Remedial Investigation and Feasibility Study

Jacobson Terminals

5350 30th Avenue NW
Seattle, Washington

Prepared for
Washington State
Department of Ecology

May 12, 2016
17800-56

HARTCROWSER

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ACRONYMS AND ABBREVIATIONS

µg/L	micrograms per liter
AFDW	ash-free dry weight
ARAR	applicable or relevant and appropriate requirement
Aspect	Aspect Consulting
AST	aboveground storage tank
bgs	below ground surface
cis-DCE	cis-1,2-dichloroethene
City	City of Seattle
COC	contaminant of concern
CSM	conceptual site model
CWA	Clean Water Act
DCA	disproportionate cost analysis
DGPS	differential global positioning system
Ecology	Washington State Department of Ecology
EIM	Environmental Information Management
EPA	Environmental Protection Agency
FS	feasibility study
GAC	granular activated carbon
IA	interim action
HASP	health and safety plan
IDW	investigation-derived waste
mg/kg	milligram per kilogram
MIG	mean individual growth
NA	natural attenuation
NWTPH	Northwest Total Petroleum Hydrocarbon
ORC	oxygen release compound
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
ppm	parts per million
PQL	practical quantitation limit
PRB	permeable reactive barrier
PVC	polyvinyl chloride
RACER™	Remedial Action Cost Engineering and Requirements System
RAO	remedial action objective
RI	remedial investigation
RIWP	remedial investigation work plan
SAPA	Sediment and Analysis Plan Appendix
SCO	sediment cleanup objective
Site	Jacobson Terminals Site
SMS	Sediment Management Standards
TCE	trichloroethene

TCLP	toxicity characteristic leaching procedure
TEE	terrestrial ecological evaluation
TOC	total organic carbon
TSS	total suspended solids
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System
USTs	underground storage tanks
VCP	Voluntary Cleanup Program
VOC	volatile organic compound
WAC	Washington Administrative Code
ZVI	zero-valent iron

1.0 EXECUTIVE SUMMARY

This report presents the results of a remedial investigation (RI) and feasibility study (FS) completed for the Jacobson Terminals Site (Site) at 5350 30th Avenue NW in Seattle, Washington (Figure 1). The primary objectives of the RI/FS were to delineate soil and groundwater contamination in the upland portion of the Site, assess sediment quality in the adjacent Lake Washington Ship Canal, and evaluate viable remediation alternatives and recommend the best alternative to address risk to Site receptors. This RI/FS was prepared in accordance with Washington State Department of Ecology procedures given in Washington Administrative Code (WAC) 73-340-350(8). Results are summarized below. Please refer to the main body of this RI/FS for more detailed discussions.

1.1 Background

The Site was historically used for lumber mill operations, storage, and boat loading/unloading. Since 1975, the Site has been used as a marine support facility and for boat storage. Numerous environmental investigations have taken place since the 1980s at the Site and surrounding properties. A historical release of transformer oil on the northern portion of the Site created a plume of polychlorinated biphenyls (PCBs) and several chlorinated benzene compounds in groundwater. This area of PCB contamination is known as the Interim Action (IA) area, located in the north-central portion of the Site (Figure 2). An interim remedial action has been developed, but not implemented to remove the soil impacted by PCBs. A separate area of PCB- and petroleum-impacted soil was discovered in the alley separating the United States Army Corps of Engineers (USACE) property and the Site along the west boundary of the Site and an area of chlorinated ethene impacted soil and groundwater, originating from the upgradient Market Street Property, is located in the northern portion of the property. The Site has been enrolled in Ecology's Voluntary Cleanup Program (VCP) since 2001 under VCP number NW0611.

1.2 Hart Crowser Delineation Investigation

In 2013 and extending into 2014, Ecology tasked Hart Crowser with completing a soil, groundwater, and sediment investigation to delineate PCB contamination in the northern portion of the Site in support of the planned IA. PCB and chlorinated benzene concentrations in soil exceeded applicable screening criteria and extended further than previous investigations estimated. Soil with PCB concentrations exceeding Model Toxics Control Act (MTCA) Method A unrestricted cleanup levels was largely delineated, except for the northeast corner of the impacted area. PCB concentrations in groundwater exceeding surface water protection levels were found in all the monitoring wells sampled, including compliance monitoring wells and existing deep wells.

1.3 Hart Crowser RI/FS

1.3.1 Purpose and Approach

In 2014, Ecology tasked Hart Crowser with completing this remedial investigation (RI) and feasibility study (FS) to:

- Assess soil and groundwater contamination in the upland portion of the Site,
- Further evaluate sediment quality in the adjacent Lake Washington Ship Canal,
- Develop remedial alternatives to address soil and groundwater contamination, and
- Recommend the most appropriate alternative based on Site chemical and physical conditions.

Our investigation included collecting soil samples from 19 borings and eight newly installed monitoring wells; groundwater samples from all new and 20 existing wells; and five sediment samples, with biological testing of three of those samples.

1.3.2 Screening Information

For this RI/FS, contaminant screening criteria were updated to be protective of the Ship Canal using the most conservative freshwater screening levels for consumption of aquatic organisms, which are the Federal Clean Water Act (CWA) Section 304, National Toxics Rule 40 CFR 131, or MTCA Method B surface water levels, whichever is lower. For chemicals with no freshwater screening level, MTCA Method A drinking water cleanup levels were used. To evaluate whether contaminant of concern (COC) concentrations in soil comply with screening levels that are protective of adjacent surface waters, screening levels were calculated using Ecology's Three-Phase Partitioning Model (WAC 173-340-747). For chemicals with no MTCA freshwater screening level, the MTCA Method A unrestricted or Method B direct contact soil cleanup level was used.

1.3.3 Results

Our investigation confirmed that PCB soil impacts are primarily located in the general vicinity of the IA Area, but several other locations also contained PCB concentrations in soil exceeding MTCA screening criteria. Additional COCs were also detected, including diesel-range organics, chlorinated solvents, and metals. The widespread prevalence of Site COCs suggests that these impacts likely have regional sources and/or are residuals from legacy contamination (historical industrial activities at the Site and surrounding properties). In addition to those contamination sources, local sources are suggested by elevated concentrations of COCs in soil and groundwater outside of the IA Area.

Four impacted hotspot areas at the Site have been identified that exceed screening criteria and warrant additional characterization:

1. Soil samples from monitoring well JT-MW-07S (located in the south portion of the Site; Figure 2) collected at a relatively shallow depth contained elevated concentrations of diesel- and oil-range organics, metals, and PCBs that exceeded applicable screening levels. PCB concentrations also exceeded the screening level in deeper samples. Additionally, concentrations of diesel- and oil-range organics and

arsenic in groundwater exceeded screening criteria. PCB concentrations in soil and groundwater collected from JT-MW-08S (located south of JT-MW-07S) also exceeded screening levels.

2. Soil samples from the PCB- and petroleum-impacted area near MW-4/JT-US-39 (located along the west Site boundary with the USACE property; Figure 2), contained PCBs and volatile aromatic compounds exceeding screening criteria. Groundwater samples from monitoring wells HC-MW-1, HC-MW-3, and MW-4 exceeded the applicable cleanup levels for petroleum hydrocarbons, indicating that residual soil contamination in the area is still impacting groundwater.

3. An area of PCB-impacted soil was identified near JT-US-46, located approximately 25 feet south of the IA Area (Figure 2), where shallow and deep soil PCB concentrations exceed the PCB screening level. It is not known whether this contamination represents a separate release or potential contaminant migration from the IA Area.

4. Near JT-US-53 (located in the northwest portion of the Site, directly downgradient of the City property treatment wall; Figure 2), relatively shallow soil samples contained PCB concentrations exceeding screening criteria. Nearby groundwater samples collected from shallow monitoring well IW-5S and deep monitoring well IW-5D also contained PCB concentrations exceeding screening criteria. Additionally, concentrations of volatile organic compounds (VOCs) in soil and groundwater exceeded screening criteria near JT-US-53. Chlorinated solvent impacts are likely residual contamination from the City and Market properties to the north, but a PCB release likely occurred historically in near JT-US-53.

Our preliminary assessment of potential vapor intrusion impacts to indoor air indicates that shallow groundwater VOC concentrations exceed the applicable vapor intrusion screening levels. Since the historical source of VOCs upgradient of the Site has been contained with a treatment wall, and the primary contaminant mass at the site (the IA Area in the north-central portion of the Site) is expected to be removed, soil vapor intrusion into buildings/structures at the Site should not pose a significant risk to human health. However, vapor intrusion into occupied Site structures should be fully assessed following the IA to confirm that vapor intrusion is not a risk to human health.

Metal and PCB concentrations in sediment adjacent to the site exceed MTCA cleanup screening levels (CSLs) and sediment cleanup objective (SCO) levels, respectively. Although bioassay toxicity testing results indicate a relatively low risk to benthic organisms, the extent of PCB-impacted sediment directly adjacent to the Site is not fully delineated, and additional sediment and upland source data along the Ship Canal should be collected and further evaluated to develop a more complete model of contaminant transport to the adjacent sediment.

A conceptual site model (CSM) was developed to identify potentially complete pathways through which human and terrestrial and aquatic receptors might be exposed to contaminated soil, groundwater, and surface sediment (Figure 17). The FS focuses on the pathway through which groundwater migrates to surface water and sediment. Several pathways are potentially complete only

if Site or utility work includes digging in the soil or groundwater. The vapor intrusion pathway may exist for utility workers as well as indoor occupants, since some Site COCs can volatilize in soil and migrate to the surface.

1.3.4 Remedial Alternatives

The FS portion of this report identifies and recommends the best remedial action alternative to mitigate contaminant migration pathways identified in the CSM. Common remedial technologies were screened to eliminate unsuitable approaches. All alternatives assume the interim action removal will be completed.

Five remedial alternatives were identified:

- **Alternative 1.** Interim Action, Natural Attenuation with Institutional Controls, and Compliance Monitoring.
- **Alternative 2.** Interim Action, Hot Spot Excavation with Institutional Controls, and Compliance Monitoring (Figure 16).
- **Alternative 3.** Interim Action, Treatment Wall and Extension with Institutional Controls, and Compliance Monitoring (Figure 18).
- **Alternative 4.** Interim Action, Excavation of Soil Exceeding Remedial Action Objectives with Institutional Controls, and Compliance Monitoring (Figure 19).
- **Alternative 5**. Interim Action, Hot Spot Excavation, Treatment Wall Installation contingency with Institutional Controls, and Compliance Monitoring.

These alternatives were evaluated for protectiveness and balancing factors (effectiveness, long-term reliability, implementability, implementation risk, and reasonableness of cost).

The planned IA will remove the bulk of the PCB mass from the Site and the existing treatment wall will limit residual contaminant migration downgradient of the IA Area. Despite the significant contaminant mass reduction achieved by the IA, hot spots identified during this RI will continue to pose a risk to the Ship Canal. Therefore, remediation of these areas is required under MTCA unless additional information is collected that empirically demonstrates that the groundwater to surface water/sediment pathway is not complete and upland contamination does not threaten the Ship Canal.

1.3.5 Preferred Alternative

Based on a comparative analysis in accordance with MTCA evaluation criteria and discussions with Ecology, the preferred remediation alternative is Alternative 5. This alternative involves hot spot excavation and off-site disposal in a Subtitle C landfill facility (and Subtitle D depending on characterization of the hotspots); continued institutional controls and compliance monitoring; and a contingency for a groundwater treatment wall if compliance monitoring indicates contaminants in groundwater remain above cleanup levels after the hot spot removal.

2.0 INTRODUCTION

This report presents the results of a remedial investigation (RI) and feasibility study (FS) performed for the Washington State Department of Ecology (Ecology) at the Jacobson Terminals Site (Site) at 5350 30th Avenue NW in Seattle, Washington (Figure 1). The RI/FS focused on addressing soil and groundwater contamination in the upland portion of the Site and evaluating sediment quality in the adjacent Lake Washington Ship Canal. An interim action (IA) plan has been developed to remove the soil impacted by polychlorinated biphenyls (PCBs) in the IA Area located in the north-central portion of the Site (Figure 2). This RI/FS will discuss the IA Area, but focus on remedial alternatives for the rest of the Site.

The Jacobson Terminals facility has been enrolled in Ecology's Voluntary Cleanup Program (VCP) since 2001 under VCP number NW0611. Aspect Consulting (Aspect) has been the owner's environmental consultant since 2003. The work for this report follows previous investigations and remedial actions conducted at the Site beginning in 1996. Hart Crowser's work for this RI/FS was conducted under contract with Ecology.

2.1 Purpose

The purpose of this RI/FS is to develop and evaluate remedial alternatives for soil and groundwater contamination and recommend the most appropriate alternative based on chemical and physical conditions at the Site. This RI/FS is intended to achieve cleanup standards specified in Washington Administrative Code (WAC) 173-340-430(2). An RI/FS typically includes the environmental investigation of a site and the development, screening, and evaluation of a full range of cleanup alternatives.

This RI/FS presents the findings of the environmental investigation from which a Site Conceptual Model (CSM) is developed; presents the results of evaluating potential remediation alternatives to advance the Site toward closure; summarizes the benefits, disadvantages, and approximate costs associated with each remediation alternative; and recommends a preferred alternative based on the evaluation. The focus of this RI/FS is to remove or stabilize elevated concentrations of contaminants of concern (COCs) in soil to reduce the risk of contaminant migration to the Lake Washington Ship Canal. Although sediment in the Ship Canal was investigated as part of this RI/FS, it is not included in the remedial alternatives and feasibility study.

3.0 SITE DESCRIPTION AND BACKGROUND

The Jacobson Terminals facility is located at 5350 30th Avenue NW in the Ballard district of Seattle (Figure 1). The Site's boundaries are the Lake Washington Ship Canal (Ship Canal) to the south and east, the Seaborn property to the east, the United States Army Corps of Engineers (USACE) property to the west, and the City of Seattle (City) property to the north.

3.1 Location Conditions and Surrounding Properties

The Site is located along the north shore of the Ship Canal and is generally flat. The northwest corner, which is used for parking, is approximately 5 feet above the elevation of the rest of the Site, at the approximate elevation of the City property and railroad tracks. This area in the northwest corner of the Site slopes toward the south and east.

Fencing and gates control access to the Site. The Site is zoned industrial (IG1 U/65). Large boat storage racks are located in the central and north-central areas of the Site. Small business offices/warehouses border the Corps property along the west Site boundary.

Numerous utilities run through the PCB IA Area to the buildings and docks in the southern portion of the Site. A municipal sewer line approximately 10 feet below ground surface (bgs) runs east–west through the north portion of the Site. A private sewer connects to the municipal line from the on-Site businesses. Other utilities include a fire hydrant in the north-central portion of the Site; an underground water line that enters the Site at the north-central boundary from the City property and runs east–west near the northeast boat rack, then branches to the south toward the south boat rack; high- and low-voltage overhead power lines that run predominantly east–west in the north portion of the Site; and communication lines that also run predominantly east–west in the north portion of the Site with connections to the buildings on the Site and to adjacent properties. An industrial stormwater discharge permit has been issued for the Site. Copper, nickel, and total suspended solids (TSS) are listed as COCs on the permit and stormwater runoff is sampled quarterly. Compliance samples are collected during rain events from surface flow off the dock. A separate, small stormwater treatment system treats local runoff near the north boat repair garage. The treatment system consists of a surface skimming unit and a granular activated carbon (GAC)/walnut shell filtration. The system discharges directly to the sanitary sewer, as do other catch basins on the Site. The treatment system effluent is not currently sampled.

3.1.1 Current Conditions at Surrounding Properties

The USACE property contains offices, maintenance buildings, and a tourist facility for the Hiram M. Chittenden Locks, which are part of the Ship Canal. The Seaborn property is used for boat moorage and office space. The City property, formerly Burlington Northern Railroad right-of-way, contains active railroad tracks. Adjacent and north of the City property and railroad tracks, NW 54th Street runs east–west. Further north, upgradient of the Site, is the Market Street property, at 2801 NW Market Street, which consists of commercial businesses and eateries.

3.1.2 Historical Site Use

3.1.2.1 Jacobson Terminals Property

The Site is on a former estuarine tideflat. In the 1920s, the area was filled with wood waste, construction debris, and sand dredged from the Lake Washington Ship Canal. The property was used to operate a lumber mill from approximately 1890 to the 1930s. Beginning around 1940, the property was used for storage and loading/unloading from docked boats. Since Alan and Brian Jacobson

(partners in A&B Jacobson LLC) purchased the property in 1975, the property has been used as a marine support facility and boat storage.

3.1.2.2 Market Street Property

Approximately 14 interconnected buildings were constructed on the Market Street property between 1946 and 1955. Fuel tanks and shell casings were reportedly manufactured at the property before the factory operation switched to steel window frame manufacturing in the late 1940s. In 1955, the factory stopped producing steel frames and began producing aluminum window frames. This manufacturing process used extrusion presses, an anodizing circuit of 21 aboveground storage tanks (ASTs) constructed of steel or concrete, 10 underground storage tanks (USTs), a paint room, and an interior drainage system that included 24 floor drains, trench drains, and sumps.

From approximately 1948 to 1978, wastewater from the Market Street property was discharged directly to the Ship Canal; in later years, the wastewater was treated on the property and discharged to the King County Metro wastewater collection system. Wastewater discharge violations of the Metro permit regulations for pH and metal concentration exceedances are documented in the project file. In the late 1970s, a video inspection of the sewer pipes was conducted, during which severe deterioration and disintegration of the pipes was observed. The former owner of the Market Street property reportedly replaced the pipes. Window manufacturing operations ceased at the Market Street property in 1989 (Hart Crowser 2000). Currently, the Market Street property is used primarily for commercial business.

3.1.2.3 USACE Property

West of the Jacobson Terminals property is a USACE maintenance facility. This property is used primarily for managing the Hiram M. Chittenden Locks on the Ship Canal, but also for storage/staging of equipment and materials. The storage areas are located in the east portion of the USACE property. Groundwater monitoring wells for the Jacobson Terminals property have been installed along the USACE property boundary.

3.2 Summary of Previous Environmental Characterization and Remediation Activities

Several environmental investigations and remedial actions have been completed at the Site and the adjacent USACE property, as well as at City and Market Street properties. COCs and remedial activities are summarized below.

3.2.1 Contaminants of Concern

Historical environmental investigations and this RI indicate the major COCs at the Site have been:

- PCBs in soil and groundwater at the Site;
- Tri-, di-, and chlorobenzene in soil and groundwater at the Site;
- Petroleum hydrocarbons in soil and groundwater at the Site;

- Chlorinated solvents tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cis-DCE), and vinyl chloride in soil and groundwater on the Market Street, City, and Corps properties, and on the Jacobson Terminals Site; and

- Metals in soil and groundwater on the Market Street and City properties and on the Jacobson Terminals Site.

PCBs, volatile organic compounds (VOCs), diesel-range organics, and metals are the focus of this RI/FS, and their nature and extent is the sole basis for evaluation of the remediation alternatives.

3.2.2 Historical Environmental Characterization

Numerous environmental investigations have taken place since the 1980s at the Site and surrounding properties. Soil and groundwater data collected from the Site and surrounding wells are in the 2013 data gaps report (Hart Crowser 2013).

Groundwater monitoring was first conducted to delineate a vinyl chloride plume identified at the upgradient Market Street property. Historical releases of metals, low- and high-pH solutions, and solvents occurred on the Market Street property resulting in localized exceedances of metals in soil and groundwater and an extensive groundwater plume of PCE and associated degradation products (primarily TCE, cis-DCE, and vinyl chloride), as shown on Figure 2. Prior to 1999, when a treatment wall was installed along the boundary between the City property and the Site, the plume extended from the Market Street and City properties onto the USACE property and the Jacobson Terminals Site (Aspect 2004).

A separate area of chlorinated solvents, located on the City property downgradient of the Market Street treatment wall, was identified as the likely source of chlorinated solvent impacts on the Site (Hart Crowser 2013). However, elevated concentrations of chlorinated solvents observed during RI activities in the northwest corner of the Site suggest there are still soil impacts downgradient of the Market Street treatment wall (Hart Crowser 2014a).

A historical release of transformer oil on the northern portion of the Site created a plume of PCBs and several chlorinated benzene compounds in groundwater. Concentrations of PCBs and chlorinated benzenes exceeding the applicable cleanup levels (see Section 4.2 for screening criteria) have been identified downgradient of where the presumed transformer oil release occurred, in soil samples up to 30 feet bgs. Ecology has prepared an Interim Action work plan to remove contaminated soil in this area.

During construction activities in the early 1990s, a separate area of PCB- and petroleum-impacted soil was discovered in the alley along the west boundary of the Site, directly adjacent to the USACE property (Figure 2).

Historical soil and groundwater sampling data are summarized in our 2013 data gaps report (Hart Crowser 2013).

3.2.3 Historical Remediation Activities

3.2.3.1 Jacobson Terminals Property

A number of remedial actions have been completed at the Site by the current property owners to address potential human and ecological exposure to the COCs identified..

In 1996, PCB- and petroleum-contaminated soil was removed from between two buildings bordering the USACE property. Much of the source material was removed, but confirmation sampling indicated that petroleum hydrocarbon concentrations remained above cleanup levels in samples collected from the sidewalls and bottom of the excavation (Hart Crowser 1997).

In 2001 and 2002, Fenton's reagent (acidified hydrogen peroxide and ferrous iron) was applied via injection wells installed north of the PCB area and chlorinated benzene plume to provide more aggressive oxygen enhancement for degrading cis-DCE and vinyl chloride (Figure 2). In December 2003, a continuous permeable treatment wall containing GAC and zero-valent iron (ZVI) was installed between the IA Area and the Ship Canal to remove PCBs and chlorinated benzenes from groundwater (Aspect 2003).

3.2.3.2 Market Street Property

In 1989, seven of the 10 USTs were taken out of service and all fluids, sludge, ASTs, piping, and other features associated with the anodizing process were removed from the Market Street property and disposed of. The drains, catch basins, floors, and walls of the property were also cleaned. In 1993, Fentron decommissioned all 10 USTs and removed approximately 100 tons of petroleum-impacted soil from the Site (EMCON 1996).

In 1991, EMCON installed a pump-and-treat system along the southwestern portion of the Market Street property to address solvents in groundwater (EMCON 1996). The system did not fully capture the solvent plume and was shut down in 1999 and replaced with a passive treatment wall and ZVI gates system just beyond the southwest Site boundary, on the City property. The wall consists of three impermeable funnel sections constructed of cement bentonite that captures groundwater and directs it through two permeable gates filled with a mixture of granular iron and sand. At the same time, a magnesium oxide product (an oxygen releasing compound, or ORC) was injected into groundwater on the Site along the Ship Canal to treat solvents that had already migrated past the newly constructed treatment wall. A deed restriction was placed on the Market Street property that addresses residual contamination beneath the existing building (Hart Crowser 2000).

3.2.4 Recent Investigations

Hart Crowser completed a soil, groundwater, and sediment investigation in 2013 and 2014. Soil results indicated that PCBs and chlorinated benzene concentrations exceeding the applicable screening criteria extended further than previous investigations had estimated. Results of the investigation are summarized in the draft IA work plan (IAWP; Hart Crowser 2014a).

The 2014 investigation delineated the extent of PCB impacts exceeding Model Toxics Control Act (MTCA) Method A industrial cleanup levels, but did not delineate concentrations exceeding screening levels protective of surface water. Soil with PCB concentrations exceeding MTCA Method A unrestricted cleanup levels was largely delineated, except for near the northeast corner of the impacted area. Soil with chlorinated benzene concentrations exceeding surface water protection screening levels were also not delineated along the eastern and southern edges of the impacted area.

PCB concentrations in groundwater exceeding surface water protection levels were found in all the monitoring wells sampled, including compliance monitoring wells JT-12 and JT-6. Existing deep wells, screened approximately 25 to 30 feet bgs, also had low-level PCB impacts exceeding surface water protection levels. Arsenic concentrations in many of the wells also exceeded surface water protection levels.

The sediment investigation found PCB and arsenic impacts above Washington Sediment Management Standards (SMS) freshwater sediment cleanup objective (SCO) levels, but below cleanup screening levels (CSLs).

3.3 Environmental Setting

This section describes the environmental setting of the Site, including geology, hydrogeology, and surface water hydrology.

3.3.1 Geology

The Site soil generally consists of approximately 10 feet of fill overlying native estuarine sediment. The fill is a diverse mixture of silty sand, silt, wood waste, and occasional wood debris. A layer of wood waste approximately 6 to 10 feet deep has been identified over much of the northern portion of the Site. Below the fill layer is native sand or silty sand up to 16 to 18 feet bgs. Beneath the sand layer is a layer of discontinuous silt and clay, typically 1 to 4 feet thick. Below this fill unit are discontinuous layers of sand and silt of increasing density. A generalized geologic cross section of the IA Area is provided on Figure 3.

During the 2013 to 2014 RI activities, the silt and clay layer was not observed at MW-200 and JT-US-33. This suggests that the layer may not be continuous.

3.3.2 Hydrogeology

3.3.2.1 Groundwater Flow Patterns

Shallow groundwater in the area generally flows toward the south-southeast before discharging into the Ship Canal. Groundwater elevations at the Site are typically 7 to 8 feet relative to the City of Seattle elevation datum. Groundwater is typically encountered 4 to 7 feet bgs at the Site. The groundwater elevation fluctuates approximately 2 feet seasonally and depends largely on the elevation of the Ship Canal, which is adjusted seasonally by the USACE. Figure 4 shows shallow groundwater elevation contours measured at the Site in April of 2015.

Groundwater elevations have typically been lower in the JT-9 area, near the sewer line, than on the rest of the Site. A sewer camera survey in April 2003 indicated that a connection to the side sewer was located in this area. The camera noted water flowing in at the side sewer connection and significant scale buildup. The sewer line is below the water table (see Figure 3); therefore, leakage of shallow groundwater into the sewer could result in the observed groundwater depression (Aspect 2003). Groundwater measurements collected as part of this investigation found similar conditions in the IA Area.

Groundwater elevation measurements collected during RI activities on April 2, 2015, indicate that the shallow groundwater gradient in the southern portion of the Site is to the southeast toward the Ship Canal. Measurements from several shallow monitoring wells (SRW-3, MW-4, JT-MW-100, and JT-11) were not included in the groundwater contour map because of anomalously low water elevation measurements likely caused by insufficient time to equilibrate after the well was opened and the air-tight well cap was removed. Wells included in the groundwater contour map are listed on Figure 4.

3.3.2.2 Groundwater Flow Rates

An upward gradient has been identified between the deeper, water-bearing zone (beneath the silty clay layer) and the shallower water-bearing zone, with the hydrostatic head typically 1 to 2 feet greater at wells JT-5, MW-8D, MW-100, and MW-200 than at adjacent shallower wells.

Saturated-zone soil at the Site is reported to have generally low hydraulic conductivities ranging from 40 to 250 feet per year. Slug tests performed in 2003 indicated that at five of six wells tested, the average hydraulic horizontal gradient was 0.02 foot per foot across the Site, and assuming a porosity of 0.4, the estimated groundwater flow rate is 0.1 foot per day (40 feet per year). Using the maximum calculated hydraulic conductivity in the remaining well, the groundwater flow rate would be 0.7 foot per day (250 feet per year). Using vinyl chloride (a very mobile compound in groundwater) as a conservative tracer, groundwater velocity was calculated at approximately 0.4 foot per day, or 150 feet per year (Aspect 2003).

3.3.3 Ship Canal Surface Water Hydrology

In 1914, Lake Union was hydraulically connected to Lake Washington by construction of the Montlake Cut between Portage Bay and Union Bay. Lake Union was also connected to the then-marine waters of Salmon Bay by construction of the Fremont Cut. The connection to Shilshole Bay and Puget Sound, and a means to control water levels, was established by constructing the Hiram M. Chittenden Locks. The Fremont Cut and the Montlake Cut make up the Lake Washington Ship Canal. The locks and dam maintain the Ship Canal water level.

These modifications increased inflow to Lake Union by diverting the outflow from Lake Washington into the Montlake Cut and, hence, Lake Union, which now drains west into Salmon Bay. During periods of high water flow, the north part of Lake Union can flush (completely exchange water) in about 7 days. However, the southern part of Lake Union does not completely flush and remains relatively stagnant. Opening the locks also allows a periodic influx of dense salt water from Puget Sound into the Ship Canal. Because the saltwater is heavier than freshwater, it sinks to the bottom of the canal and

moves eastward following the density gradient into Lake Union. The balance between the saltwater intrusion and the flushing rate at a given time varies. During the rainy season and spring thaw, runoff from the Cascade foothills is high and the lake is flushed. In the summer, as the runoff flow decreases and lock openings increase, saltwater intrusion increases.

The USACE maintains the water level in Lake Washington and Lake Union by regulating flow through the locks on the western end of Salmon Bay. Lake Union water levels vary by roughly 2 feet during the year, from 20 feet during the winter to 22 feet during the summer.

Ecology designates the Lake Washington Ship Canal from the locks (river mile 1.0) to Lake Washington (river mile 8.6) as "lake class,", stipulating that water quality must meet the requirements for most, if not all, of the following uses: wildlife habitat; general recreation; fish reproduction, rearing, and harvest; water supply; and stock watering. However, elevated salinity within the portion of the Ship Canal adjacent to the Site would likely severely limit its potential use as a source for potable water.

4.0 REMEDIAL INVESTIGATION

Remedial investigation activities at the Site between November 2014 and January 2015. The activities were conducted in general accordance with the remedial investigation work plan (RIWP) dated November 24, 2014 (Hart Crowser 2014b). The additional work included:

- Collecting 71 soil samples from 19 push-probe borings and during installation of eight monitoring wells for chemical analysis of the Site COCs.
- Installing and sampling six groundwater monitoring wells downgradient of the IA Area to assess conditions near the treatment wall, and installing and sampling two monitoring wells away from known PCB-impacted areas to determine whether low-level PCB impacts are present throughout the Site and possibly related to regional deposition from past industrial operations.
- Collecting groundwater samples from 20 existing monitoring wells for chemical analysis of the identified Site-specific COCs to assess groundwater conditions across the Site.
- Collecting five sediment samples adjacent to the Site for chemical analysis and comparison with SMS (Ecology 2013) for VOCs, PCBs, total metals, sulfides, ammonia, and total organic carbon (TOC).
- Collecting three sediment bioassay samples adjacent to the Site for comparison with performance standards according to the SMS (WAC 173-204-563, Table VII).

Field activities are described in detail in Appendix A.

4.1 Remedial Investigation Activities

4.1.1 Soil Investigation

Soil sampling was completed to assess Site COC concentrations outside of the IA Area, better delineate the extent of PCB and chlorinated benzene impacts exceeding the applicable screening levels within the IA Area, and evaluate the residual impacts downgradient of the excavated area of PCB- and petroleum-impacted soil adjacent to the USACE property. The soil investigation was conducted between December 8 and December 16, 2014. During the activities, 19 push-probe borings (JT-US-39 through JT-US-57) were advanced, eight monitoring wells (JT-MW-01S, JT-MW-02S, JT-MW-03D, JT-MW-04D, JT-MW-05S, JT-MW-06D, JT-MW-07S, and JT-MW-08S) were installed from which a total of 71 soil samples were collected for analysis.

The push-probe borings were advanced to a depth of approximately 20 feet bgs using a truck-mounted drill rig, conducted by a driller subcontracted by Hart Crowser. All samples from push-probe borings and hollow-stem auger borings (for monitoring wells) were classified in accordance with American Society for Testing and Materials (ASTM) Method D2888, and pertinent characteristics of the subsurface conditions were recorded on boring logs. Samples were evaluated in the field using visual observations, headspace vapor screening, and sheen testing at regular intervals.

Soil samples were placed into pre-cleaned containers provided by the laboratory, handled in accordance with standard and approved procedures presented in the RIWP, and stored at temperatures specified by the laboratory and applicable analytical methods.

Soil samples were analyzed for one or more of the following:

- PCBs by Environmental Protection Agency (EPA) Method 8082A;
- VOCs by EPA Method 8260C;
- Metals (arsenic, cadmium, chromium, lead, and mercury) by EPA Method 200.8/7471;
- TOC by Plumb (1981);
- Diesel- and oil-range petroleum hydrocarbon analysis by Northwest Total Petroleum Hydrocarbon (NWTPH)-Dx; and
- Total solids by EPA Method 160.3M/SM 2540B.

Two samples were analyzed for leachable lead by toxicity characteristic leaching procedure (TCLP) by EPA Methods 1311/6010C, for investigation-derived waste (IDW) profiling.

All samples were delivered to Analytical Resources, Inc., of Tukwila, Washington. Boring logs and a detailed description of field activities are in Appendix A.

4.1.2 Groundwater Investigation

Groundwater sampling/monitoring was conducted in November and December 2014. A total of 31 groundwater samples (including three duplicate samples) were collected from previously existing monitoring wells (HC-MW-1, HC-MW-2, HC-MW-3, MW-4, IW-5S, IW-5D, SRW-1, SRW-2, SRW-3, JT-3, through JT-7, JT-9 through JT-12, MW-100, and MW-200) and eight new monitoring wells (JT-MW-01S, JT-MW-02S, JT-MW-03D, JT-MW-04D, JT-MW-05S, JT-MW-06D, JT-MW-07S, and JT-MW-08S).

The existing wells selected for groundwater sampling included those downgradient of the PCB source area (JT-3 through JT-7, JT-9 through JT-12, MW-100, and MW-200), those within the treatment wall (SRW-1, SRW-2, SRW-3), three deep wells (JT-5, MW-100, and MW-200), two compliance wells (JT-6 and JT-12), wells in areas away from known PCB and chlorinated benzene impacts (JT-4, IW-5S, and IW-5D), and wells associated with the excavated petroleum-impacted area adjacent to the USACE property (HC-MW-1, HC-MW-2, HC-MW-3, and MW-4).

