PLANT 1 WATERFRONT PROBING SUMMARY REPORT
SITE: FORMER BP HARBOR ISLAND TERMINAL
CLEANUP SITE ID: 4426

SEAPORT MIDSTREAM PARTNERS LLC. SEATTLE TERMINAL
1652 SW LANDER STREET
SEATTLE, WASHINGTON

CONSENT DECREE NO. 00-2-05714-8SEA

FEBRUARY 2020

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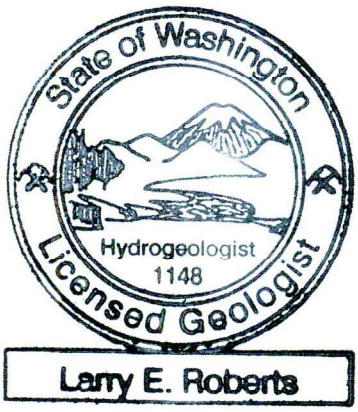

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List of Abbreviations and Acronyms

APS	Applied Professional Services, Inc.
BGS	Below Ground Surface
CAP	Cleanup Action Plan
COC	Chain of Custody
cPAHs	Carcinogenic Polycyclic Aromatic Hydrocarbons
CSM	Conceptual Site Model
CUL	Cleanup Level
EDR	Engineering Design Report
GWCMCP	Groundwater Compliance Monitoring and Contingency Program
ID	Inner Diameter
IHS	Indicator Hazardous Substance
LNAPL	Light Non-Aqueous Phase Liquid
µg/l	Micrograms per Liter
mg/kg	Milligrams per kilogram
MLLW	Mean Low Low Water
NAD-83	North American Datum of 1983
NAVD-88	North American Vertical Datum of 1988
NGVD-29	National Geodetic Vertical Datum of 1929
PID	Photoionization Detector
PPM	Parts Per Million
QA	Quality Assurance
QC	Quality Control
RI/FS	Remedial Investigation / Feasibility Study
SAP	Sampling and Analysis Plan
SVE	Soil Vapor Extraction
TPH	Total Petroleum Hydrocarbons
TPH-D	Total Petroleum Hydrocarbons – Diesel Range
TPH-G	Total Petroleum Hydrocarbons – Gasoline Range
TPH-O	Total Petroleum Hydrocarbons – Oil Range
VOCs	Volatile Organic Compounds

Executive Summary

This report presents the results of a soil and groundwater investigation along the waterfront at Plant 1 of the former BP Harbor Island Terminal (the Site). The investigation was conducted to evaluate the effectiveness of ongoing and completed remedial actions in obtaining cleanup objectives and to evaluate the remaining extent of known indicator hazardous substances (IHSs) (benzene, gasoline, diesel, and oil) and separate phase hydrocarbons (i.e. free product or Light Non-Aqueous Phase Liquid [LNAPL]) in subsurface soils and groundwater. Remedial actions have been ongoing since the early 1990s in this area of the Site to address historical environmental impacts. In 2000, remedial action requirements for the Site were formalized in Consent Decree No. 00-2-05714-8SEA. The Consent Decree's Groundwater Compliance Monitoring and Contingency Program (GWCMCP) identified performance and confirmational criteria to be used in determining when ongoing remedial actions have completed their remedial objectives. This investigation was intended to aid in determining if these criteria have been met. The results will also be utilized in an upcoming evaluation of how a new seawall installed along the waterfront affected site hydrology.

This investigation involved the completion of 41 direct push borings from ground surface, through the vadose zone, and approximately 10 feet into the saturated zone. Soils were field screened for IHS and LNAPL impacts, laboratory analyses were performed on the most impacted soils observed in each boring, and a total of 11 of the borings were converted to temporary piezometer wells. These wells were screened across the vadose zone and into shallow groundwater and were subsequently developed and sampled for the presence of LNAPL and dissolved IHSs in groundwater.

Field screening and laboratory analyses showed much of the soil to be below associated cleanup levels (CULs), with a few remaining areas containing residual hydrocarbon impacts along a narrow vertical profile, at and just below the soil/groundwater interface (i.e. the smear zone). Most soils in the unsaturated zone showed little indication of the presence of IHSs or residual LNAPL. IHS concentrations detected from analyzing soil samples collected from the most impacted soil observed in each boring (typically 2 to 3 feet below the groundwater interface) were mainly at or below expected residual LNAPL saturation concentrations, indicating that mobile LNAPL has been removed throughout the area of investigation to the extent practicable.

Groundwater sampling and analyses showed no free LNAPL to be present in any of the 11 temporary wells. No sheen on groundwater was observed in four wells, a slight sheen was observed in six wells, and a moderate sheen was observed in one well. Dissolved IHSs detected in shallow groundwater were below the CULs (established for the more deeply screened conditional point of compliance wells) in seven of the temporary wells. Gasoline was above the CUL in two of the temporary wells and diesel was above the CUL in two other temporary wells. The groundwater monitoring results appear similar to results from recent monitoring in nearby compliance and recovery wells. The groundwater monitoring results from this investigation and past sampling events indicate that remedial actions performed to date have removed LNAPL to the extent practicable.

The results of this investigation show that remedial actions along the Plant 1 waterfront have reduced or removed most of the preexisting soil impacts in the unsaturated zone and that no free LNAPL was

detected on groundwater. The results indicate that the performance criterion from the GWCMCP requiring the lack of measurable product (LNAPL) thickness to discontinue recovery system operations has been met. It appears that the current remedial system has recovered LNAPL to the extent practicable and further operation of the existing groundwater pump and treatment system is unlikely to provide additional environmental benefit.

1. Introduction

This report presents the results of a soil and groundwater investigation along the waterfront at Plant 1 of the former BP Harbor Island Terminal (the Site) (Figure 1). The soil and groundwater investigation was conducted in accordance with the requirements of Consent Decree No. 00-2-05714-8SEA (Ecology, 2000), the Sampling and Analysis Plan (TechSolve, 1999b), the Plant 1 Waterfront Probing Work Plan submitted to Ecology on January 7, 2019 (TechSolve, 2019a), and incorporates Ecology's contingencies to the work plan's approval (Ecology, 2019).

1.1. Waterfront Probing Objective

This investigation was conducted to delineate the extent of remaining IHSs and LNAPL in a historically known source area along the Plant 1 waterfront (Figure 2). This probing investigation evaluates the effectiveness of remedial actions in achieving Site cleanup criteria, including if remaining IHSs and LNAPL have been recovered to the extent practicable. These evaluations are focused on determining if ongoing remedial actions should continue, if additional contingency actions are needed to meet cleanup objectives, or if remedial actions have met associated performance criteria. The primary objectives of this waterfront probing investigation are to:

- Evaluate the spatial (vertical and horizontal) distribution of IHSs remaining in the known historical subsurface plume located beneath the warehouse and loading rack area.
- Evaluate the extent of remaining mobile LNAPL available for capture.
- Identify any remaining IHS source areas with elevated impacts along the waterfront.
- Identify the potential for IHS source areas to create sheen in the adjacent waterway.
- Identify former IHS source areas that have met cleanup standards.
- Evaluate continuing or discontinuing remedial actions.
- Aid in the reevaluation of waterfront hydrologic and geologic conditions.

This investigation is also intended to support a planned hydraulic evaluation of potential changes to groundwater and surface water interactions due to the installation of a new seawall along the northern half of the waterfront at Plant 1 (i.e. evaluate changes to the historic Conceptual Site Model [CSM]), as requested by Ecology (Ecology, 2015). A hydraulic evaluation involving a background water level assessment has been proposed to Ecology under a separate work plan (TechSolve, 2019c) to reevaluate site hydrogeology. The new seawall was installed in 2017 and 2018 to improve the long-term seismic stability of the Site, as previously detailed to Ecology (TechSolve, 2018b). The results of the background water level assessment will be used in conjunction with the results of this probing investigation to meet the objectives listed above.

2. Site Description and History

2.1. Site Description

The Site is located on Harbor Island, a 455-acre man-made island, which lies between the East and West Waterways of the Duwamish River (Figure 1). Shallow soils, the upper 6 to 16 feet or so, were deposited hydraulically from dredged sediments of the Duwamish River. Deeper soils are native deposits that have been shown to be unconsolidated silty, fine-to coarse-grained sand with thin

interbeds of silt and clay (Weston 1993). The native sediments were deposited by the fluvial /deltaic environment of the Duwamish River delta.

Currently, about 95 percent of the island is covered by impervious surfaces, following island-wide redevelopment that occurred in the early 2000s. The island's pervious surfaces, which are areas of groundwater recharge, consist primarily of land adjacent to aboveground storage tanks and by railroad tracks.

Plant 1 occupies about 12 acres on the western portion of the island, along the West Waterway of the Duwamish River. Plant 1 was constructed in the 1930s and has operated as a bulk fuel storage and transfer facility under several owners since that time. Seaport Midstream Partners, LLC is the current property owner and TLP Management Services, LLC manages ongoing operations at the Site.

Remedial Investigation/Feasibility Studies (RI/FS) (Geraghty & Miller, 1994, 1996, and 1997) showed IHSs present in groundwater and soil at the Site, including highly weathered total petroleum hydrocarbons (TPH) as diesel (TPH-D), with lesser amounts of weathered gasoline (TPH-G) and heavier oil (TPH-O), likely from historic spills at the Site. The RI/FS showed that a primary area of impact at the Site was a petroleum based LNAPL plume located beneath the warehouse and loading rack area adjacent to the Duwamish Waterway (Figure 2). The vertical distribution of this plume was contained within an approximate 5-foot smear zone extending from the vadose zone, through the capillary fringe, and into the saturated zone. The vertical width of the smear zone along the waterfront has been attributed to seasonal groundwater fluctuation of around 2 feet and an additional 1 or 2 feet of daily groundwater fluctuation from diurnal tidal changes, which alter surface water elevations by up to 16 feet in the adjacent waterway. The RI attributed the reduced tidal response in shallow groundwater directly inland of the waterway to the following:

- A lack of continuous horizontal stratification in the shallower hydraulic fill, which does not maintain pathways as transmissive to surface waters as those in the deeper native deposits.
- That several barriers to shallow groundwater flow exist along Plant 1 including the warehouse foundation installed to approximately 22.5 feet beneath the warehouse floor (elevation of approximately -7 feet NAVD 88) and the historical wooden island bulkhead that is estimated to have been completed to an elevation of about -5 feet NAVD88.

In addition, it is likely that the low conductivity of the shallow sediments, combined with the high, unconfined storage coefficient, contribute significantly to the attenuation of the tidal effects on inland groundwater levels.

The new seawall installed in 2017 and 2018 along the northern portion of Plant 1 has created an additional barrier that may further attenuate the tidal response on inland groundwater, further isolating groundwater from surface water in nearby upland areas. The seawall consists primarily of an interlocking steel sheet pile wall, with anchored tiebacks. The sheet pile wall was completed to an elevation of approximately -68 feet NAVD88.

2.2 Site History

Consent Decree No. 00-2-05714-8SEA was entered into with Ecology in 2000, which established cleanup criteria and identified remedial actions to be implemented at the Site. The Consent Decree identified remedial actions for the Plant 1 Waterfront area and for inland Plant 1 soils in the Cleanup

Action Plan (CAP) (Ecology, 1999) and in the Engineering Design Report (EDR) (TechSolv and AG&M, 2000).

Remedial actions implemented at Plant 1, include:

- Pumping and treatment for an LNAPL plume and dissolved hydrocarbon recovery along the waterfront of Plant 1 (interim actions were implemented in the early 1990s and final actions were implemented in the early 2000s following implementation of the Consent Decree).
- Excavation of accessible TPH impacted soil "hot spots" in the inland portions of Plant 1.
- Natural attenuation of inaccessible soils.
- Air Sparging and Soil Vapor Extraction (SVE) for accelerated mass removal of residual hydrocarbons in inaccessible soils at Plant 1.
- Remedial action performance and groundwater compliance monitoring.
- Deed restrictions.
- Institutional controls.

2.2.1 Cleanup Criteria

IHSs and Site cleanup levels (CULs) for the Site were identified and defined in the CAP and are summarized below.

The TPH cleanup action level for subsurface soil at the primary area of concern (Plant 1) was established to meet remedial objectives for protecting surface water at property boundaries and shorelines of the Duwamish Waterway. The soil Total TPH (TPH-G+TPH-D+TPH-O) CUL is also protective for other chemical constituents in petroleum product (i.e., benzene, toluene, ethylbenzene, xylenes [BTEX]) and is:

Total TPH	10,000 milligrams per kilogram (mg/kg)

Site groundwater CULs established by Ecology were based on surface water standards, to be protective of aquatic organisms in the Duwamish River. These standards were based on adopted ambient water quality criteria (Washington Administrative Code 173-201A and Section 304 of the Federal Clean Water Act). Surface water standards were not established for TPH when the CAP was approved; therefore, groundwater CULs for TPH-G, TPH-D, and TPH-O were selected by Ecology as protective cleanup goals. Site groundwater CULs are:

Product (LNAPL)	No sheen
Benzene	71 micrograms per liter (µg/L)
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)	0.031 µg/L
TPH-G	1,000 µg/L
TPH-D	10,000 µg/L
TPH-O	10,000 µg/L

The achievement of the CULs listed above is to be met at various conditional points of compliance, which were established in the Groundwater Compliance Monitoring and Contingency Program (GWCMCP) (TechSolv, 1999a), Exhibit F of the Consent Decree (Ecology, 2000), and are not applicable at all areas of the Site.

Compliance criteria were established in the GWCMCP for both performance monitoring and for confirmational monitoring. Performance monitoring is intended to document that the cleanup action is performing as anticipated. Confirmational monitoring is intended to monitor the long-term effectiveness of the cleanup action once cleanup and performance and compliance criteria have been met.

Many of the confirmational and performance monitoring criteria have been met at the Site, as previously documented to Ecology (TechSolve, 2019b) and monitoring is ongoing to evaluate if remaining criteria have been met. This report is intended to directly evaluate if the separate phase hydrocarbon performance criteria for Plant 1 (Section 2.2.3 of the GWCMCP) have been met. The performance criterion for separate phase hydrocarbons (LNAPL) is the removal to the maximum extent practicable or a lack of measurable product thickness in compliance monitoring wells, product recovery systems and until a persistent sheen is no longer observed on the waterway. A measurable thickness of free product is defined as greater than or equal to 0.01 feet thick.

This report is also intended to aid in the indirect evaluation of whether criteria have been met, including the following:

- Plant 1 performance criteria for dissolved TPH constituents in groundwater, which is obtainment of the CULs listed above for Benzene, TPH-G, TPH-D, and TPH-O in confirmational monitoring wells (i.e. monitoring wells at the property boundary and downgradient of plume areas).
- Plant 1 confirmational criteria for separate phase hydrocarbons, which is the lack of sheen in associated compliance monitoring wells for a period of a year.
- Plant 1 confirmational criteria for groundwater, which is obtainment of the CULs listed above in confirmational monitoring wells for four quarters or the concentrations of analytes have stabilized and reached equilibrium.

2.2.2 Waterfront Remedial Actions

Groundwater remedial actions have been conducted along the waterfront at Plant 1 since 1992. An interim groundwater/LNAPL recovery system operated from 1992 through 2002, and an interim soil vapor extraction (SVE) system operated from 1996 through 2002. Final remediation systems were installed in 2002, as described in the EDR (TechSolv and AG&M, 2000a), and included SVE, groundwater/LNAPL recovery, and air sparging.

Operation of the waterfront SVE system was discontinued in 2008, as the system no longer recovered measurable concentrations of hydrocarbons and no longer enhanced biodegradation in inaccessible hot spot soils. Air sparging along the waterfront was also discontinued in 2008, as SVE air monitoring data indicated air-sparging operations no longer volatilized measurable quantities of hydrocarbons and likely increased biofouling in LNAPL/groundwater recovery wells, as documented in past reports (e.g. TechSolve, 2018a).

While many of the remedial actions have been completed at Plant 1, the groundwater/LNAPL recovery system continues to operate along the waterfront to depress groundwater and capture LNAPL and shallow groundwater containing dissolved hydrocarbons. Additionally, containment booms are monitored and maintained on the West Duwamish Waterway adjacent to Plant 1 to contain and capture occasional sheens that have appeared on surface water.

Monitoring is conducted at Plant 1 in accordance with the GWCMCP and SAP to confirm that remedial actions have attained cleanup standards and/or have met defined performance standards. Monitoring results show that ongoing and completed remedial actions have improved groundwater, soil, and surface water conditions at Plant 1, including reductions in free LNAPL, reduced dissolved hydrocarbon concentrations in groundwater, and decreased frequency of hydrocarbon sheens in the Duwamish Waterway (TechSolve, 2018a).

Reduced LNAPL and dissolved hydrocarbon capture by ongoing remedial actions has been attributed to most recoverable IHSs having been captured or reduced. Performance monitoring data along the waterfront at Plant 1 indicate that the groundwater/LNAPL recovery system has likely recovered LNAPL to the extent technically practicable, as required by the Consent Decree. Several lines of evidence support this hypothesis, including both system recovery data and monitoring data from recovery and monitoring wells. Asymptotic recovery curves (Figure 3) indicate limited mobile LNAPL likely remains along the waterfront at Plant 1, as most of the available LNAPL has been recovered during the 26 years that interim (1992-2002) and final (2002-2018) groundwater LNAPL recovery systems have operated at the Site. Monitoring for concentrations of dissolved phase IHSs in groundwater over time has shown decreasing or stable concentrations in confirmation compliance wells (Table 1 and Appendix A) and recovery wells (Table 2 and Appendix A) along the Plant 1 waterfront by the warehouse and loading rack areas. Much of this area now appears to no longer contain recoverable LNAPL and dissolved IHSs are mainly below CULs.

System performance and monitoring data collected prior to this investigation indicated that LNAPL has been recovered to the extent technically practicable and this investigation was intended to provide additional data to support or disprove this conclusion. While reductions in LNAPL capture over time were believed to be due to a lack of remaining LNAPL, it was possible that reduced LNAPL capture was the result of decreased system efficiencies (e.g. biofouling of wells decreasing well yields), detailed in the Waterfront Probing Work Plan (TechSolve, 2019a).

3. Waterfront Probing Investigation

The following tasks were completed as part of the waterfront probing investigation:

- Selection of specific probing locations and well locations.
- Location of subsurface utilities in the work area.
- Direct push probing of soils at 41 boring locations to 15 to 20 feet below ground surface (BGS) by licensed drillers.
- Field screen soil cores for IHSs and LNAPL.
- Backfilling and sealing of select boring locations.

- Installation and development of piezometer wells in 11 completed borings and development of the wells for groundwater sampling and for potential pumping studies, to be evaluated as part of the Site hydraulic evaluation.
- Laboratory analysis of soil cores and groundwater samples for concentrations of IHSs and LNAPL impacts.
- Reevaluation of the CSM with updated data from the investigation.
- Preparation of this summary report to detail the investigation results and provide recommendations for the continuation, discontinuation or implementation of contingency remedial actions to meet the cleanup criteria of the Consent Decree.

3.1. Probing Locations

Probing locations were focused on the area of the Site along the Plant 1 waterfront with known historical IHS impacts (Figure 2). The probing locations (Figure 4) were selected to collect representative soil and groundwater samples on close enough spacing to accurately evaluate conditions along the waterfront. These locations were selected to cover accessible locations at the Site, along the Plant 1 waterfront where active remedial actions are ongoing. Probing locations were selected utilizing a grid pattern with row spacing set at 20 feet on center. Site restrictions, subsurface utility locations, subsurface and overhead obstructions, and drill rig limitations required the abandonment and relocation of a limited number of borings as field conditions dictated.

3.2. Probing Field Activities

3.2.1. Site Preparation and Utility Location

Prior to initiating field activities, potential probing areas were delineated and marked in the field. These areas were then checked for subsurface utilities by placing a public utility request. A ground penetrating radar survey was then conducted on all boring locations by Applied Professional Services (APS). A privately conducted utility location was next conducted by APS to further confirm and evaluate the findings from the public locate and the ground penetrating radar survey. Probing locations (Figure 4) were adjusted as necessary based upon the location of identified utilities.

3.2.2. Probing and Well Installation

Direct-push soil borings were advanced by Washington State licensed drillers from Cascade Drilling, July 22nd through July 31st, 2019. Construction of all soil borings and subsequent decommissioning was conducted in accordance with WAC 173-160. All probing was overseen by TechSolve geologists registered in the state of Washington, or scientists working under the supervision of a registered geologist. All onsite staff utilized throughout the project were 40-hour HAZWOPER trained and had undergone site specific training on the Site, project, and potential hazards.

Cascade Drilling used a Geoprobe® Model 7822DT direct push track mounted probe rig for the completion of all borings. Soils from all borings were collected from ground surface, continuously above, through, and below the historically known smear zone in 5-foot intervals using new acrylic liners for each sample interval. Soil borings were completed to a depth of 15 feet BGS outside of the warehouse, and to a depth of 20 feet BGS inside the warehouse. The deeper boring depths were selected as the warehouse sits on an elevated foundation that is on average 3.5 feet higher than surrounding ground surface. All borings were completed to depths below where LNAPL and IHS impacts were detected with field screening, indicating sampling was completed across the entire historically known smear zone in all borings.

A total of 11 of the completed borings were converted to temporary piezometer wells (Figure 4). Wells were installed in these borings to:

- Evaluate remaining LNAPL thickness on groundwater.
- Evaluate for LNAPL and sheen presence on groundwater.
- Collect groundwater samples for the analysis of dissolved phase IHSs.
- Potentially use in additional studies that may be conducted as part of the Site hydraulic evaluation.

All piezometer wells were installed with 1-inch inner diameter (ID) PVC riser-pipe in the unsaturated zone. The piezometer wells were screened with 1-inch ID Geoprobe prepackaged well screen, which are 5-feet long 0.01-inch slotted PVC well screen surrounded with stainless steel mesh and filled with 20/40 sand. The annulus around the prepackaged well screens was filled with 20/40 washed silica sand from 1 foot below to 2 feet above the screened interval. Bentonite chipping, grouting, and installation of flush mount monuments were then conducted in accordance with WAC 173-360 to complete well construction.

All temporary piezometer wells were screened through the vadose zone and into the saturated zone, with all screened intervals extending above the highest historically measured groundwater elevations in this area of the Site. Historical groundwater elevations along the Plant 1 waterfront are detailed in the hydrograph included as Figure 5. The locations of the wells included on the hydrograph are shown on Figure 6.

Wells completed in the elevated warehouse were screened from 7 feet BGS to depth, and wells outside the warehouse were screened from 3 feet BGS to depth. Seven wells were installed with 10 feet of well screen and the remaining four wells (MW-02-PI, MW-07-PI, MW-10-PI, MW-11-PI) were installed with 15 feet of well screen. The additional 5 feet of screen were added to these four wells for additional drawdown capacity if additional studies (e.g. pumping tests) are needed near these wells as part of the upcoming hydraulic evaluation. Locations for these more deeply screened wells were selected to be near current recovery wells (Wells RW-4, RW-2, and RW-9 [Figure 6]) with the highest remaining IHS impacts detected (Table 2 and Appendix A) where, if needed, additional pumping tests are most likely to be conducted.

All wells were developed the week of August 19, following completion of well drilling. All wells were gauged prior to development and no free LNAPL was observed in any well. Each well was then developed for several hours utilizing a combination of pumping and surging with Waterra Hydrolift-2 pumps with dedicated tubing and foot valves. Over five well volumes were removed from each well and well development was continued until turbidity decreased and stabilized.

3.2.3. Soil Logging, Field Screening, and Soil Sampling

Soil cores were logged (Appendix B) for lithologic description and were described using the Unified Soil Classification System, in accordance with Section 3: Field Procedures, of the SAP (Appendix C). All major soil layers encountered were similar to classification results from previous studies (e.g. the RI/FS). Soil cores were retained from all 11 of the borings converted to piezometer wells and these soils can be analyzed to confirm grain size distribution and textural classifications if needed as part of future studies.

Soil cores were visually screened for staining indicative of petroleum impacts and for hydrocarbon odors. Field screening of soils for LNAPL and sheen was performed at one-foot intervals in all borings with a sheen test, where about 1 teaspoon of soil is placed in a gold pan containing water, contents are mixed and the water surface is visually observed for the presence of a petroleum sheen or LNAPL. Sheen and LNAPL observed were classified as:

- NS (no sheen) – No visible sheen on the water surface.
- SS (slight sheen) - Light, colorless, dull sheen; spread is irregular, not rapid.
- MS (moderate sheen) - Pronounced sheen over limited area; some color/iridescence; spread is irregular, sometimes rapid; sheen does not spread over entire water surface.
- HS (heavy sheen) - Heavy sheen with pronounced color/iridescence; spread is rapid; the entire water surface is covered with sheen.
- HS w/LNAPL (heavy sheen with LNAPL) – Heavy sheen with free LNAPL observed on water.

A headspace vapor analysis was also performed at one-foot intervals in all borings by placing soil in an enclosed bag and measuring the presence of organic vapors with a photoionization detector (PID). The PID utilized was a MiniRae model 3000 with a 10.6 eV lamp, which was calibrated daily with 100 parts per million (ppm) isobutylene gas.

Field screening results were used to direct further sampling of undisturbed soils from each boring for laboratory analyses as detailed in Sections 4.1.1 and 4.1.3. Sample collection during the probing investigation was conducted in accordance with the requirements of the SAP (Appendix C). The preparation of soil samples for the analysis of volatile organic compounds (VOCs) was conducted in accordance with EPA Method 5035A.

Detailed soil boring logs and field notes were recorded to document environmental conditions encountered and probing activities, respectively. The soil boring logs are included in Appendix B.

3.2.4. Surveying

Boring surface completion points, piezometer wells top of casing points, and piezometer well lid points were surveyed by licensed surveyors from Pacific Geomatic Services, Inc. for both location and elevation. All points were surveyed vertically for elevation to within 0.01 foot and for horizontal location to within 0.1 foot. Points were surveyed for location to the Horizontal Datum NAD-83 and for elevation to the Vertical Datum NAVD-88. All elevations listed in this report are in the NAVD-88 datum unless otherwise noted. Note that elevations provided in historical reports referenced in this report (e.g. the RI/FS) were typically to the no longer used NGVD-29 Datum, and elevations provided by others (e.g. for the new seawall) are often to Mean Low Low Water (MLLW). Comparison of points at the Site that have been surveyed in multiple datums show NGVD-29 elevations are on average 3.4 feet lower than NAVD-88, and MLLW elevations are on average 2.4 feet higher than NAVD-88.

3.2.5. Decontamination Procedures

All down-hole and reusable equipment was decontaminated prior to use at new locations to prevent cross-contamination of borings, wells, samples, as well as to prevent the potential transport of contaminants offsite. Decontamination procedures were conducted in accordance with Section 3.1.4 of the SAP (Appendix C). Decontamination waste materials were managed according to the procedures outlined below.

3.2.6. Waste Handling and Disposal

All investigation derived wastes were managed in accordance with Dangerous Waste regulations under 173-303 WAC, as well as Solid Waste Handling Standards under 173-350 WAC, and in accordance with Section 3.1 of the SAP (Appendix C). Generated wastes and their disposal method included the following:

- Two 55-gallon drums containing 1,400 pounds of excavated soils from probing cores. Soils were sampled, profiled, and disposed of as non-hazardous waste by Clean Harbors under a non-hazardous manifest.
- One 55-gallon drum containing 300 pounds of asphalt from coring, disposed of as non-hazardous waste by Clean Harbors under a non-hazardous manifest.
- Decontamination rinse water and fluids, which were processed through the permitted remediation water treatment system onsite and disposed of to the sanitary sewer.
- Disposable personal protection equipment and sampling equipment, which were added to the Site's solid waste stream.

3.3 Groundwater Sampling

Groundwater was sampled from the temporary piezometer wells on September 26th and September 27th, 2019. Sampling was conducted during the lowest low tide periods for the month of September, when groundwater was discharging into surface waters, as requested by Ecology (Ecology, 2019). Sampling was conducted from 0828 to 1225 on September 26 and from 0817 to 1045 on September 27. NOAA tidal predictions for the Lockheed Harbor Island Shipyard Station 9447110 during the September 26th sampling period was from -0.65 to 3.0 feet MLLW (-3.0 to 0.65 feet NAVD88) and from -0.55 to 2.0 feet MLLW (-2.9 to -0.35 feet NAVD88) for the September 27th sampling period. Groundwater elevations measured in the wells ranged from 7.71 to 8.9 feet MLLW (5.36 to 6.55 feet NAVD88) during these sampling periods (Table 3). These data show that during the sampling periods, groundwater elevations were higher than adjacent surface water elevations and groundwater was discharging to surface water throughout the sampling of all wells.

Groundwater was sampled in accordance with the requirements of the SAP (Appendix C). Prior to sampling, all wells were gauged for LNAPL presence/thickness, depth to groundwater, and total depth with an oil/water interface metering probe. Calculations were made to determine the volume of water in each well. The presence of LNAPL and sheen on groundwater were further evaluated by collecting groundwater at the groundwater surface with a new polyethylene bailer, pouring the water into a beaker, and visually observing the water surface for the presence of a petroleum sheen or LNAPL. LNAPL and sheen observations were classified utilizing the same scale listed in Section 3.2.3. If no LNAPL was observed in any well groundwater sampling was initiated. Samples and well purge water were collected from the groundwater surface with a polyethylene bailer. Recovered groundwater was visually monitored for parameters throughout sampling and purging, including sheen presence and strength. A minimum of three well volumes of water were purged from each well prior to sampling. Groundwater samples were collected for laboratory analysis once measured field parameters, including; pH, temperature, and conductivity, had stabilized. All field measurements and sampling information was documented and retained on water sampling logs.

3.4 Sample Handling and Analytical Methodology

Sample handling and analyses were conducted in accordance with the standards and procedures identified in the SAP (Appendix C).

Soil samples were selected from each boring for laboratory analysis of IHS concentrations based upon the results of field screening. Soil samples selected for analyses were collected from boring depths with the highest impacts detected with field screening methodologies. Soils were analyzed for concentration of IHSs including TPH-G, TPH-D, and TPH-O utilizing NWTPH-Gx and NWTPH-Dx analytical methods. TPH-G samples were collected in accordance with EPA method 5035A protocol for preparing samples for the analysis of VOCs.

Groundwater samples were collected with polyethylene bailers from shallow groundwater (i.e. at the groundwater surface where the highest concentration of IHSs would be expected). Groundwater samples were analyzed for concentrations of IHSs including TPH-G, TPH-D, TPH-O, and benzene, using NWTPH-Gx, NWTPH-Dx, and EPA-8260 analytical methods, respectively.

All soil and groundwater samples were placed in laboratory provided sample containers, chilled coolers, and delivered to the ALS Environmental - Everett Washington Laboratory under standard chain of custody (COC) protocol. All analyses were performed by ALS Environmental, an Ecology accredited laboratory (Accreditation #: C601-19). Full data package reports were provided by ALS Environmental documenting all analyses performed, which are available upon request and were not included as appendices to this report due to size.

3.4.1. Quality Assurance and Quality Control

Quality assurance (QA) objectives and procedures for field sampling, chain-of-custody, and laboratory analyses are identified in the SAP (Appendix C). The procedures identified in the SAP were used to ensure data are usable, defensible, and can be used for decision making. Specific procedures for sampling, chain-of-custody, calibration, laboratory analysis, reporting of data, internal quality control (QC), audits, preventive maintenance, and corrective actions that were identified in the SAP were utilized during this probing investigation.

Data validation summaries are provided in Appendix D and detail the QA/QC criteria for soil and groundwater field sampling, chain-of-custody, and laboratory analyses. The data validation summaries detail the review of analytical data reports, if data were validated, and whether the QA/QC criteria were met. All laboratory analytical results were reported with associated QA/QC data, and limited data (two results total) were qualified with a J qualifier (the associated values are approximated). All laboratory reports are retained at the TechSolve office.

4. Results

4.1 Field Observations

4.1.1. Soil Observations

Similar soil conditions were encountered in all 41 borings (Figure 4), with black to grey fine silty sands encountered from ground surface (elevations ranging from about 11 to 15 feet) to an elevation of

approximately -3 feet. Deeper soils transitioned to sands, silt, and clay. The shallower and deeper soils are representative of soils encountered during the RI, discussed in Section 2.1. The approximate soil boundaries and interfaces are shown on Figure 7. Soil boring logs detailing soil lithology are included in Appendix B.

4.1.2 Groundwater Observations

Groundwater was encountered at an elevation of between 5 to 7 feet in all borings and during groundwater monitoring of the temporary piezometer wells (Figure 8 and Table 3). The approximate 2 feet of variation in recorded groundwater elevations along the waterfront likely reflect the effects of diurnal tidal exchange, which are discussed in Section 2.1.

4.1.3 IHS Field Screening

All soil cores were field screened from all borings (Figure 4) using the methodology detailed in Section 3.2.3. Visual and odor screening in general showed hydrocarbon odor and staining to be limited to soils at and a few feet below the groundwater interface. Shallow unsaturated soils were mostly free of hydrocarbon odor and staining. Hydrocarbon odor and staining decreased with depth in the saturated zone, with little to no detections at boring termination depths. Odor and visual staining screening results were consistent with field screening and laboratory analytical results (i.e. the highest IHS impacts were consistently detected across all screening and laboratory analysis methods).

The results from field screening soils for LNAPL and sheen are provided in Table 4. Field screening for LNAPL and sheen was conducted at one-foot intervals in all borings, utilizing the sheen test detailed in Section 3.2.3. Screening results showed a heavy sheen or heavy sheen with LNAPL to be present in 27 of the 41 borings, with limited free LNAPL detected in 7 borings. Heavy sheens were typically limited to a 1 to 2-foot vertical band in each boring, at an elevation of around 3 feet. Wider vertical bands of heavy sheen, from 4 feet to 6 feet thick, were only observed in four borings (B-02, B-03, B-20, and B-43). Moderate to slight sheens were typically observed at shallower and deeper depths than where heavy sheens were observed. Slight to moderate sheens were typically observed in borings over a vertical band ranging from 1 to 12 feet in width. The shallowest sheen observed was in Boring B-43 at an elevation of 8 feet and the deepest sheen observed was in Boring B-06 at an elevation of -4.5 feet.

The results from headspace vapor analysis of soils are provided in Table 4. Headspace vapor analysis was conducted at one-foot intervals in all borings with a PID utilizing the test procedure detailed in Section 3.2.3. Soils tested with a PID showing elevated headspace vapor results typically also had greater LNAPL and sheen detected with the field screening results detailed in the previous paragraph. The highest PID readings (i.e. greater than 100 ppm) were typically found over a 1 to 2-foot vertical band, at an elevation of around 3 feet. Lower PID readings (i.e. less than 100 ppm) were typically observed at shallower and deeper depths than where the highest PID readings were observed. Lower PID readings were typically observed in borings over a vertical band ranging from 1 to 12 feet in width. The shallowest PID readings detected above 100 PPM were from boring B-43, at an elevation of 8 feet, and the deepest PID readings detected above 100 PPM was in Boring B-17 at an elevation of -1.5 feet.

Field screening results (PID and LNAPL/sheen screening) indicate that the unsaturated soils in all borings, except for Boring B-43, showed minimal to no signs of IHS impacts. Field screening results from the most impacted borings showed the highest soil impacts to be located within a 2 to 4-foot vertical band. IHS impacts were not detected in most borings below an average elevation of -3.1 feet

MSL. The highest concentrations of IHSs detected in soil were, on average, 2.7 feet below the elevation of static groundwater. Groundwater was encountered at an average elevation of 5.4 feet during probing and the average static groundwater elevation measured in the temporary piezometer wells was 6.0 feet. The highest soil impacts were detected at an average elevation of 3.3 feet.

The combined results from the visual screening, odor screening, LNAPL and sheen screening, and headspace vapor analyses were utilized to identify the most impacted soils from each boring. The most impacted soils identified in each boring were then collected for laboratory analyses.

4.2 Soil Analytical Results

Soil samples were selected from each boring for laboratory analysis of IHS concentrations based upon the results of field screening. Soil samples selected for analyses were collected from boring depths with the highest impacts detected with field screening methodologies. These soil samples were collected on average at an elevation of 3.3 feet, with the highest sampling elevation at 5.5 feet in Boring B-09 and the lowest sampling elevation at -1.5 feet in Boring B-17.

Soils were analyzed for concentration of IHSs including TPH-G, TPH-D, and TPH-O utilizing NWTPH-Gx and NWTPH-Dx analytical methods. The results from these analyses are presented in Table 4.

A comparison of the analytical results from soils analyses to the established soil CUL of 10,000 mg/kg for Total TPH (TPH-G+TPH-D+TPH-O) showed the following:

- Twenty-eight of the 41 borings were below the CUL.
- Seven borings (B-32, B-15, B-06, B-24, B-21, B-13, and B-43) exceeded the CUL by less than 3,000 mg/kg.
- Three borings (B-14, B-43, and B-01) exceeded the CUL by less than CUL by less than 8,000 mg/kg.
- Two borings (B-20 and B-19) were more than double the CUL.
- One boring (B-02) was more than triple the CUL.

An evaluation of the TPH fractions detected in the soil analyses shows that on average, Total TPH was comprised of 13% TPH-G, 78% TPH-D, and 9% TPH-0. Borings with TPH-G fractions greater than 20% (as high as 52% TPH-G in Boring B-41) were all below the associated Total TPH CUL. All but one of the borings that exceeded the Total TPH CUL had a TPH-D fraction greater than 80%. The analysis of the TPH fractions indicates that the TPH present is primarily diesel range with lesser amounts of gasoline and lube oil.

An evaluation of TPH fractions and chromatograms indicated that remaining TPH is weathered to highly weathered. Individual chromatograms from the TPH-D/O and TPH-G soil analyses were provided by the laboratory. The response signals plotted on the chromatograms, primarily from the TPH-D/O analyses, in general, lack clearly defined peaks and appear as unresolved humps, indicating that the detected TPH is highly weathered. A laboratory chemist reviewed all chromatograms and provided notations on the chromatograms estimating product type. These notations indicated that the TPH product type to be primarily weathered to highly weathered diesel. The full data package containing the chromatograms was not included as an appendix due to size and can be provided upon request.

4.3 Groundwater Sampling and Analytical Results

The 11 temporary piezometer wells (Figure 8) were gauged for the presence of LNAPL and sampled for laboratory analyses on September 26th and 27th, 2019, following well development and during a low tide period, as detailed in Section 3.3. Groundwater was collected at the groundwater surface (i.e. where the highest concentration of IHSs would be expected) for visual sheen and LNAPL observations and for laboratory analyses. Groundwater samples were analyzed for concentrations of IHSs including TPH-G, TPH-D, TPH-O, and benzene, using NWTPH-Gx, NWTPH-Dx, and EPA-8260 analytical methods, respectively. The results from the gauging and analyses are presented in Table 3.

Well gauging with an oil/water interface metering probe showed no indication of measurable or detectable free LNAPL to be present in any of the 11 temporary piezometer wells. The presence of LNAPL and sheen on groundwater was then visually evaluated from groundwater collected at the groundwater surface, which showed the following:

- No sheen was observed on groundwater in four temporary piezometer wells (MW-04-PI, MW-05-PI, MW-06-PI, and MW-08-PI)
- A slight sheen was observed on groundwater in six temporary piezometer wells (MW-01-PI, MW-02-PI, MW-03-PI, MW-07-PI, MW-09-PI, and MW-10-PI)
- A moderate sheen was observed on groundwater in one temporary piezometer well (MW-11-PI)
- A heavy sheen was not observed on groundwater in any temporary piezometer well.
- No free LNAPL was observed on groundwater in any temporary piezometer well.

A comparison of results from the groundwater analyses for dissolved phase IHSs in the temporary piezometer wells to the dissolved phase groundwater CULs established for the conditional points of compliance showed the following:

- Seven of 11 wells were below all dissolved phase groundwater CULs.
- All 11 wells were below the benzene CUL of 71 µg/L.
- Two wells (MW-10-PI at 2,200 µg/L and MW-11-PI at 6,300 µg/L) exceeded the TPH-G CUL of 1,000 µg/L.
- Two wells (MW-02-PI and MW-03-PI both at 13,000 µg/L) exceeded the TPH-D CUL of 10,000 µg/L.

Note that the dissolved phase CULs listed above are applicable to confirmational monitoring wells, which monitor groundwater downgradient of the plume and where groundwater is discharging to surface waters. These dissolved phase CULs are not applicable to the temporary piezometer wells, which represent groundwater conditions within a historically identified source area.

5. Summary and Findings

This investigation evaluates the extent of remaining IHSs in soils and groundwater along the Plant 1 waterfront. This area of the Site (Figure 2) was previously identified in the RI as containing TPH and LNAPL in excess of applicable CULs. This area of the Site contains an active fuel loading rack, offices, a warehouse, and other infrastructure that make it inaccessible to remedial actions such as excavation. In-situ remedial actions have been ongoing in this area of the Site to improve site conditions since the late 1990s. While many of these actions have been completed, a groundwater/LNAPL recovery system

continues to operate along the waterfront to depress groundwater and capture LNAPL and shallow groundwater.

5.1. IHSs Remaining in Soil

Field screening results and laboratory analyses of soils from completed borings (Table 4) indicate that much of the soil in the investigation area is at or below the associated CUL for Total TPH. Soils exceeding the CUL appear to be confined within a 2 to 4-foot vertical band extending downward from the groundwater surface. The highest concentrations of IHSs were encountered, on average, 2.7 feet below the elevation of static groundwater. There were little to no detections of IHSs in soil in shallow unsaturated soils or in soils at depths below the warehouse foundation, island bulkhead, and new seawall, which function as barriers to groundwater and surface water exchange.

5.1.1 Lateral and Vertical Soil TPH Contours

Two-dimensional contour maps were developed to estimate the lateral and vertical extents of Total TPH in soil in the study area. Figure 9 provides a lateral estimation of TPH using the laboratory analytical results collected from soils exhibiting the highest TPH impacts in each boring. Figure 9 represents the highest concentrations of total TPH expected throughout the study area. Figure 10, Figure 11, and Figure 12 provide vertical estimations of the extent of total TPH. The locations of these north/south cross-sectional figures are highlighted on Figure 9. The TPH concentration contours plotted on Figures 10-12 utilize PID and sheen test screening results to extrapolate a total TPH value for each one-foot interval in each boring. Estimated total TPH values for each one-foot interval were calculated by multiplying the boring's laboratory derived total TPH concentration by a ratio of the PID and sheen test screening results for that foot interval against the PID and sheen test screening results for the interval sampled for laboratory analysis. Data based upon these results were then gridded utilizing Kriging in Surfer and contour maps were developed and manually adjusted to reduce bias (e.g. the overestimation of TPH in the unsaturated zone and the underestimation of TPH in the upper several feet of the saturated zone).

The lateral estimations of the highest concentrations of total TPH, shown in Figure 9, indicate that soils exceeding the CUL are located by the south end of the warehouse (by B-02 and nearby borings), near the center of the warehouse (by borings B-19 and B-20), and by the loading rack in the northern part of the study area. Figure 9 also indicates that the highest total TPH concentrations expected are below the soil total TPH CUL in portions of the warehouse and directly north of the warehouse.

The vertical estimations of total TPH shown on Figures 10-12 indicate that the bulk of total TPH exceeding the soil total TPH CUL is limited to the upper 5 feet of saturated soil in a few isolated areas, also identified in Figure 9. The vertical estimations indicate that a few small "hot spots" remain in soil and that most soils in the investigation area are below the soil total TPH CUL.

5.1.2 Residual LNAPL Saturation in Soil

While some soils in the investigation area exceed the total TPH CUL, the distribution and concentrations appear insufficient to suggest the presence of mobile and recoverable LNAPL. Numerous documents (e.g. MassDEP, 2016) have been published identifying residual LNAPL concentration values, below which LNAPL is theoretically immobile in subsurface soils, and, by extension is:

- the maximum level of LNAPL that can exist in soil and not be mobile; and

- the minimum level of LNAPL that will remain in soil after the completion of conventional remedial recovery efforts.

Residual LNAPL concentration values are dependent on specific soil and LNAPL physical properties, so actual site-specific values will vary. However, various researchers have published values for these metrics since the early 1960s and a collection of these values appears in API's Soil and Groundwater Bulletin No. 9 (Brost et al., 2000). These values can be used as a line of evidence to determine if LNAPL is mobile onsite. Published values for conditions most closely matching Site conditions (i.e. weathered diesel range LNAPL in fine sands to silty sands) range from 13,333 mg/kg to 98,100 mg/kg, with several values in the 30,000 to 34,000 mg/kg range.

The actual residual LNAPL concentration values for soils in the investigation are likely to be on the higher end of the published values, given that:

- LNAPL detected in the investigation was primarily weathered to highly weathered diesel, which indicates an older release, typically less mobile than a new, or fresh, release.
- Elevated TPH soil concentrations were only detected over narrow vertical profiles less than 4 feet in thickness, indicating a diminished LNAPL source area.
- The highest TPH soil concentrations were typically encountered 2 feet below static groundwater. If LNAPL were mobile, highest TPH concentrations would be expected at the groundwater interface, where LNAPL would accumulate.

5.2. IHSs Remaining in Groundwater

Groundwater sampling and analytical results (Figure 8 and Table 3) showed no free LNAPL to be present throughout the investigation area and dissolved phase IHSs were mainly below CULs applicable to the more deeply screened (i.e. where groundwater and surface water exchange is occurring) point of compliance wells.

Groundwater gauging results showed no measurable free LNAPL to be present on groundwater in the 11 temporary piezometer wells. Visual inspections of groundwater from these wells showed no signs of LNAPL presence or that of a heavy sheen in the 11 wells. One well (MW-11-PI) exhibited a moderate sheen, six wells (MW-01-PI, MW-02-PI, MW-03-PI, MW-07-PI, MW-09-PI, MW-10-PI) exhibited a slight sheen, and four wells (MW-04-PI, MW-05-PI, MW-06-PI, MW-08-PI) exhibited no sheen on groundwater.

Groundwater sampling and laboratory analysis results showed dissolved phase IHSs to be below point of compliance CULs in 7 of the 11 temporary piezometer wells. Two wells (MW-10-PI and MW-11-PI) exceeded the TPH-G CUL and two wells (MW-02-PI and MW-03-PI both at 13,000) exceeded the TPH-D CUL. All 11 wells were below the benzene CUL.

5.3. Compliance with Performance and Confirmational Criteria

5.3.1. LNAPL Removal Performance Criterion

The performance criterion for the removal of separate phase hydrocarbons (LNAPL) to the maximum extent practicable or a lack of measurable product (LNAPL) thickness in compliance monitoring wells appears to have been met in the investigation area. As detailed in previous sections, no measurable

LNAPL was detected on groundwater in any of the temporary piezometer wells installed during this investigation. Detected TPH in soil appears to be below residual saturation limits, indicating that any remaining LNAPL is not mobile or recoverable by the active groundwater/LNAPL recovery system.

5.3.2. Waterway Sheen Criterion

The performance criterion for a persistent sheen to no longer be observed on the waterway was also evaluated as part of this investigation. Specifically, this investigation was intended to evaluate if there was a pathway for LNAPL migration from inland soils and groundwater to surface water in locations where a sheen has historically been observed on surface water. Oil sorbent booms have been maintained in the waterway to contain sheens that have appeared on surface water. Two booms are currently located alongside the warehouse (Figure 6) to best contain occasional sheens that have been observed in the waterway. Booms and the waterway are monitored weekly, at a minimum, for the presence of oil sheens and the monitoring results are included in Table 5. Sheen events over the last decade (2010 through 2019) have been infrequent, with 75 light sheens observed at various times along the warehouse in the 1,428 inspections conducted. A light sheen was last observed in the waterway in August of 2019.

It has been theorized in previous reports that the observed sheens originated from small cracks and discontinuities in the concrete warehouse foundation and underlying sheet piling, or island bulkhead. The foundation and bulkhead act as a "hanging" wall, trapping LNAPL while allowing groundwater to flow beneath the base of the foundation and bulkhead.

This investigation indicates that sheens detected in the waterway are not originating from an ongoing source of LNAPL migrating through discontinuities in the concrete warehouse foundation and underlying sheet piling, or island bulkhead. This is supported by data from this investigation showing a lack of LNAPL in the temporary piezometer wells, and data showing that detected TPH in soil appears to be below residual LNAPL saturation limits. The lack of an ongoing inland LNAPL source causing surface water sheen is also supported by the ongoing sheen monitoring data (Table 5), which show that no sheens have been observed over the last decade at low tide periods when groundwater to surface water gradients are highest. All observed sheens have occurred at medium to high tidal stages.

Sheen observances have occurred in what has been historically referred to as "targeting" where small bubbles create a sheen in the waterway, several feet away from the shoreline. The mechanism for sheen occurrence most closely resembles what has been defined by others (ITRC, 2018) as ebullition, where:

> "Biodegradation of naturally-occurring organic compounds or of the petroleum itself that is affecting sediments, can generate gases that migrate upward through sediments due to buoyancy. NAPLs are hydrophobic and preferentially attach to the surface of a gas bubble passing through, which subsequently transports the NAPL to the air-water interface. NAPL-coated bubbles reaching the surface of a water body yield a sheen because the surface tension of water is much higher than petroleum."

Determining the source of the observed sheens in the waterway was beyond the scope of this investigation. Sources could be from the adjacent island bulkhead, which was created with creosote timbers, or from a historic release that migrated or occurred waterward of the existing concrete warehouse foundation, underlying sheet piling, and island bulkhead. The source is

assumed to be limited, as sheens have only been observed in 5% of the monitoring conducted over the last decade, the observed sheens have been light to very light in strength, are not widespread, and have occurred in limited and defined locations that have been contained and captured with booms.

5.3.3. Dissolved Phase IHS Criterion

The Plant 1 performance criterion for dissolved TPH constituents in groundwater is obtainment of the CULs listed in Section 2.2.1 for Benzene, TPH-G, TPH-D, and TPH-O in confirmational monitoring wells (i.e. monitoring wells at the property boundary and downgradient of plume areas). The Plant 1 confirmational criteria for groundwater is obtainment of these CULs in confirmational monitoring wells for four quarters or until analytes have stabilized and reached equilibrium.

While the obtainment of the dissolved phase CULs is not a criterion for shallow groundwater in the area that was investigated in this report, shallow groundwater was evaluated in the study area to determine if remaining dissolved phase IHSs posed a potential risk to the confirmational monitoring wells, which are screened in deeper groundwater, where groundwater and surface water exchange is occurring.

The potential for dissolved phase IHS migration from shallow groundwater in the investigation area to deeper groundwater, representing the point of compliance, in excess of CULs appears unlikely due to the following:

- Shallow groundwater in the former source area, which is contained by bulkheads, seawalls and foundations, is predominantly below the dissolved phase CULs applicable to deeper uncontained groundwater that discharges to surface water. Analytical results showed dissolved phase IHSs to be below the CULs in 7 of the 11 temporary piezometer wells, indicating shallow groundwater meets the deeper groundwater's CULs near these wells.
- TPH-G concentrations in the confirmational monitoring well (AMW-04) nearest the two wells that exceeded the TPH-G CUL (MW-10-PI and MW-11-PI) has been below the CUL in every quarter since monitoring was initiated in 2000 (Table 1 and Appendix A).
- TPH-D concentrations in the confirmational monitoring well (AMW-02) nearest the two wells that exceeded the TPH-D CUL (MW-02-PI and MW-03-PI) has been below the CUL in every quarter since monitoring was initiated in 2000 (Table 1 and Appendix A).

Additional evaluations relating to the obtainment of the dissolved phase IHS criteria for performance and confirmational monitoring have been proposed as part of a planned site hydraulic evaluation, which is currently being formalized with input from Ecology.

5.4. Recommendations for Ongoing Remedial Actions

As detailed in Section 2.2.2, a groundwater/LNAPL recovery system continues to operate along the waterfront to depress groundwater and capture LNAPL and shallow groundwater containing dissolved hydrocarbons. The groundwater/LNAPL recovery system pumps shallow groundwater from 9 recovery wells (RW-1, RW-2, RW-4, RW-5, RW-6, RW-7, RW-8, RW-9, RW-10) located along the waterfront at Plant 1 (Figure 6). System performance data, collected prior to this investigation (TechSolve 2018a) indicate that the system has likely recovered LNAPL to the extent technically practicable, as required by the Consent Decree. As detailed, several lines of evidence support this hypothesis. However, these lines of evidence were likely insufficient to fully determine if LNAPL has

been recovered to the extent technically practicable, as it was possible that reduced LNAPL capture was the result of decreased system efficiencies, detailed in the Waterfront Probing Work Plan (TechSolve, 2019a) and previous Annual Site Reports (e.g. TechSolve, 2018a).

This investigation provides additional supporting evidence, as detailed in the previous sections, that recoverable LNAPL is no longer present throughout the investigation area, which represents the expected capture limits of the system. This investigation indicates that continued operation of the groundwater/LNAPL recovery system is unlikely to recover additional LNAPL, and that LNAPL has been recovered throughout the investigation area to the extent technically practicable. Continued operation of the groundwater/LNAPL recovery system is unlikely to reduce remaining IHSs detected during this investigation and addressing these remaining IHSs is likely unnecessary, as the cleanup criteria set forth in the Consent Decree appear to have been met.

The groundwater/LNAPL recovery system was designed (TechSolv and AG&M, 2000a) to provide hydraulic control and groundwater capture throughout the investigation area. While the system locally depresses groundwater around individual recovery wells, the system was not intended to, and is incapable of, depressing groundwater throughout the investigation area to depths where the highest soil impacts were observed in this investigation. The highest soil impacts detected in this investigation appeared to be residual, immobile, and were encountered on average 2.7 feet below static groundwater. As such, another remedial strategy would be required to address remaining soils with residual and immobile impacts that exceed the total TPH CUL. However, as the cleanup criteria appear to have been met in this area of the Site, continued compliance with the provisions of the existing Restrictive Covenant entered into under the Consent Decree is likely sufficient to meet Site cleanup objectives. The provisions of the Restrictive Covenant prevent the alteration, modification, or removal of existing structures (i.e. the warehouse, loading rack, and paved drive areas) in any manner that may result in the release or exposure to the environment of the remaining contaminated soil or create a new exposure pathway without prior written approval from Ecology.

5.5. Data Gaps

Boring B-43 soil results indicate that a shallow source area remains beneath the loading rack, in the area directly north of the investigation area. While additional investigative activities by the loading rack may be beneficial, the access to this area is limited. The loading rack is an active fueling rack in continual operation and access in the load rack area is limited due to substantial aboveground and belowground infrastructure. Ground surface at the load rack is covered with concrete and further covered with a roof and gutter system that both function as effective caps in this area. Measurable LNAPL in no longer detected in shallow groundwater adjacent to the load rack in Recovery Wells RW-2 and RW-4. Dissolved phase IHSs in nearby point of compliance monitoring walls (AMW-05 to the north of the loading rack and AMW-04 to the south of the loading rack) have been below CULs in every quarter since monitoring was initiated in 2000 (Table 1 and Appendix A).

Borings B-13 and B-01 collected at the southern property boundary indicate that limited soil impacts may extend to the south of the property. While additional investigative activities along the southwestern property boundary may be beneficial, the access to this area is also limited. Extensive belowground stormwater infrastructure both for the Site and a separate City of Seattle stormwater line exist directly south of these borings, limiting access for any additional investigation. Impacted soils in this area do not appear to be impacting groundwater, as all dissolved phase IHSs were below CULs and LNAPL was not detectable in temporary piezometer well MW-01-PI.

6. Conclusions

This investigation was conducted to evaluate the effectiveness of ongoing and completed cleanup actions in obtaining cleanup criteria and to evaluate the remaining extent of historical known IHSs and separate phase hydrocarbons (LNAPL) in subsurface soils and groundwater along the Plant 1 waterfront.

The results of this investigation along the Plant 1 waterfront show that:

- Soil impacts in the unsaturated zone are mainly below the soil total TPH CUL, which is attributed to historical remedial actions, such as SVE, that removed impacts in the unsaturated zone.
- Maximum soil impacts detected in 68 percent of the borings (28 out of 41) were below the TPH CUL.
- Soils in excess of the total TPH CUL in the saturated zone do not appear to extend beneath the warehouse foundation, historical island bulkhead, or the new seawall installed along the northern half of Plant , which act as barriers to groundwater/surface water exchange.
- Soils in excess of the total TPH CUL are in a narrow vertical band, typically starting at the groundwater interface and are, on average, less than 4 feet in thickness. The highest soil impacts detected were, on average, 2.7 feet below the elevation of static groundwater.
- The remaining LNAPL contained in the soils is primarily heavily weathered diesel, which is residual in nature, is not mobile, and is not partitioning into the dissolved phase in groundwater to any appreciable concentration.
- Groundwater monitoring of the 11 temporary piezometer wells showed no measurable or detectable free LNAPL on groundwater in the investigation area.
- Remaining soil impacts identified in the investigation area do not appear to be sufficient to create a sheen in the adjacent waterway. Data from this investigation and from historical sheen observations in the waterway could not identify the source of the historic sheens, but the source is assumed to be minimal and not recoverable by upland remedial actions, such as the existing groundwater/LNAPL recovery system.
- The performance criterion from the GWCMCP requiring the lack of measurable product (LNAPL) thickness in the product recovery system appears to have been met.
- The operating groundwater/LNAPL recovery system appears to have recovered LNAPL to the extent practicable.
- Further operation of the existing groundwater/LNAPL recovery system is unlikely to provide additional remedial benefit.

To conservatively test that LNAPL has been recovered to the extent practicable it may be appropriate to discontinue groundwater/LNAPL recovery system pumping and groundwater recovery on a trial basis, where the system is maintained in an operable state and operation can be resumed promptly if measurable and recoverable LNAPL is detected. Increased monitoring of shallow groundwater throughout the investigation area can be conducted following trial system shutdown to aid in evaluating if performance criteria (e.g. no measurable product in the recovery system) have been met. The trial discontinuation of remedial system operations has been previously conducted elsewhere at the Site (e.g. discontinuation of the Inland SVE system) with Ecology's approval.

Further evaluations of the obtainment of performance and confirmational criteria will be conducted as part of the planned hydraulic evaluation (TechSolve 2019c). The primary objectives of the hydraulic investigation are to:

- Evaluate changes to natural gradients and surface water/groundwater relationships due to the new seawall by evaluating current conditions against historical models.
- Evaluate the relationship between surface water and shallow and deep groundwater levels, potential exchanges, and the current natural gradient across the Site.
- Evaluate if the existing compliance monitoring well network, located along the waterfront and behind the new seawall, continues to adequately monitor the zone of groundwater and surface water exchange.
- Aide in future evaluations of whether modifications to ongoing remedial actions are necessary to attain cleanup standards and achieve Site closure.

The results of this soil and groundwater investigation indicate that performance criteria for ongoing remedial actions appear to have been met at the established points of compliance. The hydraulic evaluation will aid in determining if the existing points of compliance remain appropriate for the Site, or if changes in site hydrology due to the new seawall require new or modified points of compliance. Once the hydraulic investigation is completed, further evaluations can be completed to determine if cleanup actions are complete, if performance and compliance criteria have been met, if points of compliance should be modified, and if additional actions are warranted to meet specific compliance criteria.

