 and 3-2 was provided without any discussion. Were these used in the data analysis/interpretation? In Figure 3-1, how total VOC concentration was determined? Has TPH played any roles in these VOC measurements? Is the field PID specific to cVOCs?	Figures 3-1 and 3-2 are discussed in Section 3.2, including how these interpretations were used. The field PID is non-specific and will ionize any VOC with an ionization potential less than 10.6 eV (which includes the	Figure 3-1 and 3-2 should be updated with the goodness of fit curve and coefficient of determination.	We will add this requested information to the figures.

Comments from Ecology					
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			most relevant petroleum VOCs). Figures 3-1 and 3-2 document the analysis performed to demonstrate that the non-specific total VOC measurements are a reasonable surrogate for the target cVOCs.		
15.	Section 4.3	The report stated, "VOC concentrations in vapor quickly rise to a peak value upon system startup and initial extraction optimization, then decline slowly over the following weeks until air sparging is initiated." While visually this may appear to be the case, we also need to account for the variability in the data and that RPDs up to 200% have been deemed acceptable for the project.	The cited RPDs are between the CalScience data set and the verification laboratory replicate data set. These RPDs should not be construed to apply between measurements within the single data set used for these trend analyses.	Response not accepted. While that is correct "RPDs are between the CalScience data set and the verification laboratory replicate data set", we cannot ignore the variability of the individual data points in a single data set. The RPDs set the stage for data variability and how they can be used/interpreted. Ecology recommends adding uncertainty languages in these trends.	The Navy's response does not ignore the variability of the individual data points in a single data set. Instead, we are pointing out that the cited RPDs do not represent the variability within the CalScience data set. Additional uncertainty language, beyond that already included in the report, is not necessary.
16.	Section 4.3	The report stated, "Air sparging caused a rapid rise in VOC concentrations at all three extraction wells, even though the extraction wells are located at substantially different distances from the air sparge point (roughly 10 ft, 40 ft, 210 ft)." It is not understandable why the VOC concentration would jump significantly in MW1-76 and MW1-77 since they seem to be quite far from the radius of influence of air sparging well AS1-1. Is it because there may be a short circuiting with connected permeable paleochannel? We also noted the	Yes, the subsurface lithologies are the likeliest explanation for the observed affects of air sparging, as discussed in Section 4.7.2, "In the area of the South Plantation, the construction of sparge point AS1-1 appears to have been optimal, with the point set just above the clay aquitard	Response accepted.	Thank you.

Comments from Ecology					
Comment Number	**Section/Page Number**	**Comment**	**Response**	**Ecology Response (01/11/2023)**	**Additional Navy Response (1/18/23)**
		concentration in these two wells remained similar during AS.	within a coarse sand/fine gravel (bottom depth of sparge point 27.5 ft bgs). The high permeability of this coarse unit probably accounts for the wide lateral distribution of air observed from sparging during the pilot test."		
17.	Section 4.3	The report stated, "This indicates that the soils and contaminants in the vicinity of each of the three extraction wells respond similarly to extraction, and that each well is placed in a similar location relative to the highest VOC concentrations in the vicinity of each well." Is this supported by the site recharacterization data? It appears MW1-66 is in within the highest source area and MW1-76 and MW1-77 are outside the hotspot area (see Figure 1-3 and Figure 4-12). The range of concentrations in MW1-76 and MW1-77 screened interval based on PID data is at lease 2 to 3 orders of magnitude lower (Figure 4-12). Alternately, the plume map (Figure 1-3) is not accurate for this degree of interpretation.	Yes, this statement is supported by the site characterization data. As written the statement does not claim that the concentrations are the same around each extraction well, but rather that the wells are similar positioned relative to the highest concentrations near each well. This is in comparison to other possibilities, such as the hypothetical case where one well was farther from the nearby highest concentrations and therefore might have shown increasing concentrations as VOCs were drawn toward the well from a more distant hot spot.	Response accepted.	Thank you.
18.	Figure 4-3	The report stated, "As shown on Figure 4-3, VOC concentrations in extracted groundwater declined by an order of magnitude between the first and second samples (one week apart) and then remained within a relatively narrow range of 20 to 40 mg/L total VOCs." After the initial decline TCE concentration started to increase and decrease after air sparging	This is a good observation, thank you. The cis-1,2-DCE concentration does appear to be more stable than the TCE concentration, perhaps indicating a more uniform source strength for cis-1,2-DCE? This breakdown product is more ubiquitous at the site	Response accepted. Please follow up with the additional text.	Thank you. The additional text will be included in the final report.

Comments from Ecology					
Comment Number	Section/Page Number	Comment	Response	Ecology Response (01/11/2023)	Additional Navy Response (1/18/23)
		while cis-DCE remained constant. Is there any interpretation for this?	compared to TCE. Although a bit speculative, we can add a note to this effect in Section 4.3.		
19.	Table 4-2	This Table shows MW1-77 as pumping from May 3 to July 28, whereas Figure 2-3 shows MW1-77 is mostly non pumping.	See addition of Table 4-2 footnote, as stated above. We will revise the Y-axis label on Figure 2-3 Y-axis to be "Well Discharge Flow Rate" instead of "Well Pump Flow Rate," to clarify that extraction was occurring, even if downwell pumping was not.	What footnote of Table 4-2? Please follow up with the revised Figure.	From the response to EPA Comment 3, "The Table 4-2 footnote will be clarified to indicate that 'pumping' wells refers to total discharge from well: submersible discharge rates in addition to vacuum extraction via stinger tubes." The revised figure will be included in the final report.

Response to Comments
NBK Keyport OU 1 N
HVDPE Pilot Study Report
Dated November 10, 2022

Comment Number	Section/Page Number	Comment	Response
Comments from Andrew Schmeising, Suquamish Tribe			
1.	General Comment	The report is vague on the types of instruments and measurement devices used. Suggest including all system process measurement gauges (including type) on the schematic diagram on Figure 1-5, or perhaps include them on a take-off table, with the type of instrument used at each measurement or sampling port on the diagram. If this information was included somewhere I apologize for missing it.	When measurements are first discussed in the report, the instrument used will be described and an appendix will be referenced that includes cut sheets of the instruments used.
2.	Sections 2.4.1 and 5.1	Report Sections: Section 2.4.1 "vapor flow rate", Table 2-4 "System Operating Parameters", Mass removal figures (Figures 4-4 through 4-11), and Section 5.1 "The estimates of mass removal during the pilot test...". Questions based on the above references to *flow rate*, and Appendix F Field Logs (pages 210-261 of PDF) columns 2-4 (vacuum, flowrate, concentration) and columns 5-13 (extraction wells status and isolated PID readings) 1) How was vapor flow rate in column 3 determined? Was it field measured using a flow meter, or was it calculated? 2) How did flow rate vary based on the number of extraction wells turned on? Was this information recorded elsewhere? 3) How was inlet concentration affected by different combinations of wells being on at different times? 4) How did mass removal rates change due to expected reduced flow when extraction wells were cycled off? 5) How was groundwater flow rate determined? Was it field measured at the time of sample collection, or was it calculated from totals? 6) How was air-sparge flow rate determined? Was it field measured or was it calculated?	The following information will be added to Sections 2.3.1, 2.4.1 or 4.4.1, based on the context: 1. Vapor flow rate in column 3 was measured thru a DS-300-3 Dwyer Flow Sensor pitot tube. The differential pressure was measured within a Dwyer Model 477-1 manometer 0-20" Water Column. The differential pressure was compared to a flow chart (see attached) of a third-party certified DS-300-3 pitot tube. 2. When taking daily flow rates of vapor, the Total Inlet flow rates did not vary by more than 7 cfm during pre-air sparge and no more than 3 cfm once air sparge started on June 18 (as shown in the daily field logs). 3. For the majority of the event, vapor extraction was conducted in all three wells at the same time. The inlet concentration shown in the field logs do not show much effect. 4. The extraction wells were cycled on and off only during an approximately 10-

Comment Number	Section/Page Number	Comment	Response
			minute window per day to obtain individual well vapor concentration readings. This would have a minimal effect on overall mass removal rates during the event. 5. Treated groundwater daily flow in gallons was measured thru a 1" Sensus SR II totalizer water meter (specifications attached) and recorded three times per day. The flow rate was calculated using these totalizer readings. 6. Air sparge flow rate was field measured thru a Dwyer RMC-121 (0-10 scfm air) Rate-Master Polycarbonate Flowmeter (specifications attached) and recorded at least once per day during air sparging.
Comments from Benjamin Leake, EPA			
1.	General Comment	EPA has some concerns about the ability of HVDPE to stop off-site migration of contaminants at this site. For example, the drawdown vs time graphs in Appendix I clearly show the influence of tidal fluctuations on drawdown, but the magnitude of the change is different at each well. As long as waste is saturated, preventing off-site migration with HVDPE appears to be impractical. As noted in the report, it is likely that significant volumes of highly contaminated water would need to be extracted and treated to make vapor extraction effective. These issues must be considered when deciding whether to carry HVDPE forward and during development of a future FFS.	The Navy concurs with these observations and believes that the same observations and conclusions are captured in the report. These issues will be considered as part of the future FFS, which will include the evaluation of other options/technologies. We do note, however, that most of the variability in water levels shown on the drawdown versus time graphs in Appendix I more likely represent cycling of the pumping system, rather than tidal influence. Consider the portion of the curve following system shut-down when similar fluctuations are not observed over several days of recovery. Refer to the USGS Open-File Report (2019-1098) on groundwater response to tidal fluctuations for

Comment Number	Section/Page Number	Comment	Response
			more detail on tidal influence on groundwater at OU 1 (Opatz and Dinicola, 2019).
2.	Section 1.1.1, page 1-3	This section states that "Shallow groundwater has consistently been interpreted to flow through the landfill in a radial direction and discharge into the marsh northwest, west, southwest, and south of the landfill." Along with the fact that the landfill is covered with areas of grass, trees, asphalt, and concrete, this information suggests that the landfill is a point of groundwater recharge through the permeable cover. In the future FFS, EPA recommends investigating ways to decrease infiltration into the landfill to reduce percolation through landfill wastes.	The Navy acknowledges this comment and agrees to include an assessment of infiltration in the future FFS.
3.	Section 2.3.1, page 2-5	The second paragraph in this section states that the submersible pump in MW1-77 was turned off on June 14, 2022, "to assess any effects of using stinger tubes only, without submersible pumps." Section 4.5.1 reiterates that the "down-well pump in well MW1-77 was shut down early in the test to focus groundwater recovery on MW1-66 and MW1-76", but Figures 2-3 and 4-1 show MW1-77 being turned off from May 8, 2022, through the end of the test. The status of the pump in MW1-77 should be clarified and presented consistent throughout the report. Additionally, the report should offer some additional commentary on the effects of turning off the pump in MW1-77. Note that Table 4-2 shows MW1-77 as "pumping" for Neuman analytical solution of the constant-rate extraction test.	The statement in Section 2.3.1 will be corrected to read, "On June 14, 2022, the stinger tube in well MW1-77 was gradually lowered, reaching 17 ft bgs by June 16, 2022, to assess any effects of using stinger tubes only, without submersible pumps. The submersible pump in this well had been previously turned off on May 8, 2022." This text from Section 4.7.3 will be reiterated in Section 2.3.1, "HVDPE systems can sometimes operate without down-well pumps. In these cases, the vacuum and air flows achieved through the stinger tubes are sufficient to entrain groundwater at the rate that it enters the extraction wells and allow for complete dewatering of the extraction wells during system operation." The Table 4-2 footnote will be clarified to indicate that "pumping" wells refers to total

Comment Number	Section/Page Number	Comment	Response
			discharge from well: submersible discharge rates in addition to vacuum extraction via stinger tubes.
4.	Section 3.1, page 3-1	The last paragraph in this section states that PFAS compounds were detected in MW1-76 and MW1-77, but that they were "below their respective PALs established in the SAP." Table 3-2 shows PFHxS and PFNA with a PAL of "NE", or "Not Established", which should be clarified in the text. Some reference to the pending PFAS Remedial Investigation at OU1 would add clarity to this section of the report.	The following will be added at the end of this paragraph, "Regulatory standards for PFAS compounds are evolving rapidly, and at the time of the SAP standards were not established for some PFAS compounds where such standards are now available. An in-progress remedial investigation for PFAS at OU 1 will consider all available PFAS data and the most recent regulatory standards."
5.	Section 3.3, page 3-2, 3-3	This section of the report states that the replicated sample pairs had relative percent differences (RPDs) within the acceptable ranges listed in the SAP. While true, RPDs of the scale shown in Table 3-5, especially for the vapor results, do not inspire confidence in the comparisons. For example, the RPDs for Sample VR-TI-16-220601 were between 185% and 199%. Some more detailed explanation of these differences would improve confidence in these comparisons.	The following additional explanation will be added, "The larger RPDs for vapor samples compared to water samples likely reflects inherent small-scale temporal variations in concentrations, which tend to be higher in vapor than in water process streams. For both water and vapor, the verification samples collected were replicate samples, collected immediately following collection of the parent sample. Lower RPDs would likely have been achieved if duplicate samples were collected, which would have required plumbing changes at the sample port to allow simultaneous filling of parent and duplicate sample containers."
6.	Section 4.5, page 4-7	The final paragraph in this section describes why vacuum measurements from observation wells were not collected. Although this appears to be a reasonable explanation, the lack of these measurements means that the number of sparge wells	The Navy concurs that the limitations of the available data will need to be considered during evaluation of all potential remedial alternatives in the future FFS. However, the

Comment Number	Section/Page Number	Comment	Response
		suggested in Section 4.7.1 (3 evenly spaced wells) is speculative. EPA questions whether the information gathered during the pilot study will be adequate to thoroughly evaluate HVDPE as a potential remedy. A better understanding of any potential sparge system will be needed, most likely in the future FFS.	observed widespread effects from a single sparge well are sufficient to conclude that relatively few sparge wells would be needed to cover a wide area, and the Navy therefore feels that the best professional judgement of 3 sparge wells as a point of comparison is somewhat better than speculative.
7.	Section 4.5.1, page 4-7	This section states that maximum drawdown was calculated partly based on the groundwater head after approximately six days of recovery. Water level in several of the wells show a leveling off after a few days in the Appendix I series of figures, but the water levels in MW1-68, and to a lesser extent P1-7 and P1-10, do not appear to have reached a stable level at the end of the graph. The basis for this six-day period should be included in the report. Note that several values in Table 2-5 are based on that calculation.	Following additional review of these graphs, we stand by the conclusion that all wells were substantially recovered compared to the end-of-test drawdown conditions and that any additional water level change in these wells would not have a material impact on the conclusions of the study. Because the test duration was 3 months and spanned a period of variable seasonal precipitation, recovery cannot be meaningfully defined based on the starting water level pre-test to the final water level post-test. Natural water level variations over this period obscure the effects of dewatering and recovery based on operation of the HVDPE system. A better definition is the recovery from a known pumped condition and flow rate just before shut down to the point where the recovery curve becomes asymptotic. This is similar to how recovery is measured and defined for both traditional pumping tests and slug tests. In this case, 6 days of recovery monitoring post shut down documents an initial steep recovery followed by flattening to an asymptote.

Comment Number	Section/Page Number	Comment	Response
8.	Section 4.7.1, page 4-7	This section states that “a much more densely distributed network of extraction wells – on the order of nine to 15 extraction wells” could be required to achieve the necessary lowering of the water table. This is based upon drawdown data calculated from “static” water levels measured after pumping started or maximum drawdown minus water level measured six days after pumping ceased. Additionally, this statement fails to address the problems associated with an extraction well located mostly in silt, as was the case for MW1-77. It is not clear to EPA whether the data gathered will be adequate to evaluate HVDPE as a possible remedy, and a future FFS will need to revisit this topic in more detail. Note that this language is repeated in Section 5.2.	The Navy appreciates learning EPA’s opinion on the adequacy of the pilot study and will consider this opinion during preparation of the FFS. The drawdown effects measured in observation wells distributed throughout the area of extraction provides ample evidence to support the conclusion in the cited statement. Therefore, the cited statement has not been revised.
9.	Section 5.0, page 5-1	EPA recommends some assessment of the study objectives be added to this section, or possibly included in a new section. Section 1.3 states that the “overall objective of the pilot test described in this report was to test the effectiveness of HVDPE as a potential remedial technology to treat hot spots at OU 1, optimize the remedy and stop off-site migration of contaminants, including to adjacent resources.” The text under Decision Rule 3 hints at this, but a definitive assessment of the degree to which the study met its objectives would be beneficial. Based on the data gathered by the pilot study, the report should recommend whether or not HVDPE should be further evaluated as a potential remedial technology at this site.	The language from section 4.1 will be reiterated in Section 5, “Some data evaluation called for in the SAP can only be completed following additional data collection and analysis under separate contract. These evaluations will be discussed in the pending supplemental RI for OU 1 and include: • Evaluation of rebound based on post-test groundwater sample analyses. • Evaluation of source strength reduction scenarios using the numeric fate and transport model being developed under separate contract.” A statement will also be added, “The data that were generated during the pilot study

Comment Number	Section/Page Number	Comment	Response
			and that are available for inclusion in this report indicate that the pilot study met its overall objective to the effectiveness of HVDPE as a potential remedial technology to treat hot spots at OU 1, optimize the remedy and stop off-site migration of contaminants, including to adjacent resources." The first sentence of the last paragraph of page 5-3 will be revised to replace the caveat words, "…could reasonably…" with "should."
10.	Section 5.1, page 5-1	Decision Rule 1 is stated in part as "Decide the best estimate of the expected contaminant mass that could be removed…", but this is not done in the report. This Section states that additional mass of up to 600kg per year, or as little as 60 kg per year, might be removed. Although the text of Section 4 does a good job comparing the estimates that led to these numbers, a "best estimate" should be presented based on the results of the pilot study.	The Navy disagrees that it would add value to select a single number as a best estimate of expected contaminant mass removal. As presented, the best estimate is a relatively wide range of values, which appropriately conveys the uncertainty in the forecast. A sentence will be added to this section to highlight this uncertainty and explain this is a best estimate at this time. This uncertainty should be, and will be, considered during evaluation of this technology in the FFS.
Comments from Ecology			
1.	General: Efficacy of the pilot test	In general, the HVDPE system was able to remove significant mass of VOCs (about 350 kg) from the landfill in a period of 3 months, which can be called a successful pilot test. However, many questions still need to be answered before this can be used as a remedial technology for the FFS. These include uncertainty in the mass removal estimates (see more specific comments below), likely interference with total petroleum	Thank you for this overall assessment of the pilot study results.

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		hydrocarbon (TPH) VOCs (see below), reevaluation of post groundwater samples, uncertainty (unavailability) of the total VOC mass present in the landfill, uncertainty in the ROI estimates (water level and drawdown are not static), and other factors. Nonetheless, information obtained is very useful and can help remedy selection in the FFS. More evaluation can be planned based on lessons learned from this pilot test and fill in the data gaps.	
2.	General: Mass removal estimates	The report presented huge uncertainty in removing mass (additional 60 kg to 600 kg) for a one-year full scale operation. This may not justify its full-scale operation given that other technologies and cost factor is yet to be analyzed. From technical point of view, the mass removal rate based estimate makes more sense as VOC concentration continued to go down with time. Even though cumulative mass removal has a better fit, it should be noted the time period (3 month) is small and VOC extraction could go down drastically after 3 months without a new extraction well point. Also, 60 kg is more conservative estimate. The biggest issue is there is not a good estimate of how much VOC mass is remaining in the landfill. Without this estimate, restoration timeframe calculations cannot be done. Rebound groundwater concentration data after the pilot along with previous recharacterization/ groundwater levels could shed some light into this matter. Ecology recommends that the Navy make good estimates of the mass remaining in the landfill.	The Navy agrees that the forecast methods show a one-order-of-magnitude uncertainty in the potential future mass remove estimate. This wide range of values conveys the uncertainty in the forecast. A sentence will be added to this section to highlight this uncertainty and explain this is a best estimate at this time. This uncertainty should be, and will be, considered during evaluation of this technology in the FFS. The Navy will consider making an estimate of the mass remaining in the landfill, which would likely require applying a phase partitioning model to the 3-dimensional interpolated isoconcentration shells to account for both dissolved and sorbed mass. Any such estimate would be part of the pending supplemental RI report.
3.	General: TPH and its effect on the pilot test	Several boring logs log indicated heavy hydrocarbon odor (AS1-1, SP-B182/MW1-77), which indicates presence of TPH. Has TPH played any roles in the overall pilot test	Certainly VOCs other than that the target cVOCs, including petroleum VOCs, are present in the landfill. The nature of the

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		effectiveness? Ecology noted that TPH was also found/detected in phase 2 site characterization. As such, it appears that any VOC source removal action would be affected by TPH. Ecology also noted Vapor-PID mass removal is higher than Vapor-LAB mass removal. Has the Navy put any thoughts on this front? It should be noted that the activated carbon supply company can also provide information whether the carbon usage was higher/similar given the mass of VOCs (measured in the lab) removed.	HVDPE technology is to non-specifically extract all available VOCs. Petroleum VOCs were certainly ionized by the field PID and included in the total VOC value reported by the instrument, whereas the laboratory analysis focused on the target cVOCs of interest. Collateral remediation of other VOCs (beyond the target cVOCs) would occur with the use of HVDPE. The mix of VOCs extracted would affect the performance of the treatment components (carbon loading, etc.). These effects as experienced by the pilot system are incorporated into our analysis by the nature of the total VOC values used for the overall performance calculations.
4.	Section 2.3 HVDPE System startup and operation	It was difficult to follow in the text when vacuum was off/on (what wells?). Apparently, vacuum was off during AS startup, and turned back on the day after when bubbles were seen. However, Figure 2-2 does not reflect that. It may be helpful to show different operating parameters in a Table or graph to visualize the operation.	The best detailed summary of operating conditions is the table at the end of Appendix F. The second sentence of Section 2.3.2 will be revised to read, “At the start of air sparging, vapor extraction was turned off at MW1-76 and MW1-77, with extraction only from MW1-66 located immediately adjacent to the sparge point.”
5.	Water level “data logger” data validation	Were there any wells that were equipped with data loggers checked with manual measurements? If not, what type of QA/QC was done to validate the data logger data?	Yes, there were some manual measurements of wells with installed dataloggers however all analysis of datalogger data was based on drawdown compared to an arbitrary zero (not tied to absolute elevation). The dataloggers are factory calibrated.
6.	Tidal influence on drawdown	Drawdown curves presented in appendix I show daily variations. What is the reason for these fluctuations? How	The reason for these fluctuations is stated on Page 4-8, “The plots of groundwater drawdown (Appendix I), as recorded by the

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		much was the tidal fluctuations in groundwater, if any, when there were no pumping in south plantation? Has tidal influence played any roles in drawdown calculations or aquifer parameter estimation? In addition, what is the blue line on drawdown Vs. time curve for P1-6?	dataloggers measuring on 5-minute intervals, show a high degree of fluctuation in drawdown. This fluctuation is the result of numerous brief system shutdowns needed for regular system maintenance." Although there may be an overlay of tidal influence, past tidal studies have shown that any such influence at this inland portion of OU 1 would be very small (a few inches of variation) compared to the variation documented (several feet). A steady diurnal pattern is not apart in the groundwater fluctuations. The blue line represents raw data, uncorrected for barometric pressure and will be removed from this graph.
7.	Figure 2.2 and 2.3	The pumping rate for MW1-66 and MW1-76 showed quite a bit variation (and therefore total pumping rate) whereas vacuum remained constant. Any explanations? Also, MW1-77 was shut off couple of days later as mentioned in Figure 4-1 and 4-2 but was not discussed in the text. Please explain. show any variation.	Managing water flow rates to balance against the treatment capacity is more sensitive than for vapor flow. At the beginning of the study more tuning of groundwater pumping rate was required to maximize drawdown with treatment capacity available. Later pumping rate variations are primarily an artifact of the frequency of totalizer readings and the brief periodic maintenance shut-downs. Additional text will be added to Section 2.3.1 regarding MW1-77 in response to comments from EPA and the Suquamish Tribe.
8.	Table 2-5. Maximum Drawdown	It appears the water level was not fully recovered after 6 days of recovery. For example, MW1-68 recovered about 60% from the static water level at start of HVDPE test. Yet "Maximum	Because the test duration was 3 months and spanned a period of variable seasonal precipitation, recovery cannot be

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		Drawdown" was defined as "difference of final DTW reading prior to HVDPE system shutoff and DTW following 6 days of recovery". Explain the rationale for this definition specially when recovery is less than 90%.	meaningfully defined based on the starting water level pre-test to the final water level post-test. Natural water level variations over this period obscure the effects of dewatering and recovery based on operation of the HVDPE system. A better definition is the recovery from a known pumped condition and flow rate just before shut down to the point where the recovery curve becomes asymptotic. This is similar to how recovery is measured and defined for both traditional pumping tests and slug tests. In this case, 6 days of recovery monitoring post shut down documents an initial steep recovery followed by flattening to an asymptote.
9.	Table 2-5. Footnote "d"	If static water level was collected after start of test (on 5/6/2022), then how maximum drawdown was calculated (manual measurements).	In Table 2-5, we will change static water level values to the ones collected on 5/3/22, and delete footnote "d". These values are at the bottom of the field data sheets for 5/3/22.
10.	Section 3.4 Data Validation	What percent of data were usable (# of usable results/# of expected sample results in SAP). In addition, Include the third-party data validation report as an appendix to the report.	No data were rejected (i.e., 100% of the validated data were usable) as stated in the last paragraph of 3.4. The laboratory reports and data validation reports will be added to the report as appendices.
11.	Section 3.4 Data Validation Table 3-3	The report stated, "Field duplicate RPD criteria for soil samples was less than or equal to (≤) 50% for cVOCs.". This seems incorrect. RPD for vinyl chloride in the duplicate pair SPB182-S-7.5-220421/SP-B182-S-8.0-220421 in soil is 66% (Table 3-3). RPD for cis-1,2-DCE in the duplicate pair SPB182-S-7.5-220421/SP-B182-S-8.0-220421 is 175%. The report provided explanation for cis-1,2-DCE. it stated, "Results for these analytes and samples should be considered estimates."	The vinyl chloride was erroneously not estimated J. This has been corrected in the final report. Thank you for identifying this error. Other corrections have been made as you suggested.

Comment Number	Section/Page Number	Comment	Response
		Are these results flagged "J"? These results are about 50 to 700 times the quantitation level (QL) in the SAP. Also, why use the term "should be"?	
12.	Table 3-4. Flag H, H3 of CalClean results and data interpretation	A significant number of samples were flagged "H - Sample was prepped or analyzed beyond the specified holding time" and "H 3 - Sample was received and analyzed past holding time". What is the reason for this delay? Were any of these results were used in the data analysis that would influence decision making? It appears trend analysis and mass removal estimates were performed with these data that did not go through a third-party data validation. As such, data interpretation needs to be qualified in the report (uncertainty is high).	Although these H-flagged data do introduce additional uncertainty into the absolute values of the reported results, the overall total VOC values track well with the field PID and individual key VOC values track well with the independent verification laboratory results when considered as concentration trends over time. The uncertainty in these values primarily impacts the already uncertain estimates of potential future absolute mass removal (which are more strongly affected by the difficulty of predicting the response of the subsurface to long-term HVDPE). Conclusions regarding the potential future effectiveness of full-scale HVDPE at the site, likely extraction and sparge well configurations, and impact on overall site cleanup are not substantively impacted by these uncertainties.
13.	Table 3-5. RPD between CalClean and Pace	The RPD between CalClean and Pace results for vapor samples are beyond normally accepted RPD values. The Navy used a 1996 reference and extrapolated soil to vapor. The report stated, "Based on this reference and the SAP, VOCs have an acceptable RPD range of 25 to 400% in soil and 50 to 200% in water." The SAP has 35% for groundwater 50% for soil. Extending these values to 200% in water and 400% in soil (and vapor) through a very old reference makes the data quality questionable. Note that the homogeneity of contaminants in water is greater than soil and through that logic homogeneity of	The RPD targets and the reference for those targets were accepted as part of the approved SAP. The following additional explanation will be added, "The larger RPDs for vapor samples compared to water samples likely reflects inherent small-scale temporal variations in concentrations, which tend to be higher in vapor than in water process streams. For both water and vapor, the verification samples collected were replicate

Comment Number	Section/Page Number	Comment	Response
		contaminants in air should be greater than water (and soil definitely). As such, data interpretation needs to be qualified in the report (uncertainty is high).	samples, collected immediately following collection of the parent sample. Lower RPDs would likely have been achieved if duplicate samples were collected, which would have required plumbing changes at the sample port to allow simultaneous filling of parent and duplicate sample containers."
14.	Figure 3-1 and 3-2	Figure 3-1 and 3-2 was provided without any discussion. Were these used in the data analysis/interpretation? In Figure 3-1, how total VOC concentration was determined? Has TPH played any roles in these VOC measurements? Is the field PID specific to cVOCs?	Figures 3-1 and 3-2 are discussed in Section 3.2, including how these interpretations were used. The field PID is non-specific and will ionize any VOC with an ionization potential less than 10.6 eV (which includes the most relevant petroleum VOCs). Figures 3-1 and 3-2 document the analysis performed to demonstrate that the non-specific total VOC measurements are a reasonable surrogate for the target cVOCs.
15.	Section 4.3	The report stated, "VOC concentrations in vapor quickly rise to a peak value upon system startup and initial extraction optimization, then decline slowly over the following weeks until air sparging is initiated." While visually this may appear to be the case, we also need to account for the variability in the data and that RPDs up to 200% have been deemed acceptable for the project.	The cited RPDs are between the CalScience data set and the verification laboratory replicate data set. These RPDs should not be construed to apply between measurements within the single data set used for these trend analyses.
16.	Section 4.3	The report stated, "Air sparging caused a rapid rise in VOC concentrations at all three extraction wells, even though the extraction wells are located at substantially different distances from the air sparge point (roughly 10 ft, 40 ft, 210 ft)." It is not understandable why the VOC concentration would jump	Yes, the subsurface lithologies are the likeliest explanation for the observed affects of air sparging, as discussed in Section 4.7.2, "In the area of the South Plantation, the construction of sparge point AS1-1

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		significantly in MW1-76 and MW1-77 since they seem to be quite far from the radius of influence of air sparging well AS1-1. Is it because there may be a short circuiting with connected permeable paleochannel? We also noted the concentration in these two wells remained similar during AS.	appears to have been optimal, with the point set just above the clay aquitard within a coarse sand/fine gravel (bottom depth of sparge point 27.5 ft bgs). The high permeability of this coarse unit probably accounts for the wide lateral distribution of air observed from sparging during the pilot test."
17.	Section 4.3	The report stated, "This indicates that the soils and contaminants in the vicinity of each of the three extraction wells respond similarly to extraction, and that each well is placed in a similar location relative to the highest VOC concentrations in the vicinity of each well." Is this supported by the site recharacterization data? It appears MW1-66 is in within the highest source area and MW1-76 and MW1-77 are outside the hotspot area (see Figure 1-3 and Figure 4-12). The range of concentrations in MW1-76 and MW1-77 screened interval based on PID data is at lease 2 to 3 orders of magnitude lower (Figure 4-12). Alternately, the plume map (Figure 1-3) is not accurate for this degree of interpretation.	Yes, this statement is supported by the site characterization data. As written the statement does not claim that the concentrations are the same around each extraction well, but rather that the wells are similar positioned relative to the highest concentrations near each well. This is in comparison to other possibilities, such as the hypothetical case where one well was farther from the nearby highest concentrations and therefore might have shown increasing concentrations as VOCs were drawn toward the well from a more distant hot spot.
18.	Figure 4-3	The report stated, "As shown on Figure 4-3, VOC concentrations in extracted groundwater declined by an order of magnitude between the first and second samples (one week apart) and then remained within a relatively narrow range of 20 to 40 mg/L total VOCs." After the initial decline TCE concentration started to increase and decrease after air sparging while cis-DCE remained constant. Is there any interpretation for this?	This is a good observation, thank you. The cis-1,2-DCE concentration does appear to be more stable than the TCE concentration, perhaps indicating a more uniform source strength for cis-1,2-DCE? This breakdown product is more ubiquitous at the site compared to TCE. Although a bit speculative, we can add a note to this effect in Section 4.3.

Comment Number	Section/Page Number	Comment	Response
19.	Table 4-2	This Table shows MW1-77 as pumping from May 3 to July 28, whereas Figure 2-3 shows MW1-77 is mostly non pumping.	See addition of Table 4-2 footnote, as stated above. We will revise the Y-axis label on Figure 2-3 Y-axis to be "Well Discharge Flow Rate" instead of "Well Pump Flow Rate," to clarify that extraction was occurring, even if downwell pumping was not.

APPENDIX B

Approved Field Change Request Forms

Task Order:	FCR Number:	Date:
F4225 (X045NW)	01	4/27/2022
Location: NBK Keyport OU 1 Source Investigations		**NTR / RPM:** Charlie Escola/Carlotta Cellucci
Document: Final Accident Prevention Plan and Site Safety and Health Plan for Operable Unit 1 Pilot Study, Naval Base Kitsap, Keyport, Washington, March, 2022		**NIRIS Document #:**

Description (items involved, submit sketch, if applicable)

1. Addition of Battelle geologist Hunter Butler as an approved collateral duty Field Site Manager (FSM) and Site Safety and Health Officer (SSHO), based on the attached certifications. Mr. Butler's last medical fitness clearance was April 1, 2022.

Reason for Change

1. Because of the relatively long duration of field work for this project, staffing flexibility is needed. Allowing Mr. Butler to act as SSHO/FSM will provide additional staffing flexibility.

Task Order:	FCR Number:	Date:
F4225 (X045NW)	01	4/27/2022

Recommended Disposition (submit sketch, if applicable)

The following additions or changes are made to the Accident Prevention Plan (APP) and Site Safety and Health Plan (SSHP) for Keyport Operable Unit 1 Source Investigations:

1. Add Hunter Butler as FSM and SSHO via this FCR as an addendum to the APP.

Additional Details

None

Task Order:	FCR Number:	Date:
F4225 (X045NW)	01	4/27/2022

Will this change result in a contract cost or time change? ☐ Yes ☒ No

Estimate of contract cost or time charge (if any)

Preparer (signature)	Date	Preparer's Title	Reviewer (signature and title)	Date
	4/28/22	Battelle PM	N/A	N/A

Approval	Date	Approval	Date
Navy RPM approval (signature) ☐ Comments (attached) ☐ No Comments		Battelle PM approval (signature) ☐ Comments (attached) ☒ No Comments	4/28/22
Battelle QAO approval (signature) N/A ☐ Comments (attached) ☐ No Comments	N/A	Battelle SS/SSHO approval (signature) ☐ Comments (attached) ☐ No Comments	
Battelle Program Manager approval (signature) N/A ☐ Comments (attached) ☐ No Comments	N/A	Other approval (signature and title) N/A ☐ Comments (attached) ☐ No Comments	N/A

Distribution: Project File
Site File
Navy RPM
Battelle PM

<table>
<tr><td>Task Order:
F4225 (X045NW)</td><td>FCR Number:
02</td><td>Date:
5/6/2022</td></tr>
<tr><td colspan="2">Location:
NBK Keyport OU 1 Source Investigations</td><td>NTR / RPM:
Charlie Escola/Carlotta Cellucci</td></tr>
<tr><td colspan="2">Document:
Final Accident Prevention Plan and Site Safety and Health Plan for Operable Unit 1 Pilot Study, Naval Base Kitsap, Keyport, Washington, March, 2022</td><td>NIRIS Document #:</td></tr>
<tr><td colspan="3">Description (items involved, submit sketch, if applicable)

1. Addition of CalClean technician Kevin Kaiser as an approved collateral duty Field Site Manager (FSM) and Site Safety and Health Officer (SSHO), based on the attached certifications, and limited to site operations being performed by CalClean.</td></tr>
<tr><td colspan="3">Reason for Change

1. Because CalClean will operate their equipment on site 24/7, CalClean staff will need to oversee the safety of their work.</td></tr>
</table>

Task Order:	FCR Number:	Date:
F4225 (X045NW)	02	5/6/2022

Recommended Disposition (submit sketch, if applicable)

The following additions or changes are made to the Accident Prevention Plan (APP) and Site Safety and Health Plan (SSHP) for Keyport Operable Unit 1 Source Investigations:

1. Add Kevin Kaiser as FSM and SSHO for work performed by CalClean via this FCR as an addendum to the APP.

Additional Details

None

Task Order:	FCR Number:	Date:
F4225 (X045NW)	02	5/6/2022

Will this change result in a contract cost or time change? ☐ Yes ☒ No

Estimate of contract cost or time charge (if any)

Preparer (signature)	Date	Preparer's Title	Reviewer (signature and title)	Date
[signature]	5/6/2022	Battelle PM	N/A	N/A

Navy RPM approval (signature)	Date	Battelle PM approval (signature)	Date
☐ Comments (attached) ☐ No Comments		[signature] ☐ Comments (attached) ☒ No Comments	5/6/2022
Battelle QAO approval (signature) N/A ☐ Comments (attached) ☐ No Comments	Date N/A	Battelle SS/SSHO approval (signature) ☐ Comments (attached) ☐ No Comments	Date
Battelle Program Manager approval (signature) N/A ☐ Comments (attached) ☐ No Comments	Date N/A	Other approval (signature and title) N/A ☐ Comments (attached) ☐ No Comments	Date N/A

Distribution: Project File
Site File
Navy RPM
Battelle PM

APPENDIX C

Daily Field Reports

DAILY FIELD REPORT 4/19/2022	Contract No. N39430-16-D-1802, CTO N4425521F4225 References Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)
Project: G24790.79 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: 50-56 F, 6 mph wind, 13 mph gust, sun with rain showers	
To: Carlotta Cellucci	
From: Andy Lewis	

PERSONNEL ON SITE:
Battelle: Andy Lewis, Michael Meyer, Hunter Butler; NAVFAC NW: Carlotta Cellucci; Holt Services: Jeffery Johnson

SUMMARY OF WORK COMPLETED:
Holt staged equipment and supplies at the site, Battelle and NAVFAC NW conducted a site walk.

DEVIATIONS FROM WORKPLAN:
None.

SAFETY OBSERVATIONS AND GOOD CATCHES:
Placed cones along walkway to port-a-potty at motorcycle training area and coordinated with motorcycle training lead regarding field work to ensure safety of motorcycle trainees and project staff.

FIELD ACTIVITY CHRONOLOGY:
0730 – Battelle arrived on site and begin load-in of field gear and setup for drilling. Holt Services staff on site at Pass&ID for badging.
0910 – Holt Services notified Battelle that two staff could not be badged because their ID did not meet Navy requirements. Pre-con meeting postponed to Wednesday, April 20. Stage drilling equipment on site.
0930 – Carlotta Cellucci on site. Battelle and Ms. Cellucci walked site and discussed project approach and logistics. Measured storm drain in support of landfill venting project.
0945 – Holt Services offsite.
1115 – All offsite for the day.

SUMMARY OF FINDINGS:
Holt Services had two employees that could not get badged today, two different employees will return tomorrow to get badged. Holt Services was able to stage two trailers onsite, near the southern plantation. Battelle and NAVFAC NW conducted a site walk looking at the offsite wells and culverts. The two proposed offsite well locations will require guardrail removal and one wood post to be removed for well installation. Out fall location KDB09-704 was located and the measurements from bottom of the invert to the top of the concrete pad was 42 inches, the top of the invert to the top of the concrete pad is 24 ½ inches.

PLANS FOR THE FOLLOWING DAY:

Complete mobilization, hold pre-con meeting and begin to drill HVDPE extraction wells.

ATTACHMENTS:

None.

Copies to: Michael Meyer, Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: _Andy Lewis ___________________________

DAILY FIELD REPORT 4/20/2022	Contract No. N39430-16-D-1802, CTO N4425521F4225 References Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)
Project: G24790.79 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: 45-52° F, 6 mph wind NW, 10 mph gust, sun with rain shower in the afternoon	
To: Carlotta Cellucci	
From: Andy Lewis	

PERSONNEL ON SITE:
Battelle: Andy Lewis, Michael Meyer, Hunter Butler; NAVFAC NW: Carlotta Cellucci and Amanda Rohrbaugh; Holt Services: Jeffery Johnson, Kelly Arndt.

SUMMARY OF WORK COMPLETED:
Held pre-con/kickoff meeting with project staff and NAVFAC NW. Holt employees got their badges, site mobilization and equipment staged, drilled to 20ft at SP-B181/MW1-76, placed casing in-ground, sampled soil and completed boring logs.

DEVIATIONS FROM WORKPLAN:
None.

SAFETY OBSERVATIONS AND GOOD CATCHES:
Discussed with HVDPE subcontractor, CalClean, via telephone filling a trench within their work area with gravel to prevent trips.

FIELD ACTIVITY CHRONOLOGY:
0730 – Battelle arrived on site and begin load-in of field gear and setup for drilling.
0830 – A. Lewis departed site to pick up coolers at Fed-Ex in Bremerton.
1030 – A Lewis arrived back onsite, went through Eurofins coolers.
1130 - Holt Drilling onsite to get badging set up, Driller Jeffery Johnson and Driller helper Kelly Arndt.
1230 – Pre-Construction Meeting conducted, discussed work and went over Health and Safety; Battelle: A. Lewis, M. Meyer, H. Butler, S. Verdibello, A. Piemonte, S. Moore, and G. Deruzzo; NAVFAC NW: C. Cellucci and A. Rohrbaugh; Holt Drilling: Jeffery Johnson and Kelly Arndt.
1315- Holt Drilling started to stage equipment and supplies.
1320- NAVFAC NW offsite.
1425- Holt Drilling set up on SP-B181/MW1-76.
1507- Start to drill on SP-B181/MW1-76.
1512- Started to fill out boring logs and set up to sample.
1520- Collect soil sample at 7.0 ft interval.
1538- Collect soil sample at 12.0 ft interval.
1553- Collect soil sample at 18.0 ft interval.

1559- Casing has been placed in well, drillers stop work and start to demobilization for the day. Continue with boring logs and packing samples. Final depth drilled at end of the day at SP-B181/MW1-76: 20 feet below ground surface.
1620- Holt Drilling offsite.
1630- M. Meyer offsite.
1715- A. Lewis and H. Butler offsite.
1800- A. Lewis onsite Lowes to buy supplies.
1835- End of field work.

SUMMARY OF FINDINGS:

At SP-B181/MW1-76 collected grab soil samples from the depths of highest photoionization detector (PID) readings:

7.0 feet – 2,085 ppb
12.0 feet – 712 ppb
18.0 feet – 1,180 ppb

Heaving conditions in the zone 15 to 20 caused loss of the core and required multiple recovery attempts. Lithology and PID readings in this depth interval are less representative of depth-specific conditions because of the disturbed nature of the core.

PLANS FOR THE FOLLOWING DAY:

Install well MW1-76, drill, sample, and install SP-B182/MW1-77. Depending on drilling progress, may also install sparge well AS1-1.

ATTACHMENTS:

Daily tailgate H&S form.

Copies to: Michael Meyer, Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: _Andy Lewis ___________________________

<table>
<tr><td rowspan="1">DAILY FIELD REPORT
4/21/2022</td><td colspan="2">Contract No.
N39430-16-D-1802, CTO N4425521F4225
References
Draft Sampling and Analysis Plan (Battelle 2022)
Accident Prevention Plan (Battelle 2019)</td></tr>
<tr><td colspan="3">Project: G24790.79 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing</td></tr>
<tr><td colspan="3">Location: Naval Base Kitsap Keyport, WA OU1</td></tr>
<tr><td colspan="2">Client: Naval Facilities Engineering Command Northwest</td><td>Contractor: Battelle</td></tr>
<tr><td colspan="3">Weather: 45-55 F, 6 MPH wind NE, gusting to 22 MPH, rain showers in AM, then clearing.</td></tr>
<tr><td colspan="3">To: Carlotta Cellucci</td></tr>
<tr><td colspan="3">From: Andy Lewis</td></tr>
</table>

PERSONNEL ON SITE:
Battelle: Andy Lewis and Hunter Butler; Holt Services: Jeffery Johnson and Kelly Arndt.

SUMMARY OF WORK COMPLETED:
Completed installing well SP-B181/MW1-76, will return to install monument and bollards. Drilled, sampled soil, and installed well at SP-B182/MW1-77 and completed boring logs.

DEVIATIONS FROM WORKPLAN:
None.

SAFETY OBSERVATIONS AND GOOD CATCHES:
Placed an orange cone with caution tape marking off the area discussed with HVDPE subcontractor, CalClean, via telephone filling a trench within their work area with gravel to mitigate potential trip hazard next week.

FIELD ACTIVITY CHRONOLOGY:
0640 A. Lewis picked up ice for field samples.
0650 A. Lewis arrived onsite to prep for day, load truck, calibrate PID.
0725 H. Butler onsite to prep for day.
0745 Holt Drilling onsite: J. Johnson and K. Arndt.
0750 Conducted a tailgate H&S meeting and discussed day's work. H&S topics included slips/trips/falls, backing up equipment, pinch points, cold stress, hydration, emergency equipment location, were some topics discussed.
0915 Drillers set up and working on installation of MW1-76.
1115 Clean up around MW1-76 and start to mob equipment to soil boring SB-B182/MW1-77.
1225 Holt takes lunch break.
1255 Holt completes lunch break and continues to mob onto soil boring SB-B182/MW1-77.
1345 Set up on SB-B182/MW1-77, start to drill. Collected PID field readings on soil boring.
1425 Reached 20ft at location SP-B182/MW1-77, continued to work on soil boring log.
1430 After collecting soil boring logs and PID readings, decided to collect samples at depths 7.5 ft (10,400 PPB) PID, 11ft (4,150 PPB), 16ft (625 PPB).
1440 Collect sample at 7.5 ft, SP-B182-S-7.5-220421.
1450 Collect duplicate sample at 7.5 ft, SP-B182-S-8.0-220421.
1500 Collect sample at 11 ft, SP-B182-S-11.0-220421.

1510 Start to install well at MW1-77.
1515 Collect sample at 16 ft, SP-B182-S-16.0-220421.
1610 Drillers complete installing casing at MW1-77, work on mobbing to next location and wrapping up site.
1645 Holt offsite for day.
1650 Continue to log soil boring, charge meters and demob, and walked site.
1710 A. Lewis and H. Butler offsite.

SUMMARY OF FINDINGS:

Completed installation of 4-inch PVC monitoring well casing at SP-B181B/MW1-76 at a depth of 20 feet bgs with screen from 5 to 20 feet bgs. Well surface completion to be installed concurrently with other adjacent well installations. Secured location and remobilized to proposed location of SP-B182/MW1-77.

Advanced and logged soil boring SP-B182/MW1-77 to 20 feet bgs; screened vertical soil profile with photoionization detector (PID) for evidence of target volatile compounds; and collected grab soil samples from the depths of the three highest PID readings for additional fixed laboratory analysis:

8.0 feet – 10,400 ppb
11.0 feet – 4,150ppb
16.0 feet – 625 ppb

Completed installation of 4-inch PVC monitoring well casing at SP-B182B/MW1-77 at a depth of 20.0 feet bgs with screen from 5 to 20 feet bgs. Well surface completion to be installed concurrently with other adjacent well installations. Secured location and prepared to mobilize to proposed location of air sparging point AS1-1.

PLANS FOR THE FOLLOWING DAY:

Install air sparging point AS1-1, drill and log. Depending on drilling progress, may also start to install boring SP-B175/MW1-70.

ATTACHMENTS:

Daily tailgate H&S form.

Copies to: Michael Meyer, Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: _Andy Lewis ___________________________

DAILY FIELD REPORT 4/22/2022	Contract No. N39430-16-D-1802, CTO N4425521F4225 References Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)
Project: G24790.79 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: 41-57 F, ENE wind at 5 mph, gusting to 8 mph, occasional drizzle	
To: Carlotta Cellucci	
From: Andy Lewis	

PERSONNEL ON SITE:
Battelle: Andy Lewis, Michael Meyer, and Hunter Butler; Holt Services: Jeffery Johnson and Kelly Arndt.

SUMMARY OF WORK COMPLETED:
Completed installing AS1-1, will return to install monument and bollards. Drilled and completed the soil logs.

DEVIATIONS FROM WORKPLAN:
None.

SAFETY OBSERVATIONS AND GOOD CATCHES:
Found an old utility vault approximately 1x1 ft and 14 inches deep with a faded orange cone on top with the lid near the Southern plantation. Talked to Dale Hunt at NBK Keyport Hazardous Waste who provided a piece of steel plate to place over the utility vault. Cleaned and cleared debris around vault, placed the plate over the vault and placed a cone on the plate.

FIELD ACTIVITY CHRONOLOGY:
0655 A. Lewis onsite Keyport to mob truck, calibrate PID, and prepare for day.
0710 H. Butler onsite.
0720 M. Meyer and Holt Drilling onsite. Conducted a tailgate H&S meeting. Topics included; no heavy lifting, proper PPE, equipment inspections, tight work areas, backing in tight areas were some topics discussed.
0745 conducted a site walk in the southern plantation looking at well locations, established a plan to install and develop wells.
0755 prep to drill well AS1-1.
0910 start to drill AS1-1.
1105 reached 30 feet and confirmed clay at 27.8 feet bgs.
1110 Drillers take a lunch break.
1140 Drillers complete lunch break.
1145 Skookum arrived to unload a portable toilet and hand wash station.
1210 Skookum offsite after unloading equipment.
1350 installation of AS1-1 is complete. Drillers prepare for Monday, setting drill rig, cleaning equipment, prepping site for next week, filling water totes, staging full drums, decon equipment, and site cleanup.

1400 A. Lewis worked with Dale Hunt place steel plate over an old utility vault near the south plantation, prepped area around the vault and laid the metal over the hole.
1415 H. Butler completed the soil logging for AS1-1, disposed soil into soil drums.
1520 H. Butler offsite.
1540 A. Lewis and Holt offsite.
1600 A. Lewis arrived at Silverdale Fed-Ex to pick up Battelle and Eurofins sample coolers.
1615 A. Lewis departed Fed-Ex to home office.
1655 A. Lewis arrived at home office to unload service truck, unload coolers, clear and clean service truck, pack truck for Monday, scan forms, complete daily report, and QC forms.
1830 End of Day.

SUMMARY OF FINDINGS:
Mobilized to, advanced soil boring, and installed 1-inch PVC air sparge well at location AS1-1.

Soil boring for AS1-1 was advanced to the to the proposed target depth of approximate 29 feet bgs with a sonic drilling rig to the identify and confirm the target soil depth interval for installation of the air sparge well. The depth of the target soil zone was confirmed at 27.8 feet bgs at this location and the air sparge well was installed at a depth of 27.5 feet bgs. The air sparge well was completed with a 2.2-foot porous 1-inch PVC sparge point installed above the target soil zone at 27.5 feet bgs. The air sparge well was completed to ground surface and secured pending installation of the surface well box. A high PID response was noted throughout the boring, as expected based on known contamination in this area.

PLANS FOR THE FOLLOWING DAY:
Monday April 25th we are planning to install, log, and sample well MW1-70 in the southern plantation. Field technician Angela Piemonte will arrive in the afternoon to get badged and start well development.

ATTACHMENTS:
Daily tailgate H&S form.

Copies to: Michael Meyer, Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: _Andy Lewis ___________________________

DAILY FIELD REPORT 4/25/2022	**Contract No.** N39430-16-D-1802, CTO N4425521F4225 **References** Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)
Project: G24790.79 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: Partly cloudy, 47 – 63 F, SW-W wind at 0-10 mph, gusting to 12 mph.	
To: Carlotta Cellucci	
From: Michael Meyer	

PERSONNEL ON SITE:
Battelle: Michael Meyer, Angela Piemonte, and Hunter Butler; Holt Services: Jeffery Johnson and Kelly Arndt.

SUMMARY OF WORK COMPLETED:
Continued mobilization onto proposed monitoring well location SP-B175/MW1-70. Initiated drilling advance for collection of soil samples and installation of monitoring well assembly for SP-B175/MW1-70. Advanced and sampled soils to 50 ft bgs; collected geotechnical soil samples at 15 ft bgs, 25 ft bgs, and 38 bgs; collected analytical samples at 25 ft bgs, 38 ft bgs and 50 ft bgs; and completed the soil logs. Initiated setup of pumping and monitoring equipment for development of new HVDP pilot test monitoring wells.

DEVIATIONS FROM WORKPLAN:
None.

SAFETY OBSERVATIONS AND GOOD CATCHES:
Monitored slip-trip-fall and pinch-point hazards around drilling rig during sampling operations due to uneven and saturated ground conditions, and utilization of an automated sampling drive-hammer. Driller improved on hammer handling and setup process by using the skid steer to manage the heavy hammer.

FIELD ACTIVITY CHRONOLOGY:
0615 A. Lewis called in sick, advised drillers ETA 0800.
0715 H. Butler onsite Keyport, prepare for day.
0720 M. Meyer onsite, continued prep for drilling and development operations, calibrate PIDs.
0755 Holt Drilling onsite.
0800 M. Meyer offsite for drilling support supplies. Conducted a tailgate H&S meeting. Topics included: heavy lifting with use of automatic hammer, proper PPE, equipment inspections, tight work areas, and footing on uneven ground were some topics discussed.
0810 Continue prep to drill well SP-B175/MW1-70.
0830 M. Meyer back onsite, continue setup operations. Advised Terra Core samplers in from Eurofins Lab by FedEx by 1200 today.
0910 Start to drill SP-B175/MW1-70.
1025 Reached 15 ft bgs, set up for geotech sample, cleared hole for sampling.
1145 Complete setup for geotech sampling with split-spoon sampling and auto-hammer.

1150 Collect geotech sample at 15 ft bgs.
1230 Drillers take a lunch break, M. Meyer out for FedEx sampling supplies.
1300 Drillers complete lunch break, set up to advance and sample at 25 ft bgs.
1330 M. Meyer back on site with sampling equipment.
1345 Prep for sampling at 25 ft bgs.
1430 Collect geotech and chemical sample at 25 ft bgs. Continue drilling operations to 38 ft bgs. A. Piemonte on site at Pass & Decal for badging.
1500 Break. A. Piemonte on site. Prep for sampling at 38 ft bgs. Prep for well development operations on HVDP well SP-B181/MW-76.
1527 Collect geotech and chemical sample at 38 ft bgs. Continue soil boring advance to 50 ft bgs.
1605 Advance to 50 ft bgs. Prep for sample retrieval.
1627 Chemical sample collected at 50 ft bgs.
1630 Start cleanup and secure site.
1715 Drillers offsite.
1725 H. Butler offsite
1730 M. Meyer and A. Piemonte offsite.

SUMMARY OF FINDINGS:
Completed mobilization and initiated soil boring at location SP-B175/MW1-70.

Soil boring for SP-B175/MW1-70 was advanced to the to the intermediate depth of approximate 50 feet bgs with a sonic drilling rig to the identify and confirm the target soil depth interval for installation of a deep-water-zone monitoring well. Soil samples were collected for geotechnical analysis at 15 ft, 25 ft and 38 ft bgs; and chemical analysis at 25 ft, 38 ft and 50 ft bgs. Soil samples were containerized, labeled, and preserved on site pending shipment to the analytical laboratory. Boring was secured at 50 ft bgs at the end of day. Elevated PID readings were noted until the last 2-3 feet of clay (47 to 50 feet bgs), when the PID consistently read 0 ppb.