The new monitoring wells were installed in areas around and downgradient of the PCB- and chlorinated-benzene-impacted area, as well as in areas away from known impacts. Three deep monitoring wells (JT-MW-03D, JT-MW-04D, and JT-MW-06D) were installed to collect soil and groundwater data from the lower aquifer; three shallow wells (JT-MW-01S, JT-MW-02S, and JT-MW-05S) were installed to assess conditions around the treatment wall; and two shallow wells (JT-MW-07S and JT-MW-08S) were installed to assess conditions away from known PCB and chlorinated benzene impacts.

The deep monitoring wells were installed to a depth of approximately 30 feet bgs, and the shallow wells were installed to a total depth of approximately 20 feet bgs. The 2-inch polyvinyl chloride (PVC) casing monitoring wells were installed using a truck-mounted hollow-stem auger drill rig. Deep wells were screened from 20 to 25 feet bgs and shallow wells were screened from 7 to 17 feet bgs. After installation, the wells were developed by pumping and surging until either (1) water from the well became visibly clear, (2) turbidity measurements stabilized, or (3) a minimum of 10 well volumes were purged. Groundwater samples were collected no sooner than 24 hours after the wells were developed, using low-flow sampling procedures.

The wells selected for sampling were measured for depth to water using an electronic interface probe. Groundwater samples were collected using disposable polyethylene tubing, a peristaltic pump, and low-flow sampling techniques; the samples were monitored for field parameters including oxygen, temperature, conductivity, and pH. Groundwater samples were collected into pre-cleaned containers provided by the laboratory, handled in accordance with standard and approved procedures presented in the RIWP, and stored at temperatures specified by the laboratory and the applicable analytical methods.

Groundwater samples were analyzed for one or more of the following:

- PCBs by EPA Method 8082A;
- VOCs by EPA Method 8260C;
- Diesel- and oil-range hydrocarbons by NWTPH-DX;

- Total metals (arsenic, cadmium, chromium, lead, and mercury) by EPA Methods 200.8/7470A;
- Dissolved metals (arsenic, cadmium, chromium, lead, and mercury) by EPA Methods 200.8/7470A;
- Semivolatile VOCs by EPA Method 8270D; and
- TSS by SM240D.

All groundwater samples were delivered to Analytical Resources, Inc., of Tukwila, Washington. Boring logs and a detailed description of field activities are in Appendix A.

4.1.3 Sediment Investigation

Five sediment samples were collected to further evaluate potential environmental impacts in the portion of the Ship Canal adjacent to the Site. Sediment sampling was completed on January 12, 2015. The sediment samples were collected using boat-mounted Power Van Veen surface sediment sampling equipment. The sampling locations, designated JT-SS-06 through JT-SS-10, are shown on Figure 2. Three sediment samples (JT-SS-06, JT-SS-08, and JT-SS-10) were collected for bioassay analysis of potential sediment toxicity to aquatic organisms.

Each sample was photographed and visually classified in the field in accordance with the Unified Soil Classification System (USCS; ASTM D2488). All sediment sample locations were navigated to using a differential global positioning system (DGPS) aboard the sampling vessel to achieve a target horizontal accuracy of 3 meters in accordance with Ecology's Sediment and Analysis Plan Appendix (SAPA) (Ecology 2008) and Puget Sound Estuary Program (PSEP) protocols. Water depths were measured directly by lead-line and converted to mudline elevations.

Sediment samples were analyzed for the following analytes:

- VOCs by EPA Method 8260C;
- PCBs by EPA Method 8082;
- Metals (arsenic, cadmium, chromium, lead, and mercury) by EPA Method 200.8/6010/7470;
- Ammonia by EPA Method 350.3;
- Total sulfides using PSEP protocols (PSEP 1986); and
- TOC by Plumb (1981).

The following sediment bioassays were conducted on JT-SS-06, JT-SS-08, and JT-SS10:

- Amphipod (*Hyalella azteca*)
  - 28-day growth
  - 28-day mortality

- Midge (*Chironomus dilutus*)
  - 10-day mortality
  - 10-day growth

All sediment samples were delivered to Analytical Resources, Inc., of Tukwila, Washington, for chemical analysis. Bioassay samples were shipped to Northwest Aquatic Sciences of Newport, Oregon. A detailed description of field activities is in Appendix A, and sample descriptions are in Table A-1.

4.2 Screening Criteria

Screening levels for soil, groundwater, and sediment are presented below.

4.2.1 Soil

Soil COC concentrations have historically been compared with MTCA Method A industrial screening levels or MTCA Method C direct contact levels for industrial sites (Hart Crowser 1999).

To evaluate whether COC concentrations in soil comply with screening levels that are protective of adjacent surface waters, screening levels were calculated using Ecology's Three-Phase Partitioning Model (WAC 173-340-747). This model provides a conservative estimate for establishing a soil concentration screening level that will not contaminate groundwater above an acceptable level. Surface water screening values, presented in Table 1, were used to compute soil screening levels protective of receptors that might be exposed through the groundwater exposure pathway. For chemicals with no MTCA freshwater screening values, the MTCA Method A unrestricted or Method B direct contact cleanup level was used.

For the IA Area, PCB concentrations were also compared with the MTCA Method A unrestricted cleanup level of 1 milligram per kilogram (mg/kg) and the MTCA Method A industrial cleanup level of 10 mg/kg for evaluation of remediation alternatives costs. The remedial action objective (RAO) level for the IA Area soil removal was determined to be the MTCA Method A unrestricted cleanup level.

4.2.2 Groundwater

Groundwater COC concentrations have historically been compared with surface water protection criteria. Depending on the COC, either MTCA Method B freshwater screening criteria or Washington state freshwater screening criteria as defined in WAC 173-201A were used (Hart Crowser 1999).

Because of the Site's proximity to the Ship Canal, according to WAC 173-340-720 and 173-340-730 the Site is considered to have potential impact on surface water. Therefore, screening levels were updated using the most conservative freshwater screening levels for consumption of aquatic organisms, which are the Federal Clean Water Act (CWA) Section 304, National Toxics Rule 40 CFR 131, or MTCA Method B surface water criteria, whichever is lower. For chemicals with no freshwater screening values, MTCA Method A cleanup levels were used. Groundwater screening levels are shown in Table 1.

4.2.3 Sediment

Sediment analytical results were compared with the Washington State Freshwater Sediment Cleanup Objective Criteria and Freshwater Sediment Cleanup Screening Levels as defined in WAC 173-204. Sediment screening levels are shown in Table 1.

Table 1 – Proposed Cleanup Levels

Contaminant of Concern	Soil Cleanup Level (mg/kg)[a]	Groundwater Cleanup Level (µg/L)[b]	Sediment Cleanup Level (mg/kg)[h]
Total PCBs[c]	0.0000787	0.000064	0.11
Diesel-range organics[d]	2,000	500	--
Heavy oil[d]	2,000	500	--
Arsenic	7[e]	0.098[c]	14
Cadmium	5.6	40.5[f]/5[d]	2.1
Chromium[d]	2,000	50	72
Lead[d]	250	15	360
Mercury	0.146	0.14	0.66
1,2,4-Trichlorobenzene	0.0056	2.03[f]	--
1,2-Dichlorobenzene	2.33	3,000	--
1,3-Dichlorobenzene	0.011	10	--
1,4-Dichlorobenzene	0.02	21[f]	--
Benzene	0.0064	5[f]	--
Chlorobenzene	0.434	800[f]	--
1,1-Dichloroethene	0.0011	3.2[g]	--
Tetrachloroethene	0.015	29	--
Trichloroethene	0.0023	7[f]	--
Naphthalene	6.56	4,710[f]	--
Vinyl chloride	0.0005[c]	1.6	--
Dioxins TEQ	0.049 (pg/g)[i]	--	--

Notes:

a. Calculated using the Three-Phase Partitioning Model (MTCA equation 747-1), using the most conservative freshwater screening levels presented in this table, unless otherwise noted.
b. Clean Water Act S304 freshwater screening level for consumption of organisms for groundwater migration to surface water pathway, unless otherwise noted.
c. The screening level for soil/groundwater is lower than the method practical quantitation limit (PQL); MTCA defaults the screening level up to the PQL.
d. Compared with MTCA Method A cleanup levels (soil/groundwater).
e. Compared with regional natural background concentration in soil for Puget Sound (Ecology 1994).
f. Compared with MTCA Method B, lowest carcinogen or non-carcinogen, surface water screening level, standard formula value.
g. Compared with National Toxics Rule 40 CFR 131 freshwater screening level for consumption of organisms based on groundwater migration to surface water.
h. Ecology Sediment Management Standards (SMS) sediment cleanup objective (SCO) screening level.
i. 47 pg/g for background level using 90th percentile based on Urban Seattle Area Soil Dioxin and PAH Concentrations Initial Summary Report (Ecology 2011).

4.3 Remedial Investigation Results

Similar to previous investigations, this RI found PCB-impacted soil extending beyond the area previously identified in the 2013 data gaps report (Hart Crowser 2013), as well as beyond the IA Area delineated in the 2014 IAWP (Hart Crowser 2014a). VOC concentrations in soil exceeded applicable screening levels at several locations, including areas west of the IA Area. Several metals were also detected in soil samples at concentrations exceeding applicable screening levels. Groundwater PCB concentrations exceeded applicable surface water screening levels in most of the monitoring wells sampled. Along the USACE property boundary, near the historical PCB and petroleum hydrocarbon excavation area, diesel-range organics and PCBs were found at levels exceeding soil and groundwater screening levels.

PCBs were detected in all five sediment samples at concentrations exceeding the SCO level, but not the sediment CSL. Concentrations of metals in all five sediment samples also exceeded applicable SCO levels. One sediment sample exceeded the mercury CSL.

The remedial investigation results are described in the following sections.

4.3.1 Soil Results

Soil sampling results from this RI are discussed below. Soil analytical data from this investigation are in Table 2a, and analytical data from the previous IAWP investigations are in Tables 2b and 2c. Figure 2 is a site plan showing exploration locations. Analytical data for selected COCs is on Figures 5a through 5d (PCBs), Figures 6a through 6c (chlorinated benzenes), Figures 7a through 7c (combined oil and diesel-range organics and benzene), Figures 8a through 8c (chlorinated ethenes), Figures 9a through 9c (lead), and Figures 10a through 10c (other metals). Laboratory reports and our chemical data quality review are in Appendix B.

4.3.1.1 PCBs

Concentrations of total PCBs in soil were detected above screening levels protective of surface water (0.0000787 mg/kg) in samples from 16 of the 27 borings, and in 22 of the 71 samples analyzed. The screening level protective of surface water is below the laboratory method detection limit. The distribution of PCB exceedances is presented by depth intervals of from 0 to 10 feet bgs, 10 to 18 feet bgs, and below 18 feet bgs on Figures 5a, 5b, and 5c, respectively.

Aroclor 1260 was the most frequently detected PCB; it was detected in a total of 14 borings. Three other Aroclors were detected in Site soil. Aroclor 1254 was detected in 13 borings, Aroclor 1262 was detected in two borings, and Aroclor 1242 was detected in one boring. Upland and sediment Aroclor distribution is presented on Figure 5d.

PCB impacts above the MTCA Method A unrestricted cleanup level (1 part per million [ppm]) were found in areas further to the south and west of the previously identified source area; however, total PCB concentrations were not found to exceed the MTCA Method A industrial cleanup level (10 ppm).

The MTCA Method A unrestricted cleanup level was exceeded in a total of five samples from four separate borings (JT-US-39, JT-US-46, JT-US-53, and JT-MW-07S). All four of these borings are beyond the south and west boundaries of the IA Area. Sample depths at these locations ranged from 2 feet bgs (JT-US-39) to 17.5 feet bgs (JT-US-46). Soil collected at 6 to 6.5 feet bgs and 17 to 17.5 feet bgs from boring JT-US-46, which is directly south of the main plume but outside of the IA Area, exceeded the MTCA Method A unrestricted cleanup level. Soil collected at 2.5 to 3 feet bgs from boring JT-US-53, which is in the northwest portion of the Site and east of the IA Area, exceeded the MTCA Method A unrestricted cleanup level. Soil collected at 2 to 2.5 feet bgs from boring JT-US-39, located centrally along the USACE west property boundary, south of the IA Area, exceeded the MTCA Method A unrestricted cleanup level. Soil collected at 2.5 to 4 feet bgs in boring JT-MW-07S (in the south-central portion of the Site, well outside the IA Area) also exceeded the MTCA Method A unrestricted cleanup level.

4.3.1.2 Chlorinated Benzenes

The chlorinated benzenes 1,4-dichlorobenzene; 1,3-dichlorobenzene; 1,2-dichlorobenzene; 1,2,4-trichlorobenzene; and chlorobenzene were not detected above screening levels during this investigation. Chlorinated benzene sample locations and exceedances from previous IAWP investigations are on Figures 6a through 6c.

4.3.1.3 Petroleum Hydrocarbons

Petroleum hydrocarbon concentrations in soil were compared with the MTCA Method A unrestricted cleanup level of 2,000 mg/kg. Diesel-range organics and/or lube oil was detected in 15 of the 17 soil samples analyzed for petroleum hydrocarbons (Figures 7a, 7b, and 7c). Lube oil concentration exceeded the MTCA Method A unrestricted cleanup level in only one sample, collected at 2.5 to 4 feet bgs from boring JT-MW-07S (located in the south-central portion of the Site). The diesel-range organics concentration exceeded the Method A unrestricted cleanup level in this sample, as well. Diesel-range organics concentration exceeded the Method A unrestricted cleanup level in soil collected at 2.5 to 3 feet bgs from boring JT-US-50, which is directly north of the IA Area. If the diesel-range organics and lube oil concentrations are combined, the same MTCA cleanup level can be used for comparison (Ecology 2004). The combined concentration of diesel-range organics and lube oil in samples from Jt-MW-3D-S1, collected from 5 to 6.5 feet bgs, also exceeds the MTCA Method A cleanup level.

4.3.1.4 Volatile Hydrocarbons

Benzene was detected in 25 samples at 16 locations (see Figures 7a, 7b, and 7c). Only one sample, collected at 2 to 2.5 feet bgs from boring JT-US-39 (located near the Site boundary with the Corps property) contained benzene at a concentration above the calculated MTCA Method B screening level protective of surface water (0.0064 mg/kg).

Naphthalene was detected in 13 samples at nine locations. Three samples, collected from two different locations, contained naphthalene concentrations above the calculated MTCA Method B screening level protective of surface water (6.56 mg/kg). The highest concentration (38 mg/kg) was detected in soil collected at 2 to 2.5 feet bgs from boring JT-US-39 (near the Site's boundary with the

USACE property). Soil samples collected at 2.5 to 3 feet bgs and 5.5 to 6 feet bgs from boring JT-US-44 (in the central portion of the Site) contained naphthalene concentrations of 15 mg/kg and 26 mg/kg, respectively.

Ethylbenzene was detected in 11 samples at 10 locations. Two samples, at three different locations, contained ethylbenzene concentrations above the calculated Method B screening level protective of surface water (0.056mg/kg). The highest exceedance (52 mg/kg) was detected in soil collected at 2 to 2.5 feet bgs from boring JT-US-39 (near the Site boundary with the USACE property). Soil collected at 13 to 13.5 feet bgs from boring JT-US-53 (in the northwest portion of the Site) and 1.5 to 2 feet bgs from boring JT-US-51 (in the north portion of the Site) contained ethylbenzene concentrations of 9.5 mg/kg and 0.32 mg/kg, respectively.

Total xylenes were detected in 16 samples at 11 locations. Samples at two different locations contained total xylene concentrations above the MTCA Method A screening level of 9 mg/kg. The highest exceedance (115.5 mg/kg) was detected in soil collected at 2 to 2.5 feet bgs from boring JT-US-39 (near the Site boundary with the USACE property). Soil collected at 13 to 13.5 feet bgs from boring JT-US-53 (in the northwest portion of the Site) contained a total xylene concentrations of 31.8 mg/kg.

4.3.1.5 Chlorinated Ethenes

The chlorinated solvents PCE, TCE, vinyl chloride (chloroethene), and/or 1,1-dichloroethene (1,1-DCE) were detected at concentrations exceeding applicable soil screening levels in samples from five borings, three of which are adjacent to and north of the IA Area (see Figures 8a, 8b, and 8c). Chlorinated solvent concentrations exceeded applicable screening levels in samples from two other areas, which are west of the IA Area. These exceedances are likely related to chlorinated ethene impacts documented from the upgradient Market Street property.

PCE was detected at seven locations. In three samples from three different locations directly northeast of the IA Area, PCE concentrations were above the calculated MTCA Method B screening level protective of surface water (0.015 mg/kg). The sample collected at 11 to 11.5 feet bgs from boring JT-US-54 had the highest concentration, 0.045 mg/kg. Soil collected at 7 to 7.5 feet bgs from boring JT-US-51 had a PCE concentration of 0.025 mg/kg, and one soil sample, from boring JT-US-50 and collected at 7 to 7.5 feet bgs, contained a PCE concentration of 0.021 mg/kg. PCE was detected in soil samples collected from two borings located south of the IA Area at concentrations below the applicable screening level.

TCE was detected in eight samples collected at five locations. In four samples, from three different locations directly northeast of the IA Area, TCE concentrations were above the calculated MTCA Method B screening level protective of surface water (0.0023 mg/kg). The highest concentration, 0.029 mg/kg, was detected in soil collected at 11 to 11.5 feet bgs from boring JT-US-54. Soil collected at 7 to 7.5 feet bgs from two borings, JT-US-50 and JT-US-51, also exceeded the applicable screening level. Soil collected at 14.5 to 15 feet bgs from boring JT-US-50 also exceeded screening criteria.

1,1-DCE was detected at only one location, JT-US-49 (in the northwest portion of the Site, outside the IA Area), in a sample collected at 19.5 to 20 feet bgs. The 1,1-DCE concentration of 0.0017 mg/kg in

this sample exceeded the calculated MTCA Method B screening level protective of surface water (0.0011 mg/kg).

Vinyl chloride was detected at three locations, all above the calculated MTCA Method B screening level protective of surface water (0.0005 mg/kg), which is below the laboratory practical quantitation limit (PQL) of 0.001 mg/kg. The PQL was therefore used as the screening level. Soil collected at 18.5 to 19 feet bgs from boring JT-US-53, at 19.5 to 20 feet from boring JT-US-48, and at 19.5 to 20 feet from boring JT-US-49 contained vinyl chloride concentrations of 0.075 mg/kg, 0.012 mg/kg, and 0.052 mg/kg, respectively, all exceeding the screening level. These borings with vinyl chloride exceedances are west and southwest of the IA Area.

4.3.1.6 Metals

Metals were detected in all 30 soil samples analyzed for arsenic, cadmium, chromium, lead, and mercury (see Figures 9a through 10c). Screening levels for metals are based on concentrations protective of surface water. For metals with no surface water screening levels, MTCA Method A unrestricted cleanup levels were used. Six soil samples contained arsenic, cadmium, lead, and/or mercury at concentrations exceeding applicable screening levels.

Arsenic was detected in all 30 samples analyzed. Eight samples contained arsenic concentrations above the Puget Sound regional background 90th percentile level of 7 mg/kg (Ecology 1994). Soil samples collected at 1.5 to 2 feet bgs from boring JT-US-51 (located directly northeast of the IA Area) contained arsenic at a concentration of 17.1 mg/kg (Figure 10a). All other exceedances ranged from 7.4 mg/kg to 11.9 mg/kg; these exceedances occurred in areas directly northeast of the IA Area, between the treatment wall and the Ship Canal, and in central portions of the Site. Although several soil samples contained arsenic concentrations that exceed the 90th percentile value, the observed concentrations do not exceed the range of background concentrations measured in the Puget Sound area study (Ecology 1994).

Cadmium was detected in 11 of the 30 samples analyzed. One sample, collected at 2.5 to 4 feet bgs from boring JT-MW-07S (the south-central portion of the Site) contained a cadmium concentration of 8 mg/kg (Figure 10a), exceeding the concentration protective of surface water (5.6 mg/kg).

Lead was detected in all 30 samples analyzed. Only two samples exceeded the MTCA Method A unrestricted cleanup level of 250 mg/kg. Soil collected at 2.5 to 4 feet bgs from boring JT-MW-07S (in the south-central portion of the Site) contained a lead concentration of 1,770 mg/kg (Figure 9a). Soil collected at 1.5 to 2 feet bgs from boring JT-US-51 (directly northeast of the IA Area) contained a lead concentration of 2,350 mg/kg. Follow-up TCLP analysis was performed on both samples and found leachable lead at 10.2 milligrams per liter (mg/L) in JT-MW-07S, exceeding the Washington State Toxicity Characteristic Dangerous Waste Concentration of 5 mg/L (WAC 173-303-100). Leachable lead was measured in JT-US-51 at 3.1 mg/L, below the dangerous waste designation criterion.

Mercury was detected in 15 of the 30 samples analyzed. Five samples exceeded the calculated MTCA Method B screening level protective of surface water (0.146 mg/kg). Soil collected at 2.5 to 4 feet bgs from boring JT-MW-07S (located in the south-central portion of the Site) contained the highest

mercury concentration, 1.17 mg/kg. Soil samples collected from shallow depths (5 to 6.5 feet bgs, from boring JT-MW-03D, located between the treatment wall and the Ship Canal, and 1.5 to 2 feet bgs, from boring JT-US-51, located directly northeast of the IA Area) contained mercury concentrations of 0.28 mg/kg and 0.17 mg/kg, respectively. Two samples collected at greater depths (12.5 to 13 feet from boring JT-US-39 and 10 to 10.5 feet bgs from JT-US-40, both located near the PCB- and petroleum-contaminated soil area) both contained a mercury concentration of 0.15 mg/kg.

Chromium was detected in all 30 samples at concentrations below the MTCA Method A unrestricted cleanup level of 2,000 mg/kg.

4.3.2 Groundwater Results

In groundwater samples, PCB concentrations above the surface water screening level protective of surface water (0.000064 micrograms per liter [µg/L]) were found in 20 of the 28 monitoring wells sampled, three of which were newly installed south and east of the IA Area. PCB concentrations above applicable screening levels were also found in the six deep wells sampled at the Site (IW-5D, JT-5, MW-100, MW-200, JT-MW-03D, and JT-MW-04D). Total and/or dissolved arsenic concentrations exceeded the surface water screening level of 0.098 µg/L in 26 of the monitoring wells sampled. Several VOCs were also detected in groundwater samples, exceeding the applicable screening levels for benzene and vinyl chloride. Petroleum hydrocarbon concentrations exceeded the applicable screening level in two monitoring wells (HC-MW-3 and MW-4) adjacent to the west Site boundary and one new monitoring well in the central portion of the Site (JT-MW-07S).

Groundwater analytical results are presented in Tables 3a and 3b. Groundwater COC concentrations are on Figures 11 through 15.

4.3.2.1 PCBs

The PCB Aroclor 1260 was the most commonly detected Aroclor; it was found in samples from 20 of the 28 monitoring wells. Aroclor 1260 was detected at concentrations ranging from 0.011 µg/L to 2.5 µg/L. Monitoring well MW-200, a deep well within the vicinity of the IA Area, contained the highest concentration (2.5 µg/L) of Aroclor 1260. Monitoring well MW-4, a shallow well along the west Site boundary near the historical PCB- and petroleum-impacted soil remediation area, contained an Aroclor 1260 concentration of 1.6 µg/L. Aroclor 1254 was also detected in samples collected from six monitoring wells, ranging in concentrations from 0.011 mg/L to 0.37 µg/L. All PCB detections exceeded the CWA freshwater screening level for consumption of organisms (0.000064 µg/L).

Samples from three shallow wells (JT-3, JT-7, and JT-11) downgradient of the PCB-impacted soil area contained total PCB concentrations of 1.05 µg/L, 0.025 µg/L, and 0.1 µg/L, respectively. These wells are upgradient of the treatment wall. The PCB concentration was 0.011 µg/L in the sample from SRW-1, which is within the treatment wall. The downgradient compliance well JT-6 sample contained a total PCB concentration of 0.017 µg/L. The downgradient compliance well JT-12 sample did not have a detectable concentration of PCBs. Samples from deep wells JT-5, MW-100, and MW-200, screened from 25 to 30 feet bgs, contained total PCB concentrations of 0.079 µg/L, 0.062 µg/L, and 2.5 µg/L, respectively.

Three of the eight newly installed wells were screened in the deep aquifer (25 to 30 feet bgs) and five were screened in the shallow aquifer (7 to 17 feet bgs). The groundwater sample from only one of the shallow wells, JT-MW-08S (along the south Site boundary, near the Ship Canal), exceeded the PCB screening level, with a concentration of 0.088 µg/L. The groundwater samples from two deep wells, JT-MW-03D and JT-MW-04D, exceeded PCB surface water screening criteria. The PCB concentration in the groundwater sample from monitoring well JT-MW-04D (directly upgradient of the treatment wall) was 0.059 µg/L. The groundwater sample from JT-MW-03D, between the treatment wall and the Ship Canal, contained a PCB concentration of 0.019 µg/L. Groundwater PCB results are on Figure 11.

4.3.2.2 Total Petroleum Hydrocarbons

Diesel-range organics were detected in samples from four of the five monitoring wells analyzed. Samples from three of the five monitoring wells exceeded the applicable MTCA Method A cleanup level of 500 µg/L. Concentrations in groundwater samples from wells HC-MW-3, JT-MW-07S, and MW-4 were 2,200 µg/L, 970 µg/L, and 680 µg/L, respectively. The concentration in the groundwater sample from HC-MW-1 was 400 µg/L, which is just below the applicable cleanup level. In addition, groundwater samples collected from monitoring wells HC-MW-3 and JT-MW-07S contained concentrations of lube oil at 830 µg/L and 560 µg/L, respectively, both exceeding the applicable cleanup level. If the diesel-range organics and lube oil concentrations are combined, the same MTCA cleanup level can be used for comparison (Ecology 2004). Therefore, the combined concentration of diesel-range organics and lube oil in the sample from HC-MW-1 also exceeds the MTCA Method A cleanup level. All these monitoring wells are in the central portion of the Site and near the west Site boundary with the USACE property, within the vicinity of the historical PCB and diesel remedial excavation area. Groundwater petroleum analytical data are on Figure 12.

4.3.2.3 VOCs

Samples from compliance well JT-12 contained concentrations of 1,4-dichlorobenzene; 1,3-dichlorobenzene; 1,2-dichlorobenzene; chlorobenzene; and benzene; none of these exceeded applicable screening levels. Samples from compliance well JT-6 contained 1,4-dichlorobenzene, chlorobenzene, and vinyl chloride at concentrations below applicable screening levels.

Benzene was detected in groundwater samples from 15 monitoring wells, two of which had concentrations exceeding the applicable screening level of 5 µg/L. Samples from monitoring wells JT-6 and JT-11, both downgradient of the IA Area, contained benzene concentrations of 5.5 µg/L and 5.6 µg/L, respectively. Groundwater benzene analytical data are on Figure 12.

Vinyl chloride was detected in groundwater samples collected from 12 monitoring wells, only one of which exceeded the applicable screening level of 1.6 µg/L. The sample from monitoring well IW-5S (in the northwest portion of the Site and downgradient of the Market Street property) contained a vinyl chloride concentration of 3.7 µg/L. Groundwater chlorinated ethene analytical data are on Figure 13.

1,4-dichlorobenzene was detected below the applicable screening level of 21 µg/L in samples from 13 monitoring wells.

1,2,4-trichlorobenzene was detected only in the sample from the deep monitoring well JT-MW-200 (near the IA Area); the concentration was 2.03 µg/L, below the applicable screening level (1.96 µg/L).

4.3.2.4 Metals

Arsenic was the only metal detected above the calculated MTCA Method B screening level (0.098 µg/L), which is below the laboratory PQL (0.2 µg/L). The PQL was used as the screening level. Dissolved arsenic was detected in samples from 24 of the 26 wells sampled for metals, at concentrations from 0.2 to 48.9 µg/L. Total arsenic was detected in all of the 26 wells at concentrations from 0.2 to 50.8 µg/L. Groundwater metals analytical data are on Figures 14 (dissolved) and 15 (total).

4.3.3 Sediment Results

Sediment analytical data, toxicity bioassay test results, and sediment PCB loading calculations are discussed below. Sediment analytical data are in Tables 4a (adjacent to site) and 4b (other studies in the Ship Canal and Salmon Bay), and sediment bioassay toxicity test results are in Table 5. Sediment analytical results are on Figures 5a–d (PCBs), 6a–c (chlorinated benzenes), 9a–c (lead), and 10a–c (other metals) with the soil results. For comparison purposes, Figure 5e presents PCB results in sediment from studies completed by others in the Ship Canal and Salmon Bay. Bioassay sample locations are on Figure 2 and the laboratory bioassay testing results are included in Appendix C.

4.3.3.1 Sediment Analytical Results

All five samples of surface sediment from JT-SS-06 through JT-SS-10 (adjacent to the south and east Site boundaries), collected at depths just below the mud line (within the top 10 centimeters), contained PCB concentrations exceeding the SCO level (0.11 mg/kg). However, none of the sediment samples exceeded the sediment CSL (2.5 mg/kg). Ecology's Environmental Information Management (EIM) database contains records of elevated PCB concentrations in Ship Canal sediment (Ecology 1996) similar to concentrations measured in sediment collected adjacent to the Jacobson Site during this RI.

All five of the surface sediment samples listed above had arsenic concentrations exceeding the SCO level (14 mg/kg). Sediment collected from JT-SS-08 and JT-SS-09 (located near the northeast and south Site boundaries, respectively) exceeded the SCO level for chromium (72 mg/kg). Sediment samples from JT-SS-09 and JT-SS-10 (located near the south Site boundary) contained concentrations of mercury exceeding the SCO level of 0.66 mg/kg. The sediment sample from JT-SS-09, with a mercury concentration of 1 mg/kg, also exceeded the sediment CSL (0.8 mg/kg).

4.3.3.2 PCB Sediment Loading

PCB sediment loading calculations were performed to determine whether migration from upland sources was sufficient to explain existing conditions or if there were other potential sources of PCBs to sediment. These calculations and the assumptions behind them are explained in Appendix C.

Sediment loading calculations estimated the following PCB concentrations:

$$\text{PCB concentration (0 to 10 centimeters)} = \frac{4.96x10^{7}\,\mu g}{4{,}775\ ft^2\ \text{x}\ 0.33\ \text{ft x}\ 28.3\,\frac{L}{ft^3}\,\text{x}\ 2.5\,\frac{kg}{L}} = 445\ \mu g/kg$$

$$\text{PCB concentration (0 to 1 foot)} = \frac{4.96x10^{7}\,\mu g}{4{,}775\ ft^2\ \text{x}\ 1\ \text{ft x}\ 28.3\,\frac{L}{ft^3}\,\text{x}\ 2.5\,\frac{kg}{L}} = 148\ \mu g/kg$$

The average measured PCB concentrations in sediment for depth intervals of 0 to 10 centimeters and 0 to 1 foot were 876 and 222 µg/kg, respectively. The measured concentrations were about two times the estimated concentrations. However, given the high uncertainty in the estimated value due to the variability of the input parameters, the agreement between measured and estimated sediment PCB concentrations was relatively good.

4.3.3.3 Sediment Toxicity Bioassay Testing

To determine whether sediment COC concentrations were negatively impacting aquatic organisms in the adjacent ship canal sediment, bioassay toxicity testing was performed on samples from three locations, JT-SS-06, JT-SS-08, and JT-SS-10. Bioassay tests were the chronic 28-day amphipod survival and growth tests using *Hyalella azteca,* and the chronic 10-day midge survival and growth tests using *Chironomus dilutus*. All four tests were conducted on sediment collected from each of the three sampling locations. Northwest Aquatic Sciences of Newport, Oregon, performed the bioassay toxicity testing.

SMS Criteria. Sediment quality was evaluated using biological criteria established in the SMS (Ecology 2013); analytical results are compared with SMS criteria in Table 5. These criteria consider both the degree of biological response (a numerical comparison) and the statistical significance (a statistical comparison). As for chemical parameters, the SMS establishes the SCO level (the response at or below which *no* adverse effects are expected) and the CSL (the response at or below which no *significant* adverse effects are expected) criteria for evaluating sediment quality. The SCO level is more stringent than the CSL and allows for less biological response in the test treatments. Sediment quality is determined by comparing responses observed in the test treatments with those in the control treatment.

Under the SMS rules, the **28-day amphipod survival test** fails the SCO level if the mean mortality in the sediment sample is more than 10 percent greater than the control and the difference is statistically significant ($p \geq 0.05$). Tests fail the CSL if the mean mortality is more than 25 percent greater than the control and the difference is statistically significant ($p \geq 0.05$).

The **10-day midge survival test** fails the SCO level if the mean mortality in the sediment sample is more than 20 percent greater than the control and the difference is statistically significant ($p \geq 0.05$). Tests fail the CSL if the mean mortality is more than 30 percent greater than the control and the difference is statistically significant ($p \geq 0.05$).

The **amphipod 28-day growth test** measures mean individual growth (MIG) rates by ash-free dry weight (AFDW). A test fails the SCO level if the MIG rate in the sediment sample is less than 75 percent of the control and if the difference is statistically significant ($p \geq 0.05$). The test fails the CSL if the MIG rate is less than 60 percent of the control and the difference is statistically significant ($p \geq 0.05$).

The **midge 10-day growth test** measures MIG rates by AFDW. A test fails the SCO level if the MIG in the sediment sample is less than 80 percent of the control and if the difference is statistically significant ($p \geq 0.05$). The test fails the CSL if the MIG in the sediment sample is less than 70 percent of the control and the difference is statistically significant ($p \geq 0.05$).