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Tables

Table 1 – Groundwater Monitoring Analytical Resultsfor TPH and Benzene
Table 2 – Waterfront Groundwater Recovery Wells Petroleum Hydrocarbon History
Table 3 – Waterfront Probing Field and Laboratory Groundwater Sampling Results
Table 4 – Waterfront Probing Field and Laboratory Soil Sampling Results
Table 5 – Containment Boom Sheen Monitoring

Table 1. Groundwater Monitoring Analytical Results for TPH and Benzene
Plant 1 Waterfront Confirmation Wells
Site: Former BP Harbor Island Terminal

Well	Date	TPH-G WTPH-G (µg/L)	TPH-D WTPH-DX (µg/L)	TPH-O WTPH-DX (µg/L)	Benzene EPA 8021 & 8260 (µg/L)
Plant 1					
AMW-01	12/21/2000	ND	1,310	ND	14.0
AMW-01	3/28/2001	59.3	2,600	ND	69.6
AMW-01	6/13/2001	105 U	944	ND	**470**
AMW-01	10/4/2001	ND	851	ND	**152**
AMW-01	12/12/2001	ND	1700 J	ND UJ	**1,260**
AMW-01	3/7/2002	153	1,410	ND	**1,410**
AMW-01	6/12/2002	143 J	2,100	ND	**1,680**
AMW-01	9/19/2002	139 J	571 J	ND UJ	**1,180**
AMW-01	12/17/2002	196	2,190	ND	**74.6**
AMW-01	3/26/2003	101	2,100	ND	**933**
AMW-01	6/27/2003	ND	2,090	ND	**1,260**
AMW-01	9/18/2003	55	2,140	ND	48.5
AMW-01	12/22/2003	136	1750 J	ND	**571**
AMW-01	3/8/2004	ND UJ	ND	ND	**961**
AMW-01	6/16/2004	138	386	ND	**1,540**
AMW-01	9/28/2004	83	ND	ND	**292**
AMW-01	12/6/2004	103	ND	ND	**411**
AMW-01	3/10/2005	113	ND	ND	**812**
AMW-01	6/21/2005	129	ND	ND	**1,130**
AMW-01	9/27/2005	77	ND UJ	ND	**181 J**
AMW-01	12/13/2005	ND UJ	342	ND	**132**
AMW-01	3/21/2006	88	ND	ND	**363**
AMW-01	7/6/2006	ND UJ	ND	ND	**912**
AMW-01	9/18/2006	91.7	ND	ND	7.38
AMW-01	12/12/2006	**1,650 J**	ND UJ	ND UJ	**539 J**
AMW-01	3/21/2007	89.9	ND	ND	**457**
AMW-01	6/6/2007	61	ND	ND	**486**
AMW-01	9/12/2007	65	ND	ND	**157**
AMW-01	12/18/2007	ND	ND	ND	10.6 J
AMW-01	3/25/2008	ND	ND	ND	**76**
AMW-01	6/25/2008	64.9	ND	ND	**370**
AMW-01	9/17/2008	55.0	ND	ND	**162**
AMW-01	12/16/2008	ND	ND	ND	**330**
AMW-01	3/11/2009	ND	ND	ND	**374**
AMW-01	6/10/2009	ND	R	R	**240 J**
AMW-01	9/16/2009	ND	ND	ND	7.4
AMW-01	12/16/2009	ND	ND	ND	**280**
AMW-01	3/30/2010	ND	ND	ND	**310**
AMW-01	6/9/2010	ND	720	ND	**280**
AMW-01	9/14/2010	ND	ND	ND	69.7
AMW-01	12/14/2010	ND	ND	ND	**282**
AMW-01	3/22/2011	ND	ND	ND	**247**
AMW-01	6/22/2011	ND	300 J	ND	39.6
AMW-01	9/27/2011	ND	ND	ND	22.2
AMW-01	12/20/2011	ND	ND	ND UJ	**151**
AMW-01	3/20/2012	ND	ND	ND	**178**
Cleanup Level		1,000	10,000	10,000	71
Method Reporting Limit		50	250	750	0.5

Table 1. Groundwater Monitoring Analytical Results for TPH and Benzene
Plant 1 Waterfront Confirmation Wells
Site: Former BP Harbor Island Terminal

Well	Date	TPH-G WTPH-G (µg/L)	TPH-D WTPH-DX (µg/L)	TPH-O WTPH-DX (µg/L)	Benzene EPA 8021 & 8260 (µg/L)
Plant 1, continued					
AMW-01	6/21/2012	ND	ND	ND	**77**
AMW-01	9/10/2012	ND	ND	ND	38.7 J
AMW-01	12/19/2012	ND	ND	ND	61.2
AMW-01	3/19/2013	ND	ND	ND	**110**
AMW-01	6/25/2013	ND	ND	ND	12
AMW-01	9/10/2013	ND	ND	ND	17
AMW-01	12/10/2013	ND	ND	ND	17
AMW-01	3/11/2014	ND	990 J	ND	**77**
AMW-01	6/10/2014	ND UJ	1,100	ND	7.3
AMW-01	9/9/2014	ND	440 J	ND UJ	8.4
AMW-01	12/9/2014	ND	1,500	ND	20
AMW-01	3/10/2015	ND U	1,200 J	ND	68
AMW-01	6/9/2015	ND	450	ND	50
AMW-01	9/22/2015	ND	250	ND	12
AMW-01	12/15/2015	ND	430 J	ND UJ	38 J
AMW-01	3/8/2016	ND	320 J	ND UJ	24
AMW-01	6/8/2016	ND	1,200 J	ND UJ	4.1
AMW-01	9/8/2016	ND	1,300	ND	5.1
AMW-01	12/6/2016	ND U	800 J	ND	7.3
AMW-01	3/7/2017	230 J	1,300 J	1,100 J	1.0
AMW-01	6/7/2017	ND	ND UJ	ND	1.9
AMW-01	9/12/2017	ND	ND	ND	2.4
AMW-01	12/5/2017	ND	ND	ND	1.0
AMW-01	3/20/2018	240	ND	ND	ND
AMW-01	6/19/2018	ND UJ	480	710	ND
AMW-01	9/11/2018	ND	ND UJ	ND UJ	ND
AMW-01	12/11/2018	ND	610	ND	ND
AMW-01	3/12/2019	ND	ND	ND	ND
AMW-01	6/18/2019	ND	270	ND	ND
AMW-01	9/24/2019	ND	350 J	ND UJ	ND
AMW-01	12/17/2019	ND	ND	ND	ND
AMW-02	12/21/2000	ND	803	ND	3.14
AMW-02	3/28/2001	Not accessible due to earthquake damage to warehouse.			
AMW-02	6/13/2001	ND	999	ND	3.88 U
AMW-02	10/4/2001	ND	1,200	ND	10.90
AMW-02	12/12/2001	ND	1,500 J	ND UJ	5.47
AMW-02	3/7/2002	Not accessible due to repair of earthquake damage to warehouse.			
AMW-02	6/12/2002	ND	2,420	ND	1.49
AMW-02	9/19/2002	ND UJ	495 J	ND UJ	1.61
AMW-02	12/17/2002	ND	1,890	ND	4.08
AMW-02	3/26/2003	ND	2,200	ND	5.23
AMW-02	6/27/2003	ND	1,680	ND	1.11
AMW-02	9/18/2003	ND	2,430	790	2.01
AMW-02	12/22/2003	ND	1,880 J	ND	ND
AMW-02	3/8/2004	ND	ND	ND	ND
Cleanup Level		1,000	10,000	10,000	71
Method Reporting Limit		50	250	750	0.5

Table 1. Groundwater Monitoring Analytical Results for TPH and Benzene
Plant 1 Waterfront Confirmation Wells
Site: Former BP Harbor Island Terminal

Well	Date	TPH-G WTPH-G (µg/L)	TPH-D WTPH-DX (µg/L)	TPH-O WTPH-DX (µg/L)	Benzene EPA 8021 & 8260 (µg/L)
Plant 1, continued					
AMW-02	6/16/2004	ND	ND	ND	2.40
AMW-02	9/28/2004	ND	ND	ND	0.85
AMW-02	12/8/2004	ND	ND	ND	23.2
AMW-02	3/10/2005	ND	ND	ND	38.4
AMW-02	6/21/2005	ND	ND	ND	16.1
AMW-02	9/27/2005	ND	ND	ND	9.04
AMW-02	12/13/2005	ND	366	ND	7.26
AMW-02	3/21/2006	ND	ND	ND	2.16
AMW-02	7/6/2006	ND	ND	ND	41.1
AMW-02	9/18/2006	ND	ND	ND	3.18
AMW-02	12/12/2006	84.5 UJ	ND UJ	ND UJ	25.8 J
AMW-02	3/21/2007	ND	ND	ND	**92.2**
AMW-02	6/6/2007	ND	ND	ND	**442**
AMW-02	9/12/2007	ND	ND	ND	4.03 J
AMW-02	12/18/2007	ND	ND	ND	66.2
AMW-02	3/25/2008	75.9	ND	ND	**343**
AMW-02	6/25/2008	ND	ND	ND	**125**
AMW-02	9/17/2008	ND	ND	ND	30.7
AMW-02	12/16/2008	ND	ND	ND	**189**
AMW-02	3/11/2009	ND	ND	ND	**421**
AMW-02	6/10/2009	ND	R	R	**100**
AMW-02	9/16/2009	ND	ND	ND	12
AMW-02	12/16/2009	ND	ND	ND	**110**
AMW-02	3/30/2010	ND	1,000	ND	**210**
AMW-02	6/9/2010	ND	1,000	260	**130**
AMW-02	9/14/2010	ND	ND	ND	22.6
AMW-02	12/14/2010	ND	ND	ND	**96.2 J**
AMW-02	3/22/2011	ND	ND	ND	**149**
AMW-02	6/22/2011	ND	ND	ND	20.0
AMW-02	9/27/2011	ND	ND	ND	6.5
AMW-02	12/20/2011	ND	ND	ND	12.2
AMW-02	3/20/2012	ND	ND	ND	31.6
AMW-02	6/21/2012	ND	ND	ND	**82.5**
AMW-02	9/10/2012	ND	ND	ND	12.7 J
AMW-02	12/19/2012	ND	ND	ND	12.4
AMW-02	3/19/2013	ND	ND	ND	9.3
AMW-02	6/25/2013	ND	ND	ND	13.0
AMW-02	9/10/2013	ND	ND	ND	8.1
AMW-02	12/10/2013	ND	ND	ND	5.7
AMW-02	3/11/2014	ND	ND	ND	19.0
AMW-02	6/10/2014	ND UJ	320	ND	12.0
AMW-02	9/9/2014	ND	270	ND	29.0
AMW-02	12/9/2014	ND	530	ND	15.0
AMW-02	3/10/2015	ND U	370	ND	ND
AMW-02	6/9/2015	ND	ND	ND	3.1
AMW-02	9/22/2015	ND	ND	ND	2.0
Cleanup Level		1,000	10,000	10,000	71
Method Reporting Limit		50	250	750	0.5

Table 1. Groundwater Monitoring Analytical Results for TPH and Benzene
Plant 1 Waterfront Confirmation Wells
Site: Former BP Harbor Island Terminal

Well	Date	TPH-G WTPH-G (µg/L)	TPH-D WTPH-DX (µg/L)	TPH-O WTPH-DX (µg/L)	Benzene EPA 8021 & 8260 (µg/L)
Plant 1, continued					
AMW-02	12/15/2015	ND	ND	ND	4.4
AMW-02	3/8/2016	ND	290	ND	1.9
AMW-02	6/8/2016	ND	840	ND	3.0
AMW-02	9/8/2016	ND	810	ND	15.0
AMW-02	12/6/2016	ND	510	ND	4.4
AMW-02	3/7/2017	ND	850	740	ND
AMW-02	6/6/2017	ND	ND	ND	2.7
AMW-02	9/12/2017	ND	ND	ND	1.1
AMW-02	12/5/2017	ND	ND	ND UJ	0.96
AMW-02	3/20/2018	53.0	ND	ND	2.30
AMW-02	6/19/2018	ND	ND	ND	0.92
AMW-02	9/11/2018	ND	300	ND	1.20
AMW-02	12/11/2018	ND	560	ND	1.50
AMW-02	3/12/2019	ND	ND	ND	ND
AMW-02	6/18/2019	ND	630	ND	2.40
AMW-02	9/24/2019	ND	260	ND	12.0
AMW-02	12/17/2019	ND	ND	ND	**87**, 67 J, 61 J, 64 J (69.75 Average)**
AMW-03	12/21/2000	127	1,420	ND	ND
AMW-03	3/28/2001	Not accessible due to earthquake damage to warehouse.			
AMW-03	6/13/2001	ND	745	ND	ND
AMW-03	10/4/2001	ND	1,210	ND	ND
AMW-03	12/12/2001	ND	1,080 J	ND UJ	ND
AMW-03	3/7/2002	Not accessible due to earthquake damage to warehouse.			
AMW-03	6/12/2002	ND	1,070	ND	ND
AMW-03	9/19/2002	ND UJ	643 J	ND UJ	ND UJ
AMW-03	12/17/2002	ND	1,160	ND	ND
AMW-03	3/26/2003	ND	1,240	ND	ND
AMW-03	6/27/2003	ND	713	ND	ND
AMW-03	9/18/2003	ND	1,050	ND	ND
AMW-03	12/22/2003	ND	374 J	ND	ND
AMW-03	3/8/2004	ND	ND	ND	ND
AMW-03	6/16/2004	ND	ND	ND	1.02
AMW-03	9/28/2004	ND	ND	ND	ND
AMW-03	12/8/2004	ND	ND UJ	ND UJ	ND
AMW-03	3/10/2005	ND	ND	ND	1.56
AMW-03	6/21/2005	ND	ND	ND	0.99
AMW-03	9/27/2005	ND	ND UJ	ND	0.997
AMW-03	12/13/2005	ND	ND	ND	0.828
AMW-03	3/21/2006	ND	ND	ND	2.770
AMW-03	7/6/2006	ND	ND	ND	2.28
AMW-03	9/18/2006	ND	ND	ND	ND
AMW-03	12/12/2006	ND UJ	ND UJ	ND UJ	0.974 J
AMW-03	3/21/2007	ND	ND	ND	ND
AMW-03	6/6/2007	ND	ND	ND	ND
Cleanup Level		1,000	10,000	10,000	71
Method Reporting Limit		50	250	750	0.5

Table 1. Groundwater Monitoring Analytical Results for TPH and Benzene
Plant 1 Waterfront Confirmation Wells
Site: Former BP Harbor Island Terminal

Well	Date	TPH-G WTPH-G (µg/L)	TPH-D WTPH-DX (µg/L)	TPH-O WTPH-DX (µg/L)	Benzene EPA 8021 & 8260 (µg/L)
Plant 1, continued					
AMW-03	9/12/2007	ND	ND	ND	ND UJ
AMW-03	12/18/2007	ND	ND	ND	ND
AMW-03	3/25/2008	ND	ND	ND	ND
AMW-03	6/25/2008	ND	ND	ND	ND
AMW-03	9/17/2008	ND	ND	ND	ND
AMW-03	12/16/2008	ND	ND	ND	ND
AMW-03	3/11/2009	ND	ND	ND	ND
AMW-03	6/10/2009	ND	R	R	ND
AMW-03	9/16/2009	ND	ND	ND	ND
AMW-03	12/16/2009	ND	ND	ND	ND
AMW-03	3/30/2010	ND	400	ND	ND
AMW-03	6/9/2010	ND	230	ND	ND
AMW-03	9/14/2010	ND	ND	ND	ND
AMW-03	12/14/2010	ND	ND	ND	ND
AMW-03	3/22/2011	ND	ND	ND	0.54
AMW-03	6/22/2011	ND	ND	ND	ND
AMW-03	9/27/2011	ND	ND	ND	ND
AMW-03	12/20/2011	ND	ND	ND	ND
AMW-03	3/20/2012	ND	ND	ND	0.52
AMW-03	6/21/2012	ND	ND	ND	ND
AMW-03	9/10/2012	ND	ND	ND	ND
AMW-03	12/19/2012	ND	ND	ND	ND
AMW-03	3/19/2013	ND	ND	ND	ND
AMW-03	6/25/2013	ND	ND	ND	ND
AMW-03	9/10/2013	ND	ND	ND	ND
AMW-03	12/10/2013	ND	ND	ND	ND
AMW-03	3/11/2014	ND	320 J	ND	ND
AMW-03	6/10/2014	ND UJ	430	ND	ND
AMW-03	9/9/2014	ND	360	ND	ND
AMW-03	12/9/2014	ND	570	ND	ND
AMW-03	3/10/2015	ND U	650	ND	ND
AMW-03	6/9/2015	ND	410	ND	ND
AMW-03	9/22/2015	ND	ND	ND	ND
AMW-03	12/15/2015	ND	ND	ND	ND
AMW-03	3/8/2016	ND	250	ND U	ND
AMW-03	6/8/2016	ND	840	ND	ND
AMW-03	9/7/2016	ND	330	ND	ND
AMW-03	12/6/2016	ND	820	ND	ND U
AMW-03	3/7/2017	ND	890	510	ND
AMW-03	6/6/2017	ND	ND	ND	ND
AMW-03	9/12/2017	ND	ND	ND	ND
AMW-03	12/5/2017	ND	ND	ND	ND
AMW-03	3/20/2018	ND	ND	390	ND
AMW-03	6/19/2018	ND	ND	ND	ND
AMW-03	9/11/2018	ND	ND	ND	ND
AMW-03	12/11/2018	ND	370	ND	ND
Cleanup Level		1,000	10,000	10,000	71
Method Reporting Limit		50	250	750	0.5

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Plant 1 Waterfront Confirmation Wells
Site: Former BP Harbor Island Terminal

Well	Date	TPH-G WTPH-G (µg/L)	TPH-D WTPH-DX (µg/L)	TPH-O WTPH-DX (µg/L)	Benzene EPA 8021 & 8260 (µg/L)
Plant 1, continued					
AMW-03	3/12/2019	ND	ND	ND	ND
AMW-03	6/18/2019	ND	ND	ND	ND
AMW-03	9/24/2019	ND	ND	ND	ND
AMW-03	12/17/2019	ND	ND	ND	ND
AMW-04	12/21/2000	ND	1,570	ND	0.66
AMW-04	3/28/2001	ND	1,660	ND	0.766
AMW-04	6/13/2001	ND	987	ND	ND
AMW-04	10/4/2001	ND	379	ND	ND
AMW-04	12/12/2001	ND	930 J	ND UJ	ND
AMW-04	3/7/2002	ND	519	ND	2.94
AMW-04	6/12/2002	ND	1,200	ND	0.63
AMW-04	9/19/2002	ND UJ	760 J	ND UJ	1.45 J
AMW-04	12/17/2002	ND	1,070	ND	ND
AMW-04	3/26/2003	ND	1,240	ND	0.84
AMW-04	6/27/2003	ND	875	ND	ND
AMW-04	9/18/2003	ND	1,660	ND	ND
AMW-04	12/22/2003	ND	686 J	ND	1.73
AMW-04	3/8/2004	ND	ND	ND	ND
AMW-04	6/16/2004	ND	ND	ND	ND
AMW-04	9/27/2004	ND	ND	ND	ND
AMW-04	12/6/2004	ND	ND	ND	ND
AMW-04	3/10/2005	ND	ND	ND	ND
AMW-04	6/21/2005	ND	ND	ND	ND
AMW-04	9/27/2005	ND	ND UJ	ND	ND
AMW-04	12/13/2005	ND UJ	ND	ND	ND UJ
AMW-04	3/21/2006	ND	ND	ND	0.65
AMW-04	7/6/2006	ND UJ	ND	ND	ND UJ
AMW-04	9/18/2006	ND	ND	ND	ND
AMW-04	12/12/2006	ND UJ	ND UJ	ND UJ	ND UJ
AMW-04	3/21/2007	ND	ND	ND	0.64
AMW-04	6/6/2007	ND	ND	ND	ND
AMW-04	9/12/2007	ND	ND	ND	ND UJ
AMW-04	12/18/2007	ND	ND	ND	ND
AMW-04	3/26/2008	ND	ND	ND	ND
AMW-04	6/25/2008	ND	ND	ND	ND
AMW-04	9/17/2008	ND	ND	ND	ND
AMW-04	12/16/2008	ND	ND	ND	0.63
AMW-04	3/11/2009	ND	ND	ND	ND
AMW-04	6/10/2009	ND	R	R	ND
AMW-04	9/16/2009	ND	ND	ND	ND
AMW-04	12/16/2009	ND UJ	ND	ND	ND
AMW-04	3/30/2010	ND	610	ND	0.57
AMW-04	6/9/2010	ND	430	ND	ND
AMW-04	9/14/2010	ND	ND	ND	ND
AMW-04	12/14/2010	ND	ND	ND	ND
Cleanup Level		1,000	10,000	10,000	71
Method Reporting Limit		50	250	750	0.5

Table 1. Groundwater Monitoring Analytical Results for TPH and Benzene
Plant 1 Waterfront Confirmation Wells
Site: Former BP Harbor Island Terminal

Well	Date	TPH-G WTPH-G (µg/L)	TPH-D WTPH-DX (µg/L)	TPH-O WTPH-DX (µg/L)	Benzene EPA 8021 & 8260 (µg/L)
Plant 1, continued					
AMW-04	3/22/2011	ND	ND	ND	ND
AMW-04	6/22/2011	ND	ND	ND	ND
AMW-04	9/27/2011	ND	ND	ND	ND
AMW-04	12/27/2011	ND	ND	ND	ND
AMW-04	3/20/2012	ND	ND	ND	ND
AMW-04	6/21/2012	ND	ND	ND	ND
AMW-04	9/10/2012	ND	ND	ND	ND
AMW-04	12/19/2012	ND	ND	ND	ND
AMW-04	3/19/2013	ND	ND	ND	ND
AMW-04	6/25/2013	ND	ND	ND	ND
AMW-04	9/10/2013	ND	ND	ND	ND
AMW-04	12/10/2013	ND	ND	ND	ND
AMW-04	3/11/2014	ND	780 J	ND	ND
AMW-04	6/10/2014	ND UJ	400	ND	ND
AMW-04	9/9/2014	ND	480	ND	ND
AMW-04	12/9/2014	ND	630	ND	ND
AMW-04	3/10/2015	ND U	590	ND	ND
AMW-04	6/9/2015	ND	420	ND	ND
AMW-04	9/22/2015	ND	ND	ND	ND
AMW-04	12/15/2015	ND	ND	ND	ND
AMW-04	3/8/2016	ND	390	ND U	ND
AMW-04	6/8/2016	ND	860	ND	ND
AMW-04	9/8/2016	ND	800	ND	ND
AMW-04	12/6/2016	ND	830	ND	ND U
AMW-04	3/7/2017	ND	830	640	ND
AMW-04	6/6/2017	ND	ND	ND	ND
AMW-04	9/12/2017	ND	ND	ND	ND
AMW-04	12/5/2017	ND	ND	ND	ND
AMW-04	3/20/2018	74 J	ND	ND	ND
AMW-04	6/19/2018	ND	300	ND	ND
AMW-04	9/11/2018	ND	ND	ND	ND
AMW-04	12/11/2018	ND	500	ND	ND
AMW-04	3/12/2019	59	ND	ND	ND
AMW-04	6/18/2019	ND	ND	ND	ND
AMW-04	9/24/2019	ND	ND	ND	ND
AMW-04	12/17/2019	ND	ND	ND	ND
AMW-05	12/21/2000	ND	1,450	ND	ND
AMW-05	3/28/2001	ND	1,360	ND	ND
AMW-05	6/13/2001	ND	440	ND	ND
AMW-05	10/4/2001	71.4 U	318	ND	ND
AMW-05	12/12/2001	ND	940 J	ND UJ	ND
AMW-05	3/7/2002	ND	1,100	ND	2.12
AMW-05	6/12/2002	78	1,180	ND	0.701
AMW-05	9/19/2002	ND UJ	760 J	ND UJ	1.45 J
AMW-05	12/17/2002	ND	1,820	ND	ND
Cleanup Level		1,000	10,000	10,000	71
Method Reporting Limit		50	250	750	0.5

Table 1. Groundwater Monitoring Analytical Results for TPH and Benzene
Plant 1 Waterfront Confirmation Wells
Site: Former BP Harbor Island Terminal

Well	Date	TPH-G WTPH-G (µg/L)	TPH-D WTPH-DX (µg/L)	TPH-O WTPH-DX (µg/L)	Benzene EPA 8021 & 8260 (µg/L)
Plant 1, continued					
AMW-05	3/26/2003	ND	1,900	ND	0.577
AMW-05	3/27/2003	ND	381 J	ND UJ	ND
AMW-05	9/19/2003	ND	2,150	ND	ND
AMW-05	12/22/2003	ND	1,420 J	ND	0.833
AMW-05	3/8/2004	ND	ND	ND	ND
AMW-05	6/16/2004	ND	ND	ND	ND
AMW-05	9/27/2004	ND	ND	ND	ND
AMW-05	12/6/2004	ND	ND	ND	ND
AMW-05	3/10/2005	ND	ND	ND	ND
AMW-05	6/21/2005	ND	ND	ND	ND
AMW-05	9/27/2005	ND	ND UJ	ND	ND
AMW-05	12/13/2005	ND	ND	ND	0.727
AMW-05	3/21/2006	ND	ND	ND	0.692
AMW-05	7/6/2006	ND	ND	ND	ND
AMW-05	9/18/2006	ND	ND	ND	ND
AMW-05	12/12/2006	ND UJ	ND UJ	ND UJ	0.565 J
AMW-05	3/21/2007	ND	ND	ND	1.11
AMW-05	6/6/2007	ND	ND	ND	ND
AMW-05	9/12/2007	ND	ND	ND	ND UJ
AMW-05	12/18/2007	ND	ND	ND	ND
AMW-05	3/26/2008	ND	ND	ND	ND
AMW-05	6/25/2008	ND	ND	ND UJ	ND
AMW-05	9/17/2008	ND	ND	ND UJ	ND
AMW-05	12/16/2008	ND	ND	ND	0.768
AMW-05	3/11/2009	ND	ND	ND	0.885
AMW-05	6/10/2009	ND	R	R	ND
AMW-05	9/16/2009	54	ND	ND	ND
AMW-05	12/16/2009	ND UJ	ND	ND	ND
AMW-05	3/30/2010	ND	890	ND	1.3
AMW-05	6/9/2010	ND	640	ND	ND
AMW-05	9/14/2010	ND	ND	ND	ND
AMW-05	12/14/2010	ND	ND	ND	ND
AMW-05	3/22/2011	ND	ND	ND	ND
AMW-05	6/22/2011	ND	ND	ND	ND
AMW-05	9/27/2011	ND	ND	ND	ND
AMW-05	12/20/2011	ND	ND	ND	ND
AMW-05	3/20/2012	ND	ND	ND	ND
AMW-05	6/21/2012	ND	ND	ND	ND
AMW-05	9/10/2012	ND	ND	ND	ND
AMW-05	12/19/2012	ND	ND	ND	ND
AMW-05	3/19/2013	ND	ND	ND	ND
AMW-05	6/25/2013	ND	ND	ND	ND
AMW-05	9/10/2013	ND	ND	ND	ND
AMW-05	12/10/2013	ND	ND	ND	ND
AMW-05	3/11/2014	ND	ND	ND	ND
AMW-05	6/10/2014	ND UJ	560	ND	ND
Cleanup Level		1,000	10,000	10,000	71
Method Reporting Limit		50	250	750	0.5

Table 1. Groundwater Monitoring Analytical Results for TPH and Benzene
Plant 1 Waterfront Confirmation Wells
Site: Former BP Harbor Island Terminal

Well	Date	TPH-G WTPH-G (µg/L)	TPH-D WTPH-DX (µg/L)	TPH-O WTPH-DX (µg/L)	Benzene EPA 8021 & 8260 (µg/L)
Plant 1, continued					
AMW-05	9/9/2014	ND	300	ND	ND
AMW-05	12/9/2014	ND	460	ND	ND
AMW-05	3/10/2015	ND	480	ND	ND
AMW-05	6/9/2015	ND	300	ND	ND
AMW-05	9/22/2015	ND	ND	ND	ND
AMW-05	12/15/2015	ND	ND	ND	ND
AMW-05	3/8/2016	ND	ND	ND U	ND
AMW-05	6/8/2016	ND	850	ND	ND
AMW-05	9/8/2016	ND	1,300	ND	2.0
AMW-05	12/6/2016	ND	420	ND	ND U
AMW-05	3/7/2017	ND	910	1,000	ND
AMW-05	6/6/2017	ND	ND	ND	ND
AMW-05	9/12/2017	ND	ND	ND	ND
AMW-05	12/5/2017	ND	ND	ND	ND
AMW-05	3/20/2018	ND	ND	340	ND
AMW-05	6/19/2018	ND	ND	ND	ND
AMW-05	9/11/2018	ND	ND	ND	ND
AMW-05	12/11/2018	ND	320	ND	ND
AMW-05	3/12/2019	51	ND	ND	ND
AMW-05	6/18/2019	ND	ND	ND	ND
AMW-05	9/24/2019	ND	ND	ND	ND
AMW-05	12/17/2019	ND	ND	ND	ND
Cleanup Level		1,000	10,000	10,000	71
Method Reporting Limit		50	250	750	0.5

Note: Values in **bold** exceed the cleanup level.

J Estimated value.
µg/L Micrograms per liter.
NA Not analyzed.
ND Constituent not detected above reporting limit.
NS Not sampled.
TPH Total petroleum hydrocarbons.
TPH-D Total petroleum hydrocarbons as diesel.
TPH-G Total petroleum hydrocarbons as gasoline.
TPH-O Total petroleum hydrocarbons as oil.
U Undetected.
WTPH-DX Washington State Method for Analysis of Diesel and Oil in Water - Extended.
WTPH-G Washington State Method for Analysis of Gasoline in Water.
EPA 8021 or EPA 9260 - EPA Methods for Analysis of Benzene in Water.
** AMW-02 benzene result from 12/17/2019 of 69.75 is the average of 4 analyses performed from the sample.

Table 2. Waterfront Groundwater Recovery Wells Petroleum Hydrocarbon History
Site: Former BP Harbor Island Terminal

Well ID	Date	Gasoline mg/l	Diesel mg/l	Oil mg/l	Benzene ug/l	Toluene ug/l	Ethylbenzene ug/l	Xylenes (total) ug/l
RW-10	Nov-03	0.625			1.2	0.892	2.42	3.07
RW-10	Aug-04	0.661	**36.2**	3.46	0.5	0.5	0.653	1.99
RW-10	Feb-05	0.473	1.21	0.75	0.5	0.5	0.5	1.41
RW-10	Nov-05	0.420	13.3	1.63	0.5	0.5	0.5	1
RW-10	Mar-06	0.066	4.14	0.75	0.5	0.5	0.5	1
RW-10	Nov-06	0.930	3.48	1.09	0.5	0.5	0.5	1
RW-10	May-07	0.073	0.255	*0.5*	0.5	0.5	0.5	1
RW-10	Nov-07	0.246	4.65	0.841	0.5	0.5	0.5	1
RW-10	Apr-08	0.235	1.91	*0.515*	0.5	0.5	0.5	1
RW-10	Nov-08	0.347	8.21	0.946	0.5	0.5	0.5	1
RW-10	Apr-09	0.448	5.95	0.804	0.5	0.5	0.5	1.36
RW-10	Nov-09	0.320	5.2	0.78	*0.5*	*1*	*1*	*2*
RW-10	Apr-10	0.460	2.3	*0.49*	*0.5*	*1*	*1*	*2*
RW-10	Nov-10	0.251	2.4	0.65	*0.5*	*1*	*1*	*3*
RW-10	Apr-11	0.6	1.5	0.68	*0.5*	*1*	*1*	*3*
RW-10	Nov-11	0.171	0.22	*0.39*	*0.5*	*1*	*1*	*3*
RW-10	Apr-12	0.366	0.51	0.46	*0.5*	*1*	*1*	*3*
RW-10	Nov-12	*0.1*	*0.11*	*0.11*	*0.5*	*0.5*	*0.5*	*1.5*
RW-10	Apr-13	0.2	0.36	*0.49*	*0.5*	*0.5*	*0.5*	*0.5*
RW-10	Nov-13	0.13	*0.25*	*0.25*	*0.5*	*0.5*	*0.5*	*1*
RW-10	Apr-14	0.16	1.6	0.73	*0.14*	*0.16*	*0.13*	0.13
RW-10	Nov-14	0.11	0.78	0.36	*1.0*	*1.0*	*1.0*	*3.0*
RW-10	Apr-15	0.091	0.97	0.8	*2.0*	*2.0*	*3.0*	*3.0*
RW-10	Nov-15	0.67	1.5	0.28	4.3	*2.0*	*3.0*	0.73
RW-10	Apr-16	0.28	1.9	1.4	*2.0*	*2.0*	*3.0*	*3.0*
RW-10	Nov-16	0.069	0.77	0.32	*0.2*	*0.2*	*0.2*	*0.5*
RW-10	Apr-17	*0.5*	*0.11*	*0.25*	*2.0*	*2.0*	*3.0*	*3.0*
RW-10	Nov-17	0.069	0.36	*0.25*	*0.2*	*0.2*	*0.2*	*0.5*
RW-10	Apr-18	0.12	0.33	*0.26*	*0.2*	*0.2*	*0.2*	*0.5*
RW-10	Nov-18	0.12	3.4	2.8	*0.2*	*0.2*	*0.2*	*0.5*
RW-10	Apr-19	0.073	1.6	0.96	*0.2*	*0.2*	*0.2*	*0.5*
RW-10	Nov-19	0.053	1.7	0.84	*0.5*	*2.0*	*2.0*	*4.0*
RW-10	Average	0.3	3.5	0.8	0.7	0.8	1.0	1.7
RW-9	Nov-03	**13.1**			5	43.2	146	1180
RW-9	Aug-04	**1.24**	**94.9**	2.19	0.5	0.5	1.23	1.64
RW-9	Feb-05	0.907	**22.1**	<15	0.5	0.5	3.64	4.74
RW-9	Nov-05	0.568	4.31	0.708	0.5	0.5	0.968	1.45
RW-9	Mar-06	0.166	1.68	0.75	0.5	0.5	0.5	1
RW-9	Nov-06	0.359	5.98	1.17	0.5	0.5	0.647	1.09
RW-9	May-07	0.402	2.08	*0.5*	5.43	0.5	1.4	1.49
RW-9	Nov-07	0.184	**70.1**	**11.6**	0.5	*0.5*	*0.5*	*1*
RW-9	Apr-08	0.170	**18.2**	2.94	3.21	*0.5*	*0.5*	*1*
RW-9	Nov-08	0.130	**49.5**	8.21	0.5	*0.5*	*0.5*	*1*
RW-9	Apr-09	0.280	**45.1**	6.71	0.5	*0.5*	*0.5*	*1*
RW-9	Nov-09	0.670	**32**	6.8	1.5	*1*	*1*	*2*
RW-9	Apr-10	**6.0**	**110**	**24**	*0.5*	*1*	*1*	*2*
RW-9	Nov-10	0.207	2.0	0.53	*0.5*	*1*	*1*	*3*
RW-9	Apr-11	**1.12**	**276**	**45.9**	*0.5*	*1*	*1*	*3*
RW-9	Nov-11	0.289	2.3	*0.39*	*0.5*	*1*	*1*	*3*
RW-9	Apr-12	0.113	**33.2**	5.3	0.72	*1*	*1*	*3*
RW-9	Nov-12	*0.1*	8.2	8.4	0.5	*0.5*	*0.5*	*1.5*
RW-9	Apr-13	0.1	**44.0**	8.5	*0.5*	*0.5*	*0.5*	*0.5*
RW-9	Nov-13	0.062	**14.0**	2.6	*0.5*	*0.5*	*0.5*	*1*
RW-9	Apr-14	0.14	**56.0**	**16**	*0.14*	*0.16*	*0.13*	*0.12*
RW-9	Nov-14	0.14	7.1	2.7	*1.0*	*1.0*	*1.0*	*3.0*
RW-9	Apr-15	0.18	**14.0**	4.9	*2.0*	*2.0*	*3.0*	*3.0*
RW-9	Nov-15	0.32	**7.6**	3.0	*2.0*	*2.0*	*3.0*	*3.0*
RW-9	Apr-16	**1.5**	**180.0**	**38.0**	*2.0*	*2.0*	*3.0*	*3.0*
RW-9	Nov-16	0.17	**12.0**	3.8	*0.2*	*0.2*	*0.2*	*0.5*
RW-9	Apr-17	0.5	**64.0**	**17.0**	*2.0*	*2.0*	*3.0*	*3.0*
RW-9	Nov-17	0.14	**14.0**	4.4	*0.2*	*0.2*	*0.2*	*0.5*
RW-9	Apr-18	0.068	**11.0**	3.3	*0.2*	*0.2*	*0.2*	*0.5*
RW-9	Nov-18	0.093	**17.0**	7.2	*0.2*	*0.2*	*0.2*	*0.5*
RW-9	Apr-19	*0.05*	8.7	2.8	*0.2*	*0.2*	*0.2*	*0.5*
RW-9	Nov-19	0.054	7.5	2.4	*0.2*	*2.0*	*2.0*	*4.0*
RW-9	Average	**0.9**	**39.8**	8.1	1.1	2.1	5.6	38.6
Groundwater Cleanup Level		**1.0**	**10.0**	**10.0**	**71**			
Reporting Limits/Units		0.05 mg/l	0.25 mg/l	.750 mg/l	0.5 ug/l	Varies	Varies	Varies

Table 2. Waterfront Groundwater Recovery Wells Petroleum Hydrocarbon History
Site: Former BP Harbor Island Terminal

Well ID	Date	Gasoline mg/l	Diesel mg/l	Oil mg/l	Benzene ug/l	Toluene ug/l	Ethylbenzene ug/l	Xylenes (total) ug/l
RW-8	Nov-03	0.367			0.5	0.5	0.787	2.23
RW-8	Aug-04	0.181	**19.8**	2.19	0.5	0.5	0.53	2.13
RW-8	Feb-05	0.218	2.58	0.75	0.5	0.5	0.564	3.04
RW-8	Nov-05	0.099	0.575	0.721	0.5	0.5	0.5	1
RW-8	Mar-06	0.050	1.44	0.75	0.5	0.5	0.5	1
RW-8	Nov-06	0.050	3.58	0.762	0.5	0.5	0.5	1
RW-8	May-07	0.068	0.273	*0.5*	0.5	0.5	0.5	1
RW-8	Nov-07	0.065	0.29	0.543	0.5	0.5	0.5	1
RW-8	Apr-08	0.067	0.279	*0.529*	0.5	0.5	0.5	1
RW-8	Nov-08	0.088	3.85	0.492	0.5	0.5	0.5	1
RW-8	Apr-09	0.091	0.255	*0.476*	0.5	0.5	0.5	1
RW-8	Nov-09	0.140	1.3	*0.47*	*0.5*	*1*	*1*	*2*
RW-8	Apr-10	0.150	1.1	*0.49*	*0.5*	*1*	*1*	*2*
RW-8	Nov-10	0.105	1.0	*0.39*	*0.5*	*1*	*1*	*3*
RW-8	Apr-11	0.0995	2.6	0.59	*0.5*	*1*	*1*	*3*
RW-8	Nov-11	0.183	1.7	*0.39*	*0.5*	*1*	*1*	*3*
RW-8	Apr-12	*0.05*	1.3	*0.39*	*0.5*	*1*	*1*	*3*
RW-8	Nov-12	0.185	4.0	3.6	*0.5*	*0.5*	*0.5*	*1.5*
RW-8	Apr-13	0.062	2.7	0.52	*0.5*	*0.5*	*0.5*	*0.5*
RW-8	Nov-13	0.1	0.82	*0.25*	*0.5*	*0.5*	*0.5*	*1*
RW-8	Apr-14	0.13	3.40	0.91	0.15	*0.16*	*0.13*	0.52
RW-8	Nov-14	0.14	**10.0**	3.2	*1.0*	*1.0*	*1.0*	*3.0*
RW-8	Apr-15	0.13	5.2	2.0	*2.0*	*2.0*	*3.0*	*3.0*
RW-8	Nov-15	0.39	5.5	1.5	0.91	*2.0*	*3.0*	*3.0*
RW-8	Apr-16	0.28	**18.0**	7.7	*2.0*	*2.0*	*3.0*	*3.0*
RW-8	Nov-16	0.25	7.6	0.64	0.64	*0.2*	*0.2*	*0.5*
RW-8	Apr-17	0.5	2.0	0.37	2.00	*2.0*	*3.0*	*3.0*
RW-8	Nov-17	0.12	3.8	1.30	*0.20*	*0.2*	*0.2*	*0.5*
RW-8	Apr-18	0.11	4.0	1.20	*0.20*	*0.2*	*0.2*	*0.5*
RW-8	Nov-18	0.16	3.0	1.10	*0.20*	*0.2*	0.44	2.0
RW-8	Apr-19	0.091	0.95	*0.26*	*0.20*	*0.2*	*0.2*	*0.5*
RW-8	Nov-19	0.081	0.7	*0.75*	*0.50*	*2.0*	*2.00*	*4.0*
RW-8	Average	0.2	3.7	1.2	0.6	0.8	0.9	1.8
RW-7	Nov-03	0.148			0.5	0.5	0.518	2.87
RW-7	Aug-04	0.050	7.6	1.2	0.5	0.5	0.5	1.09
RW-7	Feb-05	0.050	1.21	0.75	0.5	0.5	0.5	1
RW-7	Nov-05	0.050	0.35	0.728	0.5	0.5	0.5	1
RW-7	Mar-06	0.050	0.25	0.75	0.5	0.5	0.5	1
RW-7	Nov-06	0.063	3.16	1.34	0.5	0.5	0.5	1
RW-7	May-07	0.414	0.49	*0.515*	0.5	0.5	0.5	1
RW-7	Nov-07	0.187	0.25	*0.5*	0.5	0.5	0.5	1
RW-7	Apr-08	0.063	0.25	*0.5*	0.5	0.5	0.5	1
RW-7	Nov-08	0.071	0.236	*0.472*	0.5	0.5	0.5	1
RW-7	Apr-09	0.123	0.238	*0.476*	0.5	0.5	0.5	1
RW-7	Nov-09	0.075	0.69	*0.47*	*0.5*	*1*	*1*	*2*
RW-7	Apr-10	0.140	0.85	*0.49*	*0.5*	*1*	*1*	*2*
RW-7	Nov-10	0.11	0.46	*0.4*	*0.5*	*1*	*1*	*3*
RW-7	Apr-11	0.207	1.1	*0.41*	*0.5*	*1*	*1*	*3*
RW-7	Nov-11	*0.05*	0.13	*0.4*	*0.5*	*1*	*1*	*3*
RW-7	Apr-12	*0.05*	0.21	*0.42*	*0.5*	*1*	*1*	*3*
RW-7	Nov-12	*0.1*	0.32	0.37	*0.5*	*0.5*	*0.5*	*1.5*
RW-7	Apr-13	0.081	0.63	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*
RW-7	Nov-13	*0.05*	0.45	*0.24*	*0.5*	*0.5*	*0.5*	*1*
RW-7	Apr-14	0.07	2.4	0.6	0.17	*0.16*	0.17	0.23
RW-7	Nov-14	0.064	0.92	*0.25*	*1.0*	*1.0*	*1.0*	*3.0*
RW-7	Apr-15	0.073	5.2	1.6	*2.0*	*2.0*	*3.0*	*3.0*
RW-7	Nov-15	0.11	0.41	0.88	*2.0*	*2.0*	*3.0*	*3.0*
RW-7	Apr-16	0.26	7.9	2.5	*2.0*	*2.0*	*3.0*	*3.0*
RW-7	Nov-16	0.11	0.89	*0.25*	*0.2*	*0.2*	*0.2*	*0.5*
RW-7	Apr-17	0.5	0.75	*0.27*	*2.0*	*2.0*	*3.0*	*3.0*
RW-7	Nov-17	0.05	0.21	*0.26*	*0.2*	*0.2*	*0.2*	*0.5*
RW-7	Apr-18	0.061	1.2	*0.26*	*0.2*	*0.2*	*0.2*	*0.5*
RW-7	Nov-18	0.065	0.48	*0.26*	*0.2*	*0.2*	*0.2*	*0.5*
RW-7	Apr-19	*0.05*	0.25	*0.26*	*0.2*	*0.2*	*0.2*	*0.5*
RW-7	Nov-19	*0.05*	*0.25*	*0.75*	*0.2*	*2.0*	*2.0*	*4.0*
RW-7	Average	0.1	1.3	0.6	0.6	0.8	0.9	1.7
Groundwater Cleanup Level		**1.0**	**10.0**	**10.0**	**71**			
Reporting Limits/Units		0.05 mg/l	0.25 mg/l	.750 mg/l	0.5 ug/l	Varies	Varies	Varies

Table 2. Waterfront Groundwater Recovery Wells Petroleum Hydrocarbon History
Site: Former BP Harbor Island Terminal

Well ID	Date	Gasoline mg/l	Diesel mg/l	Oil mg/l	Benzene ug/l	Toluene ug/l	Ethylbenzene ug/l	Xylenes (total) ug/l
RW-1	Nov-03	0.858	8.73	1.34	1.03	0.758	2.71	3.39
RW-1	Aug-04	**1.00**	**31.6**	2.08	0.685	0.787	2.1	4.18
RW-1	Feb-05	**1.03**	**18.9**	0.75	10.5	4.66	4.06	20.2
RW-1	Nov-05	0.547	2.19	0.708	0.5	0.5	0.5	1.67
RW-1	Mar-06	0.144	4.78	0.802	0.5	0.5	0.5	1
RW-1	Nov-06	0.173	3.28	*0.487*	0.5	0.5	0.5	1
RW-1	May-07	0.081	0.972	*0.526*	0.5	0.5	0.5	1
RW-1	Nov-07	0.056	0.596	*0.505*	0.5	0.5	0.5	1
RW-1	Apr-08	0.068	0.25	*0.5*	0.5	0.5	0.5	1
RW-1	Nov-08	0.050	0.274	*0.472*	0.5	0.5	0.5	1
RW-1	Apr-09	0.074	0.332	*0.481*	0.5	0.5	0.5	1
RW-1	Nov-09	0.073	0.44	*0.47*	*0.5*	*1*	*1*	*2*
RW-1	Apr-10	0.071	0.31	*0.49*	*0.5*	*1*	*1*	*2*
RW-1	Nov-10	0.143	0.32	*0.39*	*0.5*	*1*	*1*	*3*
RW-1	Apr-11	0.0991	0.95	*0.39*	*0.5*	*1*	*1*	*3*
RW-1	Nov-11	0.14	6.9	1.6	*0.5*	*1*	*1*	*3*
RW-1	Apr-12	0.131	0.86	*0.4*	0.53	*1*	*1*	*3*
RW-1	Nov-12	*0.1*	0.23	0.35	*0.5*	*0.5*	*0.5*	*1.5*
RW-1	Apr-13	0.15	0.47	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*
RW-1	Nov-13	0.12	0.4	*0.25*	*0.5*	*0.5*	*0.5*	*1*
RW-1	Apr-14	0.17	0.9	0.34	0.3	*0.16*	0.35	0.44
RW-1	Nov-14	0.19	0.72	*0.25*	*1.0*	*1.0*	*1.0*	*3.0*
RW-1	Apr-15	0.18	5.0	1.2	*2.0*	*2.0*	*3.0*	*3.0*
RW-1	Nov-15	0.52	0.96	0.18	2.6	*2.0*	*3.0*	*3.0*
RW-1	Apr-16	0.24	2.5	0.69	*2.0*	*2.0*	*3.0*	*3.0*
RW-1	Nov-16	0.16	0.63	0.078	0.22	*0.2*	0.25	*0.5*
RW-1	Apr-17	0.5	0.17	0.26	*2.00*	*2.0*	*3.00*	*3.0*
RW-1	Nov-17	0.086	0.85	0.078	0.26	*0.2*	*0.20*	*0.5*
RW-1	Apr-18	0.2	0.69	*0.26*	0.23	*0.2*	0.31	*0.5*
RW-1	Nov-18	0.16	1.5	0.36	*0.20*	*0.2*	*0.20*	*0.5*
RW-1	Apr-19	0.11	0.73	*0.25*	*0.20*	*0.2*	0.25	*0.5*
RW-1	Nov-19	0.11	*0.25*	*0.75*	*0.50*	*2.0*	*2.00*	*4.0*
RW-1	Average	0.2	3.1	0.6	1.0	0.9	1.2	2.4
RW-6	Nov-03	**1.81**			**569**	23.1	10	116
RW-6	Aug-04	0.067	0.25	0.75	0.5	0.5	0.5	1
RW-6	Feb-05	0.101	0.25	0.75	0.5	0.5	0.788	1.3
RW-6	Nov-05	**8.19**	**115**	**14.7**	7.62	2.56	53.6	524
RW-6	Mar-06	**31.80**	**560**	**300**	12.7	9.15	96.7	568
RW-6	Nov-06	**1.14**	**26.8**	*1.05*	0.591	0.5	0.636	10
RW-6	May-07	**1.02**	**38.9**	*5.05*	34	1.44	16.6	15.2
RW-6	Nov-07	0.05	1.9	*5.32*	0.5	0.5	0.5	1
RW-6	Apr-08	0.33	5.56	0.542	10.2	1.22	9.56	6.9
RW-6	Nov-08	0.05	0.734	*0.472*	0.5	0.5	0.5	1
RW-6	Apr-09	0.175	1.14	*0.476*	6.93	0.5	3.08	3.32
RW-6	Nov-09	*0.050*	0.73	*0.47*	*0.5*	*1*	*1*	*2*
RW-6	Apr-10	**1.10**	3.2	*0.49*	53	2	9.4	6.7
RW-6	Nov-10	0.266	2.5	*0.39*	*0.5*	*1*	*1*	*3*
RW-6	Apr-11	0.595	*0.37*	*0.41*	15.1	*1*	9.5	6.7
RW-6	Nov-11	*0.05*	0.21	*0.38*	*0.5*	*1*	*1*	*3*
RW-6	Apr-12	*0.05*	0.98	*0.4*	1.1	*1*	*1*	*3*
RW-6	Nov-12	*0.1*	*0.11*	*0.11*	*0.5*	*0.5*	*0.5*	*1.5*
RW-6	Apr-13	0.18	1.1	*0.49*	0.82	*0.5*	*0.5*	0.55
RW-6	Nov-13	0.052	0.29	*0.25*	*0.5*	*0.5*	*0.5*	*1*
RW-6	Apr-14	0.19	1.4	0.36	2.1	0.34	1.3	0.64
RW-6	Nov-14	0.068	0.46	*0.25*	*1.0*	*1.0*	*1.0*	*3.0*
RW-6	Apr-15	0.13	0.46	*0.26*	*2.0*	*2.0*	*3.0*	*3.0*
RW-6	Nov-15	0.097	0.6	0.14	*2.0*	*2.0*	*3.0*	*3.0*
RW-6	Apr-16	0.21	6.3	2.4	*2.0*	*2.0*	*3.0*	*3.0*
RW-6	Nov-16	0.18	1.3	0.32	*0.2*	*0.2*	*0.2*	*0.5*
RW-6	Apr-17	0.5	0.66	0.51	*2.0*	*2.0*	*3.0*	*3.0*
RW-6	Nov-17	0.05	0.22	0.27	*0.2*	*0.2*	*0.2*	*0.5*
RW-6	Apr-18	0.11	0.54	*0.25*	*0.2*	*0.2*	*0.2*	*0.5*
RW-6	Nov-18	0.086	0.58	*0.25*	*0.2*	*0.2*	*0.2*	*0.5*
RW-6	Apr-19	0.053	0.14	*0.25*	*0.2*	*0.2*	*0.2*	*0.5*
RW-6	Nov-19	*0.05*	0.46	*0.75*	*0.5*	*2.0*	*2.0*	*4.0*
RW-6	Average	**1.5**	**24.9**	**10.9**	22.8	1.9	7.3	40.5
Groundwater Cleanup Level		**1.0**	**10.0**	**10.0**	**71**			
Reporting Limits/Units		0.05 mg/l	0.25 mg/l	.750 mg/l	0.5 ug/l	Varies	Varies	Varies

Table 2. Waterfront Groundwater Recovery Wells Petroleum Hydrocarbon History
Site: Former BP Harbor Island Terminal

Well ID	Date	Gasoline mg/l	Diesel mg/l	Oil mg/l	Benzene ug/l	Toluene ug/l	Ethylbenzene ug/l	Xylenes (total) ug/l
RW-5	Nov-03	**2.10**	4.13	0.75	5.21	0.657	83.5	186
RW-5	Aug-04	**7.60**	**14.5**	1.55	1.93	1.67	324	630
RW-5	Feb-05	**3.18**	**17.4**	**15**	**37.8**	40	38.5	287
RW-5	Nov-05	**19.60**	**1240**	**361**	**43.2**	42	66.2	879
RW-5	Mar-06	**1.79**	**13.3**	7.5	1.06	24.2	8.03	129
RW-5	Nov-06	0.741	8	1.67	0.5	0.5	0.732	4.23
RW-5	May-07	**2.920**	**13.9**	2.01	22.1	0.705	16.7	60.1
RW-5	Nov-07	1.430	2.16	0.639	1.08	0.5	1.87	2.07
RW-5	Apr-08	0.240	7.71	2.17	5.64	0.5	1.19	1.48
RW-5	Nov-08	**1.520**	0.916	*0.472*	6.32	0.5	2.85	3.55
RW-5	Apr-09	0.873	**11.7**	2.45	**93.3**	2.42	8.74	16.5
RW-5	Nov-09	0.066	0.4	*0.47*	*0.5*	*1*	*1*	*2*
RW-5	Apr-10	0.570	1.4	*0.49*	7.3	*1*	15	29
RW-5	Nov-10	0.785	0.9	*0.39*	30.5	*1*	2	5.3
RW-5	Apr-11	0.801	1.3	*0.41*	10.3	*1*	3.5	7
RW-5	Nov-11	0.18	1.2	*0.39*	9.2	*1*	5.6	3.9
RW-5	Apr-12	0.746	0.35	*0.41*	14.1	*1*	6.8	26
RW-5	Nov-12	*0.1*	0.38	0.41	1.6	*0.5*	*0.5*	*1.5*
RW-5	Apr-13	0.18	**26**	2.2	0.57	*0.5*	*0.5*	*0.5*
RW-5	Nov-13	0.22	*0.25*	*0.25*	0.83	*0.5*	*0.5*	*1*
RW-5	Apr-14	0.46	2.8	0.79	5.2	0.55	1.9	4.1
RW-5	Nov-14	0.28	1.7	0.56	*1.0*	*1.0*	*1.0*	*3.0*
RW-5	Apr-15	0.45	2.4	0.89	3.2	*2.0*	*3.0*	*3.0*
RW-5	Nov-15	0.39	2.2	0.36	*2.0*	*2.0*	*3.0*	*3.0*
RW-5	Apr-16	0.63	2.4	0.82	*2.0*	*2.0*	*3.0*	3.3
RW-5	Nov-16	0.72	4.4	1.00	0.59	*0.2*	0.40	0.41
RW-5	Apr-17	0.5	0.51	0.26	*2.00*	*2.0*	*3.00*	*3.00*
RW-5	Nov-17	0.32	1	0.26	1.10	*0.3*	2.60	0.74
RW-5	Apr-18	0.45	0.56	0.28	1.30	0.3	1.30	1.20
RW-5	Nov-18	0.25	4.2	2.10	1.40	*0.2*	0.76	4.50
RW-5	Apr-19	0.4	0.62	*0.26*	1.40	0.33	1.10	0.73
RW-5	Nov-19	*0.05*	0.55	0.75	0.50	*2.0*	*2.0*	*4.0*
RW-5	Average	**1.6**	**43.4**	**12.8**	9.8	4.2	19.1	72.1
RW-4	Nov-03	**4.89**			36.1	44.3	337	281
RW-4	Aug-04	**182.0**	**681**	**150**	**617**	7740	2750	15,200
RW-4	Feb-05	**49.4**	**2,610**	**765**	**347**	2830	834	7,210
RW-4	Nov-05	**77.5**	**3,650**	**1820**	**341**	6940	1100	8,010
RW-4	Mar-06	**26.1**	**440**	**150**	30.2	654	346	3,340
RW-4	Nov-06	**7.23**	**139**	*5.26*	65.2	157	47	1,090
RW-4	May-07	0.82	8.08	*0.543*	3.97	0.547	3.89	77.5
RW-4	Nov-07	**1.29**	0.553	*0.543*	1.97	0.536	3.5	106
RW-4	Apr-08	0.07	2.91	*0.532*	0.5	0.5	0.5	4.57
RW-4	Nov-08	0.73	6.43	*0.472*	6.86	0.5	3.6	28.2
RW-4	Apr-09	0.565	7.93	*0.481*	8.17	0.5	1.43	18.3
RW-4	Nov-09	**5.5**	**25**	1.2	22	1.9	30	310
RW-4	Apr-10	**4.2**	**10**	*0.49*	46	1.6	24	155
RW-4	Nov-10	**2.61**	**20**	0.86	39.9	*1.0*	15	47.9
RW-4	Apr-11	**5.73**	**29.5**	1.2	67.9	1.2	44.8	158
RW-4	Nov-11	**4.51**	**56.2**	1.4	48.5	*1.0*	43.6	98.3
RW-4	Apr-12	**6.24**	**38.1**	1.4	56.8	*1.2*	45.3	106
RW-4	Nov-12	0.771	**10.7**	9.2	7.5	*0.5*	3.9	10.1
RW-4	Apr-13	**1.1**	7.1	*0.5*	16	*0.5*	5.4	2.32
RW-4	Nov-13	0.77	0.63	*0.25*	12	*0.5*	6.2	12
RW-4	Apr-14	**3.7**	**50**	2.7	14	0.49	14	22
RW-4	Nov-14	**1.9**	8.7	0.57	15	*1.0*	16	23
RW-4	Apr-15	**3.0**	4.1	0.35	13	*2.0*	18	18
RW-4	Nov-15	**2.3**	**18**	0.95	13	0.45	5.3	7.6
RW-4	Apr-16	**3.1**	**22**	1.4	12	*2.0*	7	*3.0*
RW-4	Nov-16	0.86	**50**	2.9	1.9	*0.2*	0.41	*0.5*
RW-4	Apr-17	**2.2**	**22**	0.96	8.4	*2.0*	4	*3.0*
RW-4	Nov-17	**1.3**	**20**	1.2	22	1.2	2.7	1.3
RW-4	Apr-18	**1.3**	**24**	1.2	4.3	0.26	2.3	0.6
RW-4	Nov-18	**1.2**	**33**	1.9	12	0.34	0.45	1.1
RW-4	Apr-19	0.77	**28**	1.1	5.5	*0.20*	2.9	0.74
RW-4	Nov-19	0.48	**35**	*3.8*	10	*2.0*	*2.0*	*4.0*
RW-4	Average	**12.6**	**260**	**94**	59.6	574.7	178.8	1135.9
Groundwater Cleanup Level		**1.0**	**10.0**	**10.0**	**71**			
Reporting Limits/Units		0.05 mg/l	0.25 mg/l	.750 mg/l	0.5 ug/l	Varies	Varies	Varies

Table 2. Waterfront Groundwater Recovery Wells Petroleum Hydrocarbon History
Site: Former BP Harbor Island Terminal

Well ID	Date	Gasoline mg/l	Diesel mg/l	Oil mg/l	Benzene ug/l	Toluene ug/l	Ethylbenzene ug/l	Xylenes (total) ug/l
RW-2	Nov-03	**2.07**			**820**	369	34.5	124
RW-2	Aug-04	**7.03**	46	1.41	**2,270**	382	354	1,180
RW-2	Feb-05	**4.65**	1.02	0.75	**1,690**	450	296	752
RW-2	Nov-05	**2.82**	0.76	0.708	**1,540**	299	159	353
RW-2	Mar-06	**2.39**	6.84	3.75	**1,120**	112	138	224
RW-2	Nov-06	**13.10**	**14.3**	1.05	**1,830**	516	410	1,810
RW-2	May-07	**8.25**	6.35	*0.505*	**254**	33.1	237	1,150
RW-2	Nov-07	**3.55**	3.32	*0.538*	**895**	5	79.4	172
RW-2	Apr-08	**2.06**	**10.0**	*0.515*	**245**	5	58	190
RW-2	Nov-08	**1.42**	1.1	*0.481*	**360**	4.04	17.6	40
RW-2	Apr-09	0.497	0.864	*0.476*	49	1.78	9.49	22
RW-2	Nov-09	**2.4**	2.6	*0.48*	**400**	23	150	410
RW-2	Apr-10	**1.5**	1.0	*0.49*	**200**	1.5	66	98
RW-2	Nov-10	0.36	8.1	*0.6*	34.9	*1.0*	7.7	23.3
RW-2	Apr-11	**1.0**	1.5	*0.39*	**146**	1.3	27.8	51.7
RW-2	Nov-11	0.96	0.69	*0.39*	**363**	4.7	36.5	63.8
RW-2	Apr-12	0.57	**13.9**	*0.74*	**139**	*1.0*	13.7	17.4
RW-2	Nov-12	0.71	1.0	*0.91*	**196**	1.2	11.2	8.3
RW-2	Apr-13	0.47	3.0	*0.49*	**230**	2.0	20	6.6
RW-2	Nov-13	0.40	4.6	*0.25*	**80**	2.9	6.2	5.5
RW-2	Apr-14	**2.20**	7.2	0.53	**290**	100	84	79
RW-2	Nov-14	**2.30**	3.2	0.29	**460**	10	140	140
RW-2	Apr-15	**2.20**	2.7	0.3	**340**	28	77	55
RW-2	Nov-15	**1.6**	2.4	0.15	**330**	1.9	20	19
RW-2	Apr-16	**4.1**	**50**	2.3	**250**	16	40	31
RW-2	Nov-16	**3.6**	**170**	7.2	**330**	0.98	5.20	1.4
RW-2	Apr-17	**1.7**	7.4	0.28	**150**	130	29	15
RW-2	Nov-17	0.89	4.2	0.25	**390**	2.8	22	9.2
RW-2	Apr-18	**1.1**	**52**	2.2	**130**	6.6	4.9	2.2
RW-2	Nov-18	**2.4**	**16**	0.76	**180**	36	13	59
RW-2	Apr-19	0.66	8.1	0.32	26	0.49	5.4	1.2
RW-2	Nov-19	0.92	**20**	*3.8*	16	*2.0*	*2.0*	*4.0*
RW-2	Average	**2.5**	**15.2**	1.1	**492**	79.7	80.5	222.4
GM-11S	Nov-03	**2.28**			**614**	38.3	67.2	141
GM-11S	Aug-04	**2.06**	**57**	3.93	**506**	2.17	49.3	84.1
GM-11S	Feb-05	**2.42**	**25.1**	<15	55.6	0.848	25.5	17.3
GM-11S	Nov-05	**2.15**	**37.4**	<7.14	**124**	3.66	13.7	5.34
GM-11S	Mar-06	**1.41**	**17.8**	7.5	**218**	2.5	24.5	5
GM-11S	Nov-06	0.131	**10.8**	*1.05*	13.5	0.5	2.86	1.59
GM-11S	May-07	**1.68**	1.1	*0.556*	**175**	2.5	81.2	35.1
GM-11S	Nov-07	**2.20**	2.34	*0.505*	56.2	4.16	48.4	34.3
GM-11S	Apr-08	**1.93**	0.319	*0.532*	65.7	1.76	185	132
GM-11S	Nov-08	**1.66**	1.23	*0.472*	**95.3**	1.76	44.5	14.8
GM-11S	Apr-09	**1.26**	0.942	*0.481*	5.34	0.898	19.1	11.1
GM-11S	Aug-09	**1.90**	1.2	*0.48*	71	2.4	37	6.3
GM-11S	Nov-09	**1.50**	3.6	*0.48*	36	1.1	48	24
GM-11S	Apr-10	**3.00**	5	0.5	46	1.6	93	156
GM-11S	Nov-10	**1.39**	1.8	*0.48*	42	1.9	64.9	37.1
GM-11S	Apr-11	**1.42**	0.52	*0.4*	18.4	*1*	26.5	20.1
GM-11S	Nov-11	**2.28**	0.47	*0.38*	30.9	1.7	22.9	10.3
GM-11S	Apr-12	**2.24**	1.1	*0.38*	33	1.7	59.2	40.4
GM-11S	Nov-12	0.671	0.83	0.62	11.4	0.86	44.6	27.9
GM-11S	Apr-13	0.5	0.35	*0.49*	20	0.52	23	9.1
GM-11S pumping discontinued in May 2013 due to line blockage and concentrations mainly below cleanup levels.								
GM-11S	Nov-13	0.33	0.47	0.58	4.1	0.6	10	1
GM-11S	Apr-14	**1.2**	3.9	1.4	10	0.82	23	2.7
GM-11S	Nov-14	0.72	0.83	0.4	6.5	8.7	*1.0*	*3.0*
GM-11S	Apr-15	0.2	0.51	0.35	*2.0*	*2.0*	*3.0*	*3.0*
GM-11S	Nov-15	0.5	0.77	0.41	1.6	0.54	0.52	0.70
GM-11S	Apr-16	0.52	7.1	1.8	14.0	*2.0*	*3.0*	*3.0*
GM-11S	Nov-16	0.078	0.34	0.21	*0.2*	*0.2*	*0.2*	*0.5*
GM-11S	Apr-17	0.5	0.11	0.25	*2.0*	*2.0*	*3.0*	*3.0*
GM-11S	Nov-17	0.83	1.4	0.37	3.8	2.5	0.4	1.7
GM-11S	Apr-18	0.22	1.4	0.98	*0.2*	0.2	*0.2*	*0.5*
GM-11S	Nov-18	0.48	4.8	4.0	*0.2*	*0.2*	*0.2*	*0.5*
GM-11S	Apr-19	0.3	2.0	0.57	2.0	1.2	0.27	*0.5*
GM-11S	Nov-19	0.66	2.1	*0.75*	*0.5*	*2.0*	*2.0*	*4.0*
GM-11S	Average	**1.2**	6.1	1.0	**69.2**	2.9	31.1	25.4
Groundwater Cleanup Level		**1.0**	**10.0**	**10.0**	**71**			
Reporting Limits/Units		0.05 mg/l	0.25 mg/l	.750 mg/l	0.5 ug/l	Varies	Varies	Varies

Table 2. Waterfront Groundwater Recovery Wells Petroleum Hydrocarbon History
Site: Former BP Harbor Island Terminal

Well ID	Date	Gasoline mg/l	Diesel mg/l	Oil mg/l	Benzene ug/l	Toluene ug/l	Ethylbenzene ug/l	Xylenes (total) ug/l

Detection limits for many of the Oil analyses were raised due to sample dilution for diesel analyses.
These samples are listed with a "<" notation.
Values in italics were not detected at the listed reporting limit.
Values in bold exceed the cleanup level for confirmational wells.
Note that cleanup levels are included for reference only. Cleanup levels are to be met at points of compliance, which are downgradient from the recovery wells listed above.

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Table 3: Waterfront Probing Field and Laboratory Groundwater Sampling Results
Project: 2019 Waterfront Probing Investigation
Site: Former BP Harbor Island Terminal

Boring ID #	Well ID #	Sample Date and Time	Depth To Groundwater (Feet BGS)	Groundwater Elevation (NAVD 88 Datum)	Sheen Strength Observed	Measurable Free LNAPL Present	Gasoline NTWPH-Gx Result (µg/L)	Diesel NTWPH-Dx Result (µg/L)	Oil NTWPH-Dx Result (µg/L)	Benzene EPA-8260 Result (µg/L)
B-01	MW-01-PI	9/27/19 8:17 AM	5.41	6.55	**Slight**	None	110	460	<750	<0.5
B-03	MW-02-PI	9/26/19 11:05 AM	8.87	5.97	**Slight**	None	530	**13,000**	<1,500	<0.5
B-05	MW-03-PI	9/26/19 10:17 AM	8.76	6.32	**Slight**	None	<50	**13,000**	2,200	<0.5
B-07	MW-04-PI	9/26/19 9:47 AM	8.73	6.22	None	None	150	2,500	<750	<0.5
B-09	MW-05-PI	9/26/19 9:14 AM	9.09	6.1	None	None	<50	3,400	2,000	<0.5
B-11	MW-06-PI	9/26/19 8:28 AM	8.83	6.28	None	None	52	380	<750	<0.5
B-25	MW-07-PI	9/26/19 12:25 PM	8.98	6.14	**Slight**	None	240	5,600	860	<0.5
B-33	MW-08-PI	9/27/19 8:50 AM	5.96	6.06	None	None	180	<250	<750	<0.5
B-35	MW-09-PI	9/27/19 9:12 AM	5.67	5.88	**Slight**	None	530	1,800	<750	<0.5
B-41	MW-10-PI	9/27/19 9:50 AM	5.53	5.36	**Slight**	None	**2,200**	6,000	<750	68
B-42	MW-11-PI	9/27/19 10:45 AM	5.51	5.5	**Moderate**	None	**6,300**	3,400	<750	63
				Groundwater Cleanup Criteria[(a)]:	**None [(a)]**	**<0.01 feet**	**1,000 [(a)]**	**10,000 [(a)]**	**10,000 [(a)]**	**71 [(a)]**
						Reporting Limit:	50	250	750	0.5

Definitions:

µg/L - micrograms per liter
BGS - Below Ground Surface
LNAPL - Light Non-Aqueous Phase Liquid

Notes:

Values in bold exceed the associated cleanup criterion.
[(a)] - Associated cleanup criteria are to be met at the point of compliance, which is downgradient from the wells in this study. Data provided for comparison purposes only.