PLANS FOR THE FOLLOWING DAY:
Tuesday April 26th we are planning to continue soil sampling and installation of well MW1-70 in the southern plantation. Well development operations for HVDP wells will recommence with SP-B181/MW-76.

ATTACHMENTS:
Daily tailgate H&S form.

Copies to: Michael Meyer, Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: ___________________________

DAILY FIELD REPORT **4/26/2022**	**Contract No.** N39430-16-D-1802, CTO N4425521F4225 **References** Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)
Project: G24790.79 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: Partly cloudy, 42 – 60 F, SW-NW wind at 0-10 mph, gusting to 14 mph; lt. showers mid-day.	
To: Carlotta Cellucci	
From: Mike Meyer	

PERSONNEL ON SITE:

Battelle: Michael Meyer, Angela Piemonte, and Hunter Butler; Holt Services: Jeffery Johnson and Kelly Arndt.

SUMMARY OF WORK COMPLETED:

Continued drilling advance for collection of soil samples and installation of monitoring well assembly for SP-B175/MW1-70. Advanced and sampled soils from 50 ft bgs to 100 ft bgs; attempted geotechnical soil samples at 55 ft bgs (two attempts) and 60 ft bgs (one attempt), no returns at either location due to apparently saturated unconsolidated granular soils not retained in sand-catcher equipped split spoon sampler; collected analytical samples at 56 ft bgs, 60 ft bgs, 70 ft bgs, 80 ft bgs, 90 bgs and 100 ft bgs; and completed the soil logs. Initiated set up and operation of pumping and monitoring equipment for completion of development of new HVDPE pilot test monitoring wells SP-B181/MW1-76 and SP-B182/MW1-77.

DEVIATIONS FROM WORKPLAN:

None.

SAFETY OBSERVATIONS AND GOOD CATCHES:

Monitored slip-trip-fall and pinch-point hazards around drilling rig during sampling operations due to uneven and saturated ground conditions, and utilization of an automated sampling drive-hammer. Bobcat loader stuck in saturated soils near east gate of South Plantation due to excessive loading, unstable soils and uneven ground. Loader extracted with reduced load and safety tow strap.

FIELD ACTIVITY CHRONOLOGY:

A. Lewis continued out sick.

0710 H. Butler onsite Keyport, prepare for day.

0720 A. Piemonte on site, prepare for day.

0725 M. Meyer onsite, continued prep for drilling and development operations, calibrate PIDs.

0725 Holt Drilling onsite.

0815 Conducted a tailgate H&S meeting. Topics included: heavy lifting with use of automatic hammer, proper PPE, equipment inspections, tight work areas, and footing on uneven ground were some topics discussed.

0830 H. Butler offsite for tool run.

0840 Continue to drill well SP-B175/MW1-70 boring from 50 ft bgs. Start well development of SP-B181/MW1-76.

0900 H. Butler back on site. Set up for geotech sample at 55 ft bgs. with split-spoon sampling and auto-hammer.

0933 55 ft sampler retrieved, no returns due to soil conditions.
0952 Resample 55 ft bgs, again no returns.
1000 Complete development of SP-B181/MW1-76. Move on to SP-B182/MW1-77, start development.
1025 Advance to 60 ft bgs, attempt to collect geotech sample, again no return.
1040 Collect analytical sample at 56 ft bgs.
1045 Collect analytical sample at 60 ft bgs.
1100 Advance boring to 70 ft bgs.
1130 Lunch break.
1150 M. Meyer call to C. Cellucci to advise of soil conditions to 70 bgs. Agreed to advance and sample to 100 ft bgs to attempt to identify lower confining layer and granular soils beneath.
1200 Collect chemical samples at 64 ft and 70 ft bgs. Continue drilling operations to 100 ft bgs.
1240 Advance boring to 80 ft bgs.
1315 Advance boring to 90 ft bgs.
1320 Collect chemical sample at 80 ft bgs.
1335 Collect chemical sample at 90 ft bgs.
1400 Advance boring to 100 ft bgs.
1405 M. Meyer call to C. Cellucci to advise of soil conditions to 100 bgs. Agreed to set well at 80 ft bgs.
1415 Start preparations to set well at 80 ft bgs.
1430 Collect chemical sample at 100 ft bgs. Complete well development of SP-B182/MW1-77.
1500 M. Meyer off site.
1630 Monitoring well installed and set at 80 ft bgs. Start cleanup operations.
1645 Bobcat overloaded and stuck in unstable saturated soils near east gate. Start extraction operations.
1715 Bobcat extracted from unstable soils, continue cleanup operations.
1730 Drillers offsite.
1735 Site secured. A. Piemonte and H. Butler offsite.

SUMMARY OF FINDINGS:

Completed soil sampling and monitoring well installation at location SP-B175/MW1-70.

Soil boring for SP-B175/MW1-70 was advanced to the to the final depth of 100 feet bgs with a sonic drilling rig to identify and confirm the target soil depth interval for installation of a deep-water-zone monitoring well. Monitoring well MW1-70 was installed at depth of 80 ft bgs. Soil samples were attempted for geotechnical analysis at 55 ft and 60 ft bgs, no recovery for either depth; and chemical analysis at 56 ft, 60 ft, 70 ft, 80 ft, 90 ft and 100 bgs. Soil samples were containerized, labeled, and preserved on site pending shipment to the analytical laboratory. PID readings from soil cores below 50 feet were typically near ambient background concentrations.

Monitoring wells MW1-76 and MW1-77 were developed until water parameters were achieved in accordance with the SAP.

PLANS FOR THE FOLLOWING DAY:

Wednesday April 27th crew will mobilize to the southwest corner of the southern plantation for soil sampling and installation of deep well SP-B174/MW1-69.

HVDPE subcontractor crew to mobilize on site and initiate set up for performance of pilot test operations.

ATTACHMENTS:

Daily tailgate H&S form.

Copies to: Michael Meyer, Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: ___________________________

DAILY FIELD REPORT 4/27/2022	Contract No. N39430-16-D-1802, CTO N4425521F4225 References Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)
Project: G24790.79 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: Partly cloudy, 40 – 58 F, NW-SE wind at 0-8 mph, gusting to 10 mph; lt. showers PM.	
To: Carlotta Cellucci	
From: Michael Meyer	

PERSONNEL ON SITE:
Battelle: Michael Meyer, Angela Piemonte, and Hunter Butler; Holt Services: Jeffery Johnson and Kelly Arndt.

SUMMARY OF WORK COMPLETED:
Cleanup and demobilized following installation of monitoring well assembly for SP-B175/MW1-70.

Mobilized to site of sampling location SP-B174/MW1-69 at southwest corner of southern plantation. Advanced and sampled soils from 0 ft bgs to 48 ft bgs; geotechnical soil samples collected at 10 ft bgs a 48 ft bgs; collected analytical samples at 10 ft bgs, 16 ft bgs, 20 ft bgs, 25 ft bgs, 35 bgs and 45 ft bgs; and prepared the soil logs.

DEVIATIONS FROM WORKPLAN:
No deviations from the workplan.

SAFETY OBSERVATIONS AND GOOD CATCHES:
Monitored set up operations at SP-B174/MW1-69 due to surrounding trees, uneven ground and relocation of perimeter fencing to access the boring site. Monitored slip-trip-fall and pinch-point hazards around drilling rig during sampling operations due to uneven and saturated ground conditions, and utilization of an automated sampling drive-hammer.

FIELD ACTIVITY CHRONOLOGY:
A. Lewis continued out sick.
0700 H. Butler onsite Keyport, prepare for day.
0730 A. Piemonte on site, continued prep for drilling and development operations, calibrate PIDs. Holt Drilling onsite.
0735 Conducted tailgate H&S meeting. Topics included: heavy lifting with use of automatic hammer, proper PPE, equipment inspections, tight work areas, and footing on uneven ground were some topics discussed.
0745 Started cleanup and demobilization from SP-B175/MW1-70.
1020 Move drill rig to SP-B174/MW1-69.
1100 M. Meyer on site.
1230 Lunch break. Driller received and unloaded additional supplies.

1315 Back from lunch break, remove perimeter fence from south side of SP-B174/MW1-69. Final set up of drill rig.
1423 Initiate advance and sampling at SP-B174/MW1-69.
1440 Set up for geotech sample at 10 ft bgs with split-spoon sampling and auto-hammer.
1500 10 ft geotech sampler retrieved, continue boring advance to 48 ft bgs.
1530 Collect analytical samples at 10 ft, 16 ft, and 20 feet bgs.
1645 Advance boring to 48 ft bgs. Set up for geotech sample at 48 ft bgs with split-spoon sampling and auto-hammer. Collect analytical samples at 25 ft, 35 ft, and 45 feet bgs.
1702 48 ft geotech sampler retrieved. Secure borehole and drill rig. Start cleanup operations.
1715 M. Meyer off site.
1730 Drillers offsite.
1800 Site secured. A. Piemonte and H. Butler offsite.

SUMMARY OF FINDINGS:

Completed soil sampling and monitoring well installation at location SP-B175/MW1-70. Clean up, decon equipment and remobilized to location SP-B174/MW1-69.

Soil boring for SP-B174/MW1-69 was advanced to the intermediate depth of 48 feet bgs with a sonic drilling rig to the identify and confirm the target soil depth interval for installation of a deep-water-zone monitoring well. Soil samples were collected for planned geotechnical analysis at 10 ft and 48 ft bgs; and chemical analysis at 10 ft, 16 ft, 20 ft, 25 ft, 35 ft and 45 bgs. Soil samples were containerized, labeled, and preserved on site pending shipment to the analytical laboratory. PID readings up to 209 ppm were measured in the upper 10 feet of the boring, decreasing to near ambient background concentrations below 21 feet bgs.

PLANS FOR THE FOLLOWING DAY:

Thursday April 27th crew will continue soil sampling and installation of deep well SP-B174/MW1-69.

HVDP contracting crew to mobilize on site and initiate set up for performance of pilot test operations.

ATTACHMENTS:

Daily tailgate H&S form.

Copies to: Michael Meyer, Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: ___________________________

DAILY FIELD REPORT **4/28/2022**	**Contract No.** N39430-16-D-1802, CTO N4425521F4225 **References** Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)
Project: G24790.79 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: Partly cloudy, 40 – 58 F, NW-SE wind at 0-8 mph, gusting to 10 mph; lt. showers PM.	
To: Carlotta Cellucci	
From: Hunter Butler	

PERSONNEL ON SITE:
Battelle: Michael Meyer, Angela Piemonte, Samuel Moore and Hunter Butler; Holt Services: Jeffery Johnson and Kelly Arndt; Cal Clean: Davis Rios, Kevin Kaiser.

SUMMARY OF WORK COMPLETED:
Continued drilling advance for collection of soil samples and installation of monitoring well assembly for SP-B174/MW1-69. Advanced and sampled soils from 50 ft bgs to 90 ft bgs; collected geotechnical soil samples at 52 ft bgs and 58 ft bgs; collected analytical samples at 56 ft bgs, 70 ft bgs, 80 ft bgs, and 90 bgs and 100 ft bgs; and prepared the soil logs. Initiated set up and operation of pumping and monitoring equipment for completion of development of new HVDPE pilot test monitoring well SP-B175/MW1-70.

HVDPE mobilized on site to initiate set up of HVDPE system for pilot testing starting 05-02-22. Started moving treatment and support equipment from covered storage on site to eastern perimeter of southern plantation.

DEVIATIONS FROM WORKPLAN:
The sampling rationale for well MW1-69 established in the SAP indicated that the well would be installed below the clay previously identified in the area beginning at 55 feet bgs. Because the clay was found to be 28 feet thick during drilling of the well bore fore MW1-69, the Navy directed Battelle to install the well above the clay to reduce the vertical distance between the historical shallow contaminated samples and the results from this deeper well.

SAFETY OBSERVATIONS AND GOOD CATCHES:
Monitored drilling operations at SP-B174/MW1-69 due to surrounding trees, uneven ground and relocation of perimeter fencing to access the boring site. Monitored slip-trip-fall and pinch-point hazards around drilling rig during sampling operations due to uneven and saturated ground conditions, and utilization of an automated sampling drive-hammer.

FIELD ACTIVITY CHRONOLOGY:
A. Lewis continued out sick.
0700 H. Butler onsite Keyport. Cal Clean on site. H. Butler offsite for supplies.
0720 H. Butler and A. Piemonte on site, continued prep for drilling and development operations, calibrate PIDs. Holt Services onsite.

0815 Conducted tailgate H&S meeting. Topics included: HVDPE equipment moving activities; heavy lifting with use of automatic hammer, proper PPE, equipment inspections, tight work areas, and footing on uneven ground were some topics discussed.
0845 Continue to drill well SP-B174/MW1-69 boring from 48 ft bgs. S. Moore prepped for slug testing.
0900 Set up for geotech sample at 52 ft bgs with split-spoon sampling and auto-hammer.
0928 52 ft geotech sample contains only gravel, fines washed out during extraction. Continue to drill to 58 ft bgs.
1023 Advance to 58 ft bgs. Set up for geotech sample with split-spoon sampling and auto-hammer.
1043 Collect 58 ft bgs geotech sample.
1120 Collect analytical sample at 52 feet bgs. Continue advance to 70 ft bgs.
1145 Advance to 70 ft bgs. Need to refill drill rig potable water supply.
1200 Lunch break. Driller refilled drill rig potable water supply. M. Meyer offsite to pick up vacuum system sampling supply shipment.
1250 Drill crew back in, continue drilling to 80 ft bgs.
1300 Advanced to 80 ft bgs. Call to M. Meyer, advised consolidated soils to 80 ft bgs, directed to advance to 90 ft bgs.
1340 Advanced to 90 ft bgs. M. Meyer back on site. Set up A. Piemonte for groundwater sampling April 29th.
1350 90 ft bgs core retrieved, unconsolidated soils from 80 ft to 87 ft bgs. M. Meyer called C. Cellucci and advised of boring condition. Directed by C. Cellucci to set well at 52 ft bgs. Begin preparations to set monitoring well at 52 ft bgs.
1413 Collect analytical sample at 73 feet bgs.
1425 Collect analytical sample at 83 feet bgs.
1430 M. Meyer off site.
1500 S. Moore starts development of monitoring well SP-B175/MW1-70. A. Piemonte off site to collect sampling containers from A. Lewis.
1520 Monitoring well pipe installed at 52 ft bgs, continue backfill.
1635 Monitoring well SP-B174/MW1-69 complete at 52 ft bgs. Secure borehole and drill rig. Start cleanup operations.
1645 A. Piemonte back on site.
1700 Drillers off site.
1800 Completed development of MW1-70.
1830 Site secured. A. Piemonte, S. Moore and H. Butler offsite.

SUMMARY OF FINDINGS:

Completed soil sampling and monitoring well installation at location SP-B174/MW1-69.

Soil boring for SP-B174/MW1-69 was advanced to the to the final depth of 90 feet bgs with a sonic drilling rig to the identify and confirm the target soil depth interval for installation of a deep-water-zone monitoring well. Monitoring well MW1-69 was installed at depth of 52 ft bgs per client direction to confirm groundwater conditions above lower confining layer. Soil samples were attempted for geotechnical analysis at 52 ft and 58 ft bgs, no recovery for 52 ft bgs and confirmed confining consolidated soils at 58 ft bgs; and chemical analysis at 52 ft, 73 ft and 83 bgs. Soil samples were containerized, labeled, and preserved on site pending shipment to the analytical laboratory.

Monitoring well MW1-70 was developed until water parameters were achieved in accordance with the SAP.

PLANS FOR THE FOLLOWING DAY:

Friday April 29th drilling crew will demobilize from MW1-69 and install secured monitoring well surface completions and traffic bollards at MW1-69, MW1-70, MW1-76, and MW1-77. Slug testing will commence for monitoring wells supporting HVDPE testing. Groundwater samples will be collected for baseline analysis from MW1-76, and MW1-77 prior to inclusion in HVDPE testing program.

CalClean crew continues to mobilize on site and initiate set up for performance of pilot test operations commencing Monday, May 2nd.

ATTACHMENTS:
Daily tailgate H&S form.

Copies to: Michael Meyer, Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: ___________________________

DAILY FIELD REPORT **4/29/2022**	**Contract No.** N39430-16-D-1802, CTO N4425521F4225 **References** Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)
Project: G24790.79 - Naval Base Kitsap Keyport, WA OU1 HVDPEE Pilot Testing	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: Partly cloudy, 45 – 63 F, W-S wind at 0-5 mph, gusting to 7 mph.	
To: Carlotta Cellucci	
From: Hunter Butler	

PERSONNEL ON SITE:
Battelle: Angela Piemonte, Samuel Moore and Hunter Butler; Holt Services: Jeffery Johnson and Kelly Arndt; CalClean: Noel Shenoi, Davis Rios, Kevin Kaiser.

SUMMARY OF WORK COMPLETED:
Demobilized drilling rig from location of SP-B174/MW1-69; pressure-washed drill casing for subsequent use. Drilling crew installed surface completions at new monitoring and air-sparge well locations SP-B174/MW1-69, SP-B175/MW1-70, SP-B181/MW1-76, SP-B182/MW1-77 and AS1-1. Traffic control bollards to be installed around designated wells at a later date.

Initiated set up and operation of in-well water pressure transducers for monitoring of HVDPEE pilot test commencing Monday, May 2nd, 2022.

Collected baseline groundwater samples from new monitoring wells SP-B174/MW1-69 and SP-B175/MW1-70 prior to initiation of HVDPE pilot test.

CalClean continued on site to set up of HVDPE system for treatment program starting Monday, May 2nd, 2022. Continued moving treatment and support equipment from covered storage on site to eastern perimeter of southern plantation.

DEVIATIONS F.ROM WORKPLAN:
No deviations from the workplan.

SAFETY OBSERVATIONS AND GOOD CATCHES:
Monitored demobilization operations at SP-B174/MW1-69 due to surrounding trees, uneven ground and relocation of perimeter fencing to access the boring site. Monitored slip-trip-fall and pinch-point hazards around drilling rig during demob operations due to uneven and saturated ground conditions. Monitored moving and forklift operations for CalClean during HVDPE equipment location and set up.

FIELD ACTIVITY CHRONOLOGY:
A. Lewis continued out sick.
0700 H. Butler onsite Keyport. CalClean on site.

0720 A. Piemonte and S. Moore on site, continued prep for drilling and development operations, calibrate PIDs. Holt Services onsite, continued prep for groundwater sampling, transducer installation operations, and monitoring well box installs; calibrate PIDs. A. Piemonte and S. Moore completed chain-of-custody review prior to laboratory courier pickup.

0725 Holt Services onsite, initial meeting to start demobilization from SP-B174-MW1-69.

0800 Laboratory courier at main gate for sample pickup. Samples transferred.

0815 Conducted individual tailgate H&S meetings for Battelle, CalClean and Holt. Topics included: HVDPE equipment moving activities; heavy lifting of automatic hammer, proper PPE, equipment inspections, tight work areas, and footing on uneven ground were some topics discussed.

0900 S. Moore starts performance of slug tests south plantation monitoring wells. A. Piemonte starts set up for HVDPE groundwater monitoring well sampling.

0915 Demobilized drill rig and support equipment from SP-B174/MW1-69. Start installation of surface completion well boxes for SP-B174/MW1-69 and SP-B181/MW1-76.

1115 A. Piemonte completes groundwater monitoring well sampling at SP-B182/MW1-77; moves to SP-B181/MW1-76.

1145 Completed installation of monitoring well boxes at MW1-69 and MW1-76. Moved to east end of southern plantation for completion of remaining well boxes.

1200 Lunch break.

1230 H. Butler off site.

1245 H. Butler on site. Drillers continue fabrication of well box framing for east end wells.

1300 Meet with CalClean on forklift operations.

1315 A. Piemonte starts groundwater monitoring well purging at SP-B181/MW1-76.

1435 Groundwater parameters stabilized, collect groundwater sample at SP-B181/MW1-76.

1455 Groundwater sampling completed, start cleanup.

1515 Drilling crew completed well box installations for AS1-1, MW1-70 and MW1-77. Drilling crew starts decon operations and preparation for drilling operations in central parking lot on Monday, May 2nd, 2022.

1615 Drillers off site. Continue slug testing and groundwater pressure transducer installation and monitoring.

1815 Complete slug testing and groundwater pressure transducer installation and monitoring, start cleanup operations.

1845 Site secured. A. Piemonte, S. Moore and H. Butler offsite.

SUMMARY OF FINDINGS:

No drilling conducted today. Responses of wells to sampling and slug testing matched expectations.

PLANS FOR THE FOLLOWING DAY:

Monday, May 2nd, 2022 drilling crew will mobilize to proposed monitoring well location SP-B176-MW1-71 in the middle of asphalt parking area the central landfill and start drilling and sampling activities.

Initiate and complete well development of SP-B174-MW1-69.

CalClean to start pilot test operations commencing Monday, May 2nd.

ATTACHMENTS:

Daily tailgate H&S form.

	Signed: ______________________________

DAILY FIELD REPORT **5/2/2022**	**Contract No.** N39430-16-D-1802, CTO N4425521F4225 **References** Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)
Project: G24790.79 and G24790.30 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing and Vertical Extent Investigation	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: Overcast to partly cloudy, 48 – 68 F, SW-W wind at 0-5 mph, showers AM.	
To: Carlotta Cellucci	
From: Hunter Butler	

PERSONNEL ON SITE:

Battelle: Angela Piemonte, Samuel Moore and Hunter Butler; Holt Services: Jeffery Johnson and Kelly Arndt; CalClean: Noel Shenoi, Davis Rios, Kevin Kaiser.

SUMMARY OF WORK COMPLETED:

Mobilized to location CL-B176/MW1-71 in the middle of the Central Landfill. Advanced boring and sampled soils from 0 ft bgs to 50 ft bgs; geotechnical soil samples collected at 25 ft bgs and 48 ft bgs; collected analytical samples at 8 ft bgs, 28 ft bgs, 40 ft bgs and 45 ft bgs; and prepared the soil logs.

Continued set up and operation of in-well pressure transducers for monitoring of HVDPE pilot test commencing Tuesday, May 3rd, 2022.

CalClean continued on site to set up of HVDPE system for treatment program starting Tuesday, May 3rd, 2022. Continued installation of treatment and support equipment into test wells in the eastern portion of the southern plantation.

DEVIATIONS FROM WORKPLAN:

No deviations from the workplan.

SAFETY OBSERVATIONS AND GOOD CATCHES:

None today.

FIELD ACTIVITY CHRONOLOGY:

A. Lewis continued out sick.
0715 H. Butler on site Keyport. CalClean on site.
0720 A. Piemonte on site.
0725 M. Meyer and Holt Services onsite.
0735 S. Moore on site.
0750 Conducted individual tailgate H&S meetings for Battelle, CalClean and Holt. Topics included: HVDPE equipment moving activities; heavy lifting of automatic hammer, proper PPE, equipment inspections, tight work areas, and footing on uneven ground were some topics discussed.

0800 A. Piemonte continued prep for drilling and development operations, calibrate PIDs.
0815 M. Meyer and S. Moore discussion with CalClean on well head assembly requirements for testing.
0915 Drillers start mobilization to CL-B176-MW1-71.
0930 Set up on CL-B176-MW1-71. C. Cellucci on site for meeting on startup of CalClean operations.
1012 Drillers initiate drilling operations with cutting of parking lot asphalt at boring location. Install mud tub for drilling fluid capture.
1040 Drillers out for pumping equipment and lunch break.
1145 Back from lunch break, final set up of drill rig.
1215 Initiate advance and sampling at CL-B176/MW1-71.
1235 Install 5-foot secondary containment casing for fluid control.
1248 Collect analytical sample at 8 ft bgs.
1340 Set up for geotech sample at 25 ft bgs with split-spoon sampling and auto-hammer.
1400 Clear cable tangle in drill rig hoist winch.
1431 25 ft geotech sampler retrieved, continue boring advance to 45 ft bgs.
1450 M. Meyer off site. S. Moore initiates development of MW1-69.
1505 Advance to 30 ft bgs.
1545 Advance to 40 ft bgs. Collect analytical samples at 28 ft and 40 ft bgs.
1620 Advance boring to 45 ft bgs. Set up for geotech sample at 45 ft bgs with split-spoon sampling and auto-hammer.
1655 45 ft geotech sampler retrieved.
1705 Advance to 50 ft bgs, set casing. Secure borehole and drill rig. Start cleanup operations.
1715 Drillers offsite.
1723 Collect analytical sample at 45 feet bgs. Continue cleanup operations.
1745 Site secured. A. Piemonte, S. Moore and H. Butler offsite.

<u>SUMMARY OF FINDINGS:</u>

Soil boring for CL-B176/MW1-71 was advanced to the intermediate depth of 50 feet bgs with a sonic drilling rig to the identify and confirm the target soil depth interval for installation of a deep-water-zone monitoring well. Soil samples were collected for planned geotechnical analysis at 25 ft and 45 ft bgs; and chemical analysis at 8 ft, 28 ft, 40 ft and 45 ft bgs. Field PID readings were as high as 6,188 ppb (at 28 ft bgs), dropping to below 200 ppb by 50 ft bgs.

CalClean continued on site to set up of HVDPE system for treatment program starting Tuesday, May 3rd, 2022. Continued installation of testing equipment in the eastern perimeter of southern plantation.

<u>PLANS FOR THE FOLLOWING DAY:</u>

Tuesday, May 3rd, 2022 drilling crew will continue advancement, sampling and installation of monitoring well location CL-B176-MW1-71 in the middle of asphalt parking area the middle of the landfill and start drilling and sampling activities.

Initiate and complete well development of SP-B174-MW1-69. CalClean to start pilot test operations commencing Tuesday, May 3rd, 2022.

<u>ATTACHMENTS</u>:

Daily tailgate H&S form.

	Signed: ______________________________

DAILY FIELD REPORT 5/3/2022	Contract No. N39430-16-D-1802, CTO N4425521F4225 References Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)

Project: G24790.79 and G24790.30 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing and Vertical Extent Investigation

Location: Naval Base Kitsap Keyport, WA OU1

Client: Naval Facilities Engineering Command Northwest | **Contractor:** Battelle

Weather: 44-59 degrees F, South wind at 3mph, gusting to 6 mph, cloudy with sun breaks

To: Carlotta Cellucci

From: Hunter Butler

PERSONNEL ON SITE:

Battelle: Michael Meyer, Angela Piemonte, Samuel Moore, Andy Lewis, and Hunter Butler; Holt Services: Jeffery Johnson and Kelly Arndt; Cal-Clean: Noel Shenoi, Kevin Kauser, and Davis Rios.

SUMMARY OF WORK COMPLETED:

Completed boring to 100 ft bgs at MW1-71, metal casing broke while installing monitoring well casing. Will return tomorrow to work on the fix to remove metal casing. HVDPE Pilot Test system started, minor issues to a pump with new parts arriving tomorrow by Fed-Ex. System should be fully operational tomorrow after the fix has been made. Well MW1-69 was surged and developed. Slug testing was completed in wells MW1-43 and MW1-44, aquifer.

DEVIATIONS FROM WORKPLAN:

Collected soils samples for chemical analysis at 95 ft and 100 ft bgs in targeted soils identified at those depths instead of proposed samples at projected target location from 75 ft to 80 ft bgs, based on the deeper drilling depth required and the sampling objectives.

SAFETY OBSERVATIONS AND GOOD CATCHES:

Access to wells located outside the Southern tree plantation fencing had blackberries near ground elevation that created a trip hazard. Cut back and pushed blackberries to the side and bought wood planks to allow assess to the wells that are in the marsh areas.

FIELD ACTIVITY CHRONOLOGY:

0645 A. Lewis onsite.
0700 H. Butler onsite, site briefing conducted.
0720 Holt Drilling onsite.
0730 M. Meyer, S. Moore and A. Piemonte onsite.
0735 Conducted a tailgate H&S meeting with Battelle and Holt Drilling.
0745 Holt Drilling set up work area, filled water tanks, and set up drums around MW1-71.
0810 Conducted a tailgate H&S meeting with Cal-Clean.
0900 Holt Drilling started to drill on MW1-71.
0902 Battelle and Cal-Clean collected first round of water level measurements in the Southern tree plantation.

0917 A. Lewis offsite after advising H. Butler, ASSHO, to buy loppers and plywood to fix areas to access wells outside the Southern tree plantation fenced area along the marsh.
0952 A. Lewis back onsite, advised H. Butler.
1120 Start to surge well MW1-69 and work on development.
1210 Cal-Clean work on setting pumps to run system, M. Meyers and S. Moore supporting efforts.
1330 Reached stable setting for the Pilot Study pumps.
1410 Complete well development at well MW1-69, start to clean and demob from well location.
1440 Complete well decon and demob from well MW1-69.
1455 Complete boring at well MW1-71 at 100 ft bgs. M. Meyer called C. Cellucci to confirm the depth of the monitoring well installation; well to be set at 100 ft bgs. Start to place casing and demob.
1510 M. Meyer offsite.
1515 A. Lewis demob site support truck. H. Butler and A. Piemonte still working on soil characterization and sampling.
1600 A. Lewis and S. Moore set up on well MW1-43 to complete aquifer slug testing. Moved to MW1-44 to set up to complete the aquifer slug test.
1700 Aquifer slug testing is complete at well MW1-43.
1715 Holt Drilling offsite, metal casing broke off with 60 ft left below ground. H. Butler called M. Meyer to advise. Monitoring well construction operations and well location secured pending determination of drill casing removal. Will return in the morning to continue work.
1755 Complete the aquifer slug testing at well MW1-44.
1805 Cal-Clean and Battelle staff off site.

SUMMARY OF FINDINGS:

Soil boring for SP-B176/MW1-71 was advanced to 100 ft bgs to identify a target water bearing zone beneath low-transmissivity soils identified from approximately 50 to 60 ft bgs in adjacent soil boring and monitoring well locations. Clay was found extending to approximately 95 feet bgs, and the well was installed with a 5-foot screen from 95 to 100 feet bgs in a saturated sand.

Soil samples were collected for planned geotechnical analysis at 55 ft bgs; and chemical analysis at 55 ft, 60 ft, 65 ft, 70 ft, and within the screened interval at 95 ft and 100 bgs. Soil samples were containerized, labeled, and preserved on site pending shipment to the analytical laboratory. Only three PID readings up to 155 ppb (approximately 35 ppb background) were measured in the lower 50 feet of the boring, remaining or decreasing to near ambient background concentrations below 86 feet bgs.

PLANS FOR THE FOLLOWING DAY:

Complete the removal of casing broken downhole at MW1-71, set casing. Set up and start to bore/sample at well location MW1-72. Complete aquifer slug tests in Northern tree plantation.

ATTACHMENTS:

Daily tailgate H&S form.

Copies to: Michael Meyer, Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: ___________________________

DAILY FIELD REPORT 5/4/2022	**Contract No.** N39430-16-D-1802, CTO N4425521F4225 **References** Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)
Project: G24790.79 and G24790.30 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing and Vertical Extent Investigation	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: 45-65 degrees F, NW wind at 0-5mph, gusting to 7 mph, partly cloudy with sun breaks	
To: Carlotta Cellucci	
From: Hunter Butler	

PERSONNEL ON SITE:

Battelle: Michael Meyer, Angela Piemonte, Samuel Moore, Andy Lewis, and Hunter Butler; Holt Services: Jeffery Johnson and Kelly Arndt; Cal-Clean: Noel Shenoi, Kevin Kauser, and Davis Rios.

SUMMARY OF WORK COMPLETED:

Completed installation of PVC monitoring well casing in MW1-71 after reconnecting metal drill casing separated during completion operations. Demobilized from MW1-71, cleaned equipment and moved to MW1-72 in north plantation. Causeway aquifer slug testing completed.

DEVIATIONS FROM WORKPLAN:

Completed final surface installation of MW1-71 with bentonite grout from 47 ft bgs to ground surface instead of bentonite chips to surround and encase lodged PVC casing at that depth. Remainder of monitoring well MW1-71 completed to depth per workplan.

SAFETY OBSERVATIONS AND GOOD CATCHES:

Controlled drill cuttings, displaced water and grouting operations during well completion with combination of surface containment and vacuuming operations to minimize surface impacts and potential slip hazards.

FIELD ACTIVITY CHRONOLOGY:

0645 A. Lewis onsite. Cal Clean onsite.
0700 H. Butler onsite, site briefing conducted.
0725 S. Moore, A. Piemonte and Holt Drilling onsite.
0745 Conducted a tailgate H&S meeting with Battelle and Holt Drilling.
0755 Holt Drilling set up work area, continue recovery operations for disconnected drill casing in MW1-71.
0800 A. Lewis conducted a tailgate H&S meeting with Cal-Clean. S. Moore and A. Piemonte conduct QC audit of COCs for laboratory shipment, A. Lewis joins audit after H&S meeting with Cal Clean.
0830 Drilling crew reconnects drill casing for extraction in MW1-71. Seven-foot section of PVC well pipe vibrates loose during drill casing extraction and lodges at 47 feet bgs. Drill crew continues extraction operations on PVC section.
0900 A. Piemonte offsite for lab courier pick up of samples.
0945 A. Piemonte, S. Moore and A. Lewis mobilize for slug testing and water level measurements on the causeway.

1020 Call to M. Meyer and advise of drill casing conditions for MW1-71; unable to retrieve 7-foot section of PVC well casing. Determined that full grouting of remaining well borehole and PVC casing in-place appropriate resolution to well condition and completion of the well. Advised drillers to backfill remaining well borehole annulus with grout. Set up for well grouting operations.
1130 MW1-71 grouted to ground surface.
1200 Drill casing removed from MW1-71, start cleanup operations.
1215 Lunch break.
1300 Return from lunch, continue cleanup of MW1-71.
1430 Mobilize drill rig to NP-B177/MW1-72 in north plantation. Move soil and water drums from MW1-71 to storage.
1515 Drill crew pressure wash drill equipment and casings.
1545 M. Meyer on site for status update, continue cleanup operations and mobilization to NP-B177/MW1-72.
1600 Drilling crew offsite.
1645 Battelle staff off site.

SUMMARY OF FINDINGS:

Monitoring well MW1-71 completed at 100 ft bgs. Completed collection of groundwater elevations and slug testing of monitoring wells on the causeway. Continued monitoring operation support for Cal Clean pilot testing program.

PLANS FOR THE FOLLOWING DAY:

Start to advance and sample at well location MW1-72. Complete aquifer slug tests in northern tree plantation. Continue monitoring operation support for Cal Clean pilot testing program.

ATTACHMENTS:

Daily tailgate H&S form.

Copies to: Michael Meyer, Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: ___________________________

DAILY FIELD REPORT **5/5/2022**	**Contract No.** N39430-16-D-1802, CTO N4425521F4225 **References** Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)

Project: G24790.79 and G24790.30 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing and Vertical Extent Investigation	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: Overcast to partly cloudy, 45 – 52 F, SW-W wind at 0-9 mph, showers all day.	
To: Carlotta Cellucci	
From: Hunter Butler	

PERSONNEL ON SITE:

Battelle: Angela Piemonte and Hunter Butler; Holt Services: Jeffery Johnson and Kelly Arndt; Cal Clean: Noel Shenoi, Davis Rios, Kevin Kaiser.

SUMMARY OF WORK COMPLETED:

Mobilized to site of sampling location NP-B177/MW1-72 in the northern plantation. Advanced and sampled soils from 0 ft bgs to 75 ft bgs; geotechnical soil samples collected at 40 ft bgs and 75 ft bgs; collected analytical samples at 7 ft, 30 ft, 35 ft, 40 ft, 45 ft, 50 ft, 55 ft, 60 ft, 65 ft and 75 ft bgs; and prepared the soil logs.

Continued monitoring operation support for Cal Clean pilot testing program.

DEVIATIONS F.ROM WORKPLAN:

No soil returns after 3 attempts to collect geotechnical sample at 65 ft bgs. Collected grab sample of 65-foot soil cuttings for grain-size analysis.

SAFETY OBSERVATIONS AND GOOD CATCHES:

None today.

FIELD ACTIVITY CHRONOLOGY:

0715 H. Butler on site. A. Lewis and A. Piemonte on site. Cal Clean on site.
0730 Holt Drilling onsite.
0745 Conducted individual tailgate H&S meetings for Battelle, Cal Clean and Holt.
0800 Continued prep for drilling and development operations, calibrate PIDs.
0915 Drillers complete mobilization to NP-B177-MW1-72.
0940 Drillers initiate drilling and sampling of NP-B177-MW1-72.
1015 Collect analytical sample at 7 ft bgs.
1050 Advance to 40 ft bgs. Advise M. Meyer of progress.
1105 40 ft cuttings out, set up for geotech sample with split-spoon sampling and auto-hammer.
1120 40 ft geotech sampler retrieved.
1145 Collect analytical samples at 30 ft, 35 ft and 40 ft bgs.
1200 50 ft cuttings out, lunch break.

1245 Back from lunch, continue drilling to 60 ft bgs.
1330 60 ft cuttings out.
1345 Collect analytical sample at 45 feet bgs.
1400 Collect analytical samples at 50 ft, 55 ft and 60 ft bgs.
1415 Set up for geotech sample at 65 ft bgs.
1425 65 ft geotech sampler retrieved, no returns. Repeat attempt at 65 ft, still no returns.
1441 Collect analytical sample at 65 feet bgs
1445 Advise M. Meyer, try 3rd attempt geotech sample at 65 ft.
1500 A. Lewis initiates development of MW1-71.
1525 No returns in split spoon sampler at 65 ft bgs in 3rd try, grab bulk sample, continue to 70 ft bgs.
1555 65-foot cuttings out, all sand. Advise M. Meyer, continue to 70 bgs, all sand.
1630 Advance boring to 75 ft bgs, silt and peat. Advise M. Meyer, continue to 75 ft bgs. Set up for geotech sample at 75 ft bgs, set well at 70 ft bgs.
1643 Collect analytical sample at 75 feet bgs.
1705 75 ft geotech sampler retrieved. Secure borehole and drill rig. Complete development of MW1-71. Start cleanup operations.
1715 Drillers offsite.
1723 Continue cleanup operations.
1730 Site secured. A. Piemonte, A. Lewis and H. Butler offsite.

SUMMARY OF FINDINGS:
Mobilized to site of sampling location NP-B177/MW1-72 in the northern plantation. Advanced and sampled soils from 0 ft bgs to 75 ft bgs; geotechnical soil samples collected at 40 ft bgs and 75 ft bgs; collected analytical samples at 7 ft, 30 ft, 35 ft, 40 ft, 45 ft, 50 ft, 55 ft, 60 ft, 65 ft and 75 ft bgs; and prepared the soil logs. Field PID readings were as high as 1,203 ppb at 9 ft bgs, dropping to below 100 ppb at 11 ft bgs. Values as high as 244 ppb were measured in the 30-44 ft bgs range, with values all below 200 ppb deeper than 44 ft bgs.

Completed development of monitoring well MW1-71.

Cal Clean continued pilot test operations in the eastern perimeter of southern plantation.

PLANS FOR THE FOLLOWING DAY:
Friday, May 6th, 2022, drilling crew will continue the installation of monitoring well NP-B177-MW1-72.

Cal Clean continue pilot test operations in the eastern perimeter of southern plantation.

ATTACHMENTS:
Daily tailgate H&S form.

Copies to: Michael Meyer, Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: ___________________________

DAILY FIELD REPORT 5/6/2022	**Contract No.** N39430-16-D-1802, CTO N4425521F4225, F4359 **References** Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)
Project: G24790.79 and G24790.30 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing and Vertical Extent Investigation	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: 44-55 degrees F, W wind at 0-5mph, overcast, showers through mid-day.	
To: Carlotta Cellucci	
From: Hunter Butler	

PERSONNEL ON SITE:

Battelle: Michael Meyer, Angela Piemonte, Andy Lewis, and Hunter Butler; Holt Services: Jeffery Johnson and Kelly Arndt; Cal-Clean: Noel Shenoi, Kevin Kauser, and Davis Rios.

SUMMARY OF WORK COMPLETED:

Completed installation of PVC monitoring well casing in MW1-72. Demobilized from MW1-72, cleaned equipment and moved to MW1-73 in north plantation.

DEVIATIONS FROM WORKPLAN:

Completed final installation of MW1-72 with bentonite grout from 53 ft bgs to ground surface instead of bentonite chips to minimize soil heaving and potential chip bridging during well installation. Remainder of monitoring well MW1-72 completed to depth per workplan.

SAFETY OBSERVATIONS AND GOOD CATCHES:

Controlled drill cuttings, displaced water and grouting operations during well completion to minimize surface impacts and potential slip hazards.

FIELD ACTIVITY CHRONOLOGY:

0645 A. Lewis onsite. Cal Clean onsite.
0720 H. Butler onsite.
0725 A. Piemonte on site.
0730 M. Meyer and Holt Drilling onsite.
0745 Conducted a tailgate H&S meeting with Battelle and Holt Drilling.
0800 M. Meyer and A. Lewis check on functional status of bumped well in southern plantation.
0830 Drilling crew starts installation of monitoring well in MW1-71.
0900 M. Meyer off site.
0930 Well pipe, screen sand and bentonite chip seal installed to 70 ft bgs, allowed to hydrate. Set up for grouting operations.
1100 MW1-72 grouted to ground surface, start cleanup and decon operations.
1200 Mobilize drill rig to NP-B177/MW1-73 in north plantation. Lunch break.
1230 Return from lunch, continue cleanup and set on MW1-73.

1400 Drill crew finish pressure wash drill equipment and casings and move on to MW1-73. Continue cleanup operations in parking area.
1430 Drilling crew offsite.
1445 Battelle staff off site.

SUMMARY OF FINDINGS:

Monitoring well MW1-72 completed at 70 ft bgs.

Continued monitoring operation support for Cal Clean pilot testing program.

PLANS FOR THE FOLLOWING DAY:

Monday, May 9th, 2022, start advance and soil sampling at well location MW1-73. Complete well development of MW1-72. Continue monitoring operation support for Cal Clean pilot testing program.

ATTACHMENTS:

Daily tailgate H&S form.

Copies to: Michael Meyer, Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: ___________________________

DAILY FIELD REPORT 5/9/2022	Contract No. N39430-16-D-1802, CTO N4425521F4225, F4359 **References** Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)
Project: G24790.79 and G24790.30 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing and Vertical Extent Investigation	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: 42-55 degrees F, South wind at 5 mph, gusting to 10 mph, cloudy with sun breaks	
To: Carlotta Cellucci	
From: Hunter Buter	

PERSONNEL ON SITE:

Battelle: Angela Piemonte, Andy Lewis, and Hunter Butler; Holt Services: Jeffery Johnson and Kelly Arndt; Cal-Clean: Kevin Kauser.

SUMMARY OF WORK COMPLETED:

Completed boring to 80 ft bgs at MW1-73. Well MW1-72 was surged and developed. Drums in the northern plantation from MW1-72 were palletized.

DEVIATIONS FROM WORKPLAN:

NA

SAFETY OBSERVATIONS AND GOOD CATCHES:

Mud from plantations were kept within the plantations, Bobcat stayed inside the plantations to not track mud onto asphalt. Creating a cleaner work area and less slippery mud in parking area. Removed frayed section of drill rig winch cable, reattached hoist assembly.

FIELD ACTIVITY CHRONOLOGY:

0700 A. Lewis and H. Butler onsite, discussed day's work.
0715 A. Piemonte onsite.
0730 Holt Drilling onsite. Conducted a tailgate H&S meeting, topics included Slips/Trips/Falls, tight work areas, no heavy lifting, cold stress-take breaks as needed, proper PPE, ergonomics were some topics discussed.
0740 Conducted a tailgate H&S meeting with CalClean.
0750 H. Butler offsite, Holt Drilling mob to MW1-73, cleaning equipment.
0900 A. Lewis and A. Piemonte set up on MW1-72 to complete the surge well and complete well development.
0920 H. Butler onsite.
0950 Set up on well MW1-73, start drilling.
1050 Collect analytical sample at 7 ft bgs.
1102 purge complete at MW1-72 for well development, 100 gallons purged. Cleaned and decon DC pump.
1130 Drilling break to remove frayed section of winch cable and replace hoist assembly. Set up for geotech sample at 30 ft bgs. A. Lewis support sampling at MW1-73, alongside H. Butler and A. Piemonte.
1220 Collect geotech sample at 30 ft bgs.

1225 Holt Drilling breaks for lunch.
1255 Holt Drilling completes lunch and continues work at MW1-73.
1310 A. Lewis onsite dumpster to dispose of common waste and check in with Cal-Clean.
1325 Collect analytical sample at 40 ft bgs.
1345 Advance to 50 ft bgs. Set up for geotech sample at 50 ft bgs.
1350 Collect analytical sample at 48 ft bgs.
1400 No sample recovery at 50 ft bgs; resampled with partial recovery.
1430 Coned off drums in parking lot.
1505 Advance to 58 ft bgs. Set up for geotech sample at 58 ft bgs.
1515 Collect geotech sample at 58 ft bgs. Collect analytical sample at 55 ft bgs.
1605 Collect analytical samples at 60 ft, 65 ft and 70 ft bgs.
1620 Drillers drilled to 80ft bgs at MW1-73, ran out of water until next day. Advised M. Meyer of clay soils to 80 ft bgs. Filled tanks with water and placed inside plantation. Dug bollard holes for MW1-72, will set later. All full drums from MW1-72 were palletized, prep for next day.
1715 H. Butler and A. Piemonte offsite.
1745 A. Lewis and Holt Drilling offisite.

SUMMARY OF FINDINGS:

Soil boring for NP-B178/MW1-73 was advanced to 80 feet bgs with a sonic drilling rig to attempt to identify and confirm the target soil depth interval for installation of a deep-water-zone monitoring well. Deep target water bearing zone beneath low-transmissivity soils identified from approximately 50 to 60 ft bgs in adjacent soil boring and monitoring well location was not identified to 80 ft bgs. Additional soil sampling tentatively planned to identify target soils at 90 ft bgs.

Soil samples were collected for planned geotechnical analysis at 30 ft, 50 ft and 58 ft bgs; and chemical analysis at 7 ft, 30 ft, 40 ft, 48 ft, 55 ft, 60 ft, 65 ft and 70 ft. Soil samples were containerized, labeled, and preserved on site pending shipment to the analytical laboratory.

Only five elevated PID readings from 597 to 1344 ppb (approximately 0 to 130 ppb background) were measured in scattered locations in the lower 32 feet of the boring.

PLANS FOR THE FOLLOWING DAY:

Complete installation of MW1-73, slug test MW1-72, Navy and Regulator site walk, work on installation of monuments and bollards, start demob.

ATTACHMENTS:

Daily tailgate H&S form.

Copies to: Michael Meyer, Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: ___________________________

DAILY FIELD REPORT **5/10/2022**	**Contract No.** N39430-16-D-1802, CTO N4425521F4225, F4359 **References** Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)

Project: G24790.79 and G24790.30 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing and Vertical Extent Investigation	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: 41-57 degrees F, SSE wind 6 mph, gusting to 10 mph, overcast with sun breaks	
To: Carlotta Cellucci	
From: Hunter Butler	

PERSONNEL ON SITE:

Battelle: Michael Meyer, Angela Piemonte, Andy Lewis, and Hunter Butler; Holt Services: Jeffery Johnson and Kelly Arndt; Cal-Clean: Kevin Kauser and Noel Shenoi, Site walk visitors see daily safety briefing.

SUMMARY OF WORK COMPLETED:

Installed well at MW1-73 and demob from well MW1-73. Installed surface completion monitoring well security boxes at MW1-71 and MW1-72. Collect VOC sample at treatment system. Initiate cleanup operations for demob from site.

DEVIATIONS FROM WORKPLAN:

Completed final installation of MW1-73 with bentonite grout from 83 ft bgs to ground surface instead of bentonite chips to minimize soil heaving and potential chip bridging during well installation. Remainder of monitoring well MW1-73 completed to depth per workplan. Collected final two soil samples at the bottom of the soil boring at 95ft and 100ft.

SAFETY OBSERVATIONS AND GOOD CATCHES:

NAVFAC NW and visitors onsite, shut drill rig down during site walk.

FIELD ACTIVITY CHRONOLOGY:

0700 A. Lewis onsite.
0710 H. Butler and A. Piemonte onsite.
0730 M. Meyer and Holt Drilling onsite. Conduct a tailgate H&S meeting. Topics included: no heavy lifting, proper PPE, pinch points, motorcycle training traffic, clean work areas, caution when backing equipment, were some topics discussed.
0750 Discuss daily tailgate meeting with CalClean.
0815 Start sampling treatment system air samples. Continued drilling of MW1-73 from 80ft to 100ft.
0845 Complete sampling treatment system air samples.
0900 C. Cellucci onsite.
0915 Drilling and sampling at MW1-73 continues and A. Lewis supports.
0940 Advanced to 100ft at MWMW1-73. Target sand encountered at 95ft, set well at 100ft. Collect analytical samples at 95 ft and 100 ft.

1000 Holt Drilling set up on MW1-71 to set monument.
1040 Holt Drilling complete flush mount well monument.
1100 Holt Drilling break for lunch.
1130 Holt complete break for lunch.
1150 Well casing complete at MW1-73, start backfilling.
1155 NAVFAC NW site walk arrived at northern plantation; drill rig shut down. Holt set bollards and monument at MW1-72.
1240 NAVFAC NW site walk complete, visitors offsite. Continue backfilling MW1-73.
1245 Holt Drilling installed concrete for well box and bollards at MW1-72.
1345 M. Meyer offsite.
1400 Initiate grout backfill for MW1-73. Start to remove drill casing.
1445 Drill casing removed and backfilling complete for MW-73.
1520 H. Butler offsite.
1525 Holt Drilling demob from MW1-73, starting to demob equipment/supplies from site, all drums palletized and removed from northern plantation. Decon all casing and soiled items, only the drill rig and bobcat left inside the plantation. Back blading the northern plantation and installation of monument for MW1-73 will happen tomorrow.
1845 Holt Drilling and Battelle offside, contacted Cal-Clean to let them know we are offsite for the day.

SUMMARY OF FINDINGS:

Soil boring for NP-B178/MW1-73 was advanced from the intermediate depth of 80 feet bgs with a sonic drilling rig to identify and confirm the target depth interval for installation of a deep-water-zone monitoring well. The soil boring was advanced to 100 ft bgs to identify a target water bearing zone beneath low-transmissivity soils identified from approximately 50 to 60 ft bgs in adjacent soil borings and monitoring well locations. Sand and gravel were identified at 90 ft to 100 ft bgs. Monitoring well construction confirmed with C. Cellucci in the targeted soils at 100 ft bgs.

Soil samples were collected for planned chemical analysis at the confirmed identified bottom of the soil boring at 95 ft and 100 bgs. Soil samples were containerized, labeled, and preserved on site pending shipment to the analytical laboratory. Only background level PID readings up to 18 ppb (approximately 15 ppb background) were measured in the lower 20 feet of the boring.

PLANS FOR THE FOLLOWING DAY:

Holt Drilling site demob, remove drill rig and bob cat from northern plantation, back blade all work areas in the southern and northern tree plantations. Develop MW1-73, install monument box and bollards at MW1-73. Install bollards at all remaining wells in southern plantation. Sample newly installed wells. Holt complete site demob, clean site and organize supplies for next well installation event planned for the causeway area.

ATTACHMENTS:

Daily tailgate H&S form.

Copies to: Michael Meyer, Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: ___________________________

DAILY FIELD REPORT **5/11/2022**	**Contract No.** N39430-16-D-1802, CTO N4425521F4225, F4359 **References** Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)
Project: G24790.79 and G24790.30 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing and Vertical Extent Investigation	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: 43-59 degrees F, SSW wind 12 mph, gusting to 21 mph, overcast/sun breaks/rain showers	
To: Carlotta Cellucci	
From: Hunter Butler	

PERSONNEL ON SITE:

Battelle: Angela Piemonte, Andy Lewis, and Hunter Butler; Holt Services: Jeffery Johnson and Kelly Arndt; Cal-Clean: Kevin Kauser and Noel Shenoi.

SUMMARY OF WORK COMPLETED:

Installation of monument at MW1-73, bollards placed around all existing wells, well development at MW1-73, sampling completed at MW1-69, site cleanup and demob. Holt offsite until next well installation.

DEVIATIONS FROM WORKPLAN:

None.

SAFETY OBSERVATIONS AND GOOD CATCHES:

Last day that Holt will be onsite, discussed not to rush and take time to demob.

FIELD ACTIVITY CHRONOLOGY:

0700 A. Lewis onsite.
0715 H. Butler and A. Piemonte onsite.
0730 Holt Drilling onsite. Conduct a tailgate H&S meeting. Topics included; tight work areas, no heavy lifting, pinch points, proper PPE, hydration, ergonomics, were some topics discussed.
0745 Conduct tailgate H&S with CalClean.
0750 Holt Drilling continues demob, installation of bollards, installation of monument at MW1-73, backblading site, and clean equipment. All drums in both plantations were palletized and stored undercover at laydown, except three drums in the northern plantation that will get moved on next event.
0915 Ship samples via MC Delivery pickup to Eurofins in Fife.
0945 Surge well MW1-73.
1025 H. Butler offsite.
1043 Start to develop well MW1-73, set purge rate to 1G/Min.
1045 A. Piemonte set up and starts the aquifer slug test at MW1-72.
1200 A. Piemonte completes aquifer slug test at MW1-72.
1315 A. Lewis completes well development at MW1-73.
1350 A. Lewis and A. Piemonte set up to purge and sample MW1-69.

1600 Holt Drilling lifted well monument MW1-57 to try to fix the kink in channel zero. After lifting monument, the kink remains at about 4ft.
1655 Collect samples at MW1-69.
1720 Arrived back at the northern plantation shed to clean, demob, repack samples; support Holt demob; and prepare for next day.
1740 Holt Drilling offsite.
1800 Contacted CalClean and stated we are offsite, Battelle offsite.

SUMMARY OF FINDINGS:
No significant findings from the work performed today.

PLANS FOR THE FOLLOWING DAY:
Complete vapor sampling AM; sample wells MW1-71 and MW1-72; organize bottles and count; ship vapor samples and physical soil samples; and complete site cleanup.

ATTACHMENTS:
Daily tailgate H&S form.

Copies to: Michael Meyer, Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: ___________________________

DAILY FIELD REPORT **5/12/2022**	**Contract No.** N39430-16-D-1802, CTO N4425521F4225, F4359 **References** Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)

Project: G24790.79 and G24790.30 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing and Vertical Extent Investigation	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: 49-51 degrees F, S. Wind at 12 MPH, gusting to 29 MPH, Overcast with rain showers	
To: Carlotta Cellucci	
From: Andy Lewis	

PERSONNEL ON SITE:
Battelle: Angela Piemonte and Andy Lewis; Cal-Clean: Kevin Kauser.