Sediment Bioassay Result Summary. None of the sediment sample test results exceeded the CSL either by exceeding a CSL or by two test results exceeding the SCO level. Two sediment samples, from JT-SS-08 and JT-SS-10, exceeded the SCO level for growth in the *Chironomus* 10-day growth bioassay test. This was the only test for which the SCO level was exceeded. Bioassay toxicity test results are summarized in Table 5 and in the following text. The full report, including water quality, laboratory control criteria, and all other applicable acceptability criteria, is in Appendix C.

Amphipod (*Hyalella azteca*) 28-Day Survival and Growth Test Results. The control sediment sample mean mortality was 5.0 percent. Mean mortality for sediment samples from JT-SS-06, JT-SS-08, and JT-SS-10 was 22.5, 20.0, and 13.8 percent, respectively. The results were not found to be significantly significant, so none of these sediment samples exceed the SCO or CSL criteria for mortality.

The biomass of sediment samples from JT-SS-06 and JT-SS-08 was above that of the control sediment. The sediment sample from JT-SS-10 had an individual biomass of 0.28 milligrams (mg), which was statistically significantly lower than that of the control (0.32 mg). However, the sample from JT-SS-10 did not exceed either the SCO or CSL criteria for growth.

Midge (*Chironomus dilutus*) 10-Day Survival and Growth Test Results. The mean mortality for the control sediment sample in the *Chironomus* test was 6.3 percent. Mean mortality for sediment samples from JT-SS-06, JT-SS-08, and JT-SS-10 was 10.0, 15.0, and 8.8 percent, respectively. None of these were more than 20 percent over the control mortality. Therefore, none of the sediments exceeded the SCO or CSL criteria for mortality.

The average individual AFDW for the control samples was 1.22 mg. All three sediment samples resulted in growth that was statistically significantly lower than control growth. Two of the three sediment samples, from JT-SS-08 and JT-SS-10, resulted in exceedances under the SCO criteria for growth, with AFDWs of 0.93 mg/individual and 0.91 mg/individual, respectively. No sediment sample failed the CSL criteria for growth.

4.4 Data Assessment and Data Gaps

This section presents an evaluation of environmental data collected as part of this RI including identification of data gaps.

4.4.1 Soil and Groundwater

Supplemental soil and groundwater sampling was completed to fill data gaps, better delineate the extent of PCB and chlorinated benzene impacts in the IA Area, evaluate the residual impacts downgradient of the excavated area of PCB- and petroleum-impacted soil adjacent to the USACE property, and determine whether COCs are present outside of previously identified areas of concern.

This study confirmed that PCB soil impacts exceeding MTCA Method A Unrestricted cleanup levels are primarily located in the general vicinity of the IA Area. However, analytical results for one sample (from JT-US-46, approximately 25 feet south of the IA Area) show PCB impacts to soil exceeding the IA RAO. This area is being treated as a separate hot spot because of its distance from the main PCB plume and its different Aroclor signature.

Impacts to groundwater in the deep aquifer were confirmed near and downgradient of the IA Area. PCB concentrations in shallow wells downgradient of the treatment wall were generally lower than those reported for the 2013-2014 RI.

The locations where soil and groundwater samples were collected with COC detections are throughout the Site; the COCs were PCBs, diesel-range organics, chlorinated solvents, and metals. The widespread prevalence of Site COCs suggests that these impacts likely have regional sources and/or are residuals from legacy contamination (historical industrial activities at the Site and surrounding properties). In addition to those sources, however, the elevated COCs in soil and groundwater samples taken outside of the IA Area found in this study suggest potentially localized sources of contamination. The following five impacted upland areas at the Site (identified by their boring ID) have been identified and likely warrant additional characterization. Additionally, the source and extent of dioxin and furan impacts at the Site are not well understood.

JT-MW-07S. In the vicinity of monitoring well JT-MW-07S (located in the south portion of the Site), soil samples contained elevated concentrations of diesel-range organics, lube oil, arsenic, cadmium, lead, mercury, and PCBs. Field screening during well installation identified large metal and brick debris to a depth of approximately 7 feet bgs. Three attempts were made to advance this boring after refusal was encountered in the upper 5 feet because of the excessive amount of wood and metal debris. Woody debris and pulp with an oily sheen were observed beneath the surface subgrade to a depth of approximately 17.5 feet bgs.

Concentrations of these COCs exceeded the applicable screening levels in soil samples collected from a relatively shallow depth of 2.5 to 4 feet bgs. The PCB concentration at this shallow depth exceeded the MTCA Method A unrestricted cleanup level. PCB concentrations in samples taken at a depth of 7.5 to 9 feet bgs exceeded the applicable screening level protective of surface water. Leachable lead was detected at concentrations above the characteristic dangerous waste level in near-surface soil at this location. However, lead was not detected above screening levels in groundwater at this location. Concentrations of diesel-range organics and lube oil in groundwater samples from JT-MW-07S exceeded the MTCA Method A cleanup level. Additional investigation will likely be necessary in this area to fully characterize the extent of COCs in soil and groundwater.

JT-MW-08S. PCB concentrations in soil samples from several depths ranging from 7.5 to 19 feet bgs from monitoring well JT-MW-08S (located directly south of JT-MW-07S) exceeded the applicable screening level. Woody debris and pulp with a slight oily sheen were observed at a depth of approximately 10 to 16.5 feet bgs. PCB concentration in the groundwater sample from JT-MW-08S also exceeded the applicable screening level protective of surface water. Additional investigation will likely be necessary in this area to fully characterize the extent of COCs in soil and groundwater.

JT-MW-4/JT-US-39. This study identified the historical PCB and diesel-impacted soil area, located along the west Site boundary with the USACE property, as a remaining area of concern. Concentrations of petroleum hydrocarbons in groundwater samples from monitoring wells HC-MW-1, HC-MW-3, and MW-4 exceeded the MTCA Method A cleanup level, indicating historical soil remediation has not been completely effective. In addition, groundwater samples from monitoring well MW-4 had PCB concentrations exceeding surface water protection criteria.

Soil collected at 2 to 2.5 feet bgs from boring JT-US-39 (located directly south of MW-4) contained total PCBs exceeding the MTCA Method A unrestricted cleanup level. In addition, soil collected at this depth contained concentrations of benzene, ethylbenzene, and naphthalene above applicable screening levels. In boring JT-US-39, a strong odor and sheen were observed in near-surface soil, suggesting a nearby surface release may be responsible for the impacts at this location. Signs of contamination similar to this were not observed in HC-US-55 (located immediately south of JT-US-39). The presence of PCBs in relatively shallow soil and petroleum hydrocarbons in nearby groundwater at separate locations will require additional investigations to fully characterize the extent of COCs in soil and groundwater.

JT-US-46. Soil samples from boring JT-US-46 collected at depths of 6 to 6.5 feet bgs and 17 to 17.5 feet bgs contained PCBs at concentrations exceeding the MTCA Method A unrestricted cleanup level. This boring is approximately 25 feet directly south of and adjacent to the main PCB plume IA Area. The detections may be related to the IA Area; however, in both samples, Aroclor 1254 comprised 34 percent of the total PCBs, and Aroclor 1260 accounted for the remaining 66 percent. Within the IA Area, Aroclor 1260 accounted for almost all of the detected PCBs. The presence of Aroclor 1254 suggests the contamination could be the result of a separate release. Additional investigations will likely be needed to fully characterize the extent of PCBs in this area.

JT-US-53. The soil sample from boring JT-US-53 collected at a relatively shallow depth of 2.5 to 3 feet bgs contained PCBs at a concentration exceeding the MTCA Method A unrestricted cleanup level. A soil sample collected at 7.5 to 8 feet bgs contained PCBs at a concentration exceeding the applicable screening level protective of surface water. All the soil samples collected at this location at depths ranging from 2.5 to 19 feet bgs also contained ethylbenzene, with a concentration exceeding the applicable screening level from the sample taken at a depth of 13 to 13.5 feet bgs. This boring is in the northwest portion of the Site, directly downgradient of the treatment wall along the City property to the north. Because the elevated PCB concentrations were found at relatively shallow depths and this location is well beyond the boundary of the IA Area, it is likely that a PCB release occurred historically in this area. Nearby groundwater samples collected from shallow monitoring well IW-5S and deep monitoring well IW-5D contained PCB concentrations exceeding the screening level protective of

surface water. Additionally, vinyl chloride concentrations in soil samples collected at 18.5 to 19 feet bgs from JT-US-53 exceeded the applicable screening level protective of surface water, and groundwater samples collected from the shallow monitoring well IW-5S contained a vinyl chloride concentration exceeding screening levels. The vinyl chloride is likely residual contamination from the City and Market properties to the north. This new area of concern will likely require further characterization to delineate the extent of PCB impacts.

Dioxins and Furnas. During the 2013-2014 IA investigation, three soil samples were analyzed for dioxins and furans. Analytical results were compared to the MTCA Method B screening level (0.049 picogram per gram [pg/g]) calculated with the three phase partitioning model (MTCA equation 747-1) using the lowest surface water protection level for protection of human health, considering food ingestion only. The sample locations, JT-US-003-S2 (7.5-8 feet bgs), JT-US-004-S2 (7-7.5 feet bgs), and JT-US-005-S2 (10-10.5 feet bgs) are located within the IA Area, where soil contamination has been largely delineated and planned for removal during the planned IA. While measured dioxin concentrations (1.59 to 5.53 pg/g TEQ) exceed MTCA screening criteria in these three soil samples, they are below the average urban dioxin TEQ concentration (19.1 pg/g) reported in the Urban Seattle Area Soil Dioxin and PAH Concentrations Initial Summary Report (Ecology 2011).

Despite being within the lower range of dioxin concentrations encountered in urban Seattle areas, Site soil dioxin concentrations still have the potential to impact surface water and sediment in the Ship Canal. As such, the presence and magnitude of potential soil, groundwater, and sediment dioxin and furan impacts is unknown and is considered a data gap warranting future investigation.

4.4.2 Vapor Intrusion

The potential for vapor intrusion was evaluated using the EPA Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air (EPA 2015), the Ecology Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action (Ecology 2009), and Ecology's revised groundwater vapor intrusion screening levels (VISLs) provided by their Cleanup Levels and Risk Calculation (CLARC) Master Table of screening levels (revised in April 2015). Using groundwater data as the basis for vapor intrusion assessment, the following can be assumed: only shallow groundwater monitoring well samples apply, the default vapor attenuation factor (VAF=0.001) may be applied to the local permeable vadose zone geology of the Site, the water table is shallow (historically measured less than ten feet from the top of casing of monitoring wells at the site), and light non-aqueous phase liquid (LNAPL) has not encountered above the water table.

As a preliminary assessment of the potential for vapor intrusion, it is necessary to determine which buildings at the Site are close enough to the contaminant source. The 'inclusion zone', according to guidance documents, is defined as 100 lateral/vertical feet from the well-defined source boundary. According to the Ecology guidance document, the source boundary is defined as an "estimate of where VOCs in shallow groundwater or soil decrease to their practical quantitation limits", in other words, wherever VOCs have been detected. Based on this definition of source boundary, the buildings at the Site are within the 'inclusion zone' of potential vapor intrusion impact due to widespread VOC detections in shallow groundwater (Table 3a). Regulatory guidance then leads to further

recommendations in assessment, including the input of shallow groundwater data into the Johnson and Ettinger Vapor Intrusion Model (JEM) to predict possible vapor concentrations, or completing a soil gas survey to directly evaluate vapor concentrations present around buildings at the site. Since several parameters required for the JEM are not currently available, and a soil gas survey data has not been conducted at the site, this assessment is based on shallow groundwater sample data collected and comparison of VOC concentrations with the applicable VISLs.

Comparing shallow groundwater VOC concentrations with the applicable VISLs result in several screening level exceedances. Two shallow monitoring wells, approximately 50 to 65 feet down-gradient of the Market St. property buildings to the north (IW-5S and JT-9, respectively), have had recent groundwater samples with vinyl chloride concentrations exceeding the applicable VISL. The shallow monitoring well MW-JT-8 with the greatest concentrations of VOCs exceeding the applicable VISLs (1,2,4-trichlorobenzene and 1,4-dichlorobenzene), is located approximately 90 feet from the nearest buildings at the Site. The shallow monitoring well nearest to buildings with VOC concentrations exceeding the VISLs is JT-11, located approximately 90 feet from the northeast corner of the northernmost building. The most recent groundwater sample collected from JT-11 had a benzene concentration exceeding the applicable VISL. Shallow monitoring wells closest to buildings at the Site (HC-MW-1S, HC-MW-2S, JT-MW-05S, JT-MW-07S, and JT-MW-08S), located approximately 5 to 55 feet from the nearest building, groundwater samples had detected concentrations of VOCs below the applicable VISLs.

Existing upgradient groundwater treatment (the Market Street treatment wall) and planned future remedial actions (PCB source are removal) reduce the long term vapor intrusion risk at the site. Following removal of the source area, VOC soil gas concentrations will decrease as soil and groundwater attenuates in surrounding areas. However, groundwater samples collected from shallow monitoring wells at the Site indicate that vapor intrusion may pose a risk to building occupants and should be assessed following the IA to confirm that vapor intrusion is not a concern to human health.

4.4.3 Sediment

Sediment metals and PCB concentrations directly adjacent to the site exceed SCO levels and mercury exceeds the CSL at one location. The primary metal exceeding SCO levels in sediment adjacent to the site is arsenic, with minor exceedances of chromium and mercury. Bioassay toxicity testing results exceed SCO criteria, but are below CSL criteria, indicating that COC occurrences in sediment adjacent to the site present a relatively low risk to benthic organisms.

Sediment investigations conducted by others in the Ship Canal and Salmon Bay have found similar COCs in sediment upstream of the Site, suggesting that these COCs likely occur as the result of multiple local and regional sources. Table 4b presents PCBs and metals concentrations in sediment collected during other studies in the waterway. Figure 5e presents those sediment sample locations with total PCB concentrations and PCB-Aroclor distribution. The data from these studies was obtained from the Ecology Environmental Information Management (EIM) online database, which was submitted from studies completed by others in the surrounding area.

PCBs in Salmon Bay Sediment. Sample locations closest to the site (SALMII968A, SALMII968B, and SALMII968C), located directly south and east of the site, contain PCB concentrations exceeding the SCO level at two of these locations (SALMII968A and SALMII968C), however at lower concentrations than the samples collected directly adjacent to the Site. Sediment collected from 20 other sample locations throughout Salmon Bay also exceed the SCO level with concentrations similar to that directly adjacent to the Site. The maximum PCB concentration of 7.6 mg/kg (SALMII967A), located over a mile upstream of the site, exceeds the CSL.

The distribution of PCB Aroclors within the waterway consists of a wide range of Aroclors while the sediments sampled directly adjacent to the Site exhibit a narrower range of Aroclors. The Aroclor distribution throughout Salmon Bay/Ship Canal includes Aroclors 1016, 1221, 1232, 1242, 1248, 1254, and 1260, and is likely a broad representation of regional contaminant transport from the upland and surface sediment mixing. The Aroclor distribution directly adjacent to the Site, a narrower range of Aroclors 1248, 1254, and 1260, may be derived from more localized contaminant transport from the surrounding uplands. However additional investigation may be useful to evaluate potential source areas.

Metals in Salmon Bay Sediment. The sample locations directly south and east of the site contain concentrations of arsenic, chromium, and mercury exceeding SCO levels. Mercury concentrations in two of these samples exceed the CSL, the highest of which is located approximately 400 feet upstream of the site. Sediment collected throughout Salmon Bay, from a total of 36 sample locations, contain mercury concentrations exceeding the SCO, 26 of which also exceed the CSL. Arsenic concentrations exceed the CSL at three locations upstream of the site. Chromium concentrations exceed the CSL at nine locations upstream of the site. Cadmium and lead also exceed SCO levels in sediment samples collected in Salmon Bay (outside of the Site area).

4.4.4 Summary

Our investigation confirmed that the bulk of PCB and chlorinated benzene contaminant mass is likely located in and around the IA Area; however, analytical results show PCB and other COC impacts to soil and/or groundwater in other areas of the site. The widespread detections suggest impacts likely have regional sources and/or are residuals from legacy contamination (historical industrial activities at the Site and surrounding properties). The soil, groundwater, and sediment data gaps described in this section require additional characterization to determine whether the groundwater to surface water/sediment pathway is complete (e.g., contaminant concentrations exceeding surface water protection at the point of compliance). Additionally, vapor intrusion assessment should be completed following IA (or sooner is the IA is delayed) to confirm that the exposure risk to indoor occupants is low.

Without additional information, it is assumed that upland groundwater contamination exceeding surface water screening levels is migrating to sediment and surface water in the Ship Canal, and building occupants may be at risk of inhaling volatilized soil and groundwater VOCs. Unless additional information is collected to contradict this assumption, soil and groundwater remediation is needed to reduce contaminant levels to below screening criteria.

5.0 CONCEPTUAL SITE MODEL

This section provides a conceptual understanding of the Site that is based on the results of historical research, subsurface investigations, and previous remedial actions. The chemicals and media of concern, the fate and transport characteristics of the release of hazardous substances, and the potential exposure pathways are discussed in this section.

A conceptual site model (CSM) presents the links between contaminant sources, release mechanisms, exposure pathways and routes, and receptors to summarize the current understanding of the risk to human health and the environment. The CSM is the basis for developing technically feasible cleanup alternatives and selecting a final cleanup, and may be refined throughout the cleanup action process as additional information becomes available.

A historical release of transformer oil in the northwest portion of the Site resulted in introduction of PCBs and chlorinated benzenes within the identified IA Area. This study has found that soil and groundwater in other areas of the Site are impacted by PCBs and other Site COCs, indicating several secondary sources.

Secondary release mechanisms include fugitive dust, plant uptake, infiltration and leaching to groundwater, and volatilization. Groundwater discharge can also potentially impact surface water. Exposure routes potentially include inhalation, ingestion, and dermal contact.

Potential human receptors include workers inside the Site buildings, potential workers during future Site development, and utility workers. Terrestrial ecological receptors include plants and animals exposed to impacted media, as well as secondary food chain consumers such as birds and mammals.

A terrestrial ecological evaluation (TEE) was not completed for the Site because it qualifies for a TEE exemption according to requirements described in WAC 173-340-7491 since it is covered by asphalt, which creates a physical barrier between contaminated media and plants and wildlife. Institutional controls will need to be employed to maintain the asphalt. Implementing these controls will require a formal written agreement between the property owner and Ecology. Assuming the controls are implemented, a TEE is not required for the Site.

5.1 Media of Concern

Soil, groundwater, and surface sediment have been identified as the affected media at the Site because results of the environmental assessments to date show elevated concentrations of PCBs, TPH, metals, chlorinated benzenes, and several other VOCs.

5.2 Contaminants of Concern

Table 6 presents the constituents that were analyzed for and detected in soil, sediment, and groundwater. Constituents detected in at least one sample at a concentration greater than the applicable cleanup level are considered COCs for the associated media. Dioxins are a COC at the Site because previous investigations found that their concentrations exceeded the calculated MTCA

Method B screening level (Hart Crowser 2014b); however, Site dioxin concentrations were within the range of typical soil concentrations measured in Ecology's Seattle Urban Dioxin Study (Ecology 2011). For this reason, samples were not analyzed for dioxins in the current investigation.

Table 6 – Contaminants of Concern

Contaminants of Concern	Soil[a]		Groundwater[b]		Sediment
	Less than MTCA Method B	Greater than MTCA Method B	Less than MTCA Method B	Greater than MTCA Method B	Above Ecology SMS SCO
Total PCBs	X[c]	X[c]	X	X	X
Diesel-range organics[d]	X	X	X	X	
Heavy oil[d]	X	X			
Arsenic[e]	X	X		X	X
Cadmium	X	X	X[f]		
Chromium[d]	X		X		X
Lead[d]	X	X	X		
Mercury	X	X			X
1,2,4-Trichlorobenzene	X	X	X[f]	X	
1,2-Dichlorobenzene	X	X	X		
1,3-Dichlorobenzene	X	X	X		
1,4-Dichlorobenzene	X	X	X[f]	X	
Benzene	X	X	X[d]	X[d]	
Chlorobenzene	X	X	X[f]		
1,1-Dichloroethene		X			
Tetrachloroethene	X	X	X		
Trichloroethene	X	X	X[f]		
Naphthalene	X	X	X[f]		
Vinyl chloride	X[c]	X[c]	X		
Dioxins TEQ		X[g]			

Notes:

a. Calculated using the Three-Phase Partitioning Model (MTCA equation 747-1), using the most conservative freshwater screening levels presented in this table, unless otherwise noted.

b. Compared with Clean Water Act S304 freshwater screening level for consumption of organisms, groundwater migration to surface water, unless otherwise noted.

c. The screening level for soil is lower than the method practical quantitation limit (PQL); by default, MTCA uses the PQL as the screening level.

d. Compared with MTCA Method A cleanup levels (soil/groundwater).

e. Compared with regional natural background concentration in soil for Puget Sound (Ecology 1994).

f. Compared with MTCA Method B, carcinogen surface water screening level, standard formula value.

g. Dioxins in Site soil do not exceed the 90th percentile urban concentration reported in the Urban Seattle Area Soil Dioxin and PAH Concentrations Initial Summary Report (Ecology 2011).

5.3 Environmental Fate of COCs

The primary physical and chemical processes that can influence contaminant concentrations and migration include:

- Adsorption to soil;
- Leaching or dissolution into groundwater;
- Volatilization; and
- Biodegradation.

In general, when transformer oil is released into the subsurface, it may travel through the unsaturated zone as free-phase product. The constituents can sorb onto soil particles and leach or dissolve into groundwater (when present) and migrate with groundwater flow. The constituents can also degrade over time through chemical or biological processes; however, the rate of natural attenuation (NA) for PCBs is relatively slow. Site NA for petroleum and volatile organics occurs at a faster rate. Volatile constituents evaporate and can migrate through the unsaturated zone as soil vapor. Some vapor may escape to the atmosphere or accumulate in enclosed spaces such as buildings.

5.4 Areas of Concern

The approximate extent of contamination is determined by considering soil and groundwater exceedances of the applicable MTCA criteria and the Site CSM. The estimated extents of contamination hot spots are shown on Figure 16. Sediment contamination in the area of the Ship Canal directly adjacent to the Site is considered an area of potential concern; however, the extent of contamination there has not been fully delineated and sediment toxicity testing indicates risk to aquatic organisms is relatively low. Therefore, sediment is not within the focus of this remedial alternative evaluation. Additionally, the main PCB plume (IA Area) in the north-central portion of the Site is addressed in the IAWP; it is not exclusive to this remedial alternative evaluation, and is excluded from discussion of hot spots in the following sections. Hot spots, which for the purposes of this report are defined as areas containing PCB concentrations exceeding 1 mg/kg, are listed below.

5.4.1 Hot Spot 1: JT-MW-07S

Soil samples collected in the vicinity of monitoring well JT-MW-07S (located in the south portion of the Site) contained several COCs at concentrations exceeding the applicable screening levels protective of surface water. Concentrations of diesel-range organics, lube oil, metals, and PCBs exceeded the applicable screening levels in soil samples collected from a relatively shallow depth of 2.5 to 4 feet bgs. PCB concentrations also exceeded the MTCA Method A unrestricted cleanup level of 1 mg/kg in samples collected at a depth of 7.5 to 9 feet bgs.

These PCB occurrences indicate an area of contamination separate from the IA Area. Additional characterization is needed to delineate the extent of contamination in this area. For FS costing purposes, the extent of impacted soil around JT-MW-07S is assumed to cover 1,900 square feet and

the depth of impacted soil is estimated to be 10 feet bgs. (based on field observations at the time of drilling, analytical data, and Site constraints [i.e., the adjacent boat rack]). The total volume of soil requiring remediation is estimated to be 700 cubic yards.

5.4.2 Hot Spot 2: MW-4/JT-US-39

This hot spot area is along the west Site boundary with the USACE property and was previously remediated to address diesel-impacted soil. Soil samples collected at 2 to 2.5 feet bgs from boring JT-US-39 (directly south of MW-4) contained PCBs at a concentration exceeding the MTCA Method A unrestricted cleanup level. Groundwater samples from monitoring wells MW-4 and HC-MW-1 (directly east of JT-US-39) contained PCBs at concentrations exceeding the applicable screening level protective of surface water.

These PCB occurrences indicate another area of contamination, separate from the IA Area. The extent of impacts around JT-US-39 has been estimated for remediation costing purposes based on field observations at the time of drilling, analytical data, and Site constraints (i.e., the adjacent buildings). Additional characterization is needed to delineate impacts in this area. For FS costing purposes, the extent of impacted soil is assumed to cover approximately 700 square feet and the depth of impacted soil is assumed to be 8 feet bgs. The total volume of soil requiring remediation is estimated to be 200 cubic yards.

5.4.3 Hot Spot 3: JT-US-46

Soil samples from boring JT-US-46 collected at depths ranging from 6 to 6.5 feet bgs and from 17 to 17.5 feet bgs contained PCBs at concentrations exceeding the MTCA Method A unrestricted cleanup level. This boring is directly south of and adjacent to the IA Area. It is unclear whether these results are associated with the IA Area or indicate a separate PCB-impacted area.

The location of the boring is approximately 25 feet south of the IA Area; the area around the boring is being treated as a separate area of concern. The impacted area around JT-US-39 has been estimated for remedial alternative costing purposes based on field observations at the time of drilling and analytical data. Additional characterization is needed to delineate impacts in this area. For FS costing purposes, the extent of impacted soil around JT-US-46 is assumed to cover approximately 1,200 square feet and the depth of impacted soil is assumed to be 18 feet bgs. The total volume of soil to be remediated is estimated to be 800 cubic yards.

5.4.4 Hot Spot 4: JT-US-53

Soil samples from boring JT-US-53 collected at a relatively shallow depth of 2.5 to 3 feet bgs had PCBs at a concentration exceeding the MTCA Method A unrestricted cleanup level. Soil collected at 7.5 to 8 feet bgs contained PCBs at a concentration exceeding the screening level protective of surface water. All the soil samples collected at this location at depths ranging from 2.5 to 19 feet bgs also contained ethylbenzene; those collected at a depth of 13 to 13.5 feet bgs had ethylbenzene concentrations exceeding the applicable screening level. Groundwater samples collected from the nearby wells, shallow monitoring well IW-5S and deep monitoring well IW-5D, contained PCB at concentrations exceeding the applicable screening level protective of surface water. Additionally, vinyl chloride

concentrations in soil samples collected at 18.5 to 19 feet bgs from JT-US-53 and groundwater samples collected from the shallow monitoring well IW-5S exceeded applicable screening levels. Boring JT-US-53 is in the northwest portion of the Site, directly downgradient of the treatment wall, along the City property to the north. Chlorinated solvent impacts in this area are likely residual contamination from the upgradient Market Street release.

The PCB occurrences indicate another area of contamination, separate from the IA Area. Hart Crowser estimated the impacted area around JT-US-53 for remedial alternative costing purposes based on field observations at the time of drilling, analytical data from the boring and nearby monitoring wells, and Site constraints (i.e., property boundaries and nearby utilities). Additional characterization is needed to delineate impacts in this area. For FS costing purposes, the extent of impacted soil around JT-US-53 is assumed to cover approximately 1,000 square feet and the depth of impacted soil is assumed to be 8 feet bgs. The total volume of soil to be remediated is estimated to be 300 cubic yards.

5.5 Receptors

Potential receptors at the Site include humans and terrestrial and aquatic ecological receptors such as plants and animals exposed to impacted media and secondary food chain consumers such as birds and mammals.

5.6 Potential Exposure Pathways

For a contaminant to present a risk to human health and/or the environment, the pathway from the contaminant to the receptor must be complete. The main exposure pathways that exist at the Site that are not currently mitigated are migration of dissolved contaminants to adjacent surface water and sediment, and inhalation risk to utility workers. Several pathways are potentially complete only if Site or utility work includes digging in the soil or groundwater. An overview of existing and potential exposure pathways is presented as a Site CSM on Figure 17. The potential exposure pathways are summarized below.

5.6.1 Soil

On-Site soil contains elevated concentrations of PCBs, metals, chlorinated benzenes, and chlorinated ethenes. The Site is paved, so there is no exposure pathway unless the pavement is removed. Workers digging in the soil for future development or utility work may be exposed to contaminants if they do not have adequate personal protective equipment or do not use safety procedures. Routes of exposure include incidental ingestion and direct contact.

5.6.2 Groundwater

Three potential exposure routes exist for groundwater: inhalation of vapors, incidental ingestion, and direct contact. Complete pathways for incidental ingestion and direct contact only exist if workers are digging in soil below the water table. Aromatic compounds dissolved in groundwater at the Site may volatilize out of the liquid phase and migrate upward into unsaturated soil pore spaces, resulting in the potential for on-Site and off-Site utility workers to be exposed to vapors.

5.6.3 Surface Water

Shallow groundwater beneath the Site migrates to the Ship Canal. There is a potential for dissolved contaminants to impact the aquatic environment.

5.6.4 Sediment

Metals and PCBs in sediment can impact the aquatic environment. There is a potential for dissolved contaminants to impact the marine environment.

5.6.5 Soil Gas

Chlorinated benzenes, petroleum constituents, and chlorinated ethenes can volatilize in soil, potentially leading to gas phase migration of the COCs to the surface. Impacts to indoor air within existing Jacobson Terminals buildings is possible, given the buildings' proximity to the southern hot spots. This pathway may also exist for utility workers.

5.6.6 Fugitive Dust

The fugitive dust pathway does not exist while the Site it paved. Fugitive dust could be a potential pathway if the pavement is removed and workers dig in the soil.

5.6.7 Plant Uptake

The COC-impacted areas at the Site are predominantly paved or covered by building foundations. Plants are not grown for human consumption and this site is paved within the impacted areas; therefore, the pathway is incomplete.

6.0 CLEANUP STANDARDS

The following sections identify RAOs and preliminary cleanup standards for the Site that were developed to address the applicable regulatory requirements for Site cleanup. These requirements address conditions relative to potential human receptor impacts. Together, the RAOs and cleanup standards provide the framework for evaluating remediation alternatives described later in this FS and for selecting a preferred alternative.

6.1 Remedial Action Objectives

The primary objective for the FS and cleanup action is to substantially eliminate, reduce, and/or control unacceptable risks to human health and the environment posed by Site COCs. The goal of remedial actions at the Site is to achieve regulatory Site closure.

6.2 Cleanup Levels

The applicable cleanup levels were discussed in Section 4.2. Soil, groundwater, and sediment cleanup levels were selected to protect human health and the environment. Table 1 (Section 4.2) summarizes the specific cleanup levels for the COCs in Site soil, groundwater, and sediment.

6.3 Point of Compliance

Soil. The standard point of compliance for soil contamination by direct contact beneath a Site is 15 feet bgs, which is a reasonable estimate of the depth that could be accessed during normal Site redevelopment activities (WAC 173-340-740[6][d]). However, since soil cleanup levels are based on protection of adjacent surface waters, the point of compliance will be established in the soil throughout the Site (WAC 173-340-740[6][b]).

Groundwater. Because of the Site's proximity to the Ship Canal, according to WAC 173-340-730 the Site is considered to have potential impact on surface water. Accordingly, the point of compliance should be the point at which the hazardous substances are released to surface water. Site limitations prevent sampling at the groundwater-surface water interface, so, as specified in WAC 173-340-720, a conditional point of compliance near this interface should be established. Screening levels were updated by Hart Crowser in 2014 to consider the most conservative freshwater screening levels for consumption of organisms (Federal Clean Water Act Section 304, National Toxics Rule 40 CFR 131, or MTCA Method B surface water criteria, whichever is lower). For chemicals with no freshwater screening values, MTCA Method A cleanup levels were used.

Sediment. For sediment cleanups, the standard point of compliance is the biologically active zone (upper 10 centimeters), which for this Site is considered to also be protective of human health (WAC 173-204-560(6)).

6.4 ARARs

This section identifies potential applicable or relevant and appropriate requirements (ARARs) to be used in assessing and implementing remedial actions at the Site. The potential ARARs focus on federal or state statutes, regulations, criteria, and guidelines. The types of potential ARARs evaluated for the Site were contaminant-, location-, and action-specific. Each type Site is summarized below and evaluated in Table 7.

In general, only the substantive requirements of ARARs are applied to MTCA cleanup Sites being conducted by Ecology (WAC 173-340-710[9][b]). Thus, cleanup actions under a formal agreement with Ecology are exempt from the administrative and procedural requirements specified in state and federal laws. This exemption also applies to permits or approvals required by local governments.

6.4.1 Contaminant-Specific ARARs

Contaminant-specific ARARs are usually health- or risk-based numerical values or methodologies that, when applied to Site-specific conditions, result in establishment of numerical contaminant values that regulatory agencies generally recognize as allowable to protect human health and the environment.

6.4.2 Action-Specific ARARs

Action-specific ARARs are pertinent to particular remediation methods and technologies, and to actions conducted to support cleanup. Action-specific ARARs are requirements that may need to be satisfied during the performance of specific remedial actions because they prescribe how certain

activities (e.g., treatment and disposal practices, media monitoring programs) must occur. Typically, action-specific ARARs are not fully defined until a preferred response action has been selected and the corresponding remedial action can be more completely refined. However, preliminary consideration of the range of potential action-specific ARARs may help focus the process of selecting a preferred remedial action alternative.

6.4.3 Location-Specific ARARs

Location-specific ARARs are restrictions placed on the concentration of hazardous substances or the conduct of activities solely because they are in a specific location. Some examples of special locations are floodplains, wetlands, historic sites, and sensitive ecosystems or habitats.