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Table 4: Waterfront Probing Field and Laboratory Soil Sampling Results
Project: 2019 Waterfront Probing Investigation
Site: Former BP Harbor Island Terminal

					Field Screening Results					Laboratory Analytical Results						
Boring ID #	Well ID #	Completion & Sample Date	Sample Depth (Feet BGS)	Sample Elevation (NAVD 88 Datum)	USCS Soil Type	Soil Recovered from depth (Yes or No)	Groundwater Present (1 - yes, 0 - no)	PID Field Screening Result (PPM)	Sheen Test Field Screening Result	Gasoline NTWPH-Gx Result (mg/kg)	Diesel NTWPH-Dx Result (mg/kg)	Oil NTWPH-Dx Result (mg/kg)	Total TPH Gasoline + Diesel + Oil Result (mg/kg)	% Gasoline of Total TPH	% Diesel of Total TPH	% Oil of Total TPH
B-01	MW-01	7/30/2019	1	11.26	SP	Yes	0	0	None							
B-01	MW-01	7/30/2019	2	10.26	SP	Yes	0	0	None							
B-01	MW-01	7/30/2019	3	9.26	SP	Yes	0	0	None							
B-01	MW-01	7/30/2019	4	8.26	SP	Yes	0	0	None							
B-01	MW-01	7/30/2019	5	7.26	SP	Yes	0	0	None							
B-01	MW-01	7/30/2019	6	6.26		No										
B-01	MW-01	7/30/2019	7	5.26		No										
B-01	MW-01	7/30/2019	8	4.26	SP	Yes	0	0	Moderate							
B-01	MW-01	7/30/2019	9	3.26	SP	Yes	1	100	Moderate							
B-01	MW-01	7/30/2019	10	2.26	SP	Yes	1	270	Heavy	3000	12000	1000	**16000**	19%	75%	6%
B-01	MW-01	7/30/2019	11	1.26		No	1									
B-01	MW-01	7/30/2019	12	0.26	SP	Yes	1	232	Heavy							
B-01	MW-01	7/30/2019	13	-0.74	SP	Yes	1	199	Heavy							
B-01	MW-01	7/30/2019	14	-1.74	SP	Yes	1	5	Slight							
B-01	MW-01	7/30/2019	15	-2.74	SP	Yes	1	1	Slight							
B-24		7/22/2019	1	14.54	SP	Yes	0	0	None							
B-24		7/22/2019	2	13.54	SP	Yes	0	0	None							
B-24		7/22/2019	3	12.54	SP	Yes	0	0	None							
B-24		7/22/2019	4	11.54	SP	Yes	0	0	None							
B-24		7/22/2019	5	10.54	SP	Yes	0	0	None							
B-24		7/22/2019	6	9.54	SP	Yes	0	0	None							
B-24		7/22/2019	7	8.54	SP	Yes	0	0	None							
B-24		7/22/2019	8	7.54	SP	Yes	0	0	None							
B-24		7/22/2019	9	6.54	SP	Yes	1	0	Slight							
B-24		7/22/2019	10	5.54	SP	Yes	1	63	Moderate							
B-24		7/22/2019	11	4.54	SP	Yes	1	54	Moderate							
B-24		7/22/2019	12	3.54	SP	Yes	1	62	Moderate							
B-24		7/22/2019	13	2.54	SP	Yes	1	1029	Heavy	1300	9800	940	**12040**	11%	81%	8%
B-24		7/22/2019	14	1.54	SP	Yes	1	249	Moderate							
B-24		7/22/2019	15	0.54	SP	Yes	1	5	Slight							
B-24		7/22/2019	16	-0.46	SP	Yes	1	154	Slight							
B-24		7/22/2019	17	-1.46	SP	Yes	1	100	Slight							
B-24		7/22/2019	18	-2.46	SP	Yes	1	20	None							
B-24		7/22/2019	19	-3.46	SP	Yes	1	0	None							
B-24		7/22/2019	20	-4.46	OH	Yes	1	0	None							
B-14		7/22/2019	1	14.44		No										
B-14		7/22/2019	2	13.44	SP	Yes	0	0	None							
B-14		7/22/2019	3	12.44	SP	Yes	0	0	None							
B-14		7/22/2019	4	11.44	SP	Yes	0	0	None							
B-14		7/22/2019	5	10.44	SP	Yes	0	0	None							
B-14		7/22/2019	6	9.44	SP	Yes	0	0	None							
B-14		7/22/2019	7	8.44	SP	Yes	0	0	None							
B-14		7/22/2019	8	7.44	SP	Yes	0	0	None							
B-14		7/22/2019	9	6.44	SP	Yes	0	0	None							
B-14		7/22/2019	10	5.44	SP	Yes	1	270	Heavy							
B-14		7/22/2019	11	4.44	SP	Yes	1	70	Moderate							
B-14		7/22/2019	12	3.44	SP	Yes	1	418	Moderate							
B-14		7/22/2019	13	2.44	SP	Yes	1	694	Moderate	850	15000	1400	**17250**	5%	87%	8%
B-14		7/22/2019	14	1.44	SP	Yes	1	50	Slight							
B-14		7/22/2019	15	0.44	SP	Yes	1	37	Slight							
B-14		7/22/2019	16	-0.56	SP	Yes	1	130	Moderate							
B-14		7/22/2019	17	-1.56	SP	Yes	1	15	Slight							
B-14		7/22/2019	18	-2.56	SP	Yes	1	36	Slight							
B-14		7/22/2019	19	-3.56	SP	Yes	1	1	None							
B-14		7/22/2019	20	-4.56	OH	Yes	1	0	None							
B-02		7/22/2019	1	14.33		No										
B-02		7/22/2019	2	13.33		No										

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Table 4: Waterfront Probing Field and Laboratory Soil Sampling Results
Project: 2019 Waterfront Probing Investigation
Site: Former BP Harbor Island Terminal

					Field Screening Results					Laboratory Analytical Results						
Boring ID #	Well ID #	Completion & Sample Date	Sample Depth (Feet BGS)	Sample Elevation (NAVD 88 Datum)	USCS Soil Type	Soil Recovered from depth (Yes or No)	Groundwater Present (1 - yes, 0 - no)	PID Field Screening Result (PPM)	Sheen Test Field Screening Result	Gasoline NTWPH-Gx Result (mg/kg)	Diesel NTWPH-Dx Result (mg/kg)	Oil NTWPH-Dx Result (mg/kg)	Total TPH Gasoline + Diesel + Oil Result (mg/kg)	% Gasoline of Total TPH	% Diesel of Total TPH	% Oil of Total TPH
B-02		7/22/2019	3	12.33	SP	Yes	0	0	None							
B-02		7/22/2019	4	11.33	SP	Yes	0	0	None							
B-02		7/22/2019	5	10.33	SP	Yes	0	0	None							
B-02		7/22/2019	6	9.33	SP	No										
B-02		7/22/2019	7	8.33	SP	Yes	0	0	None							
B-02		7/22/2019	8	7.33	SP	Yes	0	0	None							
B-02		7/22/2019	9	6.33	SP	No										
B-02		7/22/2019	10	5.33	SP	Yes	0	0	None							
B-02		7/22/2019	11	4.33	SP	Yes	0	0	None							
B-02		7/22/2019	12	3.33	SP	Yes	1	330	Heavy	480	29000	4600	**34080**	1%	85%	13%
B-02		7/22/2019	13	2.33	SP	Yes	1	319	Heavy							
B-02		7/22/2019	14	1.33	SP	Yes	1	40	Slight							
B-02		7/22/2019	15	0.33	SP	Yes	1	13	Slight							
B-02		7/22/2019	16	-0.67	SP	Yes	1	170	Heavy							
B-02		7/22/2019	17	-1.67	SP	Yes	1	68	Slight							
B-02		7/22/2019	18	-2.67	SP	Yes	1	10	Slight							
B-02		7/22/2019	19	-3.67	SP	Yes	1	0	None							
B-02		7/22/2019	20	-4.67	OH	Yes	1	0	None							
B-25	MW-07	7/23/2019	1	14.56		No										
B-25	MW-07	7/23/2019	2	13.56	SP	Yes	0	0	None							
B-25	MW-07	7/23/2019	3	12.56	SP	Yes	0	0	None							
B-25	MW-07	7/23/2019	4	11.56	SP	Yes	0	0	None							
B-25	MW-07	7/23/2019	5	10.56	SP	Yes	0	0	None							
B-25	MW-07	7/23/2019	6	9.56	SP	Yes	0	0	None							
B-25	MW-07	7/23/2019	7	8.56	SP	Yes	0	0	None							
B-25	MW-07	7/23/2019	8	7.56	SP	Yes	0	0	None							
B-25	MW-07	7/23/2019	9	6.56	SP	Yes	0	0	Slight							
B-25	MW-07	7/23/2019	10	5.56	SP	Yes	1	17	Slight							
B-25	MW-07	7/23/2019	11	4.56	SP	Yes	1	116	Moderate							
B-25	MW-07	7/23/2019	12	3.56	SP	Yes	1	3058	Heavy	1200	2100	240	3540	34%	59%	7%
B-25	MW-07	7/23/2019	13	2.56	SP	Yes	1	1403	Heavy							
B-25	MW-07	7/23/2019	14	1.56	SP	Yes	1	0	Moderate							
B-25	MW-07	7/23/2019	15	0.56	SP	Yes	1	0	Slight							
B-25	MW-07	7/23/2019	16	-0.44	SP	Yes	1	380	Slight							
B-25	MW-07	7/23/2019	17	-1.44	SP	Yes	1	0	None							
B-25	MW-07	7/23/2019	18	-2.44	SP	Yes	1	0	None							
B-25	MW-07	7/23/2019	19	-3.44	SP	Yes	1	0	None							
B-25	MW-07	7/23/2019	20	-4.44	SP	Yes	1	0	None							
B-03	MW-02	7/23/2019	1	14.31		No										
B-03	MW-02	7/23/2019	2	13.31		No										
B-03	MW-02	7/23/2019	3	12.31	SP	Yes	0	0	None							
B-03	MW-02	7/23/2019	4	11.31	SP	Yes	0	0	None							
B-03	MW-02	7/23/2019	5	10.31	SP	Yes	0	0	None							
B-03	MW-02	7/23/2019	6	9.31	SP	Yes	0	0	None							
B-03	MW-02	7/23/2019	7	8.31	SP	Yes	0	0	None							
B-03	MW-02	7/23/2019	8	7.31	SP	Yes	0	0	None							
B-03	MW-02	7/23/2019	9	6.31	SP	Yes	1	390	Heavy							
B-03	MW-02	7/23/2019	10	5.31	SP	Yes	1	850	Moderate							
B-03	MW-02	7/23/2019	11	4.31	SP	Yes	1	780	Moderate							
B-03	MW-02	7/23/2019	12	3.31	SP	Yes	1	1543	Moderate							
B-03	MW-02	7/23/2019	13	2.31	SP	Yes	1	2400	Moderate							
B-03	MW-02	7/23/2019	14	1.31	SP	Yes	1	3680	Free LNAPL	53	3100	510	3663	1%	85%	14%
B-03	MW-02	7/23/2019	15	0.31	SP	Yes	1	*0*	Free LNAPL							
B-03	MW-02	7/23/2019	16	-0.69	SP	Yes	1	200	Moderate							
B-03	MW-02	7/23/2019	17	-1.69	SP	Yes	1	1071	Slight							
B-03	MW-02	7/23/2019	18	-2.69	SP	Yes	1	0	None							
B-03	MW-02	7/23/2019	19	-3.69	SP	Yes	1	0	None							

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Table 4: Waterfront Probing Field and Laboratory Soil Sampling Results
Project: 2019 Waterfront Probing Investigation
Site: Former BP Harbor Island Terminal

					Field Screening Results					Laboratory Analytical Results						
Boring ID #	Well ID #	Completion & Sample Date	Sample Depth (Feet BGS)	Sample Elevation (NAVD 88 Datum)	USCS Soil Type	Soil Recovered from depth (Yes or No)	Groundwater Present (1 - yes, 0 - no)	PID Field Screening Result (PPM)	Sheen Test Field Screening Result	Gasoline NTWPH-Gx Result (mg/kg)	Diesel NTWPH-Dx Result (mg/kg)	Oil NTWPH-Dx Result (mg/kg)	Total TPH Gasoline + Diesel + Oil Result (mg/kg)	% Gasoline of Total TPH	% Diesel of Total TPH	% Oil of Total TPH
B-03	MW-02	7/23/2019	20	-4.69	OH	Yes	1	0	None							
B-15		7/23/2019	1	14.42		No										
B-15		7/23/2019	2	13.42		No										
B-15		7/23/2019	3	12.42	SP	Yes	0	0	None							
B-15		7/23/2019	4	11.42	SP	Yes	0	0	None							
B-15		7/23/2019	5	10.42	SP	Yes	0	0	None							
B-15		7/23/2019	6	9.42	SP	Yes	0	0	None							
B-15		7/23/2019	7	8.42	SP	Yes	0	0	None							
B-15		7/23/2019	8	7.42	SP	Yes	0	0	None							
B-15		7/23/2019	9	6.42	SP	Yes	1	0	Heavy							
B-15		7/23/2019	10	5.42	SP	Yes	1	178	Heavy							
B-15		7/23/2019	11	4.42	SP	Yes	1	831	Heavy	1200	9800	1100	**12100**	10%	81%	9%
B-15		7/23/2019	12	3.42	SP	Yes	1	2262	Moderate							
B-15		7/23/2019	13	2.42	SP	Yes	1	53	Slight							
B-15		7/23/2019	14	1.42	SP	Yes	1	5	None							
B-15		7/23/2019	15	0.42	SP	Yes	1	0	None							
B-15		7/23/2019	16	-0.58	SP	Yes	1	0	None							
B-15		7/23/2019	17	-1.58	SP	Yes	1	0	None							
B-15		7/23/2019	18	-2.58	SP	Yes	1	0	None							
B-15		7/23/2019	19	-3.58	OH	Yes	1	0	None							
B-15		7/23/2019	20	-4.58	OH	Yes	1	0	None							
B-26		7/23/2019	1	14.45		No										
B-26		7/22/2019	2	13.45	SP	Yes	0	0	None							
B-26		7/23/2019	3	12.45	SP	Yes	0	0	None							
B-26		7/23/2019	4	11.45	SP	Yes	0	0	None							
B-26		7/23/2019	5	10.45	SP	Yes	0	0	None							
B-26		7/23/2019	6	9.45	SP	Yes	0	0	None							
B-26		7/23/2019	7	8.45	SP	Yes	0	0	None							
B-26		7/23/2019	8	7.45	SP	Yes	0	0	None							
B-26		7/23/2019	9	6.45	SP	Yes	0	0	Slight							
B-26		7/23/2019	10	5.45	SP	Yes	1	350	Free LNAPL							
B-26		7/23/2019	11	4.45	SP	Yes	1	1190	Heavy	580	4200	410	5190	11%	81%	8%
B-26		7/23/2019	12	3.45	SP	Yes	1	760	Moderate							
B-26		7/23/2019	13	2.45	SP	Yes	1	40	Slight							
B-26		7/23/2019	14	1.45	SP	Yes	1	20	None							
B-26		7/23/2019	15	0.45	SP	Yes	1	10	None							
B-26		7/23/2019	16	-0.55	SP	Yes	1	*970*	Moderate							
B-26		7/23/2019	17	-1.55	SP	Yes	1	30	None							
B-26		7/23/2019	18	-2.55	SP	Yes	1	3	None							
B-26		7/23/2019	19	-3.55	OH	Yes	1	0	None							
B-26		7/23/2019	20	-4.55	OH	Yes	1	0	None							
B-04		7/23/2019	1	14.44		No										
B-04		7/22/2019	2	13.44	SP	Yes	0	0	None							
B-04		7/23/2019	3	12.44	SP	Yes	0	0	None							
B-04		7/23/2019	4	11.44	SP	Yes	0	0	None							
B-04		7/23/2019	5	10.44	SP	Yes	0	0	None							
B-04		7/23/2019	6	9.44	SP	Yes	0	0	None							
B-04		7/23/2019	7	8.44	SP	Yes	0	0	None							
B-04		7/23/2019	8	7.44	SP	Yes	0	0	None							
B-04		7/23/2019	9	6.44	SP	Yes	1	151	Slight							
B-04		7/23/2019	10	5.44	SP	Yes	1	1023	Free LNAPL							
B-04		7/23/2019	11	4.44	SP	Yes	1	850	Heavy							
B-04		7/23/2019	12	3.44	SP	Yes	1	1691	Moderate	910	3100	350	4360	21%	71%	8%
B-04		7/23/2019	13	2.44	SP / OH	Yes	1	600	Heavy							
B-04		7/23/2019	14	1.44	SP	Yes	1	0	Slight							
B-04		7/23/2019	15	0.44	SP	Yes	1	0	None							
B-04		7/23/2019	16	-0.56	SP	Yes	1	*32*	None							

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Table 4: Waterfront Probing Field and Laboratory Soil Sampling Results
Project: 2019 Waterfront Probing Investigation
Site: Former BP Harbor Island Terminal

					Field Screening Results					Laboratory Analytical Results						
Boring ID #	Well ID #	Completion & Sample Date	Sample Depth (Feet BGS)	Sample Elevation (NAVD 88 Datum)	USCS Soil Type	Soil Recovered from depth (Yes or No)	Groundwater Present (1 - yes, 0 - no)	PID Field Screening Result (PPM)	Sheen Test Field Screening Result	Gasoline NTWPH-Gx Result (mg/kg)	Diesel NTWPH-Dx Result (mg/kg)	Oil NTWPH-Dx Result (mg/kg)	Total TPH Gasoline + Diesel + Oil Result (mg/kg)	% Gasoline of Total TPH	% Diesel of Total TPH	% Oil of Total TPH
B-04		7/23/2019	17	-1.56	SP	Yes	1	0	None							
B-04		7/23/2019	18	-2.56	SP	Yes	1	0	None							
B-04		7/23/2019	19	-3.56	OH	Yes	1	0	None							
B-04		7/23/2019	20	-4.56	OH	Yes	1	0	None							
B-05	MW-03	7/23/2019	1	14.47		No										
B-05	MW-03	7/22/2019	2	13.47	SP	Yes	0	0	None							
B-05	MW-03	7/23/2019	3	12.47	SP	Yes	0	0	None							
B-05	MW-03	7/23/2019	4	11.47	SP	Yes	0	0	None							
B-05	MW-03	7/23/2019	5	10.47	SP	Yes	0	0	None							
B-05	MW-03	7/23/2019	6	9.47	SP	Yes	0	0	None							
B-05	MW-03	7/23/2019	7	8.47	SP	Yes	0	0	None							
B-05	MW-03	7/23/2019	8	7.47	SP	Yes	0	0	None							
B-05	MW-03	7/23/2019	9	6.47	SP	Yes	1	0	None							
B-05	MW-03	7/23/2019	10	5.47	SP	Yes	1	100	Slight	8.9	1300	250	1558.9	1%	83%	16%
B-05	MW-03	7/23/2019	11	4.47	SP	Yes	1	85	Slight							
B-05	MW-03	7/23/2019	12	3.47	SP	Yes	1	66	Slight							
B-05	MW-03	7/23/2019	13	2.47	SP	Yes	1	27	None							
B-05	MW-03	7/23/2019	14	1.47	SP	Yes	1	29	None							
B-05	MW-03	7/23/2019	15	0.47	SP	Yes	1	16	None							
B-05	MW-03	7/23/2019	16	-0.53		No										
B-05	MW-03	7/23/2019	17	-1.53		No										
B-05	MW-03	7/23/2019	18	-2.53		No										
B-05	MW-03	7/23/2019	19	-3.53		No										
B-05	MW-03	7/23/2019	20	-4.53		No										
B-27		7/23/2019	1	14.53		No										
B-27		7/22/2019	2	13.53	SP	Yes	0	0	None							
B-27		7/23/2019	3	12.53	SP	Yes	0	0	None							
B-27		7/23/2019	4	11.53	SP	Yes	0	0	None							
B-27		7/23/2019	5	10.53	SP	Yes	0	0	None							
B-27		7/23/2019	6	9.53	SP	Yes	0	0	None							
B-27		7/23/2019	7	8.53	SP	Yes	0	0	None							
B-27		7/23/2019	8	7.53	SP	Yes	0	0	None							
B-27		7/23/2019	9	6.53	SP	Yes	0	0	None							
B-27		7/23/2019	10	5.53	SP	Yes	0	0	None							
B-27		7/23/2019	11	4.53	SP	Yes	1	35	Slight							
B-27		7/23/2019	12	3.53	SP	Yes	1	155	Slight	870	3900	400	5170	17%	75%	8%
B-27		7/23/2019	13	2.53	SP	Yes	1	82	None							
B-27		7/23/2019	14	1.53	SP	Yes	1	33	None							
B-27		7/23/2019	15	0.53	SP	Yes	1	15	None							
B-27		7/23/2019	16	-0.47	SP	Yes	1	*110*	Slight							
B-27		7/23/2019	17	-1.47	SP	Yes	1	*66*	Slight							
B-27		7/23/2019	18	-2.47	SP	Yes	1	0	None							
B-27		7/23/2019	19	-3.47	SP	Yes	1	0	None							
B-27		7/23/2019	20	-4.47	SP	Yes	1	0	None							
B-17		7/24/2019	1	14.49		No										
B-17		7/24/2019	2	13.49	SP	Yes	0	0	None							
B-17		7/24/2019	3	12.49	SP	Yes	0	0	None							
B-17		7/24/2019	4	11.49	SP	Yes	0	0	None							
B-17		7/24/2019	5	10.49	SP	Yes	0	0	None							
B-17		7/24/2019	6	9.49	SP	Yes	0	0	None							
B-17		7/24/2019	7	8.49	SP	Yes	0	0	None							
B-17		7/24/2019	8	7.49	SP	Yes	0	0	None							
B-17		7/24/2019	9	6.49	SP	Yes	1	7	Slight							
B-17		7/24/2019	10	5.49	SP	Yes	1	77	Moderate							
B-17		7/24/2019	11	4.49	SP	Yes	1	0	None							
B-17		7/24/2019	12	3.49	SP	Yes	1	0	None							
B-17		7/24/2019	13	2.49	SP	Yes	1	66	Moderate							

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Table 4: Waterfront Probing Field and Laboratory Soil Sampling Results
Project: 2019 Waterfront Probing Investigation
Site: Former BP Harbor Island Terminal

					Field Screening Results					Laboratory Analytical Results						
Boring ID #	Well ID #	Completion & Sample Date	Sample Depth (Feet BGS)	Sample Elevation (NAVD 88 Datum)	USCS Soil Type	Soil Recovered from depth (Yes or No)	Groundwater Present (1 - yes, 0 - no)	PID Field Screening Result (PPM)	Sheen Test Field Screening Result	Gasoline NTWPH-Gx Result (mg/kg)	Diesel NTWPH-Dx Result (mg/kg)	Oil NTWPH-Dx Result (mg/kg)	Total TPH Gasoline + Diesel + Oil Result (mg/kg)	% Gasoline of Total TPH	% Diesel of Total TPH	% Oil of Total TPH
B-17		7/24/2019	14	1.49	SP	Yes	1	11	Slight							
B-17		7/24/2019	15	0.49	SP	Yes	1	0	Slight							
B-17		7/24/2019	16	-0.51	SP	Yes	1	*5*	None							
B-17		7/24/2019	17	-1.51	SP	Yes	1	232	Heavy	430	5500	490	6420	7%	86%	8%
B-17		7/24/2019	18	-2.51	SP	Yes	1	10	Slight							
B-17		7/24/2019	19	-3.51	SP	Yes	1	5	Slight							
B-17		7/24/2019	20	-4.51	SM / OH	Yes	1	2	None							
B-06		7/24/2019	1	14.48		No										
B-06		7/24/2019	2	13.48		No										
B-06		7/24/2019	3	12.48	SP	Yes	0	*0*	None							
B-06		7/24/2019	4	11.48	SP	Yes	0	*0*	None							
B-06		7/24/2019	5	10.48	SP	Yes	0	0	None							
B-06		7/24/2019	6	9.48	SP	Yes	0	0	None							
B-06		7/24/2019	7	8.48	SP	Yes	0	0	None							
B-06		7/24/2019	8	7.48	SP	Yes	0	0	None							
B-06		7/24/2019	9	6.48	SP	Yes	1	0	Slight							
B-06		7/24/2019	10	5.48	SP	Yes	1	177	Heavy							
B-06		7/24/2019	11	4.48	SP	Yes	1	151	Heavy							
B-06		7/24/2019	12	3.48	SP	Yes	1	265	Free LNAPL							
B-06		7/24/2019	13	2.48	SP	Yes	1	323	Free LNAPL	950	10000	1100	**12050**	8%	83%	9%
B-06		7/24/2019	14	1.48	SP	Yes	1	187	Moderate							
B-06		7/24/2019	15	0.48	SP	Yes	1	52	Moderate							
B-06		7/24/2019	16	-0.52	SP	Yes	1	*321*	Moderate							
B-06		7/24/2019	17	-1.52	SP	Yes	1	*16*	Moderate							
B-06		7/24/2019	18	-2.52	SM / OH	Yes	1	2	Moderate							
B-06		7/24/2019	19	-3.52	SM / OH	Yes	1	2	Slight							
B-06		7/24/2019	20	-4.52	SM / OH	Yes	1	1	Slight							
B-28		7/24/2019	1	14.51		No										
B-28		7/24/2019	2	13.51	SP	Yes	0	0	None							
B-28		7/24/2019	3	12.51	SP	Yes	0	0	None							
B-28		7/24/2019	4	11.51	SP	Yes	0	0	None							
B-28		7/24/2019	5	10.51	SP	Yes	0	0	None							
B-28		7/24/2019	6	9.51	SP	Yes	0	0	None							
B-28		7/24/2019	7	8.51	SP	Yes	0	0	None							
B-28		7/24/2019	8	7.51	SP	Yes	0	0	None							
B-28		7/24/2019	9	6.51	SP	Yes	1	0	None							
B-28		7/24/2019	10	5.51	SP	Yes	1	0	None							
B-28		7/24/2019	11	4.51	SP	Yes	1	0	None							
B-28		7/24/2019	12	3.51	SP	Yes	1	68	Moderate	160	490	130	780	21%	63%	17%
B-28		7/24/2019	13	2.51	SP	Yes	1	0	Slight							
B-28		7/24/2019	14	1.51	SP	Yes	1	0	None							
B-28		7/24/2019	15	0.51	SP	Yes	1	0	None							
B-28		7/24/2019	16	-0.49	SP	Yes	1	*12*	Moderate							
B-28		7/24/2019	17	-1.49	SP	Yes	1	0	None							
B-28		7/24/2019	18	-2.49	SP	Yes	1	0	None							
B-28		7/24/2019	19	-3.49	OH	Yes	1	0	None							
B-28		7/24/2019	20	-4.49	OH	Yes	1	0	None							
B-18		7/24/2019	1	14.45		No										
B-18		7/24/2019	2	13.45		No										
B-18		7/24/2019	3	12.45	SP	Yes	0	0	None							
B-18		7/24/2019	4	11.45	SP	Yes	0	0	None							
B-18		7/24/2019	5	10.45	SP	Yes	0	0	None							
B-18		7/24/2019	6	9.45	SP	Yes	0	0	None							
B-18		7/24/2019	7	8.45	SP	Yes	0	0	None							
B-18		7/24/2019	8	7.45	SP	Yes	0	0	None							
B-18		7/24/2019	9	6.45	SP	Yes	1	0	None							
B-18		7/24/2019	10	5.45	SP	Yes	1	36	Heavy							

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Table 4: Waterfront Probing Field and Laboratory Soil Sampling Results
Project: 2019 Waterfront Probing Investigation
Site: Former BP Harbor Island Terminal

					Field Screening Results					Laboratory Analytical Results						
Boring ID #	Well ID #	Completion & Sample Date	Sample Depth (Feet BGS)	Sample Elevation (NAVD 88 Datum)	USCS Soil Type	Soil Recovered from depth (Yes or No)	Groundwater Present (1 - yes, 0 - no)	PID Field Screening Result (PPM)	Sheen Test Field Screening Result	Gasoline NTWPH-Gx Result (mg/kg)	Diesel NTWPH-Dx Result (mg/kg)	Oil NTWPH-Dx Result (mg/kg)	Total TPH Gasoline + Diesel + Oil Result (mg/kg)	% Gasoline of Total TPH	% Diesel of Total TPH	% Oil of Total TPH
B-18		7/24/2019	11	4.45	SP	Yes	1	24	Slight							
B-18		7/24/2019	12	3.45	SP	Yes	1	189	Heavy	880	6400	710	7990	11%	80%	9%
B-18		7/24/2019	13	2.45	SP	Yes	1	60	Moderate							
B-18		7/24/2019	14	1.45	SP	Yes	1	10	Slight							
B-18		7/24/2019	15	0.45	SP	Yes	1	8	None							
B-18		7/24/2019	16	-0.55	SP	Yes	1	2	None							
B-18		7/24/2019	17	-1.55	SP	Yes	1	0	None							
B-18		7/24/2019	18	-2.55	SP	Yes	1	0	None							
B-18		7/24/2019	19	-3.55	OH	Yes	1	0	None							
B-18		7/24/2019	20	-4.55	OH	Yes	1	0	None							
B-07	MW-04	7/24/2019	1	14.44		No										
B-07	MW-04	7/24/2019	2	13.44		No										
B-07	MW-04	7/24/2019	3	12.44	SP	Yes	0	0	None							
B-07	MW-04	7/24/2019	4	11.44	SP	Yes	0	0	None							
B-07	MW-04	7/24/2019	5	10.44	SP	Yes	0	0	None							
B-07	MW-04	7/24/2019	6	9.44	SP	Yes	0	0	None							
B-07	MW-04	7/24/2019	7	8.44	SP	Yes	0	0	None							
B-07	MW-04	7/24/2019	8	7.44	SP	Yes	0	0	None							
B-07	MW-04	7/24/2019	9	6.44	SP	Yes	1	0	None							
B-07	MW-04	7/24/2019	10	5.44	SP	Yes	1	78	Moderate							
B-07	MW-04	7/24/2019	11	4.44	SP	Yes	1	152	Heavy							
B-07	MW-04	7/24/2019	12	3.44	SP	Yes	1	260	Heavy	840	3800	470	5110	16%	74%	9%
B-07	MW-04	7/24/2019	13	2.44	SP	Yes	1	105	Slight							
B-07	MW-04	7/24/2019	14	1.44	SP	Yes	1	13	Slight							
B-07	MW-04	7/24/2019	15	0.44	SP	Yes	1	4	Moderate							
B-07	MW-04	7/24/2019	16	-0.56	SP	Yes	1	13	Slight							
B-07	MW-04	7/24/2019	17	-1.56	SP	Yes	1	3	None							
B-07	MW-04	7/24/2019	18	-2.56	SP	Yes	1	3	None							
B-07	MW-04	7/24/2019	19	-3.56	OH	Yes	1	0	None							
B-07	MW-04	7/24/2019	20	-4.56	OH	Yes	1	0	None							
B-29		7/24/2019	1	14.51		No										
B-29		7/24/2019	2	13.51	SP	Yes	0	0	None							
B-29		7/24/2019	3	12.51	SP	Yes	0	0	None							
B-29		7/24/2019	4	11.51	SP	Yes	0	0	None							
B-29		7/24/2019	5	10.51	SP	Yes	0	0	None							
B-29		7/24/2019	6	9.51	SP	Yes	0	0	None							
B-29		7/24/2019	7	8.51	SP	Yes	0	0	None							
B-29		7/24/2019	8	7.51	SP	Yes	0	0	None							
B-29		7/24/2019	9	6.51	SP	Yes	1	0	None							
B-29		7/24/2019	10	5.51	SP	Yes	1	0	None							
B-29		7/24/2019	11	4.51	SP	Yes	1	130	Slight	490	2900	360	3750	13%	77%	10%
B-29		7/24/2019	12	3.51	SP	Yes	1	10	None							
B-29		7/24/2019	13	2.51	SP	Yes	1	0	None							
B-29		7/24/2019	14	1.51	SP	Yes	1	0	None							
B-29		7/24/2019	15	0.51	SP	Yes	1	0	None							
B-29		7/24/2019	16	-0.49	SP	Yes	1	0	None							
B-29		7/24/2019	17	-1.49	SP	Yes	1	0	None							
B-29		7/24/2019	18	-2.49	SP	Yes	1	0	None							
B-29		7/24/2019	19	-3.49	OH	Yes	1	0	None							
B-29		7/24/2019	20	-4.49	OH	Yes	1	0	None							
B-30		7/24/2019	1	14.55		No										
B-30		7/24/2019	2	13.55	SP	Yes	0	0	None							
B-30		7/24/2019	3	12.55	SP	Yes	0	0	None							
B-30		7/24/2019	4	11.55	SP	Yes	0	0	None							
B-30		7/24/2019	5	10.55	SP	Yes	0	0	None							
B-30		7/24/2019	6	9.55	SP	Yes	0	0	None							
B-30		7/24/2019	7	8.55	SP	Yes	0	0	None							

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Table 4: Waterfront Probing Field and Laboratory Soil Sampling Results
Project: 2019 Waterfront Probing Investigation
Site: Former BP Harbor Island Terminal

					Field Screening Results					Laboratory Analytical Results						
Boring ID #	Well ID #	Completion & Sample Date	Sample Depth (Feet BGS)	Sample Elevation (NAVD 88 Datum)	USCS Soil Type	Soil Recovered from depth (Yes or No)	Groundwater Present (1 - yes, 0 - no)	PID Field Screening Result (PPM)	Sheen Test Field Screening Result	Gasoline NTWPH-Gx Result (mg/kg)	Diesel NTWPH-Dx Result (mg/kg)	Oil NTWPH-Dx Result (mg/kg)	Total TPH Gasoline + Diesel + Oil Result (mg/kg)	% Gasoline of Total TPH	% Diesel of Total TPH	% Oil of Total TPH
B-30		7/24/2019	8	7.55	SP	Yes	0	0	None							
B-30		7/24/2019	9	6.55	SP	Yes	0	0	None							
B-30		7/24/2019	10	5.55	SP	Yes	1	25	Moderate							
B-30		7/24/2019	11	4.55	SP	Yes	1	40	None							
B-30		7/24/2019	12	3.55	SP	Yes	1	210	Moderate	800	4700	320	5820	14%	81%	5%
B-30		7/24/2019	13	2.55	SP	Yes	1	10	Heavy							
B-30		7/24/2019	14	1.55	SP	Yes	1	5	Slight							
B-30		7/24/2019	15	0.55	SP	Yes	1	3	None							
B-30		7/24/2019	16	-0.45	SP	Yes	1	5	None							
B-30		7/24/2019	17	-1.45	SP	Yes	1	3	None							
B-30		7/24/2019	18	-2.45	SP	Yes	1	0	None							
B-30		7/24/2019	19	-3.45	OH	Yes	1	0	None							
B-30		7/24/2019	20	-4.45	OH	Yes	1	0	None							
B-19		7/24/2019	1	14.52		No										
B-19		7/24/2019	2	13.52	SP	Yes	0	0	None							
B-19		7/24/2019	3	12.52	SP	Yes	0	0	None							
B-19		7/24/2019	4	11.52	SP	Yes	0	0	None							
B-19		7/24/2019	5	10.52	SP	Yes	0	0	None							
B-19		7/24/2019	6	9.52	SP	Yes	0	0	None							
B-19		7/24/2019	7	8.52	SP	Yes	0	0	None							
B-19		7/24/2019	8	7.52	SP	Yes	0	0	None							
B-19		7/24/2019	9	6.52	SP	Yes	0	3	None							
B-19		7/24/2019	10	5.52	SP	Yes	1	85	Moderate							
B-19		7/24/2019	11	4.52	SP	Yes	1	360	Moderate							
B-19		7/24/2019	12	3.52	SP	Yes	1	382	Heavy							
B-19		7/24/2019	13	2.52	SP	Yes	1	415	Heavy	2000	17000	1400	**20400**	10%	83%	7%
B-19		7/24/2019	14	1.52	SP	Yes	1	5	Moderate							
B-19		7/24/2019	15	0.52	SP	Yes	1	1	Slight							
B-19		7/24/2019	16	-0.48	SP	Yes	1	2	Moderate							
B-19		7/24/2019	17	-1.48	SP	Yes	1	130	Slight							
B-19		7/24/2019	18	-2.48	SP	Yes	1	2	None							
B-19		7/24/2019	19	-3.48	OH	Yes	1	0	None							
B-19		7/24/2019	20	-4.48	OH	Yes	1	0	None							
B-08		7/24/2019	1	14.45		No										
B-08		7/24/2019	2	13.45		No										
B-08		7/24/2019	3	12.45	SP	Yes	0	0	None							
B-08		7/24/2019	4	11.45	SP	Yes	0	0	None							
B-08		7/24/2019	5	10.45	SP	Yes	0	0	None							
B-08		7/24/2019	6	9.45	SP	Yes	0	0	None							
B-08		7/24/2019	7	8.45	SP	Yes	0	0	None							
B-08		7/24/2019	8	7.45	SP	Yes	0	0	None							
B-08		7/24/2019	9	6.45	SP	Yes	0	0	None							
B-08		7/24/2019	10	5.45	SP	Yes	1	140	Moderate	540	8200	890	9630	6%	85%	9%
B-08		7/24/2019	11	4.45	SP	Yes	1	100	Moderate							
B-08		7/24/2019	12	3.45	SP	Yes	1	125	Slight							
B-08		7/24/2019	13	2.45	SP	Yes	1	23	Slight							
B-08		7/24/2019	14	1.45	SP	Yes	1	12	Slight							
B-08		7/24/2019	15	0.45	SP	Yes	1	8	Slight							
B-08		7/24/2019	16	-0.55	SP	Yes	1	*28*	Moderate							
B-08		7/24/2019	17	-1.55	SP	Yes	1	0	Slight							
B-08		7/24/2019	18	-2.55	SP	Yes	1	0	None							
B-08		7/24/2019	19	-3.55	OH	Yes	1	0	None							
B-08		7/24/2019	20	-4.55	OH	Yes	1	0	None							
B-20		7/25/2019	1	14.47		No										
B-20		7/25/2019	2	13.47	SP	Yes	0	0	None							
B-20		7/25/2019	3	12.47	SP	Yes	0	0	None							
B-20		7/25/2019	4	11.47	SP	Yes	0	0	None							

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Table 4: Waterfront Probing Field and Laboratory Soil Sampling Results
Project: 2019 Waterfront Probing Investigation
Site: Former BP Harbor Island Terminal

					Field Screening Results					Laboratory Analytical Results						
Boring ID #	Well ID #	Completion & Sample Date	Sample Depth (Feet BGS)	Sample Elevation (NAVD 88 Datum)	USCS Soil Type	Soil Recovered from depth (Yes or No)	Groundwater Present (1 - yes, 0 - no)	PID Field Screening Result (PPM)	Sheen Test Field Screening Result	Gasoline NTWPH-Gx Result (mg/kg)	Diesel NTWPH-Dx Result (mg/kg)	Oil NTWPH-Dx Result (mg/kg)	Total TPH Gasoline + Diesel + Oil Result (mg/kg)	% Gasoline of Total TPH	% Diesel of Total TPH	% Oil of Total TPH
B-20		7/25/2019	5	10.47	SP	Yes	0	0	None							
B-20		7/25/2019	6	9.47	SP	Yes	0	0	None							
B-20		7/25/2019	7	8.47	SP	Yes	0	0	None							
B-20		7/25/2019	8	7.47	SP	Yes	0	0	None							
B-20		7/25/2019	9	6.47	SP	Yes	1	0	None							
B-20		7/25/2019	10	5.47	SP	Yes	1	130	Free LNAPL							
B-20		7/25/2019	11	4.47	SP	Yes	1	*70*	None							
B-20		7/25/2019	12	3.47	SP	Yes	1	*65*	None							
B-20		7/25/2019	13	2.47	SP	Yes	1	*48*	Free LNAPL							
B-20		7/25/2019	14	1.47	SP	Yes	1	220	Free LNAPL							
B-20		7/25/2019	15	0.47	SP	Yes	1	243	Heavy	420	23000	1800	**25220**	2%	91%	7%
B-20		7/25/2019	16	-0.53	SP	Yes	1	11	Slight							
B-20		7/25/2019	17	-1.53	SP	Yes	1	3	None							
B-20		7/25/2019	18	-2.53	SP	Yes	1	0	None							
B-20		7/25/2019	19	-3.53	OH	Yes	1	0	None							
B-20		7/25/2019	20	-4.53	OH	Yes	1	0	None							
B-31		7/25/2019	1	14.6		No										
B-31		7/25/2019	2	13.6	SP	Yes	0	0	None							
B-31		7/25/2019	3	12.6	SP	Yes	0	0	None							
B-31		7/25/2019	4	11.6	SP	Yes	0	0	None							
B-31		7/25/2019	5	10.6	SP	Yes	0	0	None							
B-31		7/25/2019	6	9.6	SP	Yes	0	0	None							
B-31		7/25/2019	7	8.6	SP	Yes	0	0	None							
B-31		7/25/2019	8	7.6	SP	Yes	0	0	None							
B-31		7/25/2019	9	6.6	SP	Yes	0	0	None							
B-31		7/25/2019	10	5.6	SP	Yes	1	98	Moderate							
B-31		7/25/2019	11	4.6		No	1									
B-31		7/25/2019	12	3.6	SP	Yes	1	274	Heavy	920	7200	360	8480	11%	85%	4%
B-31		7/25/2019	13	2.6	SP	Yes	1	46	Slight							
B-31		7/25/2019	14	1.6	SP	Yes	1	5	Slight							
B-31		7/25/2019	15	0.6	SP	Yes	1	1	Slight							
B-31		7/25/2019	16	-0.4	SP	Yes	1	23	None							
B-31		7/25/2019	17	-1.4	SP	Yes	1	5	Slight							
B-31		7/25/2019	18	-2.4	SP	Yes	1	4	Slight							
B-31		7/25/2019	19	-3.4	OH	Yes	1	0	None							
B-31		7/25/2019	20	-4.4	OH	Yes	1	0	None							
B-32		7/25/2019	1	14.63		No										
B-32		7/25/2019	2	13.63	SP	Yes	0	0	None							
B-32		7/25/2019	3	12.63	SP	Yes	0	0	None							
B-32		7/25/2019	4	11.63	SP	Yes	0	0	None							
B-32		7/25/2019	5	10.63	SP	Yes	0	0	None							
B-32		7/25/2019	6	9.63	SP	Yes	0	0	None							
B-32		7/25/2019	7	8.63	SP	Yes	0	0	None							
B-32		7/25/2019	8	7.63	SP	Yes	0	0	None							
B-32		7/25/2019	9	6.63	SP	Yes	0	0	None							
B-32		7/25/2019	10	5.63	SP	Yes	1	2	Moderate							
B-32		7/25/2019	11	4.63		No	1									
B-32		7/25/2019	12	3.63	SP	Yes	1	683	Free LNAPL	1100	11000	820	**12920**	9%	85%	6%
B-32		7/25/2019	13	2.63	SP	Yes	1	122	Free LNAPL							
B-32		7/25/2019	14	1.63	SP	Yes	1	5	Slight							
B-32		7/25/2019	15	0.63	SP	Yes	1	3	Slight							
B-32		7/25/2019	16	-0.37		No	1									
B-32		7/25/2019	17	-1.37	SP	Yes	1	231	Moderate							
B-32		7/25/2019	18	-2.37	SP	Yes	1	2	Slight							
B-32		7/25/2019	19	-3.37	OH	Yes	1	0	Slight							
B-32		7/25/2019	20	-4.37	OH	Yes	1	0	None							
B-21		7/25/2019	1	14.55		No										

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Table 4: Waterfront Probing Field and Laboratory Soil Sampling Results
Project: 2019 Waterfront Probing Investigation
Site: Former BP Harbor Island Terminal

					Field Screening Results					Laboratory Analytical Results						
Boring ID #	Well ID #	Completion & Sample Date	Sample Depth (Feet BGS)	Sample Elevation (NAVD 88 Datum)	USCS Soil Type	Soil Recovered from depth (Yes or No)	Groundwater Present (1 - yes, 0 - no)	PID Field Screening Result (PPM)	Sheen Test Field Screening Result	Gasoline NTWPH-Gx Result (mg/kg)	Diesel NTWPH-Dx Result (mg/kg)	Oil NTWPH-Dx Result (mg/kg)	Total TPH Gasoline + Diesel + Oil Result (mg/kg)	% Gasoline of Total TPH	% Diesel of Total TPH	% Oil of Total TPH
B-21		7/25/2019	2	13.55	SP	Yes	0	0	None							
B-21		7/25/2019	3	12.55	SP	Yes	0	0	None							
B-21		7/25/2019	4	11.55	SP	Yes	0	0	None							
B-21		7/25/2019	5	10.55	SP	Yes	0	0	None							
B-21		7/25/2019	6	9.55	SP	Yes	0	0	None							
B-21		7/25/2019	7	8.55	SP	Yes	0	0	None							
B-21		7/25/2019	8	7.55	SP	Yes	0	0	None							
B-21		7/25/2019	9	6.55	SP	Yes	0	0	None							
B-21		7/25/2019	10	5.55	SP	Yes	1	15	Moderate							
B-21		7/25/2019	11	4.55		No	1									
B-21		7/25/2019	12	3.55	SP	Yes	1	76	Heavy	570	10000	860	**11430**	5%	87%	8%
B-21		7/25/2019	13	2.55	SP	Yes	1	84	Slight							
B-21		7/25/2019	14	1.55	SP	Yes	1	57	Slight							
B-21		7/25/2019	15	0.55		No	1									
B-21		7/25/2019	16	-0.45		No	1									
B-21		7/25/2019	17	-1.45	SP	Yes	1	119	Moderate							
B-21		7/25/2019	18	-2.45	SP	Yes	1	6	Moderate							
B-21		7/25/2019	19	-3.45	OH	Yes	1	4	None							
B-21		7/25/2019	20	-4.45	OH	Yes	1	1	None							
B-10		7/25/2019	1	14.41		No										
B-10		7/25/2019	2	13.41	SP	Yes	0	0	None							
B-10		7/25/2019	3	12.41	SP	Yes	0	0	None							
B-10		7/25/2019	4	11.41	SP	Yes	0	0	None							
B-10		7/25/2019	5	10.41	SP	Yes	0	0	None							
B-10		7/25/2019	6	9.41	SP	Yes	0	0	None							
B-10		7/25/2019	7	8.41	SP	Yes	0	0	None							
B-10		7/25/2019	8	7.41	SP	Yes	0	0	None							
B-10		7/25/2019	9	6.41	SP	Yes	0	0	None							
B-10		7/25/2019	10	5.41	SP	Yes	1	78	Heavy							
B-10		7/25/2019	11	4.41		No	1									
B-10		7/25/2019	12	3.41	SP	Yes	1	61	Moderate							
B-10		7/25/2019	13	2.41	SP	Yes	1	121	Moderate	150	6000	650	6800	2%	88%	10%
B-10		7/25/2019	14	1.41	SP	Yes	1	5	None							
B-10		7/25/2019	15	0.41	SP	Yes	1	2	None							
B-10		7/25/2019	16	-0.59	SP	Yes	1	0	None							
B-10		7/25/2019	17	-1.59	SP	Yes	1	0	None							
B-10		7/25/2019	18	-2.59	SP	Yes	1	0	None							
B-10		7/25/2019	19	-3.59	OH	Yes	1	0	None							
B-10		7/25/2019	20	-4.59	OH	Yes	1	0	None							
B-22		7/25/2019	1	14.54		No										
B-22		7/26/2019	2	13.54		No										
B-22		7/25/2019	3	12.54	SP	Yes	0	0	None							
B-22		7/25/2019	4	11.54	SP	Yes	0	0	None							
B-22		7/25/2019	5	10.54	SP	Yes	0	0	None							
B-22		7/25/2019	6	9.54	SP	Yes	0	0	None							
B-22		7/25/2019	7	8.54	SP	Yes	0	0	None							
B-22		7/25/2019	8	7.54	SP	Yes	0	0	None							
B-22		7/25/2019	9	6.54	SP	Yes	0	0	None							
B-22		7/25/2019	10	5.54	SP	Yes	1	51	Heavy							
B-22		7/25/2019	11	4.54		No	1									
B-22		7/26/2019	12	3.54		No	1	58								
B-22		7/25/2019	13	2.54	SP	Yes	1	203	Heavy							
B-22		7/25/2019	14	1.54	SP	Yes	1	378	Moderate	1300	4700	610	6610	20%	71%	9%
B-22		7/25/2019	15	0.54	SP	Yes	1	113	Slight							
B-22		7/25/2019	16	-0.46		No	1									
B-22		7/25/2019	17	-1.46		No	1									
B-22		7/25/2019	18	-2.46	SP	Yes	1	35	Moderate							

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Table 4: Waterfront Probing Field and Laboratory Soil Sampling Results
Project: 2019 Waterfront Probing Investigation
Site: Former BP Harbor Island Terminal

					Field Screening Results					Laboratory Analytical Results						
Boring ID #	Well ID #	Completion & Sample Date	Sample Depth (Feet BGS)	Sample Elevation (NAVD 88 Datum)	USCS Soil Type	Soil Recovered from depth (Yes or No)	Groundwater Present (1 - yes, 0 - no)	PID Field Screening Result (PPM)	Sheen Test Field Screening Result	Gasoline NTWPH-Gx Result (mg/kg)	Diesel NTWPH-Dx Result (mg/kg)	Oil NTWPH-Dx Result (mg/kg)	Total TPH Gasoline + Diesel + Oil Result (mg/kg)	% Gasoline of Total TPH	% Diesel of Total TPH	% Oil of Total TPH
B-22		7/25/2019	19	-3.46	OL	Yes	1	5	Slight							
B-22		7/25/2019	20	-4.46	OH	Yes	1	0	None							
B-44		7/25/2019	1	14.49		No										
B-44		7/25/2019	2	13.49		No										
B-44		7/25/2019	3	12.49	SP	Yes	0	0	None							
B-44		7/25/2019	4	11.49	SP	Yes	0	0	None							
B-44		7/25/2019	5	10.49	SP	Yes	0	0	None							
B-44		7/25/2019	6	9.49	SP	Yes	0	0	None							
B-44		7/25/2019	7	8.49	SP	Yes	0	0	None							
B-44		7/25/2019	8	7.49	SP	Yes	0	0	None							
B-44		7/25/2019	9	6.49	SP	Yes	0	0	None							
B-44		7/25/2019	10	5.49	SP	Yes	1	45	Heavy							
B-44		7/25/2019	11	4.49		No	1									
B-44		7/26/2019	12	3.49	SP	Yes	1	141	Moderate							
B-44		7/25/2019	13	2.49	SP	Yes	1	145	Heavy	380	9700	680	**10760**	4%	90%	6%
B-44		7/25/2019	14	1.49	SP	Yes	1	20	Slight							
B-44		7/25/2019	15	0.49	SP	Yes	1	17	Slight							
B-44		7/25/2019	16	-0.51		No	1									
B-44		7/25/2019	17	-1.51	SP	Yes	1	17	Slight							
B-44		7/25/2019	18	-2.51	OH / OL	Yes	1	1	None							
B-44		7/25/2019	19	-3.51	OH / OL	Yes	1	0	None							
B-44		7/25/2019	20	-4.51	OH / OL	Yes	1	0	None							
B-11	MW-06	7/25/2019	1	14.56		No										
B-11	MW-06	7/25/2019	2	13.56		No										
B-11	MW-06	7/25/2019	3	12.56		No										
B-11	MW-06	7/25/2019	4	11.56	SP	Yes	0	0	None							
B-11	MW-06	7/25/2019	5	10.56	SP	Yes	0	0	None							
B-11	MW-06	7/25/2019	6	9.56	SP	Yes	0	0	None							
B-11	MW-06	7/25/2019	7	8.56	SP	Yes	0	0	None							
B-11	MW-06	7/25/2019	8	7.56	SP	Yes	0	0	None							
B-11	MW-06	7/25/2019	9	6.56	SP	Yes	0	0	None							
B-11	MW-06	7/25/2019	10	5.56	SP	Yes	1	72	Moderate							
B-11	MW-06	7/25/2019	11	4.56		No	1									
B-11	MW-06	7/26/2019	12	3.56	SP	Yes	1	97	Moderate							
B-11	MW-06	7/25/2019	13	2.56	SP	Yes	1	164	Heavy	400	7000	650	8050	5%	87%	8%
B-11	MW-06	7/25/2019	14	1.56	SP	Yes	1	15	Slight							
B-11	MW-06	7/25/2019	15	0.56	SP	Yes	1	5	None							
B-11	MW-06	7/25/2019	16	-0.44		No	1	27								
B-11	MW-06	7/25/2019	17	-1.44	SP	Yes	1	1	Slight							
B-11	MW-06	7/25/2019	18	-2.44	OH / OL	Yes	1	0	None							
B-11	MW-06	7/25/2019	19	-3.44	OH / OL	Yes	1	0	None							
B-11	MW-06	7/25/2019	20	-4.44	OH / OL	Yes	1	0	None							
B-09	MW-05	7/25/2019	1	14.47		No										
B-09	MW-05	7/25/2019	2	13.47		No										
B-09	MW-05	7/25/2019	3	12.47		No										
B-09	MW-05	7/25/2019	4	11.47		No										
B-09	MW-05	7/25/2019	5	10.47		No										
B-09	MW-05	7/25/2019	6	9.47		No										
B-09	MW-05	7/25/2019	7	8.47		No										
B-09	MW-05	7/25/2019	8	7.47	SP	Yes	0	0	None							
B-09	MW-05	7/25/2019	9	6.47	SP	Yes	0	0	None							
B-09	MW-05	7/25/2019	10	5.47	SP	Yes	0	0	None	<3	450	240	690	0%	65%	35%
B-09	MW-05	7/25/2019	11	4.47		No										
B-09	MW-05	7/25/2019	12	3.47		No										
B-09	MW-05	7/25/2019	13	2.47		No										
B-09	MW-05	7/25/2019	14	1.47		No										
B-09	MW-05	7/25/2019	15	0.47		No										

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Table 4: Waterfront Probing Field and Laboratory Soil Sampling Results
Project: 2019 Waterfront Probing Investigation
Site: Former BP Harbor Island Terminal

					Field Screening Results					Laboratory Analytical Results						
Boring ID #	Well ID #	Completion & Sample Date	Sample Depth (Feet BGS)	Sample Elevation (NAVD 88 Datum)	USCS Soil Type	Soil Recovered from depth (Yes or No)	Groundwater Present (1 - yes, 0 - no)	PID Field Screening Result (PPM)	Sheen Test Field Screening Result	Gasoline NTWPH-Gx Result (mg/kg)	Diesel NTWPH-Dx Result (mg/kg)	Oil NTWPH-Dx Result (mg/kg)	Total TPH Gasoline + Diesel + Oil Result (mg/kg)	% Gasoline of Total TPH	% Diesel of Total TPH	% Oil of Total TPH
B-09	MW-05	7/25/2019	16	-0.53		No										
B-09	MW-05	7/25/2019	17	-1.53		No										
B-09	MW-05	7/25/2019	18	-2.53		No										
B-09	MW-05	7/25/2019	19	-3.53		No										
B-09	MW-05	7/25/2019	20	-4.53		No										
B-33	MW-08	7/29/2019	1	11.3		No										
B-33	MW-08	7/29/2019	2	10.3		No										
B-33	MW-08	7/29/2019	3	9.3	SP	Yes	0	0	None							
B-33	MW-08	7/29/2019	4	8.3	SP	Yes	0	0	None							
B-33	MW-08	7/29/2019	5	7.3	SP	Yes	0	0	None							
B-33	MW-08	7/29/2019	6	6.3	SP	Yes	0	0	None							
B-33	MW-08	7/29/2019	7	5.3	SP	Yes	1	0	None							
B-33	MW-08	7/29/2019	8	4.3	SP	Yes	1	188	Moderate							
B-33	MW-08	7/29/2019	9	3.3	SP	Yes	1	2042	Slight	1500	2000	260	3760	40%	53%	7%
B-33	MW-08	7/29/2019	10	2.3	SP	Yes	1	5	Slight							
B-33	MW-08	7/29/2019	11	1.3	SP	Yes	1	788	Slight							
B-33	MW-08	7/29/2019	12	0.3	SP	Yes	1	20	None							
B-33	MW-08	7/29/2019	13	-0.7	SP	Yes	1	7	None							
B-33	MW-08	7/29/2019	14	-1.7	OH / OL	Yes	1	2	None							
B-33	MW-08	7/29/2019	15	-2.7	OH / SP	Yes	1	0	None							
B-35	MW-09	7/29/2019	1	10.78		No										
B-35	MW-09	7/29/2019	2	9.78		No										
B-35	MW-09	7/29/2019	3	8.78	SP	Yes	0	0	None							
B-35	MW-09	7/29/2019	4	7.78	SP	Yes	0	0	None							
B-35	MW-09	7/29/2019	5	6.78	SP	Yes	0	0	None							
B-35	MW-09	7/29/2019	6	5.78	SP	Yes	0	0	None							
B-35	MW-09	7/29/2019	7	4.78	SP	Yes	0	0	Slight							
B-35	MW-09	7/29/2019	8	3.78	SP	Yes	1	28	Moderate							
B-35	MW-09	7/29/2019	9	2.78	SP	Yes	1	203	None	4.7	520	<54	524.7	1%	99%	0%
B-35	MW-09	7/29/2019	10	1.78	SP	Yes	1	82	None							
B-35	MW-09	7/29/2019	11	0.78	SP	Yes	1	0	None							
B-35	MW-09	7/29/2019	12	-0.22	SP / OH	Yes	1	3	None							
B-35	MW-09	7/29/2019	13	-1.22	SP	Yes	1	0	None							
B-35	MW-09	7/29/2019	14	-2.22	OH	Yes	1	0	None							
B-35	MW-09	7/29/2019	15	-3.22	OH / SP	Yes	1	0	None							
B-38		7/29/2019	1	11.31		No										
B-38		7/29/2019	2	10.31		No										
B-38		7/29/2019	3	9.31	SP	Yes	0	0	None							
B-38		7/29/2019	4	8.31	SP	Yes	0	0	None							
B-38		7/29/2019	5	7.31	SP	Yes	0	0	None							
B-38		7/29/2019	6	6.31	SP	Yes	0	0	None							
B-38		7/29/2019	7	5.31	SP	Yes	0	0	None							
B-38		7/29/2019	8	4.31	SP	Yes	1	358	Moderate	1200	5100	1400	7700	16%	66%	18%
B-38		7/29/2019	9	3.31	SP	Yes	1	1408	Slight							
B-38		7/29/2019	10	2.31	SP	Yes	1	5	None							
B-38		7/29/2019	11	1.31	SP	Yes	1	480	Slight							
B-38		7/29/2019	12	0.31	SP / OH	Yes	1	13	None							
B-38		7/29/2019	13	-0.69	SP	Yes	1	4	None							
B-38		7/29/2019	14	-1.69	OH / SP	Yes	1	0	None							
B-38		7/29/2019	15	-2.69	OH / SP	Yes	1	0	None							
B-34		7/29/2019	1	10.97		No										
B-34		7/29/2019	2	9.97	SP	Yes	0	0	None							
B-34		7/29/2019	3	8.97	SP	Yes	0	0	None							
B-34		7/29/2019	4	7.97	SP	Yes	0	0	None							
B-34		7/29/2019	5	6.97	SP	Yes	0	0	None							
B-34		7/29/2019	6	5.97	SP	Yes	0	0	None							
B-34		7/29/2019	7	4.97	SP	Yes	0	0	None							

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Table 4: Waterfront Probing Field and Laboratory Soil Sampling Results
Project: 2019 Waterfront Probing Investigation
Site: Former BP Harbor Island Terminal

					Field Screening Results					Laboratory Analytical Results						
Boring ID #	Well ID #	Completion & Sample Date	Sample Depth (Feet BGS)	Sample Elevation (NAVD 88 Datum)	USCS Soil Type	Soil Recovered from depth (Yes or No)	Groundwater Present (1 - yes, 0 - no)	PID Field Screening Result (PPM)	Sheen Test Field Screening Result	Gasoline NTWPH-Gx Result (mg/kg)	Diesel NTWPH-Dx Result (mg/kg)	Oil NTWPH-Dx Result (mg/kg)	Total TPH Gasoline + Diesel + Oil Result (mg/kg)	% Gasoline of Total TPH	% Diesel of Total TPH	% Oil of Total TPH
B-34		7/29/2019	8	3.97	SP	Yes	0	0	Slight							
B-34		7/29/2019	9	2.97	SP	Yes	1	1600	Moderate	740	1400	590	2730	27%	51%	22%
B-34		7/29/2019	10	1.97	SP	Yes	1	2	None							
B-34		7/29/2019	11	0.97	SP	Yes	1	327	Moderate							
B-34		7/29/2019	12	-0.03	SP	Yes	1	29	None							
B-34		7/29/2019	13	-1.03	SP	Yes	1	2	None							
B-34		7/29/2019	14	-2.03	SP	Yes	1	1	None							
B-34		7/29/2019	15	-3.03	OH / SP	Yes	1	0	None							
B-39		7/29/2019	1	11.09		No										
B-39		7/29/2019	2	10.09	SP	Yes	0	0	None							
B-39		7/29/2019	3	9.09	SP	Yes	0	0	None							
B-39		7/29/2019	4	8.09	SP	Yes	0	0	None							
B-39		7/29/2019	5	7.09	SP	Yes	0	0	None							
B-39		7/29/2019	6	6.09	SP	Yes	0	0	None							
B-39		7/29/2019	7	5.09	SP	Yes	0	0	None							
B-39		7/29/2019	8	4.09	SP	Yes	1	91	Slight							
B-39		7/29/2019	9	3.09	SP	Yes	1	941	Moderate	1000	3400	310	4710	21%	72%	7%
B-39		7/29/2019	10	2.09	SP	Yes	1	6	None							
B-39		7/29/2019	11	1.09	SP	Yes	1	303	Moderate							
B-39		7/29/2019	12	0.09	SP	Yes	1	18	Moderate							
B-39		7/29/2019	13	-0.91	SP	Yes	1	3	None							
B-39		7/29/2019	14	-1.91	OL / OH	Yes	1	1	None							
B-39		7/29/2019	15	-2.91	OL / OH	Yes	1	0	None							
B-40		7/29/2019	1	10.75		No										
B-40		7/29/2019	2	9.75	SP	Yes	0	0	None							
B-40		7/29/2019	3	8.75	SP	Yes	0	0	None							
B-40		7/29/2019	4	7.75	SP	Yes	0	0	None							
B-40		7/29/2019	5	6.75	SP	Yes	0	0	None							
B-40		7/29/2019	6	5.75		No										
B-40		7/29/2019	7	4.75	SP	Yes	1	214	Heavy	790	4500	380	5670	14%	79%	7%
B-40		7/29/2019	8	3.75	SP	Yes	1	153	Moderate							
B-40		7/29/2019	9	2.75	SP	Yes	1	97	Moderate							
B-40		7/29/2019	10	1.75	SP	Yes	1	3	Slight							
B-40		7/29/2019	11	0.75	SP	Yes	1	7	Slight							
B-40		7/29/2019	12	-0.25	SP	Yes	1	12	None							
B-40		7/29/2019	13	-1.25	SP	Yes	1	2	None							
B-40		7/29/2019	14	-2.25	OL / OH	Yes	1	1	None							
B-40		7/29/2019	15	-3.25	OL / OH	Yes	1	0	None							
B-36		7/29/2019	1	10.66		No										
B-36		7/29/2019	2	9.66	SP	Yes	0	0	None							
B-36		7/29/2019	3	8.66	SP	Yes	0	0	None							
B-36		7/29/2019	4	7.66	SP	Yes	0	0	None							
B-36		7/29/2019	5	6.66	SP	Yes	0	0	None							
B-36		7/29/2019	6	5.66		No										
B-36		7/29/2019	7	4.66	SP	Yes	0	0	None							
B-36		7/29/2019	8	3.66	SP	Yes	1	132	Moderate	1200	4800	160	6160	19%	78%	3%
B-36		7/29/2019	9	2.66	SP	Yes	1	110	Slight							
B-36		7/29/2019	10	1.66	SP	Yes	1	7	None							
B-36		7/29/2019	11	0.66	SP	Yes	1	47	Moderate							
B-36		7/29/2019	12	-0.34	SP	Yes	1	3	None							
B-36		7/29/2019	13	-1.34	SP	Yes	1	1	None							
B-36		7/29/2019	14	-2.34	OH / SP	Yes	1	1	None							
B-36		7/29/2019	15	-3.34	OH / SP	Yes	1	0	None							
B-37		7/30/2019	1	9.98		No										
B-37		7/30/2019	2	8.98	SP	Yes	0	0	None							
B-37		7/30/2019	3	7.98	SP	Yes	0	0	None							
B-37		7/30/2019	4	6.98	SP	Yes	0	1	None							

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Table 4: Waterfront Probing Field and Laboratory Soil Sampling Results
Project: 2019 Waterfront Probing Investigation
Site: Former BP Harbor Island Terminal

					Field Screening Results					Laboratory Analytical Results						
Boring ID #	Well ID #	Completion & Sample Date	Sample Depth (Feet BGS)	Sample Elevation (NAVD 88 Datum)	USCS Soil Type	Soil Recovered from depth (Yes or No)	Groundwater Present (1 - yes, 0 - no)	PID Field Screening Result (PPM)	Sheen Test Field Screening Result	Gasoline NTWPH-Gx Result (mg/kg)	Diesel NTWPH-Dx Result (mg/kg)	Oil NTWPH-Dx Result (mg/kg)	Total TPH Gasoline + Diesel + Oil Result (mg/kg)	% Gasoline of Total TPH	% Diesel of Total TPH	% Oil of Total TPH
B-37		7/30/2019	5	5.98	SP	Yes	0	185	Moderate							
B-37		7/30/2019	6	4.98	SP	Yes	1	9	Moderate							
B-37		7/30/2019	7	3.98	SP	Yes	1	780	Heavy	1800	2900	120	4820	37%	60%	2%
B-37		7/30/2019	8	2.98	SP	Yes	1	1173	Moderate							
B-37		7/30/2019	9	1.98	SP	Yes	1	19	Slight							
B-37		7/30/2019	10	0.98	SP	Yes	1	14	None							
B-37		7/30/2019	11	-0.02	SP	Yes	1	48	None							
B-37		7/30/2019	12	-1.02	SP	Yes	1	11	None							
B-37		7/30/2019	13	-2.02	SP	Yes	1	4	None							
B-37		7/30/2019	14	-3.02	SP	Yes	1	1	None							
B-37		7/30/2019	15	-4.02	OH / SP	Yes	1	0	None							
B-13		7/30/2019	1	11.34		No										
B-13		7/30/2019	2	10.34		No										
B-13		7/30/2019	3	9.34	SP	Yes	0	0	None							
B-13		7/30/2019	4	8.34	SP	Yes	0	0	None							
B-13		7/30/2019	5	7.34	SP	Yes	0	0	None							
B-13		7/30/2019	6	6.34		No										
B-13		7/30/2019	7	5.34	SP	Yes	0	0	None							
B-13		7/30/2019	8	4.34	SP	Yes	1	0	Slight							
B-13		7/30/2019	9	3.34	SP	Yes	1	68	Moderate	160	10000	970	**11130**	1%	90%	9%
B-13		7/30/2019	10	2.34	SP	Yes	1	14	Moderate							
B-13		7/30/2019	11	1.34	SP	Yes	1	7	Moderate							
B-13		7/30/2019	12	0.34	SP	Yes	1	25	Moderate							
B-13		7/30/2019	13	-0.66	SP	Yes	1	15	Moderate							
B-13		7/30/2019	14	-1.66	OH /OL	Yes	1	0	Slight							
B-13		7/30/2019	15	-2.66	SP	Yes	1	0	None							
B-41	MW-10	7/31/2019	1	10.35		No										
B-41	MW-10	7/31/2019	2	9.35		No										
B-41	MW-10	7/31/2019	3	8.35	SP	Yes	0	0	None							
B-41	MW-10	7/31/2019	4	7.35	SP	Yes	0	0	None							
B-41	MW-10	7/31/2019	5	6.35	SP	Yes	0	0	None							
B-41	MW-10	7/31/2019	6	5.35	SP	Yes	1	82	Moderate							
B-41	MW-10	7/31/2019	7	4.35	SP	Yes	1	195	Moderate							
B-41	MW-10	7/31/2019	8	3.35	SP	Yes	1	415	Moderate	2200	2000	<98	4200	52%	48%	0%
B-41	MW-10	7/31/2019	9	2.35	SP	Yes	1	5	Slight							
B-41	MW-10	7/31/2019	10	1.35	SP	Yes	1	3	None							
B-41	MW-10	7/31/2019	11	0.35	SP	Yes	1	126	Moderate							
B-41	MW-10	7/31/2019	12	-0.65	SP	Yes	1	68	Slight							
B-41	MW-10	7/31/2019	13	-1.65	OH / SP	Yes	1	1	None							
B-41	MW-10	7/31/2019	14	-2.65	OH / SP	Yes	1	0	Slight							
B-41	MW-10	7/31/2019	15	-3.65	OH / SP	Yes	1	0	None							
B-42	MW-11	7/31/2019	1	10.47		No										
B-42	MW-11	7/31/2019	2	9.47	SP	Yes	0	0	None							
B-42	MW-11	7/31/2019	3	8.47	SP	Yes	0	0	None							
B-42	MW-11	7/31/2019	4	7.47	SP	Yes	0	1	None							
B-42	MW-11	7/31/2019	5	6.47	SP	Yes	0	150	Moderate							
B-42	MW-11	7/31/2019	6	5.47	SP	Yes	1	26	Moderate							
B-42	MW-11	7/31/2019	7	4.47	SP	Yes	1	286	Heavy	790	4100	140	5030	16%	82%	3%
B-42	MW-11	7/31/2019	8	3.47	SP	Yes	1	0	Moderate							
B-42	MW-11	7/31/2019	9	2.47	SP	Yes	1	2	Slight							
B-42	MW-11	7/31/2019	10	1.47	SP / OL	Yes	1	0	Slight							
B-42	MW-11	7/31/2019	11	0.47	SP	Yes	1	0	Slight							
B-42	MW-11	7/31/2019	12	-0.53	SP	Yes	1	0	Slight							
B-42	MW-11	7/31/2019	13	-1.53	SP	Yes	1	0	None							
B-42	MW-11	7/31/2019	14	-2.53	OH / SP	Yes	1	0	None							
B-42	MW-11	7/31/2019	15	-3.53	OH / SP	Yes	1	0	None							
B-43		7/31/2019	1	10.03		No										

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Table 4: Waterfront Probing Field and Laboratory Soil Sampling Results
Project: 2019 Waterfront Probing Investigation
Site: Former BP Harbor Island Terminal

					Field Screening Results					Laboratory Analytical Results						
Boring ID #	**Well ID #**	**Completion & Sample Date**	**Sample Depth (Feet BGS)**	**Sample Elevation (NAVD 88 Datum)**	**USCS Soil Type**	**Soil Recovered from depth (Yes or No)**	**Groundwater Present (1 - yes, 0 - no)**	**PID Field Screening Result (PPM)**	**Sheen Test Field Screening Result**	**Gasoline NTWPH-Gx Result (mg/kg)**	**Diesel NTWPH-Dx Result (mg/kg)**	**Oil NTWPH-Dx Result (mg/kg)**	**Total TPH Gasoline + Diesel + Oil Result (mg/kg)**	**% Gasoline of Total TPH**	**% Diesel of Total TPH**	**% Oil of Total TPH**
B-43		7/31/2019	2	9.03		No										
B-43		7/31/2019	3	8.03	SP	Yes	0	1272	Moderate							
B-43		7/31/2019	4	7.03	SP	Yes	0	1159	Free LNAPL							
B-43		7/31/2019	5	6.03	SP	Yes	0	1408	Free LNAPL							
B-43		7/31/2019	6	5.03	SP	Yes	0	940	Free LNAPL							
B-43		7/31/2019	7	4.03	SP	Yes	0	1472	Free LNAPL	2000	14000	640	**16640**	12%	84%	4%
B-43		7/31/2019	8	3.03	SP	Yes	0	1508	Moderate							
B-43		7/31/2019	9	2.03	SP	Yes	1	453	Slight							
B-43		7/31/2019	10	1.03	SP	Yes	1	15	Slight							
B-43		7/31/2019	11	0.03	SP	Yes	1	751	Slight							
B-43		7/31/2019	12	-0.97	SP	Yes	1	16	None							
B-43		7/31/2019	13	-1.97	SP	Yes	1	18	Slight							
B-43		7/31/2019	14	-2.97	SP	Yes	1	11	None							
B-43		7/31/2019	15	-3.97	SP	Yes	1	5	None							
													Averages:	13%	78%	9%

Definitions:

BGS - Below ground surface
NAVD 88 - The North American Vertical Datum of 1988
PID - Photoionization detector
PPM - Parts per million
TPH - Total Petroleum Hydrocarbons
USCS - Unified Soil Classification System

Notes:

Cells highlighted in blue represent the sample interval with the highest soil impacts from each boring, and the soils submitted for laboratory analysis.
Cells highlighted in grey indicate no soil was recovered from that interval during probing.
Cells highlighted in orange indicate field screening result that were affected by soil sluffing in boring and likely do not represent actual conditions at listed depth.
Total TPH results in bold exceed the Plant 1 Total TPH Soil Cleanup Level of 10,000 mg/kg

USCS Soil Types:

OH - Organic clays of medium to high plasticity, organic silts.
OL - Organic silts and organic silty clays of low plasticity.
SM - Silty - sands, sand - silt mixtures.
SP - Poorly graded sands, gravelly sands, little or no fines

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
4/29/1996	high	2			**Yes**	2.0		
4/30/1996	low	0			**Yes**	1.0		
4/30/1996	flood	1			**Yes**	2.0		
5/15/1996	low	0			No	0.0		
5/20/1996					No	0.0		
5/22/1996	ebb	1			**Yes**	1.0		
5/24/1996					**Yes**	1.0		
6/7/1996	ebb	1			**Yes**	1.0		
6/10/1996					**Yes**	0.5		
6/13/1996					No	0.0		
6/19/1996	high	2			No	0.0		
6/24/1996	medium	1			No	0.0		
7/30/1996	ebb	1			No	0.0		
8/14/1996	medium	1			No	0.0		
8/16/1996	ebb	1			**Yes**	1.0		
8/19/1996	ebb	1			**Yes**	1.0		
8/29/1996	ebb	1			**Yes**	1.0		
10/3/1996	low	0			**Yes**	1.0		
10/4/1996	ebb	1			**Yes**	0.5		
10/7/1996	flood	1	No	0.0	**Yes**	2.0		
10/10/1996	low	0	No	0.0	No	0.0		
10/11/1996	low	0	No	0.0	No	0.0		
10/23/1996	low	0	No	0.0	No	0.0		
10/25/1996	high	2	No	0.0	No	0.0		
10/30/1996	high	2	No	0.0	**Yes**	2.0		
11/1/1996	medium	1	No	0.0	**Yes**	2.0		
11/4/1996	medium	1	No	0.0	No	0.0		
11/5/1996			No	0.0	No	0.0		
11/6/1996	low	0	No	0.0	**Yes**	2.0		
11/7/1996	low	0	No	0.0	**Yes**	2.0		
11/12/1996			No	0.0	**Yes**	0.5		
11/13/1996			No	0.0	No	0.0		
11/14/1996			No	0.0	**Yes**	1.0		
11/18/1996	high	2	No	0.0	No	0.0		
11/19/1996	low	0	No	0.0	**Yes**	1.0		
11/20/1996	low	0	No	0.0	**Yes**	1.0		
11/21/1996	low	0	No	0.0	**Yes**	1.0		
12/6/1996	ebb	1	No	0.0	No	0.0		
12/9/1996	medium	1	No	0.0	No	0.0		
12/10/1996	flood	1	**Yes**	0.5	No	0.0		
12/12/1996	flood	1	No	0.0	No	0.0		
12/13/1996	flood	1	No	0.0	No	0.0		
12/16/1996	flood	1	**Yes**	2.0	**Yes**	1.0		
12/17/1996	flood	1	No	0.0	**Yes**	1.0		
12/18/1996	flood	1	**Yes**	3.0	**Yes**	1.0		
1/2/1997	high	2	**Yes**	1.0	No	0.0		
1/8/1997	high	2	**Yes**	3.0	No	0.0		
1/9/1997			**Yes**	3.0	**Yes**	1.0		
1/9/1997	ebb	1	**Yes**	3.0	**Yes**	1.0		

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
1/9/1997	high	2	**Yes**	3.0	**Yes**	3.0		
1/14/1997	low	0	**Yes**	1.0	**Yes**	1.0		
1/15/1997	low	0	**Yes**	2.0	No	0.0		
1/16/1997	low	0	**Yes**	3.0	**Yes**	1.0		
1/17/1997			**Yes**	1.5	No	0.0		
1/20/1997	low	0	**Yes**	3.0	No	0.0		
1/20/1997	high	2	**Yes**	2.0	**Yes**	1.0		
1/21/1997	high	2	**Yes**	2.5	**Yes**	0.5		
1/22/1997	flood	1	**Yes**	1.0	No	0.0		
1/23/1997	flood	1	**Yes**	1.0	No	0.0		
1/24/1997	flood	1	**Yes**	2.0	**Yes**	0.5		
1/27/1997	low	0	**Yes**	1.0	**Yes**	1.0		
1/27/1997	low	0	**Yes**	3.0	No	0.0		
1/28/1997	low	0	No	0.0	**Yes**	1.0		
1/28/1997	high	2	**Yes**	2.0	No	0.0		
1/30/1997	low	0	**Yes**	0.5	**Yes**	1.0		
1/31/1997	low	0	**Yes**	0.5	**Yes**	0.5		
2/3/1997	flood	1	**Yes**	1.0	**Yes**	0.5		
2/4/1997	flood	1	**Yes**	3.0	**Yes**	3.0		
2/5/1997	high	2	**Yes**	0.5	**Yes**	0.5		
2/6/1997	flood	1	**Yes**	2.0	**Yes**	0.5		
2/7/1997	flood	1	**Yes**	2.0	**Yes**	1.0		
2/10/1997	low	0	No	0.0	No	0.0		
2/11/1997	low	0	No	0.0	No	0.0		
2/12/1997	low	0	No	0.0	No	0.0		
2/14/1997	low	0	**Yes**	0.5	**Yes**	0.5		
2/14/1997	flood	1	**Yes**	0.5	No	0.0		
2/20/1997	ebb	1	**Yes**	2.0	**Yes**	2.0		
12/3/1997	high	2	No	0.0	No	0		
12/4/1997	ebb	1	No	0.0	No	0		
1/11/2000	medium	1	**Yes**	1.0	No	0.0		
1/21/2000	high	2	No	0.0	No	0.0		
2/16/2000	medium	1	No	0.0	No	0.0		
2/22/2000	high	2	No	0.0	No	0.0		
2/23/2000	medium	1	No	0.0	No	0.0		
2/24/2000	low	0	No	0.0	No	0.0		
3/15/2000	medium	1	No	0.0	No	0.0		
3/16/2000	medium	1	No	0.0	No	0.0		
3/21/2000	low	0	**Yes**	**1.0**	No	0.0		
4/14/2000	medium	1	**Yes**	**1.0**	No	0.0		
6/15/2000	low	0	No	0.0	No	0.0		
6/28/2000	low	0	No	0.0	**Yes**	**1.0**		
6/29/2000	low	0	No	0.0	No	0.0		
7/11/2000	high	2	No	0.0	No	0.0		
7/19/2000	low	0	No	0.0	No	0.0		
8/15/2000	low	0	No	0.0	No	0.0		
10/12/2000	low	0	No	0.0	No	0.0		
11/14/2000	medium	1	No	0.0	No	0.0		
12/14/2000	high	2	No	0.0	No	0.0		