SUMMARY OF WORK COMPLETED:
Sampled vapor ports at the treatment system, set up and sampled at MW1-71 and MW1-72.

DEVIATIONS FROM WORKPLAN:
None.

SAFETY OBSERVATIONS AND GOOD CATCHES:
Heavy winds in the afternoon, tent was kept upright by heavy sand buckets strapped to canopy.

FIELD ACTIVITY CHRONOLOGY:
0815 vapor samples collected by Cal-Clean and A. Piemonte.
0910 A. Lewis onsite, conducted a tailgate H&S meeting with A. Piemonte. Topics included; slips/trips/falls, no heavy lifting, cold stress, pinch points, proper PPE, traffic in parking lot were some topics included.
0915 set up on MW1-71 to sample.
0944 start purge at MW1-71 set purge rate to 200 ml/min.
1230 collect samples at MW1-71 (MSMSD)
1315 break down at MW1-71 and mob to MW1-72 to sample.
1345 set up on MW1-72.
1409 start to purge at MW1-72, purge rate set to 200 ml/min.
1504 complete purging at MW1-72.
1508 collect sample from MW1-72.
1514 collect duplicate sample from MW1-72.
1535 demob from MW1-72, set some outdoor items at MW1-73 to sample tomorrow, clean and calibrate equipment.
1610 A. Piemonte off site.
1615 A. Lewis met with Cal Clean to discuss sampling of the treatment system next week.
1640 A. Lewis offsite.

SUMMARY OF FINDINGS:

Well MW1-71 exhibited high turbidity readings despite substantial previous development effort. Nearly 3 hours of purging was required to meet the sampling criteria.

PLANS FOR THE FOLLOWING DAY:

Sample well MW1-73, complete bottle count for follow up sample event, clean equipment and organize shed, file field forms, prep for next event, confirm drum count, button up site, demob.

ATTACHMENTS:

Daily tailgate H&S form.

Copies to: Michael Meyer, Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: ______________________

DAILY FIELD REPORT **5/13/2022**	**Contract No.** N39430-16-D-1802, CTO N4425521F4225, F4359 **References** Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)
Project: G24790.79 and G24790.30 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing and Vertical Extent Investigation	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: 43-57 degrees F, SSE wind at 7 MPH, gusting to 10 MPH, overcast w/sun and showers	
To: Carlotta Cellucci	
From: Andy Lewis	

PERSONNEL ON SITE:
Battelle: Angela Piemonte, H. Butler, and Andy Lewis; Cal-Clean: Kevin Kauser.

SUMMARY OF WORK COMPLETED:
Purge/sample MW1-73, ship samples by Fed-ex and MC Delivery, treatment system running, mob/demob, bottle count, and cleaning of equipment.

DEVIATIONS FROM WORKPLAN:
None.

SAFETY OBSERVATIONS AND GOOD CATCHES:
Removed cones from motorcycle course and placed back into place as an outer perimeter.

FIELD ACTIVITY CHRONOLOGY
0730 A. Lewis and A. Piemonte onsite conducted a tailgate H&S meeting. Topics included slips/trips/falls, proper PPE, no heavy lifting, ergonomics, hydrations, traffic in parking lot, were some topics discussed.
0745 met with CalClean to discuss days' work.
0800 set up on MW1-73 to purge/sample.
0839 start to purge MW1-73.
0938 complete purge at MW1-73.
0940 sample MW1-73.
0959 complete sampling at MW1-73, demob from site, clean equipment.
1011 collect rinsate sample of DTW meter.
1030 H. Butler onsite, support disposal of soil cutting samples.
1200 H. Butler offsite. Continue demob and cleaning. Prep samples for shipment for MC Delivery and Fed-Ex.
1330 A. Lewis and A. Piemonte offsite, met MC Delivery at Pass and ID.
1400 A. Piemonte shipped sample by Fed-Ex in Silverdale.
1530 End of Day.

SUMMARY OF FINDINGS:
No significant findings today.

PLANS FOR THE FOLLOWING DAY:
Next week Battelle will collect a duplicate treatment system sample of vapor with Cal-Clean.

ATTACHMENTS:
Daily tailgate H&S form.

Copies to: Michael Meyer, Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: ___________________________

DAILY FIELD REPORT 5/20/2022	Contract No. N39430-16-D-1802, CTO N4425521F4225 References Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)
Project: G24790.79 and G24790.30 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing and Vertical Extent Investigation	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: 54 degrees F, partly cloudy	
To: Carlotta Cellucci	
From: Michael Meyer	

PERSONNEL ON SITE:
Battelle: Michael Meyer; Cal-Clean: Kevin Kauser.

SUMMARY OF WORK COMPLETED:
Received split vapor samples from CalClean, packaged and shipped to Pace Analytical. Staked revised locations of wells on Highway 308 causeway.

DEVIATIONS FROM WORKPLAN:
NA

SAFETY OBSERVATIONS AND GOOD CATCHES:
None today.

FIELD ACTIVITY CHRONOLOGY
0830 M. Meyer onsite.
0845 Met with Cal-Clean to receive split vapor samples collected May 18, 2022 and discuss HVDPE progress.
0935 Pack samples.
1000 Stake new planned locations for MW1-74 and MW1-75 along Highway 308 and refresh location request mark.
1015 Offsite to FedEx for shipping of samples.

SUMMARY OF FINDINGS:
Kevin noted that during the recent heavy rains surface water rose approximately 2 feet and prevented access to at least one of the surface water measurement stations. Kevin also noted that he pumps water from secondary containment into the equalization tank. This could theoretically dilute the analytical results from the groundwater influent sample, however he pumps after taking a sample. Kevin has received a fuel delivery, which went well. The system has been running normally.

Samples collected on 5/18/22:

VR-MW1-66-220518 @0845
VR-MW1-76-220518 @0825

VR-MW1-77-220518 @0835
VR-TI-11-220518 @0815

PLANS FOR THE FOLLOWING DAY:
Next visit by Battelle will be week of May 31.

ATTACHMENTS:
None.

Copies to: Michael Meyer, Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: ___________________________

DAILY FIELD REPORT 6/1/2022	**Contract No.** N39430-16-D-1802, CTO N4425521F4225 **References** Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)
Project: G24790.79 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: 61 degrees F, high clouds	
To: Carlotta Cellucci	
From: Michael Meyer	

PERSONNEL ON SITE:
Battelle: Michael Meyer; Cal-Clean: Kevin Kauser.

SUMMARY OF WORK COMPLETED:
Collected split vapor and groundwater inlet samples alongside CalClean, packaged and shipped to Pace Analytical.

DEVIATIONS FROM WORKPLAN:
NA

SAFETY OBSERVATIONS AND GOOD CATCHES:
None today.

FIELD ACTIVITY CHRONOLOGY
0720 M. Meyer onsite, checked in with K. Kauser. Set up bottles and Tedlar bags for sampling.
0810 Collect split groundwater influent sample GW-IN-05-220601.
0835 Collect split vapor total influent sample VR-TI-16-220601.
0845 Collect split vapor sample VR-MW1-76-220601.
0855 Collect split vapor sample VR-MW1-77-220601.
0905 Collect split vapor sample VR-MW1-66-220601.
0910 Pack samples.
0945 Offsite to FedEx for shipping of samples.

SUMMARY OF FINDINGS:
The system has been running normally.

PLANS FOR THE FOLLOWING DAY:
As discussed via email and phone, during the week of June 6, CalClean will trying removing the down-well pumps and test operations using only vacuum extraction to remove both water and vapor.

ATTACHMENTS:
None.

Copies to: Michael Meyer, Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: ___________________________

DAILY FIELD REPORT 6/14/2022	Contract No. N39430-16-D-1802, CTO N4425521F4225 References Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)
Project: G24790.79 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: 61 degrees F, high clouds	
To: Carlotta Cellucci	
From: Michael Meyer	

PERSONNEL ON SITE:
Battelle: Michael Meyer; Cal-Clean: Kevin Kauser.

SUMMARY OF WORK COMPLETED:
Checked in with CalClean, downloaded datalogger data, dropped off additional sampling supplies.

DEVIATIONS FROM WORKPLAN:
NA

SAFETY OBSERVATIONS AND GOOD CATCHES:
None today.

FIELD ACTIVITY CHRONOLOGY
0835 M. Meyer onsite, dropped off 5 Tedlar bags and four small sample coolers for future sample collection and shipping.
0900 Checked in with K. Kauser. Clarified that he reads air flow from his instrument and then compares it to a chart to get the scfm value (not cfm as shown on the field data sheet). Further clarified that the values listed on the field sheets for the extraction wells are flow meter readings in gallons. The values at the top of the columns are the original flow meter readings at the start of the project.
0907 Download data from MW1-68 datalogger using Bluetooth connection.
0911 Download data from P1-10 datalogger.
0919 Download data from MW1-55 datalogger.
0926 Download data from P1-7 datalogger.
0937 Download data from MW1-4 datalogger.
0945 Download data from MW1-20 datalogger.
0955 Download data from P1-6 datalogger. Repeated communications error at MW1-49. Upload remaining data to Box project folder.
1015 Offsite.

SUMMARY OF FINDINGS:
The system has been running normally. Next visit the datalogger in MW1-49 should be queried using a laptop connection.

PLANS FOR THE FOLLOWING DAY:

As discussed via email and phone, during the week of June 13, CalClean will trying lowering the stinger in MW1-77 to test the maximum depth of effective vacuum extraction to remove both water and vapor, with no assistance from the down well pumps. The pump in MW1-77 is currently off.

ATTACHMENTS:

None.

Copies to: Michael Meyer, Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: ___________________________

DAILY FIELD REPORT 6/21/2022	**Contract No.** N39430-16-D-1802, CTO N4425521F4225 **References** Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)
Project: G24790.79 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: 54 degrees F, sunny	
To: Carlotta Cellucci	
From: Michael Meyer	

PERSONNEL ON SITE:
Battelle: Michael Meyer; Cal-Clean: Kevin Kauser.

SUMMARY OF WORK COMPLETED:
Checked in with CalClean, collected split samples from HVDPE system, measured swing ties from existing surveyed wells to new wells.

DEVIATIONS FROM WORKPLAN:
NA

SAFETY OBSERVATIONS AND GOOD CATCHES:
With the start of air sparging CalClean has implemented additional safety protocols. Whip preventers have been added to pressurized hoses and protocols are in place for bleeding off pressure prior to disconnecting hoses. Because pressure injection has increased water levels and made depth to water readings less useful, and because of high VOC concentrations being driven into the air space in observation wells, CalClean suspended depth to water measurement collection.

FIELD ACTIVITY CHRONOLOGY
0725 M. Meyer onsite, checked in with K. Kauser. Set up for split sampling.
0805 to 0900 Collected split samples. Discussed with K. Kauser observations during initial air sparging operations. At higher pressures, observed bubbling in nearby puddle on the street, and water "spurts" from CMT well MW1-58. Reduced pressure to re-establish capture of injected air. Measured distance from air sparge well AS1-1 to location of bubbling observed – 51 feet. Photographed area of bubbling in relation to AS1-1.
0915 Measure swing ties from existing, surveyed wells to newly installed wells.
1000 Pack samples for shipping.
1030 M. Meyer offsite for sample shipping.

SUMMARY OF FINDINGS:

Addition of air sparging necessitated system rebalancing to ensure that injected air is captured. Collected the following samples:

VR-TI-24-220621 @ 0805
VR-MW1-66-220621 @0835
VR-MW1-76-220621 @0815
VR-MW1-77-220621 @0825
GW-IN-08-220621@0900

Measured the following swing tie distances:

<u>AS1-1</u>
82 inches to MW1-57
135 inches to P1-10
116 inches to MW1-66

<u>MW1-70</u>
121 inches to MW1-66
241 inches to P1-10
237 inches to MW1-56

<u>MW1-76</u>
188 inches to P1-7
32 feet 8 inches to MW1-49
50 feet 7 inches to P1-6

<u>MW1-69</u>
31 feet 3 inches to MW1-49
25 feet 0 inches to P1-7
50 feet 8 inches to P1-6

<u>MW1-71</u>
21 feet 0 inches to MW1-46
28 feet 7 inches to MW1-47
87 feet 1 inch to MW1-48

<u>MW1-72</u>
26 feet 0 inches to MW1-63
64 feet 6 inches to MW1-62
27 feet 8 inches to IW1-N

<u>MW1-73</u>
21 feet 11 inches to MW1-64
45 feet 5 inches to MW1-67
76 feet 0 inches to P1-3

PLANS FOR THE FOLLOWING DAY:
Continue operating HVDPE plus air sparging.

ATTACHMENTS:
None.

Copies to: Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: ___________________________

<table>
<tr><td colspan="2">DAILY FIELD REPORT
6/27/2022
6/28/2022</td><td colspan="2">Contract No.
N39430-16-D-1802, CTO N4425521F4225, F4359
References
Draft Sampling and Analysis Plan (Battelle 2022)
Accident Prevention Plan (Battelle 2019)</td></tr>
<tr><td colspan="4">Project: G24790.79 and G24790.30 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing and Vertical Extent Investigation</td></tr>
<tr><td colspan="4">Location: Naval Base Kitsap Keyport, WA OU1</td></tr>
<tr><td colspan="3">Client: Naval Facilities Engineering Command Northwest</td><td>Contractor: Battelle</td></tr>
<tr><td colspan="4">Weather: 55-91 F, sun, NE wind at 15 mph, gusting to 29 mph</td></tr>
<tr><td colspan="4">To: Carlotta Cellucci</td></tr>
<tr><td colspan="4">From: Andy Lewis</td></tr>
</table>

PERSONNEL ON SITE:

Battelle: Andy Lewis; Cal-Clean: Kevin Kauser.

SUMMARY OF WORK COMPLETED:

Checked in daily with CalClean and Michael Meyer in the am/pm while onsite working alone. Labeled all soil drums with a A, B, or W. A&B drums were sampled separately, and W drums contain water and will be processed through the treatment plant at a later point. Dale Hunt with environmental moved around drums so I can open and remove all the excess water from on top of the soil drums. Eight new drums containing excess water were generated, all labeled. Dale Hunt removed three small scoops from each drum and placed in a labeled five-gallon buckets, labeled A and B. Soil was mixed and sampled. All drums were sealed back up, Dale will return to place the drums back under the covered shed. Labeled and placed a drum inside the large white shed for CalClean to fill with sediment from the treatment system. Measured from MW1-77 to MW1-53/MW1-58/P1-10 to collect the distance for MW1-77 placement. Cleaned work area in the North plantation shed, demob from site. Shipped samples by FedEx next morning.

DEVIATIONS FROM WORKPLAN:

NA

SAFETY OBSERVATIONS AND GOOD CATCHES:

Removed branches in work areas within the southern planation to prevent tripping. Used a forklift to move drums, no drums were moved by hand.

FIELD ACTIVITY CHRONOLOGY

6-27-2022

0800 A. Lewis stopped at the Silverdale Fed-Ex to pick up sample bottles for IDW.

0810 Stopped at Home Depot to pick up field and sampling supplies.

0835 Arrive at NBK Keyport, called M. Meyer to check in.

0850 Arrived at Environmental to talk to D. Hunt regarding support to move drums.

0910 Arrived at CalClean trailer to check in with field staff.

0930 Arrived at drum storage to label drums A & B for sampling and W for drums only containing water.

1225 D. Hunt arrived to help me move drums.

1330 D. Hunt offsite, will return the following day to support sampling. Soil A drums; 1,2,3,4,44,45,5,11,12,13,14; Soil B drums: 33,34,40,41,42,18,19,24,25,26,28,29,30,31,37,43.
1510 Soil drum 28 had less than two inches of loose sediment, relabeled the drum water to run through the treatment plant later.
1615 Completed removing the water on top of all the soil drums that will be sampled. Labeled 8 drums containing decanted water. Sealed up all drums.
1710 Arrived at the Northern tree plantation shed to clean and demob for day. Contacted M. Meyers to check in.
1720 Offsite
1745 End of Day.

6/28/2022
0650 A. Lewis onsite NBK Keyport. Contacted M. Meyers to check in.
0700 Checked in with CalClean.
0710 Called Battelle chemist to confirm bottle order.
0720 Mob service vehicle and drove to the drum storage location. Opened all soil drums to be ready for sampling.
0745 D. Hunt with Environmental onsite to discuss sampling.
0802 D. Hunt back onsite to sample drums. Two new five-gallon buckets labeled A & B were used to collect three scoops from each drum.
0830 D. Hunt completed collecting samples. He will return later to place the drums back under the covered shed. Used a new stainless-steel spoon to mix up all the two composite samples.
0840 Collected sample from A drums using a new stainless-steel spoon. Sample ID: OU1-DRUM-S-A-220628.
0910 Collected sample from B drums using a new stainless-steel spoon. Sample ID: OU1-DRUM-S-B-220628.
0935 Packed up samples for shipment, re-iced cooler.
0955 Called D. Hunt to explain sampling is complete, so he can move drums back under cover. He will return after lunch to complete the task.
1010 Arrived back at the northern tree plantation shed to clean and demob.
1050 labeled and set up a drum for CalClean to place sediment from the treatment system, drum was placed under the large white shed.
1100 A. Lewis and CalClean measured from well MW1-77 to MW1-53/MW1-58/P1-10 to use the measurements for MW1-77 placement. MW1-53 (50’ 91”), MW1-58 (32’ 38”), and P1-10 (29’ 10 “).
1125 Sealed up cooler, added fresh ice for shipment.
1135 Called M. Meyer to check in and explain work completed.
1210 Arrived at Fed-Ex to ship one cooler next morning to lab in Fife WA.
1240 End of Day.

SUMMARY OF FINDINGS:
See notes above.

PLANS FOR THE FOLLOWING DAY:
Continue operating HVDPE plus air sparging.

ATTACHMENTS:
None.

Copies to: Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: ___________________________

DAILY FIELD REPORT **7/11/2022**	**Contract No.** N39430-16-D-1802, CTO N4425521F4225,F4359 **References** Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)
Project: G24790.79 and G24790.30 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing and Vertical Extent Investigation	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: 57-80 degrees F, sunny	
To: Carlotta Cellucci, Amanda Rohrbaugh	
From: Michael Meyer	

PERSONNEL ON SITE:

Battelle: Michael Meyer; Conrad Norton. Cal-Clean: Kevin Kauser. Holt Services: Tyler St. Catherine; David Pine; Marlen Gross. K&D Servies: Phillip Price; Erin Bong; Alexis Bigger; Thomas Kelly

SUMMARY OF WORK COMPLETED:

Mobilized to site and set up on location MW1-75. Drilled to 70 feet bgs.

DEVIATIONS FROM WORKPLAN:

None.

SAFETY OBSERVATIONS AND GOOD CATCHES:

Delayed drilling approximately 30 minutes to verify that Cascade Natural Gas concurred that the drill location was sufficiently far from the nearby 6-inch gas main.

FIELD ACTIVITY CHRONOLOGY

0700 C. Norton onsite
0725 M. Meyer onsite, unload supplies
0815 Holt Services onsite. Begin badging.
0800 Meet Rich from WDOT, C. Cellucci and A. Rohrbaugh from NAVFAC NW to discuss project. WDOT requests buffer truck to protect rig overnight.
0815 Meet Phillip Price from K&D Services. Signs are up and they are ready to close the lane when we are ready.
0900 Review lay down area and hold safety meeting. Close lane.
0945 Begin removing guardrail.
1025 A. Rohrbaugh and C. Cellucci offsite. Guardrail is pulled.
1115 Set up on MW 1-75, move flatbed to laydown.
1115 to 1145 lunch
1220 Ready to drill, hold for confirmation that no natural gas monitor is needed.
1310 Call from Shawn Neil at Cascade Natural Gas. Okay to drill. Begin B180.
1345 Cascade Natural Gas on site to review boring locations. Approved. Drilled to 30 ft bgs.
1410 Sewer district representatives visit – no issues.
1430 At 50ft

1505 Set up to collect a ring sample at 55 feet. However, drillers do not have the correct rings and do not have any caps. Decide to collect sample from gravel in next boring.
1645 Sample soil from Olympia Fm clay at 57 ft.
1615 End drilling for the day at 70ft. Used 100gal of water to control heave. Sample at 65 ft.
1630 Re-open lane.
1645 Off site.

SUMMARY OF FINDINGS:
Boring for well MW1-75 (boring DG-B180) drilled to 70 feet bgs. All field PID readings were zero parts per billion throughout the soil core. Collected soil samples at 57 feet and 65 feet within the peaty clay of the Olympia Formation. Held samples on ice/frozen per protocol.

PLANS FOR THE FOLLOWING DAY:
Continue drilling to identify a sand or gravel layer within the Olympia Formation for well installation.

ATTACHMENTS:
None.

Copies to: Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: ___________________________

<table>
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7/12/2022</td><td colspan="2">Contract No.
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<tr><td colspan="2">Client: Naval Facilities Engineering Command Northwest</td><td>Contractor: Battelle</td></tr>
<tr><td colspan="3">Weather: 57-81 degrees F, sunny</td></tr>
<tr><td colspan="3">To: Carlotta Cellucci, Amanda Rohrbaugh</td></tr>
<tr><td colspan="3">From: Michael Meyer</td></tr>
</table>

PERSONNEL ON SITE:

Battelle: Michael Meyer; Conrad Norton. Cal-Clean: Kevin Kauser. Holt Services: Tyler St. Catherine; David Pine; Marlen Gross. K&D Servies: Phillip Price; Erin Bong; Alexis Bigger; Thomas Kelly

SUMMARY OF WORK COMPLETED:

Constructed MW1-75. Drilled and sampled MW1-74 to 45 feet bgs.

DEVIATIONS FROM WORKPLAN:

None.

SAFETY OBSERVATIONS AND GOOD CATCHES:

Noted pinch point between casing sections on rig and remaining guard rail as casing is loaded on and removed from rig.

FIELD ACTIVITY CHRONOLOGY

0630. M. Meyer onsite. Set up for HVDPE split sampling
0715 C. Norton onsite. Hand off split sample Tedlar bags and jars to K. Kauser. Load up for drilling at MW1-75.
0745 Lane closed.
0800 Holt Services onsite.
0815 Tailgate H&S meeting – go over traffic control and sun impacts.
0830 Start rig and perform maintenance.
0905 Begin drilling and set up for split spoon sample in clay
0945 Collect split spoon sample at 70 feet bgs
1010 Cored 70 to 80 feet bgs, find sand at 75-80. Call C. Cellucci and A. Rohrbaugh to discuss results and setting well. Agree to set 5-foot well screen from 75-80 feet bgs, collect soil samples for analysis in areas with relatively high PID response and at the bottom of the boring where the PID reading was zero.
1030 Setting well MW1-75
1125 Set up Decon.
1200 Well construction complete except for monument, decon complete. Lunch. Discuss plan and ideas for repair of MW1-57.
1320 Move rig to MW1-74, retrieve HVDPE split samples from K. Kauser.

1340 Begin drilling MW1-74
1450 Drilled to 30 feet, drove split spoon at 30 feet, poor recovery in fine gravel.
1530 Drilled to 45 feet, dove split spoon at 45 feet, good recovery in fine sand.
1545 Holt Services off site. Process samples and pack up.
1600 Lane reopened. M. Meyer offsite.
1615 All offsite.

SUMMARY OF FINDINGS:
Well MW1-75 installed without issues and with minimal water added to control heave. Screening of soil from well bore for well MW1-74 showed a PID hit of 500 ppb in artificial fill at 4 feet bgs, then sporadic PID hits up to 125 ppb (43 feet bgs).

PLANS FOR THE FOLLOWING DAY:
Complete drilling of well bore for MW1-74, set well, and reassemble guard rail.

ATTACHMENTS:
None.

Copies to: Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: ___________________________

DAILY FIELD REPORT 7/13/2022	Contract No. N39430-16-D-1802, CTO N4425521F4225,F4359 References Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)

Project: G24790.79 and G24790.30 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing and Vertical Extent Investigation	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: 57-81 degrees F, sunny	
To: Carlotta Cellucci, Amanda Rohrbaugh	
From: Michael Meyer, Conrad Norton	

PERSONNEL ON SITE:

Battelle: Michael Meyer; Conrad Norton. Cal-Clean: Kevin Kauser. Holt Services: Tyler St. Catherine; David Pine; Marlen Gross. K&D Servies: Phillip Price; Erin Bong; Alexis Bigger; Thomas Kelly

SUMMARY OF WORK COMPLETED:

Drilled and sampled MW1-74 to 60 feet bgs. Constructed MW1-74. Installed flush mount surface completions at MW1-74 and MW1-75. Reinstalled guardrail posts.

DEVIATIONS FROM WORKPLAN:

None.

SAFETY OBSERVATIONS AND GOOD CATCHES:

None today.

FIELD ACTIVITY CHRONOLOGY

0700. C. Norton onsite.
0730 Lane closed. M. Meyer onsite
0800 Holt Services onsite. Hold tailgate safety meeting and discuss plans for the day.
0815 Tower up rig.
0845 Drilled to 55 feet. Set up for split spoon sample.
0945 Drilled to 60 feet. Identify top of Olympia-aged unit by peat and clay starting at 55 feet. Confirm well construction with C. Cellucci of NAVFAC NW.
1000 Begin setting MW1-74 with screen 45-55 feet bgs.
1100 MW1-74 set. Drillers take lunch. Investigate and photograph maximum sea water runout at -4 tide occurring around this time. Set up to collect FD and MS/MSD sample from MW1-74 core.
1220 Begin resetting guard rail.
1330 M. Meyer offsite for the day.
1415 Guardrail posts are reset in original locations.
1430 Begin concrete well surface completions (2).
1430 C. Norton to Fedex to send out samples.
1520 C. Norton back onsite from Fedex.

1550 Concrete well surface completion complete, Holt services offsite for the day.
1620 KnD Services reopens lane of traffic and is complete for the day.
1630 C. Norton offsite.

SUMMARY OF FINDINGS:
Lithology at MW1-74 was as anticipated. Sporadic low level PID hits were found in the MW1-74 core, with the most notable at 56 feet bgs in the peat layer.

PLANS FOR THE FOLLOWING DAY:
Develop wells MW1-74 and MW1-75. Reinstall guardrail on posts. Demobilize from highway location.

ATTACHMENTS:
None.

Copies to: Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: ___________________________

DAILY FIELD REPORT 7/14/2022	**Contract No.** N39430-16-D-1802, CTO N4425521F4225,F4359 **References** Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)

Project: G24790.79 and G24790.30 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing and Vertical Extent Investigation	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: 57-81 degrees F, sunny	
To: Carlotta Cellucci, Amanda Rohrbaugh	
From: Conrad Norton	

PERSONNEL ON SITE:

Battelle: Conrad Norton. Cal-Clean: Kevin Kauser. Holt Services: Tyler St. Catherine; David Pine; Marlen Cross. K&D Services: Phillip Price; Erin Bong; Alexis Bigger; Thomas Kelly

SUMMARY OF WORK COMPLETED:

Developed wells MW1-74 and MW1-75, completed reinstallation of guardrail, demobilized all drilling equipment from the closed lane of traffic and demobilized the traffic control company.

DEVIATIONS FROM WORKPLAN:

None.

SAFETY OBSERVATIONS AND GOOD CATCHES:

None today.

FIELD ACTIVITY CHRONOLOGY

0700 C. Norton onsite.
0705 KnD Services onsite.
0750 Holt Services onsite.
0800 Lane of traffic closed.
0810 Holt demobilizing drill rig and other equipment with flatbed truck.
0845 MW1-75 is surged and bailed.
0910 Development pumping begins at MW1-75.
0930 Drillers reinstalling guardrail.
1045 Drillers out to lunch.
1145 Driller return from lunch.
1220 Development pumping of MW1-75 complete with 750 L purged.
1230 MC Delivery picks up samples from B179 and B180.
1235 Bail and surge of MW1-74.
1250 Development pumping begins at MW1-74.
1300 Drillers loading all drums (soil and water) onto flatbed truck for transport to staging area.
1400 Development pumping at MW1-74 complete.

1410 Contacted KnD services to call off their services for Friday 7/15
1430 Drillers are demobilized from the road.
1445 KnD is given permission to open up the lane.
1515 Drillers assess damaged CMT well in South Plantation.
1530 Traffic control offsite.
1545 Holt Services offsite.
1615 C. Norton offsite.

SUMMARY OF FINDINGS:

Development of MW1-74 and MW1-75 was challenging due to high turbidity. Guardrail has been reinstalled to its original state.

PLANS FOR THE FOLLOWING DAY:

Investigate potential solutions for damaged CMT well at the South Plantation. Organize drums and complete demobilization.

ATTACHMENTS:

None.

Copies to: Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: ___________________________

DAILY FIELD REPORT 7/15/2022	Contract No. N39430-16-D-1802, CTO N4425521F4225, F4359 References Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)
Project: G24790.79 and G24790.30 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing and Vertical Extent Investigation	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: 57-81 degrees F, sunny	
To: Carlotta Cellucci, Amanda Rohrbaugh	
From: Conrad Norton	

PERSONNEL ON SITE:
Battelle: Michael Meyer, Conrad Norton. Cal-Clean: Kevin Kauser. Holt Services: Tyler St. Catherine; David Pine; Marlen Cross.

SUMMARY OF WORK COMPLETED:
Holt Services repaired previously damaged CMT well located in the South Plantation. Holt Demobilized from the site. Battelle performed slug tests at five wells.

DEVIATIONS FROM WORKPLAN:
None.

SAFETY OBSERVATIONS AND GOOD CATCHES:
None today.

FIELD ACTIVITY CHRONOLOGY
0750 C. Norton onsite.
0810 Holt Services onsite and working to repair previously broken CMT well.
0815 M. Meyer onsite.
0915 Holt successfully manipulates the position of the CMT well to open up pinched tube.
1000 Holt completes reinstallation/repair of CMT well back to original.
1005 Holt positions all drums from the site in the hazmat temporary storage location.
1045 Holt Services demobilized from the site.
1100 Battelle performing slug tests at five wells.
1530 Battelle offsite for the day.

SUMMARY OF FINDINGS:
CMT well with previously pinched/blocked sampling tube is repaired and all sample tubes are operable.

PLANS FOR THE FOLLOWING DAY:
Monday – Complete sampling of GW at MW1-74 and MW1-75.

ATTACHMENTS:
None.

Copies to: Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: ___________________________

DAILY FIELD REPORT 7/18/2022	**Contract No.** N39430-16-D-1802, CTO N4425521F4225, F4359 **References** Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)
Project: G24790.79 and G24790.30 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing and Vertical Extent Investigation	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: 57-81 degrees F, sunny	
To: Carlotta Cellucci, Amanda Rohrbaugh	
From: Conrad Norton	

PERSONNEL ON SITE:
Battelle: Conrad Norton. Cal-Clean: Kevin Kauser.

SUMMARY OF WORK COMPLETED:
Battelle collected groundwater samples from the recently installed groundwater monitoring wells MW1-74 and MW-75.

DEVIATIONS FROM WORKPLAN:
None.

SAFETY OBSERVATIONS AND GOOD CATCHES:
None today.

FIELD ACTIVITY CHRONOLOGY
0750 C. Norton onsite.
1030 Calibrations of sampling equipment complete.
1200 Sampling equipment set-up at MW1-74
1515 Sampling complete at MW1-74
1530 Set-up for sampling at MW1-75
1800 Sampling complete at MW1-75
1930 IDW/Decon water drum started in hazmat temporary storage area.
2015 C. Norton offsite.

SUMMARY OF FINDINGS:
Newly installed wells performed as expected, allowing collection of groundwater samples at MW1-74 and MW1-75.

PLANS FOR THE FOLLOWING DAY:
Package and ship groundwater samples to various laboratories. Collect HVDPE split samples from CalClean. Change the inoperable data logger in MW1-49 and add one to MW1-53.

ATTACHMENTS:

None.

Copies to: Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: ______________________________

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7/19/2022</td><td colspan="2">Contract No.
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<tr><td colspan="3">Weather: 57-81 degrees F, sunny</td></tr>
<tr><td colspan="3">To: Carlotta Cellucci, Amanda Rohrbaugh</td></tr>
<tr><td colspan="3">From: Conrad Norton</td></tr>
</table>

PERSONNEL ON SITE:

Battelle: Conrad Norton. Cal-Clean: Kevin Kauser.

SUMMARY OF WORK COMPLETED:

Battelle packed and shipped groundwater samples from the previous day's sampling of monitoring wells MW1-74 and MW-75. Battelle packaged and shipped weekly split samples provided by CalClean from the HVDPE system. Swapped an inoperable data logger at MW1-49 and added a data logger to MW1-53.

DEVIATIONS FROM WORKPLAN:

None.

SAFETY OBSERVATIONS AND GOOD CATCHES:

None today.

FIELD ACTIVITY CHRONOLOGY

0430 C. Norton onsite.
0630 All GW samples packed for shipment
0715 Data logger in MW1-49 swapped for operable data logger.
0725 Data logger added to MW1-53
0745 Split Samples from the HVDPE system collected
0830 C. Norton offsite with all samples
1000 All samples and sampling equipment shipped at Fedex near SeaTac Airport.

SUMMARY OF FINDINGS:

The data logger that was in place in MW1-49 was still exhibiting a communication error at the time of replacement.

PLANS FOR THE FOLLOWING DAY:

Field deployment complete.

ATTACHMENTS:

None.

Copies to: Steven Verdibello, Gail DeRuzzo	**Battelle - DAILY FIELD REPORT** Signed: ______________________________

DAILY FIELD REPORT 7/26/2022	Contract No. N39430-16-D-1802, CTO N4425521F4225, F4359 **References** Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)
Project: G24790.79 and G24790.30 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing and Vertical Extent Investigation	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: 67-92 degrees F, sunny	
To: Carlotta Cellucci, Amanda Rohrbaugh	
From: Andy Lewis	

PERSONNEL ON SITE:

Battelle: Andy Lewis, Cal-Clean: Kevin Kauser and Noel Shewol, Pacific Coast Carbon: Jay Jones and Dakota Mazzanti.

SUMMARY OF WORK COMPLETED:

Cal-Clean continued to clean and pack equipment as part of demobilization. Northern plantation shed was cleaned and organized. Went over the drum inventory and what drums were processed through the treatment system. Pacific Coast Carbon set up and started to vacuum out carbon. Downloaded two levelogers, cleaned, stored. Shipped equipment out by Fed-Ex.

DEVIATIONS FROM WORKPLAN:

None.

SAFETY OBSERVATIONS AND GOOD CATCHES:

Overhead power lines are present in the work area and the crew made sure to stay away from the lines.

FIELD ACTIVITY CHRONOLOGY

0725 A. Lewis picked up supplies at local retail.
0800 Arrived onsite, spoke to D. Hunt regarding support with a forklift.
0815 Met with K. Kauser to discuss today’s work and water drum placement and inventory.
0900 Arrived at the North Plantation shed to clean and organize.
1100 Pacific Coast Carbon onsite, J. Jones had badging issues.
1130 D. Hunt escorted J. Jones onsite, H&S briefing conducted.
1140 Pacific Coast Carbon setting up equipment.
1245 Started to download levelogger at well P1-10.
1330 Completed download at P1-10 and probe was cleaned and labeled.
1345 Started to download levelogger at well MW1-53.
1350 Pacific Coast Carbon starts to vacuum carbon.
1405 Complete download at MW1-53 and probe was cleaned and labeled.

1406 Forklift operator is offsite, Pacific Coast Carbon moved trailer and set supersacks in a row, will move tomorrow.
1425 Tested two leveloggers that were not working, still not working. Contacted manufacturer for an address to ship back and RMA number.
1440 N. Shenoi onsite, conducted a H&S meeting.
1515 Cleaned defective leveloggers for shipment.
1530 Pacific Coast Carbon offsite.
1545 Cal-Clean offsite.
1615 Arrived at the Northern Plantation shed to prepare equipment for shipment and tidy up.
1630 Offsite to Fed-Ex to ship equipment.
1640 Onsite Fed-Ex to ship equipment.
1705 Arrived at hotel/office to work on daily report, work on levelogger paperwork, and scans.
1830 End of day.

SUMMARY OF FINDINGS:
To better match the work schedule for Keyport Hazardous Waste personnel, plan to arrive at the site at 0600 tomorrow to start work, D. Hunt will provide escort.

PLANS FOR THE FOLLOWING DAY:
Complete the vacuum work, sample all remaining sediment/soil drums, continue to demob Cal-Clean equipment.

ATTACHMENTS:
Daily tailgate H&S form.

Copies to: Steven Verdibello, Gail DeRuzzo, Michael Meyer, Ellyn Fitch	**Battelle - DAILY FIELD REPORT** Signed: ____________________

DAILY FIELD REPORT 7/27/2022	**Contract No.** N39430-16-D-1802, CTO N4425521F4225, F4359 **References** Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)
Project: G24790.79 and G24790.30 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing and Vertical Extent Investigation	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: 63-90 degrees F, ENE wind at 6mph, Sun	
To: Carlotta Cellucci, Amanda Rohrbaugh	
From: Andy Lewis	

PERSONNEL ON SITE:

Battelle: Andy Lewis, Cal-Clean: Kevin Kauser and Noel Shenoi, Pacific Coast Carbon: Jay Jones and Dakota Mazzanti.

SUMMARY OF WORK COMPLETED:

Cal-Clean continued to clean and pack equipment as part of demobilization. Pacific Coast Carbon completed cleaning all the carbon vessels. Transferred left over water that couldn't be processed by the treatment system into drums, labeled all the empty drums, empty.

DEVIATIONS FROM WORKPLAN:

None.

SAFETY OBSERVATIONS AND GOOD CATCHES:

Small bee hive near the treatment system, Kevin with CalClean showed the site crew where it was at. It is outside the fence and not in a normal pathway.

FIELD ACTIVITY CHRONOLOGY

0535 A. Lewis onsite to prep for day and load truck.
0550 CalClean and Pacific Coast Carbon onsite, conducted a tailgate H&S meeting.
0610 Pacific Coast Carbon preps for day along with CalClean.
0615 NBK Keyport Environmental onsite to support with a forklift.
0620 A. Lewis starts to open all the soil and water drums.
0745 Complete opening all the soil and water drums.
0805 Called M. Meyer to discuss soil and water drum inventory. All the processed water drums only have 2-4 inches of water without much sediment. So we will consolidate the water drums into fewer drums and sample later.
0835 Started to transfer water starting with the drums on the outside of the white tent.
1035 All the drums outside of the tent have been transferred and closed up.
1045 Begin processing drums inside the white tent.
1150 Noel with CalClean onsite, conducted a tailgate H&S meeting.
1200 Pacific Coast Carbon completed their work, start to demob and load up equipment.
1250 Noel with Calclean and Pacific Coast Carbon offsite.

1255 Called D. Hunt and asked if he could place the drums that are outside into Building 1032.
1305 D. Hunt onsite to move drums.
1325 D. Hunt offsite, CalClean continues to demob.
1345 Completed transferring the water into drums in the white tent.
1355 Called M. Meyer to discuss the sampling and drums, there are 16 drums to sample for soil.
1415 Decant water from the soil drums.
1550 Called M. Meyer and realized I decanted and sampled from 8 EA drums that were poorly labeled.
1630 Re-collected samples from only the 8 drums that were part of Battelle and AECOM work, drum 60, 62, 69, 61, 63, 68, soil cutting from 2021 from Battelle, and AECOM soil cutting Keyport OU1.
1700 Created a composite sample of all the remaining soil drums, OU1-DRUM-S-C-220727.
1730 Complete sampling, packed and placed samples on ice, sealed up all remaining drums and placed empty drums on pallets.
1815 Labeled and sealed up treatment system drums, Back Flush and System Decon water.
1845 A. Lewis offsite.
1905 Arrive to Hotel/Office to complete daily, scan, and prepare for next day.
1930 End of Day.

SUMMARY OF FINDINGS:

Initial demobilization of HVDPE system is complete. CalClean offsite approximately 1800. Sampling of remaining soil IDW complete, and water IDW consolidated for sampling.

PLANS FOR THE FOLLOWING DAY:

Surveyors will be onsite around 0900 and plan to work until approximately 1500. CalClean staff will be offsite tomorrow morning, returning in a week to transport a couple of trailers back to California. All new wells and repaired well MW1-57 will be surveyed in. Remaining leveloggers will be downloaded, cleaned, and removed. Peat samples will be shipped to DirectAMS for bulk carbon fraction by FedEx. The two defective leveloggers will be shipped to manufacturer for inspections and possible repair. All drums will be inventoried and confirmed they are labeled properly. Document CalClean work areas.

ATTACHMENTS:

Daily tailgate H&S form.

Copies to: Steven Verdibello, Gail DeRuzzo, Michael Meyer, Ellyn Fitch	**Battelle - DAILY FIELD REPORT** Signed: ___________________________

<table>
<tr><td>DAILY FIELD REPORT
7/28/2022</td><td colspan="2">Contract No.
N39430-16-D-1802, CTO N4425521F4225, F4359
References
Draft Sampling and Analysis Plan (Battelle 2022)
Accident Prevention Plan (Battelle 2019)</td></tr>
<tr><td colspan="3">Project: G24790.79 and G24790.30 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing and Vertical Extent Investigation</td></tr>
<tr><td colspan="3">Location: Naval Base Kitsap Keyport, WA OU1</td></tr>
<tr><td colspan="2">Client: Naval Facilities Engineering Command Northwest</td><td>Contractor: Battelle</td></tr>
<tr><td colspan="3">Weather: 67-91 degrees F, NE wind at 10 mph, Sun</td></tr>
<tr><td colspan="3">To: Carlotta Cellucci, Amanda Rohrbaugh</td></tr>
<tr><td colspan="3">From: Andy Lewis</td></tr>
</table>

PERSONNEL ON SITE:
Battelle: Andy Lewis, BRH: Stephen Wilson and Kaylyn Alcantara

SUMMARY OF WORK COMPLETED:
CalClean offsite as early as 0600. All leveloggers were downloaded. Shipped peat samples, unused Pace bottles, and defective leveloggers back to manufacturer by Fed-Ex. Drum inventory. Surveyed all new wells and repaired well MW1-57. Packed up unused bottles and freezer for a hand delivery tomorrow.

DEVIATIONS FROM WORKPLAN:
None.

SAFETY OBSERVATIONS AND GOOD CATCHES:
Found a 4x4 inch block with nails that could have been a puncture in the southern plantation, picked up and placed in the trash dumpster.

FIELD ACTIVITY CHRONOLOGY
0715 A. Lewis arrived onsite Keyport.
0730 Walked to all the wells that will be surveyed to make sure they are all labeled.
0805 Went through unused bottles and set aside for shipment from the Pilot Study work.
0830 Called M. Meyer to discuss what peat samples we want to ship to DirectAMS.
0920 BRH surveying onsite, discussed days work and conducted a daily tailgate safety meeting.
0955 BRH started to survey.
1000 A. Lewis packed up peat samples from MW1-73 47.0 ft, MW1-73 57.0 ft, MW1-73 69.0 ft, and MW1-79 57ft.
1052 Offsite to Fed-Ex.
1115 Onsite Fed-Ex to ship peat samples, defective leveloggers, and unused bottles from Pace.
1205 Back onsite Keyport, met up with surveyors to discuss progress.
1215 Started to download leveloggers.
1515 BRH surveying offsite.
1554 Arrived at the North Plantation shed to drop off leveloggers.
1615 Arrived at the white tent/building 1032 to complete a drum inventory. Building 1032 56 drums total (24 on left side and 32 on right side) 26 soil (L. 16, R. 10), empty drums 25 (L. 6, R. 19), To be sampled for water 5 (L. 2, R. 3).

Note one drum on the left side part of the inventory has water that needs to be sampled from an EA drum. 20 spent carbon supersacks. White Tent; Battelle/AECOM/2021, 25 drums; soil 8, water to be sampled 4, empty 13. Note two of the "to be sampled" drums are back by the CalClean trailers. There are two drums of soil that are still not known and three empty new drums. In the white tent EA has 16 drums; 5 empty, 8 soil, 3 pending analysis.
1715 Completed a site walk, end of project. Holt items in building 1032; 3 bollards, 2 stick up monuments, 1 flush mount monument, 2 empty/new drums, 1 full pallet of hole plug, 3 partial pallets of hole plug, post hole digger. Inside white tent 16 super sacks of new carbon; CalClean items: 4 trailers, miscellaneous construction materials, buckets and hoses, using about ½ of the white tent space. Outside space CalClean has an additional 11 trailers, 2 large tanks, all the trailers have tarps over them. Southern Plantation there are hoses and saw horses w/valves nicely placed on a tarp. Overall CalClean has a perfectly clean and organized work site.
1755 Picked up garbage and A. Lewis offsite.
1815 Onsite office/hotel to complete daily, scans, prepare for next day.
1900 End of Day.

SUMMARY OF FINDINGS:

Survey of all the new wells and repaired well MW1-57 completed. All leveloggers downloaded. FedEx shipments completed (Peat samples, defective leveloggers, and unused Pace bottles). Drum inventory and site walk.

PLANS FOR THE FOLLOWING DAY:

Pick up freezer, unused bottles, and samples hand deliver to Eurofins at 0730.

ATTACHMENTS:

Daily tailgate H&S form.

Copies to: Steven Verdibello, Gail DeRuzzo, Michael Meyer, Ellyn Fitch	**Battelle - DAILY FIELD REPORT** Signed: ____________________

DAILY FIELD REPORT 7/29/2022	**Contract No.** N39430-16-D-1802, CTO N4425521F4225, F4359 **References** Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)
Project: G24790.79 and G24790.30 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing and Vertical Extent Investigation	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: 67-91 degrees F, NE wind at 10 mph, Sun	
To: Carlotta Cellucci, Amanda Rohrbaugh	
From: Andy Lewis	

PERSONNEL ON SITE:

Battelle: Andy Lewis

SUMMARY OF WORK COMPLETED:

Picked up freezer, IDW samples, and unused bottles. Hand delivered these items to Eurofins Laboratory in Fife.

DEVIATIONS FROM WORKPLAN:

None.

SAFETY OBSERVATIONS AND GOOD CATCHES:

Allowed bad drivers to pass and go around me on the highway.

FIELD ACTIVITY CHRONOLOGY

0525 Depart hotel/office.
0543 Onsite Keyport to pick up freezer, unused bottles, and samples.
0602 Offsite Keyport.
0711 Onsite Eurofins Laboratory to deliver freezer, unused bottles, and IDW soil samples.
0739 Depart Eurofins laboratory, to airport. End of day.

SUMMARY OF FINDINGS:

Delivered freezer, unused bottles, and IDW samples to Eurofins Laboratory in Fife.

PLANS FOR THE FOLLOWING DAY:

No work planned for following day.

ATTACHMENTS:

NA

Copies to: Steven Verdibello, Gail DeRuzzo, Michael Meyer, Ellyn Fitch	**Battelle - DAILY FIELD REPORT** Signed: ___________________________

DAILY FIELD REPORT **8/3/2022**	**Contract No.** N39430-16-D-1802, CTO N4425521F4225, F4359 **References** Draft Sampling and Analysis Plan (Battelle 2022) Accident Prevention Plan (Battelle 2019)
Project: G24790.79 and G24790.30 - Naval Base Kitsap Keyport, WA OU1 HVDPE Pilot Testing and Vertical Extent Investigation	
Location: Naval Base Kitsap Keyport, WA OU1	
Client: Naval Facilities Engineering Command Northwest	**Contractor:** Battelle
Weather: 52-72 degrees, overcast clearing to sunny	
To: Carlotta Cellucci, Amanda Rohrbaugh	
From: Michael Meyer	

PERSONNEL ON SITE:
Battelle: Michael Meyer

SUMMARY OF WORK COMPLETED:
Collected final IDW samples, downloaded baralogger data, labeled CMT ports, and completed final demobilization.

DEVIATIONS FROM WORKPLAN:
None.

SAFETY OBSERVATIONS AND GOOD CATCHES:
None today.

FIELD ACTIVITY CHRONOLOGY
0840 M. Meyer on site. Gather sampling gear from shed. Identify and mark drums for composite samples "D" and "E."
0900 Check in with Kenny Eiford in Building 1051 regarding support for drum sampling.
0930 With support of Keyport Hazardous Waste staff, collect composite water IDW sample "OU1-DRUM-W-E-220803" from drums 14, 20, 32, 49, 53, 59, 66, 75.
0945 Collect field blank for PFAS analysis.
1045 Collect composite soil sample "OU1-DRUM-S-D-220803" from two soil drums generated during GSI sampling effort. Download data from barometric pressure datalogger and store baralogger in shed with other dataloggers. Write port numbers and total depth of sampling ports inside lids of the three CMT wells, install new lock on MW1-57. Leave a table printout in the shed describing the CMT well ports. Collect all outdated paperwork and plans for recycling.
1145 Offsite to FedEx for sample shipping.

SUMMARY OF FINDINGS:
Battelle is now fully demobilized from NBK Keyport.

PLANS FOR THE FOLLOWING DAY:
No work planned for following day.