7.0 DEVELOPMENT OF REMEDIATION ALTERNATIVES

This section describes the screening of potential remediation technologies for the Site and development of the remediation alternatives. Candidate remedial technologies were identified and screened to develop potential cleanup alternatives for further evaluation in this FS.

7.1 Remediation Technology Screening

The remedial technologies that were identified and screened for the Site are summarized in Table 8. The screening of technologies applicable to impacted soil and groundwater remediation considered available methodologies that could address contaminants in the various media based on their expected implementability, reliability, and relative cost. Physical conditions at the Site that limit or support particular technologies, and contaminant characteristics that limit the effectiveness or feasibility of a technology, were considered in selecting remedial technologies suitable for addressing Site conditions and capable of achieving the remediation objectives.

The implementability of a technology—that is, the relative ease of installation and the time required to achieve a given level of performance—is assessed according to Site conditions. Implementability considers (1) the technology's constructability (ability to build, construct, or implement the technology under actual Site conditions); (2) the time required to achieve the required level of performance as defined by the cleanup levels and points of compliance; (3) the technology's ability to be permitted; (4) the availability of the technology; and (5) other technology-specific factors.

The EPA states that to assess the reliability of prospective technologies, an evaluator should identify each technology's level of development, performance record, and inherent construction, operation, and maintenance problems. Technologies that are not fully demonstrated, perform poorly, or are unreliable should be eliminated (EPA 1988).

Relative costs of technologies and process options are used to distinguish between similar technologies with similar expected effectiveness. The remedial alternatives retained for more detailed evaluation are, therefore, intended to be the most cost-effective applications of the remedial technologies that are most appropriate for addressing the Site conditions.

Table 8 summarizes the screening assessment process. It indicates which technologies were retained for further evaluation as remediation alternatives and which were eliminated from consideration based on implementability, reliability, or cost.

7.2 Remediation Alternative Descriptions

The technologies retained in the screening process were used to develop five remediation alternatives for further evaluation (Alternatives 1 through 5). The components of the remediation alternatives developed for the Site are summarized below. All alternatives are based on the assumption that the interim action removal will be completed and consequently, the cost of the interim action is not included in the estimated cost for each of the alternatives. Each alternative will include compliance monitoring to meet WAC 173-340-410, which inherently includes monitoring of NA effects after remediation activities. Costs were estimated using RACER™ (Remedial Action Cost Engineering and Requirements System) cost estimating software, RS Means, and recent Hart Crowser experience with similar items on other projects. Remediation alternative cost estimates are in Appendix D.

7.2.1 Alternative 1 – Interim Action, Natural Attenuation with Institutional Controls, and Compliance Monitoring

This alternative would be implemented after the PCB removal IA. It relies on natural processes and restrictive covenants to limit exposure pathways related to contaminant hot spots discussed in Section 5.4. Under this alternative, the COCs would not be removed from or contained at the Site. In order to implement this alternative, an additional investigation would need to provide sufficient evidence that surface water and sediment are not being impacted by Site discharge of contaminated groundwater, and that the vapor intrusion pathway is not complete.

If Alternative 1 was found to be viable, a plan would be developed for monitoring ongoing NA at the Site. NA is a combination of naturally occurring biological, chemical, and/or physical processes. Over time NA will reduce the mass, toxicity, mobility, volume, or concentration of some of the COCs to levels that achieve regulatory compliance, but NA will likely not be effective for PCBs or metals. The time to achieve regulatory compliance is anticipated to be long and to vary greatly for each COC.

In addition to NA, institutional controls for groundwater and soil at the Site would be established. Institutional controls are non-engineering measures taken to limit or prohibit exposure pathways to the COCs at the Site. These could be physical or legal actions, including:

- Zoning limitations;
- Deed restrictions (e.g., maintaining pavement over PCB-impacted soils); and
- Land use restrictions.

Compliance monitoring would include cap and groundwater monitoring for regulatory compliance and NA performance. Monitoring could involve wells currently installed on the Site and/or additional wells

installed at points of compliance. For this FS, we assumed groundwater monitoring would continue for 20 years.

The estimated cost for Alternative 1 is $427,000 (Table D-1).

7.2.2 Alternative 2 – Interim Action, Hot Spot Excavation with Institutional Controls, and Compliance Monitoring

This alternative would be implemented following the PCB removal IA. Hot spot excavation would target specific areas across the Site where COC concentrations exceeding MTCA Method A or B cleanup levels have been identified. These hot spot areas are discussed in Section 5.4. Excavation of discrete contaminated source areas would provide a permanent and effective technology that would limit the overall impact of remediation actions on Site operations. This alternative was evaluated using limited data collected during this RI; additional remedial investigations would likely be needed to fully delineate the extent of hot spot contamination and determine the ultimate effectiveness of this alternative.

The excavation would remove hot spots 1 through 4, in total an area of approximately 4,800 square feet (Figure 16). The excavation would extend to approximately 10 feet bgs in Area 1, 8 feet bgs in Area 2, 18 feet bgs in Area 3, and 8 feet bgs in Area 4. The estimated total excavation volume is approximately 2,000 cubic yards. Excavation would be offset from the edge of any permanent structures to avoid undermining foundation stability. This alternative does not directly address contaminated soil that may be present underneath any buildings on the Site. If confirmation sampling were to find residual COCs underneath buildings, institutional controls would be put in place to limit or prohibit COC exposure pathways in these areas.

Implementing this alternative would require:

- Removing Site obstructions such as pavement, existing wells, and buried utilities;
- Mobilizing, operating, and subsequently demobilizing trench excavation and supporting materials and equipment (e.g., decontamination equipment, temporary fencing, excavator, dump trucks, backfill materials);
- Transporting and disposing of excavated contaminated soils at a Subtitle C facility (or Subtidal D depending on additional characterization);
- Placing a chemical oxidant in the base of the Area 2 excavation to treat residual contamination;
- Replacing underground utilities if needed; and
- Restoring the Site, including re-installing monitoring wells and impervious surfaces.

Institutional controls and compliance monitoring would be similar to those of Alternative 1. We assumed 20 years of compliance monitoring would be required.

The estimated cost for Alternative 2 is $1,910,000 (Table D-1).

7.2.3 Alternative 3 – Interim Action, Treatment Wall and Extension with Institutional Controls, and Compliance Monitoring

This alternative would be implemented following the PCB removal IA. Treatment walls, or permeable reactive barriers (PRBs), such as ZVI or GAC walls, are a well-established technology often used when mass excavation is impractical. Groundwater flows at a natural gradient through the walls, which are typically constructed by excavating a trench and backfilling with a mixture of reactive materials and sand or a slurry. The COCs passing through the wall react with or are adsorbed by these materials, so groundwater exiting on the other side of the wall has been treated.

The PRB would extend along the property line adjacent to the Ship Canal (Figure 18), so the groundwater would be treated before it migrated off the Site. The soils excavated for the wall would be disposed of in an appropriately licensed and permitted off-Site landfill facility. The excavation area would be approximately 2,400 square feet (Figure 18). The depth of the trench excavation would extend to the clay-silt layer at approximately 18 feet bgs. The estimated excavation volume is approximately 1,600 cubic yards.

Implementing this alternative would require:

- Removing Site obstructions such as pavement, existing wells, and buried utilities;
- Mobilizing, operating, and subsequently demobilizing trenching equipment and supporting materials and equipment (e.g., decontamination equipment, temporary fencing, excavator, dump trucks, backfill materials);
- Transporting and disposing of excavated contaminated soils at a Subtitle C facility (or Subtidal D depending on additional characterization);
- Building the PRB via trenching and backfilling with sorptive/reactive materials;
- Replacing underground utilities if needed; and
- Restoring the Site, including re-installing monitoring wells and impervious surfaces.

Once the PRB was installed, the groundwater monitoring wells removed during the excavation would be replaced and/or additional wells would be installed to provide points of compliance. Compliance monitoring would include groundwater monitoring for regulatory compliance and engineering performance.

Institutional controls would be similar to those for Alternative 1. For this FS, we assumed groundwater monitoring would continue for 20 years after the removal activities were complete, while the restrictive covenant is in place.

The estimated cost for Alternative 3 is $5,490,000 (Table D-1).

7.2.4 Alternative 4 – Interim Action, Excavation of Soil Exceeding RAOs with Institutional Controls, and Compliance Monitoring

This alternative would be implemented following the PCB removal IA. Excavation and off-Site disposal is a commonly implemented remediation method that would permanently remove the source area's contaminated soil. Considering historical data and Hart Crowser's recent remedial investigations, it is assumed low-level COC concentrations exceeding RAOs are present in soil throughout the Site. This alternative represents a worst-case scenario; the extent of COCs would need to be confirmed with additional remedial investigations.

The excavation area would be approximately 57,000 square feet (Figure 19) and would cover most of the Site area not addressed during the IA. Hart Crowser assumed the depth of excavation would average approximately 12 feet bgs. The estimated excavation volume is approximately 25,500 cubic yards. Excavation would be offset from the edge of any permanent structures to avoid undermining foundation stability. This alternative does not address contaminated soil that may be present underneath any buildings on the Site. If confirmation sampling were to find residual COCs underneath buildings, institutional controls would be put in place to limit or prohibit COC exposure pathways in these areas.

Implementing this alternative would require:

- Removing Site obstructions such as pavement, existing wells, and buried utilities;
- Mobilizing, operating, and subsequently demobilizing soil excavation and supporting materials and equipment (e.g., decontamination equipment, temporary fencing, excavator, dump trucks, backfill materials);
- Placing chemical oxidant near the Site at the base of the PCB/petroleum area excavation bordering the USACE property and backfilling with clean fill;
- Transporting and disposing of excavated contaminated soils at a Subtitle C facility (or Subtidal D depending on additional characterization);
- Replacing underground utilities if needed; and
- Restoring the Site, including impervious surfaces.

A restrictive covenant may be required if residual contamination is observed beneath any permanent structures.

Compliance monitoring would include soil verification samples from the sidewalls and base of the excavation. Replacement groundwater monitoring wells would be installed to replace those removed during the excavation. For this FS, we assumed groundwater monitoring would continue for 5 years after completion of the removal activities while the restrictive covenant is in place. This monitoring

would not be required if contamination does not extend under any permanent structures or if monitoring results demonstrate that the residual soil impacts have not impacted groundwater.

The estimated cost for Alternative 4 is $14,800,000 (Table D-1).

7.2.5 Alternative 5 – Interim Action, Hot Spot Excavation, Treatment Wall Installation with Institutional Controls, and Compliance Monitoring

This alternative, a combination of Alternatives 2 and 3, would be implemented after the PCB-removal IA. It would include hot spot excavation and (contingently) treatment wall (PRB) installation. Hot spot excavation would target specific areas across the Site where COC concentrations exceeding MTCA Methods A or B cleanup levels have been identified. The proposed excavation locations are detailed in Section 5.4. After hot spot removal, compliance monitoring would begin to verify the effectiveness of the removal action. If exceedances continued to be detected, the treatment wall contingency would be implemented. Treatment walls are typically constructed by excavating a trench and backfilling with a mixture of reactive/sorptive materials and sand or a slurry, and are designed to treat groundwater as it flows along its natural gradient. The reactive/sorptive materials would be similar to those used in the existing 2003 treatment wall (ZVI and GAC).

The excavation would remove hot spots 1 through 4, in total an area of approximately 4,800 square feet (Figure 4). The excavation would extend to approximately 10 feet bgs in Area 1, 8 feet bgs in Area 2, 18 feet bgs in Area 3, and 8 feet bgs in Area 4. The estimated total excavation volume is approximately 2,000 cubic yards. Excavation would be offset from the edge of any permanent structures to avoid undermining foundation stability. This alternative does not directly address contaminated soil that may be present underneath any buildings on the Site. If confirmational sampling were to find residual COCs underneath buildings, institutional controls would be put in place to limit or prohibit COC exposure pathways in these areas. Additional site characterization is needed before hot spot excavation to further delineate the limits of hot spot areas. Appropriate site characterization would reduce uncertainties associated with these areas.

The contingent PRB would extend along the property line adjacent to the Ship Canal (Figure 5), so the groundwater would be treated before it migrated off the Site. The soils excavated for the wall would be disposed of in an appropriately licensed and permitted off-site landfill facility. The excavation area would be approximately 2,400 square feet (Figure 5). The depth of the trench excavation would extend to the clay-silt layer at approximately 18 feet bgs. The estimated excavation volume is approximately 1,600 cubic yards. To determine whether the treatment wall were necessary and feasible, an assessment for the potential of impacted groundwater to reach the surface water and sediment would be needed before remedial implementation.

Implementing this alternative would require:

- Removing Site obstructions such as pavement, existing wells, and buried utilities;

- Mobilizing, operating, and subsequently demobilizing trench excavation and supporting materials and equipment (e.g., decontamination equipment, temporary fencing, excavator, dump trucks, backfill materials);
- Transporting and disposing of excavated contaminated soils at a Subtitle C facility (or Subtidal D depending on additional characterization);
- Placing a chemical oxidant in the base of the Area 2 excavation to treat residual contamination;
- Compliance groundwater monitoring;
- If necessary, designing and building the treatment wall via trenching and backfilling with reactive/sorptive materials;
- Replacing underground utilities if needed; and
- Restoring the Site, including re-installing monitoring wells and impervious surfaces.

If the PRB is installed, the groundwater monitoring wells removed during the excavation would be replaced and/or additional wells would be installed to provide points of compliance. Compliance monitoring would include groundwater monitoring for regulatory compliance and engineering performance.

Institutional controls would be similar to those for Alternative 1. We assumed groundwater monitoring would continue for 20 years after the removal activities were complete, while the restrictive covenant is in place.

The estimated cost for Alternative 5 is $1.91 million for the hot spot removal alone, and $6.73 million for both the hot spot removal and treatment wall contingency (Table D-1).

8.0 MTCA EVALUATION CRITERIA

The MTCA requires four threshold requirements to be met for an alternative to be considered for selection as a remedy. Three other requirements are then used to further evaluate the alternatives that satisfy the threshold criteria. Finally, several action-specific requirements—which vary depending on the nature of the Site and the alternatives being considered—are used to further refine the remedy selection. Each of these MTCA evaluation criteria is described below.

8.1 MTCA Threshold Criteria

8.1.1 Protect Human Health and the Environment

The alternative must provide for overall protection of human health and the environment.

8.1.2 Comply with Cleanup Standards

The alternative must comply with cleanup standards (cleanup levels and the points of compliance where such cleanup levels must be met) as established in WAC 173-340-700 through 173-340-760.

8.1.3 Comply with Applicable State and Federal Laws

The alternative must comply with both applicable requirements and requirements determined to be relevant and appropriate, as defined through WAC 173-340-710.

8.1.4 Provide for Compliance Monitoring

The alternative must provide for compliance monitoring, as established under WAC 173-340-410 and WAC 173-340-720 through 173-340-760.

8.2 Other Requirements

8.2.1 Use Permanent Solutions to the Maximum Extent Practicable

As outlined in WAC 173-340-360(3), evaluation of this requirement involves conducting a disproportionate cost analysis (DCA), wherein the costs and benefits of each alternative are assessed, as defined by several evaluation criteria. The specific criteria that must be evaluated are specified in WAC 173-340-360(3)(f) and are discussed below.

Protectiveness. The overall protectiveness provided by the alternative to human health and the environment, including the degree to which existing risks are reduced, the time required to reduce risk at the site and attain cleanup standards, the on-site and off-site risks resulting from implementing the alternative, and the improvement of the overall environmental quality provided by the alternative, are evaluated against this criterion.

Permanence. This criterion evaluates the degree to which the alternative permanently reduces the toxicity, mobility, or volume of hazardous substances, including the adequacy of the alternative in destroying the hazardous substances, the reduction or elimination of hazardous substance releases and sources of releases, the degree of irreversibility of waste treatment processes, and the characteristics and quantity of treatment residuals generated.

Cost. This criterion evaluates the costs associated with the alternative, including direct capital costs (e.g., construction, equipment, land, services), indirect capital costs (e.g., engineering, supplies, contingency), long-term monitoring costs, O&M costs, and periodic costs. This is necessary so that the relative cost of each alternative can be evaluated to help identify the most practicable cleanup alternative using the DCA procedures presented in WAC 173-340-360(3)(e) and summarized below.

One of the primary goals in developing cost estimates for alternative evaluation is to ensure that costing procedures and assumptions are consistent between alternatives to reduce the potential for bias in one alternative assumption compared to other alternative assumptions. This approach presents a level playing field when evaluating the cost of one alternative versus costs for other alternatives. This cost estimating approach is appropriate for FS costs. However, because of the conservative approach

to estimating mass and area, FS cost estimates are not appropriate for use in other applications. Cost estimates that are more accurate will be developed during remedial design as part of the bidding and contractor selection process.

Effectiveness over the Long Term. Long-term effectiveness includes the degree of certainty that the alternative will be successful, the reliability of the alternative during the period of time hazardous substances are expected to remain on site at concentrations that exceed cleanup levels, the magnitude of residual risk with the alternative in place, and the effectiveness of controls required to manage treatment residues or remaining wastes. The following types of cleanup action components can be used as a guide, in descending order, when assessing the relative degree of long-term effectiveness: reuse or recycling; destruction or detoxification; immobilization or stabilization; on-site or off-site disposal in an engineered, lined, and monitored facility; on-site isolation or containment with attendant engineering controls; and institutional controls and monitoring.

Management of Short-Term Risks. This criterion evaluates the risk to human health and the environment associated with the alternative during construction and the effectiveness of measures taken to manage such risks.

Technical and Administrative Implementability. This criterion assesses the ability of the alternative to be implemented, including consideration of whether the alternative is technically possible; availability of necessary off-site facilities, services, and materials; administrative and regulatory requirements; scheduling; size; complexity; monitoring requirements; access for construction operations and monitoring; and integration with existing site operations and other current or potential remedial actions.

8.2.1.1 The Disproportionate Cost Analysis Procedure

Alternatives that meet threshold requirements for cleanup actions are assessed to determine which use permanent solutions to the maximum extent practicable per WAC 173-340-360(3). This assessment is conducted by performing a DCA.

To conduct the DCA, the alternatives are evaluated for degree of permanency and the alternative that provides the greatest degree of permanence shall be the baseline cleanup action alternative (WAC 173-340-360[3][e][ii][B]). For the purposes of this FS, we have identified Alternative 4 as the cleanup action with the greatest degree of theoretical permanency (as defined in WAC 173-340-200 for permanent cleanup actions). Alternatives 5 and 2 have the next greatest degrees of permanency, in descending order.

The alternatives are compared by evaluating the following cost/benefit criteria: protectiveness, permanence, cost, effectiveness over the long term, management of short-term risks, and technical and administrative implementability. These evaluation criteria were defined in Section 8.2.1. The regulation gives a general discussion of the types of factors to consider when evaluating each criterion.

When assessing whether a cleanup action uses permanent solutions to the maximum extent practicable, the test used (WAC 173-340-360[3][e][i]) is as follows:

> *Costs are disproportionate to benefits if the incremental costs of the alternative over that of a lower cost alternative exceed the incremental degree of benefits achieved by the alternative over that of the other lower cost alternative.*

As stated in WAC 173-340-360(3)(3)(ii)(C):

> *The comparison of benefits and costs may be quantitative, but will often be qualitative and require the use of best professional judgment. In particular, the department has the discretion to favor or disfavor qualitative benefits and use that information in selecting a cleanup action. Where two or more alternatives are equal in benefits, the department shall select the less costly alternative provided the requirements of subsection (2) of this section are met.*

8.2.2 Provide for a Reasonable Restoration Time Frame

Cleanup actions must provide for a reasonable restoration time frame. As laid out in WAC 173-340-360(4), determining whether an alternative provides for a reasonable restoration time frame involves balancing Site risks against the practicability of achieving a shorter time frame. A longer restoration time frame may be selected if the remedy has a greater degree of long-term effectiveness; however, extending the restoration time frame cannot be used as a substitute for active remedial measures when such actions are practicable. The factors considered in evaluating whether restoration time frame is reasonable include:

- The potential risks posed by the site to human health and the environment;
- The practicability of achieving a shorter restoration time frame;
- Current uses of the site, surrounding areas, and associated resources that are or may be affected by releases from the site;
- Potential future uses of the site, surrounding areas and associated resources that are or may be affected by releases from the site;
- Availability of alternative water supplies;
- Likely effectiveness and reliability of institutional controls;
- Ability to control and monitor migration of hazardous substances from the site;
- Toxicity of the hazardous substances; and
- Natural processes that reduce concentrations of hazardous substances and have been documented to occur at the site or under similar site conditions.

8.2.3 Consider Public Concerns

Consideration of public concerns is mandated under the MTCA cleanup regulation for a cleanup action led by Ecology or a potentially liable person under an Agreed Order or Consent Decree. For this cleanup, Ecology will provide a mandatory public review and comment period on a proposed cleanup action plan; therefore, this criterion was not evaluated at this time.

8.3 Action-Specific Requirements

A number of action-specific requirements are also listed in WAC 173-340(2)(c) through (h), although not all of these requirements are applicable to the Site. The action-specific requirements are described below.

8.3.1 Groundwater Cleanup Actions

This requirement is applicable to situations in which cleanup levels for groundwater cannot be achieved within a reasonable restoration time frame.

8.3.2 Soil at Current or Potential Future Residential Areas and Childcare Centers

Specific requirements pertaining to soil cleanup at current or potential future residential areas and childcare centers are found in WAC 173-340-360(2)(b). These requirements relate to soil cleanup levels established for human health protection.

8.3.3 Institutional Controls

Institutional controls must comply with the specific requirements of WAC 173-340-440 and should demonstrably reduce risks to ensure a protective remedy. A remedy should not rely primarily on institutional controls and monitoring where it is technically possible to implement a more permanent cleanup action for all or part of a Site. For complete details, see WAC 173-340-360(2)(e).

8.3.4 Releases and Migration

Cleanup actions should prevent or minimize present and future releases and migration of hazardous substances in the environment; see WAC 173-340-360(2)(f).

8.3.5 Dilution and Dispersion

Cleanup actions should not rely primarily on dilution and dispersion unless the incremental costs of any active remedial measures over the costs of dilution and dispersion grossly exceed the incremental degree of benefits of active remedial measures over the benefits of dilution and dispersion; see WAC 173-340-360(2)(g).

8.3.6 Remediation Levels

Remediation levels are defined as the particular concentration of a hazardous substance in any media above which a particular cleanup action component will be required as part of a cleanup action at the Site; see WAC 173-340-200. Specific requirements pertaining to use of remediation levels are in

WAC 173-340-360(2)(h). The alternatives being considered in this evaluation do not involve use of remediation levels; therefore, this requirement is not relevant.

9.0 EVALUATION OF REMEDIATION ALTERNATIVES

The remediation alternatives were evaluated to determine a practicable approach for addressing COC impacts to soil and groundwater at the Site. Many data gaps remain, making any formal evaluation of potential remediation alternatives incomplete; however, a general evaluation of the alternatives provides a framework to use in evaluating long-term remediation and characterization goals.

The alternatives evaluation looks at the capability of the alternatives to meet threshold requirements, whether they use permanent solutions to the maximum practicable extent (DCA), and whether the restoration time frames they achieve are reasonable. Site conditions and the alternatives evaluation are discussed below and summarized in Tables 9 and 10.

9.1 Data Summary

Site COCs present a risk to the neighboring waterbody, the Ship Canal. The PCB and chlorinated benzene impacts in the IA Area present the greatest risk to this receptor. The planned IA will remove the bulk of the source material in this area (Figure 2), and the existing treatment wall will limit residual contaminant migration. Assuming the IA successfully removes most of the PCB and chlorinated benzene mass, we expect gradual attenuation of groundwater downgradient of the IA Area. However, the time needed for NA to achieve RAOs in the shallow and deep aquifer will be considerable, and the NA rate may be influenced by COCs identified in hot spots located outside of the IA Area.

Four areas located south and west of the IA Area contain soil and groundwater COCs exceeding applicable screening levels and are considered hot spots (Figure 16). These areas are not adequately delineated. With the exception of the JT-US-47 hot spot, contamination generally appears to be confined to near-surface areas; however, PCB detections in samples from the deep aquifer at IW-8D suggest contaminant migration has likely occurred near the JT-US-53 hot spot.

Because COCs in soil and groundwater are widespread and identifiable point sources are lacking, identified COCs are likely a result of area-wide deposition related to past industrial activities at the Site, neighboring properties, and in the general vicinity of the Ship Canal. Site hot spots are likely related to releases that occurred during historical industrial activities, before the Site was paved. It is likely that similar hot spots and low-level impacts are present throughout the industrial area bordering the Ship Canal.

Site COC concentrations exceed surface water protection criteria throughout the Site; however, COC concentrations in groundwater from wells closest to the Ship Canal are relatively low. Adjacent sediment is impacted above the SCO level, but below the CSL, with the exception of one mercury detection. As noted previously, sediment PCB concentrations in other portions of the Ship Canal are similar to concentrations measured in sediment adjacent to the Jacobson Site during this RI. Additional sampling at the groundwater/surface water interface and/or calculation of screening levels that take

into account site-specific dilution factors may be needed to accurately assess short-term risk to the Ship Canal.

9.2 Threshold Requirements Evaluation

Threshold requirements required for cleanup actions are defined in WAC 173-340-360(2) (see Section 8.1). Requirements include protection of human health and the environment, compliance with MTCA cleanup standards and applicable state and federal laws, and provisions for compliance monitoring. Since compliance monitoring is a part of each alternative, the alternatives are considered equal in this respect and are not evaluated further for this criterion. Each alternative is briefly summarized and evaluated below. Table 9 summarizes the evaluation results.

9.2.1 Alternative 1 – Interim Action, Natural Attenuation with Institutional Controls, and Compliance Monitoring

Alternative 1, detailed in Section 7.2.1, relies on NA and institutional controls to attain cleanup objectives. It likely does not meet the MTCA threshold criteria outlined in Section 8.1. It would likely be protective of human activities not associated with construction and/or subsurface disturbance at the Site, but based on available information, would not protect adjacent surface waters. Surface water cleanup standards are currently exceeded and the Site COCs would not naturally attenuate in a reasonable time frame under Alternative 1 (particularly for PCBs and metals). Implementation of this alternative would not address the ongoing risk to aquatic receptors.

The planned IA will likely remove most of the PCB mass from the Site, but additional impacted areas, currently uncontrolled, will not be addressed. Evaluation of the downgradient sediment and surface water receptors is not complete. While sediment data collected during this RI suggest relatively low adverse effects to aquatic organisms, additional data are needed to determine whether COCs are significantly impacting surface water adjacent to the Site. If it is found that upland contaminant migration is not significantly impacting adjacent surface water, Alternative 1 may provide an adequate level of short-term protection until Site conditions are favorable (e.g., if there is redevelopment in the future) for implementation of a comprehensive cleanup action.

9.2.2 Alternative 2 – Interim Action, Hot Spot Excavation with Institutional Controls, and Compliance Monitoring

Alternative 2, detailed in Section 7.2.2, involves removal of impacted soil in identified hot spots to attain cleanup objectives. It is not known whether the MTCA threshold criteria outlined in Section 8.1 would be achieved. This alternative would be protective of human health during activities not associated with construction and/or subsurface disturbance at the Site; however, based on available information, it is not clear whether it would provide permanent protection to adjacent surface water and sediment. Surface water screening criteria are currently exceeded but Site COCs would likely attenuate within a reasonable time frame after implementation of Alternative 2.

Combined with the planned IA, Alternative 2 would remove a significant quantity of contaminant mass in soil and groundwater. However, there is a significant risk that if this alternative were implemented,

additional hot spots or low-level impacts exceeding conservative surface water screening criteria could be discovered. Additionally, it is possible that off-site contaminant sources, such as residual contamination along the USACE property boundary and on the Market Street property, will continue to impact the Site, potentially reducing the effectiveness of this alternative. Given the widespread low-level detection of COCs in soil and groundwater at the Site, additional characterization would be necessary to verify that this action would be sufficient to reduce groundwater concentrations to below surface water cleanup levels.

If the identified data gaps could be adequately addressed, removal of hot spots would likely be protective of surface water and sediment, meet the MTCA threshold criteria, and have the most favorable cost-benefit ratio.

9.2.3 Alternative 3 – Interim Action, Treatment Wall and Extension with Institutional Controls, and Compliance Monitoring

This alternative, described in Section 7.2.3, involves construction of a groundwater treatment wall along the southern and eastern portions of the Site, where it borders the Ship Canal. This wall would react with or entrap most groundwater COCs passing through it. Alternative 3 meets the MTCA threshold criteria outlined in Section 8.1. It would likely be protective of human health during activities not associated with construction and/or subsurface disturbance at the Site, and would provide long-term protection to adjacent surface waters; however, a treatability study would be required before implementation to assess its effectiveness. Surface water cleanup standards are currently exceeded; under this alternative, Site COCs would likely attenuate before groundwater was discharged to the Ship Canal after the treatment wall was installed. Hot spot contaminant mass would not be reduced, so COC concentrations in upgradient soil and groundwater would remain above cleanup levels.

Combined with the planned IA, this alternative would be more protective than Alternative 1 and 2, and would provide short- and long-term protection to the Ship Canal. COC migration in groundwater through the deeper aquifer and vapor intrusion concerns may not be addressed by this alternative, so further evaluation would be required. Alternative 3 would be a less permanent approach than Alternative 2, and would require long-term maintenance and future remediation to address upgradient COCs. Institutional controls would be required to maintain the wall and asphalt cap to provide long-term protectiveness.

9.2.4 Alternative 4 – Interim Action, Excavation of Soil Exceeding RAOs with Institutional Controls, and Compliance Monitoring

This alternative is detailed in Section 7.2.4 and involves removal of impacted soil from all areas of the Site not covered by existing structures. Alternative 4 meets the MTCA threshold criteria outlined in Section 8.1. It would likely be protective of human health during activities not associated with construction and/or subsurface disturbance beneath existing buildings, and would provide long-term protection to adjacent surface waters. Compliance monitoring and institutional controls would still be needed to monitor potential residual contamination beneath Site structures and to maintain future protectiveness.

Combined with the IA, this alternative would remove most of the contaminant mass, and groundwater COC concentrations would likely fall below cleanup levels. This alternative would not address upgradient contaminant sources that could recontaminate the Site or potential residual impacts beneath Site structures.

9.2.5 Alternative 5 – Interim Action, Hot Spot Excavation, Treatment Wall Installation with Institutional Controls, and Compliance Monitoring

Alternative 5, detailed in Section 7.2.5, combines Alternatives 2 and 3, which involve excavation of identified hot spot areas and contingent construction of a groundwater treatment wall along the southern and eastern portions of the Site. Alternative 5 meets the MTCA threshold criteria outlined in Section 8.1. It would likely be protective of human health during activities not associated with construction and/or subsurface disturbance at the Site, and would provide long-term protection to adjacent surface waters; however, a treatability study would be required before implementation to assess its effectiveness. Surface water cleanup standards are currently exceeded; under this alternative, Site COCs would likely attenuate before groundwater was discharged to the Ship Canal after the treatment wall was installed.

Combined with the planned IA, Alternative 5 would be more protective than Alternatives 1, 2, or 3. Alternative 5 would remove a significant quantity of contaminant mass in soil and groundwater and would provide short- and long-term protection of the Ship Canal. However, additional characterization would be needed before implementation to delineate the impacted soil and groundwater areas and determine whether the planned removal action would be effective in these areas. Additionally, there is a high likelihood that off-site contaminant sources, such as residual contamination along the USACE property boundary and on the Market Street property and potential residual impacts beneath Site structures would continue to impact the Site, potentially reducing the effectiveness of this alternative. COC migration in groundwater through the deeper aquifer might not be addressed by Alternative 5, so further evaluation would be required. Institutional controls would be required to maintain the wall and asphalt cap to provide long-term protectiveness.

9.3 Disproportionate Cost Analysis

The DCA assesses whether the alternatives use permanent solutions to the maximum extent practicable, per WAC 173-340-360(3). For the purposes of this FS alternatives evaluation, it is assumed that upland contaminant sources are unacceptably impacting the adjacent aquatic environment. If it can be demonstrated that existing Site conditions outside of the IA Area will not result in future aquatic impacts, this evaluation of applicable cleanup alternatives should be revised.

Although Alternative 1 likely does not meet MTCA threshold requirements, it is included in the DCA because the groundwater to surface water/sediment pathway has not been confirmed to be complete. The DCA criteria are described in Section 8.2.1.1, and the results of the analysis are summarized in Table 10.

9.3.1 Protectiveness

The alternatives each include physical and administrative controls (i.e., capping under impervious surfaces and environmental covenants) that reduce the potential for human exposure to COCs in the subsurface. Alternatives 2 through 5 use source control and/or a treatment wall to improve groundwater quality and reduce potential impacts to adjacent surface water and sediment. Alternative 4 is the most protective of the alternatives because it removes all accessible contaminant mass in soil and groundwater immediately. The next-most protective is Alternative 5, which includes both source control and implementation of a treatment wall. Alternatives 2 and 3 are less protective than Alternatives 4 and 5, and Alternative 1 is the least protective. However, Alternatives 1 and 2 could be as protective as Alternative 5, depending on the results of potential follow-up investigations to address data gaps identified in Section 4.4.