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
1/11/2001	medium	1	No	0.0	No	0.0		
2/15/2001	medium	1	No	0.0	No	0.0		
4/12/2001	medium	1	No	0.0	**Yes**	**1.0**		
4/13/2001	medium	1	No	0.0	No	0.0		
5/16/2001	low	0	No	0.0	No	0.0		
5/17/2001	low	0	No	0.0	No	0.0		
5/18/2001	low	0	No	0.0	No	0.0		
5/21/2001	low	0	No	0.0	No	0.0		
5/23/2001	low	0	No	0.0	No	0.0		
5/29/2001	low	0	No	0.0	No	0.0		
6/11/2001	medium	1	No	0.0	No	0.0		
7/23/2001	low	0	No	0.0	No	0.0		
8/21/2001	medium	1	No	0.0	No	0.0		
9/6/2001	high	2	No	0.0	No	0.0		
10/16/2001	low	0	No	0.0	No	0.0		
11/15/2001	medium	1	No	0.0	No	0.0		
12/10/2001	medium	1	No	0.0	No	0.0		
1/4/2002	high	2	No	0.0	No	0.0		
1/9/2002	medium	1	**Yes**	**1.0**	No	0.0		
1/11/2002	medium	1	**Yes**	**1.0**	No	0.0		
1/16/2002	high	2	**Yes**	**1.0**	No	0.0		
1/22/2002	medium	1	**Yes**	**1.0**	No	0.0		
1/23/2002	low	0	**Yes**	**1.0**	No	0.0		
2/4/2002	high	2	No	0.0	No	0.0		
2/18/2002	medium	1	No	0.0	**Yes**	**1.0**		
2/21/2002	medium	1	**Yes**	**2.0**	No	0.0		
3/21/2002	medium	1	**Yes**	**1.0**	No	0.0		
3/25/2002	medium	1	No	0.0	No	0.0		
3/26/2002	medium	1	No	0.0	No	0.0		
3/27/2002	medium	1	**Yes**	2.0	No	0.0		
4/4/2002	high	2	No	0.0	No	0.0		
5/3/2002	low	0	No	0.0	No	0.0		
5/7/2002	medium	1	No	0.0	**Yes**	**1.0**		
5/21/2002	medium	1	**Yes**	**1.0**	**Yes**	**1.0**		
6/6/2002	medium	1	No	0.0	**Yes**	**1.0**		
6/18/2002	low	0	No	0.0	No	0.0		
6/27/2002	high	2	**Yes**	**1.0**	**Yes**	**1.0**		
7/10/2002	medium	1	**Yes**	**1.0**	**Yes**	**1.0**		
7/29/2002	medium	1	No	0.0	**Yes**	**1.0**		
8/21/2002	low	0	No	0.0	No	0.0		
9/9/2002	high	2	**Yes**	**1.0**	**Yes**	**1.0**		
9/20/2002	medium	1	No	0.0	**Yes**	**1.0**		
10/9/2002	high	2	No	0.0	No	0.0		
11/25/2002	high	2	No	0.0	No	0.0		
11/27/2002	high	2	No	0.0	No	0.0		
12/19/2002	medium	1	No	0.0	No	0.0		
12/20/2002	high	2	No	0.0	No	0.0		

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
1/16/2003	medium	1	No	0.0	No	0.0		
2/3/2003	medium	1	No	0.0	No	0.0		
2/10/2003	medium	1	No	0.0	No	0.0		
2/10/2003	low	0	No	0.0	No	0.0		
2/11/2003	medium	1	No	0.0	No	0.0		
2/11/2003	high	2	No	0.0	No	0.0		
2/11/2003	low	0	No	0.0	No	0.0		
2/12/2003	medium	1	No	0.0	No	0.0		
2/13/2003	high	2	No	0.0	No	0.0		
2/13/2003	medium	1	No	0.0	No	0.0		
2/14/2003	high	2	No	0.0	No	0.0		
2/20/2003	high	2	No	0.0	No	0.0		
2/20/2003	medium	1	No	0.0	No	0.0		
2/20/2003	low	0	No	0.0	No	0.0		
2/21/2003	high	2	No	0.0	No	0.0		
2/21/2003	medium	1	No	0.0	No	0.0		
3/3/2003	medium	1	No	0.0	No	0.0		
3/10/2003	medium	1	No	0.0	No	0.0		
3/11/2003	high	2	No	0.0	No	0.0		
3/18/2003	medium	1	No	0.0	No	0.0		
4/1/2003	low	0	No	0.0	No	0.0		
4/8/2003	high	2	**Yes**	**2.0**	No	0.0		
4/15/2003	low	0	**Yes**	**2.0**	No	0.0		
4/21/2003	high	2	No	0.0	No	0.0		
5/15/2003	low	0	No	0.0	No	0.0		
5/20/2003	medium	1	No	0.0	No	0.0		
5/21/2003	medium	1	No	0.0	No	0.0		
5/27/2003	low	0	No	0.0	No	0.0		
6/3/2003	medium	1	No	0.0	No	0.0		
6/17/2003	medium	1	No	0.0	No	0.0		
7/15/2003	medium	1	No	0.0	No	0.0		
7/21/2003	low	0	No	0.0	No	0.0		
8/7/2003	low	0	No	0.0	No	0.0		
8/13/2003	medium	1	No	0.0	No	0.0		
9/15/2003	high	2	No	0.0	No	0.0		
9/16/2003	high	2	No	0.0	No	0.0		
9/17/2003	medium	1	No	0.0	No	0.0		
9/19/2003	medium	1	No	0.0	No	0.0		
10/9/2003	medium	1	No	0.0	**Yes**	**1.0**		
10/14/2003	high	2	No	0.0	No	0.0		
11/12/2003	high	2	No	0.0	No	0.0		
11/19/2003	high	2	No	0.0	No	0.0		
12/17/2003	medium	1	No	0.0	No	0.0		
12/23/2003	medium	1	No	0.0	No	0.0		
1/13/2004	medium	1	**Yes**	**1.0**	No	0.0		
1/24/2004	high	2	No	0.0	No	0.0		
2/10/2004	medium	1	**Yes**	**1.0**	No	0.0		
2/23/2004	medium	1	No	0.0	**Yes**	**1.0**		
3/17/2004	medium	1	No	0.0	No	0.0		

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
3/19/2004	medium	1	No	0.0	No	0.0		
4/15/2004	medium	1	No	0.0	**Yes**	**1.0**		
4/19/2004	medium	1	No	0.0	No	0.0		
4/22/2004	medium	1	No	0.0	No	0.0		
5/24/2004	medium	1	No	0.0	No	0.0		
5/25/2004	medium	1	No	0.0	No	0.0		
6/14/2004	medium	1	No	0.0	No	0.0		
6/15/2004	low	0	No	0.0	No	0.0		
6/23/2004	high	2	No	0.0	No	0.0		
6/28/2004	low	0	No	0.0	No	0.0		
6/29/2004	medium	1	No	0.0	No	0.0		
6/30/2004	medium	1	No	0.0	No	0.0		
7/12/2004	low	0	No	0.0	No	0.0		
7/13/2004	low	0	No	0.0	No	0.0		
8/11/2004	high	2	No	0.0	No	0.0		
8/12/2004	low	0	No	0.0	No	0.0		
8/24/2004	medium	1	No	0.0	No	0.0		
9/2/2004	high	2	No	0.0	No	0.0		
9/3/2004	high	2	No	0.0	No	0.0		
9/7/2004	medium	1	No	0.0	No	0.0		
9/10/2004	low	0	No	0.0	No	0.0		
9/16/2004	high	2	No	0.0	No	0.0		
9/21/2004	medium	1	No	0.0	No	0.0		
9/22/2004	medium	1	No	0.0	No	0.0		
9/23/2004	medium	1	No	0.0	No	0.0		
10/5/2004	medium	1	No	0.0	No	0.0		
10/13/2004	medium	1	No	0.0	**Yes**	**1.0**		
10/15/2004	high	2	No	0.0	No	0.0		
10/18/2004	high	2	No	0.0	No	0.0		
10/25/2004	low	0	No	0.0	No	0.0		
11/4/2004	medium	1	No	0.0	No	0.0		
11/18/2004	high	2	No	0.0	No	0.0		
11/23/2004	medium	1	No	0.0	No	0.0		
12/3/2004	low	0	No	0.0	No	0.0		
12/15/2004	high	2	No	0.0	No	0.0		
12/23/2004	medium	1	No	0.0	No	0.0		
1/4/2005	high	2	No	0.0	No	0.0		
1/13/2005	high	2	No	0.0	No	0.0		
1/21/2005	low	0	No	0.0	No	0.0		
2/1/2005	high	**2**	**Yes**	**1.0**	**No**	**0.0**		
2/2/2005	high	**2**	**Yes**	**2.0**	**No**	**0.0**		
2/3/2005	medium	**1**	**Yes**	**1.0**	**No**	**0.0**		
2/4/2005	medium	**1**	**Yes**	**1.0**	**No**	**0.0**		
2/7/2005	low	**0**	**Yes**	**1.0**	**No**	**0.0**		
2/8/2005	low	0	No	0.0	No	0.0		
2/15/2005	high	2	No	0.0	No	0.0		
2/25/2005	high	2	No	0.0	No	0.0		
3/2/2005	high	2	No	0.0	No	0.0		
3/8/2005	low	0	No	0.0	No	0.0		

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Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
3/15/2005	high	2	No	0.0	No	0.0		
4/4/2005	low	0	No	0.0	No	0.0		
4/11/2015	high	**2**	**Yes**	**1.0**	**No**	**0.0**		
4/13/2005	medium	**1**	**Yes**	**2.0**	**No**	**0.0**		
4/14/2005	high	**2**	**Yes**	**1.0**	**No**	**0.0**		
4/15/2005	medium	**1**	**Yes**	**2.0**	**No**	**0.0**		
4/18/2005	low	0	No	0.0	No	0.0		
4/25/2005	medium	1	No	0.0	No	0.0		
5/2/2005	low	0	No	0.0	No	0.0		
5/9/2005	medium	1	No	0.0	No	0.0		
5/16/2005	low	0	No	0.0	No	0.0		
5/20/2005	low	0	No	0.0	No	0.0		
5/23/2005	medium	1	No	0.0	No	0.0		
5/30/2005	medium	1	No	0.0	No	0.0		
6/6/2005	medium	1	No	0.0	No	0.0		
6/10/2005	medium	1	No	0.0	No	0.0		
6/13/2005	high	2	No	0.0	No	0.0		
6/20/2005	low	0	No	0.0	No	0.0		
6/27/2005	high	2	No	0.0	No	0.0		
7/4/2005	medium	1	No	0.0	No	0.0		
7/11/2005	high	**2**	**Yes**	**1.0**	No	0.0		
7/15/2005	medium	1	No	0.0	No	0.0		
7/18/2005	low	0	No	0.0	No	0.0		
7/25/2005	high	2	No	0.0	No	0.0		
8/1/2005	low	0	No	0.0	No	0.0		
8/8/2005	high	2	No	0.0	No	0.0		
8/12/2005	medium	1	No	0.0	No	0.0		
8/15/2005	low	0	No	0.0	No	0.0		
8/22/2005	medium	1	No	0.0	No	0.0		
8/29/2005	low	0	No	0.0	No	0.0		
9/5/2005	medium	1	No	0.0	No	0.0		
9/12/2005	medium	1	No	0.0	No	0.0		
9/14/2005	low	0	No	0.0	No	0.0		
9/19/2005	medium	1	No	0.0	No	0.0		
9/26/2005	low	0	No	0.0	No	0.0		
10/3/2005	medium	1	No	0.0	No	0.0		
10/10/2005	medium	1	No	0.0	No	0.0		
10/14/2005	low	0	No	0.0	No	0.0		
10/17/2005	medium	1	No	0.0	No	0.0		
10/24/2005	medium	1	No	0.0	No	0.0		
10/31/2005	low	0	No	0.0	No	0.0		
11/7/2005	high	2	No	0.0	No	0.0		
11/14/2005	low	0	No	0.0	No	0.0		
11/21/2005	high	2	No	0.0	No	0.0		
11/23/2005	medium	1	No	0.0	No	0.0		
11/28/2005	low	0	No	0.0	No	0.0		
11/29/2005	medium	1	No	0.0	No	0.0		
11/30/2005	medium	1	No	0.0	No	0.0		
12/1/2005	high	2	No	0.0	No	0.0		
12/2/2005	high	2	No	0.0	No	0.0		

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Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
12/5/2005	high	2	No	0.0	No	0.0		
12/6/2005	medium	1	No	0.0	No	0.0		
12/7/2005	high	2	No	0.0	No	0.0		
12/9/2005	high	2	No	0.0	No	0.0		
12/15/2005	high	**2**	**Yes**	**1.0**	No	0.0		
12/19/2005	high	**2**	**Yes**	**1.0**	No	0.0		
1/25/2006	low	0	**Yes**	**2.0**	**Yes**	**2.0**		
2/8/2006			**Yes**	**1.0**	No	0.0		
2/9/2006			**Yes**	**1.0**	No	0.0		
2/10/2006			**Yes**	**1.0**	No	0.0		
2/13/2006	medium	1	**Yes**	**1.0**	No	0.0		
2/14/2006	medium	1	**Yes**	**1.0**	No	0.0		
3/15/2006	low	0	No	0.0	No	0.0		
3/17/2006	low	0	No	0.0	No	0.0		
3/21/2006	high	2	No	0.0	No	0.0		
3/27/2006	low	0	No	0.0	No	0.0		
4/3/2006	high	2	No	0.0	No	0.0		
4/11/2006	medium	1	No	0.0	No	0.0		
4/14/2006	medium	1	No	0.0	No	0.0		
4/17/2006	high	2	No	0.0	No	0.0		
4/24/2006	low	0	No	0.0	No	0.0		
4/25/2006	medium	1	No	0.0	No	0.0		
4/26/2006	medium	1	No	0.0	No	0.0		
4/27/2006	medium	1	No	0.0	No	0.0		
4/28/2006	medium	1	No	0.0	No	0.0		
5/1/2006	medium	1	No	0.0	No	0.0		
5/9/2006	low	0	No	0.0	No	0.0		
5/17/2006	high	2	No	0.0	No	0.0		
5/18/2006	high	2	No	0.0	No	0.0		
5/22/2006	low	0	No	0.0	No	0.0		
5/30/2006	medium	1	No	0.0	No	0.0		
5/31/2006	high	2	No	0.0	No	0.0		
6/1/2006	high	2	No	0.0	No	0.0		
6/5/2006	medium	1	No	0.0	**Yes**	**0.5**		
6/12/2006	low	0	No	0.0	No	0.0		
6/14/2006	medium	1	No	0.0	No	0.0		
7/12/2006	low	0	No	0.0	No	0.0		
7/19/2006	medium	1	No	0.0	**Yes**	**1.0**		
7/24/2006	high	2	No	0.0	No	0.0		
7/25/2006	low	0	No	0.0	**Yes**	**1.0**		
7/31/2006	high	2	**Yes**	**1.0**	No	0.0		
8/2/2006	high	2	No	0.0	No	0.0		
8/8/2006	high	2	No	0.0	No	0.0		
8/14/2006	high	2	**Yes**	**1.0**	**Yes**	**1.0**		
8/16/2006	medium	1	**Yes**	**1.0**	**Yes**	**2.0**		
8/21/2006	low	0	No	0.0	No	0.0		
8/25/2006	high	2	**Yes**	**0.5**	**Yes**	**0.5**		
8/28/2006	high	2	No	0.0	**Yes**	**0.5**		
8/29/2006	high	2	No	0.0	No	0.0		

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Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
9/1/2006	medium	1	No	0.0	No	0.0		
9/5/2006	low	0	No	0.0	No	0.0		
9/6/2006	low	0	No	0.0	No	0.0		
9/11/2006	high	2	No	0.0	No	0.0		
9/13/2006	high	2	**Yes**	**1.0**	**Yes**	**1.0**		
9/18/2006	low	0	**Yes**	**1.0**	No	0.0		
9/19/2006	low	0	No	0.0	**Yes**	**2.0**		
9/22/2006	high	2	No	0.0	No	0.0		
9/25/2006	high	2	**Yes**	**1.0**	No	0.0		
9/27/2006	high	2	No	0.0	No	0.0		
10/2/2006	medium	1	No	0.0	No	0.0		
10/5/2006	low	0	No	0.0	No	0.0		
10/6/2006	high	2	No	0.0	No	0.0		
10/9/2006	high	2	No	0.0	No	0.0		
10/12/2006	high	2	No	0.0	No	0.0		
10/16/2006	medium	1	No	0.0	No	0.0		
10/17/2006	high	2	No	0.0	**Yes**	**1.0**		
10/23/2006	high	2	No	0.0	No	0.0		
10/25/2006	high	2	No	0.0	No	0.0		
10/30/2006	high	2	No	0.0	No	0.0		
10/31/2006	high	2	No	0.0	**Yes**	**1.0**		
11/1/2006	medium	1	No	0.0	No	0.0		
11/6/2006	high	2	No	0.0	No	0.0		
11/7/2006	high	2	No	0.0	No	0.0		
11/8/2006	high	2	No	0.0	No	0.0		
11/9/2006	high	2	No	0.0	No	0.0		
11/13/2006	high	2	**Yes**	**1.0**	No	0.0		
11/17/2006	medium	1	No	0.0	No	0.0		
11/20/2006	high	2	No	0.0	No	0.0		
11/27/2006	high	2	No	0.0	No	0.0		
11/30/2006	high	2	No	0.0	No	0.0		
12/4/2006	medium	1	**Yes**	**1.0**	No	0.0		
12/5/2006	high	2	No	0.0	**Yes**	**1.0**		
12/11/2006	high	2	No	0.0	No	0.0		
12/12/2006	medium	1	No	0.0	No	0.0		
12/13/2006	high	2	No	0.0	No	0.0		
12/14/2006	high	2	No	0.0	No	0.0		
12/15/2006	medium	1	No	0.0	**Yes**	**1.0**		
12/16/2006	medium	1	No	0.0	No	0.0		
12/18/2006	medium	1	No	0.0	No	0.0		
12/19/2006	high	2	**Yes**	**1.0**	No	0.0		
12/21/2006	high	2	No	0.0	No	0.0		
12/22/2006	high	2	No	0.0	No	0.0		
1/2/2007	high	2	No	0.0	No	0.0		
1/5/2007	high	2	No	0.0	No	0.0		
1/8/2007	high	2	No	0.0	No	0.0		
1/9/2007	high	2	No	0.0	No	0.0		
1/10/2007	high	2	No	0.0	No	0.0		
1/15/2007	high	2	No	0.0	No	0.0		

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
1/19/2007	high	2	**Yes**	**1.0**	No	0.0		
1/22/2007	high	2	**Yes**	**0.5**	No	0.0		
1/29/2007	high	2	**Yes**	**1.0**	No	0.0		
1/31/2007	high	2	No	0.0	**Yes**	**1.0**		
2/2/2007	high	2	No	0.0	No	0.0		
2/5/2007	high	2	No	0.0	No	0.0		
2/6/2007	high	2	No	0.0	No	0.0		
2/7/2007	high	2	No	0.0	No	0.0		
2/12/2007	high	2	No	0.0	No	0.0		
2/14/2007	high	2	No	0.0	No	0.0		
2/16/2007	high	2	No	0.0	No	0.0		
2/20/2007	high	2	No	0.0	No	0.0		
2/26/2007	high	2	No	0.0	No	0.0		
3/5/2007	medium	1	No	0.0	No	0.0		
3/7/2007	medium	1	No	0.0	No	0.0		
3/13/2007	high	2	No	0.0	No	0.0		
3/16/2007	medium	1	No	0.0	No	0.0		
3/19/2007	low	0	No	0.0	No	0.0		
3/20/2007	medium	1	No	0.0	No	0.0		
3/21/2007	high	2	No	0.0	No	0.0		
3/22/2007	high	2	No	0.0	No	0.0		
3/26/2007	high	2	No	0.0	No	0.0		
3/30/2007	medium	1	No	0.0	No	0.0		
4/2/2007	high	2	No	0.0	No	0.0		
4/6/2007	high	2	No	0.0	**Yes**	**1.0**		
4/9/2007	high	2	No	0.0	No	0.0		
4/12/2007	high	2	No	0.0	No	0.0		
4/13/2007	medium	1	No	0.0	No	0.0		
4/16/2007	low	0	No	0.0	No	0.0		
4/19/2007	medium	1	No	0.0	No	0.0		
4/23/2007	high	2	No	0.0	No	0.0		
4/24/2007	high	2	No	0.0	**Yes**	**1.0**		
4/26/2007	medium	1	No	0.0	No	0.0		
4/27/2007	high	2	No	0.0	No	0.0		
4/30/2007	low	0	No	0.0	No	0.0		
5/3/2007	medium	1	No	0.0	No	0.0		
5/8/2007	high	2	No	0.0	No	0.0		
5/9/2007	high	2	No	0.0	No	0.0		
5/14/2007	low	0	No	0.0	No	0.0		
5/17/2007	medium	1	No	0.0	No	0.0		
5/21/2007	high	2	No	0.0	No	0.0		
5/23/2007	medium	1	No	0.0	No	0.0		
6/1/2007	medium	1	No	0.0	No	0.0		
6/4/2007	high	2	**Yes**	**1.0**	**Yes**	**1.0**		
6/6/2007	high	2	No	0.0	No	0.0		
6/7/2007	medium	1	No	0.0	**Yes**	**1.0**		
6/11/2007	low	0	No	0.0	No	0.0		
6/13/2007	low	0	No	0.0	No	0.0		
6/14/2007	low	0	No	0.0	No	0.0		
6/18/2007	medium	1	No	0.0	No	0.0		

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
6/19/2007	high	2	No	0.0	No	0.0		
6/25/2007	low	0	No	0.0	No	0.0		
7/2/2007	high	2	No	0.0	**Yes**	**2.0**		
7/9/2007	low	0	No	0.0	No	0.0		
7/13/2007	low	0	No	0.0	No	0.0		
7/16/2007	low	0	No	0.0	No	0.0		
7/23/2007	low	0	No	0.0	No	0.0		
7/30/2007	medium	1	No	0.0	No	0.0		
7/31/2007	high	2	No	0.0	**Yes**	**1.0**		
8/6/2007	medium	1	No	0.0	No	0.0		
8/8/2007	low	0	No	0.0	No	0.0		
8/13/2007	medium	1	No	0.0	No	0.0		
8/16/2007	high	2	No	0.0	No	0.0		
8/20/2007	high	2	No	0.0	No	0.0		
8/22/2007	medium	1	No	0.0	No	0.0		
8/23/2007	medium	1	No	0.0	No	0.0		
8/24/2007	low	0	No	0.0	No	0.0		
8/27/2007	low	0	No	0.0	No	0.0		
8/30/2007	low	0	No	0.0	No	0.0		
9/4/2007	medium	1	No	0.0	No	0.0		
9/10/2007	medium	1	No	0.0	No	0.0		
9/13/2007	medium	1	No	0.0	No	0.0		
9/14/2007	high	2	No	0.0	No	0.0		
9/17/2007	high	2	No	0.0	No	0.0		
9/18/2007	high	2	No	0.0	No	0.0		
9/19/2007	high	2	No	0.0	No	0.0		
9/20/2007	medium	1	No	0.0	No	0.0		
9/24/2007	low	0	No	0.0	No	0.0		
10/1/2007	high	2	No	0.0	No	0.0		
10/2/2007	high	2	No	0.0	No	0.0		
10/3/2007	medium	1	No	0.0	No	0.0		
10/5/2007	low	0	No	0.0	No	0.0		
10/8/2007	medium	1	No	0.0	No	0.0		
10/9/2007	high	2	No	0.0	No	0.0		
10/11/2007	high	2	No	0.0	No	0.0		
10/15/2007	high	2	No	0.0	No	0.0		
10/17/2007	medium	1	No	0.0	No	0.0		
10/22/2007	low	0	No	0.0	No	0.0		
10/24/2007	medium	1	No	0.0	No	0.0		
10/25/2007	high	2	No	0.0	No	0.0		
10/29/2007	high	2	No	0.0	No	0.0		
10/31/2007	low	0	No	0.0	No	0.0		
11/1/2007	low	0	No	0.0	No	0.0		
11/2/2007	low	0	No	0.0	No	0.0		
11/5/2007	low	0	No	0.0	No	0.0		
11/6/2007	low	0	No	0.0	No	0.0		
11/12/2007	high	2	No	0.0	No	0.0		
11/13/2007	high	2	No	0.0	No	0.0		
11/15/2007	high	2	No	0.0	No	0.0		
11/16/2007	high	2	No	0.0	No	0.0		

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
11/19/2007	medium	1	No	0.0	No	0.0		
11/26/2007	high	2	No	0.0	No	0.0		
11/27/2007	high	2	No	0.0	**Yes**	**0.5**		
12/3/2007	high	2	No	0.0	No	0.0		
12/10/2007	high	2	No	0.0	No	0.0		
12/11/2007	high	2	No	0.0	No	0.0		
12/14/2007	high	2	No	0.0	No	0.0		
12/17/2007	high	2	No	0.0	No	0.0		
12/19/2007	high	2	No	0.0	No	0.0		
12/20/2007	high	2	No	0.0	No	0.0		
12/24/2007	medium	1	No	0.0	No	0.0		
1/2/2008	high	2	Yes	1.0	No	0.0		
1/7/2008	high	2	No	0.0	No	0.0		
1/11/2008	high	2	No	0.0	No	0.0		
1/14/2008	high	2	No	0.0	No	0.0		
1/21/2008	high	2	No	0.0	No	0.0		
1/22/2008	high	2	No	0.0	No	0.0		
1/28/2008	high	2	No	0.0	No	0.0		
1/29/2008	high	2	No	0.0	No	0.0		
2/4/2008	high	2	No	0.0	**Yes**	**0.5**		
2/11/2008	medium	1	No	0.0	No	0.0		
2/12/2008	high	2	No	0.0	No	0.0		
2/14/2008	high	2	No	0.0	No	0.0		
2/19/2008	high	2	No	0.0	No	0.0		
2/20/2008	high	2	No	0.0	No	0.0		
2/25/2008	high	2	No	0.0	No	0.0		
2/28/2008	high	2	No	0.0	No	0.0		
3/3/2008	medium	1	No	0.0	No	0.0		
3/4/2008	medium	1	No	0.0	No	0.0		
3/10/2008	high	2	No	0.0	No	0.0		
3/11/2008	high	2	No	0.0	No	0.0		
3/12/2008	high	2	No	0.0	No	0.0		
3/14/2008	high	2	No	0.0	No	0.0		
3/17/2008	medium	1	No	0.0	No	0.0		
3/24/2008	high	2	No	0.0	No	0.0		
3/26/2008	high	2	No	0.0	No	0.0		
3/31/2008	medium	1	No	0.0	No	0.0		
4/1/2008	medium	1	No	0.0	No	0.0		
4/7/2008	high	2	No	0.0	No	0.0		
4/10/2008	medium	1	No	0.0	**Yes**	**0.5**		
4/11/2008	medium	1	No	0.0	No	0.0		
4/15/2008	medium	1	No	0.0	No	0.0		
4/16/2008	low	0	No	0.0	No	0.0		
4/18/2008	low	0	No	0.0	No	0.0		
4/21/2008	medium	1	No	0.0	No	0.0		
4/22/2008	medium	1	No	0.0	No	0.0		
4/28/2008	medium	1	No	0.0	No	0.0		
5/2/2008	low	0	No	0.0	No	0.0		
5/5/2008	medium	1	No	0.0	No	0.0		

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
5/12/2008	medium	1	No	0.0	No	0.0		
5/16/2008	medium	1	No	0.0	No	0.0		
5/19/2008	low	0	No	0.0	No	0.0		
5/21/2008	low	0	No	0.0	No	0.0		
5/23/2008	high	2	No	0.0	No	0.0		
5/27/2008	medium	1	No	0.0	**Yes**	**0.5**		
5/29/2008	medium	1	No	0.0	No	0.0		
6/2/2008	low	0	No	0.0	No	0.0		
6/9/2008	medium	1	No	0.0	No	0.0		
6/12/2008	medium	1	No	0.0	No	0.0		
6/17/2008	low	0	No	0.0	No	0.0		
6/18/2008	low	0	No	0.0	No	0.0		
6/19/2008	medium	1	No	0.0	No	0.0		
6/23/2008	high	2	No	0.0	Yes	1.0		
6/25/2008	medium	1	No	0.0	No	0.0		
6/26/2008	medium	1	No	0.0	No	0.0		
6/27/2008	low	0	No	0.0	No	0.0		
6/30/2008	low	0	No	0.0	No	0.0		
7/7/2008	high	2	No	0.0	No	0.0		
7/8/2008	high	2	No	0.0	No	0.0		
7/14/2008	low	0	No	0.0	No	0.0		
7/16/2008	medium	1	**Yes**	**1.0**	**Yes**	**1.0**		
7/21/2008	high	2	No	0.0	No	0.0		
7/22/2008	high	2	No	0.0	No	0.0		
7/23/2008	high	2	No	0.0	No	0.0		
7/28/2008	low	0	No	0.0	No	0.0		
7/30/2008	low	0	No	0.0	No	0.0		
7/31/2008	low	0	No	0.0	No	0.0		
8/4/2008	high	2	No	0.0	No	0.0		
8/5/2008	high	2	No	0.0	No	0.0		
8/6/2008	high	2	No	0.0	No	0.0		
8/7/2008	high	2	No	0.0	No	0.0		
8/8/2008	medium	1	No	0.0	No	0.0		
8/11/2008	low	0	No	0.0	No	0.0		
8/12/2008	low	0	No	0.0	No	0.0		
8/13/2008	low	0	No	0.0	No	0.0		
8/18/2008	medium	1	No	0.0	No	0.0		
8/19/2008	high	2	No	0.0	Yes	1.0		
8/20/2008	high	2	No	0.0	No	0.0		
8/21/2008	high	2	No	0.0	No	0.0		
8/25/2008	medium	1	No	0.0	No	0.0		
8/27/2008	low	0	No	0.0	No	0.0		
9/2/2008	medium	1	No	0.0	No	0.0		
9/8/2008	medium	1	No	0.0	No	0.0		
9/16/2008	medium	1	No	0.0	No	0.0		
9/17/2008	high	2	No	0.0	No	0.0		
9/18/2008	high	2	No	0.0	No	0.0		
9/19/2008	high	2	No	0.0	No	0.0		
9/22/2008	high	2	No	0.0	No	0.0		
9/23/2008	medium	1	No	0.0	No	0.0		

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
9/24/2008	low	0	No	0.0	No	0.0		
9/29/2008	high	2	No	0.0	No	0.0		
9/30/2008	high	2	No	0.0	No	0.0		
10/1/2008	high	2	No	0.0	No	0.0		
10/2/2008	high	2	No	0.0	No	0.0		
10/6/2008	high	2	No	0.0	No	0.0		
10/13/2008	medium	1	No	0.0	No	0.0		
10/15/2008	medium	1	No	0.0	No	0.0		
10/17/2008	high	2	No	0.0	No	0.0		
10/20/2008	high	2	No	0.0	No	0.0		
10/21/2008	high	2	No	0.0	No	0.0		
10/24/2008	low	0	No	0.0	No	0.0		
10/25/2008	medium	1	No	0.0	No	0.0		
10/27/2008	high	2	No	0.0	No	0.0		
11/3/2008	high	2	No	0.0	No	0.0		
11/6/2008	high	2	No	0.0	No	0.0		
11/10/2008	medium	1	No	0.0	No	0.0		
11/14/2008	high	2	No	0.0	No	0.0		
11/17/2008	high	2	No	0.0	No	0.0		
11/18/2008	high	2	No	0.0	No	0.0		
11/21/2008	medium	1	No	0.0	No	0.0		
11/24/2008	medium	1	No	0.0	No	0.0		
11/25/2008	high	2	No	0.0	No	0.0		
12/1/2008	high	2	No	0.0	No	0.0		
12/2/2008	high	2	No	0.0	No	0.0		
12/3/2008	high	2	No	0.0	No	0.0		
12/8/2008	high	2	No	0.0	No	0.0		
12/11/2008	high	2	No	0.0	No	0.0		
12/12/2008	high	2	No	0.0	No	0.0		
12/15/2008	high	2	No	0.0	No	0.0		
12/16/2008	high	2	No	0.0	No	0.0		
12/17/2008	high	2	No	0.0	No	0.0		
12/23/2008	high	2	No	0.0	No	0.0		
12/29/2008	high	2	No	0.0	No	0.0		
1/5/2009	high	2	No	0.0	No	0.0		
1/12/2009	high	2	No	0.0	No	0.0		
1/14/2009	high	2	No	0.0	No	0.0		
1/15/2009	high	2	No	0.0	No	0.0		
1/16/2009	high	2	No	0.0	No	0.0		
1/20/2009	high	2	No	0.0	No	0.0		
1/22/2009	high	2	No	0.0	No	0.0		
1/26/2009	medium	1	No	0.0	No	0.0		
1/27/2009	high	2	No	0.0	No	0.0		
1/28/2009	medium	1	No	0.0	No	0.0		
1/29/2009	medium	1	No	0.0	No	0.0		
1/30/2009	medium	1	No	0.0	No	0.0		
2/2/2009	high	2	No	0.0	No	0.0		
2/5/2009	high	2	**Yes**	**0.5**	No	0.0		
2/9/2009	high	2	No	0.0	No	0.0		

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
2/11/2009	medium	1	No	0.0	No	0.0		
2/17/2009	high	2	No	0.0	**Yes**	**0.5**		
2/18/2009	high	2	No	0.0	No	0.0		
2/23/2009	high	2	No	0.0	No	0.0		
2/26/2009	medium	1	No	0.0	No	0.0		
3/3/2009	high	2	No	0.0	No	0.0		
3/9/2009	medium	1	No	0.0	No	0.0		
3/11/2009	medium	1	No	0.0	No	0.0		
3/16/2009	medium	1	No	0.0	No	0.0		
3/17/2009	high	2	No	0.0	No	0.0		
3/18/2009	high	2	No	0.0	No	0.0		
3/23/2009	medium	1	No	0.0	No	0.0		
3/30/2009	high	2	No	0.0	No	0.0		
3/31/2009	high	2	No	0.0	No	0.0		
4/6/2009	medium	1	No	0.0	No	0.0		
4/7/2009	medium	1	No	0.0	No	0.0		
4/13/2009	high	2	No	0.0	No	0.0		
4/15/2009	high	2	No	0.0	No	0.0		
4/16/2009	low	0	No	0.0	No	0.0		
4/21/2009	low	0	No	0.0	No	0.0		
4/27/2009	medium	1	No	0.0	No	0.0		
4/28/2009	high	2	No	0.0	No	0.0		
4/29/2009	high	2	No	0.0	No	0.0		
5/4/2009	low	0	No	0.0	No	0.0		
5/11/2009	medium	1	No	0.0	No	0.0		
5/14/0009	high	2	No	0.0	No	0.0		
5/15/2009	high	2	No	0.0	No	0.0		
5/18/2009	medium	1	No	0.0	No	0.0		
5/26/2009	medium	1	No	0.0	No	0.0		
5/27/2009	medium	1	No	0.0	No	0.0		
6/1/2009	medium	1	No	0.0	No	0.0		
6/2/2009	medium	1	No	0.0	No	0.0		
6/4/2009	low	0	No	0.0	No	0.0		
6/8/2009	medium	1	No	0.0	No	0.0		
6/10/2009	high	2	No	0.0	No	0.0		
6/11/2009	medium	1	No	0.0	No	0.0		
6/15/2009	high	2	No	0.0	No	0.0		
6/16/2009	medium	1	No	0.0	No	0.0		
6/19/2009	high	2	No	0.0	No	0.0		
6/22/2009	low	0	No	0.0	No	0.0		
6/25/2009	high	2	No	0.0	No	0.0		
6/29/2009	high	2	No	0.0	No	0.0		
7/6/2009	low	0	No	0.0	No	0.0		
7/13/2009	high	2	No	0.0	No	0.0		
7/15/2009	high	2	No	0.0	No	0.0		
7/16/2009	low	0	No	0.0	No	0.0		
7/20/2009	low	0	No	0.0	No	0.0		
7/22/2009	low	0	No	0.0	No	0.0		
7/27/2009	high	2	No	0.0	No	0.0		
8/3/2009	low	0	No	0.0	No	0.0		

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
8/10/2009	high	2	No	0.0	**Yes**	**0.5**		
8/14/2009	low	0	No	0.0	No	0.0		
8/17/2009	low	0	No	0.0	No	0.0		
8/18/2009	low	0	No	0.0	No	0.0		
8/24/2009	high	2	No	0.0	No	0.0		
8/31/2009	low	0	No	0.0	No	0.0		
9/1/2009	medium	1	No	0.0	No	0.0		
9/8/2009	high	2	No	0.0	No	0.0		
9/11/2009	high	2	No	0.0	No	0.0		
9/14/2009	medium	1	No	0.0	No	0.0		
9/16/2009	medium	1	No	0.0	No	0.0		
9/17/2009	medium	1	No	0.0	No	0.0		
9/18/2009	high	2	No	0.0	No	0.0		
9/21/2009	high	2	No	0.0	No	0.0		
9/28/2009	low	0	No	0.0	No	0.0		
10/1/2009	medium	1	No	0.0	No	0.0		
10/7/2009	high	2	No	0.0	No	0.0		
10/12/2009	medium	1	No	0.0	No	0.0		
10/20/2009	high	2	No	0.0	**Yes**	**0.5**		
10/21/2009	high	2	No	0.0	No	0.0		
10/26/2009	medium	1	No	0.0	No	0.0		
10/27/2009	medium	1	No	0.0	No	0.0		
11/2/2009	medium	1	No	0.0	No	0.0		
11/3/2009	high	2	No	0.0	No	0.0		
11/10/2009	medium	1	No	0.0	No	0.0		
11/16/2009	high	2	No	0.0	No	0.0		
11/17/2009	high	2	No	0.0	No	0.0		
11/18/2009	high	2	No	0.0	No	0.0		
11/23/2009	high	2	No	0.0	No	0.0		
11/24/2009	high	2	No	0.0	No	0.0		
11/30/2009	high	2	No	0.0	No	0.0		
12/3/2009	high	2	No	0.0	No	0.0		
12/4/2009	high	2	No	0.0	No	0.0		
12/7/2009	high	2	No	0.0	No	0.0		
12/8/2009	high	2	No	0.0	No	0.0		
12/9/2009	high	2	No	0.0	No	0.0		
12/10/2009	medium	1	No	0.0	No	0.0		
12/11/2009	high	2	No	0.0	No	0.0		
12/14/2009	high	2	No	0.0	**Yes**	**1.0**		
12/15/2009	high	2	No	0.0	No	0.0		
12/16/2009	high	2	No	0.0	No	0.0		
12/17/2009	high	2	No	0.0	No	0.0		
12/21/2009	high	2	No	0.0	No	0.0		
12/28/2009	high	2	No	0.0	No	0.0		
1/4/2010	high	2	No	0.0	No	0.0		
1/5/2010	high	2	No	0.0	No	0.0		
1/6/2010	high	2	No	0.0	No	0.0		
1/7/2010	high	2	No	0.0	No	0.0		
1/11/2010	high	2	No	0.0	No	0.0		

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
1/14/2010	high	2	No	0.0	No	0.0		
1/19/2010	high	2	No	0.0	No	0.0		
1/20/2010	high	2	No	0.0	No	0.0		
1/21/2010	high	2	No	0.0	No	0.0		
1/25/2010	high	2	No	0.0	No	0.0		
1/27/2010	high	2	No	0.0	No	0.0		
2/1/2010	high	2	No	0.0	No	0.0		
2/2/2010	high	2	No	0.0	No	0.0		
2/8/2010	high	2	No	0.0	No	0.0		
2/9/2010	high	2	No	0.0	No	0.0		
2/16/2010	high	2	No	0.0	No	0.0		
2/17/2010	high	2	No	0.0	No	0.0		
2/18/2010	high	2	No	0.0	No	0.0		
2/19/2010	high	2	No	0.0	No	0.0		
2/22/2010	high	2	No	0.0	No	0.0		
3/1/2010	high	2	No	0.0	**Yes**	**1.0**		
3/8/2010	high	2	No	0.0	No	0.0		
3/12/2010	high	2	No	0.0	No	0.0		
3/16/2010	high	2	No	0.0	No	0.0		
3/17/2010	medium	1	No	0.0	No	0.0		
3/19/2010	high	2	No	0.0	No	0.0		
3/22/2010	high	2	No	0.0	No	0.0		
3/25/2010	high	2	No	0.0	No	0.0		
3/30/2010	high	2	No	0.0	No	0.0		
3/31/2010	high	2	No	0.0	No	0.0		
4/1/2010	high	2	No	0.0	No	0.0		
4/2/2010	high	2	No	0.0	No	0.0		
4/5/2010	high	2	No	0.0	No	0.0		
4/6/2010	high	2	No	0.0	No	0.0		
4/9/2010	medium	1	No	0.0	No	0.0		
4/12/2010	medium	1	No	0.0	No	0.0		
4/14/2010	medium	1	No	0.0	No	0.0		
4/15/2010	medium	1	No	0.0	No	0.0		
4/16/2010	medium	1	No	0.0	No	0.0		
4/19/2010	high	2	No	0.0	No	0.0		
4/20/2010	high	2	No	0.0	No	0.0		
4/27/2010	high	2	No	0.0	No	0.0		
4/28/2010	high	2	No	0.0	No	0.0		
4/29/2010	high	2	No	0.0	No	0.0		
5/3/2010	high	2	No	0.0	No	0.0		
5/5/2010	medium	1	No	0.0	No	0.0		
5/6/2010	medium	1	No	0.0	No	0.0		
5/7/2010	medium	1	No	0.0	No	0.0		
5/10/2010	medium	1	No	0.0	No	0.0		
5/17/2010	high	2	No	0.0	No	0.0		
5/18/2010	high	2	No	0.0	No	0.0		
5/24/2010	low	0	No	0.0	No	0.0		
6/1/2010	medium	1	No	0.0	No	0.0		
6/7/2010	low	0	No	0.0	No	0.0		
6/9/2010	low	0	No	0.0	No	0.0		

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
6/10/2010	low	0	No	0.0	No	0.0		
6/14/2010	high	2	No	0.0	No	0.0		
6/16/2010	high	2	No	0.0	No	0.0		
6/17/2010	medium	1	No	0.0	No	0.0		
6/21/2010	low	0	No	0.0	No	0.0		
6/24/2010	low	0	No	0.0	No	0.0		
6/28/2010	high	2	No	0.0	No	0.0		
7/6/2010	low	0	No	0.0	No	0.0		
7/8/2010	low	0	No	0.0	No	0.0		
7/12/2010	medium	1	No	0.0	No	0.0		
7/13/2010	medium	1	No	0.0	No	0.0		
7/14/2010	medium	1	No	0.0	No	0.0		
7/15/2010	high	2	No	0.0	No	0.0		
7/16/2010	high	2	No	0.0	No	0.0		
7/19/2010	low	0	No	0.0	**Yes**	**1.0**		
7/20/2010	medium	1	No	0.0	**Yes**	**1.0**		
7/21/2010	low	0	No	0.0	No	0.0		
7/22/2010	low	0	No	0.0	No	0.0		
7/26/2010	high	1	No	0.0	No	0.0		
7/28/2010	medium	1	No	0.0	No	0.0		
7/29/2010	medium	1	No	0.0	No	0.0		
8/2/2010	medium	1	No	0.0	No	0.0		
8/3/2010	low	0	No	0.0	No	0.0		
8/9/2010	medium	1	No	0.0	No	0.0		
8/11/2010	high	2	No	0.0	No	0.0		
8/16/2010	medium	1	No	0.0	No	0.0		
8/18/2010	low	0	No	0.0	No	0.0		
8/19/2010	low	0	No	0.0	No	0.0		
8/23/2010	medium	1	No	0.0	No	0.0		
8/24/2010	high	2	No	0.0	No	0.0		
8/30/2010	high	2	No	0.0	No	0.0		
8/31/2010	high	2	No	0.0	No	0.0		
9/1/2010	high	2	No	0.0	No	0.0		
9/2/2010	low	0	No	0.0	No	0.0		
9/3/2010	low	0	No	0.0	No	0.0		
9/7/2010	low	0	No	0.0	No	0.0		
9/14/2010	medium	1	No	0.0	No	0.0		
9/15/2010	low	0	No	0.0	No	0.0		
9/16/2010	low	0	No	0.0	No	0.0		
9/20/2010	medium	1	No	0.0	No	0.0		
9/21/2010	medium	1	No	0.0	No	0.0		
9/22/2010	medium	1	No	0.0	No	0.0		
9/27/2010	high	2	No	0.0	No	0.0		
9/30/2010	high	2	No	0.0	No	0.0		
10/4/2010	low	0	No	0.0	No	0.0		
10/7/2010	medium	1	No	0.0	No	0.0		
10/11/2010	high	2	No	0.0	No	0.0		
10/14/2010	medium	1	No	0.0	No	0.0		
10/18/2010	medium	1	No	0.0	No	0.0		
10/19/2010	medium	1	No	0.0	No	0.0		

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
10/20/2010	medium	1	No	0.0	No	0.0		
10/21/2010	medium	1	No	0.0	No	0.0		
10/25/2010	high	2	No	0.0	No	0.0		
10/29/2010	high	2	No	0.0	No	0.0		
11/1/2010	low	0	No	0.0	No	0.0		
11/2/2010	medium	1	No	0.0	No	0.0		
11/8/2010	high	2	No	0.0	No	0.0		
11/11/2010	high	2	No	0.0	No	0.0		
11/15/2010	medium	1	No	0.0	No	0.0		
11/16/2010	medium	1	No	0.0	No	0.0		
11/17/2010	medium	1	No	0.0	No	0.0		
11/18/2010	medium	1	No	0.0	No	0.0		
11/22/2010	high	2	No	0.0	No	0.0		
11/29/2010	high	2	No	0.0	No	0.0		
11/30/2010	medium	1	No	0.0	No	0.0		
12/1/2010	medium	1	No	0.0	No	0.0		
12/2/2010	medium	1	No	0.0	No	0.0		
12/3/2010	medium	1	No	0.0	No	0.0		
12/6/2010	high	2	No	0.0	No	0.0		
12/7/2010	high	2	No	0.0	No	0.0		
12/8/2010	high	2	No	0.0	No	0.0		
12/13/2010	high	2	No	0.0	No	0.0		
12/14/2010	high	2	No	0.0	No	0.0		
12/15/2010	high	2	No	0.0	No	0.0		
12/16/2010	high	2	No	0.0	No	0.0		
12/20/2010	high	2	No	0.0	No	0.0		
12/22/2010	high	2	No	0.0	No	0.0		
12/23/2010	high	2	No	0.0	No	0.0		
12/24/2010	high	2	No	0.0	No	0.0		
12/27/2010	high	2	No	0.0	No	0.0		
1/3/2011	high	2	No	0.0	No	0.0		
1/10/2011	high	2	No	0.0	No	0.0		
1/17/2011	high	2	No	0.0	No	0.0		
1/18/2011	high	2	No	0.0	No	0.0		
1/19/2011	high	2	No	0.0	No	0.0		
1/24/2011	high	2	No	0.0	No	0.0		
1/27/2011	high	2	No	0.0	No	0.0		
1/31/2011	high	2	No	0.0	No	0.0		
2/4/2011	high	2	No	0.0	No	0.0		
2/7/2011	high	2	No	0.0	No	0.0		
2/8/2011	high	2	No	0.0	No	0.0		
2/14/2011	high	2	No	0.0	No	0.0		
2/15/2011	high	2	No	0.0	No	0.0		
2/16/2011	high	2	No	0.0	No	0.0		
2/22/2011	high	2	No	0.0	No	0.0		
2/25/2011	high	2	No	0.0	No	0.0		
2/28/2011	high	2	No	0.0	No	0.0		
3/2/2011	high	2	No	0.0	No	0.0		
3/9/2011	high	2	No	0.0	No	0.0		

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
3/10/2011	high	2	No	0.0	No	0.0		
3/11/2011	high	2	No	0.0	No	0.0		
3/14/2011	high	2	No	0.0	No	0.0		
3/21/2011	high	2	No	0.0	No	0.0		
3/22/2011	high	2	No	0.0	No	0.0		
3/23/2011	high	2	No	0.0	No	0.0		
3/24/2011	high	2	No	0.0	No	0.0		
3/28/2011	high	2	No	0.0	No	0.0		
3/29/2011	high	2	No	0.0	No	0.0		
4/4/2011	high	2	No	0.0	No	0.0		
4/5/2011	high	2	No	0.0	No	0.0		
4/11/2011	high	2	No	0.0	No	0.0		
4/12/2011	high	2	No	0.0	No	0.0		
4/13/2011	high	2	No	0.0	No	0.0		
4/19/2011	high	2	No	0.0	No	0.0		
4/20/2011	high	2	No	0.0	No	0.0		
4/21/2011	high	2	No	0.0	No	0.0		
4/22/2011	high	2	No	0.0	No	0.0		
4/25/2011	medium	1	No	0.0	No	0.0		
4/27/2011	medium	1	No	0.0	**Yes**	**1.0**		
5/2/2011	high	2	No	0.0	No	0.0		
5/9/2011	high	2	No	0.0	No	0.0		
5/16/2011	medium	1	No	0.0	No	0.0		
5/18/2011	high	2	No	0.0	No	0.0		
5/19/2011	high	2	No	0.0	No	0.0		
5/23/2011	high	2	No	0.0	No	0.0		
6/1/2011	medium	1	No	0.0	No	0.0		
6/6/2011	high	2	No	0.0	No	0.0		
6/10/2011	medium	1	No	0.0	**Yes**	**1.0**		
6/13/2011	low	0	No	0.0	No	0.0		
6/14/2011	low	0	No	0.0	No	0.0		
6/15/2011	low	0	No	0.0	No	0.0		
6/20/2011	high	2	No	0.0	No	0.0		
6/22/2011	medium	1	No	0.0	**Yes**	**0.5**		
6/23/2011	medium	1	No	0.0	No	0.0		
6/27/2011	low	0	No	0.0	No	0.0		
6/30/2011	medium	1	No	0.0	No	0.0		
7/6/2011	high	2	No	0.0	No	0.0		
7/11/2011	low	0	No	0.0	No	0.0		
7/18/2011	high	2	No	0.0	No	0.0		
7/19/2011	high	2	No	0.0	No	0.0		
7/20/2011	high	2	No	0.0	No	0.0		
7/25/2011	low	0	No	0.0	No	0.0		
7/29/2011	medium	1	No	0.0	No	0.0		
8/1/2011	high	2	No	0.0	No	0.0		
8/8/2011	low	0	No	0.0	No	0.0		
8/15/2011	high	2	No	0.0	No	0.0		
8/16/2011	high	2	No	0.0	No	0.0		
8/17/2011	high	2	No	0.0	No	0.0		
8/22/2011	low	0	No	0.0	No	0.0		

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
8/24/2011	high	2	No	0.0	No	0.0		
8/29/2011	medium	1	No	0.0	No	0.0		
8/31/2011	medium	1	No	0.0	No	0.0		
9/6/2011	medium	1	No	0.0	No	0.0		
9/12/2011	high	2	No	0.0	No	0.0		
9/13/2011	high	2	No	0.0	No	0.0		
9/14/2011	high	2	No	0.0	No	0.0		
9/20/2011	medium	1	No	0.0	No	0.0		
9/26/2011	medium	1	No	0.0	No	0.0		
9/27/2011	high	2	No	0.0	No	0.0		
9/28/2011	high	2	No	0.0	No	0.0		
9/29/2011	high	2	No	0.0	No	0.0		
10/3/2011	high	2	No	0.0	No	0.0		
10/10/2011	high	2	No	0.0	No	0.0		
10/11/2011	high	2	No	0.0	No	0.0		
10/12/2011	high	2	No	0.0	No	0.0		
10/17/2011	high	2	No	0.0	No	0.0		
10/18/2011	high	2	No	0.0	No	0.0		
10/19/2011	high	2	No	0.0	No	0.0		
10/20/2011	high	2	No	0.0	No	0.0		
10/24/2011	medium	1	No	0.0	No	0.0		
10/31/2011	high	2	No	0.0	No	0.0		
11/8/2011	medium	1	No	0.0	No	0.0		
11/14/2011	high	2	No	0.0	No	0.0		
11/21/2011	medium	1	No	0.0	No	0.0		
11/22/2011	high	2	No	0.0	No	0.0		
11/23/2011	high	2	No	0.0	No	0.0		
11/28/2011	high	2	No	0.0	No	0.0		
11/29/2011	high	2	No	0.0	No	0.0		
12/5/2011	medium	1	No	0.0	No	0.0		
12/12/2011	high	2	No	0.0	No	0.0		
12/13/2011	high	2	No	0.0	No	0.0		
12/14/2011	high	2	No	0.0	No	0.0		
12/19/2011	high	2	No	0.0	No	0.0		
12/20/2011	high	2	No	0.0	No	0.0		
12/21/2011	high	2	No	0.0	No	0.0		
12/27/2011	high	2	No	0.0	No	0.0		
1/3/2012	high	2	No	0.0	No	0.0		
1/9/2012	high	2	No	0.0	No	0.0		
1/17/2012	high	2	No	0.0	No	0.0		
1/23/2012	high	2	No	0.0	No	0.0		
1/24/2012	high	2	No	0.0	No	0.0		
1/25/2012	high	2	No	0.0	No	0.0		
1/27/2012	high	2	No	0.0	No	0.0		
1/30/2012	high	2	No	0.0	No	0.0		
2/6/2012	high	2	No	0.0	No	0.0		
2/13/2012	high	2	No	0.0	No	0.0		
2/21/2012	medium	1	No	0.0	No	0.0		
2/27/2012	high	2	No	0.0	No	0.0		

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
2/24/2012	high	2	No	0.0	No	0.0		
3/1/2012	medium	1	No	0.0	No	0.0		
3/2/2012	high	2	No	0.0	No	0.0		
3/5/2012	high	2	No	0.0	No	0.0		
3/12/2012	high	2	No	0.0	No	0.0		
3/13/2012	high	2	No	0.0	No	0.0		
3/14/2012	medium	1	No	0.0	No	0.0		
3/15/2012	high	2	No	0.0	No	0.0		
3/19/2012	high	2	No	0.0	No	0.0		
3/20/2012	high	2	No	0.0	No	0.0		
.3/21/2012	high	2	No	0.0	No	0.0		
3/22/2012	high	2	No	0.0	No	0.0		
3/26/2012	high	2	No	0.0	No	0.0		
3/28/2012	high	2	No	0.0	No	0.0		
4/2/2012	medium	1	No	0.0	No	0.0		
4/5/2012	medium	1	No	0.0	No	0.0		
4/9/2012	high	2	No	0.0	No	0.0		
4/16/2012	medium	1	No	0.0	No	0.0		
4/17/2012	medium	1	No	0.0	No	0.0		
4/18/2012	high	2	No	0.0	No	0.0		
4/19/2012	medium	1	No	0.0	No	0.0		
4/23/2012	medium	1	No	0.0	No	0.0		
4/30/2012	medium	1	No	0.0	No	0.0		
5/2/2012	medium	1	No	0.0	No	0.0		
5/7/2012	high	2	No	0.0	No	0.0		
5/8/2012	high	2	No	0.0	No	0.0		
5/14/2012	medium	1	No	0.0	No	0.0		
5/15/2012	low	0	No	0.0	No	0.0		
5/16/2012	medium	1	No	0.0	No	0.0		
5/21/2012	high	2	No	0.0	No	0.0		
5/22/2012	high	2	No	0.0	No	0.0		
5/23/2012	high	2	No	0.0	No	0.0		
5/24/2012	high	2	No	0.0	No	0.0		
5/29/2012	high	2	No	0.0	No	0.0		
5/31/2012	low	0	No	0.0	No	0.0		
6/4/2012	medium	1	No	0.0	No	0.0		
6/11/2012	medium	1	No	0.0	No	0.0		
6/12/2012	medium	1	No	0.0	No	0.0		
6/13/2012	medium	1	No	0.0	No	0.0		
6/20/2012	high	2	No	0.0	No	0.0		
6/25/2012	medium	1	No	0.0	No	0.0		
7/2/2012	low	0	No	0.0	No	0.0		
7/9/2012	medium	1	No	0.0	**Yes**	**0.5**		
7/10/2012	high	2	No	0.0	No	0.0		
7/11/2012	high	2	No	0.0	No	0.0		
7/12/2012	high	2	No	0.0	**Yes**	**0.5**		
7/16/2012	low	0	No	0.0	No	0.0		
7/17/2012	low	0	No	0.0	No	0.0		
7/19/2012	low	0	No	0.0	No	0.0		
7/20/2012	low	0	No	0.0	No	0.0		

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
7/23/2012	high	2	No	0.0	No	0.0		
7/30/2012	low	0	No	0.0	No	0.0		
8/6/2012	high	2	No	0.0	No	0.0		
8/7/2012	medium	1	No	0.0	No	0.0		
8/10/2012	medium	1	No	0.0	No	0.0		
8/13/2012	low	0	No	0.0	No	0.0		
8/14/2012	low	0	No	0.0	No	0.0		
8/15/2012	low	0	No	0.0	No	0.0		
8/20/2012	high	2	No	0.0	No	0.0		
8/23/2012	high	2	No	0.0	No	0.0		
8/28/2012	low	0	No	0.0	No	0.0		
8/29/2012	low	0	No	0.0	No	0.0		
9/4/2012	high	2	No	0.0	No	0.0		
9/5/2012	high	2	No	0.0	No	0.0		
9/7/2012	high	2	No	0.0	No	0.0		
9/10/2012	low	0	No	0.0	No	0.0		
9/11/2012	low	0	No	0.0	No	0.0		
9/17/2012	high	2	No	0.0	No	0.0		
9/18/2012	high	2	No	0.0	No	0.0		
9/19/2012	high	2	No	0.0	No	0.0		
9/20/2012	high	2	No	0.0	No	0.0		
9/21/2012	high	2	No	0.0	No	0.0		
9/25/2102	low	0	No	0.0	No	0.0		
9/26/2012	low	0	No	0.0	No	0.0		
9/27/2012	low	0	No	0.0	No	0.0		
10/1/2012	high	2	No	0.0	No	0.0		
10/9/2012	low	0	No	0.0	No	0.0		
10/15/2012	high	2	No	0.0	No	0.0		
10/16/2012	high	2	No	0.0	No	0.0		
10/22/2012	high	2	No	0.0	No	0.0		
10/23/2012	high	2	No	0.0	No	0.0		
10/24/2012	high	2	No	0.0	No	0.0		
10/25/2012	high	2	No	0.0	No	0.0		
10/26/2012	high	2	No	0.0	No	0.0		
10/29/2012	high	2	No	0.0	No	0.0		
11/7/2012	high	2	No	0.0	**Yes**	**0.5**		
11/12/2012	high	2	No	0.0	No	0.0		
11/13/2012	medium	1	No	0.0	No	0.0		
11/19/2012	high	2	No	0.0	No	0.0		
11/27/2012	high	2	No	0.0	**Yes**	**0.5**		
11/28/2012	high	2	No	0.0	No	0.0		
12/5/2012	high	2	No	0.0	No	0.0		
12/6/2012	high	2	No	0.0	**Yes**	**0.5**		
12/7/2012	high	2	No	0.0	No	0.0		
12/12/2012	medium	1	No	0.0	**Yes**	**0.5**		
12/13/2012	medium	1	No	0.0	No	0.0		
12/14/2012	medium	1	No	0.0	No	0.0		
12/17/2012	high	2	No	0.0	No	0.0		
12/18/2012	high	2	No	0.0	No	0.0		
12/19/2012	high	2	No	0.0	No	0.0		

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
12/20/2012	high	2	No	0.0	No	0.0		
12/24/2012	high	2	No	0.0	No	0.0		
1/2/2013	high	2	No	0.0	No	0.0		
1/3/2013	high	2	No	0.0	No	0.0		
1/7/2013	high	2	No	0.0	No	0.0		
1/14/2013	high	2	No	0.0	No	0.0		
1/22/2013	high	2	No	0.0	No	0.0		
1/23/2013	high	2	No	0.0	No	0.0		
1/28/2013	high	2	No	0.0	No	0.0		
1/30/2013	high	2	No	0.0	No	0.0		
1/31/2013	high	2	No	0.0	No	0.0		
2/1/2013	high	2	No	0.0	No	0.0		
2/4/2013	high	2	No	0.0	No	0.0		
2/11/2013	high	2	No	0.0	No	0.0		
2/19/2013	high	2	No	0.0	No	0.0		
2/20/2013	high	2	No	0.0	No	0.0		
2/21/2013	high	2	No	0.0	No	0.0		
2/25/2013	high	2	No	0.0	No	0.0		
3/5/2013	high	2	No	0.0	No	0.0		
3/6/2013	medium	1	No	0.0	No	0.0		
3/11/2013	medium	1	No	0.0	No	0.0		
3/12/2013	high	2	No	0.0	No	0.0		
3/13/2013	high	2	No	0.0	No	0.0		
3/18/2013	high	2	No	0.0	No	0.0		
3/25/2013	high	2	No	0.0	No	0.0		
4/1/2013	high	2	No	0.0	No	0.0		
4/2/2013	high	2	No	0.0	No	0.0		
4/8/2013	medium	1	No	0.0	No	0.0		
4/9/2013	medium	1	No	0.0	No	0.0		
4/10/2013	high	2	No	0.0	No	0.0		
4/15/2013	high	2	No	0.0	No	0.0		
4/16/2013	high	2	No	0.0	No	0.0		
4/18/2013	high	2	No	0.0	No	0.0		
4/22/2013	medium	1	No	0.0	No	0.0		
4/23/2013	medium	1	No	0.0	No	0.0		
4/24/2013	low	0	No	0.0	No	0.0		
4/25/2013	medium	1	No	0.0	No	0.0		
4/29/2013	high	2	No	0.0	No	0.0		
4/30/2013	high	2	No	0.0	No	0.0		
5/6/2013	low	0	No	0.0	No	0.0		
5/7/2013	medium	1	No	0.0	No	0.0		
5/13/2013	high	2	No	0.0	No	0.0		
5/17/2013	medium	1	No	0.0	No	0.0		
5/20/2013	medium	1	No	0.0	No	0.0		
5/21/2013	medium	1	No	0.0	No	0.0		
5/22/2013	medium	1	No	0.0	No	0.0		
5/23/2013	medium	1	No	0.0	No	0.0		
5/28/2013	high	2	No	0.0	No	0.0		
6/3/2013	medium	1	No	0.0	No	0.0		

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
6/5/2013	low	0	No	0.0	No	0.0		
6/10/2013	high	2	No	0.0	No	0.0		
6/11/2013	high	2	No	0.0	No	0.0		
6/12/2013	high	2	No	0.0	No	0.0		
6/17/2013	medium	1	No	0.0	No	0.0		
6/18/2013	medium	1	No	0.0	No	0.0		
6/19/2013	medium	1	No	0.0	No	0.0		
6/24/2013	high	2	No	0.0	No	0.0		
6/25/2013	high	2	No	0.0	No	0.0		
6/26/2013	high	2	No	0.0	No	0.0		
7/1/2013	medium	1	No	0.0	No	0.0		
7/8/2013	medium	1	No	0.0	No	0.0		
7/15/2013	medium	1	No	0.0	No	0.0		
7/18/2013	high	2	No	0.0	No	0.0		
7/22/2013	medium	1	No	0.0	No	0.0		
7/23/2013	medium	1	No	0.0	No	0.0		
7/24/2013	high	2	No	0.0	No	0.0		
7/29/2013	medium	1	No	0.0	No	0.0		
8/5/2013	medium	1	No	0.0	No	0.0		
8/12/2013	high	2	No	0.0	No	0.0		
8/19/2013	low	0	No	0.0	No	0.0		
8/20/2013	medium	1	No	0.0	No	0.0		
8/21/2013	high	2	No	0.0	No	0.0		
8/26/2013	high	2	No	0.0	No	0.0		
8/27/2013	medium	1	No	0.0	No	0.0		
9/3/2013	medium	1	No	0.0	No	0.0		
9/9/2013	high	2	No	0.0	No	0.0		
9/10/2013	high	2	No	0.0	No	0.0		
9/11/2013	medium	1	No	0.0	No	0.0		
9/12/2013	medium	1	No	0.0	No	0.0		
9/16/2013	low	0	No	0.0	No	0.0		
9/17/2013	medium	1	No	0.0	No	0.0		
9/23/2013	high	2	No	0.0	No	0.0		
9/24/2013	high	2	No	0.0	**Yes**	**0.5**		
9/25/2013	high	2	No	0.0	No	0.0		
9/27/2013	high	2	No	0.0	No	0.0		
9/30/2013	medium	1	No	0.0	No	0.0		
10/2/2013	medium	1	No	0.0	No	0.0		
10/7/2013	high	2	No	0.0	No	0.0		
10/9/2013	high	2	No	0.0	No	0.0		
10/14/2013	low	0	No	0.0	No	0.0		
10/15/2013	low	0	No	0.0	No	0.0		
10/21/2013	high	2	No	0.0	No	0.0		
10/28/2013	high	2	No	0.0	No	0.0		
10/29/2013	medium	1	No	0.0	No	0.0		
10/30/2013	medium	1	No	0.0	**Yes**	**0.5**		
10/31/2013	medium	1	No	0.0	No	0.0		
11/4/2013	high	2	No	0.0	No	0.0		
11/11/2013	high	2	No	0.0	No	0.0		
11/13/2013	medium	1	No	0.0	**Yes**	**0.5**		

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
11/18/2013	medium	1	No	0.0	No	0.0		
11/19/2013	high	2	No	0.0	No	0.0		
11/20/2013	high	2	No	0.0	No	0.0		
11/25/2013	high	2	No	0.0	No	0.0		
12/2/2013	high	2	No	0.0	No	0.0		
12/3/2013	high	2	No	0.0	No	0.0		
12/9/2013	high	2	No	0.0	No	0.0		
12/16/2013	high	2	No	0.0	No	0.0		
12/17/2013	high	2	No	0.0	No	0.0		
12/18/2013	high	2	No	0.0	No	0.0		
12/23/2013	high	2	No	0.0	No	0.0		
12/30/2013	medium	1	No	0.0	No	0.0		
1/3/2014	high	2	No	0.0	No	0.0		
1/6/2014	high	2	No	0.0	No	0.0		
1/13/2014	high	2	No	0.0	No	0.0		
1/14/2014	high	2	No	0.0	No	0.0		
1/15/2014	high	2	No	0.0	No	0.0		
1/21/2014	high	2	No	0.0	No	0.0		
1/27/2014	high	2	No	0.0	No	0.0		
1/28/2014	high	2	No	0.0	No	0.0		
2/4/2014	high	2	No	0.0	No	0.0		
2/10/2014	high	2	No	0.0	No	0.0		
2/11/2014	high	2	No	0.0	No	0.0		
2/12/2014	high	2	No	0.0	No	0.0		
2/18/2014	high	2	No	0.0	No	0.0		
2/21/2014	high	2	No	0.0	No	0.0		
2/24/2014	high	2	No	0.0	No	0.0		
3/3/2014	high	2	No	0.0	No	0.0		
3/10/2014	high	2	No	0.0	No	0.0		
3/11/2014	high	2	No	0.0	No	0.0		
3/12/2014	high	2	No	0.0	No	0.0		
3/17/2014	high	2	No	0.0	No	0.0		
3/19/2014	high	2	No	0.0	No	0.0		
3/20/2014	high	2	No	0.0	No	0.0		
3/24/2014	high	2	No	0.0	No	0.0		
3/26/2014	high	2	No	0.0	No	0.0		
3/27/2014	high	2	No	0.0	No	0.0		
3/31/2014	high	2	No	0.0	No	0.0		
4/2/2014	high	2	No	0.0	No	0.0		
4/7/2014	high	2	No	0.0	No	0.0		
4/14/2014	medium	1	No	0.0	No	0.0		
4/15/2014	medium	1	No	0.0	No	0.0		
4/16/2014	high	2	No	0.0	No	0.0		
4/17/2014	high	2	No	0.0	No	0.0		
4/21/2014	high	2	No	0.0	No	0.0		
4/22/2014	medium	1	No	0.0	No	0.0		
4/23/2014	medium	1	No	0.0	No	0.0		
4/28/2014	medium	1	No	0.0	No	0.0		
4/29/2014	high	2	No	0.0	No	0.0		