ATTACHMENTS:

NA

Copies to: Steven Verdibello, Gail DeRuzzo, Michael Meyer, Ellyn Fitch	**Battelle - DAILY FIELD REPORT** Signed: ____________________________

APPENDIX D

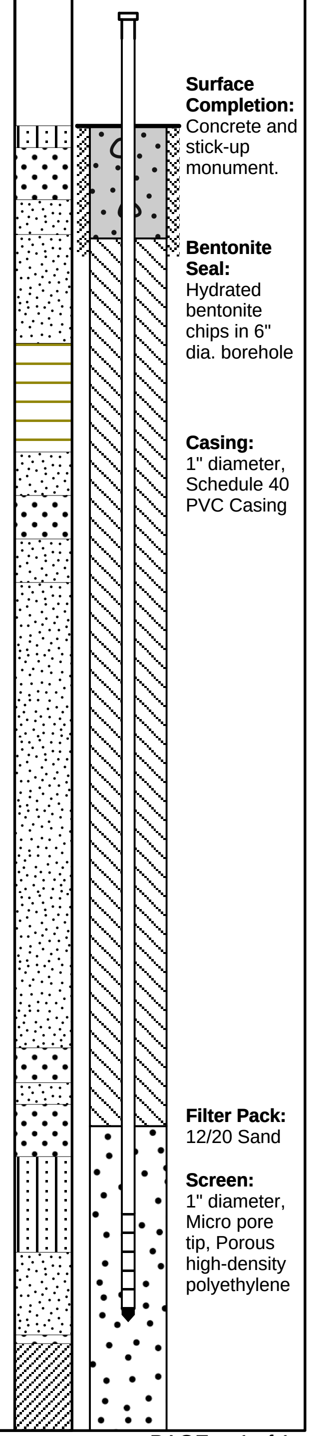
Boring and Well Logs

BATTELLE

Project: Keyport OU 1 HVDPE Pilot Test
Site: OU 1
Boring Log: AS1-1

Permit Number: 22-EP058	Drilling Contractor: Holt Services, Inc.	Northing (NAD 83): 259019.8
Project Number: G24790.79	Driller: J. Johnson	Easting (NAD 83): 1199140.5
Date Logged: 4/22/2022	Drilling Equipment: Terra Sonic Compact Crawler	Surface Elevation (NAVD 88): 13.5 ft
Geologist: Hunter Butler	Drilling Method: Rotosonic	Borehole Abandoned: No
Total Depth (ft bgs): 30	Boring Diameter: 6-inch	Backfill Method: N/A
Reviewer: Michael Meyer	Sampler Type: N/A	Device Type: 1-inch PVC sparge well
	Hammer Type: N/A	

Depth (ft bgs)	USCS Symbol	Sample Description	Gravel (%)	Sand (%)	Fines (%)	Headspace PID (ppb)	Blow Counts	Sample Recovery	Sonic Sleeve	Sample ID; Date/Time
0	SM	Gravelly, silty, very coarse to very fine SAND; dark grayish brown, 10YR4/2; gravels to 40mm diameter; vegetation; wet	10	60	30					
1	SW	Gravelly, very coarse to very fine SAND; olive brown, 2.5Y4/4; trace fines; gravels to 30mm diameter; moist	20	70	10	101			2.5	
2			20	70	10	185				
3	SP	Gravelly, fine to very fine SAND; olive brown, 2.5Y4/4; gravels to 35mm diameter; trace fines; iron staining at 1.7ft; moist				95,900				
4		Medium to fine SAND; dark gray, 5Y4/1; gravels to 40mm diameter; heavy hydrocarbon odor; wet	5	95	0	23,670			2.5	
5						>10M				
6	Pt	PEAT; black, 5Y2.5/1; heavy organic matter, leaves, grasses; heavy hydrocarbon odor; hydrocarbon sheen throughout; saturated	0	100	0	>10M			2.5	
7						>10M				
8	SP	Medium to very fine SAND; black, 5Y2.5/1; hydrocarbon odor; wet	0	100	0	>10M				
9	SW	Coarse to fine SAND; dark brown, 7.5YR3/3, mottled: very dark gray and dusky red inclusions; slight hydrocarbon odor; wet	0	100	0	>10M			2.5	
10	SP	Medium to fine SAND; dark gray, 5Y4/1; slight hydrocarbon odor; wet	0	100	0	191,900				
11		Medium to fine SAND; dark gray, 5Y4/1; gravels to 30mm diameter at 16-17 ft; wet				14,900			2.5	
12						23,980				
13						96,570			2.5	
14						42,230				
15						8,144				
16			0	100	0	51,710			2.5	
17						35,610				
18						5,700			2.5	
19						6,808				
20						24,510				
21	SW	Very coarse to medium SAND; black, 5Y2.5/1; trace gravels to 20mm diameter; wet	10	90	0	2,927			2.5	
22	SP	Medium to very fine SAND; dark greenish gray, 5GY4/1; wet	10	90	0	527				
23	SW	Medium to very fine SAND; black, 5Y2.5/1; increasing gravels with depth; wet	20	80	0	2,324			2.5	
24	SM	Gravelly silty, very coarse to very fine SAND; very dark gray, 5Y3/1; gravels to 25mm diameter, increasing with depth; wet/saturated				197				
25			20	60	20	6,825				
26	SP	Medium to fine SAND; very dark gray, 5Y3/1; trace odor; wet				4,257			2.5	
27			0	100	0	2,460				
28	SW	Gravelly, very coarse to fine SAND; brown, 10YR4/3; gravels to 15mm diameter; mottled: contact with clay	10	90	0	3,446			2.5	
29	CH	CLAY; dark gray, N4/1; very stiff; plastic	0	0	100	1,667				
30						2,297				



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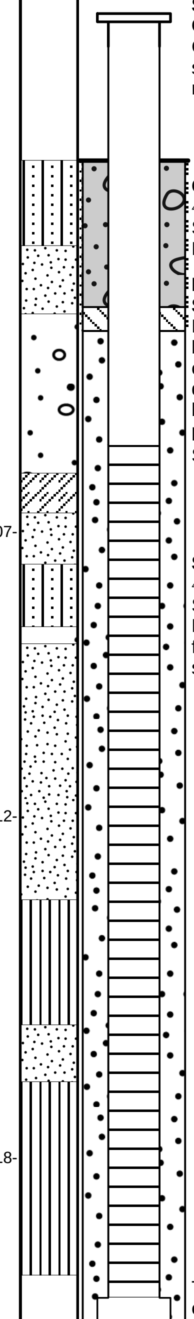
BATTELLE

Project: Keyport OU1 HVDPE Pilot Test
Site: OU 1
Boring Log: SP-181/MW1-76

Permit Number: 22-EP058	Drilling Contractor: Holt Services, Inc.	Northing (NAD 83): 259006
Project Number: G24790.79	Driller: J. Johnson	Easting (NAD 83): 1198934.2
Date Logged: 4/20/2022	Drilling Equipment: Terra Sonic Compact Crawler	Surface Elevation (NAVD 88): 16.57 ft
Geologist: Hunter Butler	Drilling Method: Rotosonic	Borehole Abandoned: No
Total Depth (ft bgs): 20	Boring Diameter: 8-inch	Backfill Method: N/A
Reviewer: Michael Meyer	Sampler Type: N/A	Device Type: 4-inch PVC
	Hammer Type: N/A	

Depth (ft bgs)	USCS Symbol	Sample Description	Gravel (%)	Sand (%)	Fines (%)	Headspace PID (ppb)	Blow Counts	Sample Recovery	Sonic Sleeve	Sample ID; Date/Time
0–1.5	SM	Gravelly silty SAND; dark olive brown, 2.5Y3/3; gravel to 75mm diameter	10	50	40				2.5	
1.5–2.7	SP	Gravelly SAND; olive gray, 5Y4/2; gravel to 30mm diameter	30	60	10	0 (2)				
2.7–5.5	Fill	ARTIFICIAL FILL; dark olive brown, 2.5Y 1/3; mix soil and debris; brick; wood; 5-inch asphalt; plastic	30	60	10	0 (3); 0 (4); 0 (5)			2.5	
5.5–6.2	OH	Sandy SILT; black, N2/; slightly plastic; debris and organics	0	20	80	0 (6)			2.5	
6.2–7.0	SP	Fines, medium to fine SAND; olive, 5Y 4/3; mottled	0	80	20	2,085 (7)				SP-B181-S-07-220420; 4/20/2022 1520
7.0–8.1	SM	Silty SAND; pale green, 5G6/2; slightly plastic; grades to sandy silt at 7.4ft	0	50	50	1,525 (8)				
8.1–8.5	Fill	ARTIFICIAL FILL; dark brown; wood; plastic; drag-down from 5'	30	60	10					
8.5–13	SP	Medium to very coarse SAND; dark gray, N4/; 6-inch very coarse beds at 9.5 ft and 12.5 ft; medium bed at 8.8 ft; fine bed at 12-12.5 ft	0	80	20	1,410 (9); 125 (10); 320 (11); 712 (12)			3.5; 2	SP-B181-S-12-220420; 4/20/2022 1538
13–15.2	MH	SILT; dark gray; N4/0; slightly plastic; soft; very fine sand at 14.5 ft.	0	10	90	410 (13); 275 (14); 55 (15)			2.5	
15.2–16.2	SP	Gravelly silty, very coarse to very fine SAND; dark gray, N4/0; gravel to 20mm diameter	10	70	20	87 (16)				
16.2–19.6	MH	Sandy SILT; dark gray, N4/0; soft; plastic; trace gravel to 20mm diameter	0	15	85	184 (17); 126 (18); 1,180 (19)			2; 2	SP-B181-S-18-220420; 4/20/2022 1553
20						210				

Lithology | Well Construction

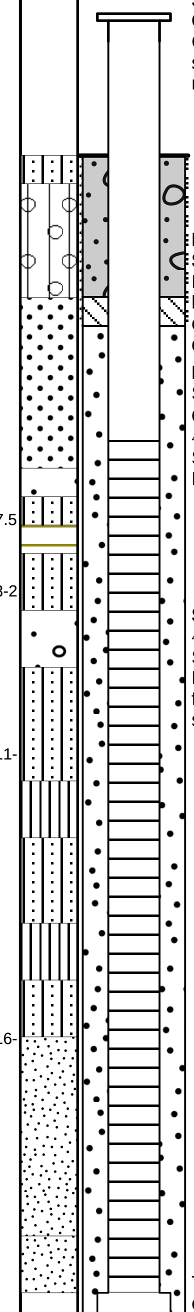


BATTELLE

Project: Keyport OU1 HVDPE Pilot Test
Site: OU 1
Boring Log: SP-B182/MW1-77

Permit Number: 22-EP058	Drilling Contractor: Holt Services, Inc.	Northing (NAD 83): 259042.5
Project Number: G24790.79	Driller: J. Johnson	Easting (NAD 83): 1199109.5
Date Logged: 4/21/2022	Drilling Equipment: Terra Sonic Compact Crawler	Surface Elevation (NAVD 88): 15.21 ft
Geologist: Hunter Butler	Drilling Method: sonic	Borehole Abandoned: No
Total Depth (ft bgs): 20	Boring Diameter: 8-inch	Backfill Method: N/A
Reviewer: Michael Meyer	Sampler Type: N/A	Device Type: 4-inch PVC monitoring well
	Hammer Type: N/A	

Depth (ft bgs)	USCS Symbol	Sample Description	Gravel (%)	Sand (%)	Fines (%)	Headspace PID (ppb)	Blow Counts	Sample Recovery	Sonic Sleeve	Sample ID; Date/Time
0–0.5	SM	Gravelly silty SAND; very dark grayish brown, 10YR 3/2; gravels to 15mm diameter; heavy roots, flora; wet	10	50	40	0			2.5	
0.5–2.5	GM	Cobbly GRAVEL; very dark grayish brown, 10YR3/2; gravels to 40mm diameter; cobbles to 6 inches; wet	40	30	30	0; 0				
2.5–5.5	SW	Gravelly, very coarse to fine SAND; very dark gray, 2.5Y3/0, N3/; gravels to 40mm; wet	30	50	20	238; 408; 2,450			2.5	
5.5–6	Fill	ARTIFICIAL FILL; Gravelly Silty SAND; very dark grayish brown, 20YR 3/2; gravels to 15mm diameter	10	50	40	563			2.5	
6–6.5	SM	Gravelly silty, coarse to fine SAND; dark gray, 2.5Y4/0, N4/; wet	25	50	25	380				SP-B182-S-7.5-220421; 4/21/2022 1440
6.5–7	Pt	PEAT; very dark grayish brown, 10YR3/2; black fibers								
7–8	SM	Silty, fine to very fine SAND; very dark gray, 5Y3/1; heavy hydrocarbon odor; wet	0	60	40	10,400; 2,900			2.5	SP-B182-S-8-220421 (duplicate); 4/21/2022 1450
8–9	Fill	ARTIFICIAL FILL; gravelly silty sand; very dark grayish brown, 10YR 3/2; gravels to 15mm diameter	10	50	40	222				
9–11	SM	Silty fine to very fine SAND; dark gray, 2.5Y4/0, N4/; slightly plastic; wet.	0	60	40	1,710; 4,150			5	SP-B182-S-11-220421; 4/21/2022 1500
11–12	MH	Very soft SILT; dark gray, 2.5Y4/0; slightly plastic.	0	0	100	254				
12–13.5	SM	Silty, medium to very fine SAND; dark gray, 2.5Y4/0, N4/	0	80	20	191				
13.5–14.5	MH	Very soft SILT; dark gray, 2.5Y4/0; slightly plastic	0	0	100	0				
14.5–15.5	SM	Silty, medium to very fine SAND; dark gray, 2.5Y4/0, N4/	0	80	20	410			5	SP-B182-S-16-220421; 4/21/2022 1515
15.5–19	SP	Medium to fine SAND; grayish brown, 7.5Y5/2; trace fines; increasing to trace gravels with depth near 19 ft; wet	0	90	10	625; 195; 553				
19–20	SP	Gravelly SAND; grayish brown, 7.5Y5/2; gravels to 40mm diameter	10	80	10	0; 0				



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APPENDIX E

Well Development and Purge Logs

BATTELLE

NBK Keyport OU1
Well Development / Purge Log

Location: NBK Keyport OU1	Well #: MW1-76	Date: 4/26/22	Project #: G24790.79	Page: 1 of 1

Equipment: Surge block; Hurricane pump; Horiba

Equipment IDs: B22539B

Personnel: A. Piemonte

Date and Time Pump Dropped: 0830 DTP: NA DTW: 8.14

EXPOSURE MONITORING
Background: ppm
Reading: ppm

WELL CONDITION: Good / Fair / Poor — Good

Total Well Depth:	22.45 BTOC		
Static Water Level:	8.14	Depth to Product:	NA
Water Column:	14.31 ft	Product Thickness:	NA
Well Casing Diameter:	4"		
Borehole Diameter:	8"	Multiplier	
Low Flow Method	Development		
Minimal Purge Sampling			

Pump Type: Peristaltic / Liquid Ring / Submersible / Bladder Pump — Submersible

Pump Rate:	3 L/min	
Purge Start Time:	0836	Hours
Purge Stop Time:	0931	Hours
Total Volume Purged:	165	L

Criteria used to stop purging/development: Dry Well / Parameter Stabilization

Time	Water Depth (BTOC)	Volume Recovered (L)	pH (units) ± 0.2	Conductivity (mS/cm) ± 5%	Turbidity (NTU) < 10	Dissolved Oxygen (mg/L) ± 0.2	Temperature (°C) ± 3%	ORP (mV) ± 20	Comments
0850	11.01	42	6.19	0.535	402	8.30	10.64	14	
0900	11.10	72	6.80	0.501	379	3.15	10.51	8	
0910	11.10	102	7.00	0.495	163	4.32	10.36	13	
0920	11.12	132	6.98	0.495	105	3.96	10.31	13	
0930	11.12	162	6.83	0.495	60.3	3.82	10.23	4	
									80% Recharge Level:
									Sample Collected:

Field Team Leader Signature:

FOUO

BATTELLE

NBK Keyport OU1
Well Development / Purge Log

Location: NBK Keyport	Well #: MW1-76	Date: 4/29/22	Project #:	Page: of

Equipment: Master Flex Sampler; Horiba; PID
Equipment IDs: From Andy Lewis; B22539B; B18979B

Personnel: A. Piemonte

Date and Time Pump Dropped: DTP: DTW: 9.0

EXPOSURE MONITORING
Background: 96 ~~ppm~~ ppb
Reading: 236 ~~ppm~~ ppb

WELL CONDITION
Good
Fair
Poor

Total Well Depth: 22.45
Static Water Level: 9.0 Depth to Product: NA
Water Column: Product Thickness: NA
Well Casing Diameter: 4"
Borehole Diameter: 8" Multiplier
Low Flow Method
Minimal Purge Sampling

Pump Type: Peristaltic Liquid Ring Submersible Bladder Pump
Pump Rate: 200 mL/min
Purge Start Time: 1330 Hours
Purge Stop Time: 1442 Hours
Total Volume Purged: ~~L~~ mL

Criteria used to stop purging/development: Dry Well Parameter Stabilization

Time	Water Depth (BTOC)	Volume Recovered ~~(L)~~ mL	pH (units) ± 0.2	Conductivity (mS/cm) ± 5%	Turbidity (NTU) < 10	Dissolved Oxygen (mg/L) ± 0.2	Temperature (°C) ± 3%	ORP (mV) ± 20	Comments
1340	9.0	2000	7.02	0.428	27.6	0.23	12.70	-57	
1350	9.0	4000	7.00	0.427	20.4	0.0	12.35	-71	
1355	9.0	5000	6.98	0.428	20.4	0.0	12.46	-72	
1400	9.0	6000	6.98	0.429	19.6	0.0	12.60	-75	
1405	9.0	7000	6.96	0.429	16.8	0.0	12.71	-76	
1415	9.0	9000	6.95	0.431	12.8	0.0	12.99	-76	
1418	9.0	9600	6.94	0.430	10.8	0.0	13.00	-77	
1421	9.0	10,200	6.94	0.431	10.8	0.0	13.01	-78	
1431	9.0	12,200	6.95	0.431	9.8	0.0	13.02	-79	
1434	9.0	12,800	6.94	0.431	8.1	0.0	13.04	-79	80% Recharge Level:
									Sample Collected: 1434

Field Team Leader Signature:

BATTELLE

NBK Keyport OU1
Well Development / Purge Log

Location:	Well #: MW1-77	Date: 4/26/22	Project #: G24790.79	Page: 1 of 1

Equipment: Surge block, Hurricane Pump, Horiba

Equipment IDs: B22539B

Personnel: A. Piemonte

Date and Time Pump Dropped: 10:29 4/26/22 DTP: —— DTW: 7.21

EXPOSURE MONITORING
Background: ppm
Reading: ppm

WELL CONDITION: Good / Fair / Poor

Total Well Depth: 22.49ft

Static Water Level: 7.21 ft — Depth to Product: NA

Water Column: 15.28 ft — Product Thickness: NA

Well Casing Diameter: 4"

Borehole Diameter: 8" — Multiplier

~~Low Flow Method~~ Development

Minimal Purge Sampling

Pump Type: Peristaltic / Liquid Ring / Submersible / Bladder Pump

Pump Rate: 3L/min

Purge Start Time: 1031 Hours

Purge Stop Time: 1247 Hours

Total Volume Purged: 273 L

Criteria used to stop purging/development: Dry Well / Parameter Stabilization

Time	Water Depth (BTOC)	Volume Recovered (L)	pH (units) ± 0.2	Conductivity (mS/cm) ± 5%	Turbidity (NTU) < 10	Dissolved Oxygen (mg/L) ± 0.2	Temperature (°C) ± 3%	ORP (mV) ± 20	Comments
1046	14.94	45	7.36	0.394	931	7.01	11.40	-124	
1056	16.11	75	7.51	0.383	991	4.58	11.12	-120	
1106	16.86	105	7.43	0.383	991	8.66	10.99	-49	
1116	17.12	135	7.30	0.390	991	8.53	10.62	-39	
1126	17.12	165	7.27	0.395	251	8.61	10.54	-34	
1131	17.12	180	7.04	0.397	248	6.44	10.69	-55	→ Stopped for new drum, but
1226	14.80	210	7.39	0.431	1000	8.55	10.83	-18	want lower turbidity (at 1132)
1246	16.67	270	7.57	0.410	222	8.01	10.73	-56	Start again at 1216
1247	—	273	—	—	—	—	—	—	→ Stop - full drum
									80% Recharge Level:
									Sample Collected:

Field Team Leader Signature:

BATTELLE

NBK Keyport OU1
Well Development / Purge Log

Location:	Well #: MW1-77	Date: 4/29/22	Project #:	Page: of

Equipment: Master Flex Sampler, Horiba, PID

Equipment IDs: From Andy Lewis, B22539B, B18979B

Personnel: S. Moore, A. Piemonte

Date and Time Pump Dropped: ~~0956 4/29/22~~ DTP: DTW: 5.2

EXPOSURE MONITORING
Background: 116 ~~ppm~~ ppb
Reading: 470 ~~ppm~~ ppb

WELL CONDITION: Good / Fair / Poor

Total Well Depth: 22.49 ft

Static Water Level: 5.2 | Depth to Product: NA

Water Column: | Product Thickness: NA

Well Casing Diameter: 4"

Borehole Diameter: 8" | Multiplier

Low Flow Method

Minimal Purge Sampling

Pump Type: Peristaltic / Liquid Ring / Submersible / Bladder Pump

Pump Rate: 200 mL/min

Purge Start Time: 0956 Hours

Purge Stop Time: 1053 Hours

Total Volume Purged: ~~L~~ mL

Criteria used to stop purging/development: Dry Well | Parameter Stabilization

Time	Water Depth (BTOC)	Volume Recovered ~~(L)~~ mL	pH (units) ± 0.2	Conductivity (mS/cm) ± 5%	Turbidity (NTU) < 10	Dissolved Oxygen (mg/L) ± 0.2	Temperature (°C) ± 3%	ORP (mV) ± 20	Comments
1002	5.41	1200	7.00	0.405	0.0	1.24	10.47	-185	
1007	5.42	2200	7.09	0.403	0.0	0.40	10.46	-222	
1012	5.42	3200	7.11	0.403	0.0	0.08	10.46	-245	
1017	5.42	4200	7.12	0.401	0.0	0.00	10.49	-261	
1022	5.42	5200	7.13	0.401	0.0	0.00	10.50	-268	
1027	5.42	6200	7.13	0.401	0.0	0.00	10.52	-276	MS/MSD taken
									80% Recharge Level:
									Sample Collected: 1027

Field Team Leader Signature:

FOUO

APPENDIX F

HVDPE System Field Data

HIGH VACUUM [ ] **SVE** or [X] **DPE** **FIELD DATA SHEET**

CALCLEAN INC.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 05/03/2022 Page 1 of 2

Client: Operator (s):

OBSERVATION WELLS

WELL	IW1-S		P1-6		P1-7		P1-10		MW1-04		MW1-20		MW1-49		MW1-50		MW1-53		MW1-55		MW1-61	
SCREEN	4.7-14.7		11.41-16.41		11.43-16.43		11.71-16.71		8.44-13.44		9.7-14.7		8.29-18.29		7.54-17.54		5.07-15.07		29.92-39.92		2.64-12.64	
DTW (ft)	4.21		7.23		6.68		4.42		6.45		3.59		6.22		8.25		3.88		5.65		5.17	
Time	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)
TRIGGER DEPTH	3.7		10.4		10.4		10.4		7.4		8.7		7.2		6.5		4.0		28.9		1.6	
1330	GW extraction pumps at steady-state: MW1-66 @ 6 GPM, MW1-76 @ 3.5 GPM, MW1-77 @ 2.0 GPM																					
1450-1515		4.57		7.90		7.54		7.25		6.97		5.16		6.79		8.95		4.50		7.10		5.23
05/04/2022																						
0810-0836		4.69		7.88		7.55		6.93		6.90		5.03		6.79		8.93		4.49		6.88		5.24
1550-1616		4.70		7.95		7.74		8.15		7.01		5.25		6.89		9.09		5.28		7.57		5.71
5-5-22 1005-1040		4.55		7.44		6.42		6.68		6.72		4.87		6.33		8.47		4.78		6.79		5.25
1430-1525		4.52		7.45		6.91		6.48		6.67		4.70		6.34		8.46		4.73		6.64		5.23

Comments: Baseline DTW recorded from 08:50 to 09:15

HIGH VACUUM ☐ **SVE** or ☒ **DPE** **FIELD DATA SHEET**

CALCLEAN INC.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 05/03/2022

Client:

Operator (s):

OBSERVATION WELLS

WELL	MW1-68		S-4B		S-9		S-10		MW1-77		MW1-76		MW1-66		Effluent							
SCREEN	38.95-48.95								Tot ~~27.83~~		~~22.09~~		~~60.22~~		~~483.90~~							
DTW (ft)	2.94		1.92		2.55		2.76		238.3 gal		220.9 gal		602.2 gal		4839.0							
Time	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)
TRIGGER DEPTH	37.9																					
14:50-1515		3.01		2.05		2.58		2.82	~~375.1~~ 375.1		~~592.5~~ 592.5		~~1391.5 1391.5~~ 1391.5		~~6375.0~~ 6375.0							
05/04/2022																						
08:10-0830		3.06		2.45		2.63		2.85	375.1		2936.1		6412.2		13520.0							
1530-1610		3.05		2.52		4.84		2.78	550.8		3921.0		8273.0		16556.0							
5-5-22 1005 1040		3.00		2.39		2.60		2.78	644.9		3987.3		8413.5		20739.5							
1430-1525		3.02		2.41		2.60		2.85	644.8		3987.2		8413.6		22862.8							
5/6 0900									644.9		3987.1		8413.4		28481.6							

Comments: MW1-77 not running at 14:50, 5/5 @ 1005 pump 77, 76, 66 NOT RUNNING 5/5 @ 1430-1525
MW1-56-1 (6.75) 2 (6.64), MW1-57-1 (7.68) 6 (7.03), MW1-58-1 (7.64) 2 (7.65) 0 (6.63)

FOUO

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Page 1 of 55

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 5/3/2022

Client:

Operator (s): KEVIN

Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	MW1-66 Off/On (ppmv)	MW1-66 DTW (ft)	MW1-66 Stinger Depth (feet)	MW1-76 Off/On (ppmv)	MW1-76 DTW (ft)	MW1-76 Stinger Depth (feet)	MW1-77 Off/On (ppmv)	MW1-77 DTW (ft)	MW1-77 Stinger Depth (feet)	~~INFL (ppmv)~~	AFTER B-1 (ppmv)	~~AFTER B-2 (ppmv)~~	~~AFTER B-3 (ppmv)~~	~~AFTER B-4~~ (ppmv) NO	EFFL. C (ppmv)	Water Meter Readings units 4839.0	Cumul. Water Discharged gals
Screen Interval: From-To (ft)																				
Initial DTW (ft btoc)																				
5/4						|			|			|							
1500				ON			ON			ON										
1530	27	37	327.1																	
1532				OFF						OFF										
1540							259.5													
1542				OFF			OFF			ON										
1550										226.7										
1552				ON			OFF			OFF										
1600				489.9																
1602				ON			ON			ON										
5/5																				
0900	27	37	340.5																	
0902				OFF						OFF										
0910							287.0													
0912				OFF			OFF			ON										
0920										202.3										
0922				ON			OFF			OFF										
0930				269.9																
0932				ON			ON			ON										
0940														0.8				1.1	20739.5	15900.5

Comments: 05/03@ 14.25 VAPOR SAMPLE (VR MW1-66-220503), @1620 (VR MW1-66-220503) 5/04 WATER SAMPLES IN-01-220504@11:11, MD1-01-220504@1115, MD2-01-220504@1120, EF-01-220504@11:25, @ 1302 pH = 7.42, @ 1426 STOP WORK TURNED OFF POWER @ 1500 RESTART SYSTEM, @ 1530 VAPOR SAMPLE TI TAKEN @1540 MW1-76, @1550 MW1-77, @1600 MW1-66, @1630 EF, @1640 VRMD-01

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706
Page 2 of 55

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 5/5/2022

Client:

Operator (s): KEVIN

Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	MW1-66 Off/On (ppmv)	MW1-66 DTW (ft)	MW1-66 Stinger Depth (feet)	MW1-76 Off/On (ppmv)	MW1-76 DTW (ft)	MW1-76 Stinger Depth (feet)	MW1-77 Off/On (ppmv)	MW1-77 DTW (ft)	MW1-77 Stinger Depth (feet)	~~INFL A~~ (ppmv)	AFTER B-1 (ppmv)	~~AFTER B-2~~ (ppmv)	~~AFTER B-3~~ (ppmv)	~~AFTER B-4~~ (ppmv)	EFFL. C (ppmv)	Water Meter Readings units	Cumul. Water Discharged gals
																			4839.0	
5/5				ON		1	ON		1	ON		1								
1305	26	37	390.5																	
1307				OFF						OFF										
1315							342.7													
1317				OFF			OFF			ON										
1325										283.5										
1327				ON			OFF			OFF										
1335				435.6																
1337				ON			ON			ON										
1630	26	37	265.5																23280.0	18441.0
5/6																				
0815	25	37	387.4																	
0817				OFF			ON			OFF										
0825							301.8													
0827				OFF			OFF			ON										
0835										271.8										
0837				ON			OFF			OFF										
0845				382.7																
0847				ON			ON			ON										
0855														0.0				0.0	28481.6	23642.6

Comments: 5/5 VAPOR SAMPLES TAKEN @ 1305 TI-02, @ 1315 MW1-76, @ 1325 MW1-77, @ 1335 MW1-66, @ 1345 MD-02, @ 1355 EF-02. 5/5 DILUTION OPEN 35 SCFM

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 5 / 6 / 2022

Client:

Operator (s): KEVIN

	Well I.D.			MW1-66			MW1-76			MW1-77			AIR MONITORING						Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft btoc)																			
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~INFL. A~~ (ppmv)	AFTER B-1 (ppmv)	~~AFTER B-2~~ (ppmv)	~~AFTER B-3~~ (ppmv)	~~AFTER B-4~~ (ppmv)	EFFL. C (ppmv)	units 4839.0	gals
5/6				ON		1	ON		1	ON		1								
1215	26	37	419.7																	
1217				OFF			ON			OFF										
1225							306.6													
1227				OFF			OFF			ON										
1235										273.8										
1237				ON			OFF			OFF										
1245				420.7																
1247				ON			ON			ON									29954.5	25115.5
1330						10			10			10								
1630	25	31	308.0																31775.4	26936.4
5/7																				
0800	25	31	307.2																	
0802				OFF			ON			OFF										
0810							177.8													
0812				OFF			OFF			ON										
0820										294.7										
0822				ON			OFF			OFF										
0830				327.0																
0832				ON			ON			ON										
0845														0.1						

Comments: 5/6 VAPOR SAMPLE TAKEN @ 1215 TI-03, @ 1225 MW1-76, @ 1235 MW1-77, @ 1245 MW1-66, @ 1255 MD-03, @ 1300 EF-03 5/7 VAPOR SAMPLES TAKEN @ 0800 TI-04, @ 0810 MW1-76, @ 0820 MW1-77, @ 0830 MW1-66, @ 0845 MD-04, @ 0850 EF-04

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 5 / 7 / 2022

Client:

Operator (s): KEVIN

		Well I.D.		MW1-66			MW1-76			MW1-77			AIR MONITORING							
	Screen Interval: From-To (ft)																			
	Initial DTW (ft btoc)			4.70			8.20			7.09										
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~INFL A~~ (ppmv)	AFTER B-1 (ppmv)	AFTER ~~B-2~~ (ppmv)	AFTER ~~B-3~~ (ppmv)	AFTER ~~B-4~~ (ppmv)	EFFL. C (ppmv)	Water Meter Readings units 4839.0	Cumul. Water Discharged gals
5/7				ON			ON			ON										
0850																		0.0	37822.1	32983.1
1200	25	32	406.7																39704.0	34865.0
1600	24	32	487.9			11			11			11							42678.5	37839.5
5/8																				
0805	24	40	507.9																	
0807				OFF			ON			OFF										
0815							408.2													
0817				OFF			OFF			ON										
0825										384.5										
0827				ON			OFF			OFF										
0835				472.3																
0837				ON			ON			ON										
0845														0.1						
0850																	0.0		54071.1	49232.1
1000						12			12			12								
1200	25	35	403.7																56134.5	51295.5
1600	24	36	387.4																58642.5	53803.5

Comments: 5/8 VAPOR SAMPLES TAKEN @0805 TI-05, @0815 MW1-76, @0825 MW1-77, @0835 MW1-66, @0845 MD-05, @0850 EF-05

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 5/9/2022

Client:

Operator (s): KEVIN

Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Well I.D.: MW1-66 Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	MW1-76 Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	MW1-77 Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	AIR MONITORING: ~~INFL A~~ (ppmv)	AFTER B-1 (ppmv)	~~AFTER B-2~~ (ppmv)	~~AFTER B-3~~ (ppmv)	~~AFTER B-4~~ (ppmv)	EFFL. C (ppmv)	Water Meter Readings units	Cumul. Water Discharged gals
Screen Interval: From-To (ft)																				
Initial DTW (ft btoc)				4.70			8.20			7.09									4839.0	
5/9				ON		12	ON		12	ON		12								
0830	25	32	579.7																	
0832				OFF			ON			OFF										
0840							356.8													
0842				OFF			OFF			ON										
0850										309.2										
0852				ON			OFF			OFF										
0900				641.5																
0902				ON			ON			ON										
0910														1.3						
0915																		0.0	69895.5	65056.5
1200	25	34	440.7																72681.5	67842.5
1600	25	34	465.6																75855.5	
5/10																				
0815	25	32	463.4																	
0817				OFF			ON			OFF										
0825							427.7													
0827				OFF			OFF			ON										
0835										454.6										
0837				ON			OFF			OFF										
0845				638.6																

Comments: 5/9 VAPOR SAMPLES TAKEN @0830 TI-06, MW1-76 @0840, MW1-77 @0850, MW1-66 @0900, MD-06 @0910, EF-06 @0915 5/10 VAPOR SAMPLE TAKEN @0815 TI-07, @0825 MW1-76, @0835 MW1-77, @0845 MW1-66, @0855 MD-07, @0900 EF-07

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 5/10/2022

Client:

Operator (s): KEVIN

Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	MW1-66 Off/On (ppmv)	MW1-66 DTW (ft)	MW1-66 Stinger Depth (feet)	MW1-76 Off/On (ppmv)	MW1-76 DTW (ft)	MW1-76 Stinger Depth (feet)	MW1-77 Off/On (ppmv)	MW1-77 DTW (ft)	MW1-77 Stinger Depth (feet)	INFL A (ppmv)	AFTER B-1 (ppmv)	AFTER B-2 (ppmv)	AFTER B-3 (ppmv)	AFTER B-4 (ppmv)	EFFL. C (ppmv)	Water Meter Readings (units)	Cumul. Water Discharged (gals)
Screen Interval: From-To (ft)																				
Initial DTW (ft btoc)				4.70			8.20			7.09									4839.0	
5/10				ON		12	ON		12	ON		12								
0855														0.5						
0900																		0.1	87026.1	82187.1
1245	25	32	377.8																89645.5	84806.5
1400						12.5			12.5			12.5								
1600	26	31	382.5																92400.5	87561.5
5/11																				
0815	26	34	501.6																	
0817				OFF			ON			OFF										
0825							443.2													
0827				OFF			OFF			ON										
0835										383.7										
0837				ON			OFF			OFF										
0845				419.5																
0847				ON			ON			ON										
0855														1.5						
0900																		1.0	103940.5	99101.5
1200	26	34	492.1			13			13			13							108724.5	103885.5
1600	26	34	445.5																	

Comments: 5/11 WATER SAMPLE TAKEN IN-02 @ 1220, MD2-02 @ 1225, MD1-02 @ 1230, EF-02 @ 1240

HIGH VACUUM [ ] SVE or [x] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 5/12/2022

Client:

Operator (s): KEVIN

		Well I.D.		**EXTRACTION WELLS** MW1-66			MW1-76			MW1-77			AIR MONITORING						Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09			INFL ~~A~~	AFTER B-1	AFTER ~~B-2~~	AFTER ~~B-3~~	AFTER ~~B-4~~	EFFL. C		
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~(ppmv)~~	(ppmv)	~~(ppmv)~~	~~(ppmv)~~	~~(ppmv)~~	(ppmv)	units 4839.0	gals
5/12				ON		13	ON		13	ON		13								
0815	26	31	407.7																	
0817				OFF			ON			OFF										
0825							451.5													
0827				OFF			OFF			ON										
0835										351.4										
0837				ON			OFF			OFF										
0845				476.9																
0847				ON			ON			ON										
0855														1.3						
0900																		1.0	120581.5	115742.5
1200	26	31	439.5																122864.5	118,025.5
1600	26	31	367.8																126145.6	121306.6
5/13																				
0830	26	33	415.5																	
0832				OFF			ON			OFF										
0840							340.0													
0842				OFF			OFF			ON										
0850										276.3										
0852				ON			OFF			OFF										
0900				375.2																

Comments: 5/12 VAPOR SAMPLES TAKEN @ 0815 TI-08, @ 0825 MW1-76, @ 0835 MW1-77, @ 0845 MW1-66, @ 0855 MD-08, @ 0900 EF-08

HIGH VACUUM [ ] SVE or [x] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: NAVAL BASE KITSAP City: KEYPORT, WA Site #: KEYPORT OU-1 Date: 5/13/2022

Client:

Operator (s): KEVIN

				EXTRACTION WELLS									AIR MONITORING							
	Well I.D.			MW1-66			MW1-76			MW1-77									Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09			INFL ~~A~~	AFTER B-1	AFTER ~~B-2~~	AFTER ~~B-3~~	AFTER ~~B-4~~	EFFL. C		
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	(ppmv)	(ppmv)	(ppmv)	(ppmv)	(ppmv)	(ppmv)	units 48390	gals
5/13						13			13			13								
0902				ON			ON			ON										
0910														1.5						
0915																		0.0	136872.5	132033.5
1200	26	33	385.6																139514.5	134675.5
1600	26	32	363.2																141906.1	138067.1
5/14																				
0830	26	32	450.3																	
0832				OFF			ON			OFF										
0840							423.7													
0842				OFF			OFF			ON										
0850										329.5										
0852				ON			OFF			OFF										
0900				351.8																
0902				ON			ON			ON										
0910														1.7						
0915																		0.0	152751.4	147912.4
1200	26	31	424.7																154599.0	149760.0
1600	26	31	438.3			12 1/2			12 1/2			12 1/2							157202.5	152363.5

Comments:

FOUO

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: NAVAL BASE KITSAP City: KEYPORT, WA Site #: KEYPORT OU-1 Date: 5/15/2022

Client:

Operator (s): KEVIN

				EXTRACTION WELLS									AIR MONITORING						Water Meter Readings	Cumul. Water Discharged
		Well I.D.		MW1-66			MW1-76			MW1-77										
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09			~~INFL A~~	AFTER B-1	~~AFTER B-2~~	~~AFTER B-3~~	~~AFTER B-4~~	EFFL. C		
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~(ppmv)~~	(ppmv)	~~(ppmv)~~	~~(ppmv)~~	~~(ppmv)~~	(ppmv)	units 4839.0	gals
5/15				ON		12 1/2	ON		12 1/2	ON		12 1/2								
0830	26	32	405.2																	
0832				OFF			OFF			ON										
0840										286.7										
0842				OFF			ON			OFF										
0850							365.7													
0852				ON			OFF			OFF										
0900				268.5																
0902				ON			ON			ON										
0910														1.3						
0915																		0.0	167238.5	162399.5
1200	26	32	391.7																169906.5	165067.5
1310	26	32	390.0																171652.0	166813.0
1600	26	31	375.3																	
5/16																				
0810	26	32	367.5																	
0812				OFF			ON			OFF										
0820							359.8													
0822				OFF			OFF			ON										
0830										298.9										
0832				ON			OFF			OFF										

Comments: 5/15 @ 1018 pH TEST 7.02, @ 1310 VAPOR SAMPLE TI-09 WAS TAKEN

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 5/16/2022

Client:

Operator (s): KEVIN

				EXTRACTION WELLS									AIR MONITORING							
		Well I.D.		MW1-66			MW1-76			MW1-77									Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09			~~INFL A~~	AFTER B-1	~~AFTER B-2~~	~~AFTER B-3~~	~~AFTER B-4~~	EFFL. C		
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	(ppmv)	(ppmv)	(ppmv)	(ppmv)	(ppmv)	(ppmv)	units 4839.0	gals
5/16				ON		12.1/2	OFF		12 1/2	OFF		12 1/2								
0840				462.7																
0842				ON			ON			ON										
0850														1.8						
0855																		0.0	178342.5	173503.5
1200	26	31	350.2																180432.0	175593.0
1600	26	31	312.7			12			12			12							183065.5	178226.5
5/17																				
0815	26	32	400.1																	
0817				OFF			ON			OFF										
0825							375.8													
0827				OFF			OFF			ON										
0835										301.8										
0837				ON			OFF			OFF										
0845				447.8																
0847				ON			ON			ON										
0855														1.7						
0900																		0.1	193841.5	189002.5
1260	26	31	378.7																196145.5	[illegible]
1600	26	31	362.5																198644.5	193805.5

Comments: 5/17 @ 0815 VAPOR SAMPLE TI-10 WAS TAKEN

FOUO

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 5/18/2022

Client:

Operator (s): KEVIN

				EXTRACTION WELLS									AIR MONITORING							
			Well I.D.	MW1-66			MW1-76			MW1-77									Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09			INFL	AFTER	AFTER	AFTER	AFTER	EFFL.		
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~A (ppmv)~~	B-1 (ppmv)	~~B-2 (ppmv)~~	~~B-3 (ppmv)~~	~~B-4 (ppmv)~~	C (ppmv)	units 4839.0	gals
5/18	-			ON		12	ON		12	ON		12								
0815	26	30	411.7																	
0817				OFF			ON			OFF										
0825							372.5													
0827				OFF			OFF			ON										
0835										285.7										
0837				ON			OFF			OFF										
0845				400.1																
0847				ON			ON			ON										
0855														1.9						
0900																		0.1	209932.5	205093.5
1230	26	30	397.3																212074.5	207235.5
1600	26	30	327.8																213991.5	209152.5
5/19																				
0815	26	32	328.9																	
0817				OFF			ON			OFF										
0825							268.3													
0827				OFF			OFF			ON										
0835										284.5										
0837				ON			OFF			OFF										
0845				339.7																

Comments: 5/18 WATER SAMPLES TAKEN - IN-03 @ 0700, MD1-03 @ 0710, MD2-03 @ 0720, EF-03 @ 0730
VAPOR SAMPLES TAKEN - TI-11 @ 0815, MW1-76 @ 0825, MW1-77 @ 0835, MW1-66 @ 0845, MD-09 @ 0855,
EF-09 @ 0900

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 5/19/2022

Client:

Operator (s): KEVIN

				EXTRACTION WELLS										AIR MONITORING							
		Well I.D.		MW1-66			MW1-76			MW1-77										Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																				
	Initial DTW (ft)			4.70			8.20			7.09			~~INFL A~~	AFTER B-1	~~AFTER B-2~~	~~AFTER B-3~~	~~AFTER B-4~~	EFFL. C			
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	(ppmv)	(ppmv)	(ppmv)	(ppmv)	(ppmv)	(ppmv)	units 4839.0	gals
5/19						12			12			12								
0847				ON			ON			ON										
0855														1.7						
0900																		0.1	221919.5	217090.5
1200	26	34	329.8																224111.0	219272.0
1600	26	34	337.4																227074.5	222235.5
5/20																				
0815	26	35	405.7																	
0817				OFF			ON			OFF										
0825							294.7													
0827				OFF			OFF			ON										
0835										238.0										
0837				ON			OFF			OFF										
0845				375.2																
0847				ON			ON			ON										
0855														1.9						
0900																		0.0	239225.5	234386.5
1200	26	35	375.8																242114.5	237275.5
1600	26	35	318.7																245203.5	240364.5

Comments: 5/20 pH TEST @ 11:11 (7.06)

FOUO

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 5/21/2022

Client:

Operator (s): KEVIN

				EXTRACTION WELLS									AIR MONITORING							
		Well I.D.		MW1-66			MW1-76			MW1-77									Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09			INFL	AFTER	AFTER	AFTER	AFTER	EFFL.		
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~A~~ (ppmv)	B-1 (ppmv)	~~B-2~~ (ppmv)	~~B-3~~ (ppmv)	~~B-4~~ (ppmv)	C (ppmv)	units 4839.0	gals
5/21				ON		12	ON		12	ON		12								
0815	26	35	366.2																	
0817				OFF			ON			OFF										
0825							305.7													
0827				OFF			OFF			ON										
0835										238.9										
0837				ON			OFF			OFF										
0845				336.5																
0847				ON			ON			ON										
0855														1.9						
0900																		0.2	257308.8	25469.8
1200	26	35	330.8																259821.5	254982.5
1600	26	35	302.8																263021.5	258182.5
5/22																				
0815	26	35	341.7																	
0817				OFF			ON			OFF										
0825							265.1													
0827				OFF			OFF			ON										
0835										217.5										
0837				ON			OFF			OFF										
0845				269.5																

Comments: 5/21 VAPOR SAMPLE TAKEN TI-12 @0815

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 5/22/2022

Client:

Operator (s): KEVIN

				EXTRACTION WELLS									AIR MONITORING						Water Meter Readings	Cumul. Water Discharged
	Well I.D.			MW1-66			MW1-76			MW1-77										
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09			~~INFL A~~	AFTER B-1	~~AFTER B-2~~	~~AFTER B-3~~	~~AFTER B-4~~	EFFL. C		
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~(ppmv)~~	(ppmv)	~~(ppmv)~~	~~(ppmv)~~	~~(ppmv)~~	(ppmv)	units 4839.0	gals
5/22						12			12			12								
0847				ON			ON			ON										
0855														2.2						
0900																		0.1	275785.5	270946.5
1200	26	35	308.7																278608.5	273769.5
1600	26	35	307.9																280976.0	276137.0
5/23																				
0815	26	36	4235																	
0817				OFF			ON			OFF										
0825							333.2													
0827				OFF			OFF			ON										
0835										236.1										
0837				ON			OFF			OFF										
0845				3286																
0847				ON			ON			ON										
0855														1.9						
0900																		0.2	293845.0	289006.0
1200	26	36	327.3																296551.5	291712.5
1600	26	36	322.5																297887.5	2950485

Comments: 5/23 VAPOR SAMPLE TAKEN TI-13 @ 0815

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 5 / 24 / 2022 Page 15 of 55

Client:

Operator (s): KEVIN

				EXTRACTION WELLS									AIR MONITORING							
		Well I.D.		MW1-66			MW1-76			MW1-77									Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09			INFL	AFTER	AFTER	AFTER	AFTER	EFFL.		
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~A (ppmv)~~	B-1 (ppmv)	~~B-2 (ppmv)~~	~~B-3 (ppmv)~~	~~B-4 (ppmv)~~	C (ppmv)	units 4839.0	gals
5/24				ON		12	ON		12	ON		12								
0815	25	36	3405																	
0817				OFF			ON			OFF										
0825							216.7													
0827				OFF			OFF			ON										
0835										181.7										
0837				ON			OFF			OFF										
0845				265.5																
0847				ON			ON			ON										
0855														1.9						
0900																		0.3	311458.5	306619.5
1200	25	36	275.0																314241.5	309402.0
1600	25	36	290.5																317342.5	312503.5
5/25																				
0815	25	36	280.0																	
0817				OFF			ON			OFF										
0825							161.5													
0827				OFF			OFF			ON										
0835										117.0										
0837				ON			OFF			OFF										
0845				200.0																

Comments: 5/25 WATER SAMPLES TAKEN IN-04 @ 0700, MD1-04 @ 0710, MD2-04 @ 0720, EF-04 @ 0730
VAPOR SAMPLES TAKEN TI-14 @ 0815, MW1-76 @ 0825, MW1-77 @ 0835, MW1-66 @ 0845, MD-10 @ 0855,
EF-10 @ 0900

FOUO

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 5/25/2022

Client:

Operator (s): KEVIN

				EXTRACTION WELLS									AIR MONITORING						Water Meter Readings	Cumul. Water Discharged
	Well I.D.			MW1-66			MW1-76			MW1-77										
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09			INFL	AFTER	AFTER	AFTER	AFTER	EFFL.		
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~A (ppmv)~~	B-1 (ppmv)	~~B-2 (ppmv)~~	~~B-3 (ppmv)~~	~~B-4 (ppmv)~~	C (ppmv)	units 4839.0	gals
5/25						12			12			12								
0847				ON			ON			ON										
0855														1.9						
0900																		0.9	329742.5	324903.5
1200	25	36	245.7																331594.0	326755.0
1600	25	36	215.7																334924.0	330085.0
5/26																				
0820	25	37	270.4																	
0822				OFF			ON			OFF										
0830							212.0													
0832				OFF			OFF			ON										
0840										178.8										
0842				ON			OFF			OFF										
0850				244.5																
0852				ON			ON			ON										
0900														1.7						
0905																		0.9	347087.5	342248.5
1200	25	37	175.5																349896.0	345057.0
1600	25	37	218.7																352558.5	347719.5

Comments:

HIGH VACUUM [ ] SVE or [x] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 5/27/2022

Client:

Operator (s): KEVIN

Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	MW1-66 Off/On (ppmv)	MW1-66 DTW (ft)	MW1-66 Stinger Depth (feet)	MW1-76 Off/On (ppmv)	MW1-76 DTW (ft)	MW1-76 Stinger Depth (feet)	MW1-77 Off/On (ppmv)	MW1-77 DTW (ft)	MW1-77 Stinger Depth (feet)	INFL ~~A~~ (ppmv)	AFTER B-1 (ppmv)	AFTER ~~B-2~~ (ppmv)	AFTER ~~B-3~~ (ppmv)	AFTER ~~B-4~~ (ppmv)	EFFL. C (ppmv)	Water Meter Readings units	Cumul. Water Discharged gals
Screen Interval: From-To (ft)																				
Initial DTW (ft)				4.70			8.20			7.09									4839.0	
5/27				ON		12	ON		12	ON		12								
0815	25	37	286.7																	
0817				OFF			ON			OFF										
0825							178.6													
0827				OFF			OFF			ON										
0835										152.3										
0837				ON			OFF			OFF										
0845				214.5																
0847				ON			ON			ON										
0855														2.0						
0900																		0.9	364833.5	359994.5
1200	25	37	237.0																367891.5	363057.5
1600	25	37	209.7																370782.5	3659435
5/28																				
0820	25	37	273.0																	
0822				OFF			ON			OFF										
0830							205.6													
0832				OFF			OFF			ON										
0840										178.6										
0842				ON			OFF			OFF										
0850				199.7																

Comments: 5/28 VAPOR SAMPLE TAKEN TI-15 @ 0820

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 5/28/2022

Client:

Operator (s): KEVIN

Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	MW1-66 Off/On (ppmv)	MW1-66 DTW (ft)	MW1-66 Stinger Depth (feet)	MW1-76 Off/On (ppmv)	MW1-76 DTW (ft)	MW1-76 Stinger Depth (feet)	MW1-77 Off/On (ppmv)	MW1-77 DTW (ft)	MW1-77 Stinger Depth (feet)	INFL (ppmv)	AFTER B-1 (ppmv)	AFTER B-2 (ppmv)	AFTER B-3 (ppmv)	AFTER B-4 (ppmv)	EFFL. C (ppmv)	Water Meter Readings (units)	Cumul. Water Discharged (gals)
Screen Interval: From-To (ft)																				
Initial DTW (ft)				4.70			8.20			7.09									4839.0	
5/28						12			12			12								
0852				ON			ON			ON										
0900														2.4						
0905																		1.0	382059.0	377220.0
1200	25	37	237.8																383913.5	379074.5
1600	25	37	223.5																387313.0	382474.0
5/29																				
0815	25	37	130.6																	
0817				OFF			ON			OFF										
0825							101.7													
0827				OFF			OFF			ON										
0835										126.2										
0837				ON			OFF			OFF										
0845				189.4																
0847				ON			ON			ON										
0855														2.1						
0900																		1.0	399151.0	394312.0
1200	25	37	248.0																401535.0	396696.0
1600	25	37	255.0																404926.0	400087.0

Comments: 5/29 pH TEST @ 0905 (7.27)

FOUO

HIGH VACUUM [ ] SVE or [x] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 5 / 30 / 2022

Client:

Operator (s): KEVIN

				EXTRACTION WELLS									AIR MONITORING							
	Well I.D.			MW1-66			MW1-76			MW1-77									Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09			INFL	AFTER	~~AFTER~~	~~AFTER~~	~~AFTER~~	EFFL.		
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~A (ppmv)~~	B-1 (ppmv)	~~B-2 (ppmv)~~	~~B-3 (ppmv)~~	~~B-4 (ppmv)~~	C (ppmv)	units 4839.0	gals
5/30				ON		12	ON		12	ON		12								
0815	25	37	242.7																	
0817				OFF			ON			OFF										
0825							172.7													
0827				OFF			OFF			ON										
0835										161.7										
0837				ON			OFF			OFF										
0845				160.8																
0847				ON			ON			ON										
0855														2.1						
0900																		1.0	412202.0	407363.0
1200	25	37	269.4																415091.0	410252.0
1600	25	37	259.8																417273.0	412434.0
5/31																				
0815	25	37	260.9																	
0817				OFF			ON			OFF										
0825							179.6													
0827				OFF			OFF			ON										
0835										195.7										
0837				ON			OFF			OFF										
0845				261.4																

Comments:

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 5/31/2022

Client:

Operator (s): KEVIN

				EXTRACTION WELLS									AIR MONITORING							
			Well I.D.	MW1-66			MW1-76			MW1-77									Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09										
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~INFL A (ppmv)~~	AFTER B-1 (ppmv)	~~AFTER B-2 (ppmv)~~	~~AFTER B-3 (ppmv)~~	~~AFTER B-4 (ppmv)~~	EFFL. C (ppmv)	units 4839.0	gals
5/31						12			12			12								
0847				ON			ON			ON										
0855														2.2						
0900																		1.1	426811.0	421972.0
1200	25	37	250.9																429861.0	425022.0
1600	25	37	209.7			12 1/2			12 1/2			12 1/2							432478.0	427639.0
6/1																				
0835	25	37	218.0																	
0837				OFF			ON			OFF										
0845							158.9													
0847				OFF			OFF			ON										
0855										1422										
0857				ON			OFF			OFF										
0905				222.9																
0907				ON			ON			ON										
0910														2.2						
0915																		1.1	445081.0	440242.0
1200	25	37	205.7																447234.0	442395.0
1600	25	37	207.4																451283.0	446444.0

Comments: 6/1 WATER SAMPLES TAKEN IN-05 @ 0810, MD1-05 @ 0815, MD2-05 @ 0820, EF-05 @ 0825,
VAPOR SAMPLES TAKEN TI-16 @ 0835, MW1-76 @ 0845, MW1-77 @ 0855, MW1-66 @ 0905, MD-11 @ 0910, EF-11 @ 0915

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 6/2/2022

Client:

Operator (s): KEVIN

Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	EXTRACTION WELLS: MW1-66 Off/On (ppmv)	MW1-66 DTW (ft)	MW1-66 Stinger Depth (feet)	MW1-76 Off/On (ppmv)	MW1-76 DTW (ft)	MW1-76 Stinger Depth (feet)	MW1-77 Off/On (ppmv)	MW1-77 DTW (ft)	MW1-77 Stinger Depth (feet)	AIR MONITORING: ~~INFL. A~~ (ppmv)	AFTER B-1 (ppmv)	~~AFTER B-2~~ (ppmv)	~~AFTER B-3~~ (ppmv)	~~AFTER B-4~~ (ppmv)	EFFL. C (ppmv)	Water Meter Readings (units)	Cumul. Water Discharged (gals)
Screen Interval: From-To (ft)																				
Initial DTW (ft)				4.70			8.20			7.09									4839.0	
6/2				ON		12 1/2	ON		12 1/2	ON		12 1/2								
0815	25	37	200.5																	
0817				OFF			ON			OFF										
0825							92.8													
0827				OFF			OFF			ON										
0835										93.5										
0837				ON			OFF			OFF										
0845				187.1																
0847				ON			ON			ON										
0855														2.3						
0900																		1.1	461381.0	456542.0
1200	25	37	186.7																463251.0	458412.0
1600	25	37	209.7																466541.0	461702.0
6/3																				
0815	25	38	289.5																	
0817				OFF			ON			OFF										
0825							278.0													
0827				OFF			OFF			ON										
0835										244.0										
0837				ON			OFF			OFF										
0845				257.8																

Comments:

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 6/3/2022 Page 22 of ____

Client:

Operator (s): KEVIN

				EXTRACTION WELLS									AIR MONITORING							
	Well I.D.			MW1-66			MW1-76			MW1-77									Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09			INFL	AFTER	AFTER	AFTER	AFTER	EFFL.		
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~A~~ (ppmv)	B-1 (ppmv)	~~B-2~~ (ppmv)	~~B-3~~ (ppmv)	~~B-4~~ (ppmv)	C (ppmv)	units 4839.0	gals
6/3						12 1/2			12 1/2			12 1/2								
0847				ON			ON			ON										
0855														2.1						
0900																		1.1	478045.0	473206.0
1200	25	38	246.7																480167.0	475328.0
1600	25	38	199.8																482942.0	478103.0
6/4																				
0815	25	38	240.0																	
0817				OFF			ON			OFF										
0825							181.9													
0827				OFF			OFF			ON										
0835										157.0										
0837				ON			OFF			OFF										
0845				188.0																
0847				ON			ON			ON										
0855														2.3						
0900																		1.1	495673.0	490834.0
1200	25	38	243.0																497774.0	492935.6
1600	25	38	228.0																500986.0	496147.0

Comments: 6/4 VAPOR SAMPl TAKEN TI-17 @ 1200

HIGH VACUUM [ ] SVE or [x] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 6/5/2022

Client:

Operator (s): KEVIN

				EXTRACTION WELLS																	
		Well I.D.		MW1-66			MW1-76			MW1-77			AIR MONITORING						Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09										
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	INFL ~~A~~ ~~(ppmv)~~	AFTER B-1 (ppmv)	AFTER ~~B-2~~ (ppmv)	AFTER ~~B-3~~ (ppmv)	AFTER ~~B-4~~ (ppmv)	EFFL. C (ppmv)	units 4839.0	gals
6/5				ON		12 1/2	ON		12 1/2	ON		12 1/2								
0815	25	38	237.0																	
0817				OFF			ON			OFF										
0825							187.0													
0827				OFF			OFF			ON										
0835										163.5										
0837				ON			OFF			OFF										
0845				212.5																
0847				ON			ON			ON										
0855														2.1						
0900																		1.1	511253.0	506414.0
1200	25	38	217.8																513934.0	509095.0
1600	25	38	185.0																516976.0	512137.0
6/6																				
0815	25	38	265.5																	
0817				OFF			ON			OFF										
0825							205.7													
0827				OFF			OFF			ON										
0835										176.0										
0837				ON			OFF			OFF										
0845				208.9																

Comments:

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: NAVAL BASE KITSAP City: KEYPORT, WA Site #: KEYPORT OU-1 Date: 6/6/2022

Client:

Operator (s): KEVIN

				EXTRACTION WELLS									AIR MONITORING							
			Well I.D.	MW1-66			MW1-76			MW1-77									Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09			~~INFL A (ppmv)~~	AFTER B-1 (ppmv)	~~AFTER B-2 (ppmv)~~	~~AFTER B-3 (ppmv)~~	~~AFTER B-4 (ppmv)~~	EFFL. C (ppmv)	units	gals
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)							48390	
6/6						12 1/2			12 1/2			12 1/2								
0847				ON			ON			ON										
0855														2.1						
0900																		1.1	529001.0	524162.0
1200	25	38	239.0																531022.0	526183.0
1600	25	38	235.0																533766.0	528927.0
6/7																				
0815	25	38	167.8																	
0817				OFF			ON			OFF										
0825							1555													
0827				OFF			OFF			ON										
0835										192.7										
0837				ON			OFF			OFF										
0845				205.0																
0847				ON			ON			ON										
0855														2.2						
0900																		1.1	543961.0	539062.0
1200	25	38	192.8																546115.0	541276.0
1600	25	38	197.4																549008.0	544169.0

Comments: 6/7 @ 1330 pH TEST (7.21)

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 6/8/2022

Client:

Operator (s): KEVIN

				EXTRACTION WELLS									AIR MONITORING							
		Well I.D.		MW1-66			MW1-76			MW1-77									Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09			INFL	AFTER	~~AFTER~~	~~AFTER~~	~~AFTER~~	EFFL.		
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~A (ppmv)~~	B-1 (ppmv)	~~B-2~~ (ppmv)	~~B-3~~ (ppmv)	~~B-4~~ (ppmv)	C (ppmv)	units 4839.0	gals
6/8				ON		12 1/2	ON		12 1/2	ON		12 1/2								
0815	25	38	218.0																	
0817				OFF			ON			OFF										
0825							166.5													
0827				OFF			OFF			ON										
0835										143.8										
0837				ON			OFF			OFF										
0845				190.6																
0847				ON			ON			ON										
0855														2.2						
0900																		1.1	558521.0	553682.0
1200	25	38	245.0																559241.0	554402.0
1600	25	38	215.0																562464.0	557625.0
6/9																				
0815	25	38	216.7																	
0817				OFF			ON			OFF										
0825							188.5													
0827				OFF			OFF			ON										
0835										175.0										
0837				ON			OFF			OFF										
0845				153.8																