9.3.2 Permanence

Alternatives 2, 4, and 5 include removal and off-site disposal of COC-impacted material from the Site, which would reduce potential sources of contamination. However, since only soil hot spot areas are removed in Alternatives 2 and 5, as opposed to removal of all accessible impacted soil in Alternative 4, Alternatives 2 and 5 have a greater likelihood of leaving residual contamination in place at the Site. The treatment wall in Alternative 3 would control contaminant mobility in groundwater and reduce contaminant toxicity, but this alternative would not include removal of upgradient contaminant sources outside of the Interim Action Area. Alternative 5 combines the benefits of Alternatives 2 and 3; it would provide some contaminant source control and reduce the mobility and toxicity of groundwater COCs. Alternative 1 would not reduce the mobility of COCs, and any reduction in COC toxicity or volume would be limited and would occur over a long period of time. Of the alternatives presented, Alternatives 4 and 5 would provide the greatest degree of theoretical permanence, followed by Alternative 2.

9.3.3 Cost

The net present value costs of implementing Alternatives 1 through 5 are estimated to total approximately $427,000, $1,910,000, $5,490,000, $14,800,000, and $1,910,000 ($6,730,000 with treatment wall), respectively, assuming a feasibility study accuracy range of –35 to +50 percent (EPA 2000). The components of these costs and assumptions made in the estimates are detailed in Appendix D.

9.3.4 Effectiveness over the Long Term

Alternative 4 (and Alternative 2 and 5 to a lesser degree) would permanently remediate soil and remove potential groundwater contaminant source areas. Off-site disposal of soil in an engineered, lined, and monitored landfill facility is expected to be effective over the long term. Alternatives 3 and 5 would provide long-term effectiveness for groundwater treatment but only Alternative 5 would address potential upgradient contaminant source areas. Alternative 4 would provide the greatest long-term effectiveness, followed by Alternatives 5, 3, 2, and 1, in decreasing order of effectiveness.

9.3.5 Management of Short-Term Risks

Short-term risks to workers during implementation of Alternatives 2 through 5 may be reduced by adherence to a health and safety plan (HASP) prepared specifically for the planned work and expected conditions at the Site. HASP procedures have been shown to effectively manage the limited risk associated with these activities.

Alternatives 2 through 5 employ relatively common on-site construction activities and entail similar short-term risks. However, the handling and off-site transport of contaminated soil pose additional short-term risks, such as potential direct-contact exposure risk to the transport personnel and risk of cross-contamination if material is lost or spilled during transport. For these reasons, Alternative 4 has the greatest short-term risk, followed by Alternative 5. Alternatives 2 and 3, which also involve off-site transport of waste material but involve lesser quantities, pose less short-term risk than Alternatives 4 and 5. Alternative 1 presents the least short-term risk.

9.3.6 Technical and Administrative Implementability

The technologies employed in each of the remediation alternatives are common to the construction industry, and, with controls in place to prevent worker exposure, can be readily implemented. The Site is in an urban waterfront area and is bordered by commercial, industrial, and governmental facilities. Nearby access to services, materials, supplies, and skilled labor should be readily available.

The earthwork and hauling required for Alternatives 2 through 5 may be staged to limit disruptions to the local infrastructure to the extent practicable, but some amount of business and traffic disruptions are likely to occur. Alternative 4 would produce the greatest amount of disruption because of the large scale of the work, followed by Alternative 5 and Alternatives 2 and 3 to a slightly lesser degree. Alternative 1 does not involve construction and thus would not cause disruptions.

Alternative 4, which involves full-site excavation, would need to overcome greater technical obstacles during excavation because underground utilities and aboveground structures would need to be managed or protected. Alternatives 3 and 5, which include treatment wall construction, may be more complex to design than Alternatives 2 and 4, which involve only excavation and backfilling. Alternatives 2 through 5 would require characterization and acceptance of the contaminated soil waste by the disposal facility. Alternatives 2, 3, and 5 would require additional site characterization to better delineate soil impacts and to verify the groundwater to surface water/sediment exposure pathway. All of the alternatives would require obtaining an environmental covenant for the residual COCs potentially remaining at the Site.

The five alternatives are technically and administratively implementable. Alternative 1 is the most implementable of the five alternatives, since it requires relatively simple design, does not involve construction work, and would not disrupt business operations. Alternative 4 is the least implementable because of the large scale of the work and the proportionate complexity. Alternative 5 is more implementable than Alternative 4 but is less implementable than Alternatives 2 and 3, which have about equal implementability.

9.3.7 Disproportionate Cost Analysis Conclusions

Under MTCA, the most practicable permanent solution is to be used as the baseline against which other alternatives are compared. Alternative 4 was judged the most permanent practicable solution and was used as the baseline for this comparison. Although Alternative 4 is the most permanent, Alternative 5 was judged to use permanent solutions to the maximum extent practicable, following the DCA completed above. Alternative 4 has significantly higher costs than Alternative 5 for minimal increase in protectiveness.

Alternative 5 may present more short-term risks and challenges during implementation than would the other alternatives. Risks would be related to the off-site transport of contaminated soil, and challenges would include disruption to local businesses. However, using the DCA criteria to compare all five alternatives, Alternative 5 was found to be:

- Equally or more protective,
- Equally or more permanent, and
- Equally or more effective over the long term.

9.4 Restoration Time Frame Evaluation

Remedial alternatives must provide for a reasonable restoration time frame as stipulated in WAC 173-340-360(2)(b)(ii). Several factors (summarized in Section 8.2.2) are considered in determining a reasonable time frame (WAC 173-340-360[4][b]). Below, the restoration time frames potentially achieved by Alternatives 1 through 5 are evaluated. Table 9 summarizes the results of the evaluation.

The five remediation alternatives can successfully address the exposure risk posed by the soil COCs in the areas of concern (via excavation and/or capping). However, Alternatives 3 and 5 use treatment wall installation to address groundwater contaminant migration and exposure risk, which the other alternatives do not address. Alternative 4 provides the most permanent remedy, although all of the alternatives leave residual contamination in place to various extents. NA processes may slowly reduce concentrations of some contaminant types; however, in Alternatives 1 and 2, where groundwater contaminant migration is not controlled, relying on NA processes to reduce contaminant concentrations would require an unreasonably long time. The restoration time frames of Alternatives 1 and 2 could practicably be shortened by adding additional treatment technologies (such as the groundwater treatment wall described in Alternative 5) or expanding the technology used (such as greater excavation volume outlined in Alternative 4). Otherwise, after addressing the identified data gaps to fully characterize hot spots and the groundwater to surface water migration pathway, sufficient evidence would need to be provided to support Alternatives 1 or 2 without additional remedial technologies.

The construction work in Alternatives 2 through 5 may disrupt other operations at the Site and potentially expose workers and Site visitors to uncovered or excavated contaminated soil. However, such disruptions would be limited to the construction periods needed to implement the remediation alternatives, which are assumed to require no longer than one construction season. Best management

practices would be employed during construction to control potential risks and disruptions associated with the work.

The current and assumed future use of the property is as a marine terminal. There is potential for surrounding areas and associated resources to be affected by releases from the Site, such as through the groundwater to surface water/sediment exposure pathway. However, it remains to be confirmed that this pathway is complete through additional site investigations. In Alternatives 2 through 5, future releases are mitigated by either removing contaminant mass from the Site, containing it in place, or by destroying or immobilizing it via in situ groundwater treatment. Where contaminant mass is contained in place, institutional controls would be implemented, which would include filing an environmental covenant for the property, maintaining fencing around the Site to limit access, and educating site personnel about the condition of the areas of concern and associated risks. These types of institutional controls are commonly applied and have been shown to be effective and reliable.

10.0 CONCLUSIONS AND PREFERRED REMEDIATION ALTERNATIVE

PCBs and other COCs are present in soil, groundwater, and sediment at several locations on the Site at concentrations exceeding applicable screening criteria. The planned IA to address the main PCB plume will remove the bulk of the upland contaminant mass and will likely reduce downgradient COC groundwater concentrations. However, soil and groundwater contamination identified by this RI will continue to exceed surface water protection screening criteria after the IA.

Bioassay results do not indicate that upland discharges from the Jacobson Site significantly impact sediment adjacent to the Ship Canal, but COC concentrations in sediment adjacent to the Ship Canal generally exceed the SCO (and mercury exceeds the CSL). Our analysis of sediment data from other areas of the Ship Canal shows that PCB Aroclors found adjacent to the Site are common in Ship Canal sediments, indicating that sediment impacts likely have regional sources and/or are residuals from legacy contamination (historical industrial activities at the Site and surrounding properties). Therefore, sediment remediation is not a component of the proposed remedial action.

The ability of each remediation alternative to meet applicable MTCA criteria is evaluated in the preceding sections and is presented in Tables 9 and 10. The remediation alternative that most closely satisfies the threshold criteria and other MTCA requirements outlined in Sections 8.1 and 8.2 is the preferred alternative for the Site. Based on the evaluation of alternatives presented in Section 9, the preferred remediation alternative if groundwater is shown to be impacting the adjacent aquatic environment is Alternative 5, which involves hot spot excavation and off-site disposal in a Subtitle C landfill facility (or Subtitle D depending on additional characterization); institutional controls; compliance monitoring; and a treatment wall construction contingency.

Combined with the IA, Alternative 5 would establish partial source control by removing identified sources of COCs. Additionally, if compliance monitoring indicates that a treatment wall is necessary, this alternative would reduce residual contaminant mass migration to adjacent surface water and

sediment and achieve groundwater protectiveness at the conditional point of compliance. Residual contamination would be capped by impervious surfaces to reduce human exposure.

The hot spot excavations would reduce toxicity permanently by removing soil in the most heavily impacted areas of the Site. If the treatment wall were in place, there would be a low risk that residual contaminants would migrate to the Ship Canal, because groundwater would be treated in situ before discharge. Groundwater toxicity would likely be reduced through chemical and physical processes while the wall was in place and properly maintained.

Additional site characterization would be needed before implementing the selected remedial action plan. The estimated cost for Alternative 5 with installation of the treatment wall is $6.73 million (−35 to +50 percent). A detailed cost estimate is provided in Appendix D for the conceptual remediation alternative. Without the treatment wall, the estimated cost of Alternative 5 would be $1.91 million, as shown in Appendix D. Estimated costs will be further refined in the remedial design stage of the cleanup action.

Cleanup action implementation will be further developed in the remedial design documents. Ecology will provide public notice and an opportunity for the public to review and comment on this draft final RIFS and the subsequent DCAP, as required under WAC 173-340-600. The detailed design phase including developing the engineering design report and project plans and specifications would occur after the public review process has been completed and public comments addressed. A schedule for the additional soil, groundwater, and sediment characterization and cleanup action implementation has not been determined.

11.0 REFERENCES

Aspect 2003. Draft Cleanup Action Plan, Jacobson Terminals. Prepared for A&B Jacobson, LLC, by Aspect Consulting LLC. August 27, 2003.

Aspect 2004. Construction Report, Reactive/Sorptive Wall Groundwater Treatment System, Jacobson Terminals Site Memorandum. Prepared for A&B Jacobson, LLC, by Aspect Consulting LLC. February 17, 2004.

Ecology 1994. Natural Background Soil Metals Concentrations in Washington State Toxics Cleanup Program Department of Ecology. Publication #94-115. October 1994.

Ecology 1996. Chemical Contaminants in Salmon Bay Sediment Results of Phase II Sampling. Ecology Publication No. 96-343. November 1996.

Ecology 2004. Determining Compliance with Method A Cleanup Levels for Diesel and Heavy Oil. June 17, 2004.

Ecology 2008. Sediment Sampling and Analysis Appendix. Guidance on the Development of Sediment Sampling and Analysis Plans Meeting the Requirements of the Sediment Management Standards (Chapter 173-203 WAC). Ecology Publication No. 03-09-043. Revised February 2008.

Ecology 2009. Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action. Ecology Publication No. 09-09-047. October 2009.

Ecology 2011. Urban Seattle Area Soil Dioxin and PAH Concentrations Initial Summary Report. Ecology Publication No. 11-09-049. September 2011.

Ecology 2013. Sediment Management Standards (Chapter 173-204 WAC) Ecology Publication No. 13-09-055. Revised February 2013.

EMCON 1996. Interim Report on Independent Cleanup, 2801 Northwest Market Street, Seattle, Washington. Prepared for Fentron Building Products, Inc., by EMCON. December 1996.

EPA 1988. Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites. Environmental Protection Agency, Office of Solid Waste and Emergency Response Publication 9200.2-154 (June 2015).

EPA 2000. A Guide to Developing and Documenting Cost Estimates During the Feasibility Study. US Environmental Protection Agency. EPA 540-R-00-002, OSWER 9355.0-75. July 2000.

EPA 2015. OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air. Environmental Protection Agency, Office of Solid Waste and Emergency Response. EPA/540/G-88/003.

Hart Crowser 1997. Petroleum-Contaminated Soil Removal, Lake Washington Ship Canal, Seattle, Washington. Prepared for Seattle District Army Corps of Engineers and Jacobson Terminals, Inc., March 1997.

Hart Crowser 1999. Cleanup Action Plan Market Street Property, Seattle, Washington. Prepared for A&B Jacobson, LLC, by Hart Crowser. June 22, 1999.

Hart Crowser 2000. Construction Report, Zero-Valent Iron Groundwater Treatment Wall, prepared by Hart Crowser. January 14, 2000.

Hart Crowser 2013. Jacobson Terminals Data Gap Report Seattle, Washington. Prepared for Washington State Department of Ecology by Hart Crowser. December 20, 2013.

Hart Crowser 2014a. Jacobson Terminals Draft Interim Action Work Plan Seattle, Washington. Prepared for Washington State Department of Ecology, by Hart Crowser. July 1, 2014.

Hart Crowser 2014b. Jacobson Terminals Remedial Investigation Work Plan Seattle, Washington. Prepared for Washington State Department of Ecology by Hart Crowser. November 24, 2014.

PSEP 1986. Recommended Protocols for Measuring Conventional Sediment Variables in Puget Sound. Prepared for U.S. Environmental Protection Agency Region 10, Office of Puget Sound, Seattle, WA. Tetra Tech, Inc., Bellevue, WA.

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Table 2a – 2014 RI/FS Soil Sample Analytical Results

Sample ID	MTCA	JT-MW-01S-S2		JT-MW-01S-S3		JT-MW-01S-S4		JT-MW-01S-S5		JT-MW-03D-S1		JT-MW-03D-S2		JT-MW-03D-S3		JT-MW-03D-S4		JT-MW-03D-S5		JT-MW-04D-S1		JT-MW-04D-S2		JT-MW-04D-S3		JT-MW-04D-S4		JT-MW-04D-S5	
Sampling Date	Method B Soil	12/16/2014		12/16/2014		12/16/2014		12/16/2014		12/15/2014		12/15/2014		12/15/2014		12/15/2014		12/15/2014		12/16/2014		12/16/2014		12/16/2014		12/16/2014		12/16/2014		
Depth in feet	Screening Level[a]	7.5 to 9		12.5 to 14		17.5 to 19		20 to 21.5		5 to 6.5		12.5 to 14		17.5 to 19		20 to 21.5		25 to 26.5		5 to 6.5		15 to 16.5		17.5 to 19		20 to 21.5		25 to 26.5	
Conventionals in %																													
Total Organic Carbon		**0.517**		**0.214**		**0.079**		**0.143**	J																				
Metals in mg/kg																													
Arsenic	7[b]	**2.9**		**4.5**		**1.7**		**1.8**		**8.3**		**2.9**		**8.1**		**7.9**													
Cadmium	5.6	0.1	U	0.1	U	0.1	U	0.1	U	**0.4**		0.1	U	0.1	U	0.1	U												
Chromium	2000[c]	**21.9**		**26.6**		**25.5**		**22.3**		**70.5**		**20.3**		**25.1**		**24**													
Lead	250[c]	**3.1**		**2**		**1.5**		**2.1**		**79.9**		**1.6**		**3.3**		**6.9**													
Mercury	0.146	**0.02**		0.02	U	0.02	U	**0.02**		**0.28**		0.03	U	0.02	U	0.02	U												
TCLP Lead in mg/L	5[d]																												
TPH in mg/kg																													
Diesel Range Organics	2000[c]									**1100**		6	U																
Lube Oil	2000[c]									**1400**		12	U																
Combined Oil and Diesel	2000[c]									**2500**		12	U																
PCBs in mg/kg																													
Aroclor 1016		0.0037	U	0.0038	U	0.0039	U	0.0039	U	0.0039	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.0038	U	0.0038	U	0.0038	U	0.0038	U
Aroclor 1221		0.0037	U	0.0038	U	0.0039	U	0.0039	U	0.0039	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.0038	U	0.0038	U	0.0038	U	0.0038	U
Aroclor 1232		0.0037	U	0.0038	U	0.0039	U	0.0039	U	0.012	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.0038	U	0.0038	U	0.0038	U	0.0038	U
Aroclor 1242		0.0037	U	0.0038	U	0.0039	U	0.0039	U	0.0039	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.0038	U	0.076	U	0.0038	U	0.0038	U
Aroclor 1248		0.0037	U	0.0038	U	0.0039	U	0.0039	U	0.0039	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.0038	U	0.0038	U	0.0038	U	0.0038	U
Aroclor 1254		0.0037	U	0.0038	U	0.0039	U	0.0039	U	0.016	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.0038	U	0.0038	U	0.0038	U	0.0038	U
Aroclor 1260		0.0037	U	0.0038	U	0.0039	U	0.0039	U	0.039	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.0038	U	0.0038	U	0.0038	U	0.0038	U
Aroclor 1262		0.0037	U	0.0038	U	0.0039	U	0.0039	U	0.0039	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.0038	U	0.0038	U	0.0038	U	0.0038	U
Aroclor 1268		0.0037	U	0.0038	U	0.0039	U	0.0039	U	0.0039	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.0038	U	0.0038	U	0.0038	U	0.0038	U
Total PCBs	0.0000787[e]	0.0037	U	0.0038	U	0.0039	U	0.0039	U	0.016	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.0038	U	0.076	U	0.0038	U	0.0038	U
Select Detected Volatiles in mg/kg																													
1,1-Dichloroethene	0.0011	0.0015	U	0.0009	U	0.001	U	0.0009	U	0.0031	U	0.001	U	0.0009	U	0.001	U	0.001	U	0.0009	U	0.0009	U	0.0009	U	0.0008	U	0.0009	U
1,2,3-Trichlorobenzene		0.0075	U	0.0047	U	0.0051	U	0.0047	U	0.015	U	0.0049	U	0.0047	U	0.0049	U	0.005	U	0.0046	U	0.0045	U	0.0044	U	0.0041	U	0.0045	U
1,2,4-Trichlorobenzene	0.0056	0.0075	U	0.0047	U	0.0051	U	0.0047	U	0.015	U	0.0049	U	0.0047	U	0.0049	U	0.005	U	0.0046	U	0.0045	U	0.0044	U	0.0041	U	0.0045	U
1,2,4-Trimethylbenzene		0.0015	U	0.0009	U	0.001	U	0.0009	U	0.0031	U	0.001	U	0.0009	U	0.001	U	0.001	U	0.0009	U	0.0009	U	0.0009	U	0.0008	U	0.0009	U
1,2-Dichlorobenzene	2.33	0.0015	U	0.0009	U	0.001	U	0.0009	U	0.0031	U	**0.0017**		0.0009	U	0.001	U	0.001	U	0.0009	U	0.0009	U	0.0009	U	0.0008	U	0.0009	U
1,3,5-Trimethylbenzene		0.0015	U	0.0009	U	0.001	U	0.0009	U	0.0031	U	0.001	U	0.0009	U	0.001	U	0.001	U	0.0009	U	0.0009	U	0.0009	U	0.0008	U	0.0009	U
1,3-Dichlorobenzene	0.011	0.0015	U	**0.0008**	T	**0.0009**	T	**0.0014**		0.0031	U	**0.0016**		0.0009	U	0.001	U	0.001	U	0.0009	U	**0.0043**		0.0009	U	0.0008	U	0.0009	U
1,4-Dichlorobenzene	0.02	0.0015	U	**0.0017**		**0.0013**		**0.0016**		0.0031	U	**0.0009**	T	0.0009	U	0.001	U	0.001	U	0.0009	U	**0.003**		0.0009	U	0.0008	U	0.0009	U
2-Butanone		0.0075	UJ	**0.0047**	J	0.0051	UJ	0.0047	UJ	0.015	U	0.0049	U	0.0047	U	**0.0034**	T	0.005	U	0.0046	UJ	0.0045	UJ	0.0044	UJ	0.0041	UJ	0.0045	UJ
4-Isopropyltoluene		0.0015	U	0.0009	U	0.001	U	0.0009	U	0.0031	U	0.001	U	0.0009	U	0.001	U	0.001	U	0.0009	U	0.0009	U	0.0009	U	0.0008	U	0.0009	U
Acetone	24,100	**0.04**		**0.036**		0.0051	U	**0.012**		**0.024**		**0.029**		0.0047	U	**0.026**		**0.02**		**0.0071**		**0.0095**		0.0044	U	**0.0082**		0.0045	U
Benzene	0.0064	**0.0008**	T	**0.0005**	T	0.001	U	**0.0005**	T	0.0031	U	**0.0018**		0.0009	U	**0.0045**		**0.0031**		0.0009	U	**0.0021**		**0.0012**		0.0008	U	0.0009	U
Bromomethane	7.08	0.0015	UJ	0.0009	UJ	0.001	UJ	0.0009	UJ	0.0031	U	0.001	U	0.0009	U	0.001	U	0.001	U	0.0009	UJ	0.0009	UJ	0.0009	UJ	0.0008	UJ	0.0009	UJ
Carbon Disulfide	170	**0.0011**	T	**0.013**		**0.0017**		**0.002**		0.0031	U	**0.0015**		**0.0012**		**0.0039**		**0.0021**		**0.0007**	T	0.0009	U	**0.0006**	T	0.0008	U	0.0009	U
Chlorobenzene	0.434	0.0015	U	**0.036**		**0.011**		**0.01**		0.0031	U	**0.0028**		0.0009	U	0.001	U	0.001	U	0.0009	U	**0.055**		**0.0009**	T	0.0008	U	0.0009	U
cis-1,2-Dichloroethene		0.0015	U	0.0009	U	0.001	U	0.0009	U	0.0031	U	0.001	U	0.0009	U	0.001	U	0.001	U	0.0009	U	**0.0015**		0.0009	U	0.0008	U	0.0009	U
Ethylbenzene	0.056	0.0015	U	0.0009	U	0.001	U	0.0009	U	0.0031	U	0.001	U	0.0009	U	0.001	U	0.001	U	0.0009	U	0.0009	U	0.0009	U	0.0008	U	0.0009	U
Iodomethane		0.0015	U	0.0009	U	0.001	U	0.0009	U	0.0031	U	0.001	U	0.0009	U	0.001	U	0.001	U	0.0009	U	0.0009	U	0.0009	U	0.0008	U	0.0009	U
Isopropylbenzene		0.0015	U	0.0009	U	0.001	U	0.0009	U	0.0031	U	0.001	U	0.0009	U	0.001	U	0.001	U	0.0009	U	0.0009	U	0.0009	U	0.0008	U	0.0009	U
Methylene Chloride	4.46	0.003	U	0.0025	U	0.0021	U	0.0019	U	0.0062	U	0.0009	U	0.002	U	0.0018	U	0.0023	U	0.0024	U	0.0023	U	0.0018	U	0.0016	U	0.0018	U
Naphthalene	6.56	0.0075	U	0.0047	U	0.0051	U	0.0047	U	0.015	U	0.0006	U	0.0047	U	0.0049	U	0.005	U	0.0046	U	0.0045	U	0.0044	U	0.0041	U	0.0045	U
sec-Butylbenzene		0.0015	U	0.0009	U	0.001	U	0.0009	U	0.0031	U	0.001	U	0.0009	U	0.001	U	0.001	U	0.0009	U	0.0009	U	0.0009	U	0.0008	U	0.0009	U
Tetrachloroethene	0.015	0.0015	U	**0.0011**		**0.001**	T	**0.001**		0.0031	U	0.001	U	0.0009	U	0.001	U	0.001	U	0.0009	U	**0.0005**	T	0.0009	U	0.0008	U	0.0009	U
Toluene	0.189	0.0015	U	0.0009	U	0.001	U	0.0009	U	0.0031	U	**0.0006**	T	0.0009	U	0.001	U	0.001	U	0.0009	U	0.0009	U	0.0009	U	0.0008	U	0.0009	U
trans-1,2-Dichloroethene	1.09	0.0015	U	0.0009	U	0.001	U	0.0009	U	0.0031	U	0.001	U	0.0009	U	0.001	U	0.001	U	0.0009	U	0.0009	U	0.0009	U	0.0008	U	0.0009	U
Trichloroethene	0.0023	0.0015	U	0.0009	U	0.001	U	0.0009	U	0.0031	U	0.001	U	0.0009	U	0.001	U	0.001	U	0.0009	U	0.0005	T	0.0009	U	0.0008	U	0.0009	U
Vinyl Chloride	0.0005[e]	0.0015	U	0.0009	U	0.001	U	0.0009	U	0.0031	U	0.001	U	0.0009	U	0.001	U	0.001	U	0.0009	U	0.0009	U	0.0009	U	0.0008	U	0.0009	U
O-Xylene		0.0015	U	0.0009	U	0.001	U	0.0009	U	0.0031	U	0.001	U	0.0009	U	0.001	U	0.001	U	0.0009	U	0.0009	U	0.0009	U	0.0008	U	0.0009	U
m, p-Xylene		0.0015	U	0.0009	U	0.001	U	0.0009	U	0.0031	U	0.001	U	0.0009	U	0.001	U	0.001	U	0.0009	U	0.0009	U	0.0009	U	0.0008	U	0.0009	U
Total Xylenes	9[c]	0.0015	U	0.0009	U	0.001	U	0.0009	U	0.0031	U	0.001	U	0.0009	U	0.001	U	0.001	U	0.0009	U	0.0009	U	0.0009	U	0.0008	U	0.0009	U

Notes:

a. Value provided is the Three-Phase Partitioning Model screening level calculated with MTCA equation 747-1 using the lowest surface water level for protection of human health considering food ingestion only (WAC 173-340-474). The cleanup levels provided are based on potential for groundwater migration to surface water.
b. Value based on regional natural background for Puget Sound (Ecology 1994)
c. MTCA Method A Soil Unrestricted Land Use Table Value.
d. Washington State Maximum Concentration of Contaminants for the Toxicity Characteristic Dangerous Waste (WAC 173-303-100).
e. The screening level is lower than the method PQL; MTCA defaults the screening level up to the PQL.
f. MTCA Method B Soil Unrestricted Land Use Direct Contact Formula Value, Carcinogen.

C = The chromotogram indicates the presence of PCBs, not DRO or RRO. Laboratory-reported results were updated to non-detect (U) for DRO/RRO.
J = Estimated value.
T = Value is between the MDL and MRL.
U = Not detected at the reporting limit indicated.
Bold = Detected value.
Shaded = Value exceeds the screening level.

Table 2a – 2014 RI/FS Soil Sample Analytical Results

Sample ID	MTCA	JT-MW-04D-S6		JT-MW-06D-S2		JT-MW-06D-S3		JT-MW-06D-S4		JT-MW-06D-S5		MW-07S-S1		JT-MW-07S-S2		JT-MW-07S-S3		JT-MW-07S-S4		MW-08S-S2		MW-08S-S3		MW-08S-S4		JT-US-39-S1		JT-US-39-S2	
Sampling Date	Method B Soil	12/16/2014		12/12/2014		12/12/2014		12/12/2014		12/12/2014		12/11/2014		12/12/2014		12/12/2014		12/12/2014		12/11/2014		12/11/2014		12/11/2014		12/09/2014		12/09/2014	
Depth in feet	Screening Level[a]	30 to 31.5		10 to 11.5		15 to 16.5		20 to 21.5		25 to 26.5		2.5 to 4		5 to 6.5		7.5 to 9		17.5 to 19		7.5 to 9		12.5 to 14		17.5 to 19		2 to 2.5		12.5 to 13	
Conventionals in %																													
Total Organic Carbon												**3.94**		**0.177**		**0.147**		**0.119**		**0.54**		**0.241**		**0.082**		**0.317**		**2.66**	
Metals in mg/kg																													
Arsenic	7[b]											**8**		**3.8**		**3.4**		**1.8**		**4**		**3.4**		**2.8**		**1.7**		**6.6**	
Cadmium	5.6											**6**		**0.2**		**0.2**		0.1	U	**0.3**		**0.3**		**0.2**		0.1	U	**0.3**	
Chromium	2000[c]											**56.6**		**26.1**		**20.5**		**18.5**		**17.6**		**21.7**		**16.5**		**23.8**		**50.9**	
Lead	250[c]											**1770**		**56.6**		**63.4**		**6.3**		**15.8**	J	**4.6**		**26.7**		**3.7**		**11.1**	
Mercury	0.146											**1.17**		**0.03**		**0.04**		0.03	U	**0.09**		**0.1**		**0.03**		0.02	U	**0.15**	
TCLP Lead in mg/L	5[d]											**10.2**																	
TPH in mg/kg																													
Diesel Range Organics	2000[c]											**6400**		**160**		**860**		**50**								**830**		**220**	
Lube Oil	2000[c]											**7300**		**21**		**310**		**65**								**800**		**410**	
Combined Oil and Diesel	2000[c]											**13700**		**181**		**1170**		**115**								**1630**		**630**	
PCBs in mg/kg																													
Aroclor 1016		0.0039	U	0.0039	U	0.004	U	0.0039	U	0.0038	U	0.0039	U	0.0038	U	0.0039	U	0.004	U	0.0038	U	0.004	U	0.0038	U	0.038	U	0.0039	U
Aroclor 1221		0.0039	U	0.0039	U	0.004	U	0.0039	U	0.0038	U	0.0039	U	0.0038	U	0.0039	U	0.004	U	0.0038	U	0.004	U	0.0038	U	0.038	U	0.0039	U
Aroclor 1232		0.0039	U	0.0039	U	0.004	U	0.0039	U	0.0038	U	0.0039	U	0.0038	U	0.0039	U	0.004	U	0.0038	U	0.004	U	0.0038	U	0.038	U	0.0039	U
Aroclor 1242		0.0039	U	0.0039	U	0.004	U	0.0039	U	0.0038	U	0.0039	U	0.0038	U	0.0039	U	0.004	U	0.0038	U	0.004	U	0.0038	U	0.038	U	0.0039	U
Aroclor 1248		0.0039	U	0.0059	U	0.004	U	0.0039	U	0.0038	U	0.61	UJ	0.0038	U	0.0078	U	0.004	U	0.019	U	0.079	U	0.048	U	0.094	U	0.0039	U
Aroclor 1254		0.0039	U	**0.015**		0.004	U	0.0039	U	0.0038	U	**1.5**		0.0057	U	**0.018**	JP	0.004	U	**0.054**		**0.39**		**0.1**		1.5	U	0.0039	U
Aroclor 1260		0.0039	U	**0.035**		0.004	U	0.0039	U	0.0038	U	0.0039	U	0.0076	U	0.0039	U	0.004	U	0.0038	U	0.004	U	**0.053**	JP	**4.5**		0.0039	U
Aroclor 1262		0.0039	U	0.0039	U	0.004	U	0.0039	U	0.0038	U	**1.1**		0.0038	U	**0.012**	JP	0.004	U	**0.017**		**0.25**		0.0038	U	0.038	U	0.0039	U
Aroclor 1268		0.0039	U	0.0039	U	0.004	U	0.0039	U	0.0038	U	0.0039	U	0.0038	U	0.0039	U	0.004	U	0.0038	U	0.004	U	0.0038	U	0.038	U	0.0039	U
Total PCBs	0.0000787[e]	0.0039	U	**0.05**		0.004	U	0.0039	U	0.0038	U	**2.6**		0.0057	U	**0.03**	J	0.004	U	**0.071**		**0.64**		**0.153**	J	**4.5**		0.0039	U
Select Detected Volatiles in mg/kg																													
1,1-Dichloroethene	0.0011	0.0007	U	0.0034	U	0.0009	U	0.001	U	0.0008	U	0.0009	U	0.0009	U	0.0014	U	0.0011	U	0.0013	U	0.0008	U	0.0008	U	2.5	U	0.0019	U
1,2,3-Trichlorobenzene		0.0036	U	0.017	U	0.0045	U	0.0052	U	0.004	U	0.0044	U	0.0043	U	0.0072	U	0.0057	U	0.0064	U	0.0041	U	0.0042	U	12	U	0.0095	U
1,2,4-Trichlorobenzene	0.0056	0.0036	U	0.017	U	0.0045	U	0.0052	U	0.004	U	0.0044	U	0.0043	U	0.0072	U	0.0057	U	0.0064	U	0.0041	U	0.0042	U	12	U	0.0095	U
1,2,4-Trimethylbenzene		0.0007	U	0.0034	U	0.0009	U	0.001	U	0.0008	U	0.0009	U	**0.0089**		0.0014	U	0.0011	U	0.0013	U	0.0008	U	0.0008	U	**160**		**0.0088**	
1,2-Dichlorobenzene	2.33	0.0007	U	0.0034	U	0.0009	U	0.001	U	0.0008	U	0.0009	U	0.0009	U	0.0014	U	0.0011	U	0.0013	U	0.0008	U	0.0008	U	2.5	U	0.0019	U
1,3,5-Trimethylbenzene		0.0007	U	0.0034	U	0.0009	U	0.001	U	0.0008	U	0.0009	U	**0.0031**		0.0014	U	0.0011	U	0.0013	U	0.0008	U	0.0008	U	**28**		**0.0017**	T
1,3-Dichlorobenzene	0.011	0.0007	U	0.0034	U	**0.0025**		**0.0015**		0.0008	U	0.0009	U	0.0009	U	0.0014	U	0.0011	U	0.0013	U	0.0008	U	0.0008	U	2.5	U	0.0019	U
1,4-Dichlorobenzene	0.02	0.0007	U	0.0034	U	**0.0032**		**0.004**		0.0008	U	0.0009	U	0.0009	U	0.0014	U	0.0011	U	0.0013	U	0.0008	U	0.0008	U	2.5	U	0.0019	U
2-Butanone		0.0036	UJ	**0.011**	T	**0.0043**	T	0.0052	U	0.004	U	0.0044	U	**0.015**		0.0072	U	**0.0029**	T	0.0064	U	**0.0032**	T	**0.0021**	T	12	U	**0.025**	J
4-Isopropyltoluene		0.0007	U	**0.0031**	T	**0.0028**		0.001	U	0.0008	U	0.0009	U	**0.0028**		0.0014	U	0.0011	U	0.0013	U	0.0008	U	0.0008	U	**4.3**		0.0019	U
Acetone	24,100	**0.0092**		**0.091**		**0.054**		0.0052	U	0.004	U	0.0044	U	**0.13**		**0.028**		**0.018**		**0.022**	J	**0.024**	J	**0.018**	J	12	U	**0.18**	
Benzene	0.0064	0.0007	U	0.0034	U	**0.0005**	T	0.001	U	0.0008	U	0.0009	U	**0.0026**		0.0014	U	0.0011	U	0.0013	U	0.0008	U	0.0008	U	**1.4**	T	0.0019	U
Bromomethane	7.08	0.0007	UJ	0.0034	U	0.0009	U	0.001	U	0.0008	U	0.0009	U	0.0009	U	0.0014	U	0.0011	U	0.0013	U	0.0008	U	0.0008	U	2.5	UJ	0.0019	UJ
Carbon Disulfide	170	**0.0005**	T	**0.018**		**0.0012**		**0.0034**		**0.0007**	T	0.0009	U	**0.0006**	T	**0.0022**		**0.001**	T	0.0013	U	**0.0078**		**0.0045**		2.5	U	**0.015**	
Chlorobenzene	0.434	0.0007	U	0.0034	U	**0.025**		**0.014**		0.0008	U	0.0009	U	0.0009	U	0.0014	U	0.0011	U	0.0013	U	0.0008	U	0.0008	U	2.5	U	0.0019	U
cis-1,2-Dichloroethene		0.0007	U	0.0034	U	0.0009	U	0.001	U	0.0008	U	0.0009	U	0.0009	U	0.0014	U	0.0011	U	0.0013	U	0.0008	U	0.0008	U	2.5	U	0.0019	U
Ethylbenzene	0.056	0.0007	U	0.0034	U	0.0009	U	0.001	U	0.0008	U	0.0009	U	**0.0009**		0.0014	U	0.0011	U	0.0013	U	0.0008	U	0.0008	U	**52**		**0.0032**	
Iodomethane		0.0007	U	0.0034	U	0.0009	U	0.001	U	0.0008	U	0.0009	U	0.0009	U	0.0014	U	0.0011	U	0.0013	U	0.0008	U	0.0008	U	2.5	UJ	0.0019	UJ
Isopropylbenzene		0.0007	U	0.0034	U	0.0009	U	0.001	U	0.0008	U	0.0009	U	**0.0011**		**0.0077**		**0.015**		0.0013	U	0.0008	U	0.0008	U	**6.8**		0.0019	U
Methylene Chloride	4.46	0.0015	U	0.0068	U	0.001	U	0.0021	U	0.0019	U	0.0007	U	0.0017	U	0.0028	U	0.0027	U	0.0026	U	0.0016	U	0.001	U	11	UJ	0.005	UJ
Naphthalene	6.56	0.0036	U	0.017	U	0.0006	U	0.0052	U	0.004	U	0.0006	U	**0.17**		0.004	U	0.0057	U	**0.02**		0.0041	U	0.0021	U	**38**		0.0095	U
sec-Butylbenzene		0.0007	U	0.0034	U	0.0009	U	0.001	U	0.0008	U	0.0009	U	0.0009	U	**0.011**		**0.033**		0.0013	U	0.0008	U	0.0008	U	**2.7**		0.0019	U
Tetrachloroethene	0.015	0.0007	U	0.0034	U	0.0009	U	0.001	U	0.0008	U	0.0009	U	0.0009	U	0.0014	U	0.0011	U	0.0013	U	0.0008	U	0.0008	U	2.5	U	0.0019	U
Toluene	0.189	0.0007	U	0.0034	U	**0.0066**		0.001	U	0.0008	U	0.0009	U	0.0018		0.0014	U	0.0011	U	0.0013	U	0.0008	U	0.0008	U	**1.3**	T	0.0019	U
trans-1,2-Dichloroethene	1.09	0.0007	U	0.0034	U	0.0009	U	0.001	U	0.0008	U	0.0009	U	0.0009	U	0.0014	U	0.0011	U	0.0013	U	0.0008	U	0.0008	U	2.5	U	0.0019	U
Trichloroethene	0.0023	0.0007	U	0.0034	U	0.0009	U	0.001	U	0.0008	U	0.0009	U	0.0009	U	0.0014	U	0.0011	U	0.0013	U	0.0008	U	0.0008	U	2.5	U	0.0019	U
Vinyl Chloride	0.0005[e]	0.0007	U	0.0034	U	0.0009	U	0.001	U	0.0008	U	0.0009	U	0.0009	U	0.0014	U	0.0011	U	0.0013	U	0.0008	U	0.0008	U	2.5	U	0.0019	U
O-Xylene		0.0007	U	0.0034	U	0.0009	U	0.001	U	0.0008	U	0.0009	U	0.0029		0.0014	U	0.0011	U	0.0013	U	0.0008	U	0.0008	U	110		0.0054	
m, p-Xylene		0.0007	U	0.0034	U	0.0009	U	0.001	U	0.0008	U	0.0009	U	0.0034		0.0014	U	0.0011	U	0.0013	U	0.0008	U	0.0008	U	5.5		0.0019	U
Total Xylenes	9[c]	0.0007	U	0.0034	U	0.0009	U	0.001	U	0.0008	U	0.0009	U	**0.0063**		0.0014	U	0.0011	U	0.0013	U	0.0008	U	0.0008	U	**115.5**		**0.0054**	