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
5/5/2014	high	2	No	0.0	**Yes**	**0.5**		
5/12/2014	medium	1	No	0.0	No	0.0		
5/13/2014	medium	1	No	0.0	No	0.0		
5/14/2014	medium	1	No	0.0	No	0.0		
5/19/2014	high	2	No	0.0	No	0.0		
5/20/2014	high	2	No	0.0	No	0.0		
5/21/2014	medium	1	No	0.0	No	0.0		
5/27/2014	low	0	No	0.0	No	0.0		
6/2/2014	high	2	No	0.0	No	0.0		
6/9/2014	low	0	No	0.0	No	0.0		
6/10/2014	medium	1	No	0.0	No	0.0		
6/16/2014	high	2	No	0.0	No	0.0		
6/17/2014	high	2	No	0.0	No	0.0		
6/18/2014	high	2	No	0.0	No	0.0		
6/23/2014	low	0	No	0.0	No	0.0		
6/24/2014	low	0	No	0.0	**Yes**	**1.0**		
6/30/2014	high	2	No	0.0	No	0.0		
7/72014	medium	1	No	0.0	No	0.0		
7/8/2014	medium	1	No	0.0	No	0.0		
7/14/2014	high	2	No	0.0	No	0.0		
7/15/2014	high	2	No	0.0	No	0.0		
7/21/2014	low	0	No	0.0	No	0.0		
7/25/2014	medium	1	No	0.0	No	0.0		
7/28/2014	high	2	No	0.0	No	0.0		
7/30/2014	low	0	No	0.0	No	0.0		
8/4/2014	medium	1	No	0.0	No	0.0		
8/11/2014	medium	1	No	0.0	No	0.0		
8/12/2014	high	2	No	0.0	No	0.0		
8/13/2014	high	2	No	0.0	No	0.0		
8/18/2014	low	0	No	0.0	No	0.0		
8/20/2014	medium	1	No	0.0	No	0.0		
8/25/2014	high	2	No	0.0	No	0.0		
9/2/2014	low	0	No	0.0	No	0.0		
9/8/2014	medium	1	No	0.0	No	0.0		
9/9/2014	high	2	No	0.0	No	0.0		
9/10/2014	high	2	No	0.0	No	0.0		
9/16/2014	medium	1	No	0.0	No	0.0		
9/17/2014	medium	1	No	0.0	No	0.0		
9/22/2014	medium	1	No	0.0	No	0.0		
9/29/2014	high	2	No	0.0	No	0.0		
10/6/2014	medium	1	No	0.0	No	0.0		
10/9/2014	high	2	No	0.0	No	0.0		
10/14/2014	high	2	No	0.0	No	0.0		
10/15/2014	high	2	No	0.0	No	0.0		
10/20/2014	medium	1	No	0.0	No	0.0		
10/21/2014	medium	1	No	0.0	No	0.0		
10/27/2014	high	2	No	0.0	No	0.0		
10/28/2014	high	2	No	0.0	No	0.0		
11/3/2014	medium	1	No	0.0	No	0.0		
11/10/2014	high	2	No	0.0	No	0.0		

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
11/17/2014	medium	1	No	0.0	No	0.0		
11/18/2014	medium	1	No	0.0	No	0.0		
11/19/2014	medium	1	No	0.0	No	0.0		
11/24/2014	high	2	No	0.0	No	0.0		
12/1/2014	high	2	No	0.0	No	0.0		
12/2/2014	high	2	No	0.0	No	0.0		
12/3/2014	medium	1	No	0.0	No	0.0		
12/4/2014	high	2	No	0.0	No	0.0		
12/8/2014	high	2	No	0.0	No	0.0		
12/9/2014	high	2	No	0.0	No	0.0		
12/10/2014	high	2	No	0.0	No	0.0		
12/15/2014	high	2	No	0.0	No	0.0		
12/16/2014	high	2	No	0.0	No	0.0		
12/17/2014	high	2	No	0.0	No	0.0		
12/22/2014	high	2	No	0.0	No	0.0		
12/29/2014	high	2	No	0.0	No	0.0		
1/5/2015	high	2	No	0.0	No	0.0		
1/12/2015	high	2	No	0.0	No	0.0		
1/13/2015	high	2	No	0.0	No	0.0		
1/14/2015	high	2	No	0.0	No	0.0		
1/20/2015	high	2	No	0.0	No	0.0		
1/26/2015	high	2	No	0.0	No	0.0		
1/27/2015	high	2	No	0.0	No	0.0		
2/3/2015	high	2	No	0.0	No	0.0		
2/4/2015	medium	1	No	0.0	No	0.0		
2/9/2015	high	2	No	0.0	No	0.0		
2/10/2015	high	2	No	0.0	No	0.0		
2/11/2015	high	2	No	0.0	No	0.0		
2/17/2015	medium	1	No	0.0	No	0.0		
2/18/2015	medium	1	No	0.0	No	0.0		
2/23/2015	high	2	No	0.0	No	0.0		
2/27/2015	high	2	No	0.0	No	0.0		
3/2/2015	medium	1	No	0.0	No	0.0		
3/9/2015	high	2	No	0.0	No	0.0		
3/16/2015	medium	1	No	0.0	No	0.0		
3/17/2015	medium	1	No	0.0	No	0.0		
3/18/2015	high	2	No	0.0	No	0.0		
3/19/2015	high	2	No	0.0	No	0.0		
3/23/2015	high	2	No	0.0	**Yes**	**0.5**		
3/24/2015	high	2	No	0.0	No	0.0		
3/25/2015	high	2	No	0.0	No	0.0		
3/30/2015	medium	1	No	0.0	No	0.0		
4/1/2015	medium	1	No	0.0	No	0.0		
4/6/2015	high	2	No	0.0	No	0.0		
4/7/2015	high	2	No	0.0	No	0.0		
4/13/2015	medium	1	No	0.0	**Yes**	**0.5**		
4/14/2015	low	0	No	0.0	No	0.0		
4/15/2015	low	0	No	0.0	No	0.0		
4/20/2015	high	2	No	0.0	No	0.0		

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
4/21/2015	high	2	No	0.0	No	0.0		
4/27/2015	medium	1	No	0.0	No	0.0		
4/28/2015	medium	1	No	0.0	No	0.0		
5/4/2015	medium	1	No	0.0	No	0.0		
5/5/2015	high	2	No	0.0	No	0.0		
5/12/2015	high	2	No	0.0	No	0.0		
5/13/2015	medium	1	No	0.0	No	0.0		
5/14/2015	medium	1	No	0.0	No	0.0		
5/18/2015	high	2	No	0.0	No	0.0		
5/26/2015	low	0	No	0.0	No	0.0		
6/1/2015	low	0	No	0.0	No	0.0		
6/8/2015	high	2	No	0.0	No	0.0		
6/9/2015	high	2	No	0.0	No	0.0		
6/10/2015	high	2	No	0.0	No	0.0		
6/15/2015	medium	1	No	0.0	No	0.0		
6/16/2015	low	0	No	0.0	No	0.0		
6/17/2015	medium	1	No	0.0	No	0.0		
6/22/2015	medium	1	No	0.0	No	0.0		
6/29/2015	low	0	No	0.0	No	0.0		
7/6/2015	high	2	No	0.0	No	0.0		
7/13/2015	low	0	No	0.0	No	0.0		
7/14/2015	low	0	No	0.0	No	0.0		
7/15/2015	low	0	No	0.0	No	0.0		
7/20/2015	high	2	No	0.0	No	0.0		
7/21/2015	high	2	No	0.0	No	0.0		
7/22/2015	medium	1	No	0.0	No	0.0		
7/27/2015	low	0	No	0.0	No	0.0		
7/28/2015	low	0	No	0.0	No	0.0		
7/29/2015	low	0	No	0.0	No	0.0		
8/3/2015	high	2	No	0.0	No	0.0		
8/10/2015	low	0	No	0.0	No	0.0		
8/11/2015	low	0	No	0.0	No	0.0		
8/17/2015	high	2	No	0.0	No	0.0		
8/24/2015	low	0	No	0.0	No	0.0		
8/31/2015	high	2	No	0.0	No	0.0		
9/1/2015	high	2	No	0.0	No	0.0		
9/8/2015	low	0	No	0.0	No	0.0		
9/14/2015	high	2	No	0.0	No	0.0		
9/15/2015	high	2	No	0.0	No	0.0		
9/16/2015	high	2	No	0.0	No	0.0		
9/17/2015	high	2	No	0.0	No	0.0		
9/21/2015	medium	1	No	0.0	**Yes**	**0.5**		
9/28/2015	high	2	No	0.0	No	0.0		
9/29/2015	high	2	No	0.0	No	0.0		
10/5/2015	medium	1	No	0.0	No	0.0		
10/8/2015	low	0	No	0.0	No	0.0		
10/12/2015	high	2	No	0.0	No	0.0		
10/13/2015	high	2	No	0.0	No	0.0		
10/14/2015	high	2	No	0.0	No	0.0		
10/19/2015	high	2	No	0.0	No	0.0		

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
10/20/2015	high	2	No	0.0	No	0.0		
10/26/2015	high	2	No	0.0	No	0.0		
11/2/2015	high	2	No	0.0	No	0.0		
11/10/2015	medium	1	No	0.0	No	0.0		
11/11/2015	medium	1	No	0.0	No	0.0		
11/13/2015	high	2	No	0.0	No	0.0		
11/16/2015	high	2	No	0.0	No	0.0		
11/17/2015	high	2	No	0.0	No	0.0		
11/18/2015	high	2	No	0.0	No	0.0		
11/23/2015	medium	1	No	0.0	No	0.0		
11/30/2015	high	2	No	0.0	No	0.0		
12/2/2015	medium	1	No	0.0	No	0.0		
12/3/2015	medium	1	No	0.0	No	0.0		
12/7/2015	high	2	No	0.0	No	0.0		
12/9/2015	high	2	No	0.0	No	0.0		
12/10/2015	high	2	No	0.0	No	0.0		
12/14/2015	high	2	No	0.0	No	0.0		
12/15/2015	high	2	No	0.0	No	0.0		
12/16/2015	high	2	No	0.0	No	0.0		
12/21/2015	high	2	No	0.0	No	0.0		
12/28/2015	high	2	No	0.0	No	0.0		
1/4/2016	high	2	No	0.0	No	0.0		
1/11/2016	high	2	No	0.0	No	0.0		
1/12/2016	high	2	No	0.0	No	0.0		
1/13/2016	high	2	No	0.0	No	0.0		
1/19/2016	high	2	No	0.0	No	0.0		
1/20/2016	medium	2	No	0.0	No	0.0		
1/25/2016	high	2	No	0.0	No	0.0		
2/1/2016	high	2	No	0.0	No	0.0		
2/8/2016	high	2	No	0.0	No	0.0		
2/9/2016	high	2	No	0.0	No	0.0		
2/10/2016	high	2	No	0.0	No	0.0		
2/16/2016	high	2	No	0.0	No	0.0		
2/22/2016	medium	1	No	0.0	No	0.0		
2/23/2016	high	2	No	0.0	No	0.0		
2/29/2016	high	2	No	0.0	**Yes**	**0.5**		
3/7/2016	high	2	No	0.0	No	0.0		
3/8/2016	high	2	No	0.0	No	0.0		
3/9/2016	high	2	No	0.0	No	0.0		
3/10/2016	high	2	No	0.0	No	0.0		
3/14/2016	high	2	No	0.0	No	0.0		
3/15/2016	high	2	No	0.0	No	0.0		
3/16/2016	high	2	No	0.0	No	0.0		
3/21/2016	high	2	No	0.0	No	0.0		
3/22/2016	high	2	No	0.0	No	0.0		
3/29/2016	high	2	No	0.0	No	0.0		
3/30/2016	high	2	No	0.0	No	0.0		
3/31/2016	high	2	No	0.0	No	0.0		
4/4/2016	medium	1	No	0.0	No	0.0		

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
4/5/2016	medium	1	No	0.0	No	0.0		
4/11/2016	high	2	No	0.0	No	0.0		
4/12/2016	high	2	No	0.0	No	0.0		
4/13/2016	medium	1	No	0.0	No	0.0		
4/18/2016	medium	1	No	0.0	No	0.0		
4/19/2016	medium	1	No	0.0	No	0.0		
4/20/2016	medium	1	No	0.0	No	0.0		
4/25/2016	high	2	No	0.0	**Yes**	**0.5**		
4/26/2016	high	2	No	0.0	No	0.0		
5/2/2016	medium	1	No	0.0	No	0.0		
5/3/2016	medium	1	No	0.0	No	0.0		
5/4/2016	medium	1	No	0.0	No	0.0		
5/9/2016	high	2	No	0.0	No	0.0		
5/10/2016	high	2	No	0.0	No	0.0		
5/11/2016	high	2	No	0.0	No	0.0		
5/16/2016	medium	1	No	0.0	No	0.0		
5/17/2016	medium	1	No	0.0	No	0.0		
5/18/2016	medium	1	No	0.0	No	0.0		
5/23/2016	high	2	No	0.0	No	0.0		
5/24/2016	high	2	No	0.0	No	0.0		
5/31/2016	low	0	No	0.0	No	0.0		
6/7/2016	high	2	No	0.0	No	0.0		
6/8/2016	high	2	No	0.0	No	0.0		
6/9/2016	high	2	No	0.0	No	0.0		
6/13/2016	low	0	No	0.0	No	0.0		
6/14/2016	low	0	No	0.0	No	0.0		
6/15/2016	medium	1	No	0.0	No	0.0		
6/20/2016	medium	1	No	0.0	No	0.0		
6/26/2016	medium	1	No	0.0	**Yes**	**0.5**		
7/6/2016	medium	1	No	0.0	No	0.0		
7/11/2016	medium	1	No	0.0	No	0.0		
7/12/2016	medium	1	No	0.0	No	0.0		
7/21/2016	high	2	No	0.0	No	0.0		
7/25/2016	high	2	No	0.0	No	0.0		
8/2/2016	low	0	No	0.0	No	0.0		
8/8/2016	high	2	No	0.0	No	0.0		
8/15/2016	low	0	No	0.0	No	0.0		
8/17/2016	medium	1	No	0.0	No	0.0		
8/18/2016	medium	1	No	0.0	No	0.0		
8/22/2016	high	2	No	0.0	No	0.0		
8/23/2016	high	2	No	0.0	No	0.0		
8/24/2016	high	2	No	0.0	No	0.0		
8/25/2016	high	2	No	0.0	No	0.0		
8/29/2016	low	0	No	0.0	No	0.0		
9/6/2016	high	2	No	0.0	No	0.0		
9/8/2016	high	2	No	0.0	No	0.0		
9/9/2016	high	2	No	0.0	No	0.0		
9/12/2016	low	0	No	0.0	No	0.0		
9/19/2016	high	2	No	0.0	No	0.0		
9/20/2016	high	2	No	0.0	No	0.0		

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
9/21/2016	high	2	No	0.0	No	0.0		
9/26/2016	low	0	No	0.0	No	0.0		
9/28/2016	medium	1	No	0.0	No	0.0		
9/29/2016	medium	1	No	0.0	No	0.0		
10/3/2016	high	2	No	0.0	**Yes**	**0.5**		
10/6/2016	high	2	No	0.0	No	0.0		
10/10/2016	high	2	No	0.0	No	0.0		
10/17/2016	high	2	No	0.0	No	0.0		
10/18/2016	high	2	No	0.0	No	0.0		
10/19/2016	high	2	No	0.0	**Yes**	**0.5**		
10/24/2016	medium	1	No	0.0	No	0.0		
10/26/2016	medium	1	No	0.0	No	0.0	**Yes**	**1.0**
10/27/2016	medium	1	No	0.0	No	0.0	**Yes**	**1.0**
10/31/2016	high	2	No	0.0	No	0.0	No	0.0
11/1/2016	high	2	No	0.0	No	0.0	No	0.0
11/2/2016	high	2	No	0.0	No	0.0	**Yes**	**1.0**
11/7/2016	high	2	No	0.0	No	0.0	**Yes**	**1.0**
11/9/2016	high	2	No	0.0	No	0.0	**Yes**	**1.0**
11/14/2016	high	2	No	0.0	No	0.0	**Yes**	**1.0**
11/15/2016	high	2	No	0.0	No	0.0	**Yes**	**1.0**
11/16/2016	high	2	No	0.0	No	0.0	**Yes**	**1.0**
11/21/2016	high	2	No	0.0	No	0.0	**Yes**	**1.0**
11/22/2016	high	2	No	0.0	No	0.0	**Yes**	**1.0**
11/28/2016	high	2	No	0.0	No	0.0	No	0.0
12/5/2016	high	2	No	0.0	No	0.0	No	0.0
12/6/2016	high	2	No	0.0	No	0.0	No	0.0
12/7/2016	medium	1	No	0.0	No	0.0	No	0.0
12/12/2016	medium	1	No	0.0	No	0.0	No	0.0
12/13/2016	high	2	No	0.0	No	0.0	No	0.0
12/14/2016	medium	1	No	0.0	No	0.0	No	0.0
12/19/2016	high	2	No	0.0	No	0.0	No	0.0
12/27/2016	high	2	No	0.0	No	0.0	No	0.0
1/2/2017	high	2	No	0.0	No	0.0	No	0.0
1/9/2017	medium	1	No	0.0	No	0.0	No	0.0
1/17/2017	high	2	No	0.0	No	0.0	No	0.0
1/18/2017	high	2	No	0.0	No	0.0	No	0.0
1/23/2017	high	2	No	0.0	No	0.0	No	0.0
1/24/2017	medium	1	No	0.0	**Yes**	**0.5**	**Yes**	**0.5**
1/27/2017	medium	1	No	0.0	No	0.0	No	0.0
1/30/2017	high	2	No	0.0	No	0.0	No	0.0
2/7/2017	medium	1	No	0.0	No	0.0	No	0.0
2/8/2017	medium	1	No	0.0	No	0.0	No	0.0
2/13/2017	high	2	No	0.0	No	0.0	No	0.0
2/14/2017	high	2	No	0.0	No	0.0	No	0.0
2/15/2017	high	2	No	0.0	No	0.0	No	0.0
2/21/2017	medium	1	No	0.0	No	0.0	No	0.0
2/27/2017	high	2	No	0.0	No	0.0	No	0.0
3/6/2017	high	2	No	0.0	No	0.0	No	0.0
3/7/2017	high	2	No	0.0	No	0.0	No	0.0

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
3/8/2017	high	2	No	0.0	No	0.0	No	0.0
3/13/2017	high	2	No	0.0	**Yes**	**0.5**	**Yes**	**0.5**
3/14/2017	high	2	No	0.0	No	0.0	No	0.0
3/15/2017	high	2	No	0.0	No	0.0	No	0.0
3/20/2017	medium	1	No	0.0	No	0.0	No	0.0
3/22/2017	medium	1	No	0.0	No	0.0	No	0.0
3/27/2017	high	2	No	0.0	No	0.0	No	0.0
4/3/2017	medium	1	No	0.0	No	0.0	No	0.0
4/5/2017	medium	1	No	0.0	No	0.0	No	0.0
4/10/2017	high	2	No	0.0	No	0.0	No	0.0
4/11/2017	high	2	No	0.0	No	0.0	No	0.0
4/12/2017	low	0	No	0.0	No	0.0	No	0.0
4/17/2017	medium	1	No	0.0	No	0.0	No	0.0
4/24/2017	medium	1	No	0.0	No	0.0	No	0.0
5/1/2017	high	2	No	0.0	No	0.0	No	0.0
5/8/2017	low	0	No	0.0	No	0.0	No	0.0
5/15/2017	high	2	No	0.0	No	0.0	No	0.0
5/16/2017	high	2	No	0.0	No	0.0	No	0.0
5/17/2017	high	2	No	0.0	No	0.0	No	0.0
5/22/2017	low	0	No	0.0	No	0.0	No	0.0
5/23/2017	low	0	No	0.0	No	0.0	No	0.0
5/30/2017	high	2	No	0.0	No	0.0	No	0.0
6/5/2017	medium	1	No	0.0	No	0.0	No	0.0
6/6/2017	medium	1	No	0.0	No	0.0	No	0.0
6/7/2017	medium	1	No	0.0	No	0.0	No	0.0
6/12/2017	high	2	No	0.0	**Yes**	**0.5**	**Yes**	**0.5**
6/13/2017	high	2	No	0.0	**Yes**	**0.5**	No	0.0
6/14/2017	high	2	No	0.0	No	0.0	No	0.0
6/19/2017	low	0	No	0.0	No	0.0	No	0.0
6/26/2017	high	2	No	0.0	**Yes**	**0.5**	No	0.0
6/27/2017	high	2	No	0.0	No	0.0	No	0.0
7/6/2017	low	0	No	0.0	No	0.0	No	0.0
7/10/2017	medium	1	No	0.0	No	0.0	No	0.0
7/11/2017	medium	1	No	0.0	No	0.0	No	0.0
7/17/2017	low	0	No	0.0	No	0.0	No	0.0
7/18/2017	low	0	No	0.0	No	0.0	No	0.0
7/19/2017	low	0	No	0.0	No	0.0	No	0.0
7/20/2017	low	0	No	0.0	No	0.0	No	0.0
7/24/2017	high	2	No	0.0	No	0.0	No	0.0
7/31/2017	low	0	No	0.0	No	0.0	No	0.0
8/2/2017	medium	1	No	0.0	No	0.0	No	0.0
8/3/2017	low	0			No	0.0	No	0.0
8/4/2017	low	0			No	0.0	No	0.0
8/5/2017	low	0			No	0.0	No	0.0
8/7/2017	medium	1			No	0.0	No	0.0
8/8/2017	high	2			No	0.0	No	0.0
8//9/2017	high	2			No	0.0	No	0.0
8/10/2017	high	2			No	0.0	No	0.0
8/14/2017	medium	1			No	0.0	No	0.0
8/18/2017	medium	1			No	0.0	No	0.0

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
8/23/2017	high	2			No	0.0	No	0.0
8/24/2017	high	2			No	0.0	No	0.0
8/28/2017	high	2			No	0.0	No	0.0
8/29/2017	high	2			No	0.0	No	0.0
9/5/2017	medium	1			No	0.0	No	0.0
9/11/2017	medium	1			No	0.0	No	0.0
9/12/2017	medium	1			No	0.0	No	0.0
9/13/2017	medium	1			No	0.0	No	0.0
9/18/2017	low	0			No	0.0	No	0.0
9/19/2017	medium	1			No	0.0	No	0.0
9/20/2017	high	2			No	0.0	No	0.0
9/25/2017	high	2			No	0.0	No	0.0
9/27/2017	high	2			No	0.0	No	0.0
10/2/2017	low	0			No	0.0	No	0.0
10/3/2017	low	0			No	0.0	No	0.0
10/5/2017	low	0			No	0.0	No	0.0
10/9/2017	high	2			No	0.0	No	0.0
10/10/2017	high	2			No	0.0	No	0.0
10/11/2017	high	2			No	0.0	No	0.0
10/12/2017	high	2			No	0.0	No	0.0
10/16/2017	low	0			No	0.0	No	0.0
10/17/2017	low	0			No	0.0	No	0.0
10/18/2017	low	0			No	0.0	No	0.0
10/19/2017	high	2			No	0.0	No	0.0
10/24/2017	high	2			No	0.0	No	0.0
10/25/2017	high	2			No	0.0	No	0.0
10/26/2017	high	2			No	0.0	No	0.0
10/30/2017	medium	1			No	0.0	No	0.0
11/2/2017	medium	1			No	0.0	No	0.0
11/6/2017	high	2			No	0.0	No	0.0
11/13/2017	medium	1			No	0.0	No	0.0
11/14/2017	low	0			No	0.0	No	0.0
11/15/2017	medium	1			No	0.0	**Yes**	**1.0**
11/20/2017	high	2			**Yes**	**0.5**	No	0.0
11/21/2017	high	2			No	0.0	No	0.0
11/22/2017	medium	1			No	0.0	No	0.0
11/27/2017	medium	1			No	0.0	**Yes**	**0.5**
11/30/2017	medium	1			No	0.0	**Yes**	**0.5**
12/4/2017	high	2			No	0.0	No	0.0
12/5/2017	high	2			No	0.0	No	0.0
12/11/2017	medium	1			No	0.0	No	0.0
12/12/2017	medium	1			No	0.0	No	0.0
12/13/2017	medium	1			No	0.0	No	0.0
12/15/2017	medium	1			No	0.0	No	0.0
12/18/2017	high	2			No	0.0	No	0.0
12/19/2017	high	2			No	0.0	No	0.0
12/20/2017	high	2			No	0.0	No	0.0
12/26/2017	high	2			No	0.0	No	0.0
1/2/2018	high	2	No	0.0	No	0.0	No	0.0

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
1/8/2018	high	2	No	0.0	No	0.0	No	0.0
1/9/2018	high	2	No	0.0	No	0.0	No	0.0
1/11/2018	high	2	No	0.0	No	0.0	No	0.0
1/16/2018	high	2	No	0.0	No	0.0	No	0.0
1/17/2018	medium	1	No	0.0	No	0.0	No	0.0
1/18/2018	high	2	No	0.0	No	0.0	No	0.0
1/22/2018	high	2	No	0.0	No	0.0	No	0.0
1/29/2018	high	2	No	0.0	No	0.0	No	0.0
2/5/2018	high	2	No	0.0	No	0.0	No	0.0
2/12/2018	medium	1	No	0.0	No	0.0	No	0.0
2/13/2018	medium	1	No	0.0	No	0.0	No	0.0
2/14/2018	medium	1	No	0.0	No	0.0	No	0.0
2/20/2018	high	2	No	0.0	No	0.0	No	0.0
2/21/2018	medium	1	No	0.0	No	0.0	No	0.0
2/22/2018	medium	1	No	0.0	No	0.0	No	0.0
2/26/2018	medium	1	No	0.0	No	0.0	No	0.0
3/1/2018	medium	1	No	0.0	No	0.0	No	0.0
3/5/2018	high	2	No	0.0	No	0.0	No	0.0
3/12/2018	high	2	No	0.0	**Yes**	**0.5**	No	0.0
3/13/2018	high	2	No	0.0	No	0.0	No	0.0
3/14/2018	high	2	No	0.0	No	0.0	No	0.0
3/19/2018	high	2	No	0.0	No	0.0	No	0.0
3/22/2018	high	2	No	0.0	No	0.0	No	0.0
3/23/2018	high	2	No	0.0	No	0.0	No	0.0
3/26/2018	medium	1	No	0.0	No	0.0	No	0.0
3/28/2018	medium	1	No	0.0	No	0.0	No	0.0
4/2/2018	high	2	No	0.0	No	0.0	No	0.0
4/9/2018	high	2	No	0.0	No	0.0	No	0.0
4/10/2018	medium	1	No	0.0	No	0.0	No	0.0
4/16/2018	high	2	No	0.0	No	0.0	No	0.0
4/17/2018	high	2	No	0.0	No	0.0	No	0.0
4/18/2018	high	2	No	0.0	No	0.0	No	0.0
4/23/2018	medium	1	No	0.0	No	0.0	No	0.0
4/25/2018	medium	1	No	0.0	No	0.0	No	0.0
4/26/2018	medium	1	No	0.0	No	0.0	No	0.0
4/27/2018	medium	1	No	0.0	No	0.0	No	0.0
4/30/2018	medium	1	No	0.0	No	0.0	No	0.0
5/2/2018	medium	1	No	0.0	**Yes**	**0.5**	No	0.0
5/7/2018	high	2	No	0.0	No	0.0	No	0.0
5/10/2018	high	2	No	0.0	No	0.0	No	0.0
5/14/2018	medium	1	No	0.0	No	0.0	No	0.0
5/15/2018	high	2	No	0.0	No	0.0	No	0.0
5/16/2018	high	2	No	0.0	No	0.0	No	0.0
5/17/2018	high	2	No	0.0	No	0.0	No	0.0
5/21/2018	medium	1	No	0.0	**Yes**	**0.5**	No	0.0
5/31/2018	high	2	No	0.0	No	0.0	No	0.0
6/4/2018	medium	1	No	0.0	No	0.0	No	0.0
6/5/2018	medium	1	No	0.0	No	0.0	No	0.0
6/11/2018	low	0	No	0.0	No	0.0	No	0.0
6/12/2018	low	0	No	0.0	No	0.0	No	0.0

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
6/13/2018	low	0	No	0.0	No	0.0	No	0.0
6/18/2018	high	2	No	0.0	No	0.0	No	0.0
6/19/2018	high	2	No	0.0	No	0.0	No	0.0
6/20/2018	medium	1	No	0.0	No	0.0	No	0.0
6/25/2018	low	0	No	0.0	No	0.0	No	0.0
7/6/2018	medium	1	No	0.0	No	0.0	No	0.0
7/11/2018	low	0	No	0.0	No	0.0	No	0.0
7/12/2018	medium	1	No	0.0	No	0.0	No	0.0
7/16/2018	high	2	No	0.0	No	0.0	No	0.0
7/17/2018	high	2	No	0.0	No	0.0	No	0.0
7/18/2018	high	2	No	0.0	No	0.0	No	0.0
7/23/2018	low	0	No	0.0	No	0.0	No	0.0
7/26/2018	low	0	No	0.0	No	0.0	No	0.0
7/31/2018	high	2	No	0.0	**Yes**	**0.5**	No	0.0
8/6/2018	low	0	No	0.0	No	0.0	No	0.0
8/14/2018	high	2	No	0.0	No	0.0	No	0.0
8/15/2018	high	2	No	0.0	**Yes**	**0.5**	No	0.0
8/21/2018	low	0	No	0.0	No	0.0	No	0.0
8/27/2018	high	2	No	0.0	No	0.0	No	0.0
8/28/2018	high	2	No	0.0	No	0.0	No	0.0
8/31/2018	medium	1	No	0.0	No	0.0	No	0.0
9/4/2018	low	0	No	0.0	No	0.0	No	0.0
9/10/2018	high	2	No	0.0	**Yes**	**0.5**	**Yes**	**0.5**
9/11/2018	high	2	No	0.0	No	0.0	No	0.0
9/12/2018	high	2	No	0.0	No	0.0	No	0.0
9/17/2018	low	0	No	0.0	No	0.0	No	0.0
9/18/2018	low	0	No	0.0	No	0.0	No	0.0
9/19/2018	low	0	No	0.0	No	0.0	No	0.0
9/24/2018	medium	1	No	0.0	No	0.0	No	0.0
9/26/2018	high	2	No	0.0	No	0.0	No	0.0
9/27/2018	high	2	No	0.0	No	0.0	No	0.0
10/1/2018	medium	1	No	0.0	No	0.0	No	0.0
10/8/2018	medium	1	No	0.0	No	0.0	No	0.0
10/15/2018	high	2	No	0.0	No	0.0	No	0.0
10/16/2018	high	2	No	0.0	No	0.0	No	0.0
10/17/2018	medium	1	No	0.0	No	0.0	No	0.0
10/23/2018	medium	1	No	0.0	No	0.0	No	0.0
10/24/2018	high	2	No	0.0	No	0.0	No	0.0
10/30/2018	high	2	No	0.0	No	0.0	No	0.0
11/5/2018	medium	1	No	0.0	No	0.0	No	0.0
11/8/2018	high	2	No	0.0	No	0.0	No	0.0
11/12/2018	high	2	No	0.0	No	0.0	No	0.0
11/13/2018	high	2	No	0.0	No	0.0	No	0.0
11/14/2018	high	2	No	0.0	No	0.0	No	0.0
11/19/2018	medium	1	No	0.0	No	0.0	No	0.0
11/26/2018	high	2	No	0.0	No	0.0	No	0.0
11/27/2018	high	2	No	0.0	No	0.0	No	0.0
12/5/2018	high	2	No	0.0	No	0.0	No	0.0

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
12/6/2018	high	2	No	0.0	No	0.0	No	0.0
12/10/2018	high	2	No	0.0	No	0.0	No	0.0
12/11/2018	high	2	No	0.0	**Yes**	**0.5**	**Yes**	**0.5**
12/12/2018	high	2	No	0.0	No	0.0	No	0.0
12/17/2018	medium	1	No	0.0	No	0.0	**Yes**	**1.0**
12/18/2018	medium	1	No	0.0	No	0.0	**Yes**	**0.5**
12/19/2018	medium	1	No	0.0	No	0.0	**Yes**	**1.0**
12/21/2018	high	2	No	0.0	No	0.0	No	0.0
12/26/2018	high	2	No	0.0	No	0.0	No	0.0
1/2/2019	medium	1	No	0.0	No	0.0	No	0.0
1/7/2019	high	2	No	0.0	No	0.0	No	0.0
1/14/2019	high	2	No	0.0	No	0.0	No	0.0
1/15/2019	high	2	No	0.0	No	0.0	No	0.0
1/16/2019	high	2	No	0.0	**Yes**	**0.5**	**Yes**	**0.5**
1/22/2019	high	2	No	0.0	No	0.0	No	0.0
1/28/2019	high	2	No	0.0	No	0.0	No	0.0
2/6/2019	high	2	No	0.0	No	0.0	No	0.0
2/13/2019	high	2	No	0.0	No	0.0	No	0.0
2/14/2019	high	2	No	0.0	No	0.0	No	0.0
2/15/2019	high	2	No	0.0	No	0.0	No	0.0
2/18/2019	medium	1	No	0.0	No	0.0	**Yes**	**0.5**
2/19/2019	low	0	No	0.0	No	0.0	No	0.0
2/26/2019	high	2	No	0.0	**Yes**	**0.5**	**Yes**	**0.5**
2/27/2019	high	2	No	0.0	No	0.0	No	0.0
3/4/2019	high	2	No	0.0	No	0.0	No	0.0
3/11/2019	high	2	No	0.0	No	0.0	No	0.0
3/12/2019	high	2	No	0.0	No	0.0	No	0.0
3/13/2019	high	2	No	0.0	No	0.0	No	0.0
3/18/20119	medium	1	No	0.0	No	0.0	No	0.0
3/19/2019	medium	1	No	0.0	**Yes**	**1.0**	No	0.0
3/20/2019	medium	1	No	0.0	No	0.0	No	0.0
3/25/2019	high	2	No	0.0	No	0.0	No	0.0
4/1/2019	medium	1	No	0.0	No	0.0	No	0.0
4/8/2019	high	2	No	0.0	**Yes**	**0.5**	**Yes**	**1.0**
4/10/2019	high	2	No	0.0	No	0.0	No	0.0
4/17/2019	medium	1	No	0.0	No	0.0	No	0.0
4/22/2019	high	2	No	0.0	**Yes**	**0.5**	No	0.0
4/23/2019	high	2	No	0.0	No	0.0	No	0.0
4/24/2019	medium	1	No	0.0	No	0.0	No	0.0
4/29/2019	medium	1	No	0.0	No	0.0	No	0.0
5/3/2019	low	0	No	0.0	No	0.0	No	0.0
5/6/2019	high	2	No	0.0	**Yes**	**0.5**	No	0.0
5/8/2019	high	2	No	0.0	No	0.0	No	0.0
5/13/2019	low	0	No	0.0	No	0.0	No	0.0
5/14/2019	low	0	No	0.0	No	0.0	No	0.0
5/15/2019	low	0	No	0.0	No	0.0	No	0.0
5/20/2019	high	2	No	0.0	**Yes**	**1.0**	**Yes**	**0.5**
5/28/2019	low	0	No	0.0	No	0.0	No	0.0
5/29/2019	low	0	No	0.0	No	0.0	No	0.0

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)
5/30/2019	low	0	No	0.0	No	0.0	No	0.0
6/3/2019	medium	1	No	0.0	No	0.0	No	0.0
6/10/2019	medium	1	No	0.0	No	0.0	No	0.0
6/11/2019	low	0	No	0.0	No	0.0	No	0.0
6/17/2019	medium	1	No	0.0	**Yes**	**0.5**	No	0.0
6/18/2019	medium	1	No	0.0	No	0.0	No	0.0
6/19/2019	high	2	No	0.0	No	0.0	No	0.0
6/24/2019	medium	1	No	0.0	No	0.0	No	0.0
7/1/2019	low	0	No	0.0	No	0.0	No	0.0
7/8/2019	high	2	No	0.0	No	0.0	No	0.0
7/9/2019	medium	1	No	0.0	**Yes**	**0.5**	No	0.0
7/10/2019	low	0	No	0.0	No	0.0	No	0.0
7/11/2019	low	0	No	0.0	No	0.0	No	0.0
7/22/2019	high	2	No	0.0	No	0.0	No	0.0
7/23/2019	high	2	No	0.0	No	0.0	No	0.0
7/24/2019	high	2	No	0.0	No	0.0	No	0.0
7/25/2019	high	2	No	0.0	No	0.0	No	0.0
7/26/2019	low	0	No	0.0	No	0.0	No	0.0
7/29/2019	low	0	No	0.0	No	0.0	No	0.0
7/30/2019	low	0	No	0.0	No	0.0	No	0.0
7/31/2019	low	0	No	0.0	No	0.0	No	0.0
8/5/2019	high	2	No	0.0	No	0.0	No	0.0
8/12/2019	low	0	No	0.0	No	0.0	No	0.0
8/13/2019	low	0	No	0.0	No	0.0	No	0.0
8/14/2019	medium	1	No	0.0	**Yes**	**0.5**	No	0.0
8/19/2019	high	2	No	0.0	No	0.0	**Yes**	**0.5**
8/26/2019	low	0	No	0.0	No	0.0	No	0.0
9/3/2019	medium	1	No	0.0	No	0.0	No	0.0
9/9/2019	low	0	No	0.0	No	0.0	No	0.0
9/10/2019	low	0	No	0.0	No	0.0	No	0.0
9/26/2019	medium	1	No	0.0	No	0.0	No	0.0
10/1/2019	high	2	No	0.0	No	0.0	No	0.0
10/8/2019	low	0	No	0.0	No	0.0	No	0.0
10/15/2019	high	2	No	0.0	No	0.0	No	0.0
10/16/2019	high	2	No	0.0	No	0.0	No	0.0
10/17/2019	high	2	No	0.0	No	0.0	No	0.0
10/22/2019	low	0	No	0.0	No	0.0	No	0.0
10/29/2019	high	2	No	0.0	No	0.0	No	0.0
11/5/2019	medium	1	No	0.0	No	0.0	No	0.0
11/12/2019	medium	1	No	0.0	No	0.0	No	0.0
11/20/2019	medium	1	No	0.0	No	0.0	No	0.0
11/25/2019	high	2	No	0.0	No	0.0	No	0.0
11/26/2019	medium	1	No	0.0	No	0.0	No	0.0
12/3/2019	medium	1	No	0.0	No	0.0	No	0.0
12/9/2019	high	2	No	0.0	No	0.0	No	0.0
12/10/2019	medium	1	No	0.0	No	0.0	No	0.0
12/11/2019	high	2	No	0.0	No	0.0	No	0.0
12/19/2019	medium	1	No	0.0	No	0.0	No	0.0
12/23/2019	low	0	No	0.0	No	0.0	No	0.0
12/27/2019	high	2	No	0.0	No	0.0	No	0.0

Table 5. Containment Boom Sheen Monitoring
Site: Former BP Harbor Island Terminal

Date	Tidal Stage		Loading Rack Area Boom Sheen Observations		Warehouse Area North Boom Sheen Observations		Warehouse Area South Boom Sheen Observations	
	Low, Medium (ebb & flood), High	Tide Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)	Sheen (**Yes**/No)	Sheen Rating (See Notes)

Notes:
Bold entries represent sheen detections.
Loading Rack Area Boom removed in August 2017 with concurrance from Ecology due to persistent lack of sheens.

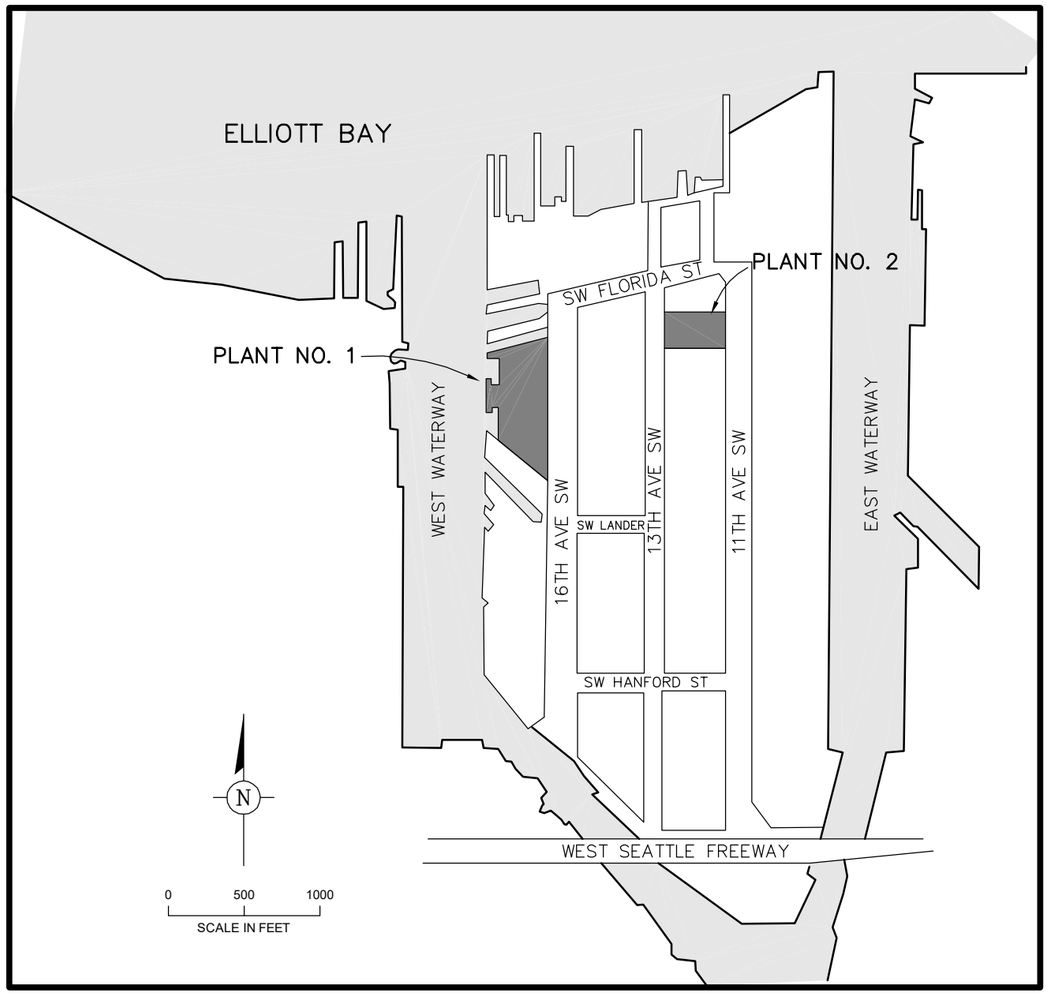
* Sheen Appearance is rated from 0.0 to 3.0 using criteria below;
0.0 No sheen present
1.0 Light sheen visible in one location
2.0 Sheen visible in several locations and is brightly colored
3.0 Sheen covers large areas of boom, outside boom, and/or LNAPL floating on surface

** Tide Level is rated from 0.0 to 2.0 using the criteria below;
0.0 Low Tide
1.0 Medium Tide (Ebb Tide & Flood Tide)
2.0 High Tide

Figures

Figure 1 – Site Location Map
Figure 2 – Areas of Remediation - Plant 1
Figure 3 – Cumulative Waterfront LNAPL Recovery Through September 2019
Figure 4 – Plant 1 Probing Investigation, Boring Locations
Figure 5 – Plant 1 Waterfront Hydrograph, 2012 through 2019
Figure 6 – Plant 1 Waterfront, Existing Well Location Map
Figure 7 – Plant 1 Probing Investigation, A-A' Plant 1 Waterfront Cross Section Map
Figure 8 – Plant 1 Probing Investigation, Groundwater Monitoring Analytical Results
Figure 9 – Plant 1 Probing Investigation, Soil Maximum Total TPH Contour Map
Figure 10 – Plant 1 Probing Investigation, A-A' TPH Contour Cross Section Map
Figure 11 – Plant 1 Probing Investigation, B-B' TPH Contour Cross Section Map
Figure 12 – Plant 1 Probing Investigation, C-C' TPH Contour Cross Section Map

AREA PLAN



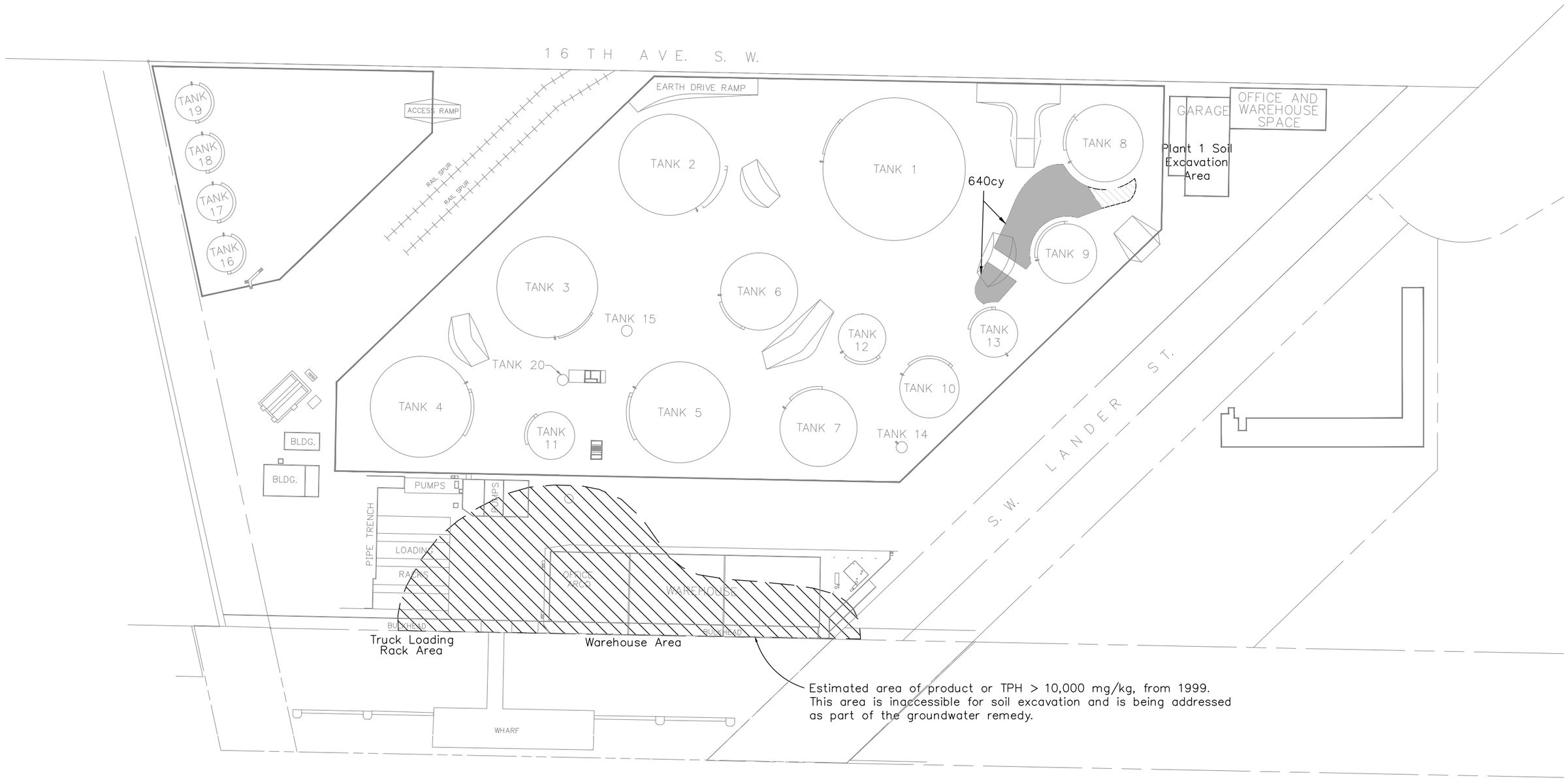
SITE PLAN

TECHSOLVE ENVIRONMENTAL
7518 NE 169th Street, Kenmore WA 98028
(425) 402-8277 FAX (425) 402-7917

Site Location Map

Site: Former BP Harbor Island Terminal
1652 Southwest Lander Street
Seattle, WA 98134

FIGURE
1



LEGEND

FROM 1999: ESTIMATED AREA OF INACCESSIBLE SOILS WITH PRODUCT OR TPH > 10,000 ppm.

EXCAVATED REMEDIATION AREAS

N

0 50 100

SCALE IN FEET

TECHSOLVE ENVIRONMENTAL

Areas of Remediation - Plant 1

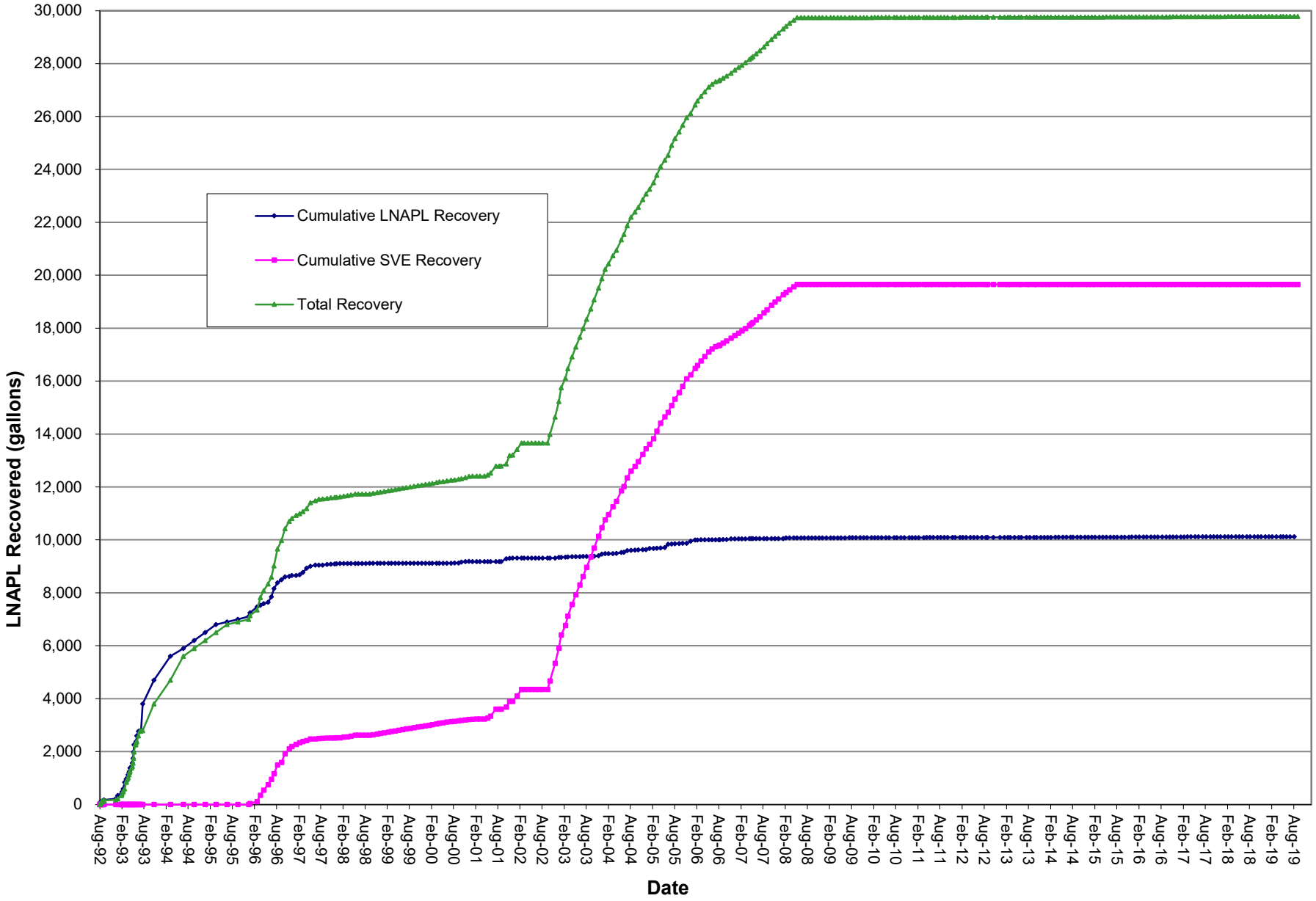
Site: Former BP Harbor Island Terminal
1652 Southwest Lander Street
Seattle, WA 98134

FIGURE

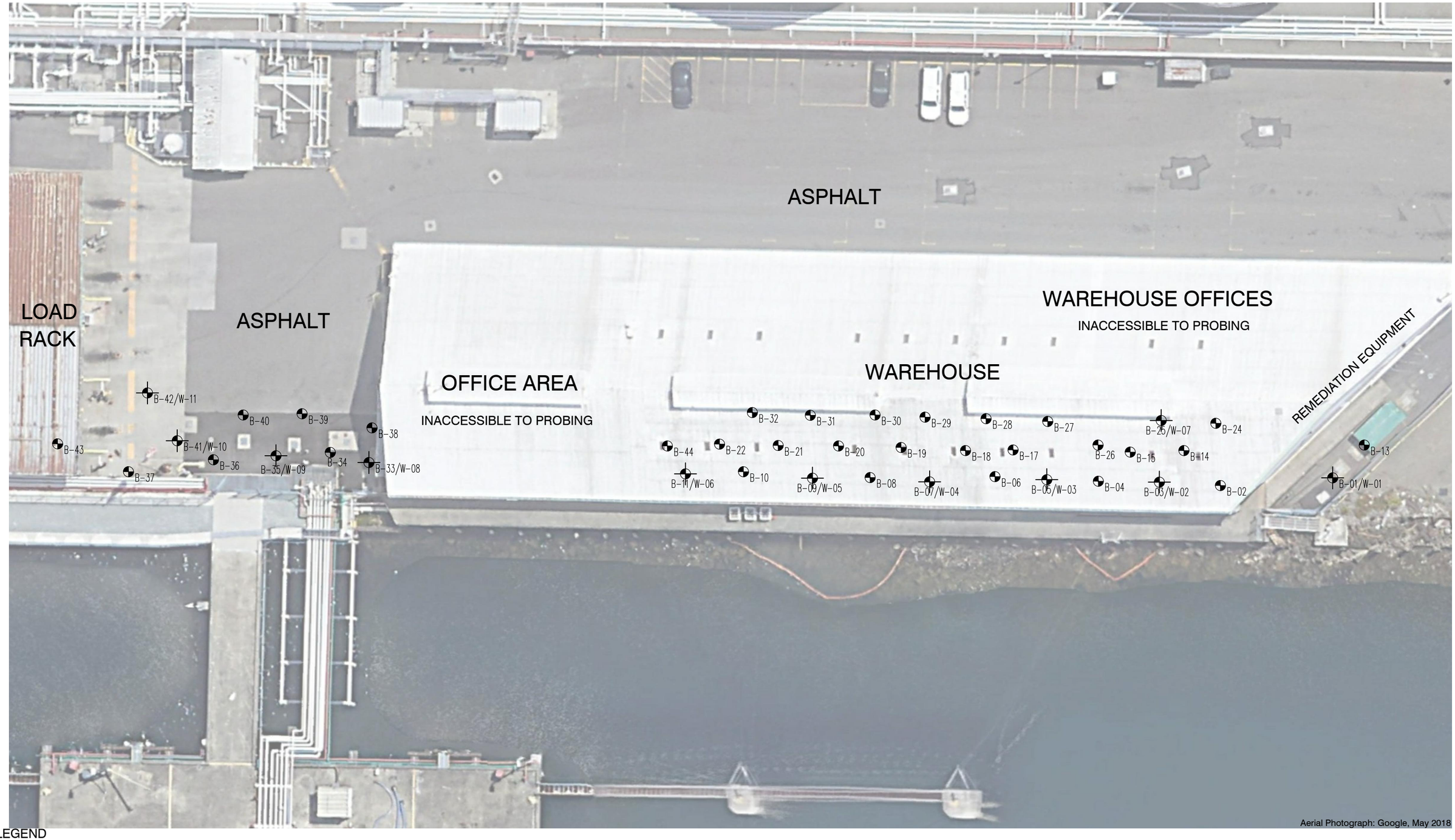
2

C:\Data\CAD\Projects\TechSolv\ARCO 21T\dwg\ARCO21T.dwg << Areas for Remediation - P1 >> OCT 07 2008 09:48:43 (bCAD)

Figure 3. **Cumulative Waterfront LNAPL Recovery Through September 2019**
Site: Former BP Harbor Island Terminal



Note: Soil vapor extraction recovery occurred January 1996 through May 2008.



Aerial Photograph: Google, May 2018

LEGEND

B-01 PROBING BORING LOCATION

B-01/W-01 PROBING BORING LOCATION / TEMPORARY PIEZOMETER WELL

N

0 15 30

SCALE IN FEET

TECHSOLVE ENVIRONMENTAL
7518 N.E. 169th Street
Kenmore, WA 98028
P:(425) 402-8277 F:(425) 402-7917

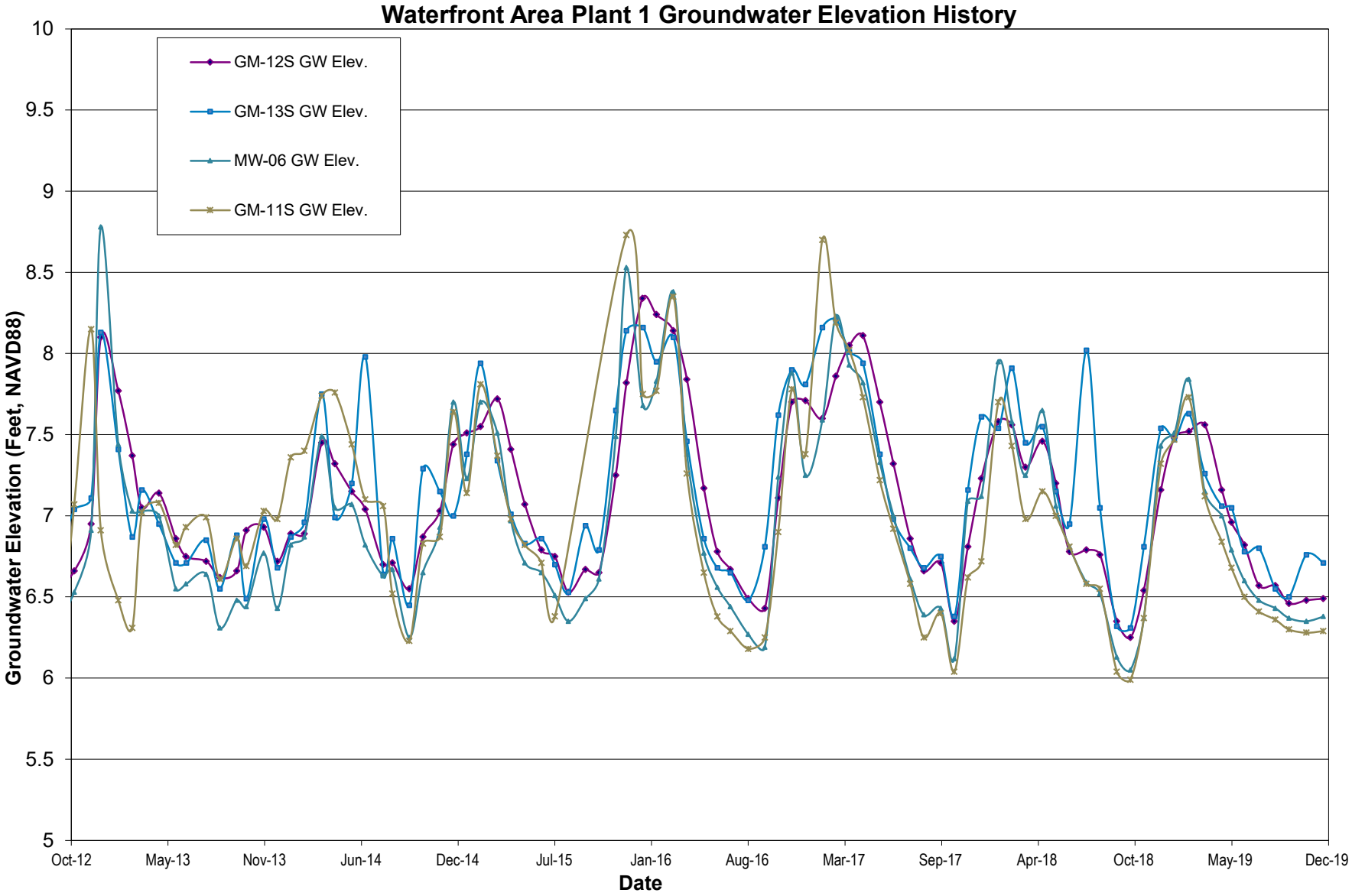
Plant 1 Probing Investigation Boring Locations

Site: Former BP Harbor Island Terminal
1652 Southwest Lander Street
Seattle, WA 98134

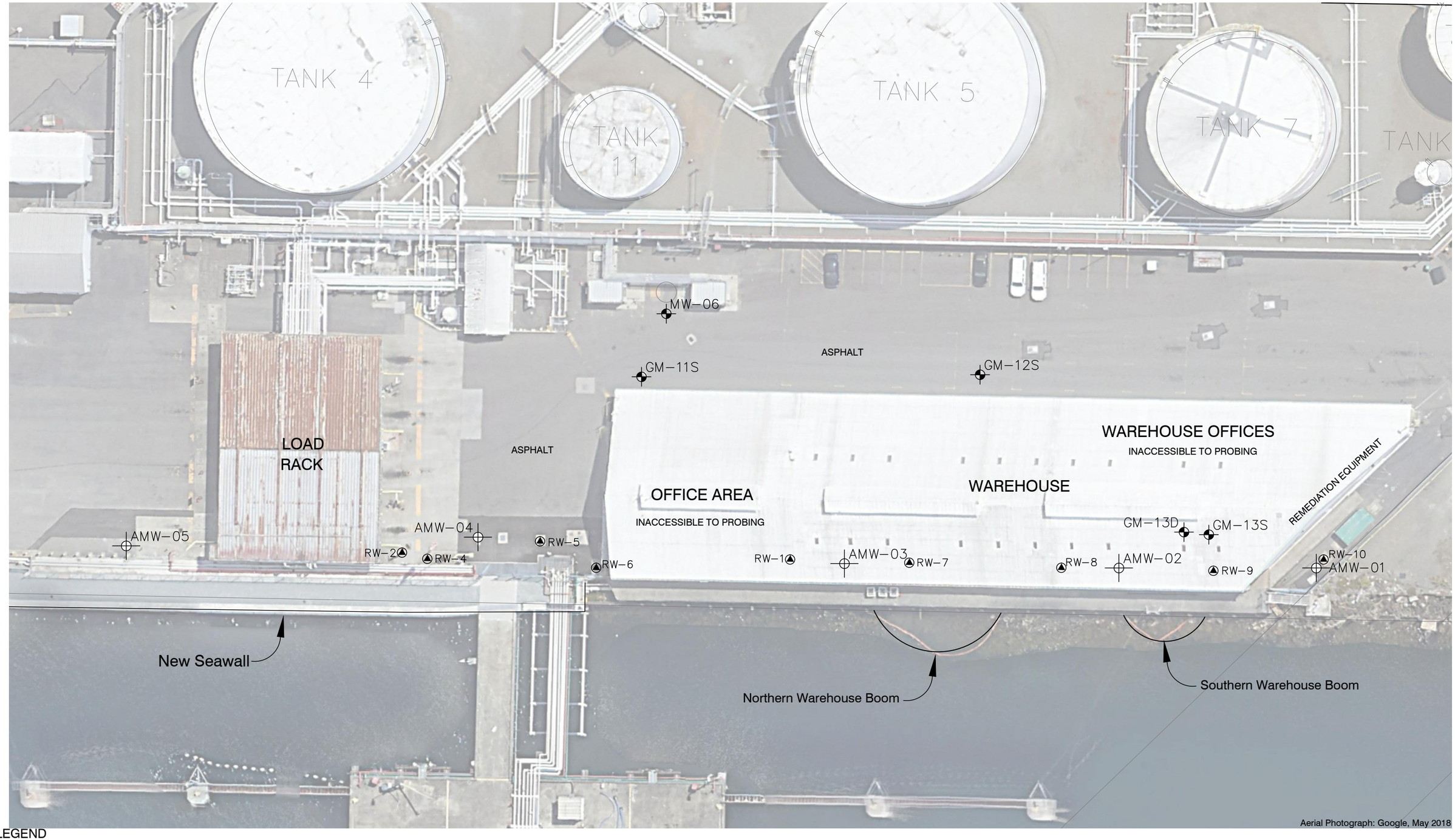
FIGURE

4

Figure 5. Plant 1 Waterfront Hydrograph
2012 through 2019
Site: Former BP Harbor Island Terminal



Note: Groundwater monitoring in well MW-06 is conducted voluntarily by TechSolve and is not part of the required monitoring program.



LEGEND

- AMW-03 Performance/Confirmation Monitoring Well
- GM-11S Monitoring Well
- RW-7 Groundwater/LNAPL Recovery Well

N

0 20 40

SCALE IN FEET

TECHSOLVE ENVIRONMENTAL
7518 N.E. 169th Street
Kenmore, WA 98028
P:(425) 402-8277 F:(425) 402-7917

Plant 1 Waterfront
Existing Well Location Map

Site: Former BP Harbor Island Terminal
1652 Southwest Lander Street
Seattle, WA 98134

FIGURE
6

\\SERVER\ServerData\data\Aproject\ARCO 21T\Drawings and CAD files\Autocad files\Quarterly GWM Figures\ P1 Historic Wells..dwg December 9, 2019

NORTH

A

SOUTH

A'

Ground Surface

Sheetpile Wall Cap

Warehouse Ground Surface

Ground Surface

Warehouse Foundation

Native/Fill Interface

Silty Sand (Fill)

Warehouse Foundation

Bulkhead Base Elev = −5' (Est.)