Comments: 6/8 WATER SAMPLE TAKEN IN-06 @ 0700, MD1-06 @ 0710, MD2-06 @ 0720, EF-06 @ 0730, VAPOR SAMPLES TAKEN TI-18 @ 0815, MW1-76 @ 0825, MW1-77 @ 0735, MW1-66 @ 0845, MD-12 @ 0855, EF-12 @ 0900

HIGH VACUUM [ ] SVE or [x] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 6/9/2022

Client: Operator (s): KEVIN

		Well I.D.		EXTRACTION WELLS MW1-66			MW1-76			MW1-77			AIR MONITORING							Cumul.
	Screen Interval: From-To (ft)																		Water Meter Readings	Water Discharged
	Initial DTW (ft)			4.70			8.20			7.09			INFL	AFTER	AFTER	AFTER	AFTER	EFFL.		
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~A~~ (ppmv)	B-1 (ppmv)	~~B-2~~ (ppmv)	~~B-3~~ (ppmv)	~~B-4~~ (ppmv)	C (ppmv)	units 4839.0	gals
6/9						12 1/2			12 1/2			12 1/2								
0847				ON			ON			ON										
0855														2.2						
0900																		1.1	574615.0	569776.0
1200	25	38	195.8																576289.0	571450.0
1600	25	38	182.7																578617.0	573778.0
6/10																				
0815	25	38	169.8																	
0817				OFF			ON			OFF										
0825							187.7													
0827				OFF			OFF			ON										
0835										173.2										
0837				ON			OFF			OFF										
0845				169.7																
0847				ON			ON			ON										
0855														2.3						
0900																		1.1	590179.0	585340.0
1200	25	38	203.9																593089.0	588250.0
1600	25	38	194.5																594678.0	589839.0

Comments:

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 6/11/2022

Client:

Operator (s): KEVIN

				EXTRACTION WELLS														
		Well I.D.		MW1-66			MW1-76			MW1-77			AIR MONITORING						Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09										
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	INFL ~~A~~ (ppmv)	AFTER B-1 (ppmv)	AFTER ~~B-2~~ (ppmv)	AFTER ~~B-3~~ (ppmv)	AFTER ~~B-4~~ (ppmv)	EFFL. C (ppmv)	units 4839.0	gals
6/11				ON		12½	ON		12½	ON		12½								
0815	25	38	226.7																	
0817				OFF			ON			OFF										
0825							141.6													
0827				OFF			OFF			ON										
0835										124.6										
0837				ON			OFF			OFF										
0845				156.8																
0847				ON			ON			ON										
0855														2.2						
0900																		1.1	605731.0	600892.0
1200	25	38	197.8																608945.0	604106.0
1600	25	38	179.8																610427.0	605588.0
6/12																				
0815	25	38	225.5																	
0817				OFF			ON			OFF										
0825							173.0													
0827				OFF			OFF			ON										
0835										155.7										
0837				ON			OFF			OFF										
0845				153.9																

Comments: 6/11 VAPOR SAMPLE TAKEN TI-19 @0815

FOUO

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 6 /12/ 2022

Client:

Operator (s): KEVIN

	Well I.D.			EXTRACTION WELLS MW1-66			MW1-76			MW1-77			AIR MONITORING						Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09			~~INFL A~~	AFTER B-1	~~AFTER B-2~~	~~AFTER B-3~~	~~AFTER B-4~~	EFFL. C		
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	(ppmv)	(ppmv)	(ppmv)	(ppmv)	(ppmv)	(ppmv)	units 48390	gals
6/12						12 1/2			12 1/2			12 1/2								
0847				ON			ON			ON										
0855														2.3						
0900																		1.1	622411.0	617572.0
1200	25	38	212.8																624518.0	619679.0
1600	25	38	218.0																626938.0	622099.0
6/13																				
0815	25	38	214.7																	
0817				OFF			ON			OFF										
0825							166.2													
0827				OFF			OFF			ON										
0835										143.8										
0837				ON			OFF			OFF										
0845				168.0																
0847				ON			ON			ON				2.3						
0855																		1.1	638726.0	633887.0
0900																			640721.0	635883.0
1200	25	38	183.7																643013.0	638174.0
1600	25	38	181.8																	

Comments:

HIGH VACUUM [ ] SVE or [x] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 6/14/2022

Client:

Operator (s): KEVIN

				EXTRACTION WELLS									AIR MONITORING							
	Well I.D.			MW1-66			MW1-76			MW1-77									Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09			~~INFL A~~	AFTER B-1	~~AFTER B-2~~	~~AFTER B-3~~	~~AFTER B-4~~	EFFL. C		
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~(ppmv)~~	(ppmv)	~~(ppmv)~~	~~(ppmv)~~	~~(ppmv)~~	(ppmv)	units 4839.0	gals
6/14				ON		12½	ON		12½	ON		12½								
0815	25	38	187.8																	
0817				OFF			ON			OFF										
0825							130.0													
0827				OFF			OFF			ON										
0835										126.5										
0837				ON			OFF			OFF										
0845				153.8																
0847				ON			ON			ON										
0855														2.2						
0900																		1.1	6541660	649327.0
1200	25	38	194.8																6565330	651694.0
1600	25	38	196.7									13½							6602310	655392.0
6/15																				
0815	25	38	205.9									14½								
0817				OFF			ON			OFF										
0825							159.9													
0827				OFF			OFF			ON										
0835										149.8										
0837				ON			OFF			OFF										
0845				246.9																

Comments: 6/14 @ 1530 LOWERED STINGER IN MW1-77 TO 13½ FT. 6/15 @ 0800 LOWERED STINGER MW1-77 TO 14½ FT
WATER SAMPLES TAKEN IN-07 @ 0700, MD1-07 @ 0710, MD2-07 @ 0720, EF-07 @ 0730, VAPOR SAMPLE TAKEN TI-20 @ 0815, MW1-76 @ 0825, MW1-77 @ 0835, MW1-66 @ 0845, MD-13 @ 0855, EF-13 @ 0900

FOUO

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 6 / 15 / 2022

Client:

Operator (s): KEVIN

		Well I.D.		EXTRACTION WELLS MW1-66			MW1-76			MW1-77			AIR MONITORING						Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09										
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~INFL A (ppmv)~~	AFTER B-1 (ppmv)	~~AFTER B-2 (ppmv)~~	~~AFTER B-3 (ppmv)~~	~~AFTER B-4 (ppmv)~~	EFFL. C (ppmv)	units 4839.0	gals
6/15						12½			12½			14½								
0847				ON			ON			ON										
0855														2.2						
0900																		1.1	668918.0	664079.0
1200	25	38	199.0																671146.0	666307.0
1600	25	38	195.6									15½							673486.0	668647
6/16																				
0815	25	38	179.8																	
0817				OFF			ON			OFF										
0825							127.0													
0827				OFF			OFF			ON										
0835										117.8										
0837				ON			OFF			OFF										
0845				137.8																
0847				ON			ON			ON										
0855														2.2						
0900																		1.1	684361.0	679522.0
1200	25	38	167.0									16½							686767.0	681928.0
1600	25	38	195.6									17.00							689645.0	684806.0

Comments:

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 6 / 17 / 2022

Client:

Operator (s): KEVIN

	Well I.D.			EXTRACTION WELLS MW1-66			MW1-76			MW1-77			AIR MONITORING							
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09			~~INFL A~~	AFTER B-1	~~AFTER B-2~~	~~AFTER B-3~~	~~AFTER B-4~~	EFFL. C	Water Meter Readings	Cumul. Water Discharged
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~(ppmv)~~	(ppmv)	~~(ppmv)~~	~~(ppmv)~~	~~(ppmv)~~	(ppmv)	units 4839.8	gals
6/17				ON		12 1/2	ON		12 1/2	ON		17.00								
0715	25	38	215.6																	
0717				OFF			ON			OFF										
0725							147.5													
0727				OFF			OFF			ON										
0735										123.1										
0737				ON			OFF			OFF										
0745				151.0																
0747				ON			ON			ON										
0755														2.2						
0800																		1.1	700611.0	

Comments:

HIGH VACUUM [ ] SVE or [x] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 6/17/2022

Client:

Operator (s): KEVIN

AIR TEST

				EXTRACTION WELLS																
		Well I.D.		MW1-66			~~MW1-76~~			MW1-77			AIR MONITORING						Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)						AIR SPARGE													
	Initial DTW (ft)												INFL	AFTER	AFTER	AFTER	AFTER	EFFL.		
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~Off/On~~ PSI ~~(ppmv)~~	~~DTW~~ SCFM ~~(ft)~~	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	A (ppmv)	B-1 (ppmv)	B-2 (ppmv)	B-3 (ppmv)	B-4 (ppmv)	C (ppmv)	units 4839.0	gals
6/17				ON																
1100			204.5				15	0.5												
1115			214.2				15	0.5												
1130			224.7				15	0.5												
1145			266.8				17	2.0												
1200			313.7				17	2.5												
1330			297.8				18	6.0												
1600			223.0				18	6.0												
6/18																				
0815			757.0				17	9.5											706967.0	

Comments: 6/17 TURNED ON AIR SPARGE @ 1100, VAPOR SAMPLE TAKEN MW1-66 @ 1130 (224.7 ppmv), MW1-66 @ 1145 (266.8 ppmv), MW1-66 @ 1200 (313.7 ppmv) 6/18 VAPOR SAMPLE TAKEN MW1-66 @ 0815 (757.0 ppmv)
AIR BUBBLES COMING UP IN STREET AREA @ 0815

FOUO

HIGH VACUUM [ ] SVE or [x] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 6/18/2022

Client: Operator (s): KEVIN

				EXTRACTION WELLS									AIR MONITORING							
	Well I.D.			MW1-66			MW1-76			MW1-77						AIR SPARGE			Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09										
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~INFL A (ppmv)~~	AFTER B-1 (ppmv)	AFTER ~~B-2 (ppmv)~~	AFTER ~~B-3 (ppmv)~~ PSI	AFTER B-4 (ppmv) SCFM	EFFL. C (ppmv)	units 4839.0	gals
6/18				ON		12½	ON		12½	ON		17								
0835	25	38																		
1200	25	38	736.0																708573.0	703734.0
1600	25	38	556.0															—	710678.0	705839.0
6/19																				
0815	25	38	482.0																	
0817				OFF			ON			OFF										
0825							421.0													
0827				OFF			OFF			ON										
0835										298.0										
0837				ON			OFF			OFF										
0845				524.0																
0847				ON			ON			ON										
0855														22						
0900															15	4.0		1.1	720488.0	715649.0
1200	25	38	401.0												15	4.0			722322.0	717483.0
1600	25	38	407.0												15	4.0			724543.0	719704.0

Comments: 6/18 OPENED WELLS MW1-76, MW1-77 @ 0835, AIR SPARGE @ 0950 TO 15 PSI / 6.0 SCFM, VAPOR SAMPLES TAKEN TI-21 @ 1200, TI-22 @ 1600 6/19 VAPOR SAMPLES TAKEN TI-23 @ 0815, MW1-76 @ 0825 MW1-77 @ 0835, MW1-66 @ 0845

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 6/20/2022

Client:

Operator (s): KEVIN

Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	MW1-66 Off/On (ppmv)	MW1-66 DTW (ft)	MW1-66 Stinger Depth (feet)	MW1-76 Off/On (ppmv)	MW1-76 DTW (ft)	MW1-76 Stinger Depth (feet)	MW1-77 Off/On (ppmv)	MW1-77 DTW (ft)	MW1-77 Stinger Depth (feet)	~~INFL (ppmv)~~	AFTER B-1 (ppmv)	~~AFTER B-2 (ppmv)~~	AIR SPARGE ~~AFTER B-3 (ppmv)~~ PSI	AIR SPARGE ~~AFTER B-4 (ppmv)~~ SCFM	EFFL. C (ppmv)	Water Meter Readings units	Cumul. Water Discharged gals
Well I.D.				MW1-66			MW1-76			MW1-77										
Screen Interval: From-To (ft)																				
Initial DTW (ft)				4.70			8.20			7.09									4839.0	
6/20				ON		12½	ON		12½	ON		17								
0815	25	38	435.3																	
0817				OFF			ON			OFF										
0825							380.7													
0827				OFF			OFF			ON										
0835										249.3										
0837				ON			OFF			OFF										
0845				629.4																
0847				ON			ON			ON										
0855														2.3						
0900																15	4	1.1	732471.0	727632.0
1200	25	38	393.7			13½						16				15	4		734509.0	729670.0
1600	25	38	462.6													15	4		737407.0	732568.0
6/21																				
0805	25	38	417.3																	
0807				OFF			ON			OFF										
0815							340.2													
0817				OFF			OFF			ON										
0825										317.7										
0827				ON			OFF			OFF										
0835				616.8																

Comments:

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 6/21/2022

Client:

Operator (s): KEVIN

				EXTRACTION WELLS									AIR MONITORING							
		Well I.D.		MW1-66			MW1-76			MW1-77						AIR SPARGE				
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09										
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	INFL ~~A (ppmv)~~	AFTER B-1 (ppmv)	AFTER ~~B-2 (ppmv)~~	~~AFTER B-3 (ppmv)~~ PSI	AFTER ~~B-4 (ppmv)~~ SCFM	EFFL. C (ppmv)	Water Meter Readings units 4839.0	Cumul. Water Discharged gals
6/21						13 1/2			12 1/2			16								
0837				ON			ON			ON										
0845																				
0850														2.3						
1200	25	38	570.8													15	4	1.1	746477.0	741638.0
1600	25	38	458.7													15	4		748382.0	743543.0
6/22																15	4		750811.0	745972.0
0815	25	38	562.2																	
0817				OFF			ON			OFF										
0825							4395													
0827				OFF			OFF			ON										
0835										349.0										
0837				ON			OFF			OFF										
0845				580.4																
0847				ON			ON			ON										
0855														2.3						
0900																15	4	1.1	761386.0	756547.0
1200	25	38	587.6													15	4		763563.0	758724.0
1600	25	38	595.9													15	4		766045.0	761206.0

Comments: 6/21 VAPOR SAMPLES TAKEN TI-24 @0805, MW1-76@0815, MW1-77@0825, MW1-66@0835, MD14@0845, EF-14@0850, WATER SAMPLES TAKEN IN-08@0900, MD1-08@0905, MD2-08@0910, EF-08@0915

FOUO

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 6/23/2022

Client:

Operator (s): KEVIN

				EXTRACTION WELLS									AIR MONITORING							
	Well I.D.			MW1-66			MW1-76			MW1-77						AIR SPARGE			Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09			~~INFL. A (ppmv)~~	AFTER B-1 (ppmv)	~~AFTER B-2 (ppmv)~~	~~AFTER B-3 (ppmv)~~ PSI	~~AFTER B-4 (ppmv)~~ SCFM	EFFL. C (ppmv)	units	gals
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)							48390	
6/23				ON		13 1/2	ON		12 1/2	ON		16								
0815	25	38	520.8																	
0817				OFF			ON				OFF									
0825							340.6													
0827				OFF			OFF				ON									
0835											294.8									
0837				ON			OFF				OFF									
0845				527.3																
0847				ON			ON				ON									
0855														2.3						
0900																15	4	1.1	774908.0	770 069.0
1200	25	38	511.7													15	4		776656.0	771817.0
1600	25	38	506.8													15	4		779052.0	774213.0
6/24																				
0815	25	38	522.5																	
0817				OFF			ON			OFF										
0825							385.6													
0827				OFF			OFF			ON										
0835										315.0										
0837				ON			OFF			OFF										
0845				404.7																

Comments: 6/23 @ 0920 pH TEST 7.38

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 6/24/2022

Client:

Operator (s): KEVIN

				EXTRACTION WELLS									AIR MONITORING							
			Well I.D.	MW1-66			MW1-76			MW1-77						AIR SPARGE			Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09										
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~INFL A (ppmv)~~	AFTER B-1 (ppmv)	~~AFTER B-2 (ppmv)~~	~~AFTER B-3 (ppmv)~~ PSI	~~AFTER B-4 (ppmv)~~ SCFM	EFFL. C (ppmv)	units 4839.0	gals
6/24						13 1/2			12 1/2			16								
0847				ON			ON			ON										
0855														2.3						
0900																15	4	1.2	787305.0	782466.0
1200	25	38	487.0													15	4		788605.0	783766.0
1600	25	38	505.3													15	4		791059.0	786220.0
6/25																				
0815	25	38	297.3																	
0817				OFF			ON			OFF										
0825							341.7													
0827				OFF			OFF			ON										
0835										290.0										
0837				ON			OFF			OFF										
0845				489.7																
0847				ON			ON			ON										
0855														2.3						
0900																15	4	1.2	799891.0	795052.0
1200	25	38	498.3													15	4		802128.0	797289.0
1600	25	38	479.6													15	4		804878.0	800039.0

Comments: 6/25 VAPOR SAMPLE TAKEN TI-25 @ 0815

~~FOUO~~

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 6/26/2022

Client:

Operator (s): KEVIN

				EXTRACTION WELLS									AIR MONITORING			AIR SPARGE				
		Well I.D.		MW1-66			MW1-76			MW1-77									Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09										
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~INFL A (ppmv)~~	AFTER B-1 (ppmv)	~~AFTER B-2 (ppmv)~~	~~AFTER B-3 (ppmv)~~ PSI	~~AFTER B-4 (ppmv)~~ SCFM	EFFL. C (ppmv)	units 4839.0	gals
6/26				ON		13 1/2	ON		12 1/2	ON		16								
0815	25	38	345.6																	
0817				OFF			ON			OFF										
0825							223.8													
0827				OFF			OFF			ON										
0835										202.2										
0837				ON			OFF			OFF										
0845				331.6																
0847				ON			ON			ON										
0855														2.3						
0900																15	4	1.2	814278.0	809439.0
1200	25	38	320.5													15	4		816555.0	811716.0
1600	25	38	327.8													15	4		819246.0	814407.0
6/27																				
0815	25	38	357.5																	
0817				OFF			ON			OFF										
0825							225.4													
0827				OFF			OFF			ON										
0835										228.7										
0837				ON			OFF			OFF										
0845				284.7																

Comments:

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 6/27/2022

Client:

Operator (s): KEVIN

			Well I.D.	EXTRACTION WELLS MW1-66			MW1-76			MW1-77			AIR MONITORING		AIR SPARGE					
			Screen Interval: From-To (ft)																	
			Initial DTW (ft)	4.70			8.20			7.09										
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~INFL (ppmv)~~	AFTER B-1 (ppmv)	~~AFTER B-2 (ppmv)~~	~~AFTER B-3 (ppmv)~~ PSI	AFTER ~~B-4~~ (ppmv) SCFM	EFFL. C (ppmv)	Water Meter Readings units 4839.0	Cumul. Water Discharged gals
6/27						13 1/2			12 1/2			16								
0847				ON			ON			ON										
0855														2.3						
0900																15	3	1.2	829145.0	824306.0
1200	25	38	368.9													15	3		831484.0	826645.0
1600	25	38	397.7													15	3		834029.0	829190.0
6/28																				
0815	25	38	506.7																	
0817				OFF			ON			OFF										
0825							313.0													
0827				OFF			OFF			ON										
0835										267.8										
0837				ON			OFF			OFF										
0845				614.2																
0847				ON			ON			ON										
0855														2.3						
0900																15	3	1.2	843103.0	838264.0
1200	25	38	553.9													15	3		846729.0	841890.0
1600	25	38	587.0			14 1/2										15	3		849474.0	844635

Comments: 6/28 VAPOR SAMPLES TAKEN TI-26 @ 0815, MW1-76 @ 0825, MW1-77 @ 0835, MW1-66 @ 0845, MD-15 @ 0855, EF-15 @ 0900. WATER SAMPLE TAKEN IN-09 @ 0910, MD1-09 @ 0915, MD2-09 @ 0920, EF-09 @ 0925
6/28 @ 1400 LOWERED STINGER IN MW1-66 TO 14 1/2

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 6/29/2022

Client:

Operator (s): KEVIN

				EXTRACTION WELLS									AIR MONITORING			AIR SPARGE				
			Well I.D.	MW1-66			MW1-76			MW1-77										Cumul. Water Discharged
	Screen Interval: From-To (ft)																		Water Meter Readings	
	Initial DTW (ft)			4.70			8.20			7.09										
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~INFL A (ppmv)~~	AFTER B-1 (ppmv)	~~AFTER B-2 (ppmv)~~	AFTER ~~B-3 (ppmv)~~ PSI	AFTER ~~B-4 (ppmv)~~ SCFM	EFFL. C (ppmv)	units 4839.0	gals
6/29				ON		14 1/2	ON		12 1/2	ON		16								
0815	25	38	530.9																	
0817				OFF			ON			OFF										
0825							263.5													
0827				OFF			OFF			ON										
0835										266.6										
0837				ON			OFF			OFF										
0845				560.3																
0847				ON			ON			ON										
0855														2.3						
0900																15	4	1.2	860508.0	855669.0
1200	25	40	498.7			15 1/2										15	4		862938.0	858099.0
16.00	25	40	481.7													15	4		865298.0	860459.0
6/30																				
0815	25	40	398.7																	
0817				OFF			ON			OFF										
0825							402.1													
0827				OFF			OFF			ON										
0835										305.6										
0837				ON			OFF			OFF										
0845				517.7																

Comments: 6/29 @ 12.00 pH TEST 7.10, MOVED STINGER IN WELL MW1-66 TO 15 1/2 FT

FOUO

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 6/30/2022

Client:

Operator (s): KEVIN

		Well I.D.		EXTRACTION WELLS: MW1-66			MW1-76			MW1-77			AIR MONITORING			AIR SPARGE			Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09										
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~INFL A (ppmv)~~	AFTER B-1 (ppmv)	~~AFTER B-2 (ppmv)~~	AFTER ~~B-3~~ ~~(ppmv)~~ PSI	AFTER ~~B-4~~ ~~(ppmv)~~ SCFM	EFFL. C (ppmv)	units 4839.0	gals
6/30						15 1/2			12 1/2			16								
0847				ON			ON			ON										
0855														2.3						
0900																15	4	1.2	875384.0	870545.0
1200	25	40	385.5													15	4		878387.0	873548.0
1600	25	40	348.9			16FT										15	4		881077.0	876238.0
7/1																				
0815	25	40	428.6																	
0817				OFF			ON			OFF										
0825							389.7													
0827				OFF			OFF			ON										
0835										342.8										
0837				ON			OFF			OFF										
0845				569.8																
0847				ON			ON			ON										
0855														2.3						
0900																15	4	1.2	892506.0	887667.0
1200	25	40	421.7													15	4		895483.0	890644.0
1600	25	40	425.6													15	4		898733.0	893894.0

Comments: 6/30 @ 1600 MOVED STINGER IN WELL MW1-66 TO 16FT

FOUO

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 7/2/2022

Client:

Operator (s): KEVIN

				EXTRACTION WELLS									AIR MONITORING			AIR SPARGE				
		Well I.D.		MW1-66			MW1-76			MW1-77									Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09			~~INFL A (ppmv)~~	AFTER B-1 (ppmv)	~~AFTER B-2 (ppmv)~~	~~AFTER B-3 (ppmv)~~ PSI	~~AFTER B-4 (ppmv)~~ SCFM	EFFL. C (ppmv)	units 4839.0	gals
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)								
7/2				ON		16FT	ON		12 1/2	ON		16FT								
0815	25	40	422.9																	
0817				OFF			ON			OFF										
0825							279.8													
0827				OFF			OFF			ON										
0835										258.0										
0837				ON			OFF			OFF										
0845				509.7																
0847				ON			ON			ON										
0855														2.4						
0900																15	4	1.3	907366.0	902527.0
1350	25	40	335.7													15	3		909879.0	905040.0
1600	25	40	347.8													15	3		911408.0	906569.0
7/3																				
0815	25	40	417.7																	
0817				OFF				ON		OFF										
0825								248.4												
0827				OFF				OFF		ON										
0835										225.7										
0837				ON				OFF		OFF										
0845				474.6																

Comments: 7/2 VAPOR SAMPLE TAKEN TI-27 @ 0815

FOUO

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 7/3/2022

Client:

Operator (s): KEVIN

	Well I.D.			EXTRACTION WELLS MW1-66			MW1-76			MW1-77			AIR MONITORING			AIR SPARGE			Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																				
	Initial DTW (ft)			4.70			8.20			7.09											
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~INFL (ppmv)~~	AFTER B-1 (ppmv)	~~AFTER B-2 (ppmv)~~	~~AFTER B-3 (ppmv)~~ PSI	AFTER ~~B-4 (ppmv)~~ SCFM	EFFL. C (ppmv)	units 48390	gals
7/3						16FT			12½			16FT								
0847				ON			ON			ON										
0855														2.4						
0900																15	3	1.3	918739.0	913900.0
1200	25	40	398.6													15	3		921235.0	916396.0
1600	25	40	392.8													15	3		923609.0	918770.0
7/4																				
0815	25	40	425.7																	
0817				OFF			ON			OFF										
0825							277.4													
0827				OFF			OFF			ON										
0835										258.6										
0837				ON			OFF			OFF										
0845				469.7																
0847				ON			ON			ON										
0855														2.4						
0900																15	3	1.3	932846.0	928007.0
1200	25	40	385.7													15	4		936044.0	931205.0
1600	25	40	382.9													15	4		939528.0	934689.0

Comments:

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 7/5/2022

Client:

Operator (s): KEVIN

Well I.D.				EXTRACTION WELLS MW1-66			MW1-76			MW1-77			AIR MONITORING			AIR SPARGE			Water Meter Readings	Cumul. Water Discharged
Screen Interval: From-To (ft)																				
Initial DTW (ft)				4.70			8.20			7.09										
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~INFL A (ppmv)~~	AFTER B-1 (ppmv)	~~AFTER B-2 (ppmv)~~	~~AFTER B-3 (ppmv)~~ PSI	~~AFTER B-4 (ppmv)~~ SCFM	EFFL. C (ppmv)	units 4839.0	gals
7/5				ON		16FT	ON		12½	ON		16FT								
0815	25	40	376.2																	
0817				OFF			ON			OFF										
0825							243.8													
0827				OFF			OFF			ON										
0835										227.8										
0837				ON			OFF			OFF										
0845				527.6																
0847				ON			ON			ON										
0855														2.4						
0900																15	4	1.3	948215.0	943376.0
1200	25	40	371.8													15	4		951418.0	946579.0
1600	25	40	387.4													15	4		953605.0	948766.0
7/6																				
0815	25	40	381.3																	
0817				OFF			ON			OFF										
0825							245.7													
0827				OFF			OFF			ON										
0835										228.6										
0837				ON			OFF			OFF										
0845				530.7																

Comments: 7/5 VAPOR SAMPLES TAKEN TI-28 @ 0815, MW1-76 @ 0825, MW1-77 @ 0835, MW1-66 @ 0845, MD-16 @ 0855, EF-16 @ 0900, WATER SAMPLES TAKEN IN-10 @ 0905, MD1-10 @ 0910, MD2-10 @ 0915, EF-10 @ 0920, pH TEST @ 0920 (7.17)

FOUO

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 7/6/2022

Client:

Operator (s): KEVIN

Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	MW1-66 Off/On (ppmv)	MW1-66 DTW (ft)	MW1-66 Stinger Depth (feet)	MW1-76 Off/On (ppmv)	MW1-76 DTW (ft)	MW1-76 Stinger Depth (feet)	MW1-77 Off/On (ppmv)	MW1-77 DTW (ft)	MW1-77 Stinger Depth (feet)	~~INFL A (ppmv)~~	AFTER B-1 (ppmv)	~~AFTER B2 (ppmv)~~	AFTER ~~B-3~~ ~~(ppmv)~~ PSI (AIR SPARGE)	AFTER ~~B-4~~ ~~(ppmv)~~ SCFM (AIR SPARGE)	EFFL. C (ppmv)	Water Meter Readings (units) 4839.0	Cumul. Water Discharged (gals)
Screen Interval: From-To (ft)																				
Initial DTW (ft)				4.70			8.20			7.09										
7/6						16 FT			12 1/2			16 FT								
0847				ON			ON			ON										
0855														2.4						
0900																15	4	1.3	961936.0	957097.0
1200	25	40	376.8													15	4		963114.0	958275.0
1600	25	40	327.7													15	4		965357.0	960518.0
7/7																				
0815	25	40	235.6																	
0817				OFF			ON			OFF										
0825							160.7													
0827				OFF			OFF			ON										
0835										109.8										
0837				ON			OFF			OFF										
0845				258.7																
0847				ON			ON			ON										
0855														2.4						
0900																15	4	1.3	973052.0	968213.0
1200	25	40	279.8													15	4		975588.0	970749.0
1600	25	40	248.7													15	4		976767.0	971928.0

Comments:

FOUO

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706
Page 46 of 55

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 7/8/2022

Client:

Operator (s): KEVIN

				EXTRACTION WELLS									AIR MONITORING				AIR SPARGE			
		Well I.D.		MW1-66			MW1-76			MW1-77									Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09			~~INFL. (ppmv)~~	AFTER B-1 (ppmv)	~~AFTER B-2 (ppmv)~~	~~AFTER B-3 (ppmv)~~	AFTER ~~B-4 (ppmv)~~	EFFL. C (ppmv)		
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)				PSI	SCFM		units 4839.0	gals
7/8				ON		16 FT	ON		12½	ON		16 FT								
0815	25	40	317.3																	
0817				OFF			ON			OFF										
0825							198.9													
0827				OFF			OFF			ON										
0835										198.8										
0837				ON			OFF			OFF										
0845				445.2																
0847				ON			ON			ON										
0855														2.4						
0900																15	4	1.3	988553.0	983714.0
1200	25	40	347.7													15	4		990745.0	985906.0
1600	25	40	338.7													15	4		993355.0	988516.0
7/9																				
0815	25	40	328.1																	
0817				OFF			ON			OFF										
0825							121.7													
0827				OFF			OFF			ON										
0835										131.7										
0837				ON			OFF			OFF										
0845				291.8																

Comments: 7/9 VAPOR SAMPLE TAKEN TI-29 @ 0815

~~FOUO~~

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 7/9/2022

Client:

Operator (s): KEVIN

			Well I.D.	EXTRACTION WELLS MW1-66			MW1-76			MW1-77			AIR MONITORING			AIR SPARGE			Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09										
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~INFL A~~ (ppmv)	AFTER B-1 (ppmv)	AFTER ~~B-2~~ (ppmv)	~~AFTER B-3 (ppmv)~~ PSI	~~AFTER B-4 (ppmv)~~ SCFM	EFFL. C (ppmv)	units 4839.0	gals
7/9						16 FT			12 1/2			16 FT								
0847				ON			ON			ON										
0855														2.4						
0900																15	4	1.3	1002051.0	997212.0
1200	25	40	310.7													15	4		1004658.0	999819.0
1600	25	40	307.4													15	4		1007095.0	1002256.0
7/10																				
0815	25	40	258.7																	
0817				OFF			ON			OFF										
0825							157.9													
0827				OFF			OFF			ON										
0835										147.9										
0837				ON			OFF			OFF										
0845				307.8																
0847				ON			ON			ON										
0855														2.4						
0900																15	4	1.3	1016435.0	1011596.0
1200	25	40	243.7													15	4		1018161.0	1013322.0
1600	25	40	230.7																1020316.0	1015477.0

Comments:

FOUO

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 7/11/2022

Client:

Operator (s): KEVIN

				EXTRACTION WELLS									AIR MONITORING							
	Well I.D.			MW1-66			MW1-76			MW1-77						AIR SPARGE			Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09										
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~INFL A (ppmv)~~	AFTER B-1 (ppmv)	~~AFTER B-2 (ppmv)~~	~~AFTER B-3 (ppmv)~~ PSI	~~AFTER B-4 (ppmv)~~ SCFM	EFFL. C (ppmv)	units 4839.0	gals
7/11				ON		16 FT	ON		12 1/2	ON		16 FT								
0815	25	40	276.7																	
0817				OFF			ON			OFF										
0825							332.7													
0827				OFF			OFF			ON										
0835										297.3										
0837				ON			OFF			OFF										
0845				489.7																
0847				ON			ON			ON										
0855														2.4						
0900																15	4	1.3	1028695.0	1023856.0
1200	25	40	270.9													15	4		1030722.0	1025883.0
1600	25	40	267.4													15	4		1033982.0	1029143.0
7/12																				
0815	25	40	296.9																	
0817				OFF			ON			OFF										
0825							159.1													
0827				OFF			OFF			ON										
0835										161.2										
0837				ON			OFF			OFF										
0845				410.4																

Comments: 7/12 VAPOR SAMPLES TAKEN TI-30 @ 0815, MW1-76 @ 0825, MW1-77 @ 0835, MW1-66 @ 0845, MD-17 @ 0855, EF-17 @ 0900, WATER SAMPLES TAKEN IN-11 @ 0905, MD1-11 @ 0910, MD2-11 @ 0915 EF-11 @ 0920, pH TEST @ 0930 (7.30)

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 7/12/2022

Client:

Operator (s): KEVIN

				EXTRACTION WELLS									AIR MONITORING							
		Well I.D.		MW1-66			MW1-76			MW1-77						AIR SPARGE			Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09			~~INFL. A (ppmv)~~	AFTER B-1 (ppmv)	~~AFTER B-2 (ppmv)~~	~~AFTER B-3 (ppmv)~~ PSI	~~AFTER B-4 (ppmv)~~ SCFM	EFFL. C (ppmv)	units 4839.0	gals
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)								
7/12						16 FT			12 1/2			16 FT								
0847				ON			ON			ON										
0855														2.4						
0900																15	4	1.3	1044665.0	1039826.0
1200	25	40	275.8													15	4		1046938.0	1042099.0
1600	25	40	278.8													15	4		1048969.0	1044130.0
7/13																				
0815	25	40	284.9																	
0817				OFF			ON			OFF										
0825							129.6													
0827				OFF			OFF			ON										
0835										156.8										
0837				ON			OFF			OFF										
0845				482.4																
0847				ON			ON			ON										
0855														2.5						
0900																15	4	1.3	1059035.0	1054196.0
1200	25	40	275.7													15	4		1060836.0	1055997.0
1600	25	40	257.8													15	4		1063295.0	1058456.0

Comments:

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706
Page 50 of 55

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 7/14/2022

Client:

Operator (s): KEVIN

Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	MW1-66 Off/On (ppmv)	MW1-66 DTW (ft)	MW1-66 Stinger Depth (feet)	MW1-76 Off/On (ppmv)	MW1-76 DTW (ft)	MW1-76 Stinger Depth (feet)	MW1-77 Off/On (ppmv)	MW1-77 DTW (ft)	MW1-77 Stinger Depth (feet)	~~INFL~~ (ppmv)	AFTER B-1 (ppmv)	~~AFTER B-2~~ (ppmv)	AIR SPARGE ~~AFTER B-3 (ppmv)~~ PSI	AIR SPARGE ~~AFTER B-4 (ppmv)~~ SCFM	EFFL. C (ppmv)	Water Meter Readings units 4839.0	Cumul. Water Discharged gals
Screen Interval: From-To (ft)																				
Initial DTW (ft)				4.70			8.20			7.09										
7/14						16FT	ON		12 1/2	ON		16FT								
0815	25	40	319.3																	
0817				OFF			ON			OFF										
0825							281.1													
0827				OFF			OFF			ON										
0835										219.9										
0837				ON			OFF			OFF										
0845				530.4																
0847				ON			ON			ON										
0855														2.5						
0900																15	4	1.3	1071656.0	1066817.0
1200	25	40	239.7													15	4		1074337.0	1069498.0
1600	25	40	288.7													15	4		1076569.0	1071730.0
7/15																				
0815	25	40	378.4																	
0817				OFF			ON			OFF										
0825							297.8													
0827				OFF			OFF			ON										
0835										278.9										
0837				ON			OFF			OFF										
0845				501.8																

Comments:

~~FOUO~~

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 7/15/2022

Client:

Operator (s): KEVIN

Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	EXTRACTION WELLS: MW1-66 Off/On (ppmv)	MW1-66 DTW (ft)	MW1-66 Stinger Depth (feet)	MW1-76 Off/On (ppmv)	MW1-76 DTW (ft)	MW1-76 Stinger Depth (feet)	MW1-77 Off/On (ppmv)	MW1-77 DTW (ft)	MW1-77 Stinger Depth (feet)	AIR MONITORING: ~~INFL A (ppmv)~~	AFTER B-1 (ppmv)	~~AFTER B-2 (ppmv)~~	AIR SPARGE: ~~AFTER B-3 (ppmv)~~ PSI	~~AFTER B-4 (ppmv)~~ SCFM	EFFL. C (ppmv)	Water Meter Readings units	Cumul. Water Discharged gals
Well I.D.				MW1-66			MW1-76			MW1-77										
Screen Interval: From-To (ft)																				
Initial DTW (ft)				4.70			8.20			7.09									48390	
7/15						16FT			12 1/2			16 FT								
0847				ON			ON			ON										
0855														2.5						
0900																15	4	1.3	1085159.0	1080320.0
1200			371.4													15	4		1086984.0	1082145.0
1600			368.9													15	4		1089483.0	1084644.0
7/16																				
0815	25	40	256.9																	
0817				OFF			ON			OFF										
0825							141.1													
0827				OFF			OFF			ON										
0835										148.8										
0837				ON			OFF			OFF										
0845				385.5																
0847				ON			ON			ON										
0855														2.5						
0900																15	4	1.3	1098347.0	1093508.0
1200	25	40	247.9													15	4		1100909.0	1096070.0
1600	25	40	239.8													15	4		1103147.0	1098308.0

Comments: 7/16 VAPOR SAMPLE TAKEN TI-31 @ 1950

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 7/17/2022

Client:

Operator (s): KEVIN

				EXTRACTION WELLS									AIR MONITORING			AIR SPARGES			Water Meter Readings	Cumul. Water Discharged
	Well I.D.			MW1-66			MW1-76			MW1-77										
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09			INFL	AFTER	AFTER	~~AFTER~~	~~AFTER~~	EFFL.		
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~A~~ ~~(ppmv)~~	B-1 (ppmv)	~~B-2~~ ~~(ppmv)~~	~~B-3~~ ~~(ppmv)~~ PSI	~~B-4~~ ~~(ppmv)~~ SCFM	C (ppmv)	units 4839.0	gals
7/17				ON		16FT	ON		12 1/2	ON		16FT								
0815	25	40	267.8																	
0817				OFF			ON			OFF										
0825							135.5													
0827				OFF			OFF			ON										
0835										149.6										
0837				ON			OFF			OFF										
0845				428.7																
0847				ON			ON			ON										
0855														25						
0900																15	4	1.3	1112015.0	1107176.0
1200	25	40	275.7													15	4		1114136.0	1109297.0
1600	25	40	253.8													15	4		1116348.0	1111509.0
7/18																				
0815	25	40	304.5																	
0817				OFF			ON			OFF										
0825							259.9													
0827				OFF			OFF			ON										
0835										241.1										
0837				ON			OFF			OFF										
0845				567.3																

Comments:

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 7/18/2022

Client:

Operator (s): KEVIN

Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	MW1-66 Off/On (ppmv)	MW1-66 DTW (ft)	MW1-66 Stinger Depth (feet)	MW1-76 Off/On (ppmv)	MW1-76 DTW (ft)	MW1-76 Stinger Depth (feet)	MW1-77 Off/On (ppmv)	MW1-77 DTW (ft)	MW1-77 Stinger Depth (feet)	~~INFL. A (ppmv)~~	AFTER B-1 (ppmv)	~~AFTER B-2 (ppmv)~~	Air Sparge ~~AFTER B-3 (ppmv)~~ PSI	Air Sparge ~~AFTER B-4 (ppmv)~~ SCFM	EFFL. C (ppmv)	Water Meter Readings units	Cumul. Water Discharged gals
Well I.D.				MW1-66			MW1-76			MW1-77										
Screen Interval: From-To (ft)																				
Initial DTW (ft)				4.70			8.20			7.09									4839.0	
7/18						16FT			12½			16FT								
0847				ON			ON			ON										
0855														2.6						
0900																15	4	1.4	1125717.0	1120878.0
1200	25	40	304.4													15	4		1128385.0	1123546.0
1600	25	40	287.6													15	4		1130150.0	1125311.0
7/19																				
0735	25	40	171.3																	
0737				OFF			ON			OFF										
0745							93.7													
0747				OFF			OFF			ON										
0755										91.3										
0757				ON			OFF			OFF										
0805				317.6																
0807				ON			ON			ON										
0815														2.6						
0820																15	4	1.4	1138016.0	1133177.0
1200	25	40	169.8													15	4		1140519.0	1135680.0
1600	25	40	166.3													15	4		1142625.0	1137786.0

Comments: 7/19 WATER SAMPLES TAKEN IN-12 @ 0705, MD1-12 @ 0710, MD2-12 @ 0715, EF-12 @ 0720
VAPOR SAMPLES TAKEN TI-32 @ 0735, MW1-76 @ 0745, MW1-77 @ 0755, MW1-66 @ 0805, MD18 @ 0815, EF-18 @ 0820

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 7/20/2022

Client:

Operator (s): KEVIN

			Well I.D.	EXTRACTION WELLS MW1-66			MW1-76			MW1-77			AIR MONITORING			AIR SPARGE			Water Meter Readings	Cumul. Water Discharged
			Screen Interval: From-To (ft)																	
			Initial DTW (ft)	4.70			8.20			7.09										
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~INFL A (ppmv)~~	AFTER B-1 (ppmv)	~~AFTER B-2 (ppmv)~~	~~AFTER B-3 (ppmv)~~ PSI	~~AFTER B-4 (ppmv)~~ SCFM	EFFL. C (ppmv)	units 4839.0	gals
7/20				ON		16 ft	ON		12 1/2	ON		16 ft								
0815	25	40	148.9																	
0817				OFF			ON			OFF										
0825							107.8													
0827				OFF			OFF			ON										
0835										77.8										
0837				ON			OFF			OFF										
0845				4345																
0847				ON			ON			ON										
0855														2.6						
0900																15	4	1.4	1151834.0	1146995.0
1200	25	40	158.7													15	4		1154342.0	1149503.0
1600	25	40	170.8													15	4		1156078.0	1151239.0
7/21																				
0815	25	40	223.6																	
0817				OFF			ON			OFF										
0825							99.4													
0827				OFF			OFF			ON										
0835										131.7										
0837				ON			OFF			OFF										
0845				405.7																

Comments: 7/20 EMPTYED All DRUM OUTSIDE 7/21 EMPTYED All DRUMS INSIDE HUT

FOUO

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CalClean Inc.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 7/21/2022

Client:

Operator (s): KEVIN

				EXTRACTION WELLS									AIR MONITORING							
	Well I.D.			MW1-66			MW1-76			MW1-77						AIR SPARGE			Water Meter Readings	Cumul. Water Discharged
	Screen Interval: From-To (ft)																			
	Initial DTW (ft)			4.70			8.20			7.09										
Time	Unit Vacuum ("Hg.)	Air Flowrate (cfm)	Vapor Inlet Conc. (ppmv)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	Off/On (ppmv)	DTW (ft)	Stinger Depth (feet)	~~INFL A (ppmv)~~	AFTER B-1 (ppmv)	~~AFTER B-2 (ppmv)~~	~~AFTER B-3 (ppmv)~~ PSI	~~AFTER B-4 (ppmv)~~ SCFM	EFFL. C (ppmv)	units 4839.0	gals
7/21						16 FT			12 1/2			16 FT								
0847				ON			ON			ON										
0855														2.6						
0900																15	4	1.4	1165812.0	1160973.0
1200	25	40	217.4													15	4		1168578.0	1163739.0
1600	25	40	207.4													15	4		1169894.0	1165055.0
7/22																				
0815	25	40	234.4																	
0817				OFF			ON			OFF										
0825							101.5													
0827				OFF			OFF			ON										
0835										119.2										
0837				ON			OFF			OFF										
0845				349.3																
0847				ON			ON			ON										
0855														2.6						
0900																15	4	1.4	1178019.0	1173180.0

Comments: 7/21 0920 pH TEST (7.35), 7/22 TOOK VAPOR SAMPLE TI-33@ 0815
SHUT DOWN @ 0910

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CALCLEAN INC.
(714) 936-2706

Project Location: NAVAL BASE KITSAP City: KEYPORT, WA Site #: KEYPORT OU-1 Date: 5/6/2022

Client: Operator (s): KEVIN

OBSERVATION WELLS

WELL	IW1-S		P1-6		P1-7		P1-10		MW1-04		MW1-20		MW1-49		MW1-50		MW1-53		MW1-55		MW1-61	
SCREEN																						
DTW (ft)	4.21		7.23		6.68		4.92		6.45		3.59		6.22		8.25		3.88		5.65		5.17	
Time	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)
5/6																						
11:55-	1255	4.64		7.52		6.77		7.43		6.79		4.81		6.34		8.50		4.79		7.10		5.22
5/7																						
1130	1230	4.73		7.75		7.31		7.50		6.91		5.45		6.60		8.76		5.01		7.32		5.18
5/8																						
1230	1350	4.96		8.19		7.95		8.30		7.21		6.98		7.02		9.23		5.31		7.83		5.21
5/9																						
0940-	1058	5.13		8.30		8.02		8.23		7.28		6.05		7.02		9.33		5.41		7.85		5.25
5/10																						
1300	1410	5.20		8.33		8.07		8.25		7.30		6.12		7.10		9.21		5.30		7.90		5.05
5/11																						
1400	.00	5.25		8.37		8.09		8.41		7.35		6.23		7.09	.06	9.22	.01	5.40		8.01	.02	5.10
5/12																						
1430	.07	5.31		8.28		8.00		8.47		7.25		6.25		6.92	.05	9.07	.00	5.50		8.00	0.12	5.12
5/13																						
1510	.00	5.22		8.31		8.00		8.25		7.27		6.05		7.05	.14	9.17	.00	5.30		7.83	.01	5.01

Comments: 5/10 @ 1630 PUT VACUUM CAPS ON IW1-S, MW1-50, MW1-53, MW1-61

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CALCLEAN INC.
(714) 936-2706

Project Location: NAVAL BASE KITSAP City: KEYPORT, WA Site #: KEYPORT OU-1 Date: 5 / 6 / 2022 Page 1B of 8

Client: Operator (s): KEVIN

OBSERVATION WELLS

WELL	MW1-56-1		MW1-56-2		~~MW1-57-0~~		MW1-57-1		MW1-57-2		MW1-58-0		MW1-58-1		MW1-58-2		MW1-68		S-4B		S-9	
SCREEN																						
DTW (ft)																	2.94		1.92		2.55	
Time	~~Vacuum "H2O~~	DTW (ft)	Vacuum "H2O	DTW (ft)	Vacuum "H2O	DTW (ft)	Vacuum "H2O	DTW (ft)	Vacuum "H2O	DTW (ft)	Vacuum "H2O	DTW (ft)	Vacuum "H2O	DTW (ft)	Vacuum "H2O	DTW (ft)	Vacuum "H2O	DTW (ft)	Vacuum "H2O	DTW (ft)	Vacuum "H2O	DTW (ft)
5/6																						
1155-	1255	7.61		8.71				8.35		8.71		7.29		8.39		8.26		3.05		2.34		2.53
5/7																						
1130-	1230	7.92		7.71				8.83		9.35		7.37		8.55		8.48		3.10		2.42		2.61
5/8																						
1230	1350	8.45		8.20				9.52		10.25		7.81		9.05		8.95		3.25		2.54		2.67
5/9																						
0940-	1058	8.41		8.20				9.39		10.20		8.00		9.15		9.00		3.38		2.62		2.73
5/10																						
1300	1410	8.47		8.21				9.37		10.24		7.93		9.20		9.04		3.50		2.65		2.71
5/11																						
1400-	1515	8.60		8.35				9.57		10.45		8.15		9.37		9.20		3.55		2.70		2.77
5/12																						
1430		7.91		7.75				8.90		8.87		7.71		8.35		8.47		3.53		2.61		2.47
5/13																						
1510		8.45		8.20				9.45		10.30		7.95		9.20		9.02		3.51		2.62		2.70

Comments:

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CALCLEAN INC.
(714) 936-2706

Project Location: NAVAL BASE KITSAP City: KEYPORT, WA Site #: KEYPORT OU-1 Date: 5/6/2022 Page 1C of 8

Client: Operator (s): KEVIN

	OBSERVATION WELLS																					
WELL	S-10								MW1-77		MW1-76		MW1-66		EFF							
SCREEN																						
DTW (ft)	2.76								238.3		220.9		602.2		4839.0							
Time	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	~~Vacuum "H_2O~~	DTW (ft)	~~Vacuum "H_2O~~	DTW (ft)	~~Vacuum "H_2O~~	DTW (ft)	~~Vacuum "H_2O~~	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)
5/6																						
1155-	1255	2.85							644.9		3987.3		8413.5		29954.5							
1630									644.9		3987.3		8413.4		31775.4							
5/7																						
0850									644.9		3987.2		8413.6		37822.1							
1130	1230	2.90													39704.0							
1600									1259.5		4610.0		9030.0		42678.5							
5/8																						
1230	1350	2.91							3061.8	OFF	7023.0		12132.5		56131.5							
1600									3061.8	OFF	7428.5		12575.5		58642.5							
5/9																						
0940	1058	2.90							3061.8	OFF	10011.3		15214.0		71641.3							
5/10																						
1300-	1410	2.93							3061.8	OFF	14044.5		18901.3		90194.5							
5/11																						
1400-	1515	2.91							3061.8	OFF	17374.2		22280.5		108000.5							
5/12																						
1430		2.95							3061.8	OFF	20641.0		25397.1		124971.5							
5/13																						
1510		2.99							3061.8	OFF	24191.6		28558.5		141906.5							

Comments: 5/6 11:55 WATER METERS MW1-77, MW1-76, MW1-66 NOT PUMPING 5/7 DOWN HOLE PUMPS ARE PUMPING @ 1245

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CALCLEAN INC.
(714) 936-2706

Project Location: NAVAL BASE KITSAP City: KEYPORT, WA Site #: KEYPORT OU-1 Date: 5/14/2022 Page 2A of 8

Client: Operator (s): KEVIN

OBSERVATION WELLS

WELL	IW1-S		P1-6		P1-7		P1-10		MW1-04		MW1-20		MW1-49		MW1-50		MW1-53		MW1-55		MW1-61	
SCREEN																						
DTW (ft)	4.21		7.23		6.68		4.92		6.45		3.59		6.22		9.25		3.88		5.65		5.17	
Time	Vacuum "H2O	DTW (ft)	Vacuum "H2O	DTW (ft)	Vacuum "H2O	DTW (ft)	Vacuum "H2O	DTW (ft)	Vacuum "H2O	DTW (ft)	Vacuum "H2O	DTW (ft)	Vacuum "H2O	DTW (ft)	Vacuum "H2O	DTW (ft)	Vacuum "H2O	DTW (ft)	Vacuum "H2O	DTW (ft)	Vacuum "H2O	DTW (ft)
5/14																						
1510	.00	5.15		8.18		7.90		7.15		7.05		5.30		7.03	.10	9.02	.06	4.83		7.10	.03	4.99
5/15																						
1320	.00	5.12		8.00		7.43		8.20		7.10		5.58		6.61	.00	8.79	.00	5.00		7.75	.00	5.02
5/16																						
0930	0.10	4.85		8.20		7.93		7.83		7.11		5.65		6.97	.06	9.07	.05	5.00		7.50	.01	4.87
5/17																						
0930	.03	5.10		8.22		7.90		8.14		7.20		5.90		7.01	.08	9.09	.02	5.20		7.71	.02	4.90
5/18																						
1130	.02	5.15		8.25		7.98		7.85		7.20		5.75		7.05	.06	9.10	.00	5.15		7.56	.02	4.90
5/19																						
1030	.00	4.95		8.15		7.91		7.64		7.35		5.51		6.99	.16	9.03	.05	5.01		7.38	.00	4.91
5/20																						
1000	.00	5.25		8.32		8.10		8.40		7.31		6.11		7.11	.06	9.20	.02	5.37		7.92	.00	4.99
5/21																						
1000	.00	5.35		8.45		8.21		8.65		7.40		6.32		7.20	.02	9.27	.21	5.47		8.10	.00	5.00
5/22																						
1000	.00	5.46		8.49		8.23		8.80		7.45		6.50		7.20	.05	9.30	.01	5.60		8.25	.00	5.10
5/23																						
1000	.00	5.60		8.61		8.35		8.90		7.55		6.59		7.30	.05	9.50	.03	5.68		8.35	.00	5.18

Comments:

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CALCLEAN INC.
(714) 936-2706

Project Location: NAVAL BASE KITSAP City: KEYPORT, WA Site #: KEYPORT OU-1 Date: 5/14/2022 Page 2B of 8

Client: Operator (s): KEVIN

OBSERVATION WELLS

WELL	MW1-56-1		MW1-56-2		~~MW1-57-0~~		MW1-57-1		MW1-57-2		MW1-58-0		MW1-58-1		MW1-58-2		MW1-88		S-4B		S-9	
SCREEN																						
DTW (ft)																	2.94		1.92		2.55	
Time	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)
5/14																						
1510		7.91		7.70				8.75		9.37		7.50		8.63		8.50		3.48		2.65		2.67
5/15																						
1320		7.20		7.05				7.43		8.12		7.51		8.05		7.95		3.40	Flood	ED		2.47
5/16																						
0930		8.12		7.87				9.04		9.90		7.15		8.78		8.59		3.22		2.60		2.64
5/17																						
0930		8.39		8.10				9.40		10.27		7.64		9.06		8.88		3.37		2.59		2.67
5/18																						
1130		8.11		7.85				8.95		9.70		7.61		8.87		8.66		3.35		2.69		2.65
5/19																						
1030		8.00		7.72				8.80		9.63		7.49		8.74		8.55		3.30		2.58		2.67
5/20																						
1000		8.55		8.31				9.60		10.55		7.98		9.30		9.10		3.43		2.67		2.72
5/21										DRY												
1000		8.80		8.52				9.95		10.56		8.09		9.50		9.30		3.51		2.70		2.79
5/22										DRY												
1000		8.95		8.63				10.07		10.55		8.35		9.65		9.50		3.62		2.71		2.85
5/23										DRY				DRY								
1000		9.02		8.77				10.20		10.55		8.45		9.65		9.62		3.71		2.79		2.93
										DRY				DRY								

Comments:

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CALCLEAN INC.
(714) 936-2706

Project Location: NAVAL BASE KITSAP | City: KEYPORT, WA | Site #: KEYPORT OU-1 | Date: 5/14/2022 | Page 2C of 8