Notes:

a. Value provided is the Three-Phase Partitioning Model screening level calculated with MTCA equation 747-1 using the lowest surface water level for protection of human health considering food ingestion only (WAC 173-340-474). The cleanup levels provided are based on potential for groundwater migration to surface water.
b. Value based on regional natural background for Puget Sound (Ecology 1994)
c. MTCA Method A Soil Unrestricted Land Use Table Value.
d. Washington State Maximum Concentration of Contaminants for the Toxicity Characteristic Dangerous Waste (WAC 173-303-100).
e. The screening level is lower than the method PQL; MTCA defaults the screening level up to the PQL.
f. MTCA Method B Soil Unrestricted Land Use Direct Contact Formula Value, Carcinogen.

C = The chromotogram indicates the presence of PCBs, not DRO or RRO. Laboratory-reported results were updated to non-detect (U) for DRO/RRO.
J = Estimated value.
T = Value is between the MDL and MRL.
U = Not detected at the reporting limit indicated.
Bold = Detected value.
Shaded = Value exceeds the screening level.

Table 2a – 2014 RI/FS Soil Sample Analytical Results

Sample ID	MTCA	JT-US-40-S2		JT-US-40-S3		JT-US-41-S2		JT-US-42-S2		JT-US-42-S3		JT-US-43-S2		JT-US-43-S3		JT-US-44-S1		JT-US-44-S2		JT-US-44-S3		JT-US-45-S2		JT-US-45-S4		JT-US-46-S2		JT-US-46-S4	
Sampling Date	Method B Soil	12/09/2014		12/09/2014		12/09/2014		12/09/2014		12/09/2014		12/09/2014		12/09/2014		12/08/2014		12/08/2014		12/08/2014		12/08/2014		12/08/2014		12/08/2014		12/08/2014		12/08/2014	
Depth in feet	Screening Level[a]	7 to 7.5		10 to 10.5		7 to 7.5		6.5 to 7		14.5 to 15		6 to 6.5		17.5 to 18		2.5 to 3		5.5 to 6		15 to 15.5		7.5 to 8		19.5 to 20		6 to 6.5		17 to 17.5	
Conventionals in %																													
Total Organic Carbon		**0.14**				**0.131**	J	**0.307**				**0.459**																	
Metals in mg/kg																													
Arsenic	7[b]	**1.6**		**7.4**		**2.1**		**3.2**				**2.3**				**1.7**		**1.8**		**5.3**		**2.1**		**11.9**					
Cadmium	5.6	0.1	U	**0.3**		0.1	U	0.1	U			0.1	U			0.1	U	0.1	U	0.1	U	0.1	U	0.1	U				
Chromium	2000[c]	**18.4**		**37.7**		**23.6**		**25.3**				**23.6**				**18**		**21.6**		**26.3**		**23.1**		**32.2**					
Lead	250[c]	**1.9**		**11.2**		**2.2**		**2.8**				**12.7**				**9.2**		**8**		**3.4**		**2.4**		**2.4**					
Mercury	0.146	0.03	U	**0.15**		0.02	U	**0.03**				**0.04**				0.02	U	0.03	U	0.03	U	0.03	U	**0.03**					
TCLP Lead in mg/L	5[d]																												
TPH in mg/kg																													
Diesel Range Organics	2000[c]	**20**				**19**		5.7	U			**19**																	
Lube Oil	2000[c]	**110**				11	U	11	U			**55**																	
Combined Oil and Diesel	2000[c]	**130**				**19**						**74**																	
PCBs in mg/kg																													
Aroclor 1016		0.0039	U	0.0038	U	0.0038	U	0.0038	U	0.004	U	0.0039	U	0.0038	U	0.0038	U	0.0039	U	0.004	U	0.0039	U	0.0038	U	0.078	U	0.038	U
Aroclor 1221		0.0039	U	0.0038	U	0.0038	U	0.0038	U	0.004	U	0.0039	U	0.0038	U	0.0038	U	0.0039	U	0.004	U	0.0039	U	0.0038	U	0.078	U	0.038	U
Aroclor 1232		0.0039	U	0.0038	U	0.0038	U	0.0038	U	0.004	U	0.0039	U	0.0038	U	0.0038	U	0.0039	U	0.004	U	0.0039	U	0.0038	U	0.078	U	0.038	U
Aroclor 1242		0.0039	U	0.0038	U	0.0038	U	**0.0064**		0.004	U	0.0039	U	0.0038	U	0.0038	U	0.0039	U	0.004	U	0.0039	U	0.0038	U	0.078	U	0.038	U
Aroclor 1248		0.0039	U	0.0038	U	0.0038	U	0.0038	U	0.004	U	0.0039	U	0.0038	U	0.0038	U	0.0039	U	0.004	U	0.0039	U	0.0038	U	0.078	U	0.19	U
Aroclor 1254		0.0039	U	0.0038	U	**0.0044**		**0.012**		0.004	U	0.0098	U	0.0038	U	0.0038	U	**0.021**		0.004	U	0.0039	U	0.0038	U	**0.63**		**0.85**	
Aroclor 1260		0.0039	U	0.0038	U	0.0038	U	**0.029**		0.004	U	**0.034**		0.0038	U	0.0038	U	**0.013**		0.004	U	0.0039	U	0.0038	U	**1.2**		**1.6**	
Aroclor 1262		0.0039	U	0.0038	U	0.0038	U	0.0038	U	0.004	U	0.0039	U	0.0038	U	0.0038	U	0.0039	U	0.004	U	0.0039	U	0.0038	U	0.078	U	0.038	U
Aroclor 1268		0.0039	U	0.0038	U	0.0038	U	0.0038	U	0.004	U	0.0039	U	0.0038	U	0.0038	U	0.0039	U	0.004	U	0.0039	U	0.0038	U	0.078	U	0.038	U
Total PCBs	0.0000787[e]	0.0039	U	0.0038	U	**0.0044**		**0.0474**		0.004	U	**0.034**		0.0038	U	0.0038	U	**0.034**		0.004	U	0.0039	U	0.0038	U	**1.83**		**2.45**	
Select Detected Volatiles in mg/kg																													
1,1-Dichloroethene	0.0011	0.0008	U	0.0018	U	0.0008	U	0.001	U	0.0011	U	0.0008	U	0.0013	U	0.097	U	0.075	U	0.0009	U	0.0009	U	0.0009	U	0.0007	U	0.001	U
1,2,3-Trichlorobenzene		0.004	U	0.009	U	0.0041	U	0.0052	U	0.0055	U	0.0042	U	0.0063	U	0.48	U	0.38	U	0.0047	U	0.0043	U	0.0045	U	0.0036	U	0.0049	U
1,2,4-Trichlorobenzene	0.0056	0.004	U	0.009	U	0.0041	U	0.0052	U	0.0055	U	0.0042	U	0.0063	U	0.48	U	0.38	UJ	0.0047	U	0.0043	U	0.0045	U	0.0036	U	**0.0024**	T
1,2,4-Trimethylbenzene		0.0008	U	0.0018	U	**0.014**		0.001	U	0.0011	U	0.0008	U	0.0013	U	0.097	U	0.075	U	0.0009	U	0.0009	U	0.0009	U	0.0007	U	0.001	U
1,2-Dichlorobenzene	2.33	0.0008	U	0.0018	U	0.0008	U	0.001	U	0.0011	U	0.0008	U	0.0013	U	0.097	U	0.075	U	0.0009	U	0.0009	U	0.0009	U	0.0007	U	**0.0005**	T
1,3,5-Trimethylbenzene		0.0008	U	0.0018	U	**0.0026**		0.001	U	0.0011	U	0.0008	U	0.0013	U	0.097	U	0.075	U	0.0009	U	0.0009	U	0.0009	U	0.0007	U	0.001	U
1,3-Dichlorobenzene	0.011	0.0008	U	0.0018	U	0.0008	U	0.001	U	0.0011	U	0.0008	U	0.0013	U	0.097	U	0.075	U	**0.001**		0.0009	U	0.0009	U	**0.0009**		**0.0024**	
1,4-Dichlorobenzene	0.02	0.0008	U	0.0018	U	**0.0014**		0.001	U	0.0011	U	0.0008	U	0.0013	U	0.097	U	0.075	U	**0.0022**		0.0009	U	0.0009	U	**0.0011**		**0.0041**	
2-Butanone		0.004	U	**0.022**		0.0041	U	0.0052	U	0.0055	U	0.0042	U	0.0063	U	0.48	U	0.38	U	0.0047	U	0.0043	U	0.0045	U	0.0036	U	**0.0038**	T
4-Isopropyltoluene		0.0008	U	0.0018	U	0.0008	U	0.001	U	**0.0042**		0.0008	U	0.0013	U	0.097	U	0.075	U	0.0009	U	0.0009	U	0.0009	U	0.0007	U	0.001	U
Acetone	24,100	**0.029**	J	**0.23**		0.0041	U	**0.041**	J	**0.029**	J	**0.032**		**0.011**		0.48	U	0.38	U	0.0047	U	**0.056**		**0.019**	J	**0.015**	J	**0.03**	
Benzene	0.0064	0.0008	U	0.0018	U	**0.0042**		0.001	U	0.0011	U	0.0008	U	0.0013	U	0.097	U	0.075	U	**0.0018**		0.0009	U	0.0019		**0.0031**		**0.001**	
Bromomethane	7.08	0.0008	UJ	0.0018	UJ	0.0008	UJ	0.001	UJ	0.0011	UJ	0.0008	UJ	0.0013	UJ	0.097	UJ	0.075	UJ	0.0009	UJ	0.0009	UJ	0.0009	UJ	0.0007	UJ	0.001	UJ
Carbon Disulfide	170	**0.0016**		**0.0071**		**0.0005**	T	**0.003**		0.0011	U	**0.0011**		0.0013	U	0.097	U	0.075	U	**0.0029**		**0.0006**	T	**0.001**		**0.0011**		**0.014**	
Chlorobenzene	0.434	0.0008	U	0.0018	U	**0.0007**	T	0.001	U	0.0011	U	0.0008	U	0.0013	U	0.097	U	0.075	U	**0.075**		0.0009	U	0.0009	U	**0.065**		**0.03**	
cis-1,2-Dichloroethene		0.0008	U	0.0018	U	0.0008	U	0.001	U	0.0011	U	0.0008	U	0.0013	U	0.097	U	0.075	U	0.0009	U	0.0009	U	0.0018		0.0007	U	**0.0006**	T
Ethylbenzene	0.056	0.0008	U	0.0018	U	**0.007**		0.001	U	0.0011	U	0.0008	U	0.0013	U	0.097	U	0.075	U	0.0009	U	0.0009	U	0.0009	U	0.0007	U	0.001	U
Iodomethane		0.0008	UJ	0.0018	UJ	0.0008	UJ	0.001	UJ	0.0011	UJ	0.0008	UJ	0.0013	UJ	0.097	UJ	0.075	UJ	0.0009	UJ	0.0009	UJ	0.0009	UJ	0.0007	UJ	0.001	UJ
Isopropylbenzene		0.0008	U	0.0018	U	**0.001**		0.001	U	0.0011	U	0.0008	U	0.0013	U	0.097	U	0.075	U	0.0009	U	0.0009	U	0.0009	U	0.0007	U	0.001	U
Methylene Chloride	4.46	0.0022	U	0.0036	U	0.0025	U	0.0021	U	0.0033	U	0.0018	UJ	0.0054	UJ	0.19	U	0.15	U	0.0026	U	0.002	U	0.0026	U	0.0016	U	0.0027	U
Naphthalene	6.56	0.004	U	0.009	U	**0.0017**	T	0.0052	U	0.0055	U	0.0042	U	0.0063	U	**15**	J	**26**		0.0047	U	0.0043	UJ	0.0045	U	**0.0054**		**0.0014**	T
sec-Butylbenzene		0.0008	U	0.0018	U	0.0008	U	0.001	U	0.0011	U	0.0008	U	0.0013	U	0.097	U	0.075	U	0.0009	U	0.0009	U	0.0009	U	0.0007	U	0.001	U
Tetrachloroethene	0.015	0.0008	U	0.0018	U	0.0008	U	0.001	U	0.0011	U	0.0008	U	0.0013	U	0.097	U	0.075	U	0.0009	U	0.0009	U	0.0009	U	0.0007	U	0.001	U
Toluene	0.189	0.0008	U	0.0018	U	**0.0028**		0.001	U	0.0011	U	0.0008	U	0.0013	U	0.097	U	0.075	U	0.0009	U	0.0009	U	0.0009	U	0.0007	U	0.001	U
trans-1,2-Dichloroethene	1.09	0.0008	U	0.0018	U	0.0008	U	0.001	U	0.0011	U	0.0008	U	0.0013	U	0.097	U	0.075	U	0.0009	U	0.0009	U	**0.001**		0.0007	U	0.001	U
Trichloroethene	0.0023	0.0008	U	0.0018	U	0.0008	U	0.001	U	0.0011	U	0.0008	U	0.0013	U	0.097	U	0.075	U	0.0009	U	0.0009	U	0.0009	U	0.0007	U	0.001	U
Vinyl Chloride	0.0005[e]	0.0008	UJ	0.0018	UJ	0.0008	UJ	0.001	UJ	0.0011	UJ	0.0008	U	0.0013	U	0.097	U	0.075	UJ	0.0009	UJ	0.0009	U	0.0009	U	0.0007	UJ	0.001	UJ
O-Xylene		0.0008	U	0.0018	U	0.019		0.001	U	0.0011	U	0.0008	U	0.0013	U	0.097	U	0.075	U	0.0009	U	0.0009	U	0.0009	U	0.0007	U	0.001	U
m, p-Xylene		0.0008	U	0.0018	U	0.0008	T	0.001	U	0.0011	U	0.0008	U	0.0013	U	0.097	U	0.075	U	0.0009	U	0.0009	U	0.0009	U	0.0006	T	0.001	U
Total Xylenes	9[c]	0.0008	U	0.0018	U	**0.0198**		0.001	U	0.0011	U	0.0008	U	0.0013	U	0.097	U	0.075	U	0.0009	U	0.0009	U	0.0009	U	**0.0006**		0.001	U

Notes:

a. Value provided is the Three-Phase Partitioning Model screening level calculated with MTCA equation 747-1 using the lowest surface water level for protection of human health considering food ingestion only (WAC 173-340-474). The cleanup levels provided are based on potential for groundwater migration to surface water.
b. Value based on regional natural background for Puget Sound (Ecology 1994)
c. MTCA Method A Soil Unrestricted Land Use Table Value.
d. Washington State Maximum Concentration of Contaminants for the Toxicity Characteristic Dangerous Waste (WAC 173-303-100).
e. The screening level is lower than the method PQL; MTCA defaults the screening level up to the PQL.
f. MTCA Method B Soil Unrestricted Land Use Direct Contact Formula Value, Carcinogen.

C = The chromotogram indicates the presence of PCBs, not DRO or RRO. Laboratory-reported results were updated to non-detect (U) for DRO/RRO.
J = Estimated value.
T = Value is between the MDL and MRL.
U = Not detected at the reporting limit indicated.
Bold = Detected value.
Shaded = Value exceeds the screening level.

Table 2a – 2014 RI/FS Soil Sample Analytical Results

Sample ID	MTCA	JT-US-47-S2		JT-US-47-S3		JT-US-47-S4		JT-US-48-S2		JT-US-48-S4		JT-US-49-S1		JT-US-49-S2		JT-US-49-S3		JT-US-50-S1		JT-US-50-S2		JT-US-50-S3		JT-US-51-S1		JT-US-51-S2		JT-US-51-S3	
Sampling Date	Method B Soil	12/08/2014		12/08/2014		12/08/2014		12/09/2014		12/09/2014		12/09/2014		12/09/2014		12/09/2014		12/08/2014		12/08/2014		12/08/2014		12/08/2014		12/08/2014		12/08/2014	
Depth in feet	Screening Level[a]	6 to 6.5		13 to 13.5		19 to 19.5		6.5 to 7		19.5 to 20		6 to 6.5		14 to 14.5		19.5 to 20		2.5 to 3		7 to 7.5		14.5 to 15		1.5 to 2		7 to 7.5		13.5 to 14	
Conventionals in %																													
Total Organic Carbon																													
Metals in mg/kg																													
Arsenic	7[b]																	**7.9**						**17.1**					
Cadmium	5.6																	**0.4**						**2.1**					
Chromium	2000[c]																	**24.4**						**36**					
Lead	250[c]																	**70**						**2350**					
Mercury	0.146																	**0.11**						**0.17**					
TCLP Lead in mg/L	5[d]																							3.1					
TPH in mg/kg																													
Diesel Range Organics	2000[c]																	**4400**	J							**12**	J		
Lube Oil	2000[c]																	**470**	J							12	UJ		
Combined Oil and Diesel	2000[c]																	**4870**	J							**12**	J		
PCBs in mg/kg																													
Aroclor 1016		0.038	U	0.0038	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.004	U	0.0039	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U
Aroclor 1221		0.038	U	0.0038	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.004	U	0.0039	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U
Aroclor 1232		0.038	U	0.0038	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.004	U	0.0039	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U
Aroclor 1242		0.038	U	0.0038	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.004	U	0.0039	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U
Aroclor 1248		0.056	U	0.0038	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.004	U	0.0039	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U
Aroclor 1254		**0.22**		0.0038	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.004	U	**0.1**		0.004	U	0.0038	U	**0.3**		0.0039	U	0.0038	U
Aroclor 1260		**0.24**		0.0038	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.004	U	**0.19**		0.004	U	0.0038	U	**0.32**		0.0039	U	0.0038	U
Aroclor 1262		0.038	U	0.0038	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.004	U	0.0039	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U
Aroclor 1268		0.038	U	0.0038	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.004	U	0.0039	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U
Total PCBs	0.0000787[e]	**0.46**		0.0038	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.004	U	**0.29**		0.004	U	0.0038	U	**0.62**		0.0039	U	0.0038	U
Select Detected Volatiles in mg/kg																													
1,1-Dichloroethene	0.0011	0.0009	U	0.0009	U	0.0009	U	0.0009	U	0.0009	U	0.001	U	0.0009	U	**0.0017**		0.0011	U	0.001	U	0.0009	U	0.11	U	0.0009	U	0.0009	U
1,2,3-Trichlorobenzene		0.0046	U	0.0045	U	0.0045	U	0.0047	U	0.0046	U	0.0051	U	0.0046	U	0.005	U	0.0053	U	0.0048	U	0.0047	U	0.55	U	0.0043	U	0.0046	U
1,2,4-Trichlorobenzene	0.0056	0.0046	U	0.0045	U	0.0045	U	0.0047	U	0.0046	U	0.0051	U	0.0046	U	0.005	U	0.0053	U	0.0048	U	0.0047	U	0.55	U	0.0043	U	0.0046	U
1,2,4-Trimethylbenzene		**0.0005**	T	0.0009	U	0.0009	U	0.0009	U	0.0009	U	0.001	U	0.0009	U	0.001	U	0.0011	U	0.001	U	0.0009	U	**0.28**		0.0009	U	**0.0005**	T
1,2-Dichlorobenzene	2.33	0.0009	U	0.0009	U	0.0009	U	0.0009	U	0.0009	U	0.001	U	0.0009	U	0.001	U	0.0011	U	0.001	U	0.0009	U	0.11	U	0.0009	U	0.0009	U
1,3,5-Trimethylbenzene		0.0009	U	0.0009	U	0.0009	U	0.0009	U	0.0009	U	0.001	U	0.0009	U	0.001	U	0.0011	U	0.001	U	0.0009	U	**0.076**	T	0.0009	U	0.0009	U
1,3-Dichlorobenzene	0.011	0.0009	U	0.0009	U	0.0009	U	**0.001**		0.0009	U	0.001	U	0.0009	U	0.001	U	0.0011	U	0.001	U	0.0009	U	0.11	U	0.0009	U	0.0009	U
1,4-Dichlorobenzene	0.02	0.0009	U	0.0009	U	0.0009	U	**0.0019**		0.0009	U	0.001	U	0.0009	U	0.001	U	0.0011	U	0.001	U	0.0009	U	0.11	U	0.0009	U	0.0009	U
2-Butanone		0.0046	U	0.0045	U	0.0045	U	0.0047	U	0.0046	U	0.0051	U	0.0046	U	0.005	U	**0.0096**		0.0048	U	0.0047	U	0.55	U	0.0043	U	0.0046	U
4-Isopropyltoluene		0.0009	U	0.0009	U	0.0009	U	0.0009	U	0.0009	U	0.001	U	0.0009	U	0.001	U	0.0011	U	0.001	U	0.0009	U	0.11	U	0.0009	U	0.0009	U
Acetone	24,100	**0.024**	J	**0.011**	J	**0.0089**	J	**0.033**	J	0.0046	U	**0.021**	J	0.0046	U	**0.019**	J	**0.098**		**0.016**	J	**0.051**	J	0.55	U	**0.043**		0.0046	U
Benzene	0.0064	**0.0011**		0.0009	U	0.0009	U	0.0009	U	0.0009	U	0.001	U	**0.0005**	T	0.001	U	**0.0019**		0.001	U	**0.0022**		0.11	U	0.0009	U	**0.0013**	
Bromomethane	7.08	0.0009	UJ	0.0009	UJ	0.0009	UJ	0.0009	UJ	0.0009	UJ	0.001	UJ	0.0009	UJ	0.001	UJ	0.0011	UJ	0.001	UJ	0.0009	UJ	0.11	UJ	0.0009	UJ	0.0009	UJ
Carbon Disulfide	170	**0.0007**	T	**0.0012**		**0.0006**	T	**0.0048**		**0.0011**		**0.0007**	T	**0.0031**		**0.001**	T	**0.0021**		**0.0006**	T	**0.0041**		0.11	U	**0.022**		0.0009	U
Chlorobenzene	0.434	**0.0066**		0.0009	U	0.0009	U	**0.0005**	T	0.0009	U	0.001	U	0.0009	U	0.001	U	0.0011	U	0.001	U	0.0009	U	0.11	U	0.0009	U	0.0009	U
cis-1,2-Dichloroethene		0.0009	U	0.0009	U	**0.0005**	T	**0.0011**		0.0009	U	0.001	U	**0.0007**	T	**0.96**		0.0011	U	**0.036**		**0.0038**		0.11	U	**0.013**		**0.001**	
Ethylbenzene	0.056	**0.0017**		0.0009	U	0.0009	U	0.0009	U	0.0009	U	0.001	U	0.0009	U	0.001	U	**0.0028**		0.001	U	0.0009	U	**0.32**		0.0009	U	0.0009	U
Iodomethane		0.0009	UJ	0.0009	UJ	0.0009	UJ	0.0009	UJ	0.0009	UJ	0.001	UJ	0.0009	UJ	0.001	UJ	0.0011	UJ	0.001	UJ	0.0009	UJ	0.11	UJ	0.0009	UJ	0.0009	UJ
Isopropylbenzene		0.0009	U	0.0009	U	0.0009	U	0.0009	U	0.0009	U	0.001	U	0.0009	U	0.001	U	**0.0042**		0.001	U	0.0009	U	**0.084**	T	0.0009	U	0.0009	U
Methylene Chloride	4.46	0.0018	U	0.0027	U	0.0022	U	0.0022	U	0.0018	U	0.002	U	0.0026	U	0.0032	U	0.0021	U	0.0029	U	0.0027	U	0.22	U	0.002	U	0.0034	U
Naphthalene	6.56	0.0046	U	0.0045	U	0.0045	U	0.0047	U	0.0046	U	0.0051	U	0.0046	U	0.005	U	0.0053	UJ	0.0048	UJ	0.0047	UJ	**1.3**	J	0.0043	UJ	0.0046	UJ
sec-Butylbenzene		0.0009	U	0.0009	U	0.0009	U	0.0009	U	0.0009	U	0.001	U	0.0009	U	0.001	U	0.0011	U	0.001	U	0.0009	U	**0.49**		0.0009	U	0.0009	U
Tetrachloroethene	0.015	0.0009	U	0.0009	U	0.0009	U	0.0009	U	0.0009	U	0.001	U	0.0009	U	0.001	U	**0.0006**	T	**0.021**		**0.011**		0.11	U	**0.025**		0.0009	U
Toluene	0.189	**0.0006**	T	0.0009	U	0.0009	U	0.0009	U	0.0009	U	0.001	U	0.0009	U	0.001	U	**0.0013**		0.001	U	0.0009	U	**0.11**	T	0.0009	U	**0.0009**	T
trans-1,2-Dichloroethene	1.09	0.0009	U	0.0009	U	0.0009	U	0.0009	U	0.0009	U	0.001	U	0.0009	U	**0.008**		0.0011	U	0.001	U	0.0009	U	0.11	U	**0.0007**	T	0.0009	U
Trichloroethene	0.0023	0.0009	U	0.0009	U	0.0009	U	0.0009	U	0.0009	U	0.001	U	0.0009	U	0.001	U	**0.0008**	T	**0.014**		**0.0038**		0.11	U	**0.0093**		**0.0008**	T
Vinyl Chloride	0.0005[e]	0.0009	UJ	0.0009	UJ	0.0009	UJ	0.0009	UJ	**0.012**	J	0.001	UJ	0.0009	UJ	**0.052**	J	0.0011	U	0.001	U	0.0009	U	0.11	U	0.0009	U	0.0009	U
O-Xylene		0.0034		0.0009	U	0.0009	U	0.0009	U	0.0009	U	0.001	U	0.0009	U	0.001	U	0.0045		0.001	U	0.0009	U	0.32		0.0009	U	0.0023	
m, p-Xylene		0.0014		0.0009	U	0.0009	U	0.0009	U	0.0009	U	0.001	U	0.0009	U	0.001	U	0.0015		0.001	U	0.0009	U	0.093	T	0.0009	U	0.0009	U
Total Xylenes	9[c]	**0.0048**		0.0009	U	0.0009	U	0.0009	U	0.0009	U	0.001	U	0.0009	U	0.001	U	**0.006**		0.001	U	0.0009	U	**0.413**		0.0009	U	**0.0023**	

Notes:

a. Value provided is the Three-Phase Partitioning Model screening level calculated with MTCA equation 747-1 using the lowest surface water level for protection of human health considering food ingestion only (WAC 173-340-474). The cleanup levels provided are based on potential for groundwater migration to surface water.
b. Value based on regional natural background for Puget Sound (Ecology 1994)
c. MTCA Method A Soil Unrestricted Land Use Table Value.
d. Washington State Maximum Concentration of Contaminants for the Toxicity Characteristic Dangerous Waste (WAC 173-303-100).
e. The screening level is lower than the method PQL; MTCA defaults the screening level up to the PQL.
f. MTCA Method B Soil Unrestricted Land Use Direct Contact Formula Value, Carcinogen.

C = The chromotogram indicates the presence of PCBs, not DRO or RRO. Laboratory-reported results were updated to non-detect (U) for DRO/RRO.
J = Estimated value.
T = Value is between the MDL and MRL.
U = Not detected at the reporting limit indicated.
Bold = Detected value.
Shaded = Value exceeds the screening level.