Warehouse Base Elev = −7'

Sandy Silt & Clay (Native Soils)

Warehouse Foundation

Island−wide Timber Bulkhead (Estimated)

Sheetpile Seawall

Sheetpile Base Elev = −68.4'

Elevation in Feet

Elevation in Feet

20 15 10 5 0 −5 −10 −15 −20

0 50 100 150 200 250 300 350 400 450

LEGEND

Approximate Groundwater Surface

Approximate Fill/Native Soil Interface

N

0 15 30

SCALE IN FEET

TECHSOLVE ENVIRONMENTAL

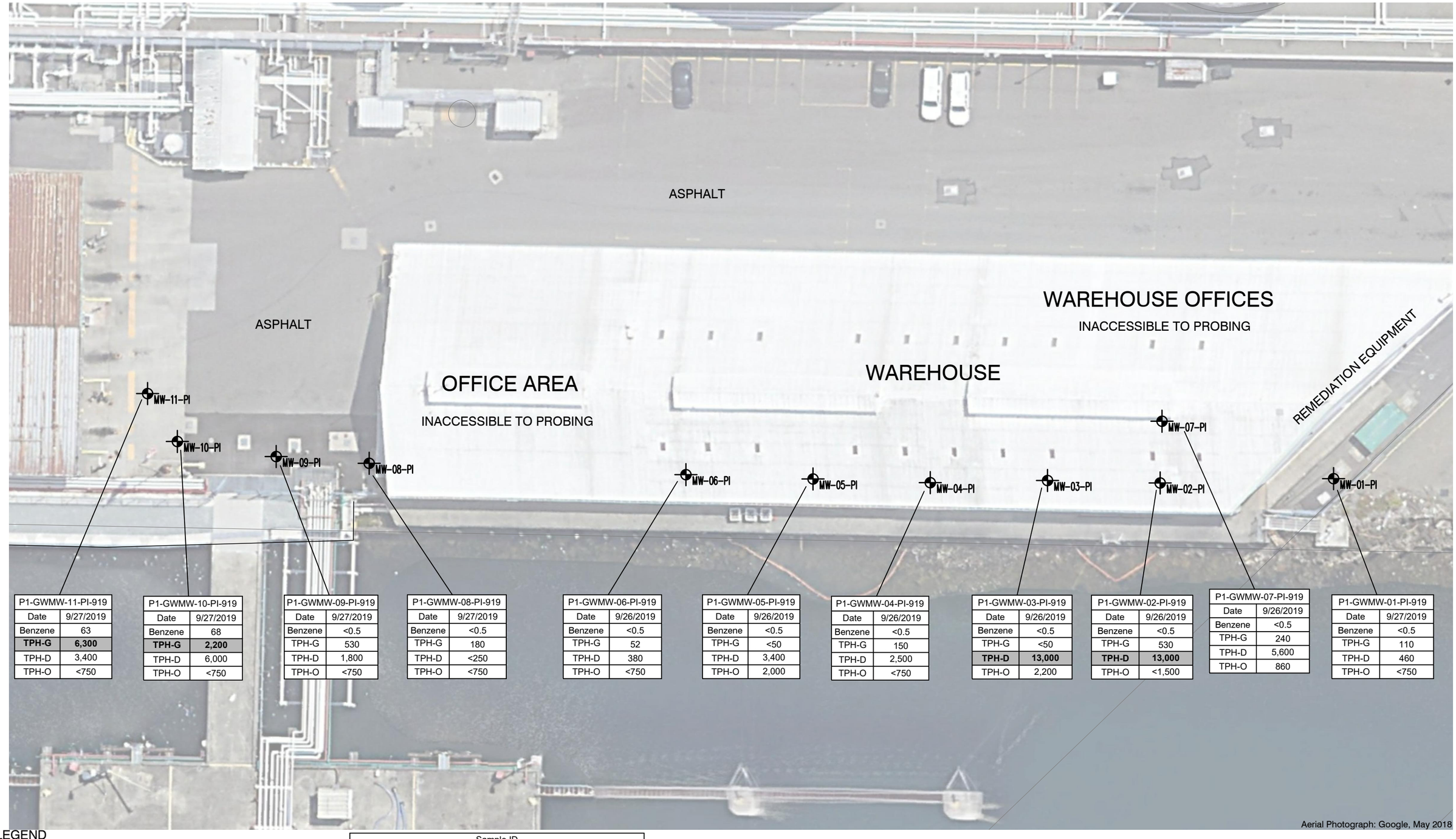
7518 N.E. 169th Street
Kenmore, WA 98028
P:(425) 402-8277 F:(425) 402-7917

Plant 1 Probing Investigation
A-A' Plant 1 Waterfront Cross Section Map

Site: Former BP Harbor Island Terminal
1652 Southwest Lander Street
Seattle, WA 98134

FIGURE

7



P1-GWMW-11-PI-919	
Date	9/27/2019
Benzene	63
TPH-G	**6,300**
TPH-D	3,400
TPH-O	<750

P1-GWMW-10-PI-919	
Date	9/27/2019
Benzene	68
TPH-G	**2,200**
TPH-D	6,000
TPH-O	<750

P1-GWMW-09-PI-919	
Date	9/27/2019
Benzene	<0.5
TPH-G	530
TPH-D	1,800
TPH-O	<750

P1-GWMW-08-PI-919	
Date	9/27/2019
Benzene	<0.5
TPH-G	180
TPH-D	<250
TPH-O	<750

P1-GWMW-06-PI-919	
Date	9/26/2019
Benzene	<0.5
TPH-G	52
TPH-D	380
TPH-O	<750

P1-GWMW-05-PI-919	
Date	9/26/2019
Benzene	<0.5
TPH-G	<50
TPH-D	3,400
TPH-O	2,000

P1-GWMW-04-PI-919	
Date	9/26/2019
Benzene	<0.5
TPH-G	150
TPH-D	2,500
TPH-O	<750

P1-GWMW-03-PI-919	
Date	9/26/2019
Benzene	<0.5
TPH-G	<50
TPH-D	**13,000**
TPH-O	2,200

P1-GWMW-02-PI-919	
Date	9/26/2019
Benzene	<0.5
TPH-G	530
TPH-D	**13,000**
TPH-O	<1,500

P1-GWMW-07-PI-919	
Date	9/26/2019
Benzene	<0.5
TPH-G	240
TPH-D	5,600
TPH-O	860

P1-GWMW-01-PI-919	
Date	9/27/2019
Benzene	<0.5
TPH-G	110
TPH-D	460
TPH-O	<750

Aerial Photograph: Google, May 2018

LEGEND

MW-01-PI — Probing Temporary Piezometer Well

Sample ID	
Date	Date Sample Collected
Benzene	Benzene (EPA 8260)
TPH-G	Total Petroleum Hydrocarbons as Gasoline (NWTPH-GX)
TPH-D	Total Petroleum Hydrocarbons as Diesel (NWTPH-DX)
TPH-O	Total Petroleum Hydrocarbons as Oil (NWTPH-DX)

Notes: **Bold** - Detected concentration exceeds site specific cleanup level
< = Not detected at listed laboratory detection limit
All listed concentrations are reported in µg/L

N

0 15 30
SCALE IN FEET

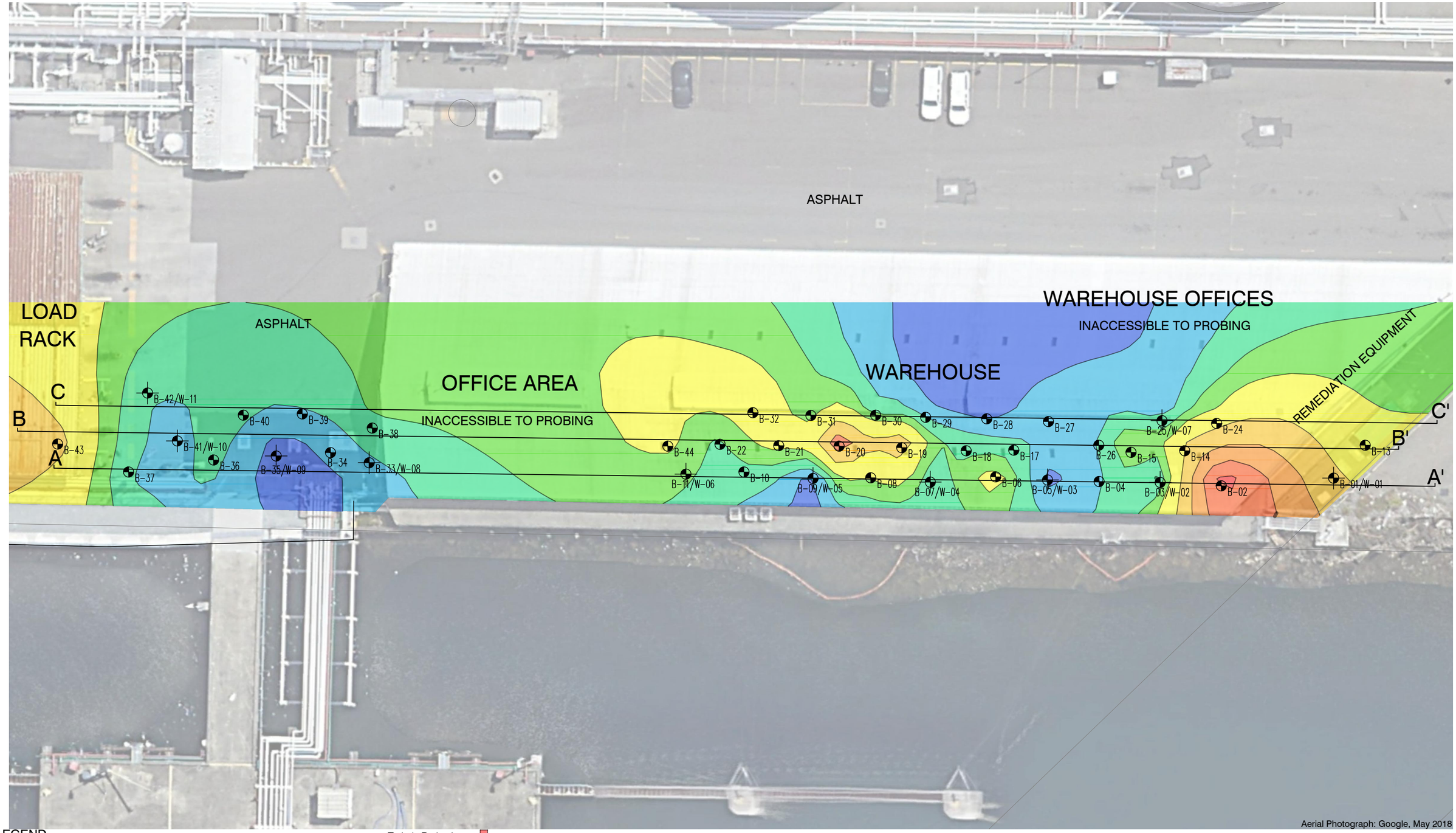
TECHSOLVE ENVIRONMENTAL
7518 N.E. 169th Street
Kenmore, WA 98028
P:(425) 402-8277 F:(425) 402-7917

Plant 1 Probing Investigation
Groundwater Monitoring Analytical Results

Site: Former BP Harbor Island Terminal
1652 Southwest Lander Street
Seattle, WA 98134

FIGURE
8

\\SERVER\ServerData\data\Project\ARCO 21T\Drawings and CAD Files\Autocad Files\Quarterly GWM Figures: Plant 1 Probin Inv Figs..dwg October 7, 2019



Aerial Photograph: Google, May 2018

LEGEND

- B-01 — Probing Boring Location
- B-01/W-01 — Probing Boring Location/Temporary Piezometer Well
- A A' — Reference To Associated Cross-Sectional Figure

Plant 1 Total Petroleum Hydrocarbon (TPH) Soil Cleanup Level (CUL) = 10,000 mg/kg

Total Petroleum Hydrocarbon Concentration Contours: (TPH-G+TPH-D+TPH-O)

- 30,000 mg/kg
- 25,000 mg/kg
- 20,000 mg/kg
- 15,000 mg/kg
- 10,000 mg/kg (Plant 1 CUL)
- 7,500 mg/kg
- 5,000 mg/kg
- 2,500 mg/kg

N

0 15 30

SCALE IN FEET

TECHSOLVE ENVIRONMENTAL
7518 N.E. 169th Street
Kenmore, WA 98028
P:(425) 402-8277 F:(425) 402-7917

Plant 1 Probing Investigation
Soil Maximum Total TPH Contour Map

BP West Coast Products Terminal 21T
1652 Southwest Lander Street
Seattle, WA 98134

FIGURE
9

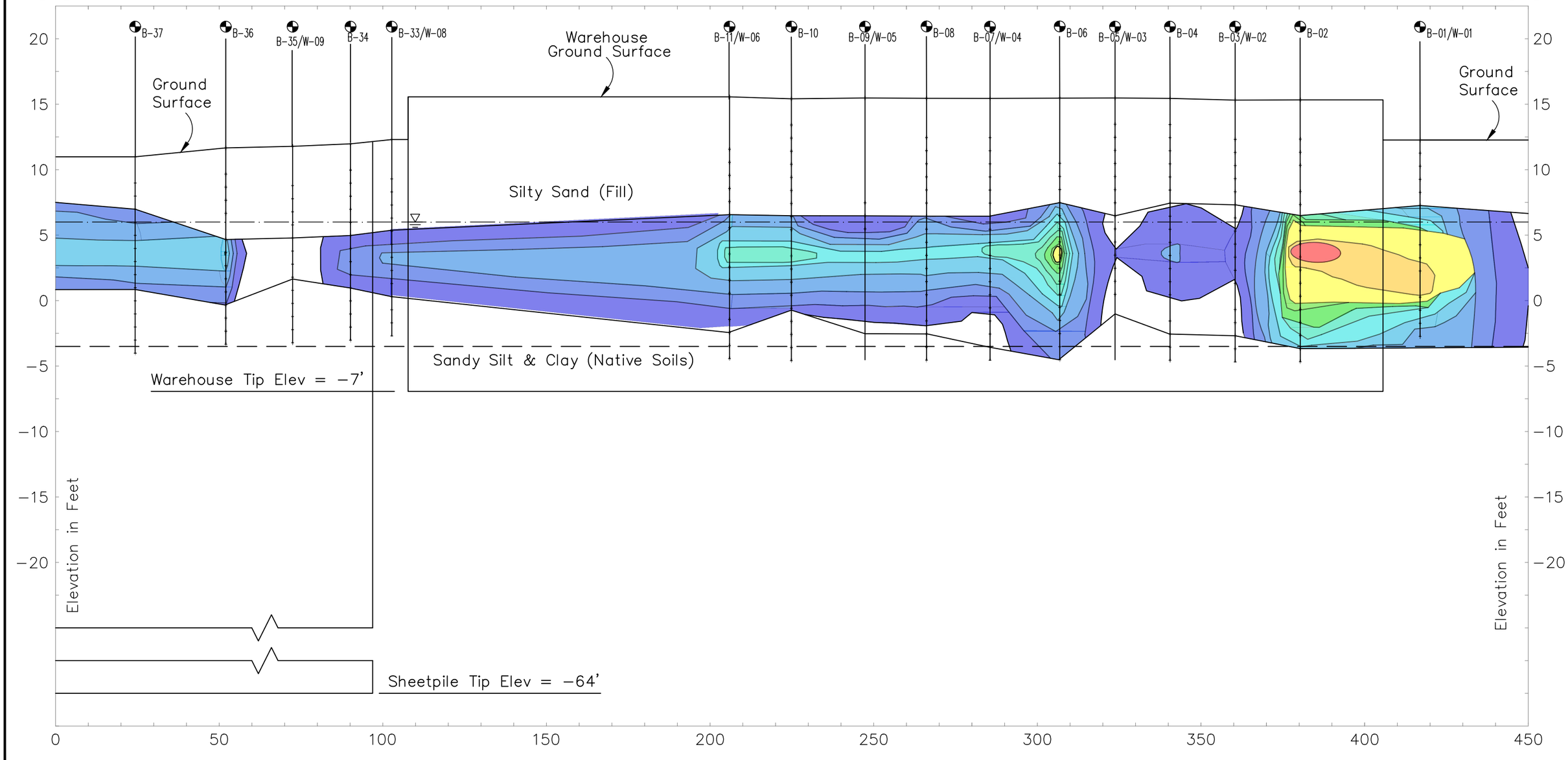
\\SERVER\ServerData\data\Aproject\ARCO 21T\Drawings and CAD Files\Autocad Files\Quarterly GWM Figures: Plant 1 Probin Inv Figs..dwg October 7, 2019

NORTH

A

SOUTH

A'



LEGEND

- B-01 — Probing Boring Location
- Approximate Groundwater Surface
- Approximate Fill/Native Soil Interface

Plant 1 Total Petroleum Hydrocarbon (TPH) Soil Cleanup Level (CUL) = 10,000 mg/kg

Total Petroleum Hydrocarbon Concentration Contours: (TPH-G+TPH-D+TPH-O)

- 30,000 mg/kg
- 20,000 mg/kg
- 10,000 mg/kg (Plant 1 CUL)
- 8,000 mg/kg
- 6,000 mg/kg
- 4,000 mg/kg
- 2,000 mg/kg

N

0 15 30

SCALE IN FEET

TECHSOLVE ENVIRONMENTAL

7518 N.E. 169th Street
Kenmore, WA 98028
P:(425) 402-8277 F:(425) 402-7917

Plant 1 Probing Investigation
A-A' Estimated TPH Cross Section Map

Site: Former BP Harbor Island Terminal
1652 Southwest Lander Street
Seattle, WA 98134

FIGURE

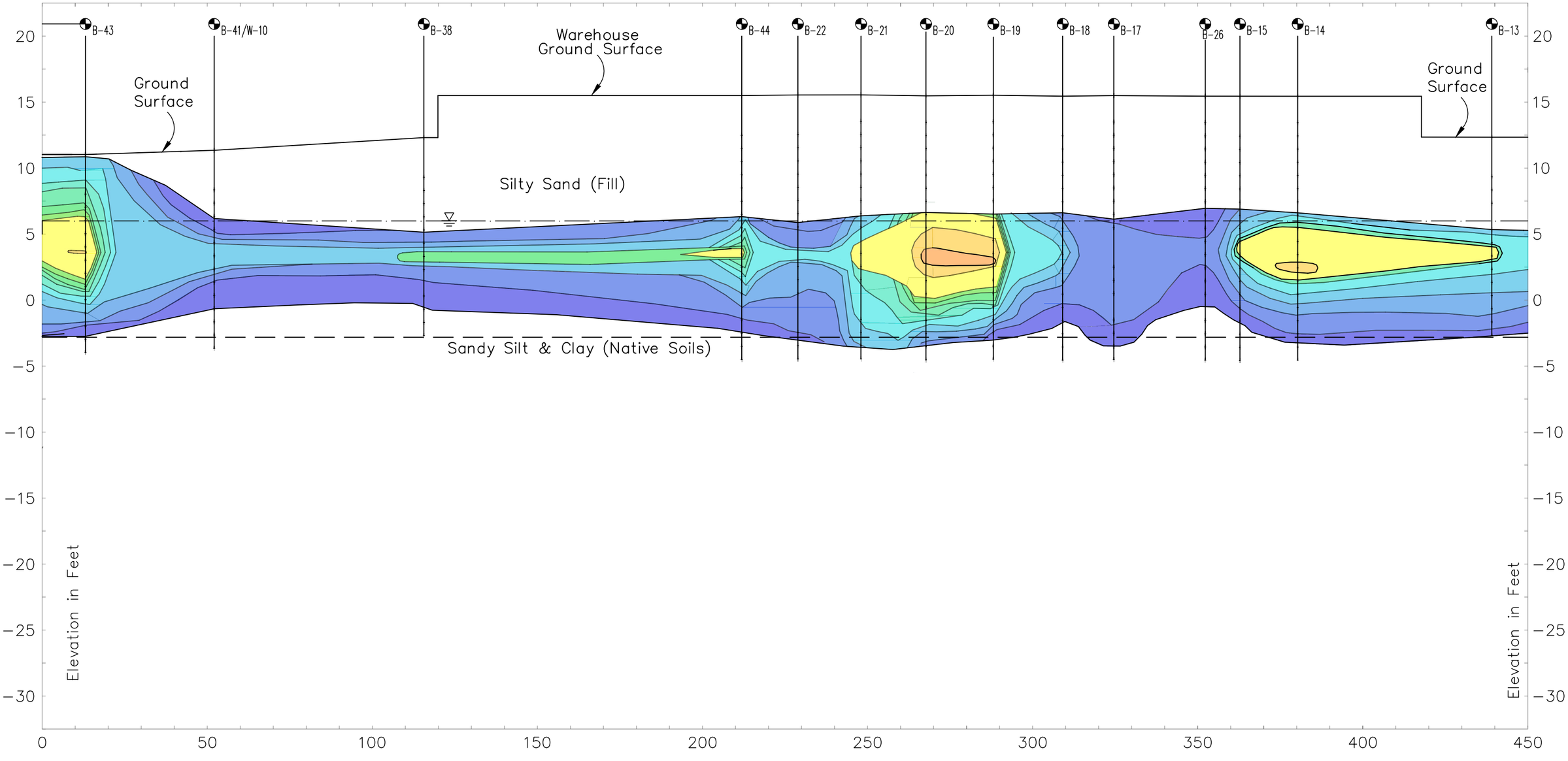
10

NORTH

B

SOUTH

B'



LEGEND

- B-01 — Probing Boring Location
- Approximate Groundwater Surface
- Approximate Fill/Native Soil Interface

Plant 1 Total Petroleum Hydrocarbon (TPH) Soil Cleanup Level (CUL) = 10,000 mg/kg

Total Petroleum Hydrocarbon Concentration Contours: (TPH-G+TPH-D+TPH-O)

- 30,000 mg/kg
- 20,000 mg/kg
- 10,000 mg/kg (Plant 1 CUL)
- 8,000 mg/kg
- 6,000 mg/kg
- 4,000 mg/kg
- 2,000 mg/kg

N

0 15 30
SCALE IN FEET

TECHSOLVE ENVIRONMENTAL
7518 N.E. 169th Street
Kenmore, WA 98028
P:(425) 402-8277 F:(425) 402-7917

Plant 1 Probing Investigation
B-B' Estimated TPH Cross Section Map

Site: Former BP Harbor Island Terminal
1652 Southwest Lander Street
Seattle, WA 98134

FIGURE

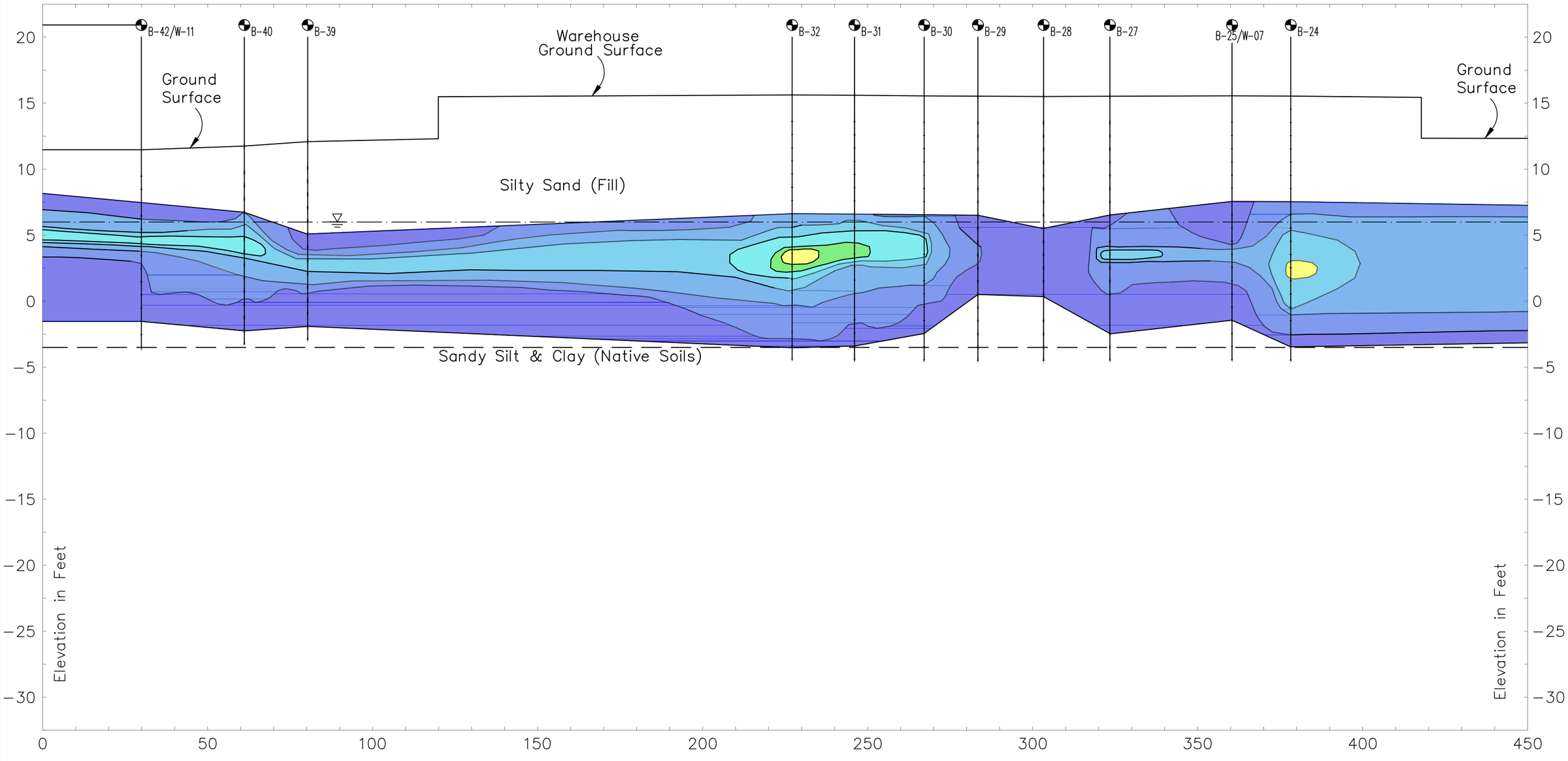
11

NORTH

C

SOUTH

C'



LEGEND

- B-01 — Probing Boring Location
- Approximate Groundwater Surface
- Approximate Fill/Native Soil Interface

Plant 1 Total Petroleum Hydrocarbon (TPH) Soil Cleanup Level (CUL) = 10,000 mg/kg

Total Petroleum Hydrocarbon Concentration Contours: (TPH-G+TPH-D+TPH-O)

- 30,000 mg/kg
- 20,000 mg/kg
- 10,000 mg/kg (Plant 1 CUL)
- 8,000 mg/kg
- 6,000 mg/kg
- 4,000 mg/kg
- 2,000 mg/kg

N

0 15 30
SCALE IN FEET

TECHSOLVE ENVIRONMENTAL
7518 N.E. 169th Street
Kenmore, WA 98028
P:(425) 402-8277 F:(425) 402-7917

Plant 1 Probing Investigation
C-C' Estimated TPH Cross Section Map

Site: Former BP Harbor Island Terminal
1652 Southwest Lander Street
Seattle, WA 98134

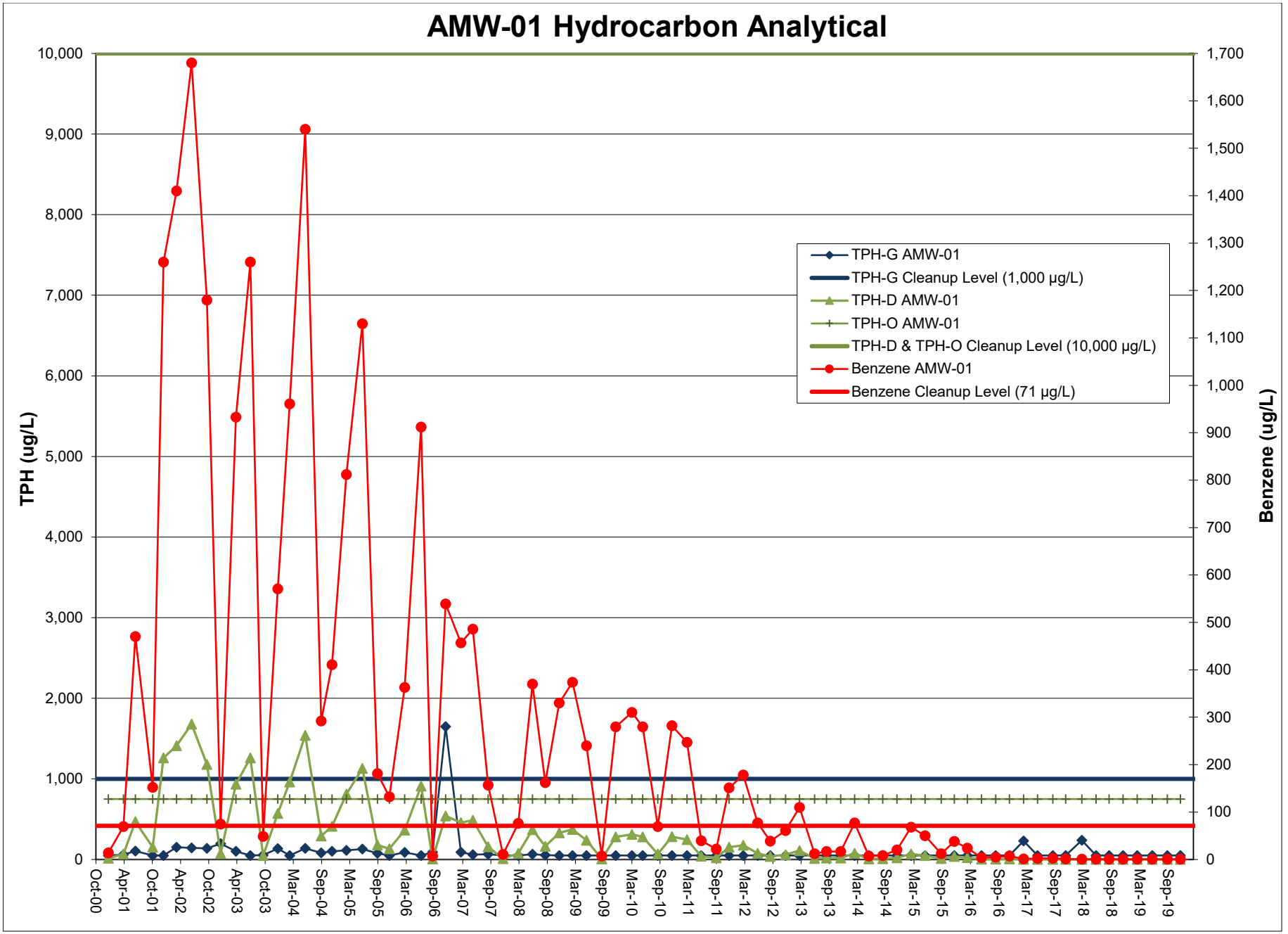
FIGURE

12

\\SERVER\ServerData\data\Aproject\ARCO 21T\Drawings and CAD files\Autocad files\Quarterly GWM Figures: Plant 1 Probin Inv Figs..dwg October 7, 2019

Appendix A

Groundwater Monitoring and Recovery Well Hydrocarbon Graphs


AMW-01 Hydrocarbon Analytical
TPH (ug/L)
Benzene (ug/L)
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
1,700
1,600
1,500
1,400
1,300
1,200
1,100
1,000
900
800
700
600
500
400
300
200
100
0
Oct-00
Apr-01
Oct-01
Apr-02
Oct-02
Apr-03
Oct-03
Mar-04
Sep-04
Mar-05
Sep-05
Mar-06
Sep-06
Mar-07
Sep-07
Mar-08
Sep-08
Mar-09
Sep-09
Mar-10
Sep-10
Mar-11
Sep-11
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Sep-14
Mar-15
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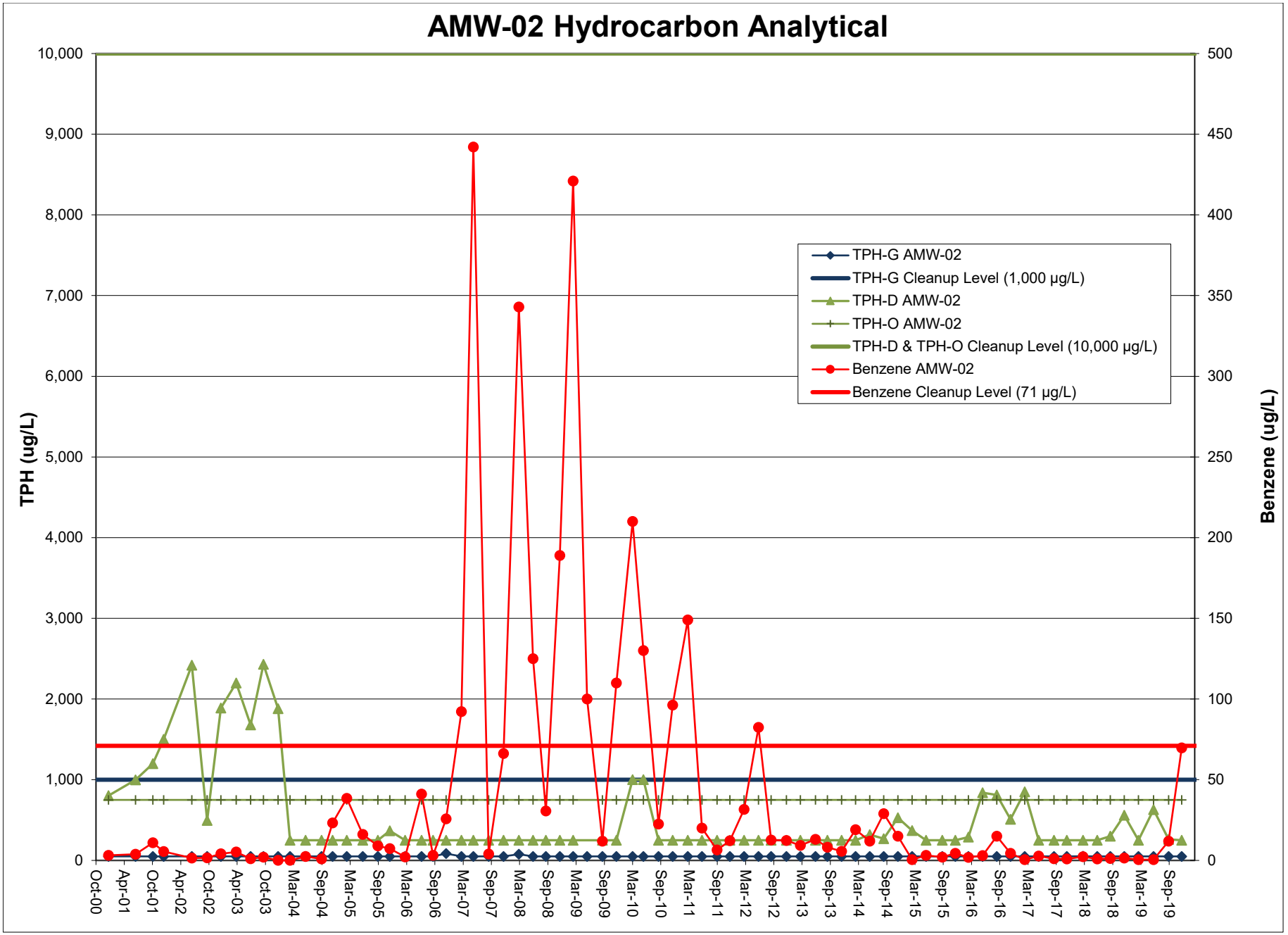
Mar-16
Sep-16
Mar-17
Sep-17
Mar-18
Sep-18
Mar-19
Sep-19
TPH-G AMW-01
TPH-G Cleanup Level (1,000 µg/L)
TPH-D AMW-01
TPH-O AMW-01
TPH-D & TPH-O Cleanup Level (10,000 µg/L)
Benzene AMW-01
Benzene Cleanup Level (71 µg/L)


AMW-02 Hydrocarbon Analytical
TPH (ug/L)
Benzene (ug/L)
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
500
450
400
350
300
250
200
150
100
50
0
TPH-G AMW-02
TPH-G Cleanup Level (1,000 µg/L)
TPH-D AMW-02
TPH-O AMW-02
TPH-D & TPH-O Cleanup Level (10,000 µg/L)
Benzene AMW-02
Benzene Cleanup Level (71 µg/L)
Oct-00
Apr-01
Oct-01
Apr-02
Oct-02
Apr-03
Oct-03
Mar-04
Sep-04
Mar-05
Sep-05
Mar-06
Sep-06
Mar-07
Sep-07
Mar-08
Sep-08
Mar-09
Sep-09
Mar-10
Sep-10
Mar-11
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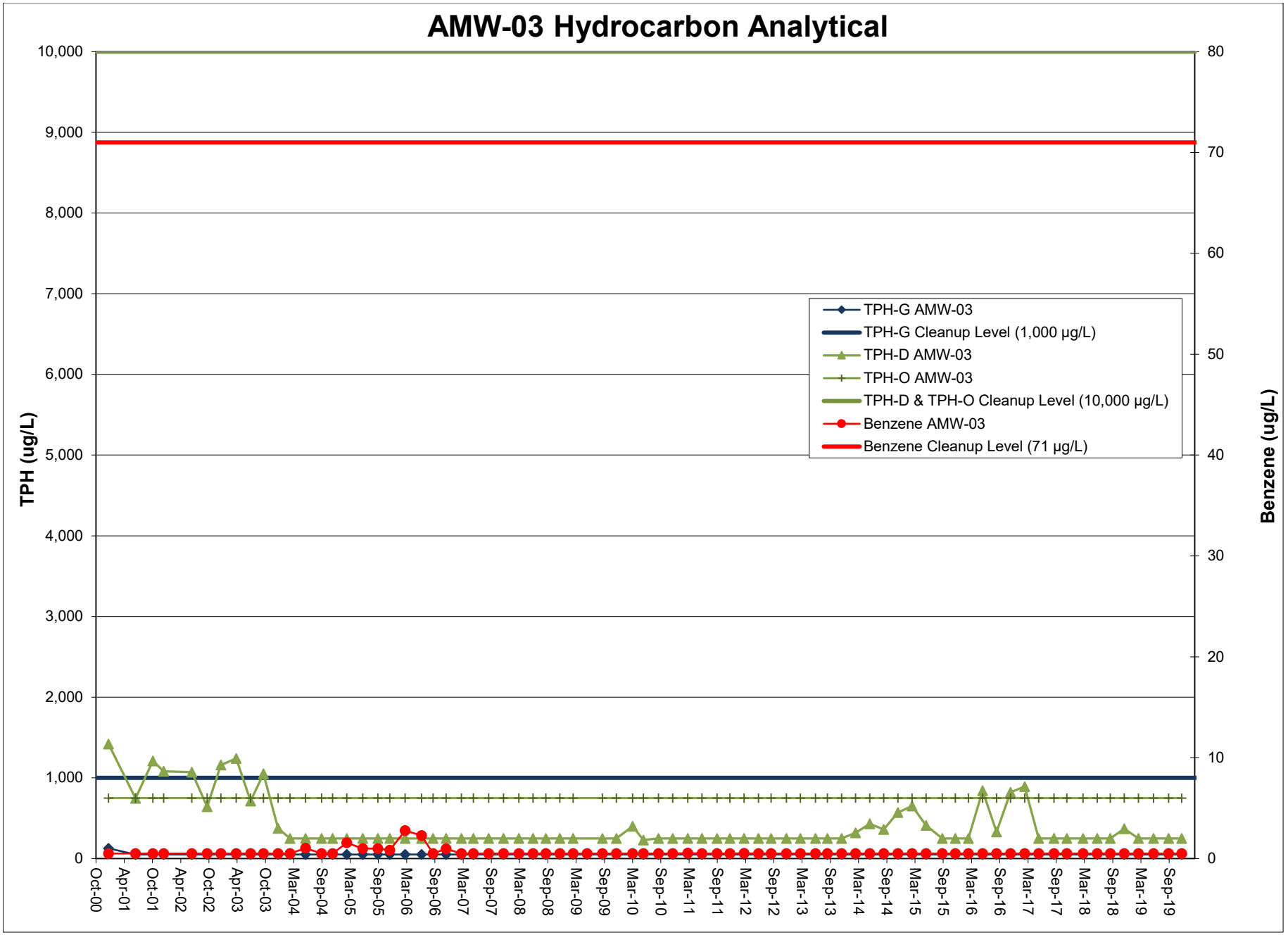
Sep-18
Mar-19
Sep-19


AMW-03 Hydrocarbon Analytical
TPH (ug/L)
Benzene (ug/L)
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
80
70
60
50
40
30
20
10
0
TPH-G AMW-03
TPH-G Cleanup Level (1,000 µg/L)
TPH-D AMW-03
TPH-O AMW-03
TPH-D & TPH-O Cleanup Level (10,000 µg/L)
Benzene AMW-03
Benzene Cleanup Level (71 µg/L)
Oct-00
Apr-01
Oct-01
Apr-02
Oct-02
Apr-03
Oct-03
Mar-04
Sep-04
Mar-05
Sep-05
Mar-06
Sep-06
Mar-07
Sep-07
Mar-08
Sep-08
Mar-09
Sep-09
Mar-10
Sep-10
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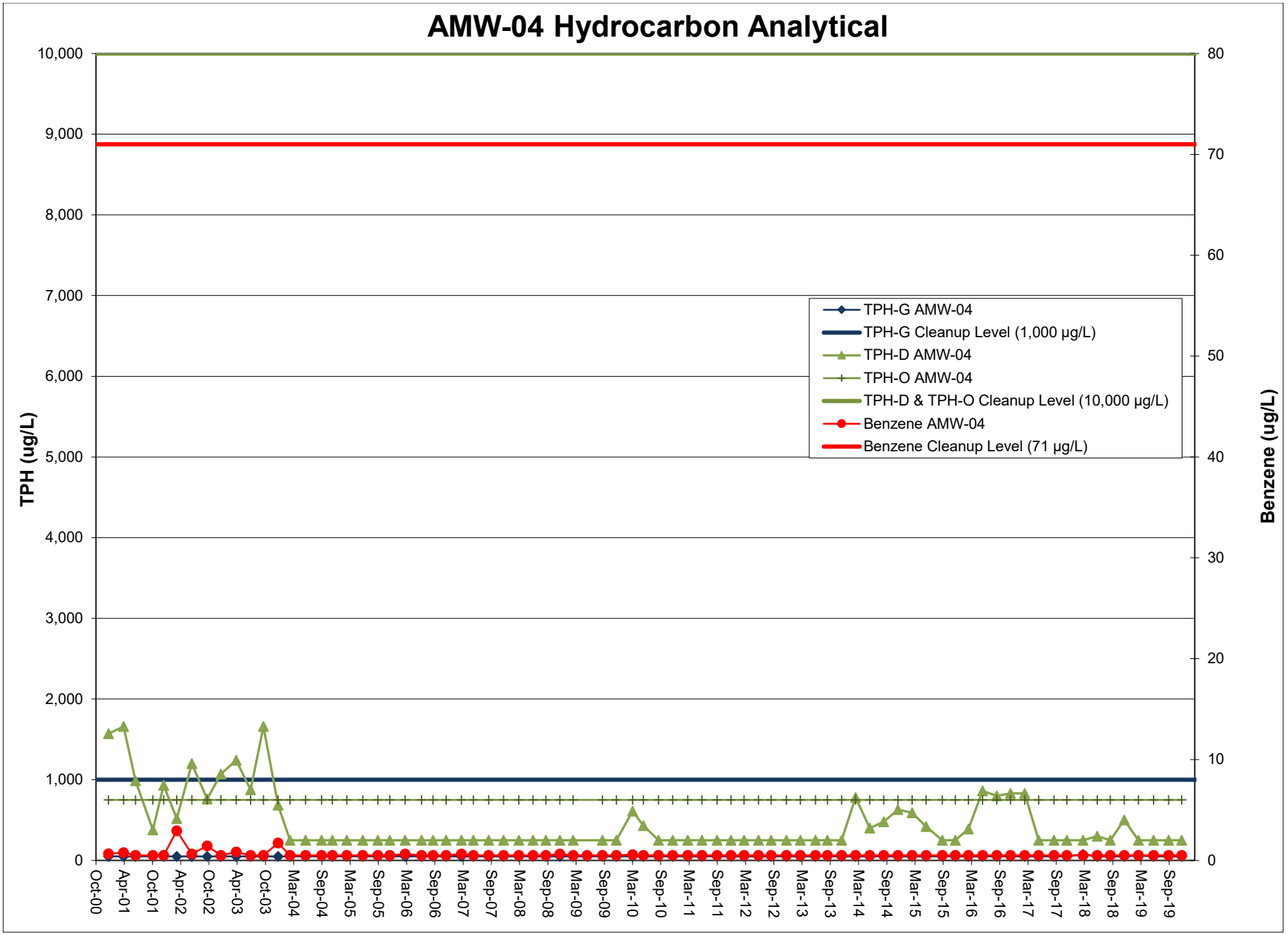
Sep-17
Mar-18
Sep-18
Mar-19
Sep-19


AMW-04 Hydrocarbon Analytical
TPH (ug/L)
Benzene (ug/L)
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
80
70
60
50
40
30
20
10
0
TPH-G AMW-04
TPH-G Cleanup Level (1,000 µg/L)
TPH-D AMW-04
TPH-O AMW-04
TPH-D & TPH-O Cleanup Level (10,000 µg/L)
Benzene AMW-04
Benzene Cleanup Level (71 µg/L)
Oct-00
Apr-01
Oct-01
Apr-02
Oct-02
Apr-03
Oct-03
Mar-04
Sep-04
Mar-05
Sep-05
Mar-06
Sep-06
Mar-07
Sep-07
Mar-08
Sep-08
Mar-09
Sep-09
Mar-10
Sep-10
Mar-11
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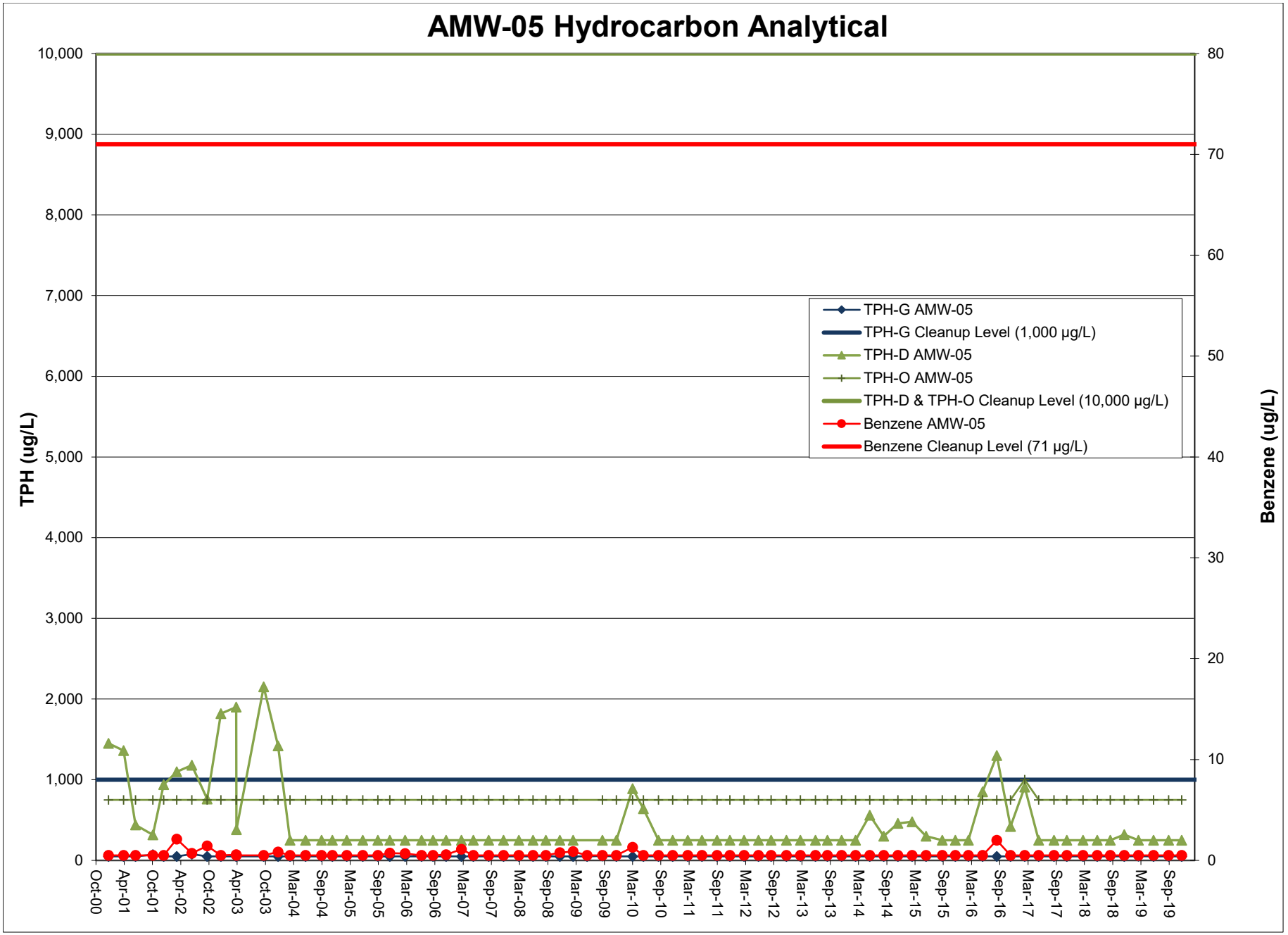
Mar-17
Sep-17
Mar-18
Sep-18
Mar-19
Sep-19


AMW-05 Hydrocarbon Analytical
TPH (ug/L)
Benzene (ug/L)
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
80
70
60
50
40
30
20
10
0
TPH-G AMW-05
TPH-G Cleanup Level (1,000 µg/L)
TPH-D AMW-05
TPH-O AMW-05
TPH-D & TPH-O Cleanup Level (10,000 µg/L)
Benzene AMW-05
Benzene Cleanup Level (71 µg/L)
Oct-00
Apr-01
Oct-01
Apr-02
Oct-02
Apr-03
Oct-03
Mar-04
Sep-04
Mar-05
Sep-05
Mar-06
Sep-06
Mar-07
Sep-07
Mar-08
Sep-08
Mar-09
Sep-09
Mar-10
Sep-10
Mar-11
Sep-11
Mar-12
Sep-12
Mar-13
Sep-13
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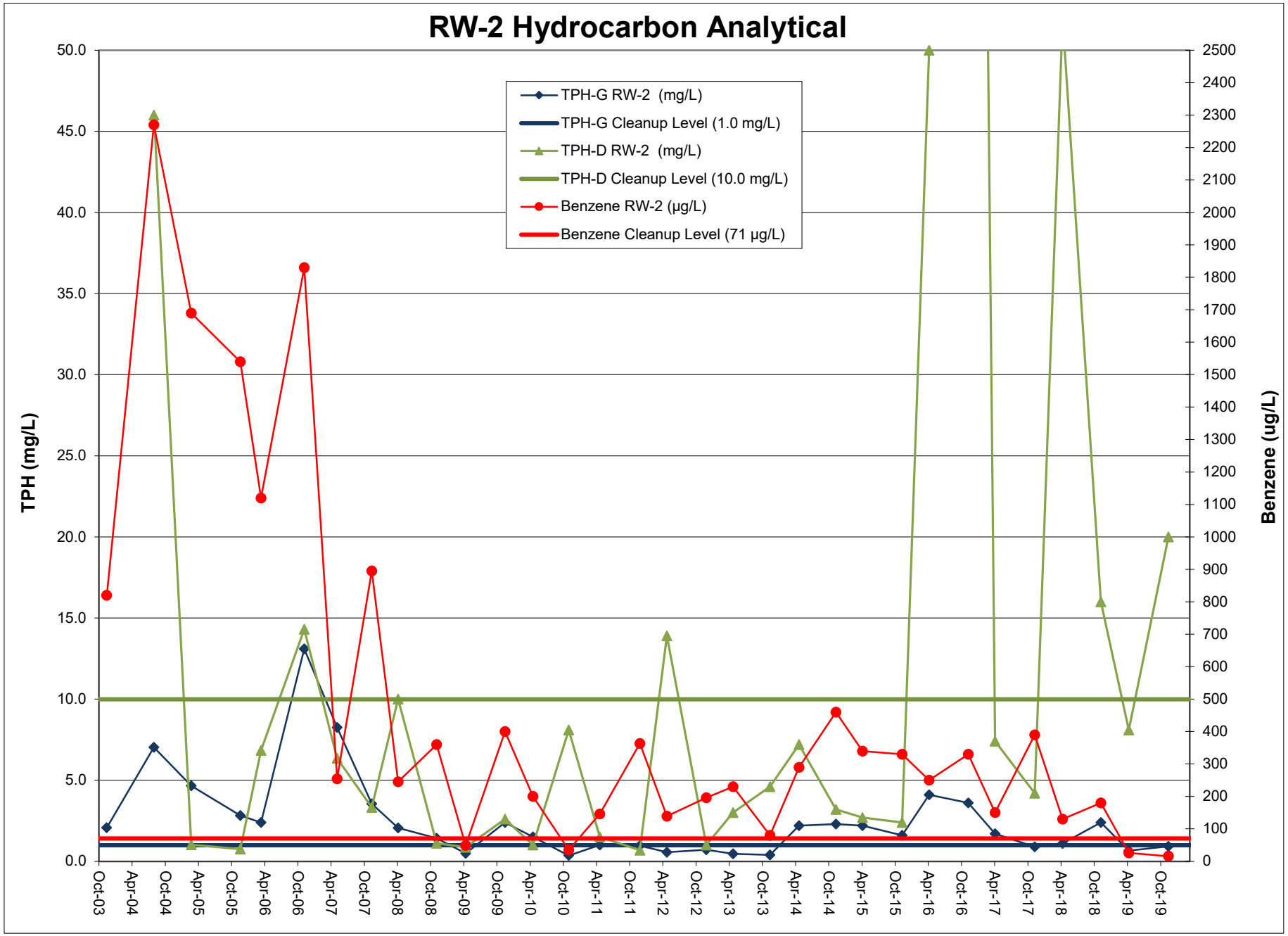
Sep-17
Mar-18
Sep-18
Mar-19
Sep-19


RW-2 Hydrocarbon Analytical
TPH (mg/L)
Benzene (ug/L)
TPH-G RW-2 (mg/L)
TPH-G Cleanup Level (1.0 mg/L)
TPH-D RW-2 (mg/L)
TPH-D Cleanup Level (10.0 mg/L)
Benzene RW-2 (µg/L)
Benzene Cleanup Level (71 µg/L)
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
2500
2400
2300
2200
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
Oct-03
Apr-04
Oct-04
Apr-05
Oct-05
Apr-06
Oct-06
Apr-07
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Apr-08
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Apr-09
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Apr-11
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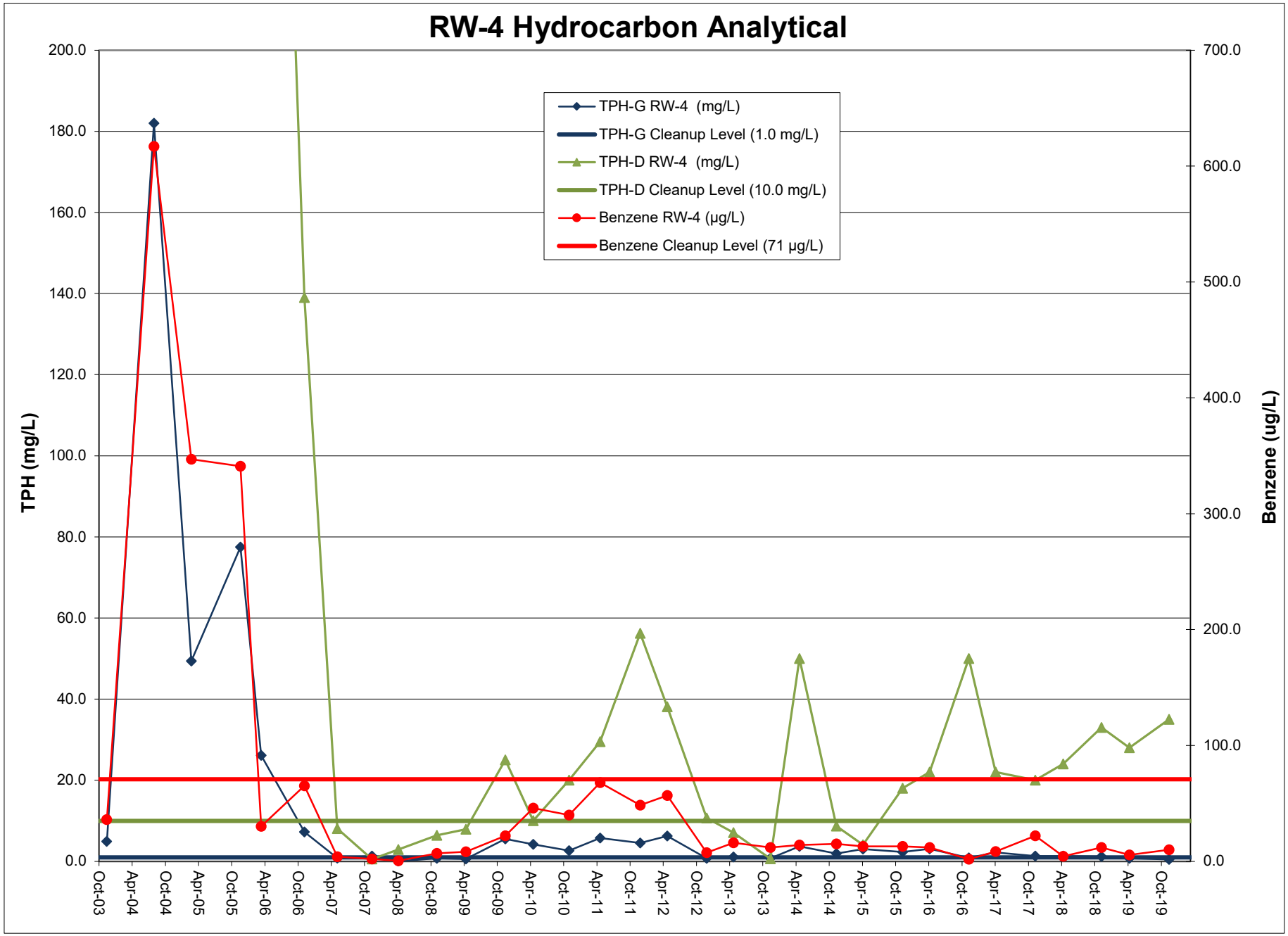
Apr-14
Oct-14
Apr-15
Oct-15
Apr-16
Oct-16
Apr-17
Oct-17
Apr-18
Oct-18
Apr-19
Oct-19


RW-4 Hydrocarbon Analytical
TPH (mg/L)
Benzene (ug/L)
TPH-G RW-4 (mg/L)
TPH-G Cleanup Level (1.0 mg/L)
TPH-D RW-4 (mg/L)
TPH-D Cleanup Level (10.0 mg/L)
Benzene RW-4 (µg/L)
Benzene Cleanup Level (71 µg/L)
200.0
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
Oct-03
Apr-04
Oct-04
Apr-05
Oct-05
Apr-06
Oct-06
Apr-07
Oct-07
Apr-08
Oct-08
Apr-09
Oct-09
Apr-10
Oct-10
Apr-11
Oct-11
Apr-12
Oct-12
Apr-13
Oct-13
Apr-14
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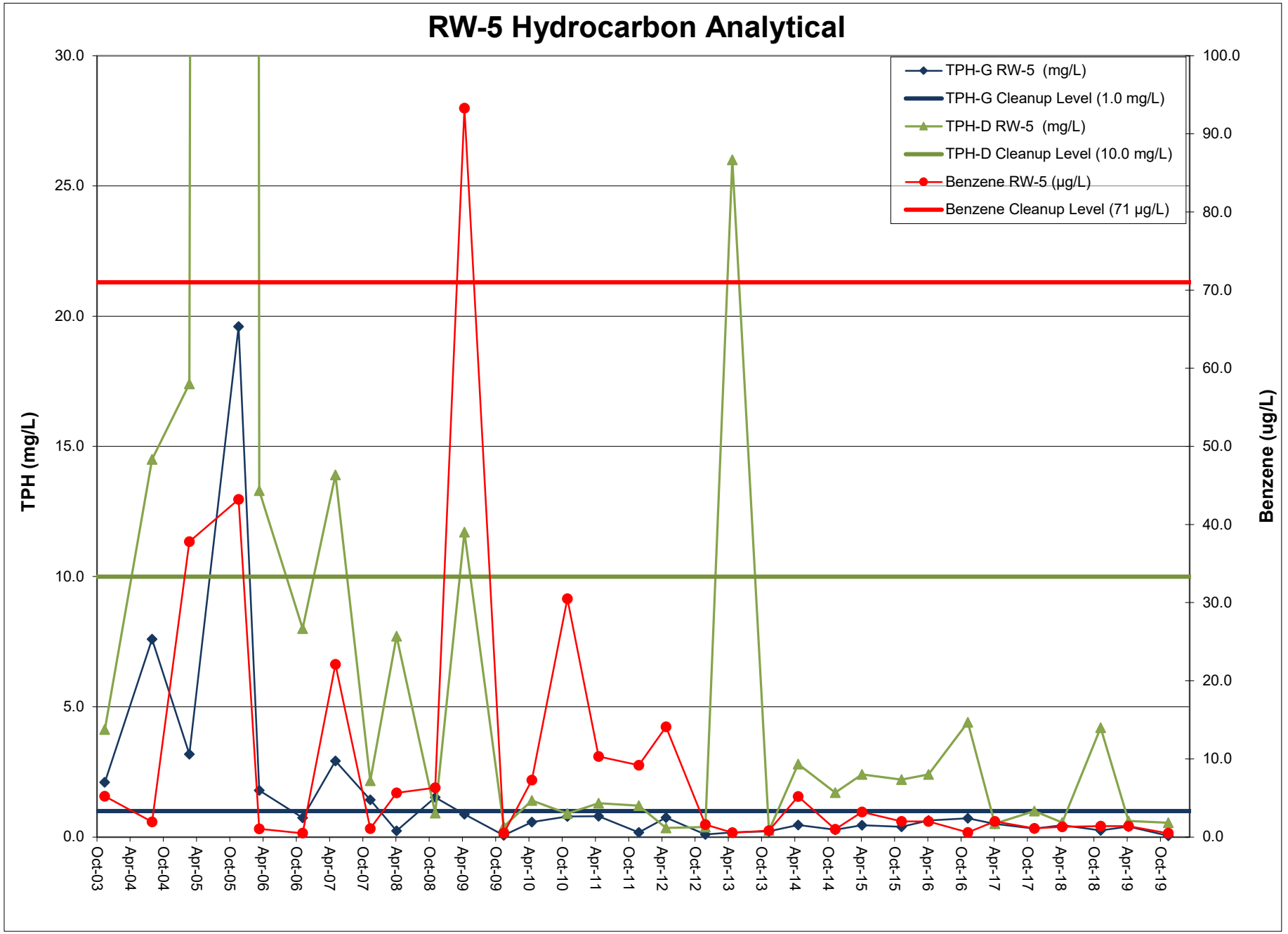
Apr-18
Oct-18
Apr-19
Oct-19


RW-5 Hydrocarbon Analytical
TPH (mg/L)
Benzene (ug/L)
TPH-G RW-5 (mg/L)
TPH-G Cleanup Level (1.0 mg/L)
TPH-D RW-5 (mg/L)
TPH-D Cleanup Level (10.0 mg/L)
Benzene RW-5 (µg/L)
Benzene Cleanup Level (71 µg/L)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Oct-03
Apr-04
Oct-04
Apr-05
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Apr-06
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Oct-09
Apr-10
Oct-10
Apr-11
Oct-11
Apr-12
Oct-12
Apr-13
Oct-13
Apr-14
Oct-14
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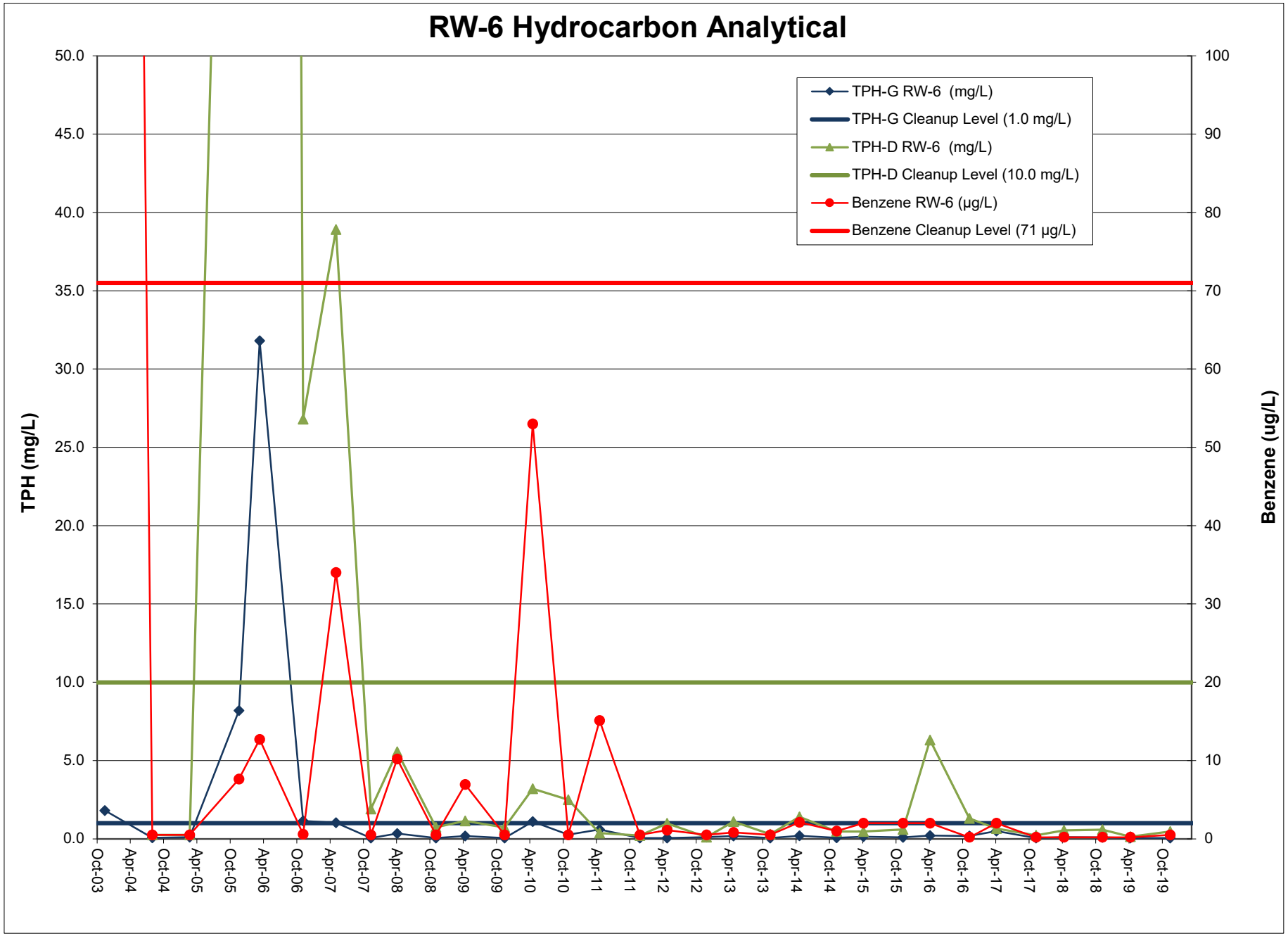
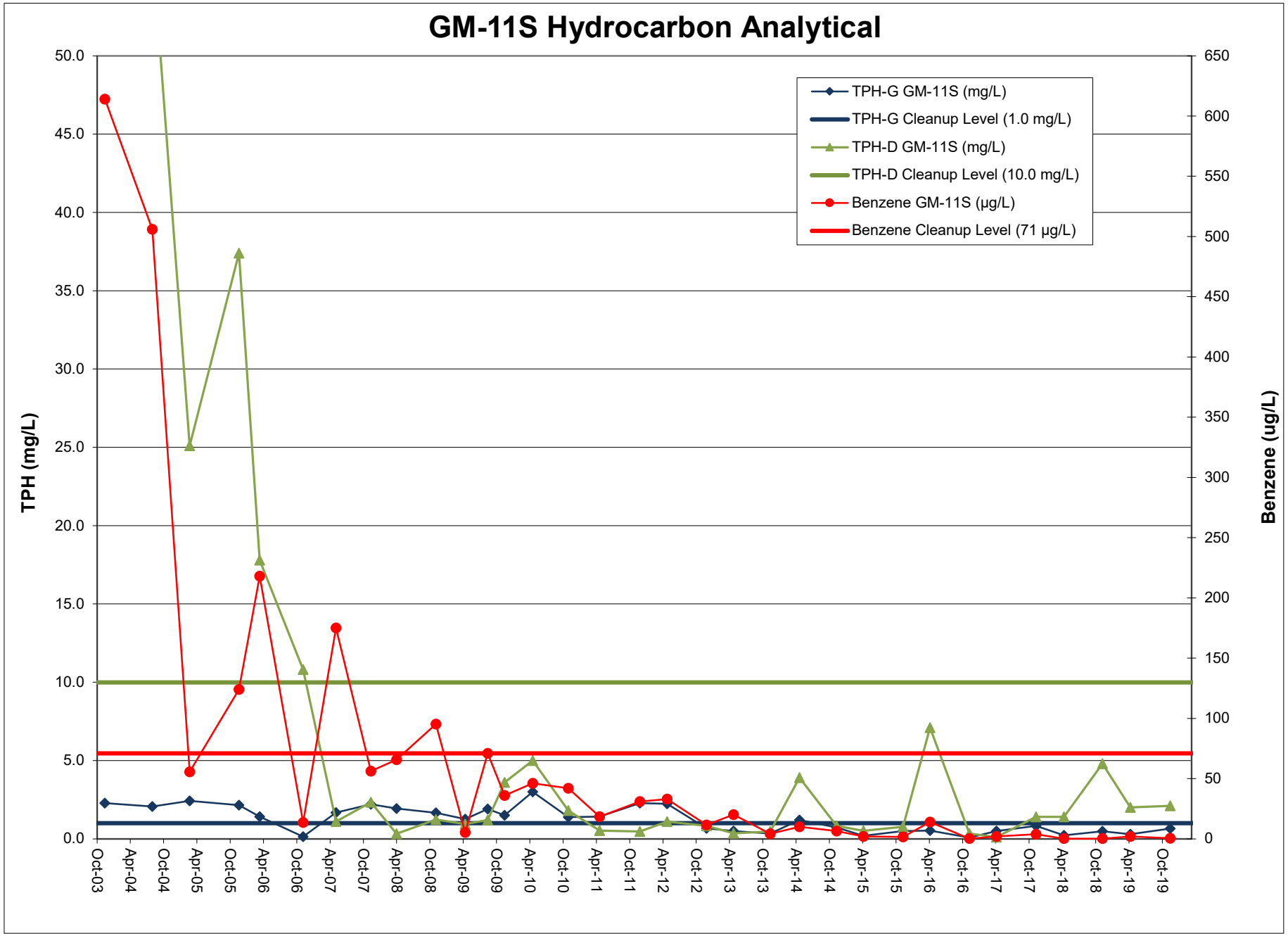
Apr-17
Oct-17
Apr-18
Oct-18
Apr-19
Oct-19


RW-6 Hydrocarbon Analytical
TPH (mg/L)
Benzene (ug/L)
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
100
90
80
70
60
50
40
30
20
10
0
TPH-G RW-6 (mg/L)
TPH-G Cleanup Level (1.0 mg/L)
TPH-D RW-6 (mg/L)
TPH-D Cleanup Level (10.0 mg/L)
Benzene RW-6 (µg/L)
Benzene Cleanup Level (71 µg/L)
Oct-03
Apr-04
Oct-04
Apr-05
Oct-05
Apr-06
Oct-06
Apr-07
Oct-07
Apr-08
Oct-08
Apr-09
Oct-09
Apr-10
Oct-10
Apr-11
Oct-11
Apr-12
Oct-12
Apr-13
Oct-13
Apr-14
Oct-14
Apr-15
Oct-15
Apr-16
Oct-16
Apr-17
Oct-17
Apr-18
Oct-18
Apr-19
Oct-19