Client: | Operator (s): KEVIN

OBSERVATION WELLS

WELL	S-10								MW1-77		MW1-76		MW1-66		EFF							
SCREEN																						
DTW (ft)	2.76								238.3		2209		602.2		4839.0							
Time	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)
5/14																						
1510		308							3061.	8 off	2766	2.1	3162	8.1	15720	2.5						
5/15																						
1320		305							3061.	8 off	30669	.5	34479	.1	170331	.0						
5/16																						
0930		308							3061.	8 off	33519.	1	36939.	1	179369	.2						
5/17																						
0930		3.05							3061.	8 off	36952	.1	39829	.3	19495	1.5						
5/18																						
1130		2.93							3061.8	off	40878.	5	42824.	5	21179	9.5						
5/19																						
1030		2.97							3061.8	OFF	44234	5	45389.	5	22311	8.5						
5/20																						
1000		2.97							3061.8	OFF	47691.	5	48068	5	240600	.5						
5/21																						
1000		2.94							3061.8	OFF	52054	.5	51274.	5	25870	2.5						
5/22																						
1000		3.00							3061.8	OFF	56151.	5	55399.	5	277129	.5						
5/23																						
1000		3.11							3061.8	OFF	60711.	5	59881.	0	29522	3.0						

Comments:

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CALCLEAN INC.
(714) 936-2706

Project Location: NAVAL BASE KITSAP City: KEYPORT, WA Site #: KEYPORT OU-1 Date: 5/24/2022 Page 3A of 8

Client: Operator (s): KEVIN

OBSERVATION WELLS

WELL	MW1-S		P1-6		P1-7		P1-10		MW1-04		MW1-20		MW1-49		MW1-50		MW1-53		MW1-55		MW1-61	
SCREEN																						
DTW (ft)	4.21		7.23		6.68		4.92		6.45		3.59		6.22		8.25		3.88		5.65		5.17	
Time	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)
5/24																						
1000	.00	5.63		8.60		8.43		8.66		7.55		6.25		7.35	.06	9.50	.11	5.64		8.20	.00	5.21
5/25																						
1230	.00	5.69		8.70		8.45		8.67		7.60		6.50		7.40	.05	9.52	.00	5.72		8.24	.00	5.27
5/26																						
1030	.00	5.74		8.75		8.45		8.80		7.65		6.55		7.37	.23	9.54	.00	5.76		8.32	.00	5.32
5/27																						
1100	.00	5.80		8.75		8.50		8.91		7.67		6.68		7.40	.06	9.50	.00	5.85		8.41	.00	5.37
5/28																						
1300	.00	5.75		8.75		8.47		9.03		7.68		6.75		7.35	.06	9.53	.00	5.85		8.49	.00	5.40
5/29																						
1030	.00	5.68		8.45		8.05		7.80		7.30		6.13		7.12	.08	9.15	.22	5.60		7.70	.00	5.35
5/30																						
1030	.00	5.35		8.30		7.98		8.51		7.34		6.26		7.00	.05	9.15	.11	5.53		8.01	.00	5.20
5/31																						
0930	.00	5.31		8.35		7.98		8.65		7.31		6.32		7.05	.05	9.14	.11	5.45		8.09	.00	5.17
6/1																						
1430	.00	5.73		8.60		8.20		8.95		7.53		6.59		7.23	.07	9.38	.01	5.75		8.35	.00	5.30
6/2																						
1030	.00	5.60		8.57		8.25		8.52		7.48		6.43		7.23	.05	9.37	.08	5.70		8.17	.00	5.30

Comments:

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CALCLEAN INC.
(714) 936-2706

Project Location: NAVAL BASE KITSAP City: KEYPORT, WA Site #: KEYPORT OU-1 Date: 5/24/2022 Page 38 of 8

Client: Operator (s): KEVIN

OBSERVATION WELLS

WELL	MW1-56-1		MW1-56-2		~~MW1-57-0~~		MW1-57-1		MW1-57-2		MW1-58-0		MW1-58-1		MW1-58-2		MW1-68		S-4B		S-9	
SCREEN																						
DTW (ft)																	2.94		1.92		2.55	
Time	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)
5/24																						
1000		8.88		8.60				9.90		10.55		8.36		9.65		9.45		3.85		2.80		2.97
5/25										DRY				DRY								
1130		8.85		8.57				9.90		10.55		8.42		9.68		9.50		3.76		2.82		3.03
5/26										DRY				DRY								
1030		8.99		8.75				10.02		1055		8.50		9.65		9.58		3.80		2.83		3.10
5/27										DRY				DRY								
1100		9.10		8.81				10.15		10.55		8.60		9.65		9.65		3.90		2.83		3.13
5/28										DRY				DRY								
1300		9.20		8.90				10.34		10.55		8.54		9.65		9.73		3.83		2.80		3.20
5/29										DRY				DRY								
1030		8.60		8.37				9.60		10.44		8.22		9.46		9.25		3.91		2.80		2.75
5/30																						
1030		8.75		8.46				9.85		1055		7.53		9.46		9.25		3.70		2.60		2.74
5/31										DRY												
0930		8.90		8.61				10.05		10.55		8.11		9.50		9.34		3.65		2.62		2.78
6/1										DRY												
1430		9.05		8.75				10.30		10.55		8.48		9.65		9.60		3.75		2.75		2.90
6/2										DRY				DRY								
1030		8.99		8.70				10.19		1055		8.32		9.65		9.57		3.75		2.70		2.93
										DRY				DRY								

Comments:

FOUO

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CALCLEAN INC.
(714) 936-2706

Project Location: NAVAL BASE KITSAP City: KEYPORT, WA Site #: KEYPORT OU-1 Date: 5/24/2022 Page 36 of 9

Client: Operator (s): KEVIN

OBSERVATION WELLS

WELL	S-10								MW1-77		MW1-76		MW1-66		EFF							
SCREEN																						
DTW (ft)	2.76								238.3		220.9		602.12		4839.0							
Time	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)
5/24																						
1000		3.20							3061.8	OFF	6557	3.5	64043.	0	312521.	5						
5/25																						
1230		3.25							3061.8	OFF	71362.	5	67778.	0	331948	.5						
5/26																						
1030		3.35							3061.8	OFF	76095.	0	71295.	0	348792	.5						
5/27																						
1100		3.32							3061.8	OFF	81418.	5	75725.	0	367181	.5						
5/28																						
1300		3.43							3061.8	OFF	86557.	5	81335.	0	384753	.5						
5/29																						
1030		321							3061.8	OFF	90552.	5	85795.	0	400748.	0						
5/30																						
1030		3.05							3061.8	OFF	93853.	0	88467.	5	414074.	0						
5/31																						
0930		3.03							3061.8	OFF	96735.	0	93411.	0	427926.	0						
6/1																						
1430		3.10							3061.8	OFF	101378.	0	99545.	0	44957	5.0						
6/2																						
1030		3.10							3061.8	OFF	104717.	0	103945.	0	46325	1.0						

Comments:

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CALCLEAN INC.
(714) 936-2706

Project Location: NAVAL BASE KITSAP City: KEYPORT, WA Site #: KEYPORT OU-1 Date: 6/3/2022

Client: Operator (s): KEVIN

OBSERVATION WELLS

WELL	MW1-5		P1-6		P1-7		P1-10		MW1-04		MW1-20		MW1-49		MW1-50		MW1-53		MW1-55		MW1-61	
SCREEN																						
DTW (ft)	4.21		7.23		6.68		4.92		6.45		3.59		6.22		8.25		3.88		5.65		5.17	
Time	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)
6/3																						
1030	.00	5.65		8.55		8.31		8.67		7.45		6.39		7.20	.06	9.31	.20	5.70		8.15	.00	5.31
6/4																						
1030	.00	5.73		8.55		8.25		8.65		7.45		6.38		7.22	.05	9.35	.00	5.69		8.15	.00	5.31
6/5																						
1030	.00	5.40		8.46		8.09		8.40		7.27		6.10		7.08	.05	9.20	2.07	5.30		7.89	.00	5.15
6/6																						
1030	.00	5.56		8.41		8.05		8.35		7.35		6.15		7.10	.06	9.20	.20	5.50		7.93	.00	5.15
6/7																						
1730	.00	5.45		8.40		8.01		8.35		7.30		6.14		7.08	.06	9.17	.01	5.50		7.90	.00	5.13
6/8																						
1350	.00	5.46		8.39		8.03		8.21		7.30		6.06		7.07	.06	9.15	.01	5.50		7.85	.00	5.19
6/9																						
1240	.00	5.58		8.58		8.22		8.50		7.41		6.17		7.20	.07	9.33	.00	5.50		8.04	.00	5.16
6/10																						
0930	.00	5.55		8.45		8.12		8.20		7.27		5.95		7.13	.07	9.23	6.90	5.02		7.79	.00	5.10
6/11																						
1000	.01	5.53		8.45		8.12		8.20		7.30		5.99		7.12	.07	9.24	2.67	5.27		7.80	.00	5.07
6/12																						
1515	.00	5.75		8.51		8.18		8.33		7.34		6.09		7.17	.06	9.30	.02	5.51		7.90	.00	5.12

Comments:

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CALCLEAN INC.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 6/3/2022 Page 43 of 8

Client: Operator (s): KEVIN

OBSERVATION WELLS

WELL	MW1-56-1		MW1-56-2		~~MW1-57-0~~		MW1-57-1		MW1-57-2		MW1-58-0		MW1-58-1		MW1-58-2		MW1-68		S-4B		S-9	
SCREEN																						
DTW (ft)																	2.94		1.92		2.55	
Time	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)
6/3																						
1030		8.45		8.23				9.20		1022		8.25		9.53		9.24		3.73		2.75		2.72
6/4																						
1030		8.80		8.52				9.90		1055		8.23		9.58		9.35		3.72		2.73		2.80
6/5										DRY												
1030		8.55		8.30				9.65		10.55		7.93		9.27		9.09		3.53		2.57		2.65
6/6										DRY												
1030		8.53		8.31				9.57		10.45		8.08		9.35		9.12		3.60		2.68		2.75
6/7																						
1230		8.56		8.35				9.63		10.49		8.09		9.36		9.12		3.53		2.62		2.80
6/8																						
1350		8.48		8.23				9.50		10.25		8.05		9.30		9.10		3.57		2.73		2.85
6/9																						
1240		8.69		8.42				9.70		1055		8.23		9.50		9.30		3.60		2.75		2.87
6/10										DRY												
0930		8.40		8.20				9.40		10.29		7.92		9.18		8.95		3.52		2.65		2.70
6/11																						
1000		8.40		8.19				9.37		10.30		7.90		9.07		8.95		3.50		2.65		2.65
6/12																						
1515		8.53		8.30				9.53		1040		8.05		9.35		9.10		3.42		2.68		2.80

Comments:

FOUO

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CALCLEAN INC.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 6/3/2022 Page 4C of 8

Client:

Operator (s): KEVIN

OBSERVATION WELLS

WELL	S-10								mw1-77		mw1-76		mw1-66		EFF							
SCREEN																						
DTW (ft)	2.76								238.3		220.9		602.2		4839.0							
Time	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	~~Vacuum~~ "H_2O GAL	DTW (ft)	~~Vacuum~~ "H_2O GAL	DTW (ft)	~~Vacuum~~ "H_2O GAL	DTW (ft)	~~Vacuum~~ "H_2O GAL	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)
6/3																						
1030		3.12							3061.8		107878.4		108161.8		479178.0							
6/4																						
1030		3.11							3061.8		111831.0		112781.0		497185.0							
6/5																						
1030		3.10							3061.8		114751.0		116187.0		512785.0							
6/6																						
1030		3.05							3061.8		118191.0		120877.0		529861.0							
6/7																						
1230		2.98							3061.8		121606.0		124994.0		546723.0							
6/8																						
1350		3.00							3061.8		125266.0		128738.0		560681.0							
6/9																						
1240		3.08							3061.8		129207.0		132572.0		576681.0							
6/10																						
0930		3.15							3061.8		132962.0		135574.0		590925.0							
6/11																						
1000		3.16							3061.8		137152.0		138982.0		606972.0							
6/12																						
1515		3.21							3061.8		141921.0		143359.0		626060.0							

Comments:

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CALCLEAN INC.
(714) 936-2706

Project Location: NAVAL BASE KITSAP City: KEYPORT, WA Site #: KEYPORT OU-1 Date: 6/13/2022 Page 5A of 8

Client: Operator (s): KEVIN

OBSERVATION WELLS

WELL	MW1-S		P1-6		P1-7		P1-10		MW1-04		MW1-20		MW1-49		MW1-50		MW1-53		MW1-55		MW1-61	
SCREEN																						
DTW (ft)	4.21		7.23		6.68		4.92		6.45		3.59		6.22		8.25		3.88		5.65		5.17	
Time	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)
6/13																						
1030	.00	5.63		8.51		8.20		8.30		7.35		6.10		7.16	.05	9.30	.20	5.47		7.90	.00	5.15
6/14																						
1000	.00	5.65		8.55		8.70		8.45		7.40		6.20		7.20	.07	9.30	.57	5.55		7.98	.00	5.20
6/15																						
1400	.00	5.55		8.45		8.10		8.01		7.25		5.85		7.14	.07	9.22	.06	5.41		7.70	.00	5.19
6/16																						
1000	.00	5.70		8.57		8.20		8.45		7.43		6.27		7.20	.07	9.32	.00	5.73		8.04	.00	5.27
6/17																						
0810	.00	5.72		8.55		8.20		8.51		7.40		6.23		7.19	.08	9.33	.00	5.70		8.03	.00	5.30
6/18	NO	READINGS																				
6/19	NO	READINGS																				
6/20	NO	READINGS																				
6/21	NO	READINGS																				
6/22	NO	READINGS																				
6/23	NO	READINGS																				
6/24	NO	READINGS																				
6/25	NO	READINGS																				
6/26	NO	READINGS																				
6/27	NO	READINGS																				
6/28	NO	READINGS																				

Comments:

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CALCLEAN INC.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 6/13/2022 Page 5B of 8

Client: Operator (s): KEVIN

OBSERVATION WELLS

WELL	MW1-56-1		MW1-56-2		~~MW1-57-0~~		MW1-57-1		MW1-57-2		MW1-58-0		MW1-58-1		MW1-58-2		MW1-68		S-4B		S-9	
SCREEN																						
DTW (ft)																	2.94		1.92		2.55	
Time	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)
6/13																						
1030		8.50		8.25				9.47		9.35		8.01		9.32		9.09		3.61		2.70		2.72
6/14																						
1000		8.60		8.35				9.62		10.46		8.10		9.40		9.17		3.68		2.71		2.80
6/15																						
1400		8.30		8.15				9.19		9.90		7.95		9.15		8.90		3.57		2.68		2.85
6/16																						
1000		8.65		8.42				9.65		10.50		8.16		9.53		9.27		3.63		2.73		2.91
6/17																						
0810		8.70		8.45				9.70		10.54		8.20		9.57		9.30		3.60		2.73		2.95
6/18	NO	READINGS																				
6/19	NO	READINGS																				
6/20	NO	READINGS																				
6/21	NO	READINGS																				
6/22	NO	READINGS																				
6/23	NO	READING																				
6/24	NO	READINGS																				
6/25	NO	READINGS																				
6/26	NO	READINGS																				
6/27	NO	READINGS																				
6/28	NO	READINGS																				

Comments:

FOUO

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CALCLEAN INC.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 6/13/2022 Page 5C of 8

Client: Operator (s): KEVIN

OBSERVATION WELLS

WELL	S-10								MW1-77		MW1-76		MW1-66		EFF							
SCREEN																						
DTW (ft)	2.76								238.3		220.9		602.2		4839.0							
Time	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	~~Vacuum "H_2O~~ GALS	DTW (ft)	~~Vacuum "H_2O~~ GAL	DTW (ft)	~~Vacuum "H_2O~~ GAL	DTW (ft)	~~Vacuum~~ "H_2O GAL	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)
6/13																						
1030		3.20							3061.8		145051.0		146209.0		64035.0							
6/14																						
1000		2.95							3062.5		148832.0		150371.0		651094.0							
6/15																						
1400		3.03							3062.5		153126.0		154354.0		671953.0							
6/16																						
1000		3.11							3062.5		156384.0		157423.0		685905.0							
6/17																						
0810		3.15							3062.5		159898.0		160986.0		700611.0							
6/18	NO	READINGS																				
6/19	NO	READINGS																				
6/20	NO	READINGS																				
6/21	NO	READINGS																				
6/22	NO	READINGS																				
6/23	NO	READINGS																				
6/24	NO	READINGS																				
6/25	NO	READINGS																				
6/26	NO	READINGS																				
6/27	NO	READINGS																				
6/28	NO	READINGS																				

Comments:

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CALCLEAN INC.
(714) 936-2706

Project Location: NAVAL BASE KITSAP City: KEYPORT, WA Site #: KEYPORT OU-1 Date: 6/29/2022 Page 6A of 8

Client: Operator (s): KEVIN

OBSERVATION WELLS

WELL	MW1-S		P1-6		P1-7		P1-10		MW1-04		MW1-20		MW1-49		MW1-50		MW1-53		MW1-55		MW1-61	
SCREEN																						
DTW (ft)	4.21		7.23		6.68		4.92		6.45		3.59		6.22		8.25		3.88		5.65		5.17	
Time	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)
6/29																						
0900	NO READINGS			—																		
6/30																						
0900	NO READINGS			—																		
7/1																						
0900	NO READINGS			—																		
7/2																						
0900	NO READINGS			—																		
7/3																						
0900	NO READINGS			—																		
7/4																						
0900	NO READINGS			—																		
7/5																						
0900	NO READINGS			—																		
7/6																						
1300	NO READING			—																		
7/7																						
0900	NO READINGS			—																		
7/8																						
900	NO READINGS			—																		

Comments:

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CALCLEAN INC.
(714) 936-2706

Project Location: NAVAL BASE KITSAP City: KEYPORT, WA Site #: KEYPORT OU-1 Date: 6/29/2022 Page 6B of 8

Client: Operator (s): KEVIN

OBSERVATION WELLS

WELL	MW1-56-1		MW1-56-2		~~MW1-57-0~~		MW1-57-1		MW1-57-2		MW1-58-0		MW1-58-1		MW1-58-2		MW1-88		S-4B		S-9	
SCREEN																						
DTW (ft)																	2.94		1.92		2.55	
Time	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)
6/29																						
0900	NO READINGS —																					
6/30																						
0900	NO READINGS —																					
7/1																						
0900	NO READINGS —																					
7/2																						
0900	NO READINGS —																					
7/3																						
0900	NO READINGS —																					
7/4																						
0900	NO READINGS —																					
7/5																						
0900	NO READINGS —																					
7/6																						
1300	NO READING —																					
7/7																						
0900	NO READINGS —																					
7/8																						
0900	NO READINGS —																					

Comments:

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CALCLEAN INC.
(714) 936-2706

Project Location: NAVAL BASE KITSAP   City: KEYPORT, WA   Site #: KEYPORT OU-1   Date: 6/29/2022   Page 6C of 8

Client: Operator (s): KEVIN

OBSERVATION WELLS

WELL	S-10								MW1-77		MW1-76		MW1-66		EFF							
SCREEN																						
DTW (ft)	2.76								238.3		220.9		602.2		4839.0							
Time	Vacuum "H₂O	DTW (ft)	Vacuum "H₂O	DTW (ft)	Vacuum "H₂O	DTW (ft)	Vacuum "H₂O	DTW (ft)	Vacuum "H₂O	DTW (ft)	Vacuum "H₂O	DTW (ft)	Vacuum "H₂O	DTW (ft)	Vacuum "H₂O	DTW (ft)	Vacuum "H₂O	DTW (ft)	Vacuum "H₂O	DTW (ft)	Vacuum "H₂O	DTW (ft)
6/29																						
0900									30625		197985.0		195635.0		860508.0							
6/30																						
0900									3062.5		202171.0		202464.0		875384.0							
7/1																						
0900									3062.5		206247.0		206265.0		892506.0							
7/2																						
0900									3062.5		210343.0		211352.0		907366.0							
7/3																						
0900									3062.5		213258.0		214075.0		918739.0							
7/4																						
0900									3062.5		216778.0		217328.0		932846.0							
7/5																						
0900									3062.5		220599.0		220844.0		948215.0							
7/6																						
1300									3062.5		2246084.0		224558.0		963214.0							
7/7																						
0900									3062.5		227671.0		227639.0		973052.0							
7/8																						
0900									3062.5		230916.0		232057.0		988553.0							

Comments:

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CALCLEAN INC.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 7/9/2022

Client:

Operator (s): KEVIN

OBSERVATION WELLS

WELL	MW1-5		P1-6		P1-7		P1-10		MW1-04		MW1-20		MW1-49		MW1-50		MW1-53		MW1-55		MW1-61	
SCREEN																						
DTW (ft)	4.21		7.23		6.68		4.92		6.45		3.59		6.22		8.25		3.88		5.65		5.17	
Time	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)
7/9																						
0900	NO READINGS																					
7/10																						
0900	NO READINGS																					
7/11																						
0900	NO READINGS																					
7/12																						
0900	NO READINGS																					
7/13																						
0900	NO READINGS																					
7/14																						
0900	NO READINGS																					
7/15																						
0900	NO READINGS																					
7/16																						
0900	NO READINGS																					
7/17																						
0900	NO READINGS																					
7/18																						
0900	NO READINGS																					

Comments:

~~FOUO~~

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CALCLEAN INC.
(714) 936-2706

Project Location: NAVAL BASE KITSAP City: KEYPORT, WA Site #: KEYPORT OU-1 Date: 7/9/2022 Page 18 of 8

Client: Operator (s): KEVIN

OBSERVATION WELLS

WELL	MW1-56-1		MW1-56-2		~~MW1-57-0~~		MW1-57-1		MW1-57-2		MW1-58-0		MW1-58-1		MW1-58-2		MW1-68		S-4B		S-9	
SCREEN																						
DTW (ft)																	2.94		1.92		2.55	
Time	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)
7/9																						
0900	NO	READINGS —																				
7/10																						
0900	NO	READINGS —																				
7/11																						
0900	NO	READINGS —																				
7/12																						
0900	NO	READINGS —																				
7/13																						
0900	NO	READINGS —																				
7/14																						
0900	NO	READINGS —																				
7/15																						
0900	NO	READINGS —																				
7/16																						
0900	NO	READINGS —																				
7/17																						
0900	NO	READINGS —																				
7/18																						
0900	NO	READINGS —																				

Comments:

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CALCLEAN INC.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 7/9/2022 Page 7C of 8

Client:

Operator (s): KEVIN

	OBSERVATION WELLS																					
WELL	S-10								MW1-77		MW1-76		MW1-66		EFF							
SCREEN																						
DTW (ft)	2.76								238.3		220.9		602.2		4839.0							
Time	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)
7/9																						
0900									3062.5		23368	4.0	23562	9.0	100205	1.0						
7/10																						
0900									3062.5		23689	8.0	23972	4.0	101643	5.0						
7/11																						
0900									3062.5		23873	1.0	24212	1.0	10286	95.0						
7/12																						
0900									3062.5		24192	8.0	24637	9.0	10446	65.0						
7/13																						
0900									3062.5		24570	5.0	25073	9.0	105903	5.0						
7/14																						
0900									3062.5		24808	1.0	25457	0.0	107165	6.0						
7/15																						
0900									3062.5		25062	7.0	25799	5.0	108515	9.0						
7/16																						
0900									3062.5		25356	5.0	26201	5.0	109834	7.0						
7/17																						
0900									3062.5		25685	1.0	26647	9.0	1112015	0						
7/18																						
0900									3062.5		25996	4.0	27070	0.0	112571	7.0						

Comments:

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CALCLEAN INC.
(714) 936-2706

Project Location: NAVAL BASE KITSAP City: KEYPORT, WA Site #: KEYPORT OU-1 Date: 7/19/2022 Page 8A of 8

Client: Operator (s): KEVIN

OBSERVATION WELLS

WELL	MW1-S		P1-6		P1-7		P1-10		MW1-04		MW1-20		MW1-49		MW1-50		MW1-53		MW1-55		MW1-61	
SCREEN																						
DTW (ft)	4.21		7.23		6.68		4.92		6.45		3.59		6.22		8.25		3.88		5.65		5.17	
Time	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)
7/19																						
0900	NO READINGS —																					
7/20																						
0900	NO READINGS —																					
7/21																						
0900	NO READINGS —																					
7/22																						
0900	NO READINGS —																					

Comments:

HIGH VACUUM [ ] SVE or [X] DPE FIELD DATA SHEET

CALCLEAN INC.
(714) 936-2706

Project Location: NAVAL BASE KITSAP City: KEYPORT, WA Site #: KEYPORT OU-1 Date: 7/19/2022 Page 8B of 8

Client: Operator (s): KEVIN

OBSERVATION WELLS

WELL	MW1-56-1		MW1-56-2		~~MW1-57-0~~		MW1-57-1		MW1-57-2		MW1-58-0		MW1-58-1		MW1-58-2		MW1-68		S-4B		S-9	
SCREEN																						
DTW (ft)																	2.94		1.92		2.55	
Time	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)
7/19																						
0900	NO	READINGS —																				
7/20																						
0900	NO	READINGS —																				
7/21																						
0900	NO	READINGS —																				
7/22																						
0900	NO	READINGS —																				

Comments:

HIGH VACUUM ☐ SVE or ☒ DPE FIELD DATA SHEET

CALCLEAN INC.
(714) 936-2706

Project Location: **NAVAL BASE KITSAP** City: **KEYPORT, WA** Site #: **KEYPORT OU-1** Date: 7/19/2022 Page 8C of 8

Client: Operator (s): KEVIN

OBSERVATION WELLS

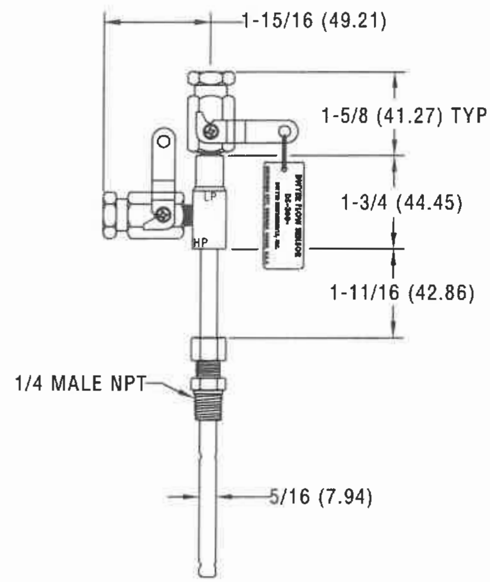
WELL	S-10								MW1-77		MW1-76		MW1-66		EFF							
SCREEN																						
DTW (ft)	2.76								238.3		220.9		602.2		4839.0							
Time	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)	Vacuum "H_2O	DTW (ft)
7/19																						
0900									3062.	5	26321	1.0	27394	4.0	113801	6.0						
7/20																						
0900									3062.	5	26660	3.0	27803	7.0	115183	4.0						
7/21																						
0900									3062.	5	26992	6.0	28167	4.0	116581	2.0						
7/22																						
0900									3062.	5	27297	8.0	28518	9.0	11780	19.0						

Comments:

~~FOUO~~

Series DS-300 Flow Sensors

Installation and Operating Instructions Flow Calculations



Series DS-300 Flow Sensors are averaging pitot tubes that provide accurate, convenient flow rate sensing. When purchased with a Dwyer Capsuhelic® for liquid flow or Magnehelic® for air flow, differential pressure gage of appropriate range, the result is a flow-indicating system delivered off the shelf at an economical price. Series DS-300 Flow Sensors are designed to be inserted in the pipeline through a compression fitting and are furnished with instrument shut-off valves on both pressure connections. Valves are fitted with 1/8˝ female NPT connections. Accessories include adapters with 1/4˝ SAE 45° flared ends compatible with hoses supplied with the Model A-471 Portable Capsuhelic® kit. Standard valves are rated at 200°F (93.3°C). Where valves are not required, they can be omitted at reduced cost. Series DS-300 Flow Sensors are available for pipe sizes from 1˝ to 10˝.

INSPECTION

Inspect sensor upon receipt of shipment to be certain it is as ordered and not damaged. If damaged, contact carrier.

INSTALLATION

General - The sensing ports of the flow sensor must be correctly positioned for measurement accuracy. The instrument connections on the sensor indicate correct positioning. The side connection is for total or high pressure and should be pointed upstream. The top connection is for static or low pressure.

Location - The sensor should be installed in the flowing line with as much straight run of pipe upstream as possible. A rule of thumb is to allow 10 - 15 pipe diameters upstream and 5 downstream. The table below lists recommended up and down piping.

PRESSURE AND TEMPERATURE

Maximum: 200 psig (13.78 bar) at 200°F (93.3°C).

Upstream and Downstream Dimensions in Terms of Internal Diameter of Pipe*

Upstream Condition	Minimum Diameter of Straight Pipe		
	Upstream		Downstream
	In-Plane	Out of Plane	
One Elbow or Tee	7	9	5
Two 90° Bends in Same Plane	8	12	5
Two 90° Bends in Different Plane	18	24	5
Reducers or Expanders	8	8	5
All Valves**	24	24	5

* Values shown are recommended spacing, in terms of internal diameter for normal industrial metering requirements. For laboratory or high accuracy work, add 25% to values.

** Includes gate, globe, plug and other throttling valves that are only partially opened. If valve is to be fully open, use values for pipe size change. **CONTROL VALVES SHOULD BE LOCATED AFTER THE FLOW SENSOR.**

DWYER INSTRUMENTS, INC.
P.O. BOX 373 • MICHIGAN CITY, INDIANA 46361, U.S.A.
Phone: 219/879-8000
Fax: 219/872-9057
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e-mail: info@dwyer-inst.com
FOUO

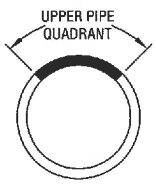
POSITION

Be certain there is sufficient clearance between the mounting position and other pipes, walls, structures, etc, so that the sensor can be inserted through the mounting unit once the mounting unit has been installed onto the pipe.

Flow sensors should be positioned to keep air out of the instrument connecting lines on liquid flows and condensate out of the lines on gas flows. The easiest way to assure this is to install the sensor into the pipe so that air will bleed into, or condensate will drain back to, the pipe.

For Air or Gas Flow

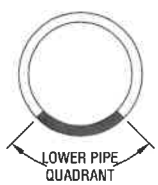
Install in upper quadrant of pipe



Condensate drains back to pipe

For Liquid or Steam Flow

Install in lower quadrant of pipe



Air bleeds back to pipe

INSTALLATION

1. When using an A-160 thred-o-let, weld it to the pipe wall. If replacing a DS-200 unit, an A-161 bushing (1/4″ x 3/8″) will be needed.

2. Drill through center of the thred-o-let into the pipe with a drill that is slightly larger than the flow sensor diameter.

3. Install the packing gland using proper pipe sealant. If the packing gland is disassembled, note that the tapered end of the ferrule goes into the fitting body.

4. Insert sensor until it bottoms against opposite wall of the pipe, then withdraw 1/16″ to allow for thermal expansion.

5. Tighten packing gland nut finger tight. Then tighten nut with a wrench an additional 1-1/4 turns. Be sure to hold the sensor body with a second wrench to prevent the sensor from turning.

INSTRUMENT CONNECTION

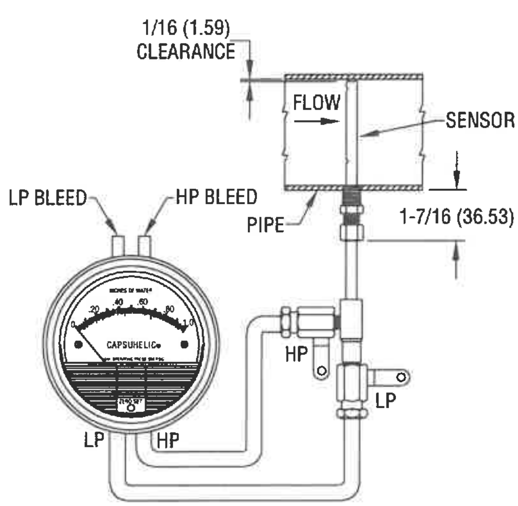
Connect the slide pressure tap to the high pressure port of the Magnehelic® (air only) or Capsuhelic® gage or transmitting instrument and the top connection to the low pressure port.

See the connection schematics below.

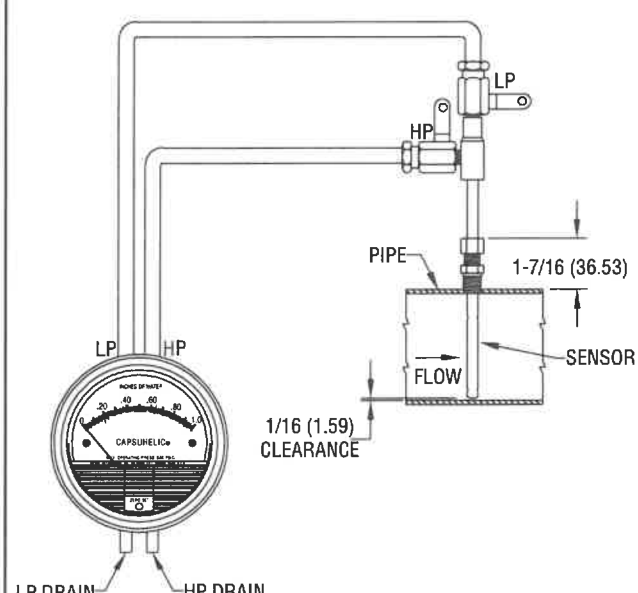
Bleed air from instrument piping on liquid flows. Drain any condensate from the instrument piping on air and gas flows.

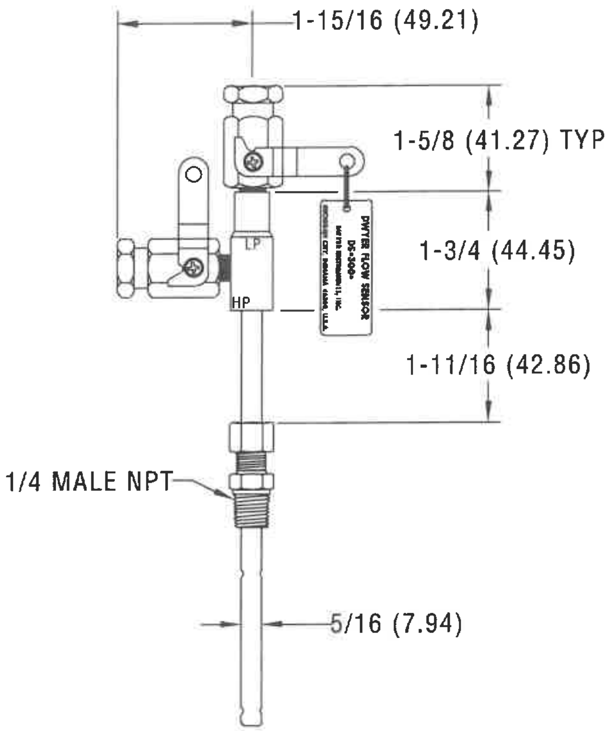
Open valves to instrument to place flow meter into service. For permanent installations, a 3-valve manifold is recommended to allow the gage to be zero checked without interrupting the flow. The Dwyer A-471 Portable Test Kit includes such a device.

Water Flow



Air or Gas Flow





Flow Calculations and Charts

The following information contains tables and equations for determining the differential pressure developed by the DS-300 Flow Sensor for various flow rates of water, steam, air or other gases in different pipe sizes.

This information can be used to prepare conversion charts to translate the differential pressure readings being sensed into the equivalent flow rate. When direct readout of flow is required, use this information to calculate the full flow differential pressure in order to specify the exact range of Dwyer Magnehelic® or Capsuhelic® gage required. Special ranges and calculations are available for these gages at minimal extra cost. See bulletins A-30 and F-41 for additional information on Magnehelic® and Capsuhelic® gages and DS-300 flow sensors.

For additional useful information on making flow calculations, the following service is recommended: Crane Valve Co. Technical Paper No. 410 "Flow of Fluids Through Valves, Fittings and Pipe." It is available from Crane Valve Company, www.cranevalve.com.

Using the appropriate differential pressure equation from Page 4 of this bulletin,calculate the differential pressure generated by the sensor under normal operating conditions of the system. Check the chart below to determine if this value is within the recommended operating range for the sensor. Note that the data in this chart is limited to standard conditions of air at 60°F (15.6°C) and 14.7 psia static line pressure or water at 70°F (21.1°C). To determine recommended operating ranges of other gases, liquids an/or operating conditions, consult factory.

Note: the column on the right side of the chart which defines velocity ranges to avoid. Continuous operation within these ranges can result in damage to the flow sensor caused by excess vibration.

Pipe Size (Schedule 40)	Flow Coefficient "K"	Operating Ranges Air @ 60°F & 14.7 psia (D/P in. W.C.)	Operating Ranges Water @ 70°F (D/P in. W.C.)	Velocity Ranges Not Recommended (Feet per Second)
1	0.52	1.10 to 186	4.00 to 675	146 to 220
1-1/4	0.58	1.15 to 157	4.18 to 568	113 to 170
1-1/2	0.58	0.38 to 115	1.36 to 417	96 to 144
2	0.64	0.75 to 75	2.72 to 271	71 to 108
2-1/2	0.62	1.72 to 53	6.22 to 193	56 to 85
3	0.67	0.39 to 35	1.43 to 127	42 to 64
4	0.67	0.28 to 34	1.02 to 123	28 to 43
6	0.71	0.64 to 11	2.31 to 40	15 to 23
8	0.67	0.10 to 10	0.37 to 37	9.5 to 15
10	0.70	0.17 to 22	0.60 to 79	6.4 to 10

FLOW EQUATIONS

1. Any Liquid

$$Q\,(GPM) = 5.668 \times K \times D^2 \times \sqrt{\Delta P / S_f}$$

2. Steam or Any Gas

$$Q\,(lb/Hr) = 359.1 \times K \times D^2 \times \sqrt{p \times \Delta P}$$

3. Any Gas

$$Q\,(SCFM) = 128.8 \times K \times D^2 \times \sqrt{\frac{P \times \Delta P}{(T + 460) \times S_s}}$$

DIFFERENTIAL PRESSURE EQUATIONS

1. Any Liquid

$$\Delta P\,(in.\ WC) = \frac{Q^2 \times S_f}{K^2 \times D^4 \times 32.14}$$

2. Steam or Any Gas

$$\Delta P\,(in.\ WC) = \frac{Q^2}{K^2 \times D^4 \times p \times 128{,}900}$$

3. Any Gas

$$\Delta P\,(in.\ WC) = \frac{Q^2 \times S_s \times (T + 460)}{K^2 \times D^4 \times P \times 16{,}590}$$

Technical Notations

The following notations apply:

ΔP = Differential pressure expressed in inches of water column
Q = Flow expressed in GPM, SCFM, or PPH as shown in equation
K = Flow coefficient— See values tabulated on Pg. 3.
D = Inside diameter of line size expressed in inches.

For square or rectangular ducts, use: $D = \sqrt{\frac{4 \times Height \times Width}{\pi}}$

P = Static Line pressure (psia)
T = Temperature in degrees Fahrenheit (plus 460 = °Rankine)
p = Density of medium in pounds per square foot
S_f = Sp Gr at flowing conditions
S_s = Sp Gr at 60°F (15.6°C)

SCFM TO ACFM EQUATION

$$SCFM = ACFM \times \left(\frac{14.7 + PSIG}{14.7}\right) \left(\frac{520^*}{460 + °F}\right)$$

$$ACFM = SCFM \times \left(\frac{14.7}{14.7 + PSIG}\right) \left(\frac{460 + °F}{520}\right)$$

$$\text{POUNDS PER CUBIC FOOT STD.} = \text{POUNDS PER CUBIC FOOT ACT.} \times \left(\frac{14.7}{14.7 + PSIG}\right) \left(\frac{460 + °F}{520^*}\right)$$

$$\text{POUNDS PER CUBIC FOOT ACT.} = \text{POUNDS PER CUBIC FOOT STD.} \times \left(\frac{14.7 + PSIG}{14.7}\right) \left(\frac{520^*}{460 + °F}\right)$$

1 Cubic foot of air = 0.076 pounds per cubic foot at 60° F (15.6°C) and 14.7 psia.
* (520°= 460 + 60°) Std. Temp. Rankine

Printed in U.S.A. 7/04

FR# 72-440451-01 Rev. 2

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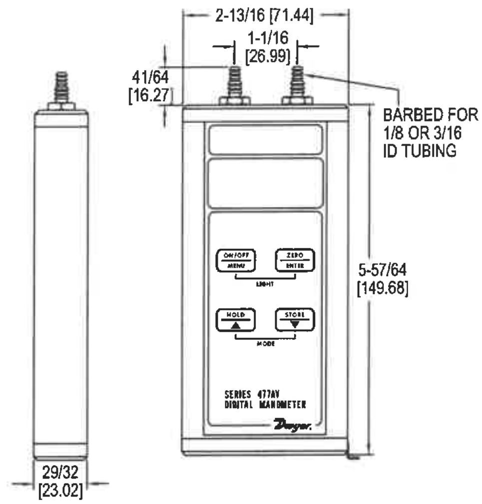
SERIES 477AV

HANDHELD DIGITAL MANOMETER

Measures Pressure, Flow and Velocity; ±0.5% Accuracy

CALIBRATION SERVICES AVAILABLE



The **Series 477AV Handheld Digital Manometer** is now available with pressure, flow, and velocity measurements along with a number of other convenient features. The built-in air velocity and flow calculations provide accuracy and conserve time and error associated with manual calculations. Also featured on this unit are adjustable zero and span values for calibrating in the field, as well as a damping feature to compensate for the fluctuating of readings.

BENEFITS/FEATURES

- Calculates and displays air velocity and volumetric air flow
- Rugged aluminum case protects instrument from damage during transport/use
- 9 selectable English and metric engineering units
- Large, easy to read display with backlight for use in dark areas
- Stores up to 40 readings with minimum, maximum, and average statistics
- Convenient all-in-one air velocity kit option available

APPLICATIONS

- Air flow monitoring, when used with a Dwyer® pitot tube
- Duct static pressure
- Commercial air balancing
- Building-zone pressure

SPECIFICATIONS

Service: Air and compatible gases.
Wetted Materials: Consult factory.
Accuracy: ±0.5% FS, 60 to 78°F (15.6 to 25.6°C); ±1.5% FS from 32 to 60°F and 78 to 104°F (0 to 15.6°C and 25.6 to 40.0°C).
Pressure Hysteresis: ±0.1% FS.
Pressure Limits: See chart.
Temperature Limits: 0 to 140°F (-17.8 to 60°C).
Compensated Temperature Limits: 32 to 104°F (0 to 40°C).
Storage Temperature Limits: -4 to 176°F (-20 to 80°C).
Display: 0.42˝ (10.6 mm) 4 digit LCD.
Resolution: See chart.
Units of Pressure: in w.c., ft w.c., in Hg, psi, oz/in^2, mm w.c., cm w.c., mm Hg, mbar, Pa, kPa, hPa.
Units of Velocity: fpm, fps, mph, m/h, m/s, k/h, knot.
Units of Flow: cfm, m^3/h, m^3/s.
Power Requirements: 9 V alkaline battery, installed non-functional, user replaceable.
Process Connections: Two barbed connections for use with 1/8˝ (3.18 mm) or 3/16˝ (4.76 mm) ID tubing. Two compression fittings for use with 1/8˝ (3.18 mm) ID x 1/4˝ (6.35 mm) OD tubing for 477AV-7 and 477AV-8 only.
Weight: 10.2 oz (289 g).
Compliance: CE.

MODEL CHART

Model	Pressure Range	Velocity Range		Available Pressure Units												Maximum Pressure
		fpm	m/s	psi	in Hg	kPa	in w.c.	mm Hg	mbar	mm w.c.	Pa	ft w.c.	oz/in^2	hPa	cm w.c.	
477AV-000	0 to 1.000 in w.c.	4004	20.34	-	0.0736	0.2491	1.000	1.868	2.491	25.40	249.1	0.0833	0.5780	2.491	2.540	5 psig
477AV-00	0 to 4.000 in w.c.	8009	40.69	0.1445	0.2942	0.996	4.000	7.473	9.96	101.6	996	0.3333	2.312	9.964	10.16	5 psig
477AV-0	0 to 10.00 in w.c.	12.66k	64.33	0.3613	0.7355	2.491	10.00	18.68	24.91	254.0	2491	0.8333	5.780	24.91	25.40	5 psig
477AV-1	0 to 20.00 in w.c.	17.91k	90.97	0.7225	1.471	4.982	20.00	37.36	49.82	508.0	4982	1.667	11.56	49.82	50.80	10 psig
477AV-2	0 to 40.00 in w.c.	25.33k	128.7	1.445	2.942	9.96	40.00	74.73	99.6	1016	9964	3.333	23.12	99.64	101.6	10 psig
477AV-3	0 to 200.0 in w.c.	56.63k	287.7	7.225	14.71	49.82	200.0	373.6	498.2	5080	-	16.67	115.6	498.2	508.0	30 psig
477AV-4	0 to 10.00 psi	66.62k	338.4	10.00	20.36	68.95	276.8	517.1	689.5	7031	-	13.07	160.0	689.5	703.1	30 psig
477AV-5	0 to 20.00 psi	94.22k	478.6	20.00	40.72	137.9	553.6	1034	1379	-	-	46.13	320.0	1379	1406	60 psig
477AV-6	0 to 30.00 psi	115.4k	586.2	30.00	61.08	206.9	830.4	1551	2069	-	-	69.20	480.0	2068	2109	60 psig
477AV-7	0 to 100.0 psi	210.7k	1070	100.0	203.6	689.5	2768	5171	6895	-	-	230.7	1600	6895	7031	150 psig
477AV-8	0 to 150.0 psi	258.0k	1311	150.0	305.4	1034	4152	7757	-	-	-	346.0	2400	-	-	200 psig

OPTIONS

To order add suffix:	Description
-NIST	NIST traceable calibration certificate

Example: 477AV-1-NIST

ACCESSORIES

Model	Description
A-47X-BOOT	Protective magnetic rubber boot
A-402A	Carrying case; tough gray nylon pouch protects any Series 477AV Manometer; double zippered for quick and easy access, with a belt loop that snaps closed; 7-1/2˝H x 3˝W x 2-1/4˝D (191 x 76 x 57 mm)

A-402A

A-47X-BOOT
(manometer not included)

FOUO

DICK MUNNS COMPANY
LIQUID & GAS FLOW CALIBRATION

ISO 17025 — IAS ACCREDITED CL-122

CERTIFICATE OF CALIBRATION

CUSTOMER:	CAL CLEAN ORANGE,CA	**CALIBRATION DATE:**	06/10/15
PO NUMBER:		**CALIBRATION DUE:**	06/10/16
INST. MANUFACTURER:	DWYER	**PROCEDURE:**	NAVAIR17-20MG,NIST250
INST. DESCRIPTION:	VELOCITY PROBE	**CALIBRATION FLUID:**	AIR
MODEL NUMBER:	DS-300-3 3" LINE	**ARRIVAL CONDITION:**	WITHIN MFG.SPECS.
SERIAL NUMBER:	DS300-3	**AS RETURNED:**	WITHIN MFG.SPECS.
RATED UNCERTAINTY:	+/-2% RD	**AMBIENT CONDITIONS:**	759mmHGA 49%RH 71F
UNCERTAINTY GIVEN:	TOTAL measurement uncertainty +/-.655% RD K=2	**CERTIFICATE FILE #:**	454524

NOTES: SCFM= 128.8 * K.FACTOR*D*D*SQRT(PSIA*DP"H20/DEG.R)

TEST POINT NUMBER	UUT INDICATED DP H2O	DM.STD. ACTUAL SCFM
1	0.001	4.08
2	0.010	12.91
3	0.080	36.55
4	0.100	40.89
5	0.200	57.85
6	0.400	81.81
7	0.800	115.77
8	1.000	129.45
9	2.000	182.96
10	5.00	289.27
11	8.00	365.83
12	10.00	408.97
13	12.00	447.97
14	16.00	517.33
15	18.00	548.95

STANDARDS USED:

VOLUME PROVER A5 +/- .04% BY VOLUME	TRACE# 1329407628,89576	DUE	05/10/16
TEMP.STD.:HART SCIENTIFIC A24 +/-.04 F	TRACE# 1390386562	DUE	02/20/16
PRESSURE STD.: A321CEC,A103 MICRO. +/-.01%RD	TRACE# 1400832461	DUE	05/12/16

All instruments used in the performance of the shown calibration have traceability to the National Institute of Standards and Technology (NIST). The uncertainty ratio between the calibration standards (DM.STD.) used and the unit under test (UUT) is a minimum of 4:1, unless otherwise noted. Calibration has been performed per the shown procedure number, in accordance with ISO 10012:2003, ISO 17025:2005, ANSI/NCSL-Z-540.3, and/or MIL-STD-45662A. Test methods: API2530-92 & ASME MFC-3M-1989.