Table 2a – 2014 RI/FS Soil Sample Analytical Results

Sample ID	MTCA	JT-US-51-S4		JT-US-52-S2		JT-US-52-S4		JT-US-53-S1		JT-US-53-S2		JT-US-53-S3		JT-US-53-S4		JT-US-54-S2		JT-US-54-S3		JT-US-55-S1		JT-US-55-S2		JT-US-56-S2		JT-US-56-S3		JT-US-57-S1	
Sampling Date	Method B Soil	12/08/2014		12/08/2014		12/08/2014		12/08/2014		12/08/2014		12/08/2014		12/08/2014		12/09/2014		12/09/2014		12/10/2014		12/10/2014		12/10/2014		12/10/2014		12/10/2014	
Depth in feet	Screening Level[a]	19.5 to 20		9 to 9.5		19.5 to 20		2.5 to 3		7.5 to 8		13 to 13.5		18.5 to 19		11 to 11.5		18 to 18.5		6.5 to 7		13.5 to 14		7 to 7.5		12 to 12.5		2.5 to 3	
Conventionals in %																													
Total Organic Carbon																				**0.442**	J								
Metals in mg/kg																													
Arsenic	7[b]									**1.6**																			
Cadmium	5.6									0.1	U																		
Chromium	2000[c]									**32.8**																			
Lead	250[c]									**2.8**																			
Mercury	0.146									0.03	U																		
TCLP Lead in mg/L	5[d]																												
TPH in mg/kg																													
Diesel Range Organics	2000[c]									**64**	J									**9.1**		**68**							
Lube Oil	2000[c]									**110**	J									**25**		**240**							
Combined Oil and Diesel	2000[c]									**174**	J									**34.1**		**308**							
PCBs in mg/kg																													
Aroclor 1016		0.0039	U	0.0038	U	0.0039	U	0.0038	U	0.004	U	0.004	U	0.0038	U	0.0039	U	0.0038	U	0.0039	U	0.0039	U	0.0038	U	0.004	U	0.0038	U
Aroclor 1221		0.0039	U	0.0038	U	0.0039	U	0.0038	U	0.004	U	0.004	U	0.0038	U	0.0039	U	0.0038	U	0.0039	U	0.0039	U	0.0038	U	0.004	U	0.0038	U
Aroclor 1232		0.0039	U	0.0038	U	0.0039	U	0.0038	U	0.004	U	0.004	U	0.0038	U	0.0039	U	0.0038	U	0.0039	U	0.0039	U	0.0038	U	0.004	U	0.0038	U
Aroclor 1242		0.0039	U	0.0038	U	0.0039	U	0.0038	U	0.004	U	0.004	U	0.0038	U	0.0039	U	0.0038	U	0.0039	U	0.0039	U	0.0038	U	0.004	U	0.0038	U
Aroclor 1248		0.0039	U	0.0038	U	0.0039	U	0.0038	U	0.004	U	0.004	U	0.0038	U	0.0039	U	0.0038	U	0.0039	U	0.0039	U	0.0038	U	0.004	U	0.0038	U
Aroclor 1254		**0.0053**		0.0038	U	0.0039	U	**0.92**		**0.12**		0.004	U	0.0038	U	0.012	U	0.0038	U	0.0039	U	0.0039	U	**0.017**		0.004	U	0.0038	U
Aroclor 1260		0.0039	U	0.0038	U	0.0039	U	**0.16**		**0.056**		0.004	U	0.0038	U	**0.016**		0.0038	U	0.0039	U	0.0039	U	**0.037**		0.004	U	0.0038	U
Aroclor 1262		0.0039	U	0.0038	U	0.0039	U	0.0038	U	0.004	U	0.004	U	0.0038	U	0.0039	U	0.0038	U	0.0039	U	0.0039	U	0.0038	U	0.004	U	0.0038	U
Aroclor 1268		0.0039	U	0.0038	U	0.0039	U	0.0038	U	0.004	U	0.004	U	0.0038	U	0.0039	U	0.0038	U	0.0039	U	0.0039	U	0.0038	U	0.004	U	0.0038	U
Total PCBs	0.0000787[e]	**0.0053**		0.0038	U	0.0039	U	**1.08**		**0.176**		0.004	U	0.0038	U	**0.016**		0.0038	U	0.0039	U	0.0039	U	**0.054**		0.004	U	0.0038	U
Select Detected Volatiles in mg/kg																													
1,1-Dichloroethene	0.0011	0.0024	U	0.002	U	0.0009	U	0.001	U	0.0073	U	0.18	U	0.0008	U	0.001	U	0.0009	U	0.0013	U	0.0021	U	0.0008	U	0.0013	U	0.0009	U
1,2,3-Trichlorobenzene		0.012	U	0.01	U	0.0043	U	0.0048	U	0.036	U	0.9	U	0.0038	U	0.0051	U	0.0046	U	0.0063	U	0.01	U	0.0042	U	0.0063	U	0.0044	U
1,2,4-Trichlorobenzene	0.0056	0.012	U	0.01	U	0.0043	U	0.0048	U	0.036	U	0.9	U	0.0038	U	0.0051	U	0.0046	U	0.0063	U	0.01	U	0.0042	U	0.0063	U	0.0044	U
1,2,4-Trimethylbenzene		0.0024	U	0.002	U	0.0009	U	**0.041**		0.0073	U	**0.26**		**0.007**		0.001	U	0.0009	U	0.0013	U	0.0021	U	0.0008	U	0.0013	U	**0.0049**	
1,2-Dichlorobenzene	2.33	0.0024	U	0.002	U	0.0009	U	0.001	U	0.0073	U	0.18	U	0.0008	U	0.001	U	0.0009	U	0.0013	U	0.0021	U	0.0008	U	0.0013	U	0.0009	U
1,3,5-Trimethylbenzene		0.0024	U	0.002	U	0.0009	U	0.001	U	0.0073	U	**0.11**	T	0.003		0.001	U	0.0009	U	0.0013	U	0.0021	U	0.0008	U	0.0013	U	**0.001**	
1,3-Dichlorobenzene	0.011	0.0024	U	0.002	U	0.0009	U	0.001	U	0.0073	U	0.18	U	0.0008	U	0.001	U	0.0009	U	0.0013	U	0.0021	U	0.0008	U	0.0013	U	0.0009	U
1,4-Dichlorobenzene	0.02	0.0024	U	0.002	U	0.0009	U	0.001	U	0.0073	U	0.18	U	0.0008	U	0.001	U	0.0009	U	0.0013	U	0.0021	U	0.0008	U	0.0013	U	0.0009	U
2-Butanone		0.012	U	0.01	U	0.0043	U	0.0048	U	0.036	U	0.9	U	0.0038	U	0.0051	U	0.0046	U	0.0063	U	**0.031**	J	0.0042	U	0.0063	U	0.0044	U
4-Isopropyltoluene		0.0024	U	0.002	U	0.0009	U	0.001	U	0.0073	U	**0.24**		0.015		**0.001**	T	0.0009	U	0.0013	U	0.0021	U	0.0008	U	0.0013	U	0.0009	U
Acetone	24,100	**0.075**	J	**0.033**	J	**0.023**	J	0.0048	U	0.036	U	0.9	U	**0.11**	J	0.088		0.0046	U	**0.033**		**0.22**		**0.034**		**0.036**		**0.044**	
Benzene	0.0064	0.0024	U	0.002	U	0.0009	U	0.001	U	0.0073	U	0.18	U	0.0008	U	**0.0005**	T	**0.0014**		0.0013	U	0.0021	U	**0.001**		0.0013	U	0.0009	U
Bromomethane	7.08	0.0024	UJ	0.002	UJ	0.0009	UJ	**0.0024**	J	0.0073	UJ	0.18	UJ	0.0008	UJ	0.001	UJ	0.0009	UJ	0.0013	UJ	0.0021	UJ	0.0008	UJ	0.0013	UJ	0.0009	UJ
Carbon Disulfide	170	**0.0015**	T	**0.0015**	T	**0.0005**	T	**0.0015**		0.0073	U	0.18	U	**0.011**		**0.024**		**0.0007**	T	**0.0076**		**0.079**		**0.018**		**0.0055**		**0.0059**	
Chlorobenzene	0.434	0.0024	U	0.002	U	0.0009	U	0.001	U	0.0073	U	0.18	U	0.0008	U	0.001	U	0.0009	U	0.0013	U	0.0021	U	0.0008	U	0.0013	U	0.0009	U
cis-1,2-Dichloroethene		0.0024	U	0.002	U	**0.0007**	T	0.001	U	0.0073	U	0.18	U	**1.6**		**0.088**		0.0009	U	0.0013	U	0.0021	U	0.0008	U	0.0013	U	0.0009	U
Ethylbenzene	0.056	0.0024	U	0.002	U	0.0009	U	**0.018**		**0.049**		**9.5**		**0.027**		0.001	U	0.0009	U	0.0013	U	0.0021	U	0.0008	U	0.0013	U	0.0009	U
Iodomethane		0.0024	UJ	0.002	UJ	0.0009	UJ	**0.0031**	J	0.0073	UJ	0.18	UJ	0.0008	UJ	0.001	UJ	0.0009	UJ	0.0013	UJ	0.0021	UJ	0.0008	UJ	0.0013	UJ	0.0009	UJ
Isopropylbenzene		0.0024	U	0.002	U	0.0009	U	**0.017**		0.0073	U	0.18	U	**0.0011**		0.001	U	0.0009	U	0.0013	U	0.0021	U	0.0008	U	0.0013	U	0.0009	U
Methylene Chloride	4.46	0.0058	U	0.0041	U	0.0033	U	0.0019	U	0.015	U	0.36	U	0.004	U	0.0034	UJ	0.0031	UJ	0.0042	UJ	0.0044	UJ	0.003	UJ	0.0045	UJ	0.0026	U
Naphthalene	6.56	0.012	UJ	0.01	U	0.0043	UJ	**0.0072**	J	0.036	UJ	0.9	UJ	**0.0027**	JT	0.0051	U	0.0046	U	0.0063	U	0.01	U	0.0005	U	0.0063	U	**0.35**	
sec-Butylbenzene		0.0024	U	0.002	U	0.0009	U	**0.012**		0.0073	U	0.18	U	**0.001**		0.001	U	0.0009	U	0.0013	U	0.0021	U	0.0008	U	0.0013	U	0.0009	U
Tetrachloroethene	0.015	0.0024	U	0.002	U	**0.0008**	T	0.001	U	0.0073	U	0.18	U	0.0008	U	**0.045**		0.0009	U	0.0013	U	0.0021	U	0.0008	U	0.0013	U	0.0009	U
Toluene	0.189	0.0024	U	0.002	U	0.0009	U	**0.0088**		0.0073	U	**0.18**		**0.0058**		0.001	U	0.0009	U	0.0013	U	0.0021	U	**0.001**		**0.0014**		0.0006	T
trans-1,2-Dichloroethene	1.09	0.0024	U	0.002	U	0.0009	U	0.001	U	0.0073	U	0.18	U	**0.004**		**0.0045**		0.0009	U	0.0013	U	0.0021	U	0.0008	U	0.0013	U	0.0009	U
Trichloroethene	0.0023	0.0024	U	0.002	U	0.0009	U	0.001	U	0.0073	U	0.18	U	**0.0008**		**0.029**		0.0009	U	0.0013	U	0.0021	U	0.0008	U	0.0013	U	0.0009	U
Vinyl Chloride	0.0005[e]	0.0024	U	0.002	UJ	0.0009	U	0.001	U	0.0073	U	0.18	U	**0.075**		0.001	U	0.0009	U	0.0013	U	0.0021	U	0.0008	U	0.0013	U	0.0009	UJ
O-Xylene		0.0024	U	0.002	U	0.0009	U	0.066		0.14		30		0.14		0.001	U	0.0006	T	0.0013	U	0.0021	U	0.0013		0.0013	U	0.001	
m, p-Xylene		0.0024	U	0.002	U	0.0009	U	0.0042		0.0073		1.8		0.009		0.001	U	0.0009	U	0.0013	U	0.0021	U	0.0005	T	0.0013	U	0.0009	
Total Xylenes	9[c]	0.0024	U	0.002	U	0.0009	U	**0.0702**		**0.1473**		**31.8**		**0.149**		0.001	U	**0.0006**		0.0013	U	0.0021	U	**0.0018**		0.0013	U	**0.0019**	

Notes:

a. Value provided is the Three-Phase Partitioning Model screening level calculated with MTCA equation 747-1 using the lowest surface water level for protection of human health considering food ingestion only (WAC 173-340-474). The cleanup levels provided are based on potential for groundwater migration to surface water.
b. Value based on regional natural background for Puget Sound (Ecology 1994)
c. MTCA Method A Soil Unrestricted Land Use Table Value.
d. Washington State Maximum Concentration of Contaminants for the Toxicity Characteristic Dangerous Waste (WAC 173-303-100).
e. The screening level is lower than the method PQL; MTCA defaults the screening level up to the PQL.
f. MTCA Method B Soil Unrestricted Land Use Direct Contact Formula Value, Carcinogen.

C = The chromotogram indicates the presence of PCBs, not DRO or RRO. Laboratory-reported results were updated to non-detect (U) for DRO/RRO.
J = Estimated value.
T = Value is between the MDL and MRL.
U = Not detected at the reporting limit indicated.
Bold = Detected value.
Shaded = Value exceeds the screening level.

Table 2a – 2014 RI/FS Soil Sample Analytical Results

Sample ID	MTCA	JT-US-57-S2	
Sampling Date	Method B Soil	12/10/2014	
Depth in feet	Screening Level[a]	6.5 to 7	
Conventionals in %			
Total Organic Carbon			
Metals in mg/kg			
Arsenic	7[b]		
Cadmium	5.6		
Chromium	2000[c]		
Lead	250[c]		
Mercury	0.146		
TCLP Lead in mg/L	5[d]		
TPH in mg/kg			
Diesel Range Organics	2000[c]		
Lube Oil	2000[c]		
Combined Oil and Diesel	2000[c]		
PCBs in mg/kg			
Aroclor 1016		0.0038	U
Aroclor 1221		0.0038	U
Aroclor 1232		0.0038	U
Aroclor 1242		0.0038	U
Aroclor 1248		0.0038	U
Aroclor 1254		**0.069**	
Aroclor 1260		**0.0096**	
Aroclor 1262		0.0038	U
Aroclor 1268		0.0038	U
Total PCBs	0.0000787[e]	**0.0786**	
Select Detected Volatiles in mg/kg			
1,1-Dichloroethene	0.0011	0.0008	U
1,2,3-Trichlorobenzene		0.004	U
1,2,4-Trichlorobenzene	0.0056	0.004	U
1,2,4-Trimethylbenzene		**0.0004**	T
1,2-Dichlorobenzene	2.33	0.0008	U
1,3,5-Trimethylbenzene		0.0008	U
1,3-Dichlorobenzene	0.011	0.0008	U
1,4-Dichlorobenzene	0.02	0.0008	U
2-Butanone		0.004	U
4-Isopropyltoluene		0.0008	U
Acetone	24,100	**0.026**	
Benzene	0.0064	0.0008	U
Bromomethane	7.08	0.0008	UJ
Carbon Disulfide	170	0.0007	T
Chlorobenzene	0.434	0.0008	U
cis-1,2-Dichloroethene		0.0008	U
Ethylbenzene	0.056	0.0008	U
Iodomethane		0.0008	UJ
Isopropylbenzene		0.0008	U
Methylene Chloride	4.46	0.002	U
Naphthalene	6.56	**0.013**	J
sec-Butylbenzene		0.0008	U
Tetrachloroethene	0.015	0.0008	U
Toluene	0.189	0.0008	U
trans-1,2-Dichloroethene	1.09	0.0008	U
Trichloroethene	0.0023	0.0008	U
Vinyl Chloride	0.0005[e]	0.0008	UJ
O-Xylene		0.0006	T
m, p-Xylene		0.0008	U
Total Xylenes	9[c]	0.0008	U

Notes:

a. Value provided is the Three-Phase Partitioning Model screening level calculated with MTCA equation 747-1 using the lowest surface water level for protection of human health considering food ingestion only (WAC 173-340-474). The cleanup levels provided are based on potential for groundwater migration to surface water.
b. Value based on regional natural background for Puget Sound (Ecology 1994)
c. MTCA Method A Soil Unrestricted Land Use Table Value.
d. Washington State Maximum Concentration of Contaminants for the Toxicity Characteristic Dangerous Waste (WAC 173-303-100).
e. The screening level is lower than the method PQL; MTCA defaults the screening level up to the PQL.
f. MTCA Method B Soil Unrestricted Land Use Direct Contact Formula Value, Carcinogen.

C = The chromotogram indicates the presence of PCBs, not DRO or RRO. Laboratory-reported results were updated to non-detect (U) for DRO/RRO.
J = Estimated value.
T = Value is between the MDL and MRL.
U = Not detected at the reporting limit indicated.
Bold = Detected value.
Shaded = Value exceeds the screening level.

Table 2b – 2013-2014 IAWP Soil Sample Analytical Results

Sample ID	MTCA	JT-US-001-S2		JT-US-001-S3		JT-US-002-S2		JT-US-003-S2		JT-US-003-S3		JT-US-004-S2		JT-US-004-S3		JT-US-004-S4		JT-US-005-S2		JT-US-005-S3		JT-US-006-S2		JT-US-006-S3		JT-US-007-S2		JT-US-007-S3	
Sampling Date	Method B Soil	1/2/2014		1/2/2014		1/2/2014		1/2/2014		1/3/2014		1/2/2014		1/2/2014		1/2/2014		1/2/2014		1/2/2014		1/2/2014		1/2/2014		1/2/2014		1/2/2014		
Depth in feet	Screening Level[a]	11 to 11.5		15.5 to 16		6.5 to 7		7.5 to 8		17 to 17.5		7 to 7.5		13 to 13.5		17.75 to 18.5		10 to 10.5		17.5 to 18.25		6.5 to 7		15.5 to 16		7.5 to 8		11.5 to 12		
Conventionals in %																													
Total Organic Carbon																												**1.16**	
Metals in mg/kg																													
Arsenic	7[b]	**5.7**				**5.2**		**17.8**				**5.5**						**4.4**		**6**		**3.1**				**2.4**		**5.9**	
Cadmium	5.6	**0.5**				**0.1**		**1.1**				0.1	U					**0.2**		0.1	U	0.1	U			0.1	U	0.1	U
Chromium	2000[c]	**26**				**35**		**35**				**24.4**						**26.1**		**26.6**		**29.6**				**23.1**		**26**	
Lead	250[c]	**49.5**				**40**		**422**				**9.4**						**60**		**1.9**		**3.1**				**2.1**		**1.9**	
Mercury	0.146	**0.09**				**0.04**		**0.13**				**0.07**						**0.03**		0.02	U	**0.03**				**0.02**		0.03	U
TCLP Lead in mg/L	5[d]																												
TPH in mg/kg																													
Diesel Range Organics	2000[c]	960	U, C			71	U, C	**1200**				**18**						1600	U, C									6.2	U
Lube Oil	2000[c]	710	U, C			54	U, C	**3500**				**29**						560	U, C									12	U
Electrical Insulating Oil	2000[c]	980	U, C			74	U, C	**1700**				**20**						1600	U, C									12	U
Gasoline Range Organics	30[c]																												
PCBs in mg/kg																													
Aroclor 1016		100	U	0.019	U	9.2	U	0.0038	U	0.078	U	0.0039	U	0.0037	U	0.0039	U	0.43	U	120	U	0.018	U	0.004	U	0.0038	U	0.0038	U
Aroclor 1221		100	U	0.019	U	9.2	U	0.0038	U	0.078	U	0.0039	U	0.0037	U	0.0039	U	0.43	U	120	U	0.018	U	0.004	U	0.0038	U	0.0038	U
Aroclor 1232		100	U	0.023	U	9.2	U	0.0038	U	0.078	U	0.0058	U	0.0056	U	0.0039	U	0.43	U	120	U	0.018	U	0.006	U	0.0038	U	0.0057	U
Aroclor 1242		100	U	0.019	U	9.2	U	0.0038	U	0.078	U	0.0039	U	0.0037	U	0.0039	U	0.43	U	120	U	0.018	U	0.004	U	0.0038	U	0.0038	U
Aroclor 1248		100	U	0.019	U	9.2	U	0.038	U	0.078	U	0.0039	U	0.0037	U	0.0039	U	0.43	U	120	U	0.018	U	0.004	U	0.0038	U	0.0038	U
Aroclor 1254		300	U	0.023	U	28	U	0.038	U	0.48	U	0.0039	U	0.0037	U	0.0058	U	2.1	U	730	U	0.018	U	0.02	U	0.0038	U	0.0038	U
Aroclor 1260		**870**		**0.051**		**74**		**0.068**		**1.2**		**0.0073**		0.0037	U	**0.015**		**5.1**		**1800**		0.018	U	**0.054**		**0.0046**		**0.0025**	T
Aroclor 1262		100	U	0.019	U	9.2	U	0.0038	U	0.078	U	0.0039	U	0.0037	U	0.0039	U	0.43	U	120	U	0.018	U	0.004	U	0.0038	U	0.0038	U
Aroclor 1268		100	U	0.019	U	9.2	U	0.0038	U	0.078	U	0.0039	U	0.0037	U	0.0039	U	0.43	U	120	U	0.018	U	0.004	U	0.0038	U	0.0038	U
Total PCBs	0.0000787[e]	**870**		**0.051**		**74**		**0.068**		**1.2**		**0.0073**		0.0037	U	**0.015**		**5.1**		**1800**		0.018	U	**0.054**		**0.0046**		**0.0025**	**J**
Select Detected Volatiles in mg/kg																													
1,1-Dichloroethene	0.0011	4.4	U	0.001	U	0.063	U	0.0024	U			0.076	U	0.069	U	0.0007	U	0.0019	U	0.1	U	0.059	U	0.068	U	0.0009	U	0.001	U
1,2,3-Trichlorobenzene		22	U	0.0048	U	0.31	U	0.012	U			0.38	U	0.34	U	0.0035	U	**0.0041**	T	**1**		0.29	U	0.34	U	0.0047	U	0.0051	U
1,2,4-Trichlorobenzene	0.0056	22	U	0.0048	U	**0.27**	**T**	0.012	U			**1.1**		**0.12**	**T**	**0.0011**	T	**0.033**		**13**		**0.11**	**T**	**0.086**	**T**	0.0047	U	0.0051	U
1,2,4-Trimethylbenzene		4.4	U	0.001	U	0.063	U	**0.0013**	JT			0.076	U	0.069	U	0.0007	U	0.0019	U	0.1	U	0.059	U	0.068	U	0.0009	U	0.001	U
1,2-Dichlorobenzene	2.33	4.4	U	0.001	U	0.063	U	0.0024	U			**1.8**		**0.089**		0.0007	U	**0.0011**	T	**0.74**		0.059	U	**0.082**		0.0009	U	0.001	U
1,3,5-Trimethylbenzene		4.4	U	0.001	U	0.063	U	0.0024	U			0.076	U	0.069	U	0.0007	U	0.0019	U	0.1	U	0.059	U	0.068	U	0.0009	U	0.001	U
1,3-Dichlorobenzene	0.011	4.4	U	0.001	U	0.17		**0.0013**	JT			**7**		**0.97**		0.0007	U	**0.0053**		**4.7**		**0.14**		**0.73**		0.0009	U	**0.0032**	
1,4-Dichlorobenzene	0.02	**5.1**		0.001	U	**0.33**		**0.0027**				**8.3**		**1.2**		0.0007	U	**0.0096**		**4.6**		**0.23**		**1.5**		0.0009	U	**0.0049**	
2-Butanone		22	U	0.0048	U	0.31	U	**0.011**	T			0.38	U	0.34	U	0.0035	U	0.0097	U	0.51	U	0.29	U	0.34	U	0.0047	U	0.0051	U
4-Isopropyltoluene		4.4	U	0.001	U	0.063	U	0.0024	U			**0.062**	T	0.069	U	0.0007	U	0.0019	U	0.1	U	0.059	U	0.068	U	0.0009	U	0.001	U
Acetone	24,100	22	U	**0.0076**		0.31	U	**0.03**	J			0.38	U	0.34	U	**0.0072**		**0.047**		0.51	U	0.29	U	0.34	U	**0.025**		**0.026**	J
Benzene	0.0064	**2.7**	T	0.001	U	**0.034**	T	**0.0015**	T			**0.42**		0.069	U	0.0007	U	**0.0026**		0.1	U	0.059	U	0.068	U	0.0009	U	**0.001**	T
Bromomethane	7.08	4.4	U	0.001	U	0.063	U	0.0024	U			0.076	U	**0.055**	T	0.0007	U	0.0019	U	0.1	U	**0.06**		0.068	U	0.0009	U	0.001	U
Carbon Disulfide	170	4.4	U	0.001	U	0.063	U	**0.0058**				0.076	U	0.069	U	**0.0008**		**0.0027**		0.1	U	0.059	U	0.068	U	**0.0016**		**0.014**	
Chlorobenzene	0.434	**170**		**0.0006**	T	**2.8**		**0.036**				**14**		**0.36**		0.0007	U	**0.027**		**2.9**		**0.34**		**3.2**		0.0009	U	**0.085**	
cis-1,2-Dichloroethene		4.4	U	0.002		0.063	U	0.0024	U			7.8		0.069	U	0.0007	U	**0.0016**	T	0.1	U	0.059	U	**0.15**		0.0009	U	0.001	U
Ethylbenzene	0.056	4.4	U	0.001	U	0.063	U	0.0024	U			0.076	U	0.069	U	0.0007	U	0.0019	U	0.1	U	0.059	U	0.068	U	0.0009	U	0.001	U
Iodomethane		4.4	U	0.001	U	0.063	U	0.0024	U			0.076	U	0.069	U	0.0007	U	0.0019	U	0.1	U	0.059	U	**0.043**	T	0.0009	U	0.001	U
Isopropylbenzene		4.4	U	0.001	U	0.063	U	0.0024	U			0.076	U	0.069	U	0.0007	U	0.0019	U	0.1	U	0.059	U	0.068	U	0.0009	U	0.001	U
Methylene Chloride	4.46	8.8	U	**0.0013**	T	0.13	U	0.0048	UJ			0.15	U	0.14	U	**0.0022**		0.0039	U	0.21	U	0.12	U	0.14	U	**0.0039**		**0.0034**	J
Naphthalene	6.56	*22*	*U*	0.0048	U	0.31	U	0.012	U			0.38	U	0.34	U	0.0035	U	0.0097	U	0.51	U	0.29	U	0.34	U	0.0047	U	0.0051	U
sec-Butylbenzene		4.4	U	0.001	U	0.063	U	0.0024	U			0.076	U	0.069	U	0.0007	U	0.0019	U	0.1	U	0.059	U	0.068	U	0.0009	U	0.001	U
Tetrachloroethene	0.015	4.4	U	0.001	U	0.063	U	0.0024	U			0.076	U	0.069	U	0.0007	U	0.0019	U	0.1	U	0.059	U	0.068	U	0.0009	U	0.001	U
Toluene	0.189	4.4	U	0.001	U	0.063	U	0.0024	U			**0.11**		0.069	U	0.0007	U	**0.0012**	T	0.1	U	0.059	U	0.068	U	0.0009	U	0.001	U
trans-1,2-Dichloroethene	1.09	4.4	U	0.001	U	0.063	U	0.0024	U			**0.44**		0.069	U	0.0007	U	0.0019	U	0.1	U	0.059	U	0.068	U	0.0009	U	0.001	U
Trichloroethene	0.0023	4.4	U	0.001	U	0.063	U	0.0024	U			**0.44**		0.069	U	0.0007	U	0.0019	U	0.1	U	0.059	U	0.068	U	0.0009	U	0.001	U
Vinyl Chloride	0.0005[e]	4.4	U	**0.0082**		0.063	U	0.0024	U			**0.41**		0.069	U	0.0007	U	0.0019	U	0.1	U	0.059	U	0.068	U	0.0009	U	0.001	U
Total Xylenes	9[c]	4.4	U	0.001	U	0.063	U	0.0024	U			**0.11**		0.069	U	0.0007	U	0.0019	U	0.1	U	0.059	U	0.068	U	0.0009	U	0.001	U

Notes:

a. Value provided is the Three-Phase Partitioning Model screening level calculated with MTCA equation 747-1 using the lowest surface water level for protection of human health considering food ingestion only (WAC 173-340-474). The cleanup levels provided are based on potential for groundwater migration to surface water.
b. Value based on regional natural background for Puget Sound (Ecology 1994).
c. MTCA Method A Soil Unrestricted Land Use Table Value.
d. Washington State Maximum Concentration of Contaminants for the Toxicity Characteristic Dangerous Waste (WAC 173-303-100).
e. The screening level is lower than the method PQL; MTCA defaults the screening level up to the PQL.
f. MTCA Method B Soil Unrestricted Land Use Direct Contact Formula Value, Carcinogen.

C = The chromotogram indicates the presence of PCBs, not DRO or RRO. Laboratory-reported results were updated to non-detect (U) for DRO/RRO.
J = Estimated value.
T = Value is between the MDL and MRL.
U = Not detected at the reporting limit indicated.
Bold = Detected value.
Shaded = Value exceeds the screening level.