GM-11S Hydrocarbon Analytical
TPH (mg/L)
Benzene (ug/L)
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
650
600
550
500
450
400
350
300
250
200
150
100
50
0
Oct-03
Apr-04
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Apr-05
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Apr-10
Oct-10
Apr-11
Oct-11
Apr-12
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Apr-14
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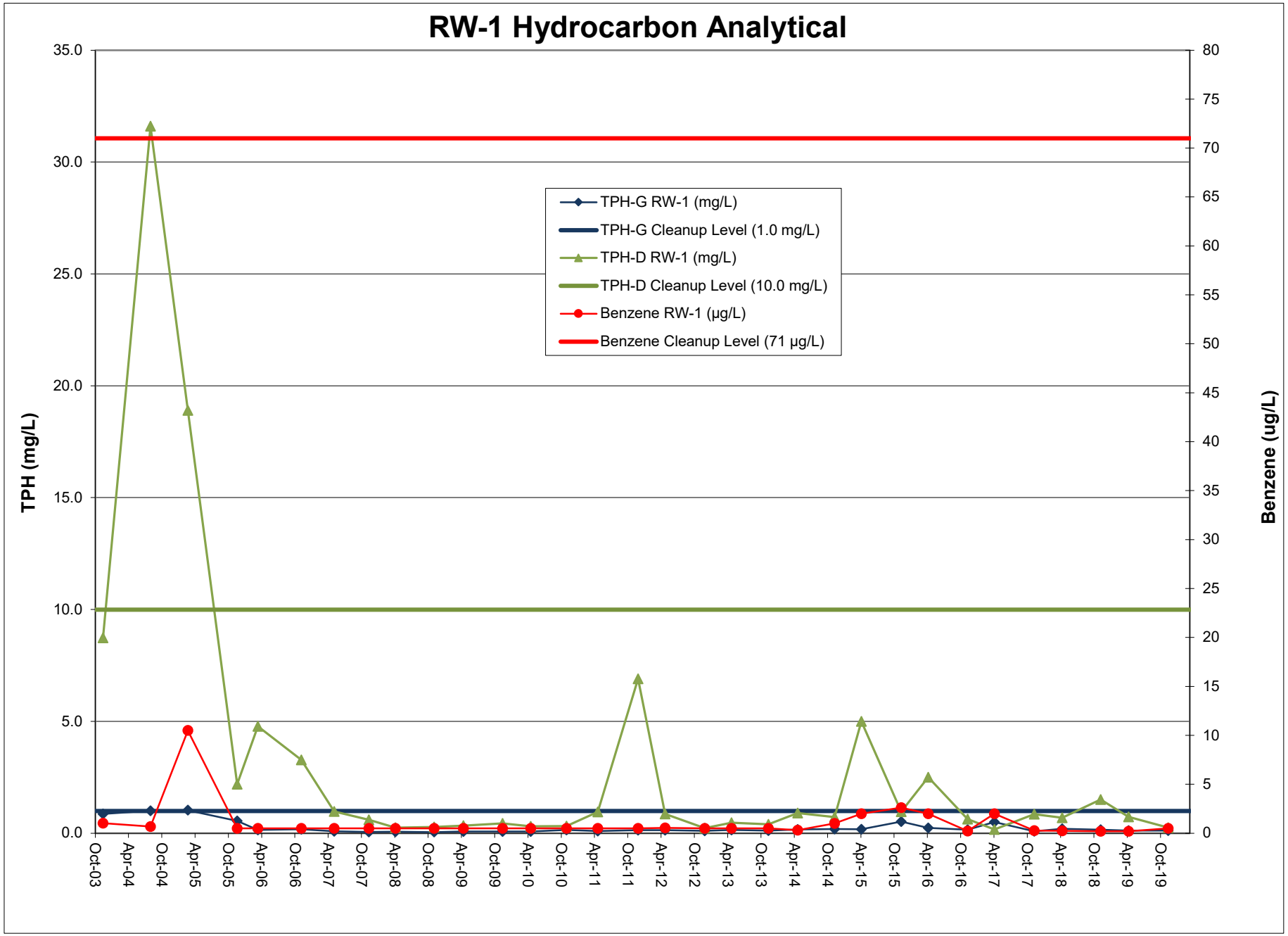
Apr-15
Oct-15
Apr-16
Oct-16
Apr-17
Oct-17
Apr-18
Oct-18
Apr-19
Oct-19
TPH-G GM-11S (mg/L)
TPH-G Cleanup Level (1.0 mg/L)
TPH-D GM-11S (mg/L)
TPH-D Cleanup Level (10.0 mg/L)
Benzene GM-11S (µg/L)
Benzene Cleanup Level (71 µg/L)


RW-1 Hydrocarbon Analytical
TPH (mg/L)
Benzene (ug/L)
TPH-G RW-1 (mg/L)
TPH-G Cleanup Level (1.0 mg/L)
TPH-D RW-1 (mg/L)
TPH-D Cleanup Level (10.0 mg/L)
Benzene RW-1 (µg/L)
Benzene Cleanup Level (71 µg/L)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
Oct-03
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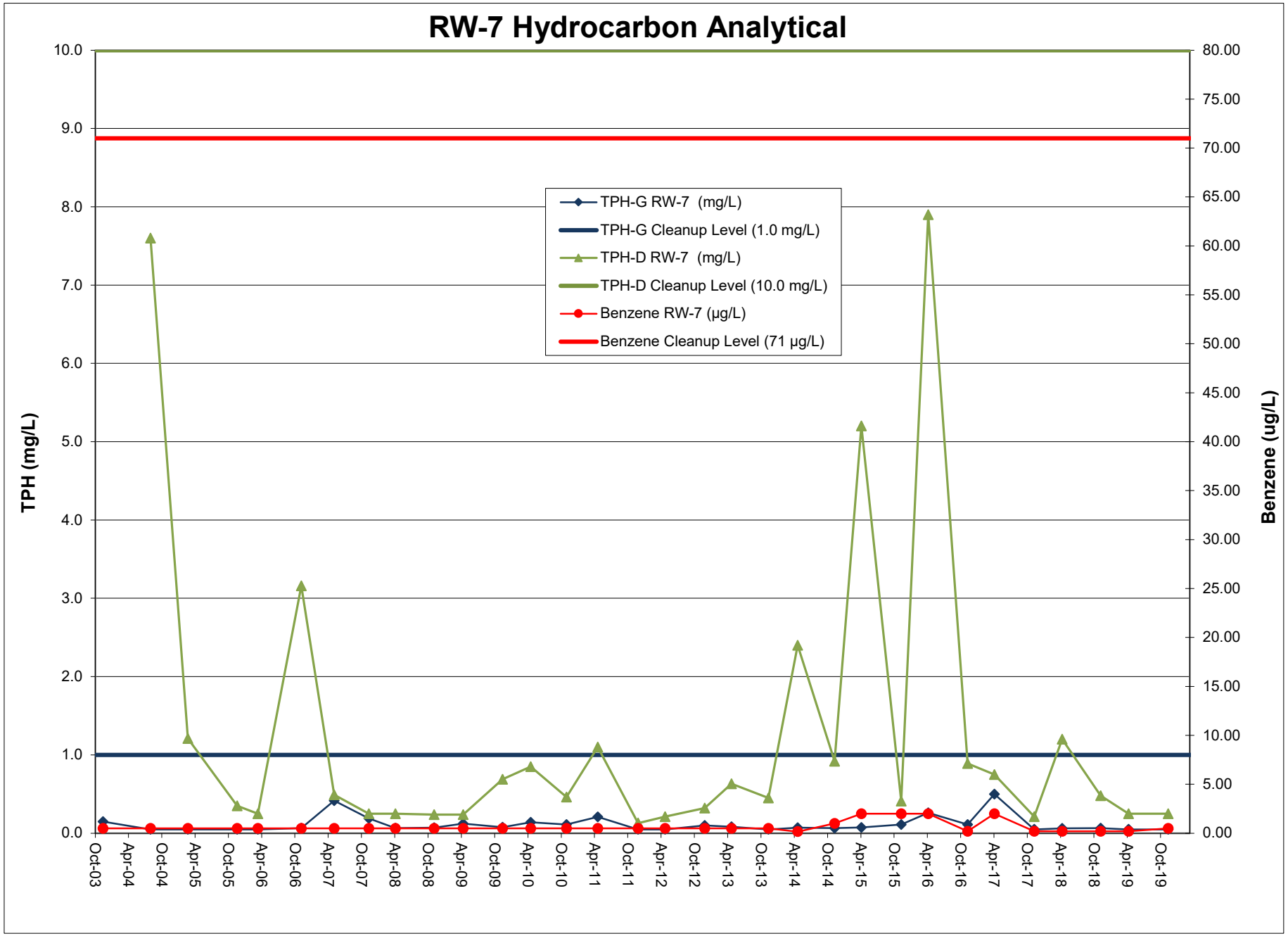
Oct-18
Apr-19
Oct-19


RW-7 Hydrocarbon Analytical
TPH (mg/L)
Benzene (ug/L)
TPH-G RW-7 (mg/L)
TPH-G Cleanup Level (1.0 mg/L)
TPH-D RW-7 (mg/L)
TPH-D Cleanup Level (10.0 mg/L)
Benzene RW-7 (µg/L)
Benzene Cleanup Level (71 µg/L)
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
80.00
75.00
70.00
65.00
60.00
55.00
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
Oct-03
Apr-04
Oct-04
Apr-05
Oct-05
Apr-06
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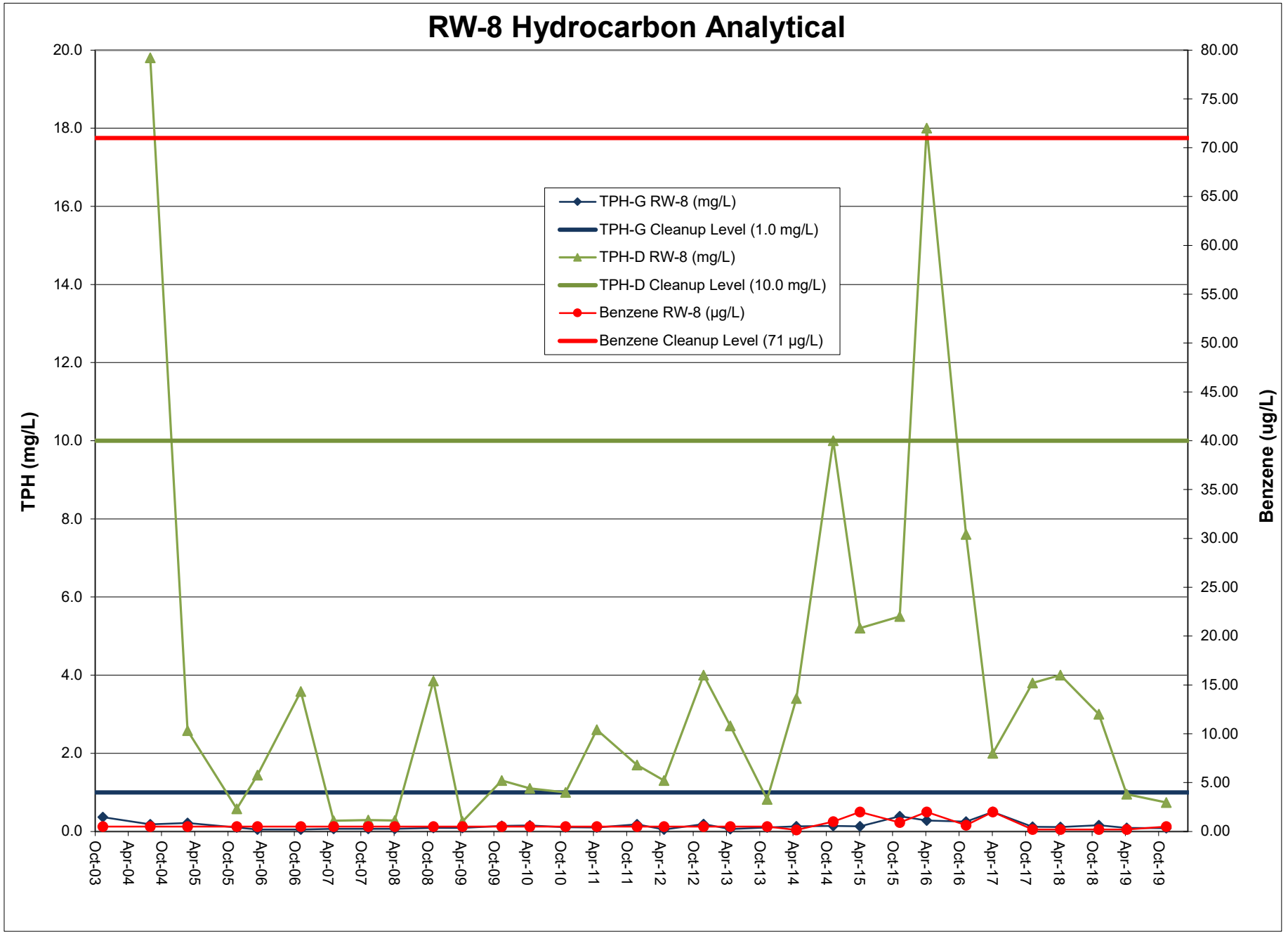
Apr-18
Oct-18
Apr-19
Oct-19


RW-8 Hydrocarbon Analytical
TPH (mg/L)
Benzene (ug/L)
TPH-G RW-8 (mg/L)
TPH-G Cleanup Level (1.0 mg/L)
TPH-D RW-8 (mg/L)
TPH-D Cleanup Level (10.0 mg/L)
Benzene RW-8 (µg/L)
Benzene Cleanup Level (71 µg/L)
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
80.00
75.00
70.00
65.00
60.00
55.00
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
Oct-03
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Apr-10
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Apr-13
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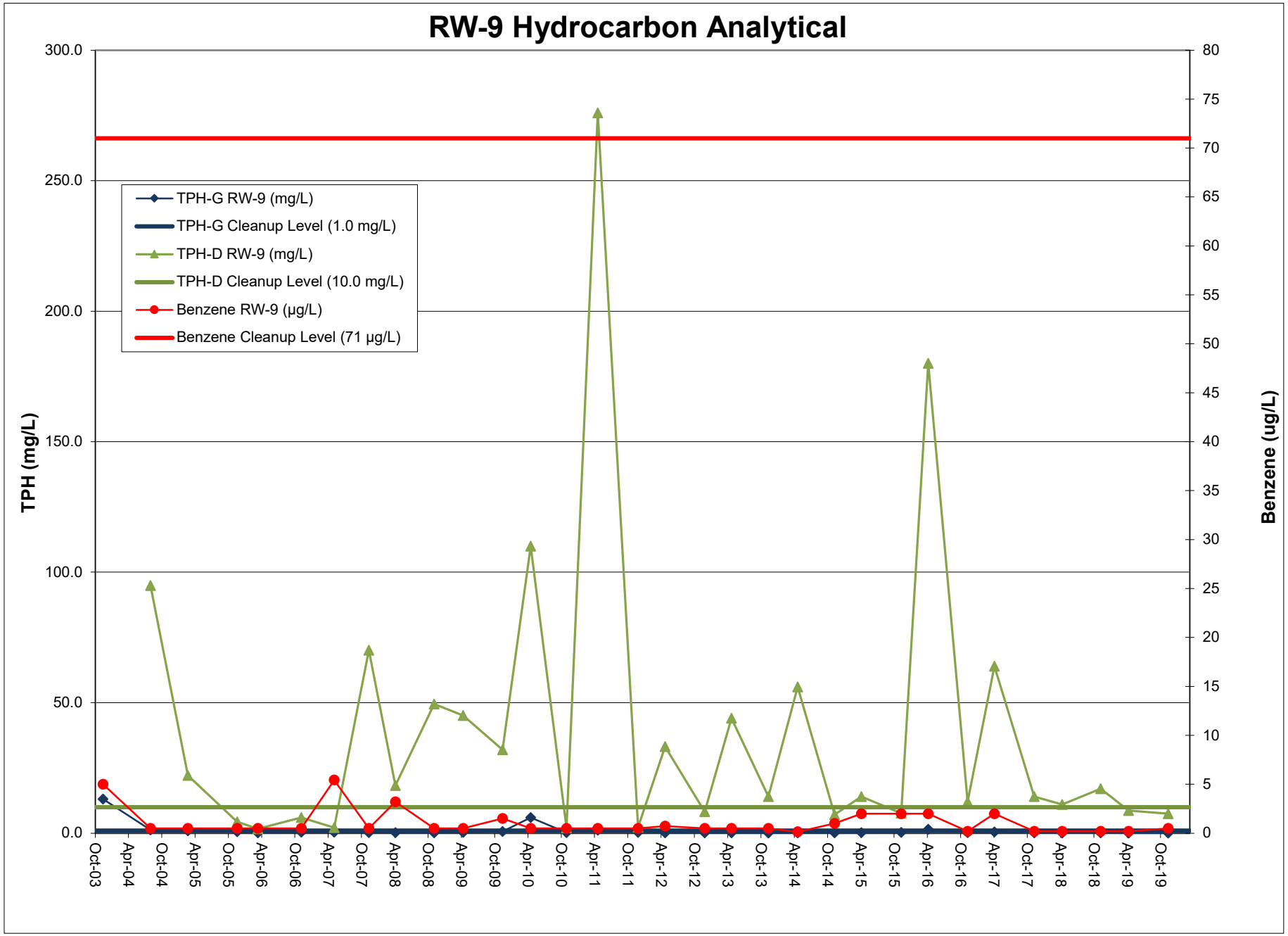
Apr-16
Oct-16
Apr-17
Oct-17
Apr-18
Oct-18
Apr-19
Oct-19


RW-9 Hydrocarbon Analytical
TPH (mg/L)
Benzene (ug/L)
300.0
250.0
200.0
150.0
100.0
50.0
0.0
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
TPH-G RW-9 (mg/L)
TPH-G Cleanup Level (1.0 mg/L)
TPH-D RW-9 (mg/L)
TPH-D Cleanup Level (10.0 mg/L)
Benzene RW-9 (µg/L)
Benzene Cleanup Level (71 µg/L)
Oct-03
Apr-04
Oct-04
Apr-05
Oct-05
Apr-06
Oct-06
Apr-07
Oct-07
Apr-08
Oct-08
Apr-09
Oct-09
Apr-10
Oct-10
Apr-11
Oct-11
Apr-12
Oct-12
Apr-13
Oct-13
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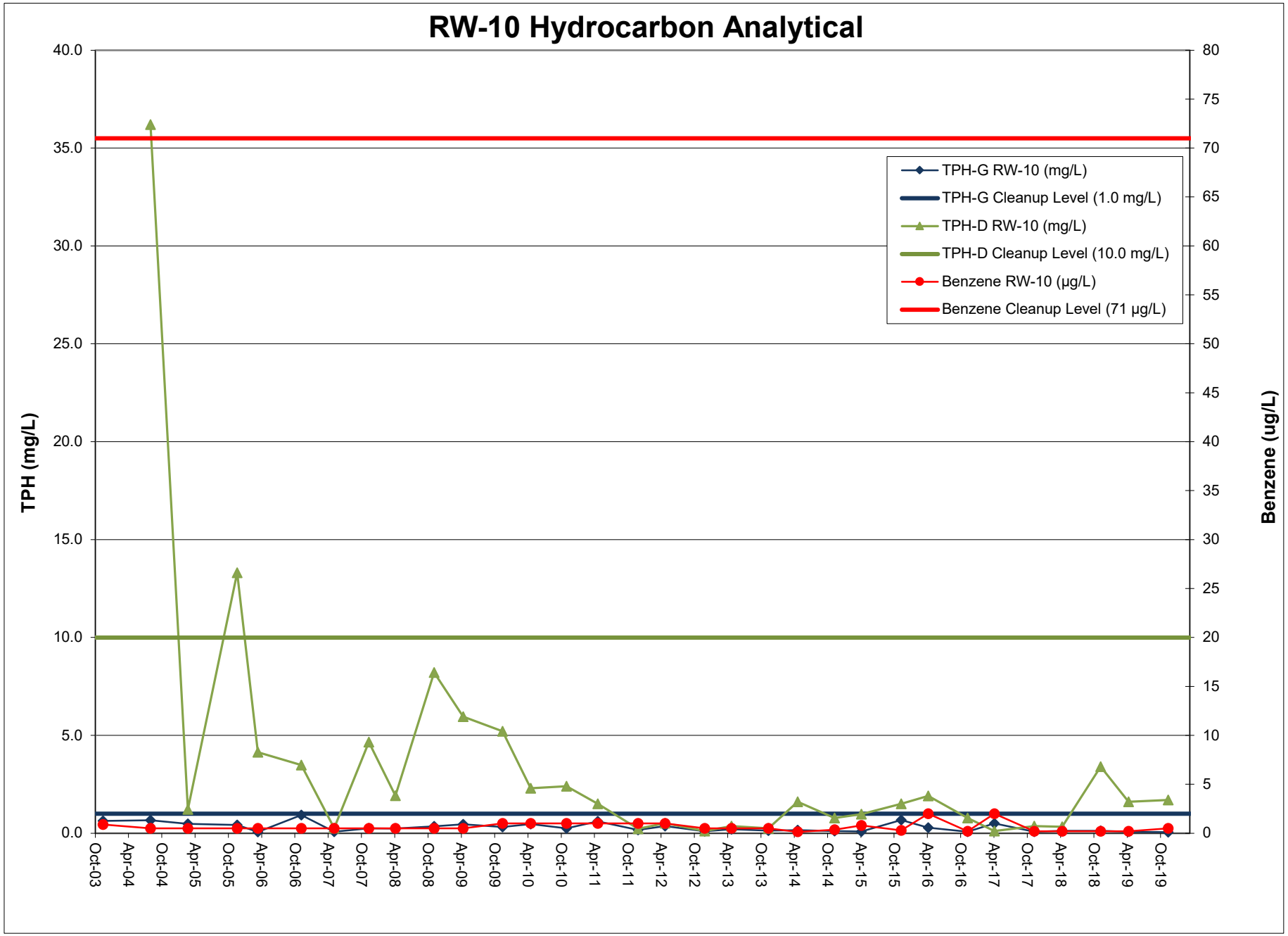
Apr-17
Oct-17
Apr-18
Oct-18
Apr-19
Oct-19


RW-10 Hydrocarbon Analytical
TPH (mg/L)
Benzene (ug/L)
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
TPH-G RW-10 (mg/L)
TPH-G Cleanup Level (1.0 mg/L)
TPH-D RW-10 (mg/L)
TPH-D Cleanup Level (10.0 mg/L)
Benzene RW-10 (µg/L)
Benzene Cleanup Level (71 µg/L)
Oct-03
Apr-04
Oct-04
Apr-05
Oct-05
Apr-06
Oct-06
Apr-07
Oct-07
Apr-08
Oct-08
Apr-09
Oct-09
Apr-10
Oct-10
Apr-11
Oct-11
Apr-12
Oct-12
Apr-13
Oct-13
Apr-14
Oct-14
Apr-15
Oct-15
Apr-16
Oct-16
Apr-17
Oct-17
Apr-18
Oct-18
Apr-19
Oct-19

Appendix B

Soil Boring Logs

TECHSOLVE ENVIRONMENTAL

Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-24**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Isyk	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/22/19 / 11:10	Date/Time Finished: 7/22 / 11:50
Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover:
Top of Casing Elevation:		
Well Construction Information: NA		
Screened Interval (ft bgs): NA	Screen: NA	Water Level While Drilling (ft bgs): 9'
Filter Pack Interval (ft bgs): NA	Riser: NA	
Seal Interval (ft bgs): NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0'	1'-0	1'-NS	SM	Dark grey to dark brown Silty
1			2'-0	2'-NS	SP	Sands (medium to fine)
2			3'-0	3'-NS		No HC Odor
3	46"		4'-0	4'-NS		
4			5'-0	5'-NS		
5		5'	6'-0	6'-NS	SM	-5'-Same as above
6			7'-0	7'-NS		- No HC Odor
7			8'-0	8'-NS		- Wet at 9' BGS
8	54"		9'-0	9'-SS		- 9'-Slight HC Odor
9			10'-63	10'-MS	SM	-10'-Same as above
10		10'	11'-54	11'-MS		- Strong HC odor at 10'
11			12'-62	12'-MS		
12			13'-102	13'-HS		- Strongest inputs at 13'
13			14'-249	14'-MS		Sample collected at 13'
14	58"		15'-5'	15'-SS	SM	-15'-Same as above
15		15'	16'-154	16'-SS		
16			17'-100	17'-SS		
17			18'-20	18'-NS		
18			19'-0	19'-NS		
19			20'-0	20'-NS	SM	-19' Same as above
20		20			OH	19.5' -Transition to Silty (dark grey)
21						Clayey Sand w rootlets
22						
23						
24						
25						

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TECHSOLVE ENVIRONMENTAL

Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle 1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-14**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/22/15 12:00	Date/Time Finished: 7/22/19 12:35
Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: concrete ~4"
Top of Casing Elevation: NA		
Well Construction Information: NA		
Screened Interval (ft bgs): NA	Screen: NA	Water Level While Drilling (ft bgs):
Filter Pack Interval (ft bgs): NA	Riser: NA	
Seal Interval (ft bgs): NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0	40"	0				0-4" concrete
1						4"-5' dark gray to dark brown silty sands. (medium to fine). No gravels. Moist. No hydrocarbon odor.
2						
3						
4			4'-0ppm	4'-NS		
5		5	5'-3ppm	5'-NS		5-10' same as above.
6			6'-0ppm	6'-NS		10' - hydrocarbon odor observed. Soils transitioned from moist to wet.
7			7'-0ppm	7'-NS		
8	40"		8'-0ppm	8'-NS		
9			9'-0ppm	9'-NS		
10		10	10'-290 ppm	10'-HS	SP	10'-15' dark gray medium to fine grain silty sands. No gravels. Wet. Hydrocarbon odor.
11			11'-70ppm	11'-MS		* Highest odor, sheen at 13'
12			12'-415 ppm	12'-HS		
13	60"		13'-694 ppm	13'-HS		
14			14'-50 ppm	-M-SS		
15		15	15'-257 ppm	15-SS		15-20 Soils same as above. Hydrocarbon odor decreased w/ depth. No noticeable odor at 19'.
16			16'-150 ppm	16-MS		
17			17'-15 ppm	17-SS		
18	60"		18'-36ppm	18'-SS		
19			19'-1 ppm	19'-NS	SM/CL	20' Transition to black to grey silty clays
20		20	20'-0ppm	20'-NS		* same collected at 13'
21						
22						
23						
24						
25						

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TECHSOLVE ENVIRONMENTAL

Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-02**	Page: **1** of **1**
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/22/19 13:30	Date/Time Finished: 7/22/19 14:10
Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: concrete ~4"
Top of Casing Elevation:		
Well Construction Information: NA		
Screened Interval (ft bgs): NA	Screen: NA	Water Level While Drilling (ft bgs): 12'
Filter Pack Interval (ft bgs): NA	Riser: NA	
Seal Interval (ft bgs): NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0			SM	0-4" Concrete.
1						
2	36"					4"-5' dark gray to dark brown medium to fine grain silty sands. No gravel. Moist. No hydrocarbon odor.
3						
4						
5			5'-0ppm	5'-NS		
6		5				5-10' same as above
7			6'-0ppm	6'-NS		
8			7'-0ppm			
9	30"		8'-0ppm	8'-NS		10-12' same as above
10						
11		10	10'-0ppm	10'-NS		12'-15' dark gray medium to fine grain silty sands. No gravel. Wet. Hydrocarbon odor.
12			11'-0ppm	11'-NS		
13	60"		12'-330ppm	12'-HS		
14			13'-319ppm	13'-HS		
15			14'-40ppm	14'-SS		15-20' same as above. Hydrocarbon odor decreasing w/ depth. No odor at 15'.
16		15	15'-13ppm	15'-SS		
17			16'-170ppm	16'-HS		
18	60"		17'-68ppm	17'-SS		
19			18'-10ppm	18'-SS		
20			19'-0ppm	19'-NS		
21		20	20'-0ppm	20'-NS		
22						
23						
24						
25						

sample collected at 12'

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TECHSOLVE ENVIRONMENTAL

Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-25** Dept of Ecology Well tag #BLK295	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/23/15 8:00	Date/Time Finished: 7/23/15 9:00

Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation:		
Well Construction Information: 1" pre-pack well		
Screened Interval (ft bgs): 7-22'	Screen: 15'	Water Level While Drilling (ft bgs): ~10'
Filter Pack Interval (ft bgs): 5-22'	Riser: 7'	
Seal Interval (ft bgs): 2.5'	Seal Type: bentonite chips	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): 2' to grade	Filter Pack: 2/12	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0			SP	0-4" concrete
1						4"-5' Dark gray to dark brown medium to fine grain silty sands. No gravel. Moist. No hydrocarbon odor.
2	48"					
3						
4						
5						
6		5'	5'-0ppm	5'-NS		5'-10' same as above. Slight hydrocarbon odor at 10'.
7			6'-0ppm	6'-NS		
8			7'-0ppm	7'-NS		
9	60"		8'-0ppm	8'-NS		10'-15' same as above. Soils are wet at ~10'. ~~Strong~~ hydrocarbon odor at 11-13'.
10			9'-0ppm	9'-SS		
11		10	10'-17ppm	10'-SS		12'- Sample collected
12			11'-116ppm	11-MS		
13			12'-3050	12-HS		15'-20' same soil description Soils are wet hydrocarbon odor at 16'. No hydrocarbon odor below 16'
14	60"		13'-1403	13-HS		
15			14'-0ppm	14-NS		
16		15	15'-0ppm	15-SS		
17			16'-350ppm	16-SS		
18	60"		17'-0	17-NS		* sample collected at 12'
19			18'-0	18-NS		
20		20'	19'-0	19-NS		
21			20'-0	20-NS		
22						
23						
24						
25						

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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-03** Ecy Well ID Tag: BLK295	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/23/19 9:20	Date/Time Finished: 7/23/19 9:50
Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: concrete
Top of Casing Elevation:		
Well Construction Information: 1" Pre-pack		
Screened Interval (ft bgs): 7'-22'	Screen: 15'	Water Level While Drilling (ft bgs): 8.5'
Filter Pack Interval (ft bgs): 5'-22'	Riser: 7'	
Seal Interval (ft bgs): 2 to 5'	Seal Type: Bentonite Chips	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): 2' to grade	Filter Pack: 2/12	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0				0-4" concrete
1						
2	40"					4"-5' Dark gray to dark brown medium to fine silty sands. No gravel. Moist. No hydrocarbon odor.
3					SP	
4						
5		5'	5'-0 ppm	5'- NS		5-10' same soil description. Strong Hydrocarbon odor at 9'. Soils transition from moist to wet at 9'.
6			6'	6- NS		
7			7'	7- NS		- Free floating product observed from 13'-17' BGS
8	54"		8' -0 ppm	8- NS		
9			9' - 360 ppm	9- HS		- Sample collected at 14'
10		10'	10' - 850 ppm	10'-MS		
11			11' - 700 ppm	11'-MS		-18' No HC odor and no staining
12	54"		12' - 1545 ppm	12'-MS		
13			13' - 2400	13'-MS		- Soils same as above until 14'
14			14' - 3680	14'-HS		
15		15	15' - 0 ppm	15'-HS		
16			16' - 200 ppm	16'-MS		
17	60"		17' - 1071 ppm	17'- SS		
18			18' - 0 ppm	18'- NS		
19			19' - 0 ppm	19'- NS		
20		20'	20' - 0 ppm	20'- NS	20' OH/SM	- Transition to dark gray to black Sandy Clay
21						
22						
23						
24						
25						

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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-15**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: 7/23/19	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/23/19 | 10:25	Date/Time Finished: 7/23/19 10:50
Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation:		
Well Construction Information: NA		
Screened Interval (ft bgs): NA	Screen: NA	Water Level While Drilling (ft bgs): 9.5'
Filter Pack Interval (ft bgs): NA	Riser: NA	
Seal Interval (ft bgs): NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0				0-4" Concrete
1						
2	40"				SP	4"-5' Dark gray/brown medium to fine silty sands. No gravel. Moist. No hydrocarbon odor.
3						
4						
5						
6		5	5'-0ppm	5'-NS		5-10' Soils description same as above. Soils transition from moist to wet at ~9.5'. Hydrocarbon odor at 9.5'. Free product at 9.5'
7			6'-0ppm	6-NS		
8			7'-0ppm	7-NS		
9	60"		8'-0ppm	8-NS		
10			9'-0ppm	9-HS		
11		10	10'-170ppm	10-HS		10-15' Same as above.
12			11'-831ppm	11-MS		14' No HC odor & No staining Sample collected at 11'
13	60"		12'-2262ppm	12-MS		
14			13'-53ppm	13-SS		
15			14'-5ppm	14-NS		
16		15	15'-0ppm	15-NS		15-18.5' same as above. No hydrocarbon odor at 15' or below.
17			16'-0ppm			
18			17'-0ppm		OH	18.5-20' Dark gray silty clay, wet.
19			18'-0ppm			
20			19'-0ppm			
21		20	20'-0ppm			
22						
23						
24						
25						

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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-26**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/25/19 10:55	Date/Time Finished: 7/25/19 11:20

Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation: NA		
Well Construction Information: NA		
Screened Interval (ft bgs): NA	Screen: NA	Water Level While Drilling (ft bgs): 10'
Filter Pack Interval (ft bgs): NA	Riser: NA	
Seal Interval (ft bgs): NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0				0-4" Concrete
1					SP	4"-5' dark gray/brow medium to fine grain silty sands. No gravels. Moist. No hydrocarbon odor observed.
2						
3	48"					
4			5'-0ppm	5'-NS		
5		5'	6'-0ppm	6'-NS		
6			7'-0ppm	7'-NS		5'-10' Same soil description. Hydrocarbon odor at ~9.5'. Soils transition from moist to wet at 10'
7	58"		8'-0ppm	8'-NS		
8			9'-0ppm	9'-SS		
9			10'-350ppm	10'-HS	SP	HC odor at 9.5'. Free prod (old weathered) observed at 10'
10		10	11'-1190ppm	11'-HS		
11			12'-760ppm	12'-MS		
12	60"		13'-40ppm	13'-SS		Contamination at 16' may be from soil sluffing.
13			14'-20ppm	14'-NS		
14			15'-20ppm	15'-NS		
15		15	16'-970ppm	16-MS		10-15' Same as above.
16			17'-30ppm	17-NS		
17	60"		18'-5ppm	18-NS		15-19' Same as above, No hydrocarbon odor at 10' and below.
18			19'-0ppm	19-NS		
19				20-NS		
20					OH	19-20' dark gray silty clay. Medium plasticity. Wet. No hydrocarbon odor.
21		20	20'-0ppm			
22						
23						
24						
25						

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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-04**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/23/15 12:40	Date/Time Finished: 7/23/15 15:05

Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation: NA		
Well Construction Information: NA		
Screened Interval (ft bgs): NA	Screen: NA	Water Level While Drilling (ft bgs): 9.0'
Filter Pack Interval (ft bgs): NA	Riser: NA	
Seal Interval (ft bgs): NA	Seal Type: NA	Water Level at Completion (ft bgs): NA
Grout Interval (ft bgs): NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0	24"	0			SP	0-4" Concrete
1						4"-5' Dark gray/brown medium to fine grained silty sands. No gravel. Some fragments of seashells in soils. Moist. No hydrocarbon odor observed.
2						
3						
4						
5	60"	5'	5'=0ppm	5'-NS		5'-10' same soil description. 9' soils change from moist to wet. 9' there is a strong hydrocarbon odor.
6			6'-0ppm	6'-NS		- Free product (heavily weathered) at 9.5'
7			7'-0ppm	7'-NS		- oily woody debris at 13' w/ 3" silty clay lens
8			8'-0ppm	8'-NS		Sample collected at 12'
9			9'-151ppm	9'-SS		
10		10'	10'-1023ppm	10'-HS	13'-OH	15'-19'
11			11'-850ppm	11'-HS		16' hydrocarbon odor. No odor past 16'. Same soil description as above.
12	60"		12'-1691ppm	12'-MS		
13			13'-600ppm	13'-HS		
14			14'-0ppm	14'-SS	SP	
15		15'	15'-0ppm	15'-HS		
16			16'-32ppm	16'-NS		
17			17'-0ppm	17'-NS		
18			18'-0ppm	18'-NS		
19			19-0ppm	19'-NS		19-20' Dark gray silty clay.
20		20	20-0ppm	20'-NS	OH	
21						
22						
23						
24						
25						

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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-05** Dept of Ecology Well	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/23/15 13:10	Date/Time Finished: 7/23/15 13:40
Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation:		
Well Construction Information: 1" pre pack		
Screened Interval (ft bgs): 7-17' bgs	Screen: 10'	Water Level While Drilling (ft bgs): 9.5
Filter Pack Interval (ft bgs): 5-17' bgs	Riser: 7'	
Seal Interval (ft bgs): 2-5' bgs	Seal Type: bentonite chips	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): 2' to grade	Filter Pack: 2/12 sand	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0				0-4" concrete
1						
2	36"				SP	4"-5' Light gray medium to fine grain silty sands. Few gravels and wood particles. Dry. No hydrocarbon odor.
3						
4						
5		5'	5'-0ppm	5'-NS		
6			6'-0ppm	6'-NS		
7	54"		7'-0ppm	7'-NS		Soils transition to dark gray at 7' BGS, soils go from dry to moist.
8			8'-0ppm	8'-NS		
9			9'-0ppm	9'-NS		Wet at 9.5' BGS
10			10'-100ppm	10'-SS		Hydrocarbon odor at 9.5' BGS
11		10'	11'-65ppm	11-SS		Sample collected at 10.5'
12			12'-66ppm	12-SS		10.5' same as above
13	60"		13'-27ppm	13-NS		
14			14'-29ppm	14-NS		15'-20 No recovery
15			15'-16ppm	15-NS		
16		15				
17						
18	0					
19						
20						
21		20				
22						
23						
24						
25						

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Soil Boring Log

Project Name and Location:	Boring Number: **B-27**	Page: 1 of 1
SeaPort Midstream Partners, Seattle **1652 SW Lander Street Seattle, WA 98134**	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/23/19 14:20	Date/Time Finished: 7/23/19 14:50

Surface Elevation:		Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation:	NA		
Well Construction Information:	NA		
Screened Interval (ft bgs):	NA	Screen: NA	Water Level While Drilling (ft bgs): 11'
Filter Pack Interval (ft bgs):	NA	Riser: NA	
Seal Interval (ft bgs):	NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs):	NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0				0-4" Concrete
1						
2					SP	4"-5' Light gray transitioning to dark gray/brown, Medium to fine grain silty sands. No gravels. Moist. No hydrocarbon odor.
3	48"					
4						
5		5	5'-0ppm	5'-NS		5-10' Same as above.
6			6'-0ppm	6-NS		
7			7'-0ppm	7-NS		
8	42"		8'-0ppm	8-NS		
9			9'-0ppm	9-NS		
10			10'-0ppm	10-NS		
11		10	10'-0ppm	11'-SS		10'-15' same soil description. Hydrocarbon odor observed at 11'. Soil transition from moist to wet at 11'.
12			11'-39ppm	12'-SS		
13			12'-155ppm	13'-NS		
14	60"		13'-82ppm	14'-NS		Sample collected at 12'
15			14'-55ppm	15'-NS		
16		15	15'-15ppm	16-SS		15'-20' same soil description. No hydrocarbon odor at 18' or below.
17			16'-100ppm	17-SS		
18			17'-66ppm	18-NS		
19	60"		18'-0ppm	19-NS		
20			19'-0ppm			
21		20	20'-0ppm	20-NS		
22						
23						
24						
25						

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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-17**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/24/19 8:00	Date/Time Finished: 7/24/19 8:40
Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation:		
Well Construction Information:		
Screened Interval (ft bgs): NA	Screen: NA	Water Level While Drilling (ft bgs): 9'
Filter Pack Interval (ft bgs): NA	Riser: NA	
Seal Interval (ft bgs): NA	Seal Type: NA	Water Level at Completion (ft bgs): NA
Grout Interval (ft bgs): NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0	36"	0			SP	0-4" Concrete
1						4"-5' Dark gray/brown medium to fine grained silty sands. No gravels. Moist. No hydrocarbon odor.
2						
3						
4						
5		5	5'- 0 ppm	5'- NS		5'-10' same soil description. Soils transition from moist to wet at ~9'. Hydrocarbon odor at ~9'.
6			6'- 0 ppm	6'- NS		
7			7'- 0 ppm	7'- NS		
8	60"		8'- 0 ppm	8'- NS		
9			9'- 7 ppm	9'- SS		
10		10	10'- 77 ppm	10'- MS		10-15' ~2' of sluff from heaving sands. Same soil description and conditions as previously described. Some woody debris at ~13'.
11			11- 0 ppm	11 ~ NS	Sluff	
12			12- 0 ppm	12 ~ NS		
13	60"		13- 66 ppm	13- MS		
14			14- 11 ppm	14- SS		
15		15	15- 0 ppm	15- SS		17'- Sample collected (only at 17')
16			16- 5 ppm	16'- NS	Sluff	15-20'- ~2' of sluff from heaving sands. Same soil description as above.
17			17- 232 ppm	17'- HS		- No HC odor at 19.5'
18	60"		18- 10 ppm	18'- SS		- Transition to black to dark gray silty sandy clay.
19			19- 5 ppm	19'- SS		
20		20	20- 2 ppm	20'- NS		20'- SM/OH
21						
22						
23						
24						
25						

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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle 1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-06**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/24/19 8:45	Date/Time Finished: 7/24/19 9:15
Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation: NA		
Well Construction Information: NA		
Screened Interval (ft bgs): NA	Screen: NA	Water Level While Drilling (ft bgs): 9'
Filter Pack Interval (ft bgs): NA	Riser: NA	
Seal Interval (ft bgs): NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0				~~0-~~4" Concrete
1					SP	4"-5' Light gray transitioning to a dark gray/brown medium to fine grained silty sands. Some brick/terra-cotta fragments at ~3'. Dry to moist at 5'. No hydrocarbon odor.
2						
3	36"					
4						
5		5	5'-0ppm	5'-NS } Sluff		
6			6'-0ppm	6'-NS }		
7			7'-0ppm	7'-NS		
8	40"		8'-0ppm	8'-NS		5-10' it appears the top 2' are sluff from dry heaving sands.
9			9'-0ppm	9'-SS		
10			10'-177ppm	10'-HS		8-10' moist to wet sands w/ 9' being the transition. 10' hydrocarbon odor.
11		10	11'-191 ppm	11'-HS		
12			12'-265 ppm	12'-HS		12-13' Free product observed (oil & heavily weathered)
13	36"		13'-325 ppm	13'-HS		
14			14'-187ppm	14'-MS		Sample collected at 13'
15			15'-82ppm	15'-MS		
16		15	16'-231ppm	16'-MS		10-15' same as above
17			17'-16ppm	17'-MS		
18	60"		18'-2ppm	18'-MS		15-18' same as above. hydrocarbon odor decreases after 17'.
19			19'-2ppm	19'-SS		
20		20	20'-1ppm	20'-SS		
21					OH	18-19' Silty clay layer. Medium plasticity. Dark gray Wet No hydrocarbon odor.
22						
23						
24					SP	19-20 dark gray medium to fine grain silty sands. No gravels. Wet. No hydrocarbon odor.
25						

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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-28**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/24/19 5:30	Date/Time Finished: 7/24/19 10:00

Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation: NA		
Well Construction Information: NA		
Screened Interval (ft bgs): NA	Screen: NA	Water Level While Drilling (ft bgs): 9'
Filter Pack Interval (ft bgs): NA	Riser: NA	
Seal Interval (ft bgs): NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0'				0-4" Concrete
1						
2	42"				SP	4"-5' Dark gray/brown medium to fine grain silty sands. No gravels. Few small instances of silty clay bands/clumps. Moist. No hydrocarbon odor.
3						
4						
5		5'	5'-0ppm	5'-NS		
6			6'-0ppm	6'-NS		
7			7'-0ppm	7'-NS		
8	44"		8'-0ppm	8'-NS		5-10' same soil description. Soils transition from moist to wet at ~9'. No hydrocarbon odor.
9			9'-0ppm	9'-NS		
10		10	10'-0ppm	10'-NS		
11			11'-0ppm	11'-NS		
12			12'-0ppm	12'-MS		10-15' same soil description. Hydrocarbon odor only observed at ~12'.
13	48"		13'-0ppm	13'-SS		Sample collected at 12'
14			14'-0ppm	14'-NS		
15		15	15'-0ppm	15'-NS		
16			16'-12ppm	16'-MS Slight		
17			17'-4ppm	17'-NS		15'-19' same soils description. Some potential slight ~~HS~~ 16'. Some woody debris at 18'
18			18'-0ppm	18'-NS		
19	54"		19'-0ppm	19'-NS		
20				20'-NS		
21		20	20'-0ppm		OH	19-20' Dark gray silty clay. Medium plasticity. Wet. No hydrocarbon odor.
22						
23						
24						
25						

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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-18**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/24/19 10:20	Date/Time Finished: 7/24/19 10:50
Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation: NA		
Well Construction Information: NA		
Screened Interval (ft bgs): NA	Screen: NA	Water Level While Drilling (ft bgs): ~9'
Filter Pack Interval (ft bgs): NA	Riser: NA	
Seal Interval (ft bgs): NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0				0-4" Concrete
1						
2						4'-5' - Dark gray/brown medium to fine grain silty sands. No gravels. Moist. No hydrocarbon odor.
3	36"				SP	
4						
5		5	5'-0ppm	5'-NS		
6			6'-0ppm	6'-NS		5-10' Same soil description. Soils transition from moist to wet at ~9'. Hydrocarbon odor observed below 9'.
7			7'-0ppm	7'-NS		
8			8'-0ppm	8'-NS		
9	48"		9'-0ppm	9'-NS		
10		10	10'-36 ppm	10'-HS		
11			11'-24ppm	11'-SS/MS		10'-15' Same soil description. Soils from 10-11' appear to be sheen.
12			12'-180ppm	12'-MS		* sample collected at 12'
13			13'-60 ppm	13-MS		
14	54"		14'-10 ppm	14-SS		15-18' Same soil description. No hydrocarbon odor.
15		15	15'-0 ppm	15-NS		
16			16'-2 ppm	16'-NS		
17			17'-0ppm	17'-NS		
18			18'-0ppm	18'-NS	OH	18'-20' Silty clay. Dark gray. wet No hydrocarbon odor
19	42"		19'-0ppm	19'-NS		
20			20'-0ppm	20'-NS		
21		20				
22						
23						
24						
25						

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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle 1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-07**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/24/15 11:10	Date/Time Finished: 7/24/15 12:50
Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation:		
Well Construction Information: 1" prepack		
Screened Interval (ft bgs): 7-17'	Screen: 10'	Water Level While Drilling (ft bgs): 9.5'
Filter Pack Interval (ft bgs): 5-17'	Riser: 5'	
Seal Interval (ft bgs): 3-5'	Seal Type: bentonite chips	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): 3 - surface	Filter Pack: 2/12 sand	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0				0-4" Concrete
1					SP	4"- 5' - light gray medium to fine grained silty sands. Some shell fragments. Few gravels. Dry. No hydrocarbon odor.
2						
3	36"					
4						
5		5'	5'- 0ppm	5'- NS		
6			6'- 0ppm	6'- NS		
7			7'- 0ppm	7'- NS		
8	50"		8'- 0ppm	8'- NS		
9			9'- 0ppm	9'- NS		
10			10'- 70ppm	10'- MS		5'-10' Soils same as above. Transition from moist to wet at 9.5' bgs Woody debris at 9.5' bgs. Hydrocarbon odor and staining at 9.5' BGS
11		10'	11'- 152ppm	11'- HS		
12			12'- 260ppm	12'- HS		Sample collected at 12'
13	45"		13'- 105ppm	13'- MS		
14			14'- 13ppm	14'- SS		
15			15'- 4ppm	15'- SS		10-15' soils same as above.
16		15'	16'- 13ppm	16'- MS		
17			17'- 3ppm	17'- SS		
18	42"		18'- 3ppm	18'- NS		15'-18.5' soils same as above. No hydrocarbon odor below 16'.
19			19'- 0ppm	19'- NS		
20		20	20- 0ppm	20'- NS		
21					OH/OL	18.5-20' dark gray silty clay. Wet. No hydrocarbon odor.
22						
23						
24						
25						

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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-29**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/24/14 / 12:50	Date/Time Finished: 7/24/14 15:10

Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation: NA		
Well Construction Information: NA		
Screened Interval (ft bgs): NA	Screen: NA	Water Level While Drilling (ft bgs): 9'
Filter Pack Interval (ft bgs): NA	Riser: NA	
Seal Interval (ft bgs): NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0'				0-4" Concrete.
1						
2						4"-5' Dark gray/brown medium to fine grained silty sand. Few gravels. Moist. No hydrocarbon odor.
3	40"				SP	
4						
5		5'	5'- 0ppm	5'- NS		5'-10' Same soil description. No gravels. Soils transition from moist to wet at ~9'. Hydrocarbon odor at ~10.5'
6			6'- 0ppm	6'- NS		
7			7'- 0ppm	7'- NS		
8	54"		8'- 0ppm	8'- NS		
9			9'- 0ppm	9'- NS		
10		10	10'- 0ppm	10'- NS		
11			11'- 150ppm	11'- SS		HC Odor at 11' bgs
12			12'- 16ppm	12'- NS		10-15' Same soil conditions. Hydrocarbon from 11-12'.
13	48"		13'- 0ppm	13'- NS		
14			14'- 0ppm	14'- NS		* Soil sample collected at 11.'
15		15'	15'- 0ppm	15'- NS		15-18.5 Same soil conditions. No hydrocarbon odors
16			16'- 0ppm	16 - NS		
17			17'- 0ppm	17 - NS		
18			18'- 0ppm	18 - NS		18.5-20 Dark gray silty clay, medium plasticity. Wet. No hydrocarbon odor.
19			19'- 0ppm	19 - NS		
20		20'	20'- 0ppm	20 - NS	OH	
21						
22						
23						
24						
25						

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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle 1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-30**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/24/19 13:15	Date/Time Finished: 7/24/19 13:35

Surface Elevation:		Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation:	NA		
Well Construction Information:	NA		
Screened Interval (ft bgs):	NA	Screen: NA	Water Level While Drilling (ft bgs): 10'
Filter Pack Interval (ft bgs):	NA	Riser: NA	
Seal Interval (ft bgs):	NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs):	NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0'				0-4" Concrete / terra cotta
1						
2	36"				SP	4"-5' Dark gray/ brown silty sands. No gravel. Moist. No hydrocarbon odors.
3						
4						
5		5'	5'-0ppm	5'-NS		5-10' same soil conditions. Hydrocarbon odors observed at 10'
6			6'-0ppm	6'-NS		
7			7'-0ppm	7'-NS		
8	60"		8'-0ppm	8'-NS		
9			9'-0ppm	9'-NS		
10			10'-25 ppm	10'-MS		10-15' Same soil conditions.
11		10	11'-40 ppm	11-(NA)-No Soil		
12			12'-210 ppm	12-MS		
13	30"		13'-10 ppm	13-HS		
14			14'-5 ppm	14-SS		
15			15'-3 ppm	15-(NA) No soil	SP	15-20' 15-16' appears to be slough w/ concrete cobbles and brick/ terra cotta.
16		15	16'-5ppm			16-19' -same soil conditions as previously described.
17			17'-3ppm			
18	60"		18'-0ppm			
19			19'-0ppm			19-20' Dark gray silty clay. Medium plasticity. Wet. No hydrocarbon odors
20		20	20'-0ppm		OH	
21						
22						
23						
24						
25						

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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle 1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-19**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/24/19 13:40	Date/Time Finished: 7/24/19 14:10
Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation: NA		
Well Construction Information: NA		
Screened Interval (ft bgs): NA	Screen: NA	Water Level While Drilling (ft bgs): 10'
Filter Pack Interval (ft bgs): NA	Riser: NA	
Seal Interval (ft bgs): NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0				0-4" Concrete
1						
2					SP	4"-5' Dark gray/brown silty sands, No gravel. Moist. No hydrocarbon odors.
3	36"					
4						
5			5'-0ppm	5'-NS		
6		5	6'-0ppm	6'-NS		5-10' same soil conditions.
7			7'-0ppm	7'-NS		
8			8'-0ppm	8'-NS		
9	48"		9'-3ppm	9'-NS		
10			10-85ppm	10'-MS		10-15' same soil conditions. Soil transitions from moist to wet at 10'.
11		10	11-360	11'-MS		
12			12-382ppm	12'-HS		- Free product observed from 12'-13' bgs
13			13-415ppm	13'-HS		Sample collected at 13'
14	60"		14-5ppm	14'-MS		
15			15-1ppm	15'-SS		15'-20': 15-18.5 same soil conditions.
16		15	16-2ppm	16'-MS		
17			17-130ppm	17'-SS		
18	60"		18-2ppm	18'-NS		18.5-20. Dark gray silty clay. No gravels. Wet. No hydrocarbon odor.
19			19-0ppm	19'-NS		
20		20	20-0ppm	20'-NS	OH	
21						
22						
23						
24						
25						

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Soil Boring Log

Project Name and Location:	Boring Number: **B-08**	Page: 1 of 1
SeaPort Midstream Partners, Seattle **1652 SW Lander Street Seattle, WA 98134**	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/24/18 14:15	Date/Time Finished: 7/24/18 14:30

Surface Elevation:		Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation:	NA		
Well Construction Information:	NA		
Screened Interval (ft bgs):	NA	Screen: NA	Water Level While Drilling (ft bgs): ~ 9.5
Filter Pack Interval (ft bgs):	NA	Riser: NA	
Seal Interval (ft bgs):	NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs):	NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0				0-4" Concrete
1						
2					SP	4"-5' Light gray silty sands. Few Gravels. Dry. No hydrocarbon odor. Term cotta/brick at 5'
3	36"					
4						
5		5'	5' 0ppm	5' - NS		5-10' Dark gray/brown silty sands. No gravel. Soils transition from moist to wet at 7.5'. Hydrocarbon odor at 10'.
6			6' 0ppm	6' - NS		
7			7' 0ppm	7' - NS		
8	42"		8' 0ppm	8' - NS		
9			9' 0ppm	9' - NS		
10		10'	10' - 140ppm	10' - MS		
11			11' - 100 ppm	11' - MS		
12	36"		12' - 125 ppm	12' - SS		10-15' Same soil conditions. Sample collected at 10' bgs
13			13' - 23 ppm	13' - SS		
14			14' - 12 ppm	14' - SS		
15		15'	15' - 8 ppm	15' - SS		15-20: 15-18.5 Same soil conditions. No Hydrocarbon odor below 16'.
16				16 - MS		
17			17' - 8 ppm	17 - SS		
18	60"		18' - 0 ppm	19 - NS		
19			19' - 0 ppm	14 - NS		
20		20	20' - 0 ppm	20 - NS		18.5-20 Dark gray silty clay. Medium plasticity. Wet. No hydrocarbon odor
21					OH	
22						
23						
24						
25						

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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-20**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/25/15 7:50	Date/Time Finished: 7/25/15 8:15

Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation: NA		
Well Construction Information: NA		
Screened Interval (ft bgs): NA	Screen: NA	Water Level While Drilling (ft bgs): ~9'
Filter Pack Interval (ft bgs): NA	Riser: NA	
Seal Interval (ft bgs): NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0				0-4" Concrete
1						
2					SP	4"-5' Dark gray / brown silty sands. No gravels. Moist. No hydrocarbon odor.
3	42"					
4						
5		5	5'-0ppm	5'-NS		5'-10' Same soil description. Silty clay layer at ~7' about 1" thick. Soils transition from moist to wet at ~9'. Hydrocarbon odor / staining at ~9.5'
6			6'-0ppm	6'-NS		
7	48"		7'-0ppm	7'-NS		
8			8'-0ppm	8'-NS		
9			9'-0ppm	9'-NS		
10		10	10'-130ppm	10'-HS		- Free product (old & weathered) observed from 10'-15' bgs
11			11'-70	11'-No recovery		
12			12'-65	12'-No recovery		
13	30"		13'-118	13'-HS		10-15' Same soils description. Very oily.
14			14-220	14'-HS		
15			15'-243	15-HS		
16		15	16'-114ppm	16-SS		15-19' Same soils description. No hydrocarbon odor below 16'.
17			17'-3ppm	17-NS		
18			18'-0ppm	18-NS		
19	60"		19'-0ppm	19-NS		
20			19'-0ppm	20-NS	OH/CL	19-20' Dark gray silty clays. Medium plasticity. Wet. No hydrocarbon odors.
21		20	20'-0ppm			
22						
23						
24						
25						

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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-31**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/25/15 8:20	Date/Time Finished: 7/25/15 8:00

Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation: NA		
Well Construction Information: NA		
Screened Interval (ft bgs): NA	Screen: NA	Water Level While Drilling (ft bgs): 9.5
Filter Pack Interval (ft bgs): NA	Riser: NA	
Seal Interval (ft bgs): NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0				0-4" Concrete
1						
2					SP	4"-5' Dark gray/brown silty sands. No gravels. Moist. No hydrocarbon odors
3	48"					
4						
5		5	5'-0ppm	5'-NS		5-10' same soils description. Soils transition from moist to wet at ~9.5'. Hydrocarbon odor/staining at ~9.5'.
6			6'-0ppm	6-NS		
7			7'-0ppm	7-NS		
8	60"		8'-0ppm	8-NS		
9			9'-0ppm	9-NS		
10			10'-98ppm	10-MS		10-15' Same soil description as above
11		10	11-No recovery	11-No recovery		
12			12-274ppm	12-HS		limited free product observed at 12' bgs
13			13-46ppm	13-SS		Sample collected at 12' bgs
14	42"		14-5ppm	14-SS		
15			15-1ppm	15-SS		15-19' 15-16' likely slough from heaving sands.
16		15		16-No recovery		
17			16-63ppm	17-SS		16-19' same soils description as above. No hydrocarbon odor.
18			17-6ppm	18-SS		
19			18-4ppm	19-NS		
20			19-0ppm	20-NS	OH/CL	19-20 Dark gray silty clay. Medium plasticity. No gravels. Wet. No hydrocarbon odor.
21		20	20-0ppm			
22						
23						
24						
25						

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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-32**	Page: **1** of **1**
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/25/19 9:10	Date/Time Finished: 7/25/19 9:35

Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation: N/A		
Well Construction Information: N/A		
Screened Interval (ft bgs): N/A	Screen: N/A	Water Level While Drilling (ft bgs): 9.5'
Filter Pack Interval (ft bgs): N/A	Riser: N/A	
Seal Interval (ft bgs): N/A	Seal Type: N/A	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): N/A	Filter Pack: N/A	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0						0-4" Concrete
1						
2					SP	4"-5' Dark gray/brown silty sands. No gravels. Some wood and Seashell fragments. Moist. No hydrocarbon odor.
3						
4	42"					
5		5	5'-0 ppm	5'-NS		
6			6'-0ppm	6'-NS		5'-10' Same soil description. No wood, Seashell or gravels. Soil transition from moist to wet at 9.5'
7			7'-0ppm	7'-NS		
8	48"		8'-0ppm	8'-NS		
9			9'-0ppm	9'-NS		Hydrocarbon odor and staining at 9.5' bgs.
10			10'-2ppm	10'-MS		
11		10	11'-	11'-No recovery		12-13' bgs free product observed (heavily weathered
12			12-683ppm	12'-HS		- Sample collected at 12' Bgs
13			13-122ppm	13'-HS		
14	48"		14-5ppm	14'-SS		
15			15-3ppm	15'-SS		10-15 Same soils description.
16		15	16	16'-No recovery		
17				17'-MS } Slough?		15-18' Same soils description. Soils at ~17 are likely slough from heaving sands. No hydrocarbon odor below 18'.
18	40"		17-231ppm	18'-SS		
19			18-2ppm	19'-SS		
20			19-0ppm	20'-NS		
21		20'	20-0ppm		OH/OL	18' - Dark gray silty clay layer. Wet. No hydrocarbon odors.
22					SP	
23					OH	19-20 - Same silty clay.
24						
25						

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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-21**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/25/19 9:50	Date/Time Finished: 7/25/19 10:10

Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation: NA		
Well Construction Information: NA		
Screened Interval (ft bgs): NA	Screen: NA	Water Level While Drilling (ft bgs): 10'
Filter Pack Interval (ft bgs): NA	Riser: NA	
Seal Interval (ft bgs): NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0				0-4" Concrete
1					SP	4"-5' light gray silty sands. Few gravels. Some silty clay bands at ~3' bgs. Moist. No hydrocarbon odor.
2						
3						
4	42"					
5		5	5'-0ppm	5'-NS		
6			6'-0ppm	6'-NS	SP	5-10' Light gray transitioning to dark gray/brown silty sands. No gravels. Soils go from moist to wet at ~10'. Hydrocarbon odor at 10'.
7			7'-0ppm	7'-NS		
8	60"		8'-0ppm	8'-NS		
9			9'-0ppm	9'-NS		
10		10	10'-15 ppm	10'-MS		
11			11-	11'-NS, refusing		
12			12-76 ppm	12'-HS		10-15 Same soils as above. Sample collected at 12' bgs
13	30"		13-84 ppm	13'-SS		
14			14-57 ppm	14'-SS		
15		15	15-No Recovery	15-NS, refusing		
16			16-slight	16'-No recovery		15-20' 16' slight.
17			17-119 ppm	17'-MS? Slight?		17-19 same soils description as above.
18	42"		18-0ppm	18'-SS		
19			19-0ppm	19'-NS		19-20' dark gray silty clay. medium plasticity. Wet. No hydrocarbon odor.
20		20'	20-1 ppm	20'-NS	CH	
21						
22						
23						
24						
25						

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Soil Boring Log

Project Name and Location:	Boring Number: **B-10**	Page: 1 of 1
SeaPort Midstream Partners, Seattle **1652 SW Lander Street Seattle, WA 98134**	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/25/19 10:20	Date/Time Finished: 7/25/19 10:40

Surface Elevation:		Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation: NA			
Well Construction Information: NA			
Screened Interval (ft bgs): NA	Screen: NA		Water Level While Drilling (ft bgs): 9.5'
Filter Pack Interval (ft bgs): NA	Riser: NA		
Seal Interval (ft bgs): NA	Seal Type: NA		Water Level at Completion (ft bgs):
Grout Interval (ft bgs): NA	Filter Pack: NA		

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0				0-4" Concrete
1						
2						4"-5' No recovery. Void space observed under Concrete.
3	Ø					
4						
5		5			SP	5-10' No recovery till 6'
6						Dark gray/brown silty sands. No gravels. Moist. transitioning to Wet at ~9.5'. Hydrocarbon odor at staining at ~9.5'
7			6'-0	6'-NS		
8	48"		7'-0	7'-NS		
9			8'-0	8'-NS		
10		10	9'-0	9'-NS		10-15 Same soil description as above.
11			10'-73 ppm	10'-HS		
12			11	11'-No recovery		Sample collected at 13' bgs
13	48"		12-61 ppm	12'-MS		
14			13-121 ppm	13'-MS		15-18' Same soil description as above.
15			14-5 ppm	14'-NS		
16		15	15-2 ppm	15-NS	OH	18-20' Dark gray silty clay. Some woody debris. medium plasticity. Wet. No hydrocarbon odor.
17			16-0	16'-NS		
18			17-0	17'-NS		
19	48"		18-0	18'-NS		
20			19-0	19'-NS		
21		20	20-0	20'-NS		
22						
23						
24						
25						

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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-22**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/25/19 11:00	Date/Time Finished: 7/25/19 11:25

Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation: NM		
Well Construction Information: NA		
Screened Interval (ft bgs): NA	Screen: NA	Water Level While Drilling (ft bgs): 10'
Filter Pack Interval (ft bgs): NA	Riser: NA	
Seal Interval (ft bgs): NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0				0-4" Concrete
1					SP	4"-5' Dark gray/brown silty sands. Few gravels, minor silty clay band at ~3'. Soils transition from dry to moist at ~2.5'. No hydrocarbon odor.
2						
3	36"					
4						
5		5'	5' - 0 ppm	5' - NS		5-10' Same as above. Soils transition to wet at ~10'. Hydrocarbon odor and staining at ~10'
6			6' - 0 ppm	6' - NS		
7			7' - 0 ppm	7' - NS		
8			8' - 0 ppm	8' - NS		
9	54"		9' - 1 ppm	9' - NS		
10		10	10' - 51 ppm	10' - HS		10-15' 10-12' appear to be slough. (moist silty sands w/ gravel).
11				11' - No recovery		
12	36"		12' 59	12' - No recovery		12-15' Dark gray silty sands, No gravel. Wet.
13			13' - 203	13' - HS		
14			14' - 378 ppm	14' - MS		Sample collected at 14'
15			15' - 113 ppm	15' - SS		
16		15	16'	16' - No recovery		15-20' low recovery.
17			17	17' - No recovery		18' same soil description above.
18	24"		18 - 35 ppm	18' - MS		19' Dark gray silty clay. Transitioning from low plasticity to high plasticity at 20'. Wet. No hydrocarbon odor.
19			19 - 5 ppm	19' - SS	OL	
20		20'	20 - 0 ppm	20' - NS	CH	
21						
22						
23						
24						
25						

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TECHSOLVE ENVIRONMENTAL

Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-44**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/25/19 12:50	Date/Time Finished: 7/25/19 13:20

Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation: NA		
Well Construction Information: NA		
Screened Interval (ft bgs): NA	Screen: NA	Water Level While Drilling (ft bgs): 9.5'
Filter Pack Interval (ft bgs): NA	Riser: NA	
Seal Interval (ft bgs): NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0						0-4" Concrete
1						
2					SP	4"-5' Light gray to dark gray/brown silty sands w/ gravel. Dry transitioning to moist at ~3'. No hydrocarbon odor.
3	42"					
4						
5		5'	5' - 0ppm	5' - NS		5-10' Same soils as above. Wet at 9.5' bgs. Hydrocarbon odor and staining at 9.5' bgs. No gravels.
6			6' 0ppm	6' - NS		
7			7' 0ppm	7' - NS		
8	60"		8' 0ppm	8' - NS		
9			9' 0ppm	9' - NS		
10		10'	10' - 45ppm	10' - MS		
11			12' - 141 ppm	11 - No recovery		10-15' 10-12' appear to be slutt from heaving sands. (light gray, dry w/ gravels).
12			13' - 145 ppm	12' - MS		
13	48"		14' - 20 ppm	13' - HS		
14				14' - SS		
15		15'	15' - 17 ppm	15' - SS		13-15' Dark gray / brown silty sands. Strong hydrocarbon odor w/ staining. Sample collected at 13' bgs.
16			16	16 - No recovery		
17	36"	36"	17 - 17ppm	17' - SS		15-18' Dark gray silty sands. Wet. No gravels. No hydrocarbon odor below 17'.
18			18 - 1 ppm	18' - NS		
19			19 - 0 ppm	19' - NS		
20		20	20 - 0 ppm	20' - NS		
21						
22						
23						
24					OL/OH	18-20 Dark gray silty clay. Low to medium plasticity. Wet. No hydrocarbon odor.
25						

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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-16**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/25/19 13:25	Date/Time Finished: 7/25/19 13:50
Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation: NA		
Well Construction Information: NA		
Screened Interval (ft bgs): NA	Screen: NA	Water Level While Drilling (ft bgs):
Filter Pack Interval (ft bgs): NA	Riser: NA	
Seal Interval (ft bgs): NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0	0	0				0-4" Concrete No recovery until 5' bgs. 4'-5' - Abandoned / Bricks and debris does not allow recovery. Attempted 2 borings 1' foot apart of each other w/ similar results.
1						
2						
3						
4						
5		5				
6						
7						
8						
9						
10		10'				
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						

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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-11**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/25/19 14:00	Date/Time Finished: 7/25/19 14:30
Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation:		
Well Construction Information: 1" prepack		
Screened Interval (ft bgs): ~~7~~-17' bgs	Screen: 10'	Water Level While Drilling (ft bgs): 9.5
Filter Pack Interval (ft bgs): 5-17' bgs	Riser: 7	
Seal Interval (ft bgs): 3-5' bgs	Seal Type: bentonite chips	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): 3'- grade	Filter Pack: 2/12 sand	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0	24"	0			SW	0-4" Concrete 4'-5' - Light brown silty sands w/ gravel. Dry. No hydrocarbon odor.
1						
2						
3						
4						
5		5	5' - 0 ppm	5' - NS		
6			6 - 0	6' - NS		
7			7 - 0	7' - NS		5'-10' Dark gray/brown silty sands. No gravels. Wet at 9.5' bgs. Hydrocarbon odor and staining at 9.5' bgs
8	42"		8 - 0	8' - NS	SP	
9			9 - 0	9' - NS		
10		10	10 - 72 ppm	10' - MS		
11			11 -	11' - No Recovery		
12			12 - 97 ppm	12' - HS		
13	42"		13 - 164 ppm	13' - HS		10-15' Same soils described above. Sample collected from 13' BGS
14			14 - 15 ppm	14' - SS		
15		15	15 - 5 ppm	15' - NS		
16			16 - 27 ppm	16' - Sheff		15-18' Same soils described above. Hydrocarbon odor not observed below 16'.
17			17 - 1 ppm	17' - SS		
18	60"		18 0 ppm	18' - NS		
19			19 - 0 ppm	19' - NS		
20		20'	20 - 0 ppm	20' - NS	OH	18-20 Dark gray silty clay. Medium to high plasticity. Wet. No hydrocarbon odor.
21						
22						
23						
24						
25						

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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-09**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/25/15 14:50	Date/Time Finished: 7/25/15 15:20
Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation:		
Well Construction Information: 1" prepack well		
Screened Interval (ft bgs): 7-17'	Screen: 10'	Water Level While Drilling (ft bgs):
Filter Pack Interval (ft bgs): 5-17'	Riser: 7'	
Seal Interval (ft bgs): 3-5'	Seal Type: bentonite chips	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): 3'-grade	Filter Pack: 2/12 sand	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0				0-4" Concrete
1						4"-5'- Pea gravel back fill from adjacent storm sewer
2	0					
3						
4						
5		5'	5'	5'- No recovery	SP	5-10 - Black silty sands w/ pea gravel heaving. No HC odor and NO HC staining (HC-Hydrocarbon)
6				6 - "		
7	36"			7 - "		
8						
9			0- 0ppm	8 - NS		
10		10'	9- 0ppm	9 - NS		Pea gravel heaving into hole results in no recovery from 10' to 20' bgs.
11			10- 0ppm	10 - NS		
12						
13	0					
14						
15		15'				Sample collected at 10' BGS
16						
17	0					
18						
19						
20		20'				
21						
22						
23						
24						
25						