Dick Munns Company • 10572 Calle Lee #130 • Los Alamitos, CA 90720
Phone (714) 827-1215 • Fax (714) 827-0823

Date: 6/10/2015

Approved By:

Calibration Technician:

FOUO

TABLE OF INTERPOLATED CALIBRATION DATA
DATA INTERPOLATED USING CUBIC SPLINE METHOD

Model Number
Serial Number
Calibration Date 06-10-2015

IND.INH2O	ACT.SCFM
0.001	4.080
0.003	6.156
0.005	8.167
0.007	10.113
0.009	11.994
0.011	13.803
0.013	15.502
0.015	17.088
0.017	18.566
0.019	19.940
0.021	21.217
0.023	22.399
0.025	23.492
0.027	24.501
0.029	25.429
0.031	26.282
0.033	27.065
0.035	27.782
0.037	28.437
0.039	29.036
0.041	29.583
0.043	30.083
0.045	30.540
0.047	30.959
0.049	31.345
0.051	31.702
0.053	32.035
0.055	32.349
0.057	32.649
0.059	32.938
0.061	33.222
0.063	33.506
0.065	33.794
0.067	34.090
0.069	34.399
0.071	34.727
0.073	35.078
0.075	35.455
0.077	35.865
0.079	36.312
0.081	36.792
0.083	37.262
0.085	37.718
0.087	38.161
0.089	38.594
0.091	39.018
0.093	39.437

TABLE OF INTERPOLATED CALIBRATION DATA
DATA INTERPOLATED USING CUBIC SPLINE METHOD

Model Number
Serial Number
Calibration Date 06-10-2015

IND.INH2O	ACT.SCFM
0.095	39.852
0.097	40.266
0.099	40.681
0.101	41.098
0.103	41.512
0.105	41.920
0.107	42.324
0.109	42.723
0.111	43.118
0.113	43.508
0.115	43.894
0.117	44.276
0.119	44.653
0.121	45.027
0.123	45.397
0.125	45.763
0.127	46.126
0.129	46.485
0.131	46.841
0.133	47.193
0.135	47.542
0.137	47.888
0.139	48.232
0.141	48.572
0.143	48.910
0.145	49.245
0.147	49.577
0.149	49.907
0.151	50.235
0.153	50.560
0.155	50.884
0.157	51.205
0.159	51.525
0.161	51.843
0.163	52.159
0.165	52.474
0.167	52.787
0.169	53.099
0.171	53.410
0.173	53.720
0.175	54.029
0.177	54.336
0.179	54.644
0.181	54.950
0.183	55.256
0.185	55.561
0.187	55.867

TABLE OF INTERPOLATED CALIBRATION DATA
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Serial Number
Calibration Date 06-10-2015

IND.INH2O	ACT.SCFM
0.189	56.172
0.191	56.476
0.193	56.781
0.195	57.086
0.197	57.392
0.199	57.697
0.201	58.003
0.203	58.307
0.205	58.608
0.207	58.908
0.209	59.205
0.211	59.501
0.213	59.794
0.215	60.085
0.217	60.375
0.219	60.662
0.221	60.947
0.223	61.231
0.225	61.512
0.227	61.792
0.229	62.070
0.231	62.346
0.233	62.620
0.235	62.893
0.237	63.163
0.239	63.432
0.241	63.700
0.243	63.966
0.245	64.230
0.247	64.492
0.249	64.753
0.251	65.012
0.253	65.270
0.255	65.526
0.257	65.781
0.259	66.035
0.261	66.286
0.263	66.537
0.265	66.786
0.267	67.034
0.269	67.280
0.271	67.526
0.273	67.770
0.275	68.012
0.277	68.254
0.279	68.494
0.281	68.733

TABLE OF INTERPOLATED CALIBRATION DATA
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Model Number
Serial Number
Calibration Date 06-10-2015

IND.INH2O	ACT.SCFM
0.283	68.971
0.285	69.208
0.287	69.443
0.289	69.678
0.291	69.912
0.293	70.144
0.295	70.376
0.297	70.607
0.299	70.836
0.301	71.065
0.303	71.293
0.305	71.520
0.307	71.746
0.309	71.972
0.311	72.197
0.313	72.420
0.315	72.644
0.317	72.866
0.319	73.088
0.321	73.309
0.323	73.530
0.325	73.749
0.327	73.969
0.329	74.188
0.331	74.406
0.333	74.624
0.335	74.841
0.337	75.058
0.339	75.274
0.341	75.490
0.343	75.706
0.345	75.921
0.347	76.136
0.349	76.351
0.351	76.566
0.353	76.780
0.355	76.994
0.357	77.208
0.359	77.422
0.361	77.635
0.363	77.849
0.365	78.062
0.367	78.275
0.369	78.489
0.371	78.702
0.373	78.915
0.375	79.128

TABLE OF INTERPOLATED CALIBRATION DATA
DATA INTERPOLATED USING CUBIC SPLINE METHOD

Model Number
Serial Number
Calibration Date 06-10-2015

IND.INH2O	ACT.SCFM
0.377	79.342
0.379	79.555
0.381	79.769
0.383	79.983
0.385	80.197
0.387	80.411
0.389	80.626
0.391	80.840
0.393	81.055
0.395	81.270
0.397	81.486
0.399	81.702
0.401	81.918
0.403	82.134
0.405	82.349
0.407	82.563
0.409	82.776
0.411	82.989
0.413	83.201
0.415	83.413
0.417	83.624
0.419	83.834
0.421	84.043
0.423	84.252
0.425	84.460
0.427	84.667
0.429	84.874
0.431	85.080
0.433	85.286
0.435	85.490
0.437	85.694
0.439	85.898
0.441	86.101
0.443	86.303
0.445	86.505
0.447	86.706
0.449	86.906
0.451	87.106
0.453	87.305
0.455	87.503
0.457	87.701
0.459	87.898
0.461	88.095
0.463	88.291
0.465	88.487
0.467	88.682
0.469	88.876

TABLE OF INTERPOLATED CALIBRATION DATA
DATA INTERPOLATED USING CUBIC SPLINE METHOD

Model Number
Serial Number
Calibration Date 06-10-2015

IND.INH2O	ACT.SCFM
0.471	89.070
0.473	89.263
0.475	89.455
0.477	89.647
0.479	89.839
0.481	90.029
0.483	90.220
0.485	90.409
0.487	90.599
0.489	90.787
0.491	90.975
0.493	91.163
0.495	91.350
0.497	91.536
0.499	91.722
0.501	91.908
0.503	92.093
0.505	92.277
0.507	92.461
0.509	92.644
0.511	92.827
0.513	93.009
0.515	93.191
0.517	93.372
0.519	93.553
0.521	93.733
0.523	93.913
0.525	94.093
0.527	94.271
0.529	94.450
0.531	94.628
0.533	94.805
0.535	94.982
0.537	95.159
0.539	95.335
0.541	95.510
0.543	95.685
0.545	95.860
0.547	96.034
0.549	96.208
0.551	96.382
0.553	96.555
0.555	96.727
0.557	96.899
0.559	97.071
0.561	97.242
0.563	97.413

TABLE OF INTERPOLATED CALIBRATION DATA
DATA INTERPOLATED USING CUBIC SPLINE METHOD

Model Number
Serial Number
Calibration Date 06-10-2015

IND.INH2O	ACT.SCFM
0.565	97.583
0.567	97.753
0.569	97.923
0.571	98.092
0.573	98.261
0.575	98.430
0.577	98.598
0.579	98.765
0.581	98.932
0.583	99.099
0.585	99.266
0.587	99.432
0.589	99.598
0.591	99.763
0.593	99.928
0.595	100.093
0.597	100.257
0.599	100.421
0.601	100.585
0.603	100.748
0.605	100.911
0.607	101.074
0.609	101.236
0.611	101.398
0.613	101.560
0.615	101.721
0.617	101.882
0.619	102.043
0.621	102.204
0.623	102.364
0.625	102.524
0.627	102.683
0.629	102.842
0.631	103.001
0.633	103.160
0.635	103.318
0.637	103.476
0.639	103.634
0.641	103.792
0.643	103.949
0.645	104.106
0.647	104.263
0.649	104.419
0.651	104.575
0.653	104.731
0.655	104.887
0.657	105.043

TABLE OF INTERPOLATED CALIBRATION DATA
DATA INTERPOLATED USING CUBIC SPLINE METHOD

Model Number
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Calibration Date 06-10-2015

IND.INH2O	ACT.SCFM
0.659	105.198
0.661	105.353
0.663	105.508
0.665	105.662
0.667	105.817
0.669	105.971
0.671	106.125
0.673	106.279
0.675	106.432
0.677	106.585
0.679	106.739
0.681	106.891
0.683	107.044
0.685	107.197
0.687	107.349
0.689	107.501
0.691	107.653
0.693	107.805
0.695	107.957
0.697	108.108
0.699	108.259
0.701	108.410
0.703	108.561
0.705	108.712
0.707	108.863
0.709	109.013
0.711	109.164
0.713	109.314
0.715	109.464
0.717	109.614
0.719	109.764
0.721	109.914
0.723	110.063
0.725	110.213
0.727	110.362
0.729	110.511
0.731	110.661
0.733	110.810
0.735	110.959
0.737	111.108
0.739	111.256
0.741	111.405
0.743	111.554
0.745	111.702
0.747	111.851
0.749	111.999
0.751	112.147

TABLE OF INTERPOLATED CALIBRATION DATA
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Model Number
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IND.INH2O	ACT.SCFM
0.753	112.296
0.755	112.444
0.757	112.592
0.759	112.740
0.761	112.888
0.763	113.036
0.765	113.184
0.767	113.332
0.769	113.480
0.771	113.627
0.773	113.775
0.775	113.923
0.777	114.071
0.779	114.219
0.781	114.366
0.783	114.514
0.785	114.662
0.787	114.809
0.789	114.957
0.791	115.105
0.793	115.253
0.795	115.400
0.797	115.548
0.799	115.696
0.801	115.844
0.803	115.991
0.805	116.139
0.807	116.286
0.809	116.433
0.811	116.579
0.813	116.726
0.815	116.872
0.817	117.018
0.819	117.164
0.821	117.310
0.823	117.455
0.825	117.600
0.827	117.745
0.829	117.890
0.831	118.034
0.833	118.178
0.835	118.323
0.837	118.466
0.839	118.610
0.841	118.753
0.843	118.897
0.845	119.040

TABLE OF INTERPOLATED CALIBRATION DATA
DATA INTERPOLATED USING CUBIC SPLINE METHOD

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IND.INH2O	ACT.SCFM
0.847	119.182
0.849	119.325
0.851	119.467
0.853	119.609
0.855	119.751
0.857	119.893
0.859	120.034
0.861	120.175
0.863	120.316
0.865	120.457
0.867	120.598
0.869	120.738
0.871	120.878
0.873	121.018
0.875	121.158
0.877	121.297
0.879	121.436
0.881	121.575
0.883	121.714
0.885	121.853
0.887	121.991
0.889	122.129
0.891	122.267
0.893	122.405
0.895	122.542
0.897	122.679
0.899	122.816
0.901	122.953
0.903	123.090
0.905	123.226
0.907	123.362
0.909	123.498
0.911	123.634
0.913	123.769
0.915	123.904
0.917	124.040
0.919	124.174
0.921	124.309
0.923	124.443
0.925	124.577
0.927	124.711
0.929	124.845
0.931	124.979
0.933	125.112
0.935	125.245
0.937	125.378
0.939	125.510

TABLE OF INTERPOLATED CALIBRATION DATA
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IND.INH2O	ACT.SCFM
0.941	125.643
0.943	125.775
0.945	125.907
0.947	126.039
0.949	126.170
0.951	126.302
0.953	126.433
0.955	126.563
0.957	126.694
0.959	126.825
0.961	126.955
0.963	127.085
0.965	127.214
0.967	127.344
0.969	127.473
0.971	127.602
0.973	127.731
0.975	127.860
0.977	127.988
0.979	128.117
0.981	128.245
0.983	128.372
0.985	128.500
0.987	128.627
0.989	128.754
0.991	128.881
0.993	129.008
0.995	129.134
0.997	129.261
0.999	129.387

TABLE OF INTERPOLATED CALIBRATION DATA
DATA INTERPOLATED USING CUBIC SPLINE METHOD

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IND.INH2O	ACT.SCFM
1.00	129.45
1.02	130.61
1.04	131.76
1.06	132.92
1.08	134.06
1.10	135.21
1.12	136.35
1.14	137.49
1.16	138.62
1.18	139.75
1.20	140.87
1.22	142.00
1.24	143.12
1.26	144.23
1.28	145.34
1.30	146.45
1.32	147.56
1.34	148.66
1.36	149.75
1.38	150.85
1.40	151.94
1.42	153.02
1.44	154.11
1.46	155.19
1.48	156.26
1.50	157.33
1.52	158.40
1.54	159.47
1.56	160.53
1.58	161.59
1.60	162.64
1.62	163.69
1.64	164.74
1.66	165.78
1.68	166.82
1.70	167.86
1.72	168.89
1.74	169.92
1.76	170.94
1.78	171.96
1.80	172.98
1.82	174.00
1.84	175.01
1.86	176.01
1.88	177.02
1.90	178.02
1.92	179.01

TABLE OF INTERPOLATED CALIBRATION DATA
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Model Number
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IND.INH2O	ACT.SCFM
1.94	180.00
1.96	180.99
1.98	181.98
2.00	182.96
2.02	183.94
2.04	184.91
2.06	185.87
2.08	186.83
2.10	187.79
2.12	188.73
2.14	189.68
2.16	190.61
2.18	191.54
2.20	192.47
2.22	193.39
2.24	194.31
2.26	195.22
2.28	196.12
2.30	197.02
2.32	197.91
2.34	198.80
2.36	199.68
2.38	200.56
2.40	201.44
2.42	202.30
2.44	203.17
2.46	204.03
2.48	204.88
2.50	205.73
2.52	206.57
2.54	207.41
2.56	208.25
2.58	209.08
2.60	209.90
2.62	210.72
2.64	211.54
2.66	212.35
2.68	213.16
2.70	213.96
2.72	214.76
2.74	215.56
2.76	216.35
2.78	217.13
2.80	217.92
2.82	218.69
2.84	219.47
2.86	220.24

TABLE OF INTERPOLATED CALIBRATION DATA
DATA INTERPOLATED USING CUBIC SPLINE METHOD

Model Number
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IND.INH2O	ACT.SCFM
2.88	221.01
2.90	221.77
2.92	222.53
2.94	223.28
2.96	224.03
2.98	224.78
3.00	225.52
3.02	226.26
3.04	227.00
3.06	227.73
3.08	228.46
3.10	229.19
3.12	229.91
3.14	230.63
3.16	231.35
3.18	232.06
3.20	232.77
3.22	233.47
3.24	234.18
3.26	234.88
3.28	235.57
3.30	236.27
3.32	236.96
3.34	237.65
3.36	238.33
3.38	239.02
3.40	239.70
3.42	240.37
3.44	241.05
3.46	241.72
3.48	242.39
3.50	243.06
3.52	243.72
3.54	244.38
3.56	245.04
3.58	245.70
3.60	246.36
3.62	247.01
3.64	247.66
3.66	248.31
3.68	248.95
3.70	249.60
3.72	250.24
3.74	250.88
3.76	251.52
3.78	252.16
3.80	252.79

TABLE OF INTERPOLATED CALIBRATION DATA
DATA INTERPOLATED USING CUBIC SPLINE METHOD

Model Number
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IND.INH2O	ACT.SCFM
3.82	253.42
3.84	254.06
3.86	254.69
3.88	255.31
3.90	255.94
3.92	256.56
3.94	257.19
3.96	257.81
3.98	258.43
4.00	259.05
4.02	259.67
4.04	260.28
4.06	260.90
4.08	261.51
4.10	262.13
4.12	262.74
4.14	263.35
4.16	263.96
4.18	264.57
4.20	265.17
4.22	265.78
4.24	266.39
4.26	266.99
4.28	267.60
4.30	268.20
4.32	268.81
4.34	269.41
4.36	270.01
4.38	270.61
4.40	271.21
4.42	271.81
4.44	272.41
4.46	273.01
4.48	273.61
4.50	274.21
4.52	274.81
4.54	275.41
4.56	276.01
4.58	276.61
4.60	277.21
4.62	277.81
4.64	278.41
4.66	279.01
4.68	279.61
4.70	280.21
4.72	280.81
4.74	281.41

ABLE OF INTERPOLATED CALIBRATION DATA
ATA INTERPOLATED USING CUBIC SPLINE METHOD

odel Number
erial Number
alibration Date 06-12-2015

ND.INH2O	ACT.SCFM
4.76	282.01
4.78	282.61
4.80	283.22
4.82	283.82
4.84	284.42
4.86	285.02
4.88	285.63
4.90	286.23
4.92	286.84
4.94	287.45
4.96	288.05
4.98	288.66
5.00	289.27
5.02	289.88
5.04	290.48
5.06	291.09
5.08	291.69
5.10	292.29
5.12	292.89
5.14	293.49
5.16	294.08
5.18	294.68
5.20	295.27
5.22	295.86
5.24	296.44
5.26	297.03
5.28	297.61
5.30	298.19
5.32	298.77
5.34	299.35
5.36	299.93
5.38	300.50
5.40	301.08
5.42	301.65
5.44	302.22
5.46	302.79
5.48	303.35
5.50	303.92
5.52	304.48
5.54	305.04
5.56	305.60
5.58	306.16
5.60	306.71
5.62	307.27
5.64	307.82
5.66	308.37
5.68	308.92

ABLE OF INTERPOLATED CALIBRATION DATA
ATA INTERPOLATED USING CUBIC SPLINE METHOD

odel Number
erial Number
alibration Date 06-12-2015

ND.INH2O	ACT.SCFM
5.70	309.47
5.72	310.02
5.74	310.56
5.76	311.11
5.78	311.65
5.80	312.19
5.82	312.73
5.84	313.27
5.86	313.80
5.88	314.34
5.90	314.87
5.92	315.40
5.94	315.94
5.96	316.47
5.98	316.99
6.00	317.52
6.02	318.05
6.04	318.57
6.06	319.09
6.08	319.61
6.10	320.13
6.12	320.65
6.14	321.17
6.16	321.69
6.18	322.20
6.20	322.72
6.22	323.23
6.24	323.74
6.26	324.25
6.28	324.76
6.30	325.27
6.32	325.78
6.34	326.29
6.36	326.79
6.38	327.30
6.40	327.80
6.42	328.30
6.44	328.80
6.46	329.30
6.48	329.80
6.50	330.30
6.52	330.79
6.54	331.29
6.56	331.79
6.58	332.28
6.60	332.77
6.62	333.27

TABLE OF INTERPOLATED CALIBRATION DATA
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Model Number
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IND.INH2O	ACT.SCFM
6.64	333.76
6.66	334.25
6.68	334.74
6.70	335.23
6.72	335.71
6.74	336.20
6.76	336.69
6.78	337.17
6.80	337.66
6.82	338.14
6.84	338.62
6.86	339.11
6.88	339.59
6.90	340.07
6.92	340.55
6.94	341.03
6.96	341.51
6.98	341.99
7.00	342.47
7.02	342.94
7.04	343.42
7.06	343.89
7.08	344.37
7.10	344.84
7.12	345.32
7.14	345.79
7.16	346.26
7.18	346.74
7.20	347.21
7.22	347.68
7.24	348.15
7.26	348.62
7.28	349.09
7.30	349.56
7.32	350.03
7.34	350.50
7.36	350.97
7.38	351.44
7.40	351.90
7.42	352.37
7.44	352.84
7.46	353.30
7.48	353.77
7.50	354.24
7.52	354.70
7.54	355.17
7.56	355.63

TABLE OF INTERPOLATED CALIBRATION DATA
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IND.INH2O	ACT.SCFM
7.58	356.10
7.60	356.56
7.62	357.03
7.64	357.49
7.66	357.96
7.68	358.42
7.70	358.88
7.72	359.35
7.74	359.81
7.76	360.27
7.78	360.74
7.80	361.20
7.82	361.66
7.84	362.13
7.86	362.59
7.88	363.05
7.90	363.52
7.92	363.98
7.94	364.44
7.96	364.90
7.98	365.37
8.00	365.83
8.02	366.29
8.04	366.75
8.06	367.22
8.08	367.68
8.10	368.13
8.12	368.59
8.14	369.05
8.16	369.51
8.18	369.96
8.20	370.42
8.22	370.87
8.24	371.33
8.26	371.78
8.28	372.23
8.30	372.68
8.32	373.13
8.34	373.58
8.36	374.03
8.38	374.48
8.40	374.93
8.42	375.38
8.44	375.82
8.46	376.27
8.48	376.71
8.50	377.16

TABLE OF INTERPOLATED CALIBRATION DATA
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IND.INH2O	ACT.SCFM
8.52	377.60
8.54	378.04
8.56	378.48
8.58	378.93
8.60	379.37
8.62	379.81
8.64	380.25
8.66	380.69
8.68	381.12
8.70	381.56
8.72	382.00
8.74	382.43
8.76	382.87
8.78	383.31
8.80	383.74
8.82	384.17
8.84	384.61
8.86	385.04
8.88	385.47
8.90	385.90
8.92	386.34
8.94	386.77
8.96	387.20
8.98	387.63
9.00	388.05
9.02	388.48
9.04	388.91
9.06	389.34
9.08	389.76
9.10	390.19
9.12	390.62
9.14	391.04
9.16	391.47
9.18	391.89
9.20	392.32
9.22	392.74
9.24	393.16
9.26	393.59
9.28	394.01
9.30	394.43
9.32	394.85
9.34	395.27
9.36	395.69
9.38	396.11
9.40	396.53
9.42	396.95
9.44	397.37

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IND.INH2O	ACT.SCFM
9.46	397.79
9.48	398.21
9.50	398.62
9.52	399.04
9.54	399.46
9.56	399.88
9.58	400.29
9.60	400.71
9.62	401.12
9.64	401.54
9.66	401.96
9.68	402.37
9.70	402.78
9.72	403.20
9.74	403.61
9.76	404.03
9.78	404.44
9.80	404.85
9.82	405.27
9.84	405.68
9.86	406.09
9.88	406.50
9.90	406.91
9.92	407.33
9.94	407.74
9.96	408.15
9.98	408.56
10.00	408.97
10.02	409.38
10.04	409.79
10.06	410.20
10.08	410.61
10.10	411.02
10.12	411.43
10.14	411.83
10.16	412.24
10.18	412.65
10.20	413.05
10.22	413.46
10.24	413.86
10.26	414.27
10.28	414.67
10.30	415.07
10.32	415.48
10.34	415.88
10.36	416.28
10.38	416.68

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IND.INH2O	ACT.SCFM
10.40	417.08
10.42	417.48
10.44	417.88
10.46	418.28
10.48	418.68
10.50	419.08
10.52	419.48
10.54	419.88
10.56	420.27
10.58	420.67
10.60	421.07
10.62	421.46
10.64	421.86
10.66	422.25
10.68	422.65
10.70	423.04
10.72	423.44
10.74	423.83
10.76	424.22
10.78	424.62
10.80	425.01
10.82	425.40
10.84	425.79
10.86	426.18
10.88	426.57
10.90	426.96
10.92	427.35
10.94	427.74
10.96	428.13
10.98	428.52
11.00	428.91
11.02	429.30
11.04	429.69
11.06	430.07
11.08	430.46
11.10	430.85
11.12	431.23
11.14	431.62
11.16	432.01
11.18	432.39
11.20	432.78
11.22	433.16
11.24	433.55
11.26	433.93
11.28	434.32
11.30	434.70
11.32	435.08

TABLE OF INTERPOLATED CALIBRATION DATA
DATA INTERPOLATED USING CUBIC SPLINE METHOD

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IND.INH2O	ACT.SCFM
11.34	435.47
11.36	435.85
11.38	436.23
11.40	436.61
11.42	437.00
11.44	437.38
11.46	437.76
11.48	438.14
11.50	438.52
11.52	438.90
11.54	439.28
11.56	439.66
11.58	440.04
11.60	440.42
11.62	440.80
11.64	441.18
11.66	441.56
11.68	441.94
11.70	442.32
11.72	442.70
11.74	443.07
11.76	443.45
11.78	443.83
11.80	444.21
11.82	444.58
11.84	444.96
11.86	445.34
11.88	445.71
11.90	446.09
11.92	446.47
11.94	446.84
11.96	447.22
11.98	447.60
12.00	447.97
12.02	448.35
12.04	448.72
12.06	449.10
12.08	449.47
12.10	449.85
12.12	450.22
12.14	450.59
12.16	450.96
12.18	451.34
12.20	451.71
12.22	452.08
12.24	452.45
12.26	452.82

TABLE OF INTERPOLATED CALIBRATION DATA
DATA INTERPOLATED USING CUBIC SPLINE METHOD

Model Number
Serial Number
Calibration Date 06-12-2015

IND.INH2O	ACT.SCFM
12.28	453.19
12.30	453.56
12.32	453.93
12.34	454.30
12.36	454.67
12.38	455.04
12.40	455.41
12.42	455.78
12.44	456.15
12.46	456.51
12.48	456.88
12.50	457.25
12.52	457.62
12.54	457.98
12.56	458.35
12.58	458.71
12.60	459.08
12.62	459.44
12.64	459.81
12.66	460.17
12.68	460.54
12.70	460.90
12.72	461.26
12.74	461.63
12.76	461.99
12.78	462.35
12.80	462.71
12.82	463.07
12.84	463.43
12.86	463.80
12.88	464.16
12.90	464.52
12.92	464.88
12.94	465.24
12.96	465.60
12.98	465.95
13.00	466.31
13.02	466.67
13.04	467.03
13.06	467.39
13.08	467.75
13.10	468.10
13.12	468.46
13.14	468.82
13.16	469.17
13.18	469.53
13.20	469.88

TABLE OF INTERPOLATED CALIBRATION DATA
DATA INTERPOLATED USING CUBIC SPLINE METHOD

Model Number
Serial Number
Calibration Date 06-12-2015

IND.INH2O	ACT.SCFM
13.22	470.24
13.24	470.59
13.26	470.95
13.28	471.30
13.30	471.66
13.32	472.01
13.34	472.37
13.36	472.72
13.38	473.07
13.40	473.42
13.42	473.78
13.44	474.13
13.46	474.48
13.48	474.83
13.50	475.18
13.52	475.54
13.54	475.89
13.56	476.24
13.58	476.59
13.60	476.94
13.62	477.29
13.64	477.64
13.66	477.99
13.68	478.33
13.70	478.68
13.72	479.03
13.74	479.38
13.76	479.73
13.78	480.08
13.80	480.42
13.82	480.77
13.84	481.12
13.86	481.46
13.88	481.81
13.90	482.16
13.92	482.50
13.94	482.85
13.96	483.19
13.98	483.54
14.00	483.88
14.02	484.23
14.04	484.57
14.06	484.92
14.08	485.26
14.10	485.60
14.12	485.95
14.14	486.29

TABLE OF INTERPOLATED CALIBRATION DATA
DATA INTERPOLATED USING CUBIC SPLINE METHOD

Model Number
Serial Number
Calibration Date 06-12-2015

IND.INH2O	ACT.SCFM
14.16	486.63
14.18	486.97
14.20	487.32
14.22	487.66
14.24	488.00
14.26	488.34
14.28	488.68
14.30	489.03
14.32	489.37
14.34	489.71
14.36	490.05
14.38	490.39
14.40	490.73
14.42	491.07
14.44	491.41
14.46	491.75
14.48	492.09
14.50	492.43
14.52	492.77
14.54	493.10
14.56	493.44
14.58	493.78
14.60	494.12
14.62	494.46
14.64	494.79
14.66	495.13
14.68	495.47
14.70	495.81
14.72	496.14
14.74	496.48
14.76	496.82
14.78	497.15
14.80	497.49
14.82	497.82
14.84	498.16
14.86	498.49
14.88	498.83
14.90	499.16
14.92	499.50
14.94	499.83
14.96	500.17
14.98	500.50
15.00	500.84
15.02	501.17
15.04	501.50
15.06	501.84
15.08	502.17

TABLE OF INTERPOLATED CALIBRATION DATA
DATA INTERPOLATED USING CUBIC SPLINE METHOD

Model Number
Serial Number
Calibration Date 06-12-2015

IND.INH2O	ACT.SCFM
15.10	502.50
15.12	502.84
15.14	503.17
15.16	503.50
15.18	503.83
15.20	504.17
15.22	504.50
15.24	504.83
15.26	505.16
15.28	505.49
15.30	505.83
15.32	506.16
15.34	506.49
15.36	506.82
15.38	507.15
15.40	507.48
15.42	507.81
15.44	508.14
15.46	508.47
15.48	508.80
15.50	509.13
15.52	509.46
15.54	509.79
15.56	510.12
15.58	510.45
15.60	510.78
15.62	511.11
15.64	511.44
15.66	511.77
15.68	512.09
15.70	512.42
15.72	512.75
15.74	513.08
15.76	513.41
15.78	513.73
15.80	514.06
15.82	514.39
15.84	514.72
15.86	515.05
15.88	515.37
15.90	515.70
15.92	516.03
15.94	516.35
15.96	516.68
15.98	517.01
16.00	517.33
16.02	517.66

TABLE OF INTERPOLATED CALIBRATION DATA
DATA INTERPOLATED USING CUBIC SPLINE METHOD

Model Number
Serial Number
Calibration Date 06-12-2015

IND.INH2O	ACT.SCFM
16.04	517.99
16.06	518.31
16.08	518.64
16.10	518.96
16.12	519.29
16.14	519.61
16.16	519.94
16.18	520.26
16.20	520.59
16.22	520.91
16.24	521.24
16.26	521.56
16.28	521.88
16.30	522.21
16.32	522.53
16.34	522.85
16.36	523.18
16.38	523.50
16.40	523.82
16.42	524.14
16.44	524.46
16.46	524.79
16.48	525.11
16.50	525.43
16.52	525.75
16.54	526.07
16.56	526.39
16.58	526.71
16.60	527.03
16.62	527.35
16.64	527.67
16.66	527.99
16.68	528.31
16.70	528.63
16.72	528.95
16.74	529.27
16.76	529.59
16.78	529.91
16.80	530.23
16.82	530.54
16.84	530.86
16.86	531.18
16.88	531.50
16.90	531.81
16.92	532.13
16.94	532.45
16.96	532.77

TABLE OF INTERPOLATED CALIBRATION DATA
DATA INTERPOLATED USING CUBIC SPLINE METHOD

Model Number
Serial Number
Calibration Date 06-12-2015

IND.INH2O	ACT.SCFM
16.98	533.08
17.00	533.40
17.02	533.71
17.04	534.03
17.06	534.35
17.08	534.66
17.10	534.98
17.12	535.29
17.14	535.61
17.16	535.92
17.18	536.24
17.20	536.55
17.22	536.86
17.24	537.18
17.26	537.49
17.28	537.81
17.30	538.12
17.32	538.43
17.34	538.74
17.36	539.06
17.38	539.37
17.40	539.68
17.42	539.99
17.44	540.31
17.46	540.62
17.48	540.93
17.50	541.24
17.52	541.55
17.54	541.86
17.56	542.17
17.58	542.48
17.60	542.79
17.62	543.10
17.64	543.41
17.66	543.72
17.68	544.03
17.70	544.34
17.72	544.65
17.74	544.96
17.76	545.27
17.78	545.58
17.80	545.88
17.82	546.19
17.84	546.50
17.86	546.81
17.88	547.11
17.90	547.42

TABLE OF INTERPOLATED CALIBRATION DATA
DATA INTERPOLATED USING CUBIC SPLINE METHOD

Model Number
Serial Number
Calibration Date 06-12-2015

IND.INH2O	ACT.SCFM
17.92	547.73
17.94	548.03
17.96	548.34
17.98	548.65

xylem
Let's Solve Water

DATA SHEET
WDS-10032-04

SR II® Water Meter

Positive Displacement Water Meter with Sensus® Electronic Register+™

The Sensus SR II® is for measurement of potable and reclaimed water flow usage in residential services.

Operation

Water flows through the meter's strainer and into the measuring chamber where it drives the piston. The hydrodynamically balanced piston oscillates around a central hub, guided by the division plate. A drive magnet transmits the motion of the piston to an electronic sensor located within the register. The Electronic Register+ calculates the rotations into volume totalization units displayed on the register LCD.

Construction

SR II meters consist of three basic components: maincase, measuring chamber and sealed register. Maincases are made of NFS approved brass with externally-threaded spuds. Registers are housed in a bonnet of synthetic polymer. Measuring chambers are Rocksyn®, a corrosion-resistant, tailored thermoplastic material formulated for long-term performance and especially suitable for aggressive water conditions. Maincase bottom plates are available in brass or, if frost protection is desired, cast iron or synthetic polymer.

Sensus Electronic Register+

The Sensus® Electronic Register+™ is an advanced electronic register with 120 days of hourly data logging with 30-day data pull intervals available. It provides greater reliability, higher-resolution readings, and more advanced features than any other electronic communication register previously available.

Magnetic Drive

The SR II features a hydrodynamically balanced piston design that eliminates premature wear of components. The meter utilizes a patented positive reliable drive coupling. The high strength magnets eliminate "drive slip" in normal use and also provide adequate strength to drive remote register units.

Maintenance

SR II meters are engineered to provide long-term value and virtually maintenance-free operation. Simplicity of design allows interchangeability of parts of like-size meters, reduced parts inventory requirements and ease of maintenance. The register can be removed without relieving the water pressure or removing the maincase from the installation.

FEATURES

- 5/8", 5/8" x 3/4", 3/4", and 1"Sizes
- Sensus® Electronic Register+™ advanced electronic register
- Hydrodynamically balanced piston design
- Compatible with current Sensus AMI/ AMR systems

BENEFITS

- Enable more cost-effective, accurate meter readings
- Deliver a wide range of flows
- Provide lasting measurement accuracy for years of dependable service
- Integrate seamlessly with the FlexNet SmartPoint® module
- Tamper resistant
- Improve customer service
- Environmental and public health conscience

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SR II® Water Meter

Positive Displacement Water Meter with Sensus® Electronic Register+™

Smart Alarms

Electronic Register+ has several user configurable smart alarms. Get alerts and address these issues before they become more costly:

- Tampering
  Detect register removal as well as magnetic interference to reduce apparent water losses and protect against unauthorized activities.
- Low Battery
  Replace your meters before they stop recording consumption through alerts indicating battery capacity to the meter is running low.
- Customer Leak
  Detect continual consumption of water over a configurable period of time to indicate downstream leaks. This can reduce water loss and leak adjustment costs.
- Reverse Flow
  Keep untreated water from re-entering your distribution system or deter tampering attempts when reverse flow is detected.
- High Flow
  Detect broken pipes, high usage and reduce property damage through an alert triggered when excessive flow rates are recorded.

SPECIFICATIONS

Service	Measurement of potable and reclaim water. 0-100% humidity. Fully submersible. IP68+rated.			
Temperature Ranges	Water operating: Ambient air operating: Storage air:	33 °F (0.55 °C) to 80 °F (26.7 °C) -22 °F (-30 °C) to 140 °F (60 °C) -30 °F (-34.4 °C) to 158 °F (70 °C)		
Low flow registration (95%-101.5%)	5/8" (DN 15 mm) size: 1/4 gpm (0.06 m³/hr)	5/8" x 3/4" (DN 15x20 mm) size: 1/4 gpm (0.06 m³/hr)	3/4" (DN 20 mm) size: 1/2 gpm (0.10 m³/hr)	1" (DN 25 mm) size: 3/4 gpm (0.15 m³/hr)
Normal operating flow range (100% ±1.5%)	5/8" (DN 15 mm) size: 1 to 20 gpm (0.25 to 4.5 m³/hr)	5/8" x 3/4" (DN 15 mm) size: 1 to 20 gpm (0.25 to 4.5 m³/hr)	3/4" (DN 20 mm) size: 2 to 30 gpm (0.45 to 7.0 m³/hr)	1" (DN 25 mm) size: 3 to 50 gpm (0.07 to 11.0 m³/hr)
Maximum pressure loss	5/8" (DN 15 mm) size: 7.0 psi at 20 gpm (0.5 bar at 4.5 m³h)	5/8" x 3/4" (DN 15 mm) size: 7.0 psi at 20 gpm (0.5 bar at 4.5 m³h)	3/4" (DN 20 mm) size: 9.0 psi at 30 gpm (0.6 bar at 7.0 m³h)	1" (DN 25 mm) size: 7.3 psi at 50 gpm (0.5 bar at 11.0 m³h)
Maximum operating pressure	150 psi (10.0 bar)			
Measurement element	Oscillating piston			
Register	Electronic Register+: Hermetically sealed, communication of smart alarms with cable output options. 9 available digits. Direct Read: Hermetically sealed, no communication output. 6 odometer wheels.			
Capacity	10,000,000 gallons, 1,000,000 cubic feet or 100,000 m³ capacity.			
Register Resolution	Electronic: .01 gallons/imperial gallons, .001 cubic foot, or .0001 m³. Direct Read: 10 gallons, 1 cubic foot, or 0.01 m³/ or 0.1 m³/sweep hand revolution.			
Meter Connections	5/8" (DN 15 mm) size: 3/4" (20 mm) threads 3/4" (DN 20 mm) size: 1" (25 mm) threads (All threads are straight pipe, external type, conforming to ANSI B1.20.1 or ISO R228, if specified.)		5/8" x 3/4" (DN 15x20 mm) size: 1" (25 mm) threads 1" (DN 25 mm) size: 1-1/4" (32 mm) threads	
Conformance to Standards	Meets the requirements of NSF 61, Annex G and NSF 372. Complies with the most current AWWA Standard C700.			
Materials	Maincase - Bismuth BiAlloy CDA 89836 or EnviroBrass II C89520 Register Box - Synthetic polymer Measuring chamber - Rocksyn		Bottom plate - Bismuth BiAlloy CDA89836 Magnets - Ceramic Casing bolts - Stainless steel Strainer - Synthetic polymer	

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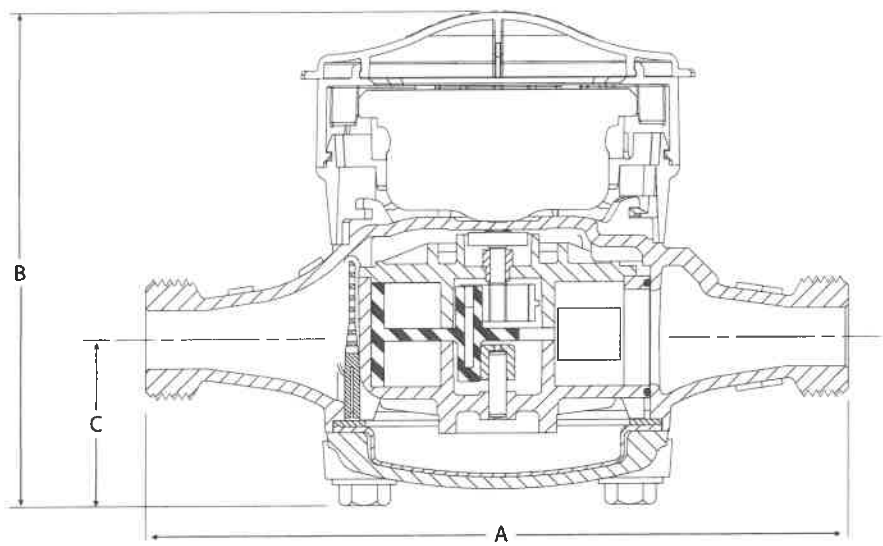
SR II® Water Meter

Positive Displacement Water Meter with Sensus® Electronic Register+™



DIMENSIONS AND NET WEIGHTS

Meter Size	A	B	C	Width	Net Weight
5/8″ (DN 15mm)	7-1/2″ (190 mm)	5-3/8″ (136 mm)	1-3/4″ (44 mm)	3-7/8″ (98 mm)	4.3 lb. (1.97 kg)
5/8″ x 3/4″ (DN 15mm x 20mm)	7-1/2″ (190 mm)	5-3/8″ (136 mm)	1-3/4″ (44 mm)	3-7/8″ (98 mm)	4.4 lb. (2.0 kg)
3/4″ Short (DN 20mm)	7-1/2″ (190 mm)	5-7/8″ (149 mm)	2-3/16″ (56 mm)	4-1/2″ (114 mm)	6.2 lb. (2.81 kg)
3/4″ (DN 20mm)	9″ (229 mm)	5-7/8″ (149 mm)	2-3/16″ (56 mm)	4-1/2″ (114 mm)	6.4 lb. (2.90 kg)
1″ (DN 25mm)	10-3/4″ (273 mm)	7-1/8″ (181 mm)	2-3/4″ (70 mm)	6-1/2″ (165 mm)	11.9 lb. (5.4 kg)

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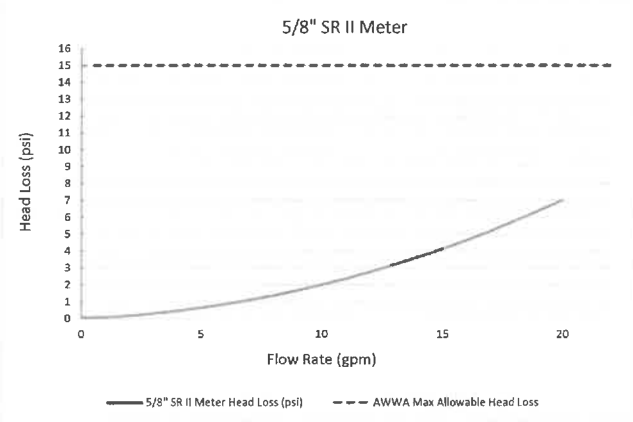
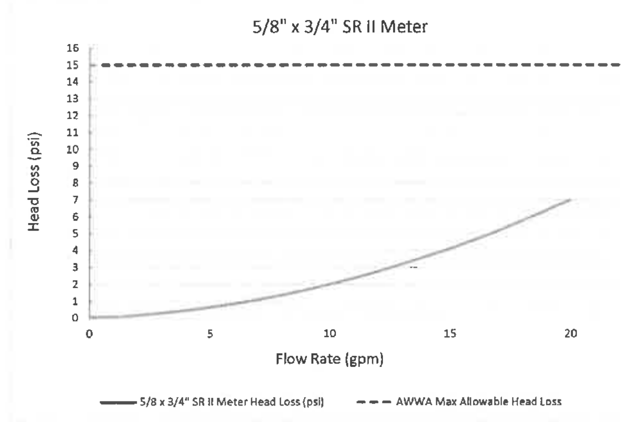
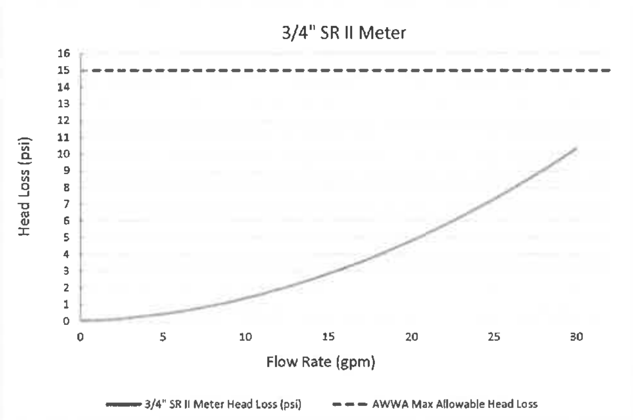
SR II® Water Meter

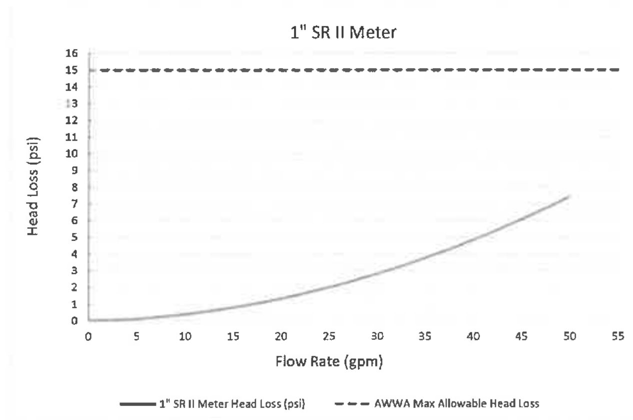
Positive Displacement Water Meter with Sensus® Electronic Register+™

Head Loss Curves









xylem

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MP-W-SR2-00-00-0312-06-A

SR II® METERS

Parts List

Sizes 5/8" through 1"

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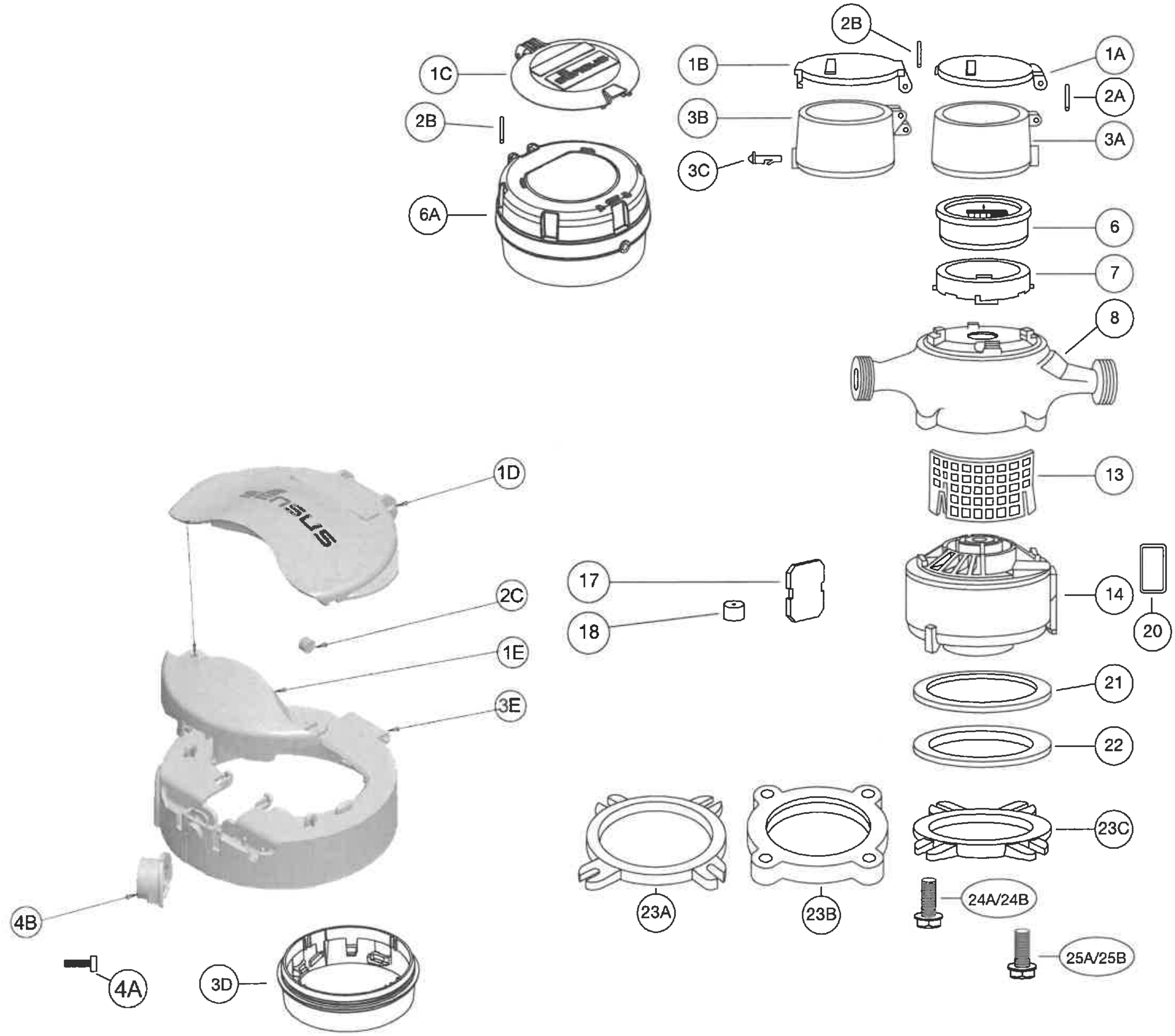
SR II® Water Meters

Sizes 5/8" through 1"

NOTES:

Prices F.O.B. Factory– subject to change without notice and such discounts as market conditions allow.



SR II® Water Meters
Sizes 5/8" through 1"

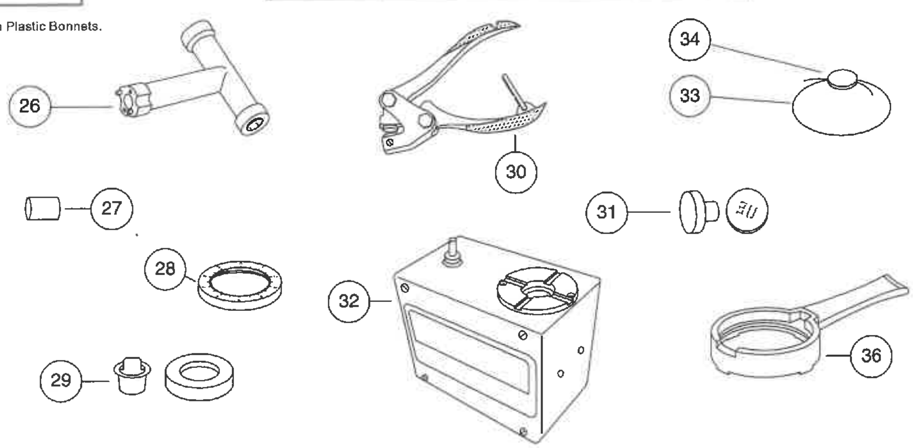
ILL. No.	Name of Part
1A	Register Lid - Bronze[1]
1B	Register Lid - Plastic[1]
1C	Register Lid - Plastic (ICE-Opto)
1D	Electronic Register Lid
1E	Electronic Regiter TR Cover
2A	Hinge Pin—Bronze Lid[1]
2B	Hinge Pin—Plastic Lid[1]
2C	Electronic Register Magnet
3A	Register Bonnet—Bronze[1]
3B	Register Bonnet—Plastic Screw[1]
3C	Register Bonnet—Plastic Pin[1]
3D	Bayonet Ring for ICE-Opto or Electronic Register
3E	Electronic Register Bonnet
4A	Tamper Resistant Screw[4]
4B	Electronic Register Lock
5	Tamper Detection Pin[2]
6	Sealed Register[5]
6A	ICE-Opto Register[5]
7	Register Retaining Ring
8	Maincase[3]
13	Strainer
14	Measuring Chamber, Complete, Tested (Rocksyn™) includes: • Measuring Chamber Top Rock Assembly with Drive Dog and Magnet (Rocksyn™)[6] • Piston[6] • Division Plate[6] • Control Roller[6] • Measuring Chamber Bottom w/Pin (Rocksyn™)[6] • Measuring Chamber Outlet Gasket

[1] Bronze Lids must be used with Bronze Bonnets and Plastic Lids with Plastic Bonnets.
[2] Can be used only with Plastic Register Bonnet.
[3] Specify Spud size by letter designation:
A. 5/8"; B. 5/8" x 3/4"; C. 3/4"; D. 3/4" x 1"; E. 1"; F. 1" x 1-1/4"
For 3/4" Maincase specify 9" or 7-1/2" laying length;
7-1/2" length is available only with 3/4" spud. • Control Roller
[4] Requires a 1/4" drive tool (not supplied) for use with Ill. #4
[5] Specify registration by letter designation:
A. U.S. Gallons; B. Cubic Feet; C. Cubic Meters; D. Other
[6] Included in measuring chamber complete. (Ill. #14)

ILL. No.	Name of Part
17	Division Plate
18	Control Roller
20	Measuring Chamber Outlet Gasket
21	Bottom Plate Gasket
22	Bottom Plate Liner
23A	Bottom Plate—Cast Iron
23B	Bottom Plate—Plastic
23C	Bottom Plate—Bronze
24A	Maincase Cap Screw—Stainless, Washerhead
24B	Maincase Cap Screw—Stainless, Washerhead-Drilled
25A	Maincase Capscrew—Bronze, Washerhead
25B	Maincase Capscrew—Bronze-Drilled, Washerhead-Drilled

ACCESSORY EQUIPMENT

ILL. No.	Name of Part
26	Spanner Wrench
27	1/4" Drive Security Socket
28	Test Rings for Standard Register
29	Thread Protectors—5/8"-1"
30	Sealing Tool
31	Sealing Tool Die
32	Register Tester
33	Sealwire 24" Length
34	Lead Seal
35	Seal Wire 1000 ft. Spool, Not Shown
36	SRII Wrench



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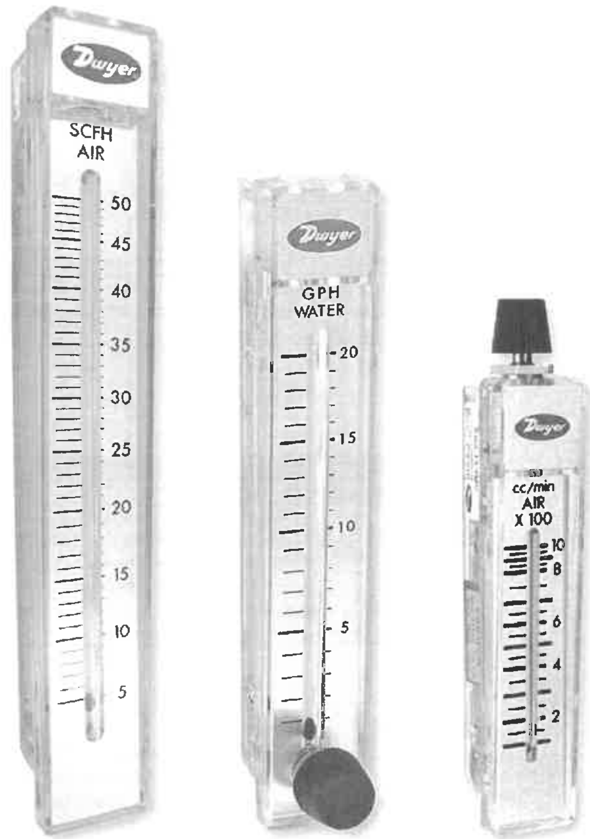
SERIES RM

RATE-MASTER® POLYCARBONATE FLOWMETERS

2″, 5″ or 10″ Scale, Interchangeable Bodies

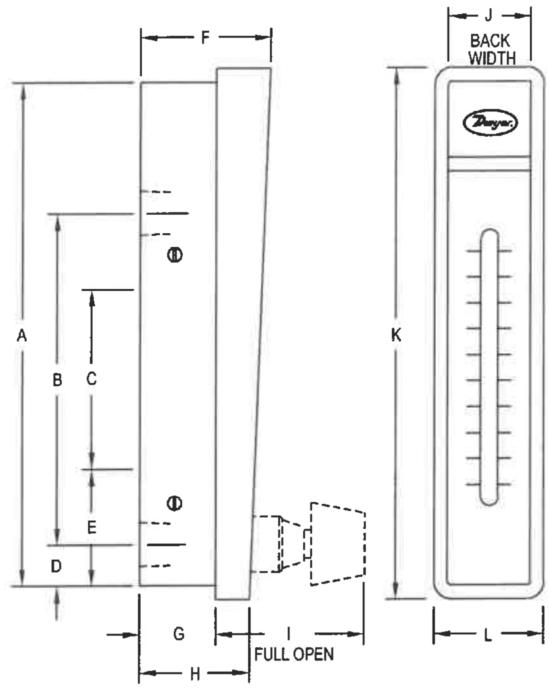
CALIBRATION SERVICES AVAILABLE



Model RMC
10″ scale, 15-3/8″ high

Model RMB-SSV
5″ scale, 8-3/4″ high

Model RMA-TMV
2″ scale, 4-13/16″ high



DIMENSIONS - FLOWMETER	Model RMA	Model RMB	Model RMC
A	4-9/16 [115.90]	8-1/2 [215.90]	15-1/8 [384.20]
B	3 [76.20]	6-7/16 [163.50]	12-1/4 [311.20]
	1/8 NPT conn.	1/4 NPT conn.	1/2 NPT conn.
C	1-5/8 [41.28]	3-15/16 [100.00]	8-3/4 [222.30]
	10-32 mtg. holes	1/4-20 mtg. holes	3/8-24 mtg. holes
D	3/8 [9.525]	5/8 [15.88]	1 [25.40]
E	1-1/16 [26.99]	1-7/8 [47.63]	2-3/4 [69.85]
F	1-3/16 [30.16]	1-3/4 [44.45]	2-1/2 [63.50]
G	11/16 [17.46]	1 [25.40]	1-7/16 [36.51]
H	61/64 [24.21]	1-7/16 [36.51]	1-31/32 [50.00]
I	1-3/8 [34.92]	1-13/16 [46.04]	2-1/2 [63.50]
J	3/4 [19.05)	1-1/4 [31.75]	2 [50.80]
K	4-13/16 [122.20]	8-3/4 [222.30]	15-3/8 [390.50]
L	1 [25.40]	1-1/2 [38.10]	2-1/4 [57.15]

The **Series RM Rate-Master® Polycarbonate Flowmeters** are a line of general use, direct reading precision flowmeters suitable for both gas and liquid applications. This Series consists of 2″ (51 mm), 5″ (127 mm) and 10″ (254 mm) scales that can be panel or surface mounted with optional precision metering valves. Within a given Series, the Rate-Master® flowmeter bodies can be instantly interchanged, allowing the piping to remain undisturbed, interchangeability of the ranges, and easy cleaning.

BENEFITS/FEATURES

- Eliminate the need for troublesome conversions with direct reading scales
- Reduce installation damage and cost due to stainless steel backbone that absorbs piping torque
- Long operation life with durable, shatter-proof polycarbonate body
- High repeatability enabled by precision injection molding around a precision tapered pin
- Increased reading accuracy with special integral flow guides that stabilize float movement
- Save time with instantaneous flow reading from scale graduations on both sides of the indicating tube

APPLICATIONS

- Medical equipment
- Air samplers
- Gas analyzers
- Pollution monitors
- Chemical injectors
- Cabinet purging

SPECIFICATIONS

Service: Compatible gases and liquids.
Wetted Materials: Body: Polycarbonate; O-ring: Neoprene and Buna-N; Metal parts: SS; Float: SS, black glass, aluminum, K monel, tungsten carbide depending on range.
Temperature Limit: 130°F (54°C).
Pressure Limit: 100 psi (6.9 bar).
Accuracy: RMA: 4%; RMB: 3%; RMC: 2% of FS.
Process Connection: RMA: 1/8″; RMB: 1/4″; RMC: 1/2″ female NPT.
Weight: RMA: 4 oz (113.4 g); RMB: 13 oz (368.5 g); RMC: 39 oz (1105.6 g).
Compliance: Meets the technical requirements of EU Directive 2011/65/EU (RoHS II).

CAUTION: Dwyer® Rate-Master® flowmeters are designed to provide satisfactory long term service when used with air, water, or other compatible media. Refer to factory for information on questionable gases or liquids. Caustic solutions, anti-freeze (ethylene glycol) and aromatic solvents should definitely not be used.

FOUO

Dwyer

SERIES RM

RATE-MASTER® POLYCARBONATE FLOWMETERS

Gas Flow from 0.05 to 1800 SCFH, Water Flow to 10 GPM

CALIBRATION SERVICES AVAILABLE

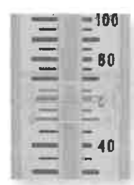
RANGE CHART - RMA 2˝ SCALE - POPULAR RANGES			
Range No.	**SCFH Air**	**Range No.**	**LPM Air**
1**	.05 to .4	26	.5 to 5
2	.1 to 1	21	1 to 10
3	.2 to 2	22	2 to 25
4	.5 to 5	23	5 to 50
5	1 to 10	24	5 to 70
6	2 to 20	25	10 to 100
7	5 to 50	**Range No.**	**CC/Min. Water**
8	10 to 100	32	5 to 50
9	15 to 150	33	10 to 110
10	20 to 200	34	20 to 300
Range No.	**CC/Min. Air**	**Range No.**	**GPH Water**
151*	5 to 50	42	1 to 11
150*	10 to 100	43	2 to 24
11	30 to 200	44	4 to 34
12	50 to 500	45	5 to 50
13	100 to 1000		
14	200 to 2500		
*Accuracy ±8%, NIST not available. **NIST not available.			

RANGE CHART - RMB 5˝ SCALE - POPULAR RANGES			
Range No.	**SCFH Air**	**Range No.**	**SCFH and LPM Air**
49***	0.5 to 5	50D	1.2 to 10/0.6 to 5
50	1 to 10	51D	2 to 20/1 to 9.5
51	3 to 20	52D	4 to 50/2 to 23
52	4 to 50	53D	10 to 100/5 to 50
53	10 to 100	54D	20 to 200/10 to 95
54	20 to 200	**Range No.**	**GPH and LPM Water**
55	40 to 400	82D	1 to 12/0.06 to 0.76
56	50 to 500	83D	1 to 20/0.065 to 1.25
57	60 to 600	85D	10 to 100/0.8 to 6.2
Range No.	**GPH Water**		
82	1 to 12		
83	1 to 20		
84	4 to 40		
85	10 to 100		
***Accuracy ±5%.			