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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-12**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/26/19 8:00	Date/Time Finished: 7/26/19 8:20
Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation: NA		
Well Construction Information: NA		
Screened Interval (ft bgs): NA	Screen: NA	Water Level While Drilling (ft bgs):
Filter Pack Interval (ft bgs): NA	Riser: NA	
Seal Interval (ft bgs): NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0						0-6" Concrete
1						6"-5' Could not complete boring,
2	0					at ~2' bgs driller hit an
3						obstruction that we could
4						not drill past, appears to
5						be a footing for the
6						warehouse wall.
7						Boring was abandoned.
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
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24						
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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-33** Dept of Ecology Well ID: BLK-301	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/29/19 8:30	Date/Time Finished: 7/29/19 9:35

Surface Elevation:		Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Asphalt
Top of Casing Elevation:			
Well Construction Information:	1" prepack well		
Screened Interval (ft bgs):	3-13'	Screen: 10'	Water Level While Drilling (ft bgs): 7'
Filter Pack Interval (ft bgs):	2-13'	Riser: 2' 8"	
Seal Interval (ft bgs):	1.5-2' bgs bentonite	Seal Type: bentonite chips	Water Level at Completion (ft bgs):
Grout Interval (ft bgs):	1.5-grade	Filter Pack: 2/12 sand	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0				0-6" ashpalt. Soft clear to 3.5' w/ hand digging.
1						6"-2' Disturbed fill material. Sands and gravel.
2						
3	36"					2'-5' Dark gray/brown silty sands. No gravel. Moist. No hydrocarbon odor.
4						
5		5	5'-0ppm	5'-NS	SP	
6			6'-0ppm	6'-NS		5-10' Dark gray/brown silty sands, few gravels. Moist transitioning to wet at ~7'. Hydrocarbon odor/staining at ~8'.
7			7'-0ppm	7'-NS		
8			8'-183ppm	8'-MS		
9	60"		9'-2042ppm	9'-SS		* Sample collected at 9'.
10				10'-SS		
11		10	10'-5 ppm	11'-SS		10-15 Same soils description. 10'-11 is likely slough.
12			11-789 ppm	12'-NS		
13			12-20 ppm	13'-NS		14' Dark gray silty clay. No gravels. Wet. No hydrocarbon odor.
14	60"		13-7 ppm	14'-NS	CH/OH	
15		15	14-2 ppm			14-14.5 same soils as previously described.
16			15-0ppm	15'-NS	SP	
17						14.5'-15. Dark gray silty clay. Medium plasticity. Wet, No hydrocarbon odor.
18					OH	
19						
20						
21						
22						
23						
24						
25						

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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-35** Dept of Ecology Well ID: BLK 302	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/24/15 10:00	Date/Time Finished: 7/24/15 10:30
Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Asphalt
Top of Casing Elevation:		
Well Construction Information: 1" pre pack well		
Screened Interval (ft bgs): 3-13' bags	Screen: 10'	Water Level While Drilling (ft bgs): 8'
Filter Pack Interval (ft bgs): 2-13'	Riser: 2' 8"	
Seal Interval (ft bgs): 2-1.5 bags	Seal Type: bentonite chips	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): 1.5- grade	Filter Pack: 2/12 sand	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0-				0-6" asphalt.
1						6"-2' - fill material. Disturbed sand and gravels.
2						
3	30"				SP	2'-5' - dark gray/brown silty sands, few gravels. moist. No hydrocarbon odor
4						
5		5'	5'-0ppm	5' NS		
6			6'-0ppm	6'-NS		5'-10' same soils description. Soils transition from moist to wet at 8'. Hydrocarbon odor/staining at 8'.
7			7'-0ppm	7'-SS		
8			8'-28ppm	8'-MS		
9	60"		9'-205ppm	9"-NS		* Sample collected at 8'.
10			10'-82ppm	10'-NS		
11		10	11'-0ppm	11'-NS		10-15' same soils description. No gravels.
12			12-3ppm	12'-NS		- Silty clay layer at 12', 14, 14.5-15
13			13-0ppm	13'-NS		
14	60"		14-0ppm	14'-NS	OH.	- Wood debris at ~13'.
15		15	15-0ppm	15'-NS		
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						

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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-38**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/29/15 10:50	Date/Time Finished: 7/29/15 11:20
Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Asphalt.
Top of Casing Elevation: NA		
Well Construction Information: NA		
Screened Interval (ft bgs): NA	Screen: NA	Water Level While Drilling (ft bgs): ~8'
Filter Pack Interval (ft bgs): NA	Riser: NA	
Seal Interval (ft bgs): NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0				0-6" asphalt.
1						6"-2' Fill material: Sands and gravels.
2						
3	42"				SP	2'-5' gray/brown silty sands. No gravels. Moist. No hydrocarbon odor
4						
5		5	5'-0ppm	5' - NS		5-7': same soil description.
6			6'-0ppm	6' - NS		
7			7'-0ppm	7' - NS		7' 2" layer of concrete rubble
8	52"		8'-358ppm	8' - MS		8-10' same soil description. Soil are wet at 8'. Hydrocarbon odor.
9			9'-1408ppm	9' - SS		
10		10'	10'-5ppm	10' - NS		Sample Collected at 8' bgs.
11			11'-4100ppm	11' - SS Sheen?		
12			12-15ppm	12' - NS		10-14' Same soil description. No observable hydrocarbon odor below 12'.
13	60"		13-4ppm	13' - NS		
14			14-0ppm	14' - NS		12.5' Dark gray silty clay layer ~4" thick.
15		15'	15-0ppm	15' - NS		14' Dark gray silty clay layer ~6" thick.
16						
17					GH	
18						
19						
20						
21						
22						
23						
24						
25						

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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-34**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/25/19 13:10	Date/Time Finished: 7/25/19 15:30
Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Asphalt
Top of Casing Elevation: NA		
Well Construction Information: NA		
Screened Interval (ft bgs): NA	Screen: NA	Water Level While Drilling (ft bgs): 8.5'
Filter Pack Interval (ft bgs): NA	Riser: NA	
Seal Interval (ft bgs): NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0				0-6" asphalt.
1						6"-5': 6"-1.5' Fill: sands and gravels.
2						
3	48"				SP	1.5'-5': Gray/Dark brown silty sands few gravels. Moist. No hydrocarbon odor.
4						
5		5	5'-0ppm	5'-NS		
6			6'-0 ppm	6'-NS		5-10' - same soil descriptions. Soils transition from moist to wet at 8.5'. Hydrocarbon odor and staining at ~8.5'.
7			7'-0ppm	7'-NS		
8	48"		8'-0ppm	8'-SS		Sample collected at 9'
9			9'-1600ppm	9'-MS		
10			10-2ppm	10'-NS		
11		10	11-327ppm	11'-MS		
12			12-29 ppm	12'-NS		10-14.5' same soil description. No observable hydrocarbons below 12'.
13			13-2 ppm	13'-NS		
14	60"		14-1 ppm	14'-NS		
15		15	15-0ppm	15'-NS		14.5-15' Dark gray silty clay, medium to high plasticity. No gravels. Wet. No hydrocarbon odor.
16					CH	
17						
18						
19						
20						
21						
22						
23						
24						
25						

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TECHSOLVE ENVIRONMENTAL

Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-39**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/29/19 18:40	Date/Time Finished: 7/29/19 19:00
Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Asphalt.
Top of Casing Elevation: NA		
Well Construction Information: NA		
Screened Interval (ft bgs): NA	Screen: NA	Water Level While Drilling (ft bgs): 8'
Filter Pack Interval (ft bgs): NA	Riser: NA	
Seal Interval (ft bgs): NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0				0- Asphalt.
1						-2' Fill: Sands, cobbles.
2						
3	42"				SP	2'-5' Gray / dark brown silty sands. No gravel. Moist. No hydrocarbon odor.
4						
5		5	5- 0ppm	5'- NS		
6			6'-	6'- NS		
7			7'- 0ppm	7'- NS		
8	44"		8'- 91ppm	8'- SS		5'-10' same soil description. Soils transition from moist to wet at ~8'. Hydrocarbon odor and staining observed at 7.5'.
9			9'- 941ppm	9'- MS		
10			10- 6ppm	10'- MS		* Sample collected at 9'
11		10	11- 303ppm	11'- MS		
12			12- 10 ppm	12'- MS		
13			13- 3ppm	13'- NS		
14			14- 1ppm	14'- NS		10-14' same soils description.
15		15	15- 0ppm	15'- NS		
16					OL	14-15' Dark gray silty clay. No gravels. Wet. No hydrocarbon odor. Woody debris present in soils.
17						
18						
19						
20						
21						
22						
23						
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TECHSOLVE ENVIRONMENTAL

Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-40**	Page: **1** of **1**
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/29/19 14:15	Date/Time Finished: 7/29/19 14:40

Surface Elevation:		Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Asphalt
Top of Casing Elevation:	NA		
Well Construction Information:	NA		
Screened Interval (ft bgs):	NA	Screen: NA	Water Level While Drilling (ft bgs): 7
Filter Pack Interval (ft bgs):	NA	Riser: NA	
Seal Interval (ft bgs):	NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs):	NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0				0-6" asphalt
1						6"-12" back fill - Light gray sandy cobbles.
2						
3	42"					
4					SP	12"-5' - dark gray/brown silty sands. No gravels. Moist. No hydrocarbon odor.
5		5'	5'-1 ppm	5' NS		
6			6'-	6 - No recovery		
7			7' - 214 ppm	7 - HS		5-10' Same soils description, Soils transition from moist to wet at ~7'. Hydrocarbon odor and staining at 7' and below. Sample collected at 7' bgs.
8	40"		8' - 153 ppm	8 - MS		
9			9' - 97 ppm	9 - MS		
10				10 - SS		
11		10	10 - 3 ppm	11 - SS		
12			11 - 7 ppm	12 - NS		
13			12 - 12 ppm	13 - NS		
14	60"		13 - 2 ppm	14 - NS		10-14' same soil description.
15			14 - 1 ppm	15 - NS		
16		15	15 - 0 ppm		OH	14-14.5' 6" band of dark gray silty clay, medium to high plasticity. No gravels. Wet. No hydrocarbon odors.
17						
18						
19						
20					SP	14.5-15.0 dark gray silty sands. No gravel Wet. No hydrocarbon odor.
21						
22						
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TECHSOLVE ENVIRONMENTAL

Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-36**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/29/19 14:50	Date/Time Finished: 7/29/19 15:10
Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Asphalt
Top of Casing Elevation:		
Well Construction Information: NA		
Screened Interval (ft bgs): NA	Screen: NA	Water Level While Drilling (ft bgs): 7.5
Filter Pack Interval (ft bgs): NA	Riser: NA	
Seal Interval (ft bgs): NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0				0-6" Asphalt.
1						6"-2' fill: sandy cobbles.
2						
3	42"				SP	2'-5 Dark gray/brown silty sands. No gravel. Moist. No hydrocarbon odor
4						
5		5	5'- 0 ppm	5'- NS		
6			6'- 0 ppm	6'- Sheff		
7			7'- 0 ppm	7'- NS	GP	5-6.5 gravelly sands. Light gray. Moist. No hydrocarbon odor.
8	60"		8'- 132 ppm	8'- MS		
9			9'- 110 ppm	9'- SS	SP	6.5-10 Dark gray brown silty sands. No gravel. Soils change from moist to wet at ~7.5'. Hydrocarbon odor and staining at ~7.5' and below.
10		10	10'- 7 ppm	10'- NS		
11			11'- 47 ppm	11'- MS		
12			12- 3 ppm	12'- NS		
13			13.1 ppm	13'- NS		Sample collected at 8' bgs
14	60"		14.1 ppm	14'- NS		10-13 same soil description.
15		15	15- 0 ppm	15'- NS		
16					OH	13'-13.5' Dark gray silty clay. High plasticity. No gravels. Wet. No Hydrocarbon odors.
17						
18					SP	13.5-14 Same SP
19					OH	14-14.5 Same OH.
20					SP	14.5-15 Same SP
21						
22						
23						
24						
25						

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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-37**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Joe	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/30/19 8:40	Date/Time Finished: 7/30/19 9:10
Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation:		
Well Construction Information: NA		
Screened Interval (ft bgs): NA	Screen: NA	Water Level While Drilling (ft bgs): ~5.5'
Filter Pack Interval (ft bgs): NA	Riser: NA	
Seal Interval (ft bgs): NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0				0-6" Concrete
1					SP	6"-5' Dark gray/brown silty sands. No gravels. Woody debris at ~4' in a silty clay band ~2" thick. Moist. Hydrocarbon odor and staining at 4.5' and below.
2						
3	42"		4'-1 ppm	4'-NS		
4						
5		5	5'-185 ppm	5'-MS		
6			6'-91 ppm	6'-MS		
7			7'-780 ppm	7'-HS		
8	60"		8'-1173 ppm	8'-MS		
9				9'-SS		5'-10' - Black silty sands with hydrocarbon odor, wet at 5.5' Bgs.
10			9'-19 ppm	10'-NS		
11		10'	10'-14 ppm	11'-NS		* Sample collected at 7' bgs
12			11'-48 ppm	12'-NS		
13			12'-11 ppm	13'-NS		10-14.5' same soil description.
14	54"		13'-4 ppm	14'-NS		
15		15'	14'-1 ppm	15'-NS		14.5-15 - Dark gray silty clay. Medium plasticity. No gravel. Wet. No hydrocarbon odor.
16			15'-0 ppm		CH	
17						
18						
19						
20						
21						
22						
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Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-13**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Joe	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/30/15 10:25	Date/Time Finished: 7/30/15 10:50
Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Asphalt
Top of Casing Elevation:		
Well Construction Information: NA		
Screened Interval (ft bgs): NA	Screen: NA	Water Level While Drilling (ft bgs): ~7.5
Filter Pack Interval (ft bgs): NA	Riser: NA	
Seal Interval (ft bgs): NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0				0-4" asphalt
1					SP	4"-5' dark gray/brown silty sands, no gravels. moist. No hydrocarbon odor.
2						
3	36"					
4						
5		5	5'- 0ppm	5' - NS		5-10' same soil description. Soils transition from moist to wet at 7.5', Hydrocarbon odor and staining at ~8.5'.
6			6' -	6 -		
7			7' - 0 ppm	7 - NS		
8			8' - 0 ppm	8 - SS		
9	42"		9' - 68 ppm	9 - MS		* sample collected at 9'
10			10' - 14 ppm	10 - MS		
11		10	11 - 7 ppm	11 - MS	SP	10-14 same soil description
12			12 - 25 ppm	12 - MS		
13			13 - 15 ppm	13 - MS		
14	60"		14 - 0 ppm	14 - SS	OL	14-14.5 dark gray silty clay. Low plasticity. wet. No hydrocarbon odor
15		15	15 - 0 ppm	15 - NS	SP	14.5-15. same SP soil description.
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						

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TECHSOLVE ENVIRONMENTAL

Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-01** Dept of Ecology Well Tag: BLK 304	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Joe	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/30/19 11:00	Date/Time Finished: 7/30/19 12:50

Surface Elevation:		Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Asphalt
Top of Casing Elevation:			
Well Construction Information:	1" prepack well		
Screened Interval (ft bgs):	3-13'	Screen: 10'	Water Level While Drilling (ft bgs): ~8.5'
Filter Pack Interval (ft bgs):	2-13'	Riser: 2'9"	
Seal Interval (ft bgs):	1.5-2'	Seal Type: bentonite chips	Water Level at Completion (ft bgs):
Grout Interval (ft bgs):	1.5 - grade	Filter Pack: 2/12 sand	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0				0-6" asphalt
1					SP	6"-5' Dark gray/brown silty sands. No gravel. Moist. No hydrocarbon odor.
2						
3	36"					
4						
5		5'	5' - 0ppm	5' - NS		5-10' same soil description. Soils transition from moist to wet at ~8.5'. Hydrocarbon odor and staining at 8.5'. free product (Heavily weathered) observed from 10'-13' bgs.
6			6' -	6' -		
7			7' -	7' -		
8	36"		8' - 0ppm	8' - MS		
9			9' - 100ppm	9' - MS		
10						
11		10	10' - 270ppm	10' - HS		* Sample collected at 12' bgs
12			11 -	11 - No recovery		
13	44"		12 - 232 ppm	12 - HS		10-15 same soils description.
14			13 - 199 ppm	13 - HS		
15			14 - 5 ppm	14 - SS		
16		15	15 - 1 ppm	15 - SS		
17						
18						
19						
20						
21						
22						
23						
24						
25						

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TECHSOLVE ENVIRONMENTAL

Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-41** Ecology well ID: BLK303	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/31/19 7:40	Date/Time Finished: 7/31/19 8:15
Surface Elevation:	Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation:		
Well Construction Information: 1" prepack		
Screened Interval (ft bgs): 3'-18'	Screen: 15'	Water Level While Drilling (ft bgs): 6'
Filter Pack Interval (ft bgs): 2'-18'	Riser: 2' 8"	
Seal Interval (ft bgs): 2'-1.5'	Seal Type: bentonite chips	Water Level at Completion (ft bgs):
Grout Interval (ft bgs): 1.5 - grade	Filter Pack: 2/12 sand	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0'				0-1' Concrete
1						
2	30"				SP	1'-5' dark gray/brown silty sands, no gravel. Moist. No hydrocarbon odor
3						
4						
5		5'	5'-0 ppm	5'-NS		5-10' same soil description. Soils transition from moist to wet at 6'. Hydrocarbon odor and staining at ~6' and below.
6			6'-82 ppm	6'-MS		
7			7'-195 ppm	7'-MS		
8	60"		8'-415 ppm	8'-MS		- Sample collected at 8' bgs
9			9'-5 ppm	9'-SS		
10			10'-3 ppm	10'-NS		
11		10	11-126 ppm	11' MS		10-13' same soil description.
12			12-68 ppm	12'-SS		
13			13-1 ppm	13'-NS	SP/OH	13-15 several small ~2" bands of dark gray silty clay, medium to high plasticity. Wet. No observable hydrocarbon odor. Clay bands are mixed in the same silty sands as previously described.
14	60"		14-0 ppm	14'-SS		
15		15	15-0 ppm	15'-NS		
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						

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TECHSOLVE ENVIRONMENTAL

Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-42** Ecology Well ID: BLK 305	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/31/19 8:20	Date/Time Finished: 7/31/19 8:45

Surface Elevation:		Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation:			
Well Construction Information:	1" prepack well		
Screened Interval (ft bgs):	3-15' bgs	Screen: 15'	Water Level While Drilling (ft bgs): 6'
Filter Pack Interval (ft bgs):	2-15' bgs	Riser: 2' 8"	
Seal Interval (ft bgs):	1.5-2'	Seal Type: bentonite chips	Water Level at Completion (ft bgs):
Grout Interval (ft bgs):	1.5 - grade	Filter Pack: 2/12 sand	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0				0-9" Concrete
1					SP	9"-5' Dark gray silty sands, no gravels. Some woody debris at ~3', 3.5', 4'. Moist. Hydrocarbon odor at ~6.
2	42"					
3						
4			4'-1 ppm	4' - NS		
5		5	5-150 ppm	5 - MS		5-10' Same soils description. Gravels observed at ~6' (4" band). Soils transition from moist to wet at 6'. Hydrocarbon odor and staining from 5-9'.
6			6'-26 ppm	6 - MS		
7			7'-286 ppm	7 - HS		Sample collected at 7' bgs
8	60"		8'-0 ppm	8 - MS		
9			9'-2 ppm	9 - SS		
10		10	10'-0 ppm	10 - SS		
11			11'-0 ppm	11' - SS	OL	~10' 2" band of silty clay at 10' Low to medium plasticity. Wet.
12			12'-0 ppm	12' - SS		
13			13'-0 ppm	13' - NS	SP	10-13 Dark gray silty sands. No gravels. Wet. No hydrocarbon odor.
14	60"		14'-0 ppm	14' - NS		
15		15	15'-0 ppm	15' - NS	OH	13-14.5 Dark gray silty clay. High plasticity. Wet. No hydrocarbon odor.
16						
17						14.5-15 - Same SP soils description. Woody debris observed ~14.5'.
18						
19						
20						
21						
22						
23						
24						
25						

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TECHSOLVE ENVIRONMENTAL

Soil Boring Log

Project Name and Location: **SeaPort Midstream Partners, Seattle** **1652 SW Lander Street Seattle, WA 98134**	Boring Number: **B-43**	Page: 1 of 1
	Contractor: **Cascade Drilling**	Drilling Method: **Direct Push / Hand Auger**
	Drill Crew: Kyle	Drill Rig: **Geoprobe 7822**
	Date/Time Started: 7/31/19 9:30	Date/Time Finished: 7/31/19 10:00

Surface Elevation:		Logged by: **S. Larsen/ M. Roberts**	Protective Cover: Concrete
Top of Casing Elevation:	NA		
Well Construction Information:	NA		
Screened Interval (ft bgs):	NA	Screen: NA	Water Level While Drilling (ft bgs): 9'
Filter Pack Interval (ft bgs):	NA	Riser: NA	
Seal Interval (ft bgs):	NA	Seal Type: NA	Water Level at Completion (ft bgs):
Grout Interval (ft bgs):	NA	Filter Pack: NA	

Depth (ft bgs)	Recovery (in.)	Sample Interval	OVM / PID (ppm)	Sheen Test: NS (none), SS (slight), MS (moderate), HS (heavy sheen)	USCS Symbol	Sample Description
0		0				0-1' Concrete
1						
2					SP	1'-5' Dark gray silty sands. Moist. Woody debris at 4'. Hydrocarbon odor and staining present at 3' and below.
3	36"		3' - 1272 ppm	3' - MS		
4			4' - 1159 ppm	4' - HS		
5		5	5' - 1408 ppm	5' - HS		
6			6' - 440 ppm	6' - HS		
7			7' - 1472 ppm	7' - HS		
8	60"		8' - 1508 ppm	8' - MS		
9			9' - 453 ppm	9' - SS		
10			10' - 15 ppm	10' - SS		5-10' Same soils description. Soils transition from moist to wet at ~9'. Woody debris at ~8'. Sample collected at 7' bgs. Heavy contamination observed from 4-8' with free product observed.
11		10	11 - 751 ppm	11' - SS		
12			12 - 16 ppm	12' - NS		
13			13 - 13 ppm	13' - SS		
14			14 - 11 ppm	14' - NS		
15			15 - 5 ppm	15' - NS		10-15' Same soil description as above.
16		15				
17						
18						
19						
20						
21						
22						
23						
24						
25						

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Appendix C

Sampling and Analysis Plan

Exhibit F of the Consent Decree

Original and unedited copy

November 1999

SAMPLING AND ANALYSIS PLAN

ARCO HARBOR ISLAND TERMINAL 21T

SEATTLE, WASHINGTON

November 1999

Prepared for

ARCO Products Company
4 Centerpointe Lane, Suite 100
La Palma, California 90623

Prepared by

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1. INTRODUCTION

This Sampling and Analysis Plan (SAP) was prepared by TechSolv Consulting Group, Inc. (TechSolv) in conjunction with ARCADIS Geraghty & Miller (Geraghty & Miller) as part of the remedial design activities and development of the Groundwater Compliance Monitoring and Contingency Program for the ARCO Products Company (ARCO) Harbor Island Terminal 21T in Seattle, Washington. Field and analytical activities as well as site history and conditions are discussed in general terms in the Groundwater Compliance Monitoring and Contingency Program. The SAP establishes specific procedures and protocols for sample collection and field analysis activities to be conducted during implementation of the remediation activities and Groundwater Compliance Monitoring and Contingency Program. This SAP fulfills the requirement for a sampling and analysis plan as defined in the Washington State Model Toxics Control Act (MTCA) (WAC 173-340-820) and meets the provisions of the Agreed Order between ARCO and the Washington State Department of Ecology (Ecology).

The sections that follow describe detailed procedures to be followed for tasks to be completed during the field program, as well as specific laboratory analytical procedures and data quality assurance. All personnel carrying out field tasks as part of the remedial design and Groundwater Compliance Monitoring and Contingency Program will be required to adhere to the health and safety provisions set forth in the Site Health and Safety Plan (SHSP). The Groundwater Compliance Monitoring and Contingency Program, SAP, and SHSP will be available to all field personnel for procedure guidance.

2. OBJECTIVES

The overall objective of the sampling program is to obtain data of known and defensible quality. In addition, the data collected during the remedial design and compliance monitoring program must be comparable with data collected during the RI activities previously completed at the site. To achieve these goals, data collection, sample collection, sample handling, and field documentation conventions must be well-defined prior to the initiation of the remedial design and compliance monitoring program and stringently adhered to during the course of the program. A detailed account of the procedures to be followed during the remedial design and compliance monitoring program is provided below. If any procedures are modified during the course of the program, the change will be documented in the field notes, explaining the change in procedure.

In addition to the overall objective, a number of the field program objectives are specific to individual tasks. The specific objectives are detailed below:

2.1 Groundwater Sampling

Groundwater samples will be collected from selected monitoring wells installed at the site to verify trends in water quality, confirm cleanup objectives have been attained, and verify cleanup objectives are maintained.

2.2 Soil Sampling

Soil samples may be collected during the installation of performance/confirmational monitoring wells along the waterfront to further define the vertical extent of petroleum hydrocarbons in the soils beneath the warehouse.

Soil samples will be collected from the perimeter of the inland soil excavations in both Plant 1 and Plant 2 to assist in quantifying any residual total petroleum hydrocarbons (TPH) remaining in the inland soils.

2.3 Sediment and Biota Sampling

One round of sediment/biota sampling will be conducted following completion of product removal and compliance monitoring to ensure protection of the aquatic organisms in the

Duwamish waterway. Sediment/biota sampling will be implemented in accordance with the procedures outlined in the State of Washington Sediment Management Standards.

2.4 Data Quality Objectives

The overall quality assurance (QA) objective is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting that will provide data of a known quality which are usable, defensible, and can be used for decision making.

Specific procedures for sampling, chain-of-custody, calibration, laboratory analysis, reporting of data, internal quality control (QC), audits, preventive maintenance, and corrective action are described in other sections of this SAP. The purpose of this section is to address the specific objectives for accuracy, precision, completeness, representativeness, and comparability.

2.4.1 Level of Quality Control Effort

Field blank, trip blank, field duplicate, and matrix spike samples will be analyzed to assess the quality of the data. Field and trip blanks provide a means to assess the quality of the data resulting from the field sampling program. Field blank samples are analyzed to check for procedural contamination at the site, which may cause sample contamination. Trip blanks are used to assess the potential for contamination of samples due to contamination migration during sample shipment and storage. Field duplicate samples are analyzed to check for sampling and analytical reproducibility. Matrix spike and matrix duplicate (MD) samples provide information about the effect of the sample matrix on the digestion and measurement methodology. For organic analyses, all matrix spikes are performed in duplicate and are hereinafter referred to as MS/MSD samples. For inorganic analyses, QC samples include MS's and MD's.

The general level of the QC effort will be one field duplicate and one field blank for every ten or fewer investigative samples. One volatile organic compound (VOC) trip blank consisting of distilled deionized ultra-pure water will be included with each shipment of aqueous VOC samples. One set of MS/MSD samples will be collected for every twenty or fewer investigative samples collected for organic analyses. Soil MS/MSD samples require no extra volume for VOCs or extractable organics; however, aqueous MS/MSD samples must be collected at triple the volume for VOCs and triple the volume for extractable organics. The quantities may vary when field conditions or sample screening dictates a change to the SAP.

2.4.2 Accuracy and Precision

Accuracy is the degree of agreement of a measured value with the true or expected value of the quantity of concern. In other words, accuracy answers the question of how close the measurement is to the true value. The farther the measurement is from the true value, the less accurate.

Precision is the degree of mutual agreement, characteristic of independent measurements, that occurs as the result of repeated application of a process under specified conditions. Precision is a measure of the reproducibility of a given measurement system and is concerned with the closeness of results.

The fundamental QA objective with respect to accuracy and precision of laboratory analytical data is to achieve the QC acceptance criteria of the analytical protocols. The accuracy and precision requirements are specified in the method protocols for organics and inorganics.

2.4.3 Completeness, Representativeness, and Comparability

2.4.3.1 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. It is expected that the subcontracted laboratory will provide data meeting QC acceptance criteria for 95 percent or more for all samples tested. Following completion of the analytical testing, the percent completeness will be calculated by the following equation:

$$Completeness\,(\%) = 100\ x\ \frac{Number\ of\ measurements\ judged\ valid}{\begin{array}{c}Total\ number\ of\ measurements\ necessary\\ to\ achieve\ a\ specified\ statistical\ level\\ of\ confidence\ in\ decision\ making\end{array}}$$

2.4.3.2 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Representativeness is a qualitative parameter which is dependent upon the proper design of the sampling program and proper laboratory protocol. The sampling network was

designed to provide data representative of the site conditions. During development of this network, consideration was given to past disposal practices, existing analytical data, and physical setting and processes. Representativeness will be satisfied by ensuring that the proper sampling techniques are used, proper analytical procedures are followed, and holding times of the samples are not exceeded in the laboratory. Representativeness will be assessed by the analysis of field duplicate samples.

2.4.3.3 Comparability

Comparability expresses the confidence with which one data set can be compared with another. The extent to which existing and planned analytical data will be comparable depends on the similarity of sampling and analytical methods. Depending on the analytical procedures and QA objectives, the analytical data collected under this program may or may not be directly comparable to existing data; however, an attempt will be made to collect data in a manner consistent with data collected under the USEPA RI/FS at Harbor Island and previous RI data collected for ARCO.

3. FIELD PROCEDURES

The following procedures will be used by all personnel when conducting field activities at ARCO Terminal 21T. Field activities consist of all site visits, including visits to collect data and samples.

3.1 GENERAL

3.1.1 Documentation

All field activities will be documented in field notes using a pen with indelible ink bound in a three-ring binder and stored at the consultant's office. Information to be recorded in the notes will include the following:

- Date
- Weather conditions
- Names of the field team members
- Times of site arrival and departure
- Documentation of all field activities conducted
- Details regarding equipment calibration and malfunctions
- Odd or unusual occurrences
- Site visitors

The field supervisor will sign the field notes at the end of each day of field work. Attachment sheets will be used to record detailed information for specific activities including, but not necessarily limited to, soil borings, well installations, soil sampling, water monitoring, and water sampling. All attachment sheets will be included with the field notes in the three-ring binder and stored at the consultant's office.

Field equipment calibration procedures will be documented in the field notes during or immediately following calibration of the instrument. The following information will be recorded for each calibration event:

- Date
- Time
- Instrument make and model
- Instrument reading of standard prior to calibration
- Instrument reading of standard following calibration
- Calibration standard used

- Any deviation from standard calibration procedures
- Reason for calibration

3.1.2 Coded Sample Identification System

Every sample collected will be labeled according to the coded identification system outlined below. Each identification code will be unique to each individual sample collected, according to the guidelines detailed below.

3.1.2.1 Primary Samples

Matrix identifiers consisting of a two-letter code will be used to designate the type of sample collected. The complete list of eligible matrix identifiers is as follows:

Code	Matrix Identifier
SD	Sediment
SS	Soil (Surface or subsurface)
GW	Groundwater
FB	Field Blank
EB	Equipment Rinsate Blank
TB	Trip Blank

A one- to three-letter code followed by a number will identify the sample location. A list of representative sample location designators follows:

Designator	Sample Location
B001	Boring B001
EX001	Excavation Sample EX001
AMW01	ARCO Monitoring Well AMW01
SW1	Surface Water Monitoring Station SW1

If more than one sample of the same matrix type is collected on a given day at the same sample location, the samples will be differentiated with a unique sample identification number separated by a hyphen from the end of the sample location designator. Notes regarding the depth of sample collection and requested sample analyses will be recorded in the field notes.

A complete sample identification code will first identify whether the sample was collected in Plant 1 or Plant 2; second, identify a sample matrix type; third, provide a unique

sample location designator; and fourth, identify the quarter and year of sample collection. The following are examples of appropriate sample identification codes:

P1-SSEX004-100-1, where:

P1 indicates the sample was collected in Plant 1,

SS identifies the sample as a soil sample,

EX004 indicates the sample was collected from an excavation at location EX004,

100 indicates the sample was collected in the First Quarter of the year 2000, and

1 indicates a unique sample identifier.

P2-GWAMW06-100, where:

P2 indicates the sample was collected in Plant 2;

GW indicates the sample is a groundwater sample;

AMW06 indicates the sample was collected from ARCO Monitoring Well 06; and

100 indicates the sample was collected in the First Quarter of the year 2000

Note: As only one sample was collected at this location on this date, no unique identifier follows the sample location designator.

3.1.2.2 Field Replicate Samples

Field replicate samples (splits and blind duplicates) will be identified using the matrix codes and adding 200 to the sample location designator. All sample labeling will be recorded on soil or water sampling logs so that the sample can be traced to any field data recorded or analytical data received for that sample.

3.1.3 Equipment Calibration

All field instruments will be operated, calibrated, and maintained according to the manufacture's instructions using industry-accepted calibration standards. Operation and maintenance manuals for all field equipment will be provided to field personnel and kept in a field file in the consultant’s office for reference. Field instruments will be calibrated and checked for proper operation at least as often as that listed in Table 1. Instruments will be calibrated on an as-needed basis should they exhibit evidence of power failure, instrument drift, or general failure.

The following instruments will be used to collect field data during the groundwater compliance monitoring program:

- Organic Vapor Meter (OVM) photoionization detector (PID)
- Explosimeter/combustible and toxic gas indicator
- Conductivity Meter
- pH Meter
- Electronic water-level indicator
- Oil/water interface probe

3.1.4 Equipment Decontamination

During remedial and groundwater compliance monitoring program field activities, equipment decontamination will be required to prevent cross-contamination of borings, wells, and samples as well as to prevent the potential transport of contaminants off site. Activity-specific decontamination procedures are summarized in Table 2 and described below.

3.1.4.1 Drilling and Soil Sampling Equipment

All drilling equipment will be cleaned prior to drilling each soil boring. This cleaning will consist of a high-pressure rinse with potable water to remove any grease, oil, or soil on the rig. Following this rinse, the drill rig will be steam cleaned with potable water. Drill rods, auger flights, bits, and sampling equipment will be steam cleaned with potable water. Steam-cleaning activities will take place in a designated area at least 50 feet from any boring location. The designated area will be lined with plastic and constructed such that decontamination rinsate products can be easily collected for storage and disposal, as outlined in Section 3.1.6, Waste Management and Disposal.

All reusable soil sampling equipment will be decontaminated before each use with a tap water rinse, followed by a detergent wash (Liquinox, Alconox, or a comparable laboratory-grade detergent), a 10-percent hydrochloric or nitric acid solution rinse, a 10-percent n-propyl alcohol or methanol solution rinse, and a final distilled water rinse.

Acid and solvent rinses will be stored in spray bottles pending use. All other decontamination washes/rinses will be stored in stainless steel buckets equipped with dedicated cleaning brushes. Rinsate from decontamination washes and rinses will be handled as described in Section 3.1.6, Waste Management and Disposal.

3.1.4.2 Water Monitoring and Sampling Equipment

Prior to measuring water levels and between each individual water level measurement, the instrument used for measurement will be decontaminated by first washing the instrument with a laboratory-grade detergent (Liquinox, Alconox, or other) and then rinsing with distilled water. If liquid hydrocarbons are encountered when collecting water level data, the probe used for measurement will be washed with a laboratory-grade detergent, rinsed with a 10-percent n-propyl alcohol or methanol solution, and then rinsed with distilled water.

Prior to monitoring well development and groundwater sampling, any reusable downhole equipment, such as pumps, will be decontaminated by first washing the equipment with a laboratory-grade detergent and then rinsing it with potable water. During decontamination, approximately 5 gallons of each laboratory-grade detergent solution and distilled water will be circulated through any pump used to purge or sample wells. Reusable bailers, spigots, and beakers will be decontaminated by washing with a laboratory-grade detergent, rinsing with distilled water, rinsing with 10-percent hydrochloric or nitric acid, a second distilled water rinse, a 10-percent n-propyl alcohol or methanol rinse, and a final rinse of distilled water.

Dedicated or disposable equipment will be used for water sampling whenever feasible to reduce the possibility of sample cross-contamination. Any equipment for which decontamination is either impossible or impractical, due to either the natures of the equipment or the nature of the contaminants, will be disposed of following each sampling event.

3.1.5 Sample Handling

All samples collected during the groundwater compliance monitoring program will be processed in a consistent manner. Water and soil samples collected for chemical and physical analysis will be immediately stored in an insulated container with solid cold packs pending delivery to the laboratory. Ice will not be used to cool samples.

Samples will be accompanied by a properly completed chain-of-custody form provided by ARCO or the contracted laboratory The sample numbers and locations will be listed on the chain-of-custody form. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents transfer of custody of samples from the sampler to another person, to the permanent laboratory, or to/from a secure storage area.

Samples will be properly packaged for shipment and dispatched to the appropriate laboratory for analysis with a separate signed custody record enclosed in each sample box or cooler. Shipping containers will be secured with strapping tape for shipment to the laboratory. The cooler will be strapped shut with strapping tape in at least two locations.

The chain-of-custody record identifies the contents of the shipping cooler and the analyses to be performed on the samples contained therein. The original and one copy of the associated chain-of-custody record will accompany each shipment to the laboratory; the original will be attached to the report of analytical results sent to the consultant. The third copy of the chain-of-custody record will be retained by the sampler and returned to the consultant's office where it will be maintained in the permanent project files.

Field personnel will not retain any sample longer than two days after collection before shipment to the laboratory. One trip blank will be included in each sample shipping container possessing samples to be analyzed for volatile organic compounds. Samples will be delivered to the laboratory by the consultant's personnel whenever practicable. When personal delivery is not practicable, a bonded, private courier service that offers same-day or next-day service will be used. The day of delivery will be dependent on the proximity of the selected analytical laboratory to the site.

Bonded couriers handling sample shipments will not be required to sign off on the custody form as long as the custody forms remain sealed inside the sample cooler and the strapping tape on the cooler remains intact.

3.1.6 Waste Management and Disposal

All generated wastes will be dealt with in accordance with the guidance provided below. Wastes include drilling/sampling-generated soil and liquid, decontamination rinsate, personal protective equipment, and disposable sampling equipment. Wastes will fall into one of the following categories:

- Drill cuttings and soil samples not submitted for laboratory analysis.
- Excavated soils.
- Purge water from sampling and development of monitoring wells.
- Decontamination rinse water.
- Disposable personal protection equipment (PPE) (Tyvek® suits, gloves, etc.).

- Disposable sampling equipment (bailers, etc.).

3.1.6.1 Drill Cuttings

Drill cuttings and soil samples not submitted for laboratory analysis will be contained in sealed 55-gallon drums and temporarily stored on-site. The drums will be labeled with the following information:

- Date
- Waste category
- A unique identification number corresponding to the physical location at which the waste was generated.

Disposal of the drums will depend on the results of chemical analyses performed on the contained materials.

If encountered, hazardous waste materials will be segregated from non-hazardous wastes. Hazardous wastes will be stored in appropriate containers and labeled in conformance with Washington State Department of Transportation requirements. Disposal of both non-hazardous and hazardous wastes and will be handled through a licensed transport, storage, and disposal company.

3.1.6.2 Excavated Soils

Prior to soil excavation field activities at both Plants 1 and 2, representative soil samples will be collected from the excavation areas and analyzed for waste disposal parameters. These in-situ soil samples will identify the waste classification (hazardous or non-hazardous) of the excavated soils prior to excavation activities. When the excavations occur, the soils will be able to immediately be properly transported off-site by a licensed transport, storage, and disposal company.

3.1.6.3 Purge and Decontamination Rinse Water

Purge water and decontamination rinse water will be temporarily contained in 55-gallon drums and transported to the on-site groundwater treatment system in operation along the waterfront. All purge water and decontamination rinse water will be processed through the treatment system prior to discharge to the sanitary sewer in accordance with the existing King

County Department of Natural Resources Industrial Waste Division permit in place for the treatment system.

3.1.6.4 Disposable Equipment

Disposable PPE and sampling equipment will be contained in drums temporarily stored at the terminal. The terminal properly disposes of this type of waste as part of the normal waste management practices of the facility.

3.2 Groundwater Monitoring Well Installation

Five groundwater monitoring wells will be installed prior to beginning performance and confirmational sampling along the waterfront in the warehouse and loading rack area at the site to enable long-term collection of chemical and physical data regarding the aquifer beneath the warehouse and loading rack. Details regarding the locations of the wells are included in the Groundwater Compliance and Contingency Plan. Drilling and installation of groundwater monitoring wells at the site will conform to *Minimum Standards for Construction and Maintenance of Wells* (Chapter 173-160 WAC) and the guidance provided in the *Handbook of Suggested Practices for the Design and Installation of Groundwater Monitoring Wells* (EPA 1991).

During the installation of each well, soil samples may be collected and submitted for chemical characterization.

3.2.1 Preparation for Drilling, Sampling, and Well Installation

Following the selection and marking of monitoring well locations, the area will be checked for subsurface lines and utilities. Utilities and lines will be located and cleared by a professional locating service using active electrical or magnetic anomaly methods. Borings will be considered cleared for drilling if no utilities, lines, or subsurface structures are located within a 5-foot radius of the monitoring well location. In the event that utilities, lines, or subsurface structures are identified within this 5-foot radius, the monitoring well location will be re-evaluated and either relocated or abandoned.

Before beginning drilling, field personnel conducting well installation and associated sampling activities will assemble the appropriate equipment. In addition, all forms identified in this table will be completed to the extent practicable before drilling begins. All field instruments to be

used during monitoring well installation will be checked to ensure proper calibration, as described in Section 3.1.3, Equipment Calibration. All equipment which will come in contact with the samples will be decontaminated before drilling commences and prior to the collection of each individual sample. Decontamination of equipment will be performed in accordance with the procedures outlined in Section 3.1.4, Equipment Decontamination.

Well construction materials, such as well screen, filter pack, well casing, and grout, will be assembled and inspected prior to drilling. Should unsuitable materials or equipment be identified during this initial inspection, drilling will be postponed until adequate materials can be assembled.

3.2.2 Drilling Methods

A qualified drilling subcontractor will complete borings for all monitoring wells using the hollow-stem auger drilling method under the supervision of field personnel. Two drill rigs will be used at the site to cope with variable access conditions. In areas where access is restricted by the presence of surface piping, buildings, or overhead obstacles, borings will be drilled using a limited access drill rig equipped with an 10.25-inch-diameter hollow-stem auger. In areas where access is unrestricted, borings will be drilled using a drill rig equipped with an 10.25-inch-diameter hollow-stem auger.

The wells will be drilled in two stages to prevent the shallow groundwater zone where product has been encountered from cross-contaminating the deeper groundwater zone. During the first stage, the boring will be advanced to a depth of approximately 20 feet below ground surface (bgs) using large diameter hollow-stem augers. Temporary conductor casing will then be installed to a depth of approximately 20 feet. Grout will be installed in the bottom of the borehole and allowed to set, such that any floating contaminants occurring at the top of the water table will be sealed out of the temporary conductor casing. Following the placement of this conductor casing, all drilling equipment will be thoroughly steam-cleaned. Drilling will then proceed to the desired depth of the well by drilling through the conductor casing using smaller diameter hollow-stem augers.

Borings will be advanced to the desired depths for soil sampling and well installation as described below. Water will not be added to the borehole to suppress heaving sands encountered during soil sampling. Water may be added during well construction if it is deemed that heaving sands will otherwise prevent successful well construction. Any water added during well construction will

be sampled and submitted to a laboratory for analysis for the analytes that will be monitored for the well according the compliance monitoring program.

3.2.2.1 Soil Sampling and Logging

If soil samples are collected during drilling, the soil samples will be collected using a decontaminated stainless-steel sampling spoon. Soil will be placed directly in a laboratory-supplied glass sample jar with a screw-tight lid. Each sample jar will be completely filled with sample prior to sealing. In addition to filling the sample container, one air-tight plastic bag will be filled with a soil sample and retained for description and headspace analysis as described below. Plastic bags used to contain samples for headspace analysis will be labeled with the sample number.

When the sample jar is completely filled with sample, it will be closed by hand tightening the cap. The capped sample container will then be wiped clean and clearly labeled per Section 3.1.2, Coded Sample Identification System. The capped and labeled sample will then be handled in accordance with the procedures outlined in Section 3.1.5, Sampling Handling. For each sample collected, new vinyl gloves will be worn both as a health and safety precaution and to reduce the possibility of sample contamination from external sources. Should the gloves come in contact during sampling with material other than the sampling equipment, the sample material, or the sample container, the soiled gloves will be replaced with clean gloves prior to continuing with sampling.

During the advancement of boreholes, soil samples may be obtained at 2.5-foot intervals for the purpose of describing the materials encountered. The sampler will be driven using a 140-pound hammer designed to free-fall 30 inches before driving the sampler and drill rod.

Soils collected at the surface and retrieved in the sampler will be logged by field personnel using the ASTM Visual-Manual Procedure (D 2488). Soil descriptions, blow counts, and the results of field screening will be recorded on a Soil Boring Log. Sampled collected in the upper half of the sampler will be used for descriptive and field screening purposes. Soils collected in the lower half of the sampler will be retained for possible submission for chemical analysis, as dictated by the sample depth and the field-screening process.

Soil samples will be quickly transferred from the sampler with minimal disturbance to a pre-cleaned glass sample jar. Glass sample jars will be closed by hand tightening the cap. The capped sample container will then be wiped clean and clearly labeled per Section 3.1.2, Coded Sample

Identification System. The capped and labeled sample will then be handled in accordance with the procedures outlined in Section 3.1.5, Sample Handling. New vinyl gloves will be worn during sample collection and the same precautions against sample cross-contamination will be observed.

Soils retained for field screening will be placed in clearly-labeled, air-tight plastic bags and set aside. These samples will then be screened for the presence of volatile organic compounds using the PID. The PID will be used to sample the headspace in the sealed plastic bag for each portion of sample set aside for field screening. The highest reading noted on the PID for each screening sample will be noted on the Boring Log.

Samples will be selected for submission to the laboratory on the basis of field parameters of headspace analysis, presence of staining or odor, and variation in lithology. The criteria and reasoning used for selection of samples from each borehole will be documented in the field notebook. If, during the course of the investigation, it is necessary to further define the vertical distribution of subsurface contaminants, additional samples will be collected from each boring. Soil samples will be collected below the encountered water table in selected locations and submitted for analysis for physical characteristics as described in the groundwater compliance monitoring program.

3.2.2.2 Well Installation

The monitoring wells will be 2 inches in diameter. Well construction details will be determined using data collected during the RI investigations. These details will be submitted to Ecology in a letter format for approval prior to the installation of any wells at the site.

All wells will be constructed using 2-inch Schedule 40 PVC threaded casing. The well screen will consist of 10-foot-long sections of continuous wrap, v-slot, Schedule 40 PVC screen. The well screen slot size will be determined based on the results of grain-size analyses conducted on soil samples collected during the RI investigation, but is assumed to be 0.01-inch. Casing and screen will be assembled according to the well specifications and lowered down the inside of the auger. All threaded sections of the well will be sealed with Viton® O-rings. All personnel handling well screen will wear clean vinyl or cotton gloves to keep the casing clean during installation. Should the casing or screen become visibly soiled during installation, it will be disassembled and cleaned to the specifications of the on-site field personnel.

The annular space between the well screen and the borehole wall will be backfilled with a filter pack of clean, No. 10-20 sorted silica sand. The sand will be poured inside the auger stem and allowed to fall into the borehole as the auger is slowly withdrawn. The filter pack will be slowly added in this fashion by alternately adding sand and withdrawing the auger until the filter pack extends at least 3 feet above the top of the well screen. A 0.5- to 1-foot-thick layer of clean, No. 35 grit silica sand will be placed on top of the filter pack before installing the well seal. The depth of the filter pack will be constantly monitored during installation by sounding the well with a weighted tape.

Well seals will consist of bentonite grout. A one foot layer of bentonite pellets will be placed atop the filter pack and allowed to hydrate for approximately 30 minutes, then bentonite grout will then be introduced into the boring annulus using a tremie pipe. The auger will be withdrawn in less than 5-foot steps as the annulus is filled with grout. The bentonite grout will seal the well from the top of the filter pack to approximately 1 foot bgs. The bentonite seal will be installed so that it fills any potential gap between the well casing and the conductor casing installed during boring advancement.

Wells will be protected at land surface with flush-mount, traffic-grade well monuments. Each monument will be set in concrete to a depth of at least 1 foot. In paved areas, the concrete will extend from the well monument at least 1.5 feet in all directions and will be poured flush with the existing pavement. A locking cap will be installed at each wellhead.

3.2.2.3 Well Development

All monitoring wells installed will be developed prior to collection of any water level data or water quality samples. The goals of well development are to remove fines left in the borehole and restore the hydraulic connection of the well to the aquifer following well drilling and installation. Monitoring well development will conform to the standards presented in *Minimum Standards for Construction and Maintenance of Well, Resource Protection Wells* (WAC 173-160-500) as well as the guidance presented in *Monitoring Well Installation and Development* (EPA 1991).

Prior to development, all wells will be checked for the presence of free product using a clear bailer. The bailer will be lowered into the well such that water or product surface is intersected. The bailer will then be withdrawn and examined. Should free product be discovered in the well, the well will not be developed. If, during continued monitoring, free-product is found to no longer occur in the well, the well will be developed prior to the initiation of groundwater sampling.

Wells will be developed using a surge-and-pump method. Surging will be conducted by using a loose-fitting block to develop differential pressures across the screened interval of the well. The surging action will settle the sand pack and loosen fines that remain in the borehole following well installation. Following surging, the well will be purged using either a hand bailer or an electric submersible pump. Each well will be surged at least three times during development.

During development, at least three well volumes of water will be removed from the well. Following the removal of each well volume, turbidity, temperature, specific conductivity, and pH will be recorded. Well development will continue either until turbidity, temperature, conductivity, and pH stabilize or five well volumes of water are removed.

All equipment used in well development will be decontaminated between wells using the procedures outlined in Section 3.1.4, Equipment Decontamination. Purge water and sediments removed from the wells will be drummed and managed in accordance with the procedures detailed in Section 3.1.5, Waste Management and Disposal.

3.2.2.4 Documentation

Soil sampling and boring information will be recorded on Soil Sampling and Boring Logs, respectively. The required information will be recorded on these logs at the time of collection or observation. Laboratory tracking and chain-of-custody documentation will be conducted as discussed in Section 3.1.5, Sample Handling.

Well construction logs will be completed for each monitoring well installed at the site. This log will be used to record details of well construction. Details regarding the development of groundwater monitoring wells will be recorded on a Well Development Log.

3.3 Hot Spot Soil Excavations

Excavations of TPH hot spots will occur at Plant 1 and Plant 2 as identified and detailed in the Groundwater Compliance Monitoring and Contingency Plan. Soil samples will be collected from the excavation perimeters following the specific procedures discussed in the sections below.

3.3.1 Sampling Locations

Soil samples will be collected from the perimeter of each of the excavations in Plants 1 and 2. The exact locations of the soil samples will be determined in the field during the excavation activities based on the actual extents of the excavations.

3.3.2 Sampling Preparation

Prior to sampling, field personnel will assemble the appropriate sampling equipment. Equipment that will come in contact with the soil will be decontaminated before each sample is collected. Decontamination will be performed in accordance with the procedures outlined in Section 3.1.4, Equipment Decontamination. Field instruments will be checked to ensure proper calibration according to the manufacturer's specifications and the procedures detailed in Section 3.1.3, Equipment Calibration.

3.3.3 Soil Sample Collection

Perimeter soil samples will be collected by using either a decontaminated hand auger or directly from the bucket of the excavation equipment using a decontaminated stainless-steel sampling spoon. Soil will be placed directly in a laboratory-supplied glass sample jar with a screw-tight lid. Each sample jar will be completely filled with sample prior to sealing. In addition to filling the sample container, one air-tight plastic bag will be filled with a soil sample and retained for description and headspace analysis as described below. Plastic bags used to contain samples for headspace analysis will be labeled with the sample number.

When the sample jar is completely filled with sample, it will be closed by hand tightening the cap. The capped sample container will then be wiped clean and clearly labeled per Section 3.1.2, Coded Sample Identification System. The capped and labeled sample will then be handled in accordance with the procedures outlined in Section 3.1.5, Sampling Handling. For each sample collected, new vinyl gloves will be worn both as a health and safety precaution and to reduce the possibility of sample contamination from external sources. Should the gloves come in contact during sampling with material other than the sampling equipment, the sample material, or the sample container, the soiled gloves will be replaced with clean gloves prior to continuing with sampling.

3.3.4 Sample Documentation

Sampling information including sample location and sample depth collected will be recorded on a Soil Sampling Log. In addition, a record of sample designation, the date, and time of collection will be recorded in the field notes. Laboratory tracking and chain-of-custody documentation is discussed in Section 3.1.5, Sample Handling.

3.4 Groundwater Sampling

Groundwater samples will be collected from monitoring wells installed during the RI and groundwater compliance monitoring program following the specific procedures discussed in the section below.

3.4.1 Sampling Locations and Frequency

Groundwater samples will be collected from the monitoring well network identified in the Groundwater Compliance and Contingency Plan, Exhibit F of the Cleanup Action Plan (CAP). The frequency of groundwater monitoring activities is also detailed in the Groundwater Compliance and Contingency Plan.

3.4.2 Sampling Preparation

Prior to sampling, field personnel will assemble the appropriate sampling equipment. Equipment that will come in contact with the ground water will be decontaminated before each sample is collected. Decontamination will be performed in accordance with the procedures outlined in Section 3.1.4, Equipment Decontamination. Field instruments will be checked to ensure proper calibration according to the manufacturer's specifications and the procedures detailed in Section 3.1.3, Equipment Calibration.

All wells will be sounded to verify identity and to determine the column of water currently present in each well. Static water-level measurements will be taken in all wells using the north side of the well casing as the measuring point (unless otherwise indicated) with an electric water level meter or interface probe. Water level measurements will be collected as described in Section 3.4.2. If product is observed in the well, both the water and product level measurements will be recorded using an interface probe. The electric water level meter and the interface probe will be decontaminated after use in each well in accordance with the procedures outlined in Section 3.1.4, Equipment Decontamination. Notes regarding the condition and integrity of the well will be recorded in the field

notes at the time of water level measurement collection. Should product be encountered in a well, the well will not be purged or sampled.

Prior to sampling, each well will be purged 3 to 5 times the volume of standing water present in the well casing. The groundwater will be purged using either a submersible pump or a disposable polyethylene hand bailer. Purge water will be pumped into 5-gallon buckets before being emptied into 55-gallon drums. The approximate number of gallons purged from each well will be recorded on the Water Sampling Log. Purge water will be handled in accordance with the procedures outlined in Section 3.1.6, Waste Management and Disposal.

Temperature, specific conductivity, and pH will be monitored during well purging. These field parameters will be monitored at least once for each well volume removed and should stabilize with continued purging. Stabilized field parameters will indicate that the well is ready for sampling. Each measurement obtained of field parameters will be recorded on the Water Sampling Log. After purging, the pump or bailer will be removed from the well and decontaminated in accordance with the procedures outlined in Section 3.1.4, Equipment Decontamination. During sampling, plastic sheeting will be placed around the wellhead to provide a relatively clean surface on which to place all sampling-related equipment.

3.4.3 Groundwater Sample Collection

To collect a groundwater sample, a disposable polyethylene bailer will be gently lowered down the well using nylon twine. The bailer will be allowed to fill and then will be quickly but gently raised out of the well to avoid agitation of the sample. Sample containers will be filled in the order listed on Table 3. The time of sampling will be immediately recorded onto the sampling log, chain-of-custody form, and sample label. Samples will be immediately placed in a cooler with ice packs pending transport to the laboratory. Laboratory instructions regarding preservation and handling of the sample will be observed at all times. Samples will be handled in accordance with Section 3.1.5, Sample Handling.

During sample collection, all sampling personnel will wear disposable vinyl gloves while handling any of the sampling equipment. Care will be taken not to allow the bailer or the twine to come in contact with possible contaminants near the well. If the bailer should become soiled during sampling, it will be cleaned using decontamination procedures outlined in Section 3.1.4, Equipment

Decontamination. If the bailer cannot be adequately cleaned, it will be replaced before sampling continues.

3.4.4 Sample Documentation

Water level data and sampling information will be recorded on a Water Sampling Log. In addition, a record of sample designation, the date, and time of collection will be recorded in the field notes. Laboratory tracking and chain-of-custody documentation is discussed in Section 3.1.5, Sample Handling.

4. ANALYTICAL PROCEDURES

The analyses to be performed on the soil and water samples collected are described in the Groundwater Compliance Monitoring and Contingency Plan. The methods referenced and their associated quantitation limits will be followed exactly.

4.1 Analytical Methods and Procedures

All samples collected for chemical analysis will be submitted to analytical laboratories accredited by the State of Washington [Chapter 173-50 WAC (Washington Administrative Code)].

Assessment of laboratory performance in analytical parameters will be done through analysis of laboratory method blanks, spiked samples, surrogate spiked samples, duplicate samples, and laboratory control samples.

Groundwater parameters such as pH, specific conductivity, salinity, temperature, dissolved oxygen, and redox potential will be measured and recorded during sample collection events by trained personnel using properly calibrated instruments.

5. QUALITY CONTROL PROCEDURES

Quality control (QC) procedures will be implemented in both the field and laboratory. The kinds of internal checks that will be carried out are described below.

5.1 Field Activities (Measurements and Screening)

QC procedures for field measurements are limited to checking the reproducibility of the measurement by obtaining multiple readings or by calibrating the instruments, when appropriate.

QC of field sampling will involve collecting field duplicates, equipment blanks, and trip blanks.

5.2 Laboratory Analysis

Internal QC procedures are specified in the method protocols. These specifications include the compounds and concentrations to be used, the QC acceptance criteria for these audits, and the types of QC checks required (method blanks, reagent/preparation blanks, MS/MSDs, calibration standards, internal standards, surrogate standards, the frequency of each audit, the specific calibration check standards, laboratory duplicate analysis).

Laboratories have a written QA/QC program which provides rules and guidelines to ensure the reliability and validity of work conducted at the laboratory. Compliance with the QA/QC program is coordinated and monitored by the laboratory's QA department, which is independent of the operating departments.

The stated objectives of a laboratory QA/QC program are to as follows:

- Ensure that all procedures are documented, including any changes in administrative or technical procedures.
- Ensure that all analytical procedures are conducted according to sound scientific principles and have been validated.
- Monitor the performance of the laboratory by a systemic inspection program and provide for corrective action as necessary.
- Collaborate with other laboratories in establishing quality levels, as appropriate.
- Ensure that all data are properly recorded and archived.

All laboratory procedures are documented in writing as either Standard Operating Procedures (SOP's) or method procedures (MP). Internal QC procedures for analytical services

will be conducted by both analytical laboratories chosen to perform work under the RI/FS in accordance with their SOP's and the individual method requirements. The specifications for the SOP's and method requirements must include the type of audits required (sample spikes, surrogate spikes, reference samples, controls, blanks), the frequency of each audit, the compounds to be used for sample spikes and surrogate spikes, and the QC acceptance criteria for these audits.

The subcontracting laboratory will document in each data package provided that both initial and ongoing instrument and analytical QC functions have been met. Any samples analyzed in nonconformance with the QC criteria, excluding matrix effects, will be reanalyzed by the laboratory if sufficient sample volume is available.

6. DATA ASSESSMENT PROCEDURES

Following receipt of all analytical data for each sampling event, the field and laboratory data will be validated to determine whether the data quality objectives have been achieved. Data validation will be performed as described in the following sections.

6.1 Field Data Validation

After completing a sampling program, the field data package (field notes, calibration records, chain-of-custody forms, etc.) will be reviewed for completeness and accuracy. Items to be considered in the field data package validation procedure will include, but are not limited to, the following:

- A review of field data contained in sampling logs for completeness.
- A verification that equipment blanks, trip blanks, and field duplicates were properly prepared, identified, and analyzed.
- A verification of the calibration of field equipment.
- A review of chain-of-custody forms for proper completion, verification of signatures of field personnel and the laboratory sample custodian, and custodial dates.

6.2 Laboratory Data Validation

After validation of the field data package, validation of the analytical data package will be performed upon receipt of the data from the laboratory.

Items to be considered in the analytical data package validation procedure will include, but are not limited to, the following:

- A comparison of sampling dates, sample extraction dates, and analysis dates to check that samples were extracted and analyzed within proper holding times.
- A review of analytical methods and required quantitation limits to verify that they agree with the Groundwater Compliance Monitoring and Contingency Plan, Exhibit F of the CAP.
- A review of field and laboratory blanks to evaluate possible contamination sources (consideration should be given to preparation techniques and frequencies as well as the analytical results).
- A review of field duplicate data for evaluation of sampling and analytical precision.
- A review of selected laboratory QA data (blanks, surrogate spike recoveries, laboratory control sample recoveries, QC check sample recoveries, laboratory duplicate recoveries, etc.) for compliance with required acceptance criteria.

Data will be validated using the USEPA laboratory data validation functional guidelines for organic and inorganic review (USEPA 1993 and 1994). Appropriate data qualifier codes (B, J, R, U, UJ, as described in the USEPA functional guidelines) will be applied to those data for which QC results do not meet acceptance standards.

TABLES

Table 1.
Instrument Calibration Frequency
Sampling and Analysis Plan
ARCO Harbor Island, Seattle, Washington

Instrument	Calibration Frequency
OVM PID	Once per day
Explosimeter	Once per day (1)
PH meter	Once per day
DO meter	Once per day
Salinity/conductivity meter	Once per day
ORP Meter	Once per day
Water-level indicator/interference probe	Once at beginning of field program

(1) Instrument calibration will be checked once per day. If calibration is correct, instrument will be recalibrated.

Table 2.
Decontamination Procedures by Activity
Sampling and Analysis Plan
ARCO Harbor Island Terminal 21T, Seattle, Washington

	Procedure
Drill rug and excavation equipment	Pressure wash Steam clean (potable H2O)
Drill rods, auger flights, drill bits, split- spoon sampler	Steam clean (potable H2O)
Hand auger, sample barrels, sampling spoons, Hydropunch	Potable H2O rinse Detergent wash 10% HCL or HNO3 rinse Distilled H2O rinse 10% methanol Distilled H2O rinse Air Dry
Pumps	5 gallons of circulated detergent solution/detergent wash 5 gallons of circulated potable H2O Outside Housing of pumps also decontaminated with the following: 10% HCL of HNO3 rinse Distilled H2O rinse 10% methanol rinse Distilled H2O rinse Air dry
Downhole equipment (sounding line, water-level indicator)	Detergent wash Distilled H2O rinse
Water sampling equipment (field instruments, beakers)	Potable H2O rinse Detergent wash 10% HCL or HNO3 rinse Distilled H2O rinse 10% methanol rinse Distilled H2O rinse Air dry

Table 3.
Sample Container Filling Order
Sampling and Analysis Plan
ARCO Harbor Island Terminal 21T, Seattle, Washington

1. Volatile Organic Compounds
2. Total Petroleum Hydrocarbon Analysis
3. Carcinogenic Polynuclear Aromaic Hydrocarbons (cPAH's)
4. Conventional Water Quality Parameters
5. Metals (total and dissolved)

Appendix D

Data Validation Summary Sheets for Soil and Groundwater

Data Validation Summary

Project Name:	Harbor Island Terminal	**Sampling Dates:**	7/22/19 - 7/31/19
Project Number:	TMMS 10289	**Matrices:**	Soil
Site Location:	Seattle, Washington	**Laboratory:**	ALS
		Lab Report ID:	EV19070155
Parameter:	Gasoline		
Analytical Method:	Washington State Method NWTPH-Gx		

Sample ID	Sample ID	Sample ID	Sample ID
B-24-13-072219	B-17-17-72419	B-31-12-72519	B-38-8-72919
B-14-13-072219	B-06-13-72419	B-32-12-72519	B-34-9-72919
B-02-12-072219	B-28-12-72919	B-21-12-72519	B-39-9-72919
B-25-12-72319	B-18-12-72419	B-10-13-72519	B-40-7-72919
B-03-14-72319	B-07-12-72419	B-22-14-72519	B-36-8-72919
B-15-11-72319	B-29-11-72419	B-44-13-72519	B-37-7-73019
B-26-11-72319	B-30-12-72419	B-11-13-72519	B-13-9-73019
B-04-12-72319	B-10-13-72419	B-9-10-72519	B-1-10-73019
B-05-10.5-72319	B-08-10-72419	B-33-9-72919	B-41-8-73119
B-27-12-72319	B-20-15-72519	B-35-8-72919	B-42-7-73119
			B-43-7-73119

	Reported		Qualification Required		
Criteria Reviewed	Yes	No	Yes	No	Comments
Field Records	X			X	
Chain of Custody	X			X	
Equipment Rinsate		N/A			
Field Duplicates		N/A			
Trip Blanks		N/A			
Preservation	X			X	One cooler temperature was slightly (0.2° C) above the recommended range. No data are qualified on this basis.
Holding Times	X			X	
Reporting Limits	X			X	
Surrogate Spikes	X			X	Many surrogate recoveries could not be determined due to high dilution. Recoveries in low or undiluted samples are within control limits. No data are qualified on this basis.
Method Blank	X			X	
Laboratory Control Sample	X			X	The relative percent difference of one LCS duplicate pair is slightly above the control limit. The recoveries are within the control limits. No data are qualified on this basis.
Matrix Spike	X		X		The relative percent difference of one matrix spike/matrix spike duplicate pair is above the control limit.
Matrix Spike Duplicate	X		X		
Laboratory Duplicate	X			X	
Initial Calibration	X			X	
Continuing Calibration	X			X	

Data Validation Summary

Project Name:	Harbor Island Terminal	**Sampling Dates:**	7/22/19 - 7/31/19
Project Number:	TMMS 10289	**Matrices:**	Soil
Site Location:	Seattle, Washington	**Laboratory:**	ALS
		Lab Report ID:	EV19070155
Parameter:	Gasoline		
Analytical Method:	Washington State Method NWTPH-Gx		

Summary of Data Qualifiers

All data are considered quantitative except for the samples and constituents listed below:

Sample ID	Analyte	Qualifier	Reason for Qualification
B-11-13-72519	Gasoline	J	Matrix Spike (Note 1)

Qualifiers:

- U The analyte was not detected at or above the quantitation limit.
- J The associated value is approximate.
- UJ The analyte was not detected at or above the quantitation limit, which is approximate.
- R The sample results are unusable. The analyte may or may not be present.

Explanation:

(1) The relative percent difference for the matrix spike/matrix spike duplicate prepared from this sample is greater than the control limit. The sample result is, therefore, qualified as an approximate value (J).

Validator: Dion Valdez Signed & Dated: August 21, 2019

Note: Data validation was performed in accordance with EPA National Functional Guidelines for Organic Data Review.

Data Validation Summary

Project Name:	Harbor Island Terminal	**Sampling Dates:**	9/26/19 - 9/27/19
Project Number:	TMMS 10289	**Matrices:**	Water
Site Location:	Seattle, Washington	**Laboratory:**	ALS
		Lab Report ID:	EV19090220
Parameter:	Benzene		
Analytical Method:	USEPA Method 8260		

Sample Date(s):	9/26/2019	9/27/2019
Sample IDs:	P1-GWMW-02-P1-919	P1-GWMW-01-P1-919
	P1-GWMW-202-P1-919	P1-GWMW-08-P1-919
	P1-GWMW-03-P1-919	P1-GWMW-09-P1-919
	P1-GWMW-04-P1-919	P1-GWMW-10-P1-919
	P1-GWMW-05-P1-919	P1-GWMW-210-P1-919
	P1-GWMW-06-P1-919	P1-GWMW-11-P1-919
	P1-GWMW-07-P1-919	RINSATE-2-P1-919
	RINSATE-1-P1-919	TRIP BLANK-2-P1-919
	TRIP BLANK-1-P1-919	

	Reported		Qualification Required		
Criteria Reviewed	Yes	No	Yes	No	Comments
Field Records	X			X	
Chain of Custody	X			X	
Equipment Rinsate	X			X	
Field Duplicates	X			X	
Trip Blanks	X			X	
Preservation	X			X	
Holding Times	X			X	
Reporting Limits	X			X	
Surrogate Spikes	X			X	
Method Blank	X			X	
Laboratory Control Sample	X			X	Lab also analyzed LCS duplicate.
Matrix Spike	X		X		Percent recoveries in MS and MSD prepared from one sample are below control limit.
Matrix Spike Duplicate	X		X		
Laboratory Duplicate		X		X	Lab analyzed MS/MSD instead.
Initial Calibration	X			X	
Continuing Calibration	X			X	

Data Validation Summary

Project Name:	Harbor Island Terminal	**Sampling Dates:**	9/26/19 - 9/27/19
Project Number:	TMMS 10289	**Matrices:**	Water
Site Location:	Seattle, Washington	**Laboratory:**	ALS
		Lab Report ID:	EV19090220
Parameter:	Benzene		
Analytical Method:	USEPA Method 8260		

Summary of Data Qualifiers

All data are considered quantitative except for the samples and constituents listed below:

Sample ID	Analyte	Qualifier	Reason for Qualification
P1-GWMW-10-P1-919	Benzene	J	MS and MSD (1)

Qualifiers:

U	The analyte was not detected at or above the quantitation limit.
J	The associated value is approximate.
UJ	The analyte was not detected at or above the quantitation limit, which is approximate.
R	The sample results are unusable. The analyte may or may not be present.

Explanation:

(1) The percent recoveries in the matrix spike and matrix spike duplicate prepared from Sample P1-GWMW-10-P1-919 are below the control limit. This sample result is, therefore, qualified as an estimate value (J).

Validator: Dion Valdez Signed & Dated: October 11, 2019

Note: Data validation was performed in accordance with EPA National Functional Guidelines for Organic Data Review.