RANGE CHART - RMC 10˝ SCALE - POPULAR RANGES			
Range No.	**SCFH Air**	**Range No.**	**GPH Water**
101	5 to 50	134	2 to 20
102	10 to 100	135	8 to 90
103	20 to 200	**Range No.**	**GPM Water**
104	40 to 400	141	.1 to 1
105	60 to 600	142	.2 to 2.2
106	100 to 1000	143	.4 to 4
107	120 to 1200	144	.8 to 7
108	200 to 1800	145	1.2 to 10
Range No.	**SCFM Air**		
121	1 to 10		
122	2 to 20		
123	4 to 30		

MODEL CHART	
Model	**Description**
RMA-X	Standard RMA
RMA-X-SSV†	RMA with stainless steel valve
RMA-X-TMV*†	RMA with top mounted valve
RMB-X	Standard RMB
RMB-X-SSV†	RMB with stainless steel valve
RMC-X	Standard RMC
RMC-X-SSV†	RMC with stainless steel valve
How To Order: Series-Range No.("X")-Valve-Option **Example:** RMA-2-SSV (Series RMA with .1-1 SCFH air range and stainless steel valve)	
*Provide same precision construction but for vacuum applications. †Valve is designed for flow adjustment only, not intended to be used as an open/shut-off valve.	

OPTIONS	
To order add suffix:	**Description**
-APF	Adjustable pointer flag for Series RMA
-BPF	Adjustable pointer flag for Series RMB
-CPF	Adjustable pointer flag for Series RMC
-NIST	NIST traceable calibration certificate
Note: Special ranges, scales, mounting arrangements, etc., are available on special order, or in OEM quantities.	



Adjustable pointer flags

Red lined pointer flags provide quick visual reference to a required flow level. Of clear plastic, they snap into place inside bezel and slide to desired level.

ACCESSORIES	
Model	**Description**
RK-RMB	Regulator kit for Series RMB
RKA	Regulator kit for Series RMA

Regulator kits

Available as optional extras for both Rate-Master® flowmeters and Visi-Float® flowmeters models. This view shows Model VFA Visi-Float® flowmeter with integrally connected constant differential pressure regulator. Recommended for use where inlet air pressure fluctuates widely and constant flow is required. The regulator maintains a constant pressure differential of approximately 3 ±.15 psig. Supply pressure must be at least 3 psig above the flowmeter discharge to operate. The standard regulator may be used with any Dwyer® Series RM or VF flowmeter up to 200 SCFH. For higher flow rates consult the factory.

USA: California Proposition 65
⚠**WARNING:** This product can expose you to chemicals including Lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

FOUO

APPENDIX G

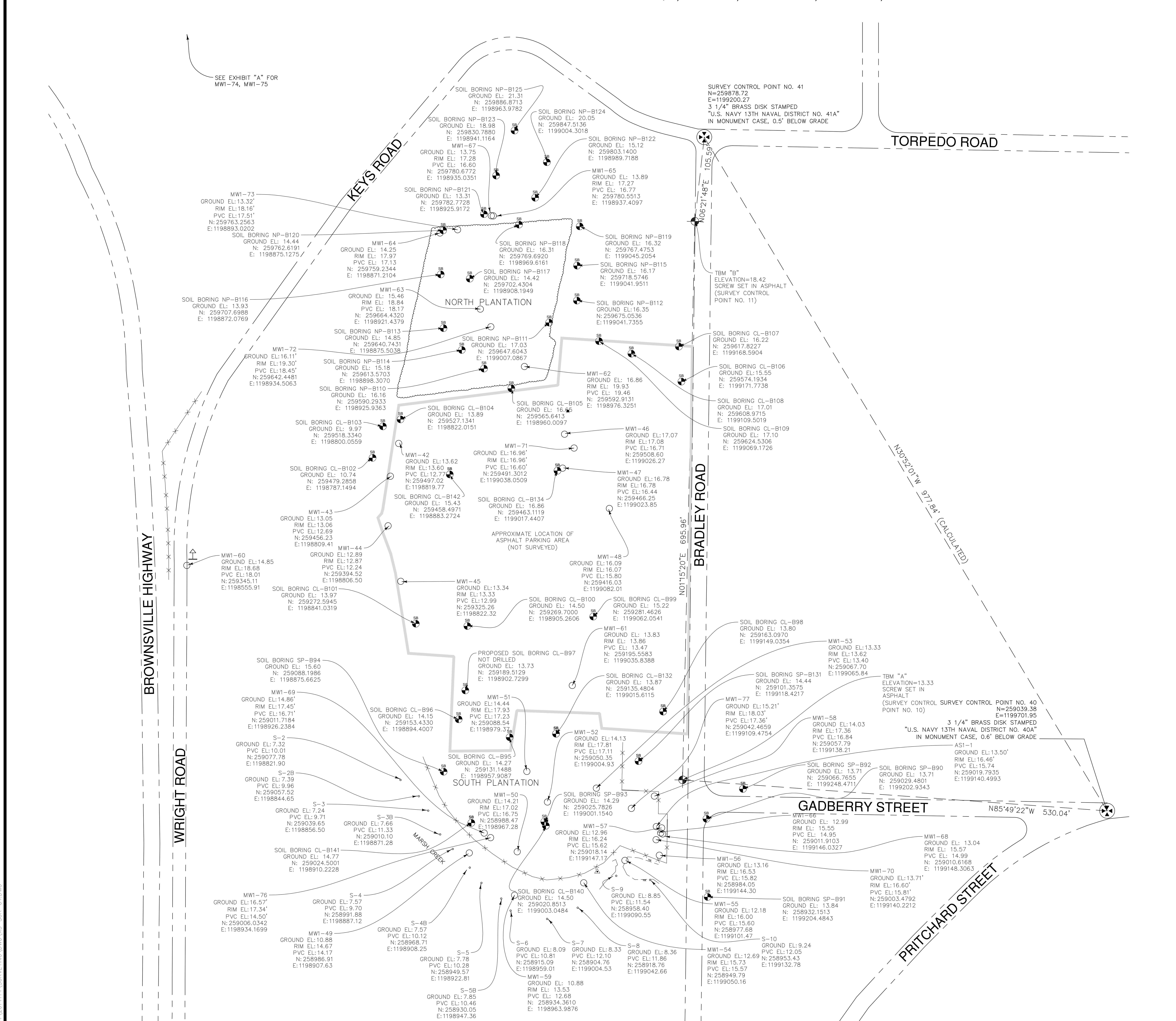
Datalogger Data

(Provided Electronically Only)

APPENDIX H

Land Survey Report

SW 1/4, SEC 36, TWP 26 N, RGE 1 E, W.M.



SOIL BORING AND MONITOR WELL LOCATIONS

NOTES:

HORIZONTAL DATUM:
NAD 83/11

BASIS OF POSITION:
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION (WSDOT) SURVEY CONTROL MONUMENT "GP18308-31", MONUMENT ID = 3180.

MONUMENT DATA;
NORTHING=260301.136
EASTING=1198547.091
ELEVATION=13.064
COORDINATES PER WASHINGTON STATE PLANE COORDINATE SYSTEM, NORTH ZONE, US SURVEY FEET.

VERTICAL DATUM:
NAVD 88

PROJECT BENCHMARK:
ABOVE REFERENCED BASIS OF POSITION MONUMENT.

DERIVATION OF CALCULATION FOR REFERENCE BETWEEN "MEAN SEA LEVEL" (MSL) AND "MEAN LOWER LOW WATER" (MLLW) TO NAVD 88;
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA) TIDAL BENCHMARK "BREMERTON", STATION ID=9445958.
BENCHMARK DATA;
TIDAL EPOCH=1983 THROUGH 2001
LOCATION; LATITUDE 47°33.7' N, LONGITUDE 122°37.4' W.
TIDAL BENCHMARK ELEVATIONS;
MLLW=0.00
NAVD 88=2.52 FEET
MSL=6.82

ELEVATION CONVERSION FACTOR:

MSL +4.30'
NAVD 88
MLLW -2.52'

SITE BENCHMARKS:

TBM "A"	ELEVATION=13.33	SCREW SET IN ASPHALT ON WEST SIDE OF BRADLEY ROAD, JUST NORTH OF GADBERRY STREET.
TBM "B"	ELEVATION=18.42	SCREW SET IN ASPHALT ON WEST SIDE OF BRADLEY ROAD, EASTERLY OF THE NORTH LINE OF THE NORTH PLANTATION GROUP OF TREES.

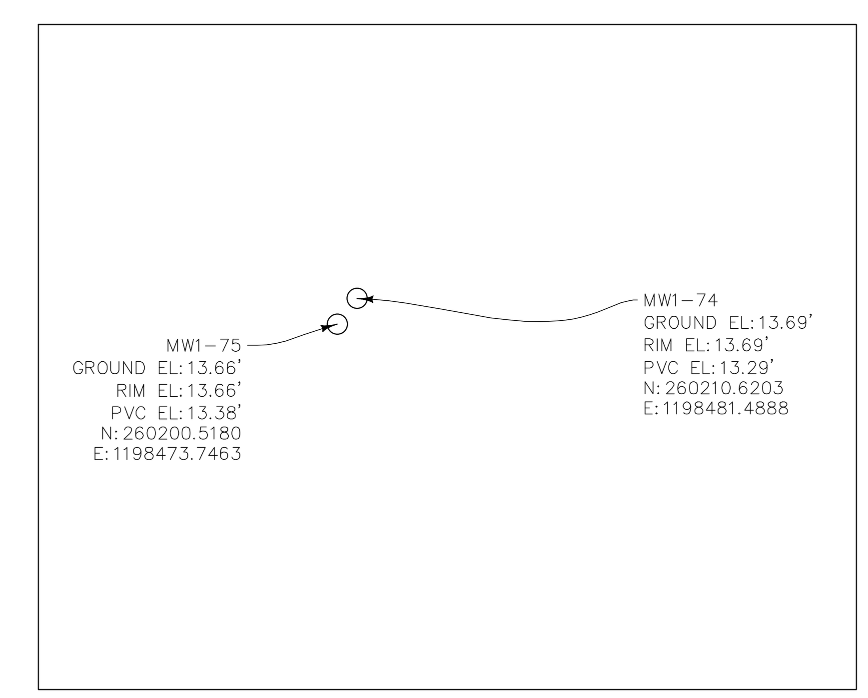
SITE SURVEY CONTROL POINTS:

10:	N=259077.99	E=1199173.32	EL=13.33	SCREW SET IN ASPHALT
11:	N=259773.78	E=1199188.57	EL=18.42	SCREW SET IN ASPHALT
40:	N=259039.38	E=1199701.95	EL=15.80	MONUMENT IN CASE
41:	N=259878.72	E=1199200.27	EL=18.70	MONUMENT IN CASE

-DATE OF FIELDWORK; AUGUST, 2014 TO JULY, 2022

-LOCATION OF ROADS AND ASPHALT PARKING AREA SHOWN ON MAP IS FOR GRAPHIC ORIENTATION PURPOSES ONLY. THESE FEATURES WERE NOT SURVEYED. THEY WERE TRACED FROM AN AERIAL PHOTOGRAPH.

EXHIBIT "A"



LEGEND

ASPHALT (ASPH)
CHAIN LINK FENCE (CLF)
FOUND SURVEY MONUMENT (AS NOTED)
SB SOIL BORING
TEMPORARY BENCHMARK (TBM)

TAYLOR R. SCHULTE, STATE OF WASHINGTON, PROFESSIONAL LAND SURVEYOR, 46446
08/03/22

BUSH, ROED & HITCHINGS, INC. CORPORATE SEAL 1969 WASHINGTON

BUSH, ROED & HITCHINGS, INC.
CIVIL ENGINEERS & LAND SURVEYORS
2009 MINOR AVE. EAST
SEATTLE, Washington
98102-3513
(206) 323-4144
1-800-935-0508
FAX# (206) 323-7135
BRH

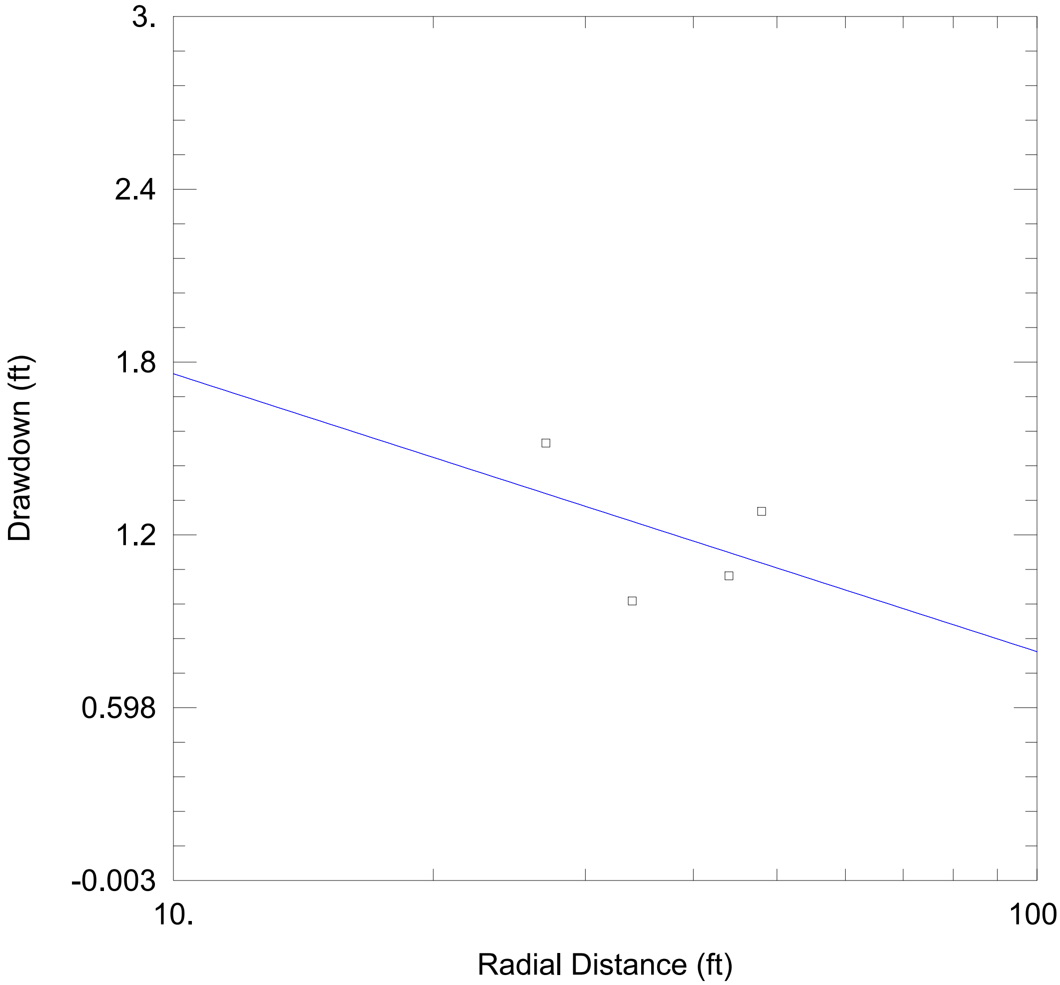
NO	REVISION	DATE

SOIL BORING, MONITOR WELL LOCATIONS
NAVAL BASE KITSAP
BATTELLE
KEYPORT KITSAP COUNTY WASHINGTON

drawn by CJM	checked by TRS
scale 1"=60'	date 08/02/22
job no. 2014114.04	
sheet 1 of 1	

APPENDIX I

Drawdown Versus Time Graphs and Aquifer Parameter Analyses



WELL TEST ANALYSIS

Data Set: C:\...\MasterDataHVDPE.aqt
Date: 09/22/22 Time: 12:29:31

PROJECT INFORMATION

Company: Battelle
Client: NAVFAC NW
Project: G24790.79
Location: Keyport OU 1
Test Well: MW1-76
Test Date: May-July 2022

AQUIFER DATA

Saturated Thickness: 40. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW1-76	0	0

Observation Wells

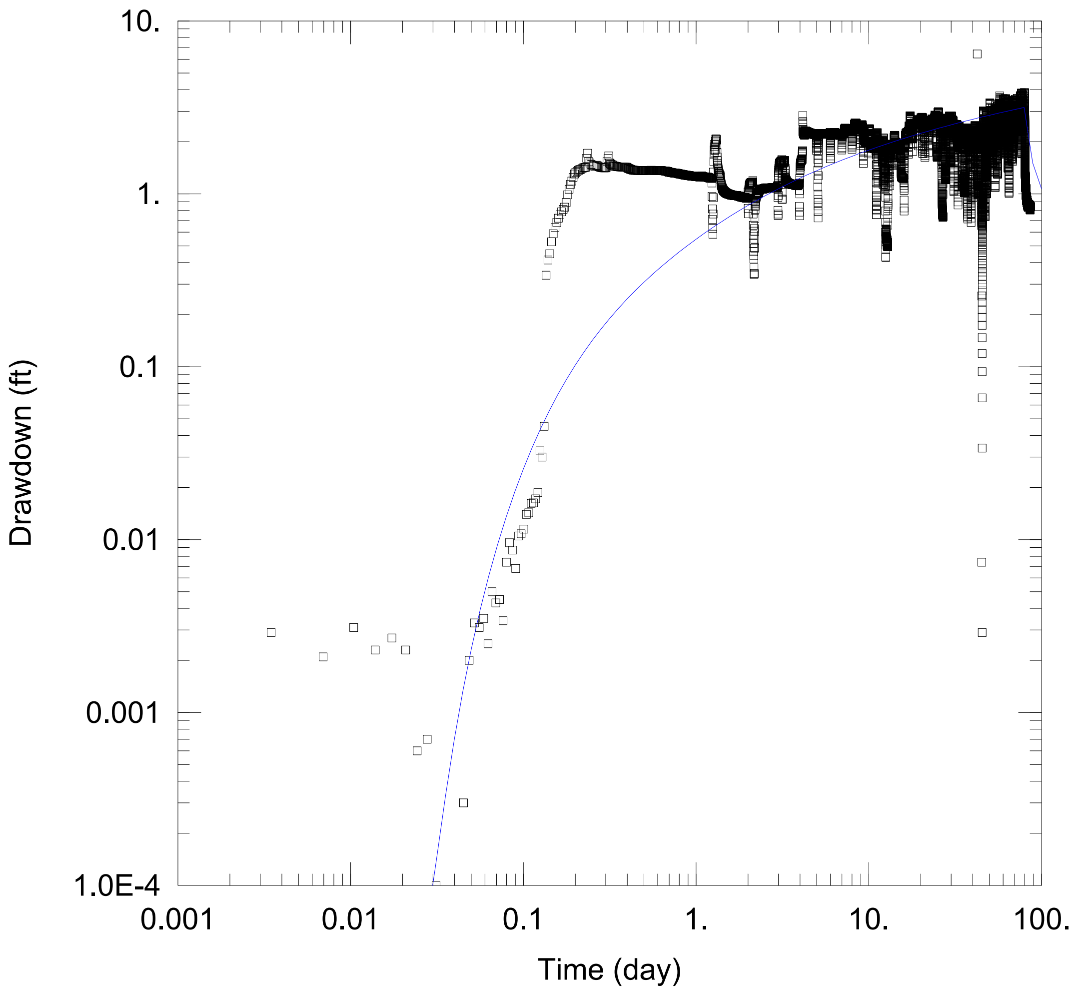
Well Name	X (ft)	Y (ft)
□ P1-6	48	0
□ P1-7	27	0
□ MW1-49	34	0
□ MW1-50	44	0

SOLUTION

Aquifer Model: Unconfined Solution Method: Cooper-Jacob

T = 321.4 ft^2/day S = 0.07278

FOUO



WELL TEST ANALYSIS

Data Set: C:\Users\verdibello\OneDrive - Battelle\Steve's Stuff\Projects\Keyport\HVDPE Reporting\Multi-Well.aqt
Date: 09/22/22 Time: 13:18:35

PROJECT INFORMATION

Company: Battelle
Client: NAVFAC NW
Project: G24790.79
Location: Keyport OU 1
Test Well: MW1-76
Test Date: May-July 2022

AQUIFER DATA

Saturated Thickness: 40. ft

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW1-66	0	0
MW1-76	-215	0
MW1-77	-30	37

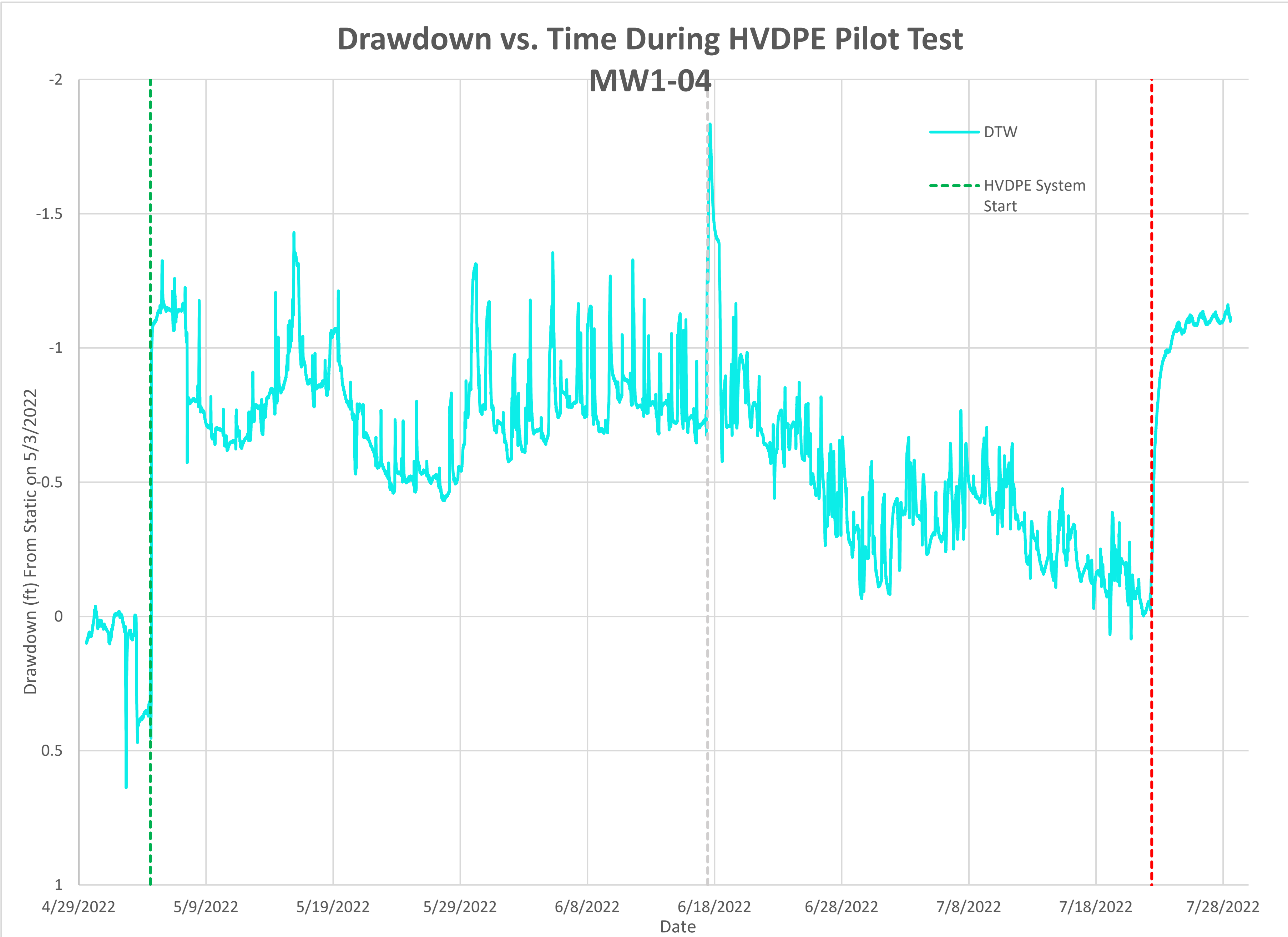
Observation Wells

Well Name	X (ft)	Y (ft)
□ MW1-55	-44	-36

SOLUTION

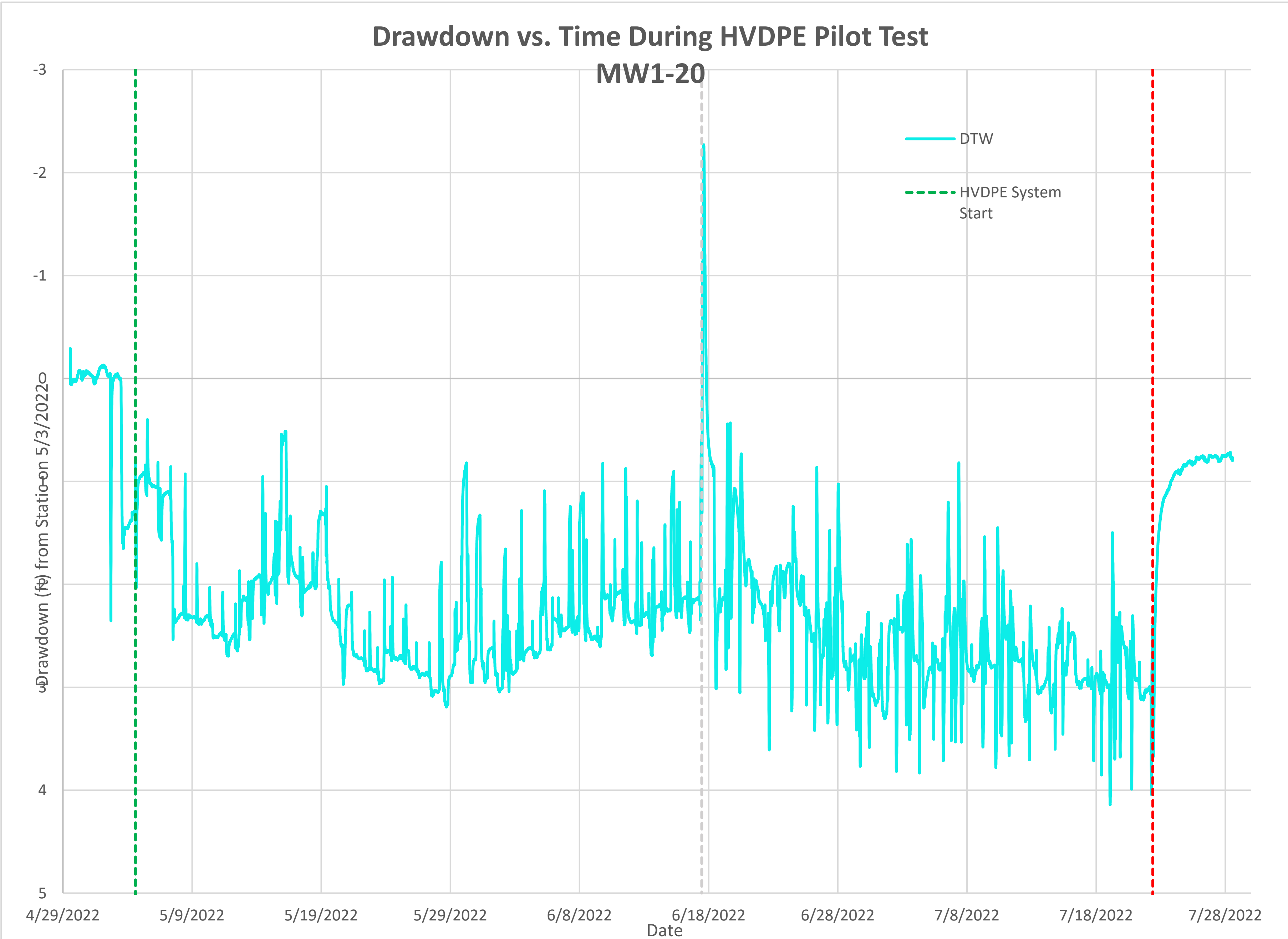
Aquifer Model: Unconfined
Solution Method: Neuman

T = 244.9 ft^2/day
S = 0.04686
Sy = 0.001
ß = 2.



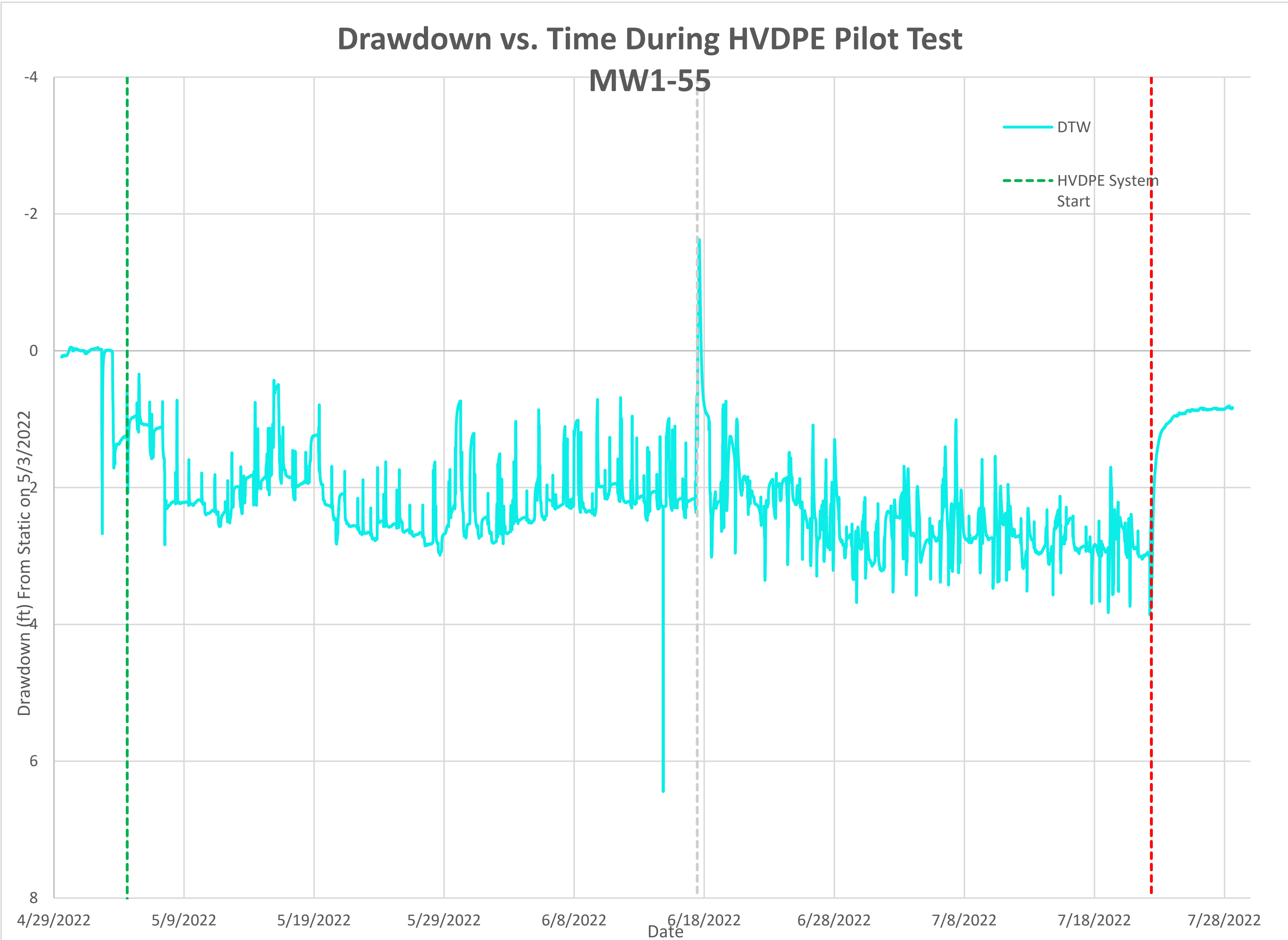
Drawdown vs. Time During HVDPE Pilot Test
MW1-04
DTW
HVDPE System Start
Drawdown (ft) From Static on 5/3/2022
-2
-1.5
-1
-0.5
0
0.5
1
4/29/2022
5/9/2022
5/19/2022
5/29/2022
6/8/2022
6/18/2022
6/28/2022
7/8/2022
7/18/2022
7/28/2022
Date

FOUO



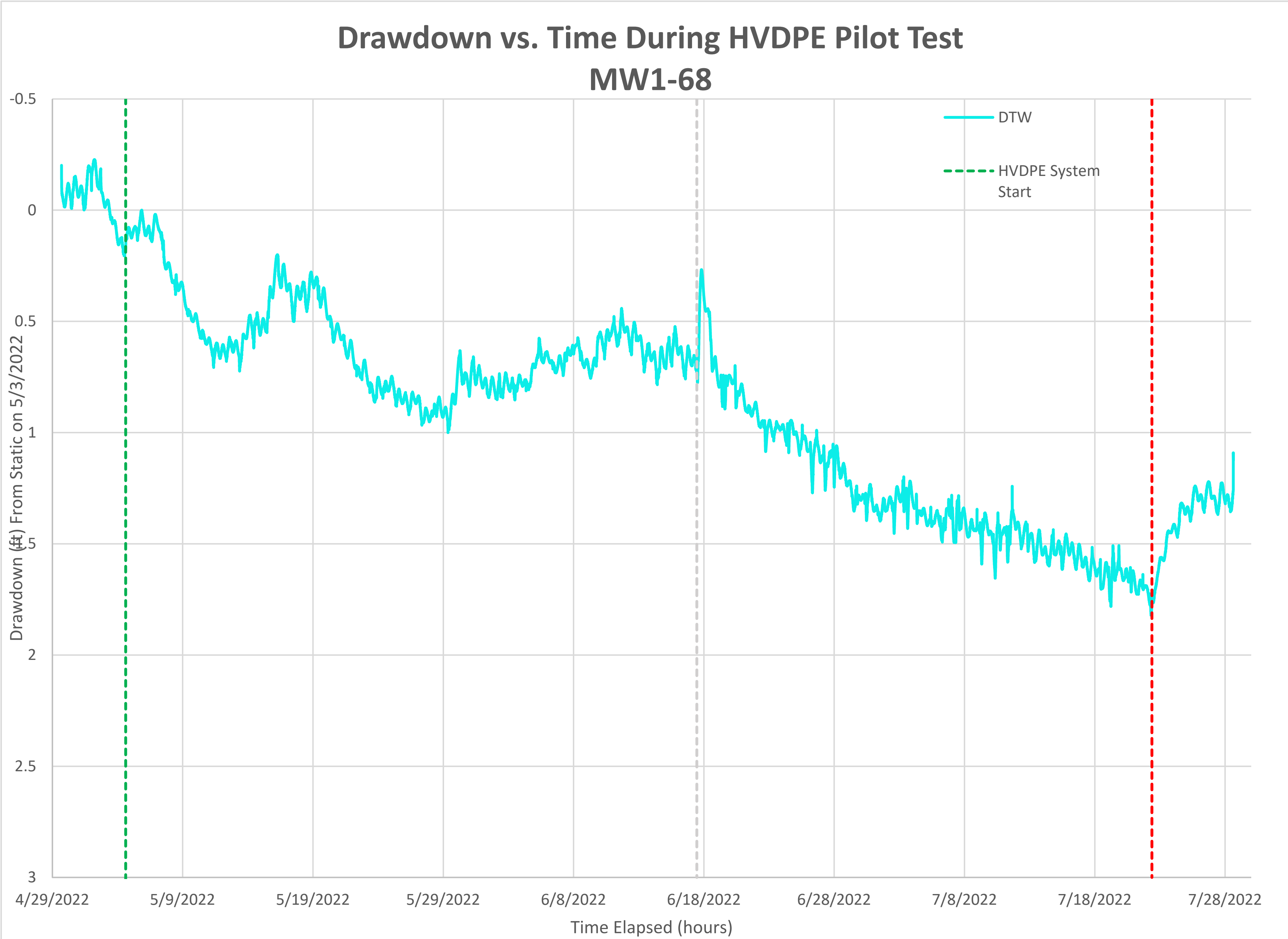
Drawdown vs. Time During HVDPE Pilot Test
MW1-20
DTW
HVDPE System Start
Drawdown (ft) from Static on 5/3/2022
-3
-2
-1
0
1
2
3
4
5
4/29/2022
5/9/2022
5/19/2022
5/29/2022
6/8/2022
6/18/2022
6/28/2022
7/8/2022
7/18/2022
7/28/2022
Date

FOUO



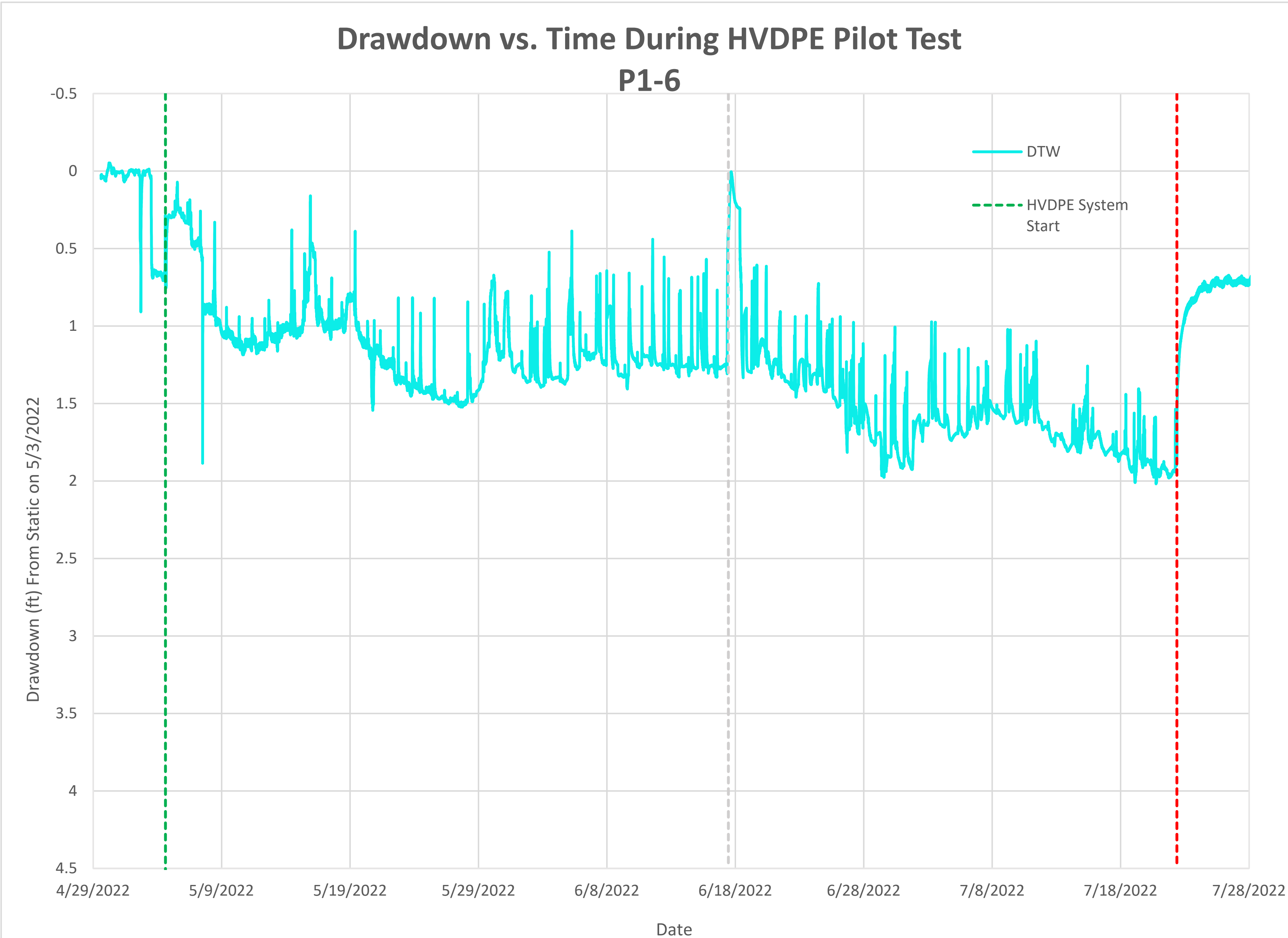
Drawdown vs. Time During HVDPE Pilot Test
MW1-55
DTW
HVDPE System Start
Drawdown (ft) From Static on 5/3/2022
-4
-2
0
2
4
6
8
4/29/2022
5/9/2022
5/19/2022
5/29/2022
6/8/2022
6/18/2022
6/28/2022
7/8/2022
7/18/2022
7/28/2022
Date

FOUO



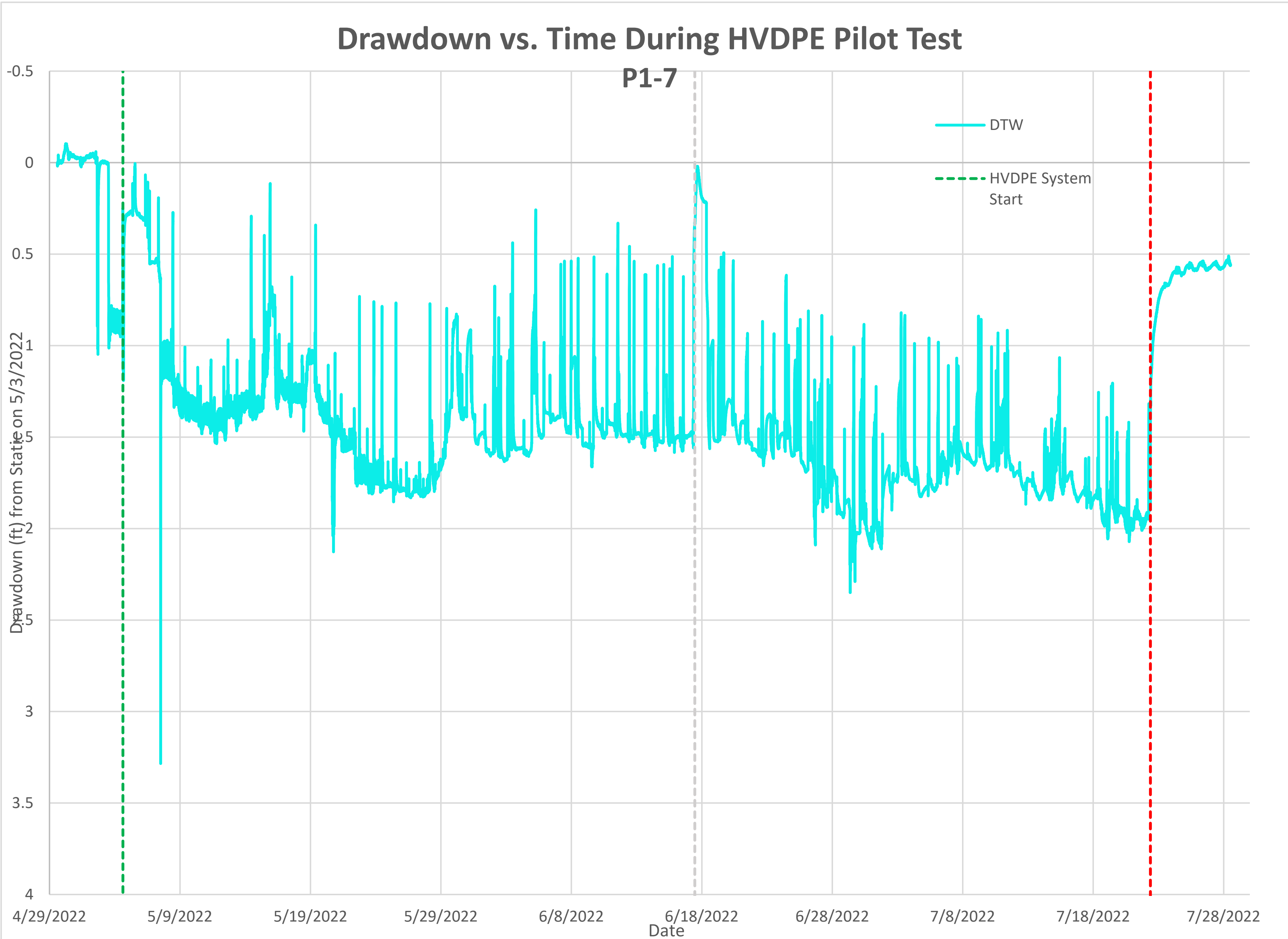
Drawdown vs. Time During HVDPE Pilot Test
MW1-68
DTW
HVDPE System Start
Drawdown (ft) From Static on 5/3/2022
-0.5
0
0.5
1
1.5
2
2.5
3
4/29/2022
5/9/2022
5/19/2022
5/29/2022
6/8/2022
6/18/2022
6/28/2022
7/8/2022
7/18/2022
7/28/2022
Time Elapsed (hours)

FOUO

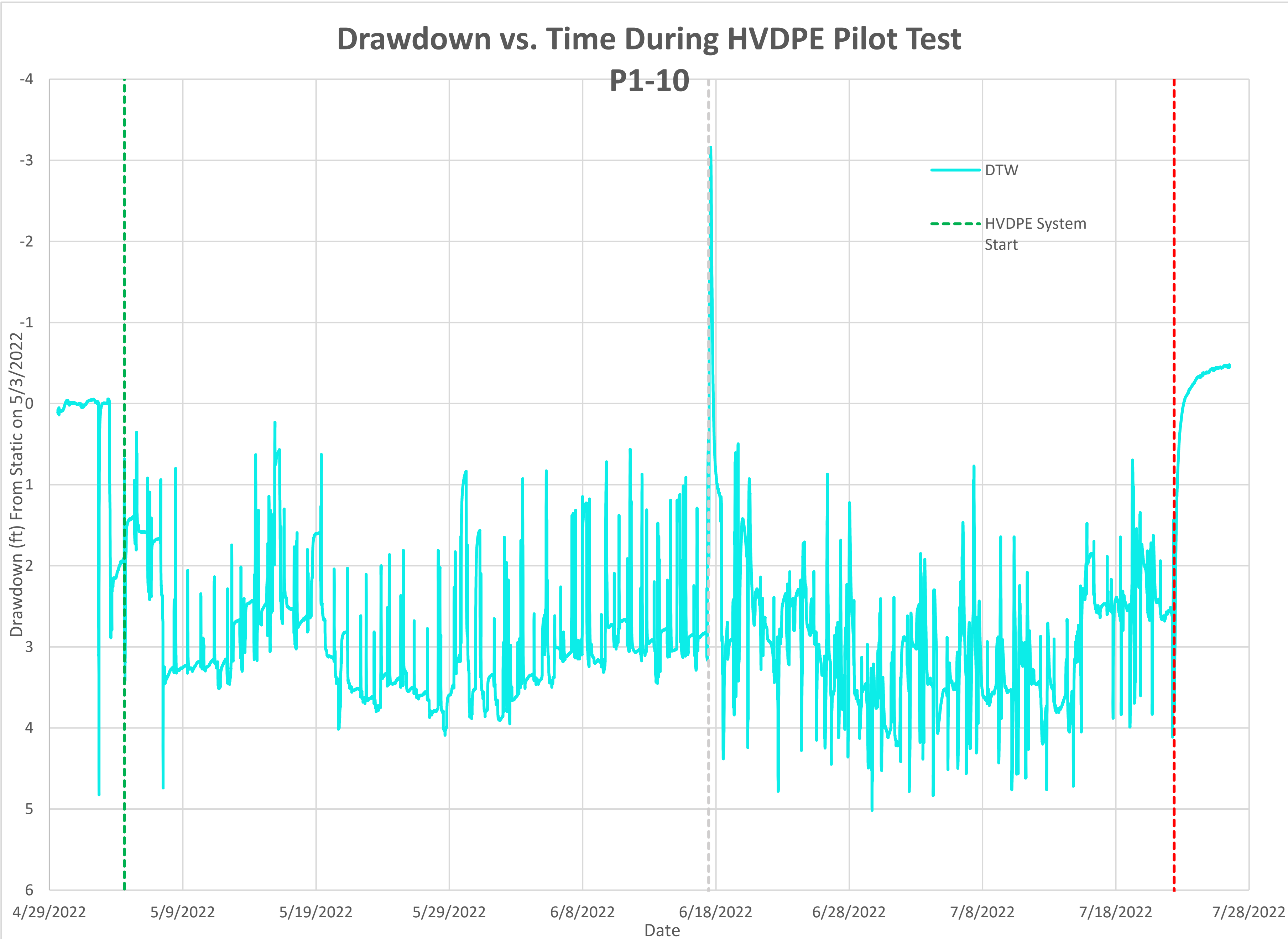


Drawdown vs. Time During HVDPE Pilot Test
P1-6
DTW
HVDPE System Start
Drawdown (ft) From Static on 5/3/2022
-0.5
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
4/29/2022
5/9/2022
5/19/2022
5/29/2022
6/8/2022
6/18/2022
6/28/2022
7/8/2022
7/18/2022
7/28/2022
Date

FOUO


Drawdown vs. Time During HVDPE Pilot Test
P1-7
DTW
HVDPE System Start
Drawdown (ft) from Static on 5/3/2022
Date
-0.5
0
0.5
1
1.5
2
2.5
3
3.5
4
4/29/2022
5/9/2022
5/19/2022
5/29/2022
6/8/2022
6/18/2022
6/28/2022
7/8/2022
7/18/2022
7/28/2022

FOUO


Drawdown vs. Time During HVDPE Pilot Test
P1-10
-4
-3
-2
-1
0
1
2
3
4
5
6
Drawdown (ft) From Static on 5/3/2022
4/29/2022
5/9/2022
5/19/2022
5/29/2022
6/8/2022
6/18/2022
6/28/2022
7/8/2022
7/18/2022
7/28/2022
Date
DTW
HVDPE System Start

FOUO

APPENDIX J

Carbon Usage Calculations

PACIFIC COAST CARBON

Date 10/6/2022
Site info Battelle HVDPE Pilot
Total Design Results

# GAC consumed/1000 gallons treated	**13.8737**
Gallons treated prior to breakthrough using Max Concentrations	

Liquid Phase Coconut Carbon Exhaustion Parameters

System Temperature	N/A
Water Flow	10 GPM
Relative Humidty	N/A
System Pressure	<10psi

Carbon Exhaustion Design Results

Contaminant		Concentration	Lbs GAC /1000 gal (Break through)
TCE	27916.67 ug/l	27.916 PPM	**2.8**
Trans 1,2 DCE	104.5 ug/l	0.1045 PPM	**0.2937**
Vinyl Chloride	269.16 ug/l	0.269 PPM	**3.98**
cis-1,2 DCE	8316.67 ug/l	8.316 PPM	**6.8**

Vinyl Chloride Carbon Exhaustion Design Results

Contaminant	Concentrations		**Lbs GAC /1000 gal (Break through)**
VC	10 ugl	0.01 ppm	**1.75**
VC	100 ug/l	0.1ppm	**3.4**
VC	2000 ug/l	2ppm	**16.2**

Carbon exhaustion design results are estimates based on predictive adsorption models and laboratory data. As such, actual carbon exhasution rates for any given project will vary depeding on multiple project parameters and may differ from the exhasution rates listed above. If you have specific questions or need further assistance please conatact Pacific Coast Carbon at 360-727-3775

PACIFIC COAST CARBON

Date 10/6/2022
Site info Battelle HVDPE Pilot
Total Design Results

# GAC consumed/1000 gallons treated	**31.52**
Gallons treated prior to breakthrough using Max Concentrations	

Liquid Phase Coconut Carbon Exhaustion Parameters

System Temperature	N/A
Water Flow	10 GPM
Relative Humidty	N/A
System Pressure	<10psi

Carbon Exhaustion Design Results

Contaminant		Concentration	Lbs GAC /1000 gal (Break through)
TCE	69000 ug/l	69.0 PPM	**6.14**
Trans 1,2 DCE	260 ug/l	0.26 ppm	**0.35**
Vinyl Chloride	1100 ug/l	1.1 ppm	**6.83**
cis-1,2 DCE	37000 ug/l	37 ppm	**18.2**

Carbon exhaustion design results are estimates based on predictive adsorption models and laboratory data. As such, actual carbon exhasution rates for any given project will vary depeding on multiple project parameters and may differ from the exhasution rates listed above. If you have specific questions or need further assistance please conatact Pacific Coast Carbon at 360-727-3775

Vinyl Chloride Carbon Exhaustion Design Results

Contaminant	Concentrations		**Lbs GAC /1000 gal (Break through)**
VC	10 ugl	0.01 ppm	**1.75**
VC	100 ug/l	0.1ppm	**3.4**
VC	2000 ug/l	2ppm	**16.2**

PACIFIC COAST CARBON

Date 10/6/2022
Site info Battelle HVDPE Pilot
Total Design Results

# GAC consumed/24 hour of operation	**660.56**
Pounds of GAC Cunsumed prior to breakthrough at Ave concentrations	

Vapor Phase Coconut Carbon Exhaustion Parameters

System Temperature	N/A
Vapor Flow	40 SCFM
Relative Humidty	N/A
System Pressure	<10psi

Carbon Exhaustion Design Results

Contaminant	Concentration ppmv	Lbs GAC /24 hour (Break through)
1,1 DCE	**124.618**	**25.68**
1,2,4 Trimethylbenzene	**463.6**	**64**
1,3,5 Trimethylbenzene	**824.64**	**80.4**
Chloroethane	**596.67**	**136.8**
trans-1,2 DCE	**188.057**	**28.48**
PCE	**461.2**	**36.8**
Vinyl Chloride	**163.08**	**68.8**
cis-1,2 DCE	**289.624**	**29.6**
TCE	**313.147**	**32.8**
Ethylbenzene	**975.902**	**83.2**
Xylene Total	**676.67**	**74**

Carbon exhaustion design results are estimates based on predictive adsorption models and laboratory data. As such, actual carbon exhasution rates for any given project will vary depeding on multiple project parameters and may differ from the exhasution rates listed above. If you have specific questions or need further assistance please conatact Pacific Coast Carbon at 360-727-3775

Date 10/6/2022
Site info Battelle HVDPE Pilot
Total Design Results

# GAC consumed/24 hour of operation	943.024
Pounds of GAC Cunsumed prior to breakthrough at max concentrations	

Vapor Phase Coconut Carbon Exhaustion Parameters

System Temperature	N/A
Vapor Flow	40 SCFM
Relative Humidty	N/A
System Pressure	<10psi

Carbon Exhaustion Design Results

Contaminant	Concentration ppmv	Lbs GAC /24 hour (Break through)
1,1 DCE	**4.8**	**2.72**
1,2,4 Trimethylbenzene	**2.6**	**0.204**
1,3,5 Trimethylbenzene	**0.9**	**0.132**
Chloroethane	**0.13**	**13.36**
trans-1,2 DCE	**20**	**7.24**
PCE	**1.2**	**0.224**
Vinyl Chloride	**270**	**82.1**
cis-1,2 DCE	**1200**	**700.8**
TCE	**1700**	**136**
Ethylbenzene	**0.38**	**0.072**
Xylene Total	**1.6**	**0.172**

Carbon exhaustion design results are estimates based on predictive adsorption models and laboratory data. As such, actual carbon exhasution rates for any given project will vary depeding on multiple project parameters and may differ from the exhasution rates listed above. If you have specific questions or need further assistance please conatact Pacific Coast Carbon at 360-727-3775