Table 2b – 2013-2014 IAWP Soil Sample Analytical Results

Sample ID	MTCA	JT-US-007-S4		JT-US-008-S2		JT-US-008-S4		JT-US-008-S5		JT-US-009-S1		JT-US-009-S2		JT-US-009-S3		JT-US-009-S4		JT-US-010-S2		JT-US-010-S3		JT-US-011-S2		JT-US-011-S3		JT-US-011-S4		JT-US-012-S1	
Sampling Date	Method B Soil	1/2/2014		1/2/2014		1/2/2014		1/2/2014		1/3/2014		1/3/2014		1/3/2014		1/3/2014		1/3/2014		1/3/2014		1/3/2014		1/3/2014		1/3/2014		1/6/2014	
Depth in feet	Screening Level[a]	16.5 to 17		6.5 to 7		15.5 to 16		18 to 18.5		1 to 2		6.5 to 7.5		12.75 to 13.5		18 to 18.75		10.5 to 11		16.5 to 17		7 to 7.5		11.5 to 12		15.5 to 16		0.5 to 2	
Conventionals in %																													
Total Organic Carbon						**0.09**																							
Metals in mg/kg																													
Arsenic	7[b]					**5.3**						**2.9**		**1.3**				**4.1**				**5.3**		**1.5**				**8.3**	
Cadmium	5.6					0.1	U					0.1	U	0.1	U			0.1	U			**0.1**		0.1	U			**2**	
Chromium	2000[c]					**25.2**						**43**		**22**				**20**				**47**		**22.2**				**41.9**	
Lead	250[c]					**1.7**						**2.4**		**1.3**				**60.1**				**9.4**		**1.4**				**167**	
Mercury	0.146					0.02	U					**0.03**		0.02	U			**0.12**				0.03	U	0.02	U			**0.39**	
TCLP Lead in mg/L	5[d]																												
TPH in mg/kg																													
Diesel Range Organics	2000[c]					660	U, C																						
Lube Oil	2000[c]					250	U, C																						
Electrical Insulating Oil	2000[c]					650	U, C																						
Gasoline Range Organics	30[c]																												
PCBs in mg/kg																													
Aroclor 1016		0.0038	U	0.0038	U	240	U	0.079	U	0.0037	U	0.0039	U	0.0038	U	0.0037	U	0.0038	U	0.004	U	1	U	0.0039	U	0.0038	U	0.01	U
Aroclor 1221		0.0038	U	0.0038	U	240	U	0.079	U	0.0037	U	0.0039	U	0.0038	U	0.0037	U	0.0038	U	0.004	U	1	U	0.0039	U	0.0038	U	0.01	U
Aroclor 1232		0.0038	U	0.0038	U	240	U	0.079	U	0.0037	U	0.0039	U	0.0038	U	0.0037	U	0.0038	U	0.004	U	1	U	0.0039	U	0.0038	U	0.01	U
Aroclor 1242		0.0038	U	0.0038	U	240	U	0.079	U	0.0037	U	0.0039	U	0.0038	U	0.0037	U	0.0038	U	0.004	U	1	U	0.0039	U	0.0038	U	0.01	U
Aroclor 1248		0.0038	U	0.0038	U	240	U	0.079	U	0.0074	U	0.0039	U	0.0038	U	0.0037	U	0.0038	U	0.004	U	1	U	0.077	U	0.0094	U	3.8	U
Aroclor 1254		0.0038	U	0.0038	U	610	U	0.36	U	0.037	U	0.0039	U	0.0038	U	0.0037	U	0.0038	U	0.004	U	15	U	0.097	U	0.0094	U	2.5	U
Aroclor 1260		**0.0034**	T	0.0038	U	**1400**		**0.81**		**0.12**		0.0039	U	0.0038	U	0.0037	U	**0.004**		**0.0042**		**22**		**0.11**		**0.017**		**1.5**	
Aroclor 1262		0.0038	U	0.0038	U	240	U	0.079	U	0.0037	U	0.0039	U	0.0038	U	0.0037	U	0.0038	U	0.004	U	1	U	0.0039	U	0.0038	U	0.01	U
Aroclor 1268		0.0038	U	0.0038	U	240	U	0.079	U	0.0037	U	0.0039	U	0.0038	U	0.0037	U	0.0038	U	0.004	U	1	U	0.0039	U	0.0038	U	0.01	U
Total PCBs	0.0000787[e]	**0.0034**	**J**	0.0038	U	**1400**		**0.81**		**0.12**		0.0039	U	0.0038	U	0.0037	U	**0.004**		**0.0042**		**22**		**0.11**		**0.017**		**1.5**	
Select Detected Volatiles in mg/kg																													
1,1-Dichloroethene	0.0011			0.056	U	0.0012	U	0.0007	U	0.0015	U	0.06	U	0.067	U			0.001	U	0.06	U	0.072	U	0.069	U	0.077	U	0.063	U
1,2,3-Trichlorobenzene				0.28	U	**1.5**	T	0.0035	U	0.0074	U	0.3	U	0.34	U			0.0052	U	0.3	U	0.36	U	0.34	U	0.39	U	0.32	U
1,2,4-Trichlorobenzene	0.0056			**0.22**	**T**	**43**		0.0035	U	**0.002**	**T**	**0.41**		**0.29**	**T**			**0.0014**	JT	0.3	U	**1.8**		0.34	U	0.39	U	0.32	U
1,2,4-Trimethylbenzene				0.056	U	0.0012	U	0.0007	U	**0.0013**	T	0.06	U	0.067	U			0.001	U	0.06	U	0.072	U	0.069	U	0.077	U	0.063	U
1,2-Dichlorobenzene	2.33			**0.046**	T	**1.5**		0.0007	U	0.0015	U	**0.078**		**0.22**				0.001	U	0.06	U	**0.16**		0.069	U	**0.28**		**0.034**	T
1,3,5-Trimethylbenzene				0.056	U	0.0012	U	0.0007	U	0.0015	U	0.06	U	0.067	U			0.001	U	0.06	U	0.072	U	0.069	U	0.077	U	0.063	U
1,3-Dichlorobenzene	0.011			**0.37**		**0.22**		0.0007	U	0.0015	U	**0.67**		**1.6**				0.001	U	**0.17**		**1.2**		**0.075**		**1.4**		**0.1**	
1,4-Dichlorobenzene	0.02			**0.59**		**5.6**		0.0007	U	0.0015	U	**1**		**1.7**				0.001	U	**3**		**3.6**		**0.19**		**1.9**		**0.3**	
2-Butanone				0.28	U	**0.0037**	T	0.0035	U	0.0074	U	0.3	U	0.34	U			0.0052	U	0.3	U	0.36	U	0.34	U	0.39	U	0.32	U
4-Isopropyltoluene				0.056	U	0.0012	U	0.0007	U	0.0015	U	0.06	U	0.067	U			0.001	U	0.06	U	0.072	U	0.069	U	0.077	U	0.063	U
Acetone	24,100			0.28	U	**0.035**	J	**0.0089**		**0.028**	J	0.3	U	0.34	U			**0.026**	J	0.3	U	0.36	U	0.34	U	0.39	U	0.32	U
Benzene	0.0064			0.056	U	**0.0009**	T	0.0007	U	0.0015	U	0.06	U	0.067	U			**0.0006**	T	0.06	U	**0.065**	**T**	0.069	U	0.077	U	0.063	U
Bromomethane	7.08			**0.062**		0.0012	U	0.0007	U	0.0015	U	**0.083**		**0.067**				0.001	U	**0.065**		**0.062**	T	**0.07**		**0.081**		**0.062**	T
Carbon Disulfide	170			0.056	U	**0.015**		**0.0008**		**0.0026**		0.06	U	0.067	U			0.001	U	0.06	U	0.072	U	0.069	U	0.077	U	0.063	U
Chlorobenzene	0.434			**0.8**		**0.031**		0.0007	U	**0.001**	T	**0.79**		**0.39**				**0.0008**	T	**2.4**		**12**		**0.75**		**0.47**		**0.14**	
cis-1,2-Dichloroethene				0.056	U	**0.0016**		0.0007	U	0.0015	U	0.06	U	0.067	U			**0.0085**		0.06	U	0.072	U	0.069	U	**0.14**		0.063	U
Ethylbenzene	0.056			0.056	U	0.0012	U	0.0007	U	0.0015	U	0.06	U	0.067	U			0.001	U	0.06	U	0.072	U	0.069	U	0.077	U	0.063	U
Iodomethane				0.056	U	0.0012	U	0.0007	U	0.0015	U	**0.049**	T	**0.036**	T			0.001	U	**0.047**	T	**0.044**	T	**0.061**	T	0.077	U	0.063	U
Isopropylbenzene				0.056	U	0.0012	U	0.0007	U	0.0015	U	0.06	U	0.067	U			0.001	U	0.06	U	0.072	U	0.069	U	0.077	U	**0.37**	
Methylene Chloride	4.46			**0.1**	T	**0.0035**	J	**0.0019**		**0.0036**		0.12	U	0.13	U			0.0021	U	0.12	U	0.14	U	0.14	U	0.16	U	0.13	U
Naphthalene	6.56			0.28	U	0.0062	U	0.0035	U	**0.19**		0.3	U	0.34	U			0.0052	U	0.3	U	0.36	U	0.34	U	0.39	U	0.32	U
sec-Butylbenzene				0.056	U	0.0012	U	0.0007	U	0.0015	U	0.06	U	0.067	U			0.001	U	0.06	U	0.072	U	0.069	U	0.077	U	**0.7**	
Tetrachloroethene	0.015			0.056	U	0.0012	U	0.0007	U	0.0015	U	0.06	U	0.067	U			0.001	U	0.06	U	0.072	U	0.069	U	0.077	U	0.063	U
Toluene	0.189			0.056	U	0.0012	U	0.0007	U	0.0015	U	0.06	U	0.067	U			0.001	U	0.06	U	0.072	U	0.069	U	0.077	U	0.063	U
trans-1,2-Dichloroethene	1.09			0.056	U	0.0012	U	0.0007	U	0.0015	U	0.06	U	0.067	U			0.001	U	0.06	U	0.072	U	0.069	U	0.077	U	0.063	U
Trichloroethene	0.0023			0.056	U	0.0012	U	0.0007	U	0.0015	U	0.06	U	0.067	U			0.001	U	0.06	U	0.072	U	0.069	U	0.077	U	0.063	U
Vinyl Chloride	0.0005[e]			0.056	UJ	**0.0008**	T	0.0007	U	0.0015	U	0.06	U	0.067	U			**0.058**		0.06	U	0.072	U	0.069	U	0.077	U	0.063	U
Total Xylenes	9[c]			0.056	U	0.0012	U	0.0007	U	0.0015	U	0.06	U	0.067	U			0.001	U	0.06	U	0.072	U	0.069	U	0.077	U	**0.036**	J

Notes:

a. Value provided is the Three-Phase Partitioning Model screening level calculated with MTCA equation 747-1 using the lowest surface water level for protection of human health considering food ingestion only (WAC 173-340-474). The cleanup levels provided are based on potential for groundwater migration to surface water.

b. Value based on regional natural background for Puget Sound (Ecology 1994).

c. MTCA Method A Soil Unrestricted Land Use Table Value.

d. Washington State Maximum Concentration of Contaminants for the Toxicity Characteristic Dangerous Waste (WAC 173-303-100).

e. The screening level is lower than the method PQL; MTCA defaults the screening level up to the PQL.

f. MTCA Method B Soil Unrestricted Land Use Direct Contact Formula Value, Carcinogen.

C = The chromotogram indicates the presence of PCBs, not DRO or RRO. Laboratory-reported results were updated to non-detect (U) for DRO/RRO.
J = Estimated value.
T = Value is between the MDL and MRL.
U = Not detected at the reporting limit indicated.
Bold = Detected value.
Shaded = Value exceeds the screening level.

Table 2b – 2013-2014 IAWP Soil Sample Analytical Results

Sample ID	MTCA	JT-US-012-S2		JT-US-012-S3		JT-US-012-S5		JT-US-013-S2		JT-US-013-S3		JT-US-013-S4		JT-US-014-S2		JT-US-014-S3		JT-US-014-S4		JT-US-015-S1		JT-US-015-S2		JT-US-016-S2		JT-US-016-S3		JT-US-017-S4	
Sampling Date	Method B Soil	1/6/2014		1/6/2014		1/6/2014		1/3/2014		1/3/2014		1/3/2014		1/3/2014		1/3/2014		1/3/2014		1/3/2014		1/3/2014		1/3/2014		1/3/2014		1/6/2014	
Depth in feet	Screening Level[a]	5 to 7		10 to 11		16.5 to 17.5		6 to 7		11 to 12		16 to 16.5		7 to 8		15 to 16		16 to 17		5.5 to 6		16 to 16.5		7.5 to 8.5		12 to 12.5		17.5 to 18.5	
Conventionals in %																													
Total Organic Carbon														**4.54**															
Metals in mg/kg																													
Arsenic	7[b]	**4.3**						**8.1**		**5.8**												**6**				**6**		**4.1**	
Cadmium	5.6	**0.4**						**0.2**		0.1	U											0.1	U			0.1	U	0.2	U
Chromium	2000[c]	**24.9**						**35**		**22**												**31**				**33**		**26**	
Lead	250[c]	**12.3**						**22.1**		**1.5**												**2.3**				**1.7**		**33.1**	
Mercury	0.146	**0.03**						**0.05**		0.03	U											0.03	U			0.03	U	**0.18**	
TCLP Lead in mg/L	5[d]																												
TPH in mg/kg																													
Diesel Range Organics	2000[c]													490	U, C														
Lube Oil	2000[c]													220	U, C														
Electrical Insulating Oil	2000[c]													460	U, C														
Gasoline Range Organics	30[c]																												
PCBs in mg/kg																													
Aroclor 1016		0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.0038	U	0.0039	U	100	U	0.0039	U	0.004	U	0.0039	U	0.0038	U	0.0038	U	0.0039	U	0.0039	U
Aroclor 1221		0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.0038	U	0.0039	U	100	U	0.0039	U	0.004	U	0.0039	U	0.0038	U	0.0038	U	0.0039	U	0.0039	U
Aroclor 1232		0.0038	U	0.0095	U	0.0039	U	0.0038	U	0.0038	U	0.0039	U	100	U	0.0039	U	0.005	U	0.0039	U	0.013	U	0.0038	U	0.0039	U	0.0058	U
Aroclor 1242		0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.0038	U	0.0039	U	100	U	0.0039	U	0.004	U	0.0039	U	0.0038	U	0.0038	U	0.0039	U	0.0039	U
Aroclor 1248		0.038	U	0.0038	U	0.0039	U	0.0096	U	0.0038	U	0.0039	U	100	U	0.0058	U	0.004	U	0.0077	U	0.0038	U	0.0038	U	0.0039	U	0.0039	U
Aroclor 1254		0.019	U	0.0095	U	0.0039	U	0.012	U	0.038	U	0.0039	U	210	U	0.039	U	0.006	U	0.019	U	0.0095	U	0.077	U	0.0039	U	0.0039	U
Aroclor 1260		**0.023**		**0.016**		**0.0027**	T	**0.014**		**0.11**		**0.005**		**400**		**0.12**		**0.013**		**0.051**		**0.026**		**0.14**		**0.0022**	T	**0.0021**	T
Aroclor 1262		0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.0038	U	0.0039	U	100	U	0.0039	U	0.004	U	0.0039	U	0.0038	U	0.0038	U	0.0039	U	0.0039	U
Aroclor 1268		0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.0038	U	0.0039	U	100	U	0.0039	U	0.004	U	0.0039	U	0.0038	U	0.0038	U	0.0039	U	0.0039	U
Total PCBs	0.0000787[e]	**0.023**		**0.016**		**0.0027**	J	**0.014**		**0.11**		**0.005**		**400**		**0.12**		**0.013**		**0.051**		**0.026**		**0.14**		**0.0022**	**J**	**0.0021**	**J**
Select Detected Volatiles in mg/kg																													
1,1-Dichloroethene	0.0011	0.001	U	**0.0012**				0.0025	U	0.0011	U	0.0017	U	21	U	0.0011	U	0.0014	U	0.066	U	0.001	U	0.0018	U	0.0011	U	0.0021	U
1,2,3-Trichlorobenzene		0.0048	U	0.0053	U			0.012	U	0.0057	U	0.0086	U	100	U	0.0056	U	0.0071	U	0.33	U	0.0048	U	0.0088	U	0.0054	U	0.01	U
1,2,4-Trichlorobenzene	0.0056	0.0048	U	0.0053	U			0.012	U	**0.0019**	T	0.0086	U	**370**		0.0056	U	0.0071	U	**0.28**	T	0.0048	U	0.0088	U	0.0054	U	0.01	U
1,2,4-Trimethylbenzene		0.001	U	0.0011	U			0.0025	U	0.0011	U	0.0017	U	21	U	0.0011	U	0.0014	U	0.066	U	0.001	U	0.0018	U	0.0011	U	0.0021	U
1,2-Dichlorobenzene	2.33	0.001	U	0.0011	U			0.0025	U	0.0011	U	0.0017	U	21	U	0.0011	U	0.0014	U	0.066	U	0.001	U	0.0018	U	0.0011	U	0.0021	U
1,3,5-Trimethylbenzene		0.001	U	0.0011	U			0.0025	U	0.0011	U	0.0017	U	21	U	0.0011	U	0.0014	U	0.066	U	0.001	U	0.0018	U	0.0011	U	0.0021	U
1,3-Dichlorobenzene	0.011	0.001	U	0.0011	U			0.0025	U	**0.0011**	T	0.0017	U	**22**		0.0011	U	0.0014	U	0.066	U	0.001	U	0.0018	U	0.0011	U	0.0021	U
1,4-Dichlorobenzene	0.02	0.001	U	0.0011	U			0.0025	U	**0.0013**		0.0017	U	**52**		0.0011	U	0.0014	U	0.066	U	**0.0009**	T	0.0018	U	0.0011	U	0.0021	U
2-Butanone		0.0048	U	0.0053	U			**0.058**		0.0057	U	0.0086	U	100	U	0.0056	U	0.0071	U	0.33	U	0.0048	U	**0.018**		0.0054	U	0.01	U
4-Isopropyltoluene		0.001	U	0.0011	U			0.0025	U	0.0011	U	0.0017	U	21	U	0.0011	U	0.0014	U	0.066	U	0.001	U	0.0018	U	0.0011	U	0.0021	U
Acetone	24,100	**0.021**		0.0053	U			**0.31**	J	**0.016**	J	0.0086	UJ	100	UJ	0.0056	UJ	0.017	J	0.33	UJ	0.0048	UJ	**0.13**		**0.049**		**0.036**	
Benzene	0.0064	0.001	U	0.0011	U			0.0025	U	0.0011	U	**0.0053**		21	U	0.0011	U	0.0014	U	0.066	U	0.001	U	0.0018	U	0.0011	U	0.0021	U
Bromomethane	7.08	0.001	U	0.0011	U			0.0025	U	0.0011	U	0.0017	U	21	U	0.0011	U	0.0014	U	0.066	U	0.001	U	0.0018	U	0.0011	U	0.0021	U
Carbon Disulfide	170	**0.0009**	T	**0.0031**				**0.011**		**0.0053**		**0.001**	T	21	U	0.0011	U	0.0014	U	0.066	U	**0.001**		**0.04**		**0.0073**		**0.013**	
Chlorobenzene	0.434	0.001	U	0.0011	U			0.0025	U	**0.0009**	T	0.0017	U	21	U	0.0011	U	0.0014	U	0.066	U	**0.0005**	T	0.0018	U	0.0011	U	0.0021	U
cis-1,2-Dichloroethene		**0.001**		**0.16**				0.0025	U	**0.0026**		**0.0046**		21	U	**0.0009**	T	0.0014	U	**2.6**		**0.0056**		0.0018	U	**0.005**		**0.0019**	T
Ethylbenzene	0.056	0.001	U	0.0011	U			0.0025	U	0.0011	U	0.0017	U	21	U	0.0011	U	0.0014	U	0.066	U	0.001	U	0.0018	U	0.0011	U	0.0021	U
Iodomethane		0.001	U	0.0011	U			0.0025	U	0.0011	U	0.0017	U	21	U	0.0011	U	0.0014	U	**0.056**	T	0.001	U	0.0018	U	0.0011	U	0.0021	U
Isopropylbenzene		0.001	U	0.0011	U			0.0025	U	0.0011	U	0.0017	U	21	U	0.0011	U	0.0014	U	0.066	U	0.001	U	0.0018	U	0.0011	U	0.0021	U
Methylene Chloride	4.46	0.0019	U	**0.0022**				**0.003**	T	**0.0023**		**0.0036**		42	U	**0.0017**	T	0.0028	U	0.13	U	**0.0015**	T	0.0035	U	**0.0023**		**0.0042**	
Naphthalene	6.56	0.0048	U	0.0053	U			0.012	U	0.0057	U	0.0086	U	100	U	0.0056	U	0.0071	U	0.33	U	0.0048	U	0.0088	U	0.0054	U	0.01	U
sec-Butylbenzene		0.001	U	0.0011	U			0.0025	U	0.0011	U	0.0017	U	21	U	0.0011	U	0.0014	U	0.066	U	0.001	U	0.0018	U	0.0011	U	0.0021	U
Tetrachloroethene	0.015	**0.0008**	T	**0.0012**				0.0025	U	**0.0018**		0.0017	U	21	U	0.0011	U	0.0014	U	**0.45**		0.001	U	0.0018	U	**0.0066**		0.0021	U
Toluene	0.189	0.001	U	0.0011	U			0.0025	U	0.0011	U	0.0017	U	21	U	0.0011	U	0.0014	U	0.066	U	0.001	U	0.0018	U	0.0011	U	0.0021	U
trans-1,2-Dichloroethene	1.09	0.001	U	**0.0018**				0.0025	U	0.0011	U	0.0017	U	21	U	0.0011	U	0.0014	U	0.066	U	0.001	U	0.0018	U	0.0011	U	0.0021	U
Trichloroethene	0.0023	**0.0006**	T	**0.0037**				0.0025	U	**0.0009**	T	0.0017	U	21	U	0.0011	U	0.0014	U	**2**		0.001	U	0.0018	U	**0.0053**		0.0021	U
Vinyl Chloride	0.0005[e]	0.001	U	**0.038**				0.0025	U	**0.033**		**0.0021**	J	21	U	**0.0024**	J	0.0014	U	**0.11**		**0.006**	J	**0.004**		0.0011	U	0.0021	U
Total Xylenes	9[c]	0.001	U	0.0011	U			0.0025	U	0.0011	U	0.0017	U	21	U	0.0011	U	0.0014	U	0.066	U	0.001	U	0.0018	U	0.0011	U	0.0021	U

Notes:

a. Value provided is the Three-Phase Partitioning Model screening level calculated with MTCA equation 747-1 using the lowest surface water level for protection of human health considering food ingestion only (WAC 173-340-474). The cleanup levels provided are based on potential for groundwater migration to surface water.
b. Value based on regional natural background for Puget Sound (Ecology 1994).
c. MTCA Method A Soil Unrestricted Land Use Table Value.
d. Washington State Maximum Concentration of Contaminants for the Toxicity Characteristic Dangerous Waste (WAC 173-303-100).
e. The screening level is lower than the method PQL; MTCA defaults the screening level up to the PQL.
f. MTCA Method B Soil Unrestricted Land Use Direct Contact Formula Value, Carcinogen.

C = The chromotogram indicates the presence of PCBs, not DRO or RRO. Laboratory-reported results were updated to non-detect (U) for DRO/RRO.
J = Estimated value.
T = Value is between the MDL and MRL.
U = Not detected at the reporting limit indicated.
Bold = Detected value.
Shaded = Value exceeds the screening level.

Table 2b – 2013-2014 IAWP Soil Sample Analytical Results

Sample ID	MTCA	JT-US-017-S5	JT-US-018-S1	JT-US-018-S2	JT-US-018-S3	JT-US-018-S4	JT-US-019-S2	JT-US-019-S3	JT-US-019-S4	JT-US-020-S2	JT-US-020-S3	JT-US-020-S4	JT-US-021-S1	JT-US-021-S2	JT-US-021-S3
Sampling Date	Method B Soil	1/6/2014	1/3/2014	1/3/2014	1/3/2014	1/3/2014	1/3/2014	1/3/2014	1/3/2014	1/6/2014	1/6/2014	1/6/2014	1/6/2014	1/6/2014	1/6/2014
Depth in feet	Screening Level[a]	20.5 to 21.5	2.5 to 3	11 to 11.5	15 to 15.5	16.5 to 17	10.5 to 11.5	14 to 14.5	16.5 to 17	5.5 to 6.5	10.5 to 11.5	16 to 17	2 to 3	10 to 11	15 to 15.75
Conventionals in %															
Total Organic Carbon							2.64			11.1					
Metals in mg/kg															
Arsenic	7[b]			**196**	**1.8**		**7.4**			**5.3**			**3.3**		
Cadmium	5.6			**26**	0.1 U		**0.4**			0.1 U			**0.2**		
Chromium	2000[c]			32.4	**24.6**		**46.2**			**23.6**			**19**		
Lead	250[c]			**1050**	**1.6**		**13.9**			**1.4**			**23.3**		
Mercury	0.146			0.2	**0.03**		**0.07**			0.02 U			0.03 U		
TCLP Lead in mg/L	5[d]								3.1						
TPH in mg/kg															
Diesel Range Organics	2000[c]						290 U, C			1000 U, C					
Lube Oil	2000[c]						260 U, C			**1500** J, C					
Electrical Insulating Oil	2000[c]						320 U, C			1300 U, C					
Gasoline Range Organics	30[c]														
PCBs in mg/kg															
Aroclor 1016		0.004 U	93 U	0.0039 U	0.0038 U	0.0038 U	150 U	0.024 U	0.0039 U	0.27 U	0.0038 U	0.004 U	0.004 U	0.0038 U	0.0038 U
Aroclor 1221		0.004 U	93 U	0.0039 U	0.0038 U	0.0038 U	150 U	0.024 U	0.0039 U	0.27 U	0.0038 U	0.004 U	0.004 U	0.0038 U	0.0038 U
Aroclor 1232		0.006 U	93 U	0.0039 U	0.0038 U	0.0038 U	150 U	0.024 U	0.0039 U	0.27 U	0.0038 U	0.004 U	0.004 U	0.0038 U	0.0038 U
Aroclor 1242		0.004 U	93 U	0.0039 U	0.0038 U	0.0038 U	150 U	0.024 U	0.0039 U	0.27 U	0.0038 U	0.004 U	0.004 U	0.0038 U	0.0038 U
Aroclor 1248		0.004 U	93 U	0.097 U	0.0038 U	0.0057 U	150 U	0.036 U	0.0039 U	20 U	0.0076 U	0.004 U	0.004 U	0.0077 U	0.013 U
Aroclor 1254		0.004 U	140 U	0.039 U	0.0038 U	0.038 U	230 U	0.36 U	0.029 U	20 U	0.011 U	0.004 U	0.016 U	0.0077 U	0.038 U
Aroclor 1260		**0.0052**	**340**	**0.073**	**0.02**	**0.093**	**580**	**0.27**	**0.046**	**59**	**0.005**	0.004 U	**0.035**	0.0049 U	**0.064**
Aroclor 1262		0.004 U	93 U	0.0039 U	0.0038 U	0.0038 U	150 U	0.024 U	0.0039 U	0.27 U	0.0038 U	0.004 U	0.004 U	0.0038 U	0.0038 U
Aroclor 1268		0.004 U	93 U	0.0039 U	0.0038 U	0.0038 U	150 U	0.024 U	0.0039 U	0.27 U	0.0038 U	0.004 U	0.004 U	0.0038 U	0.0038 U
Total PCBs	0.0000787[e]	**0.0052**	**340**	**0.073**	**0.02**	**0.093**	**580**	**0.27**	**0.046**	**59**	**0.005**	0.004 U	**0.035**	0.0049 U	**0.064**
Select Detected Volatiles in mg/kg															
1,1-Dichloroethene	0.0011	0.001 U	0.061 U	**0.56**	0.0011 U	0.001 U	1.4 U	0.063 U	0.0012 U	0.39 U	0.0011 U	0.001 U	0.0012 U	0.066 U	0.057 U
1,2,3-Trichlorobenzene		0.0051 U	**0.16** T	0.86 U	0.0055 U	0.0052 U	7 U	0.31 U	0.0058 U	1.9 U	0.0055 U	0.0052 U	0.0058 U	0.33 U	0.28 U
1,2,4-Trichlorobenzene	0.0056	0.0051 U	**0.34**	0.86 U	0.0055 U	0.0052 U	**13**	**0.17** T	0.0058 U	**1** T	**0.0029** T	0.0052 U	0.0058 U	**0.17** T	0.28 U
1,2,4-Trimethylbenzene		0.001 U	0.061 U	0.17 U	0.0011 U	0.001 U	1.4 U	0.063 U	0.0012 U	0.39 U	0.0011 U	0.001 U	**0.0007** T	**0.066**	0.057 U
1,2-Dichlorobenzene	2.33	0.001 U	**0.094**	0.17 U	0.0011 U	0.001 U	**1.7**	**0.05** T	0.0012 U	**0.22** T	0.0011 U	0.001 U	0.0012 U	**0.064** T	0.057 U
1,3,5-Trimethylbenzene		0.001 U	0.061 U	0.17 U	0.0011 U	0.001 U	1.4 U	0.063 U	0.0012 U	0.39 U	0.0011 U	0.001 U	0.0012 U	**0.036** T	0.057 U
1,3-Dichlorobenzene	0.011	0.001 U	**1.1**	0.17 U	0.0011 U	0.001 U	**7.6**	**0.42**	0.0012 U	**1.5**	**0.0018**	0.001 U	**0.0008** T	**0.31**	**0.76**
1,4-Dichlorobenzene	0.02	0.001 U	**8.5**	0.17 U	0.0011 U	0.001 U	**15**	**0.7**	0.0012 U	**4.1**	**0.0035**	0.001 U	0.0024	**0.58**	**0.91**
2-Butanone		0.0051 U	0.3 U	0.86 U	0.0055 U	0.0052 U	7 U	0.31 U	0.0058 U	1.9 U	0.0055 U	0.0052 U	**0.0037** T	0.33 U	0.28 U
4-Isopropyltoluene		0.001 U	0.061 U	0.17 U	0.0011 U	0.001 U	1.4 U	0.063 U	0.0012 U	0.39 U	0.0011 U	0.001 U	0.0012 U	0.066 U	0.057 U
Acetone	24,100	**0.011**	0.3 UJ	0.86 UJ	0.0055 U	0.0052 U	7 U	0.31 U	**0.021** J	1.9 U	**0.033** J	**0.01** J	**0.02** J	0.33 U	0.28 U
Benzene	0.0064	0.001 U	0.061 U	**0.3**	0.0011 U	0.001 U	1.4 U	0.063 U	0.0012 U	**0.43**	**0.0026**	0.001 U	0.0012 U	**0.054** T	0.057 U
Bromomethane	7.08	0.001 U	**0.059** T	**0.16** T	0.0011 U	0.001 U	1.4 U	0.063 U	0.0012 U	0.39 U	0.0011 U	0.001 U	0.0012 U	**0.1**	0.057 U
Carbon Disulfide	170	0.001 U	0.061 U	0.17 U	0.0011 U	0.001 U	1.4 U	0.063 U	**0.0012**	0.39 U	**0.012**	**0.0013**	**0.0007** T	0.066 U	0.057 U
Chlorobenzene	0.434	0.001 U	**0.98**	0.17 U	0.0011 U	0.001 U	**57**	**0.27**	0.0012 U	**33**	**0.066**	0.001 U	**0.012**	**1.2**	**1.2**
cis-1,2-Dichloroethene		**0.01**	0.061 U	**190**	**0.0015**	**0.0014**	1.4 U	0.063 U	**0.0079**	0.39 U	**0.0009** T	**0.013**	0.0012 U	**0.53**	0.057 U
Ethylbenzene	0.056	0.001 U	0.061 U	0.17 U	0.0011 U	0.001 U	1.4 U	0.063 U	0.0012 U	0.39 U	0.0011 U	0.001 U	0.0012 U	**0.079**	0.057 U
Iodomethane		0.001 U	0.061 U	0.17 U	0.0011 U	0.001 U	1.4 U	0.063 U	0.0012 U	0.39 U	0.0011 U	0.001 U	0.0012 U	**0.1** J	0.057 U
Isopropylbenzene		0.001 U	0.061 U	0.17 U	0.0011 U	0.001 U	1.4 U	0.063 U	0.0012 U	0.39 U	0.0011 U	0.001 U	0.0012 U	0.066 U	0.057 U
Methylene Chloride	4.46	**0.0023**	0.12 U	0.35 U	**0.0023**	**0.0011** T	2.8 U	0.13 U	0.0018 T	0.78 U	**0.0025**	**0.0016** T	**0.003**	0.13 U	0.11 U
Naphthalene	6.56	0.0051 U	**0.098** T	0.86 U	0.0055 U	0.0052 U	7 U	0.31 U	0.0058 U	1.9 U	0.0055 U	0.0052 U	**0.058**	0.33 U	0.28 U
sec-Butylbenzene		0.001 U	0.061 U	0.17 U	0.0011 U	0.001 U	1.4 U	0.063 U	0.0012 U	0.39 U	0.0011 U	0.001 U	0.0012 U	0.066 U	0.057 U
Tetrachloroethene	0.015	0.001 U	0.061 U	**0.82**	0.0011 U	0.001 U	1.4 U	0.063 U	0.0012 U	0.39 U	0.0011 U	0.001 U	0.0012 U	**0.057** T	0.057 U
Toluene	0.189	0.001 U	0.061 U	0.17 U	0.0011 U	0.001 U	1.4 U	0.063 U	0.0012 U	0.39 U	0.0011 U	0.001 U	0.0012 U	**0.13**	0.057 U
trans-1,2-Dichloroethene	1.09	0.001 U	0.061 U	0.75	0.0011 U	0.001 U	1.4 U	0.063 U	0.0012 U	0.39 U	0.0011 U	0.001 U	0.0012 U	**0.092**	0.057 U
Trichloroethene	0.0023	0.001 U	0.061 U	**4.6**	0.0011 U	0.001 U	1.4 U	0.063 U	0.0012 U	0.39 U	0.0011 U	0.001 U	0.0012 U	**0.24**	0.057 U
Vinyl Chloride	0.0005[e]	**0.014**	0.061 U	**23**	**0.0006** T	**0.011**	1.4 U	0.063 U	**0.014**	0.39 U	0.0011 U	**0.0034**	0.0012 U	0.066 U	0.057 U
Total Xylenes	9[c]	0.001 U	0.061 U	0.17 U	0.0011 U	0.001 U	1.4 U	0.063 U	0.0012 U	0.39 U	0.0011 U	0.001 U	0.0012 U	**0.287**	0.057 U

Notes:

a. Value provided is the Three-Phase Partitioning Model screening level calculated with MTCA equation 747-1 using the lowest surface water level for protection of human health considering food ingestion only (WAC 173-340-474). The cleanup levels provided are based on potential for groundwater migration to surface water.
b. Value based on regional natural background for Puget Sound (Ecology 1994).
c. MTCA Method A Soil Unrestricted Land Use Table Value.
d. Washington State Maximum Concentration of Contaminants for the Toxicity Characteristic Dangerous Waste (WAC 173-303-100).
e. The screening level is lower than the method PQL; MTCA defaults the screening level up to the PQL.
f. MTCA Method B Soil Unrestricted Land Use Direct Contact Formula Value, Carcinogen.

C = The chromotogram indicates the presence of PCBs, not DRO or RRO. Laboratory-reported results were updated to non-detect (U) for DRO/RRO.
J = Estimated value.
T = Value is between the MDL and MRL.
U = Not detected at the reporting limit indicated.
Bold = Detected value.
Shaded = Value exceeds the screening level.

Table 2b – 2013-2014 IAWP Soil Sample Analytical Results

Sample ID	MTCA	JT-US-022-S1		JT-US-022-S2		JT-US-022-S3		JT-US-023-S2		JT-US-023-S3		JT-US-023-S4		JT-US-024-S2		JT-US-024-S3		JT-US-024-S4		JT-US-025-S2		JT-US-025-S3		JT-US-025-S5		JT-US-26-S2		JT-US-26-S3	
Sampling Date	Method B Soil	1/6/2014		1/6/2014		1/6/2014		1/6/2014		1/6/2014		1/6/2014		1/6/2014		1/6/2014		1/6/2014		1/6/2014		1/6/2014		1/6/2014		3/11/2014		3/11/2014	
Depth in feet	Screening Level[a]	2 to 3		10 to 11.5		15 to 16		6 to 7		10 to 11.5		15 to 16		6 to 7		11 to 12		16 to 17		6.5 to 7.5		10 to 12		16 to 17		5 to 6		12 to 13	
Conventionals in %																													
Total Organic Carbon														3.5															
Metals in mg/kg																													
Arsenic	7[b]	**2.8**						**11.8**						**7.1**		**6.8**				**5.3**		**4.4**							
Cadmium	5.6	0.2	U					**0.5**						**0.2**		0.1	U			**0.2**		0.1	U						
Chromium	2000[c]	**23**						**16**						**38.6**		**24.4**				**20.9**		**27.6**							
Lead	250[c]	**14.1**						**75.3**						**33.4**		**1.7**				**54.6**		**3.3**							
Mercury	0.146	**0.05**						**0.14**						**0.05**		**0.02**				**0.07**		**0.04**							
TCLP Lead in mg/L	5[d]																												
TPH in mg/kg																													
Diesel Range Organics	2000[c]													**64**															
Lube Oil	2000[c]													**15**															
Electrical Insulating Oil	2000[c]													54	U														
Gasoline Range Organics	30[c]																												
PCBs in mg/kg																													
Aroclor 1016		0.0038	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.004	U	0.0038	U	0.0039	U	0.0039	U	0.0038	U	0.0038	U	0.039	U	0.0039	U
Aroclor 1221		0.0038	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.004	U	0.0038	U	0.0039	U	0.0039	U	0.0038	U	0.0038	U	0.039	U	0.0039	U
Aroclor 1232		0.0038	U	0.004	U	0.0038	U	0.019	U	0.02	U	0.019	U	0.004	U	0.0094	U	0.0039	U	0.0078	U	0.0038	U	0.0038	U	0.039	U	0.0039	U
Aroclor 1242		0.0038	U	0.004	U	0.013	U	0.0038	U	0.0039	U	0.0038	U	0.0059	U	0.0038	U	0.016	U	0.0039	U	0.0038	U	0.0038	U	0.039	U	0.0039	U
Aroclor 1248		0.0038	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.004	U	0.0038	U	0.0039	U	0.0039	U	0.019	U	0.0038	U	0.2	U	0.0039	U
Aroclor 1254		0.0076	U	0.004	U	0.0095	U	0.0038	U	0.0039	U	0.0038	U	0.004	U	0.0038	U	0.0039	U	0.012	U	0.058		0.0038	U	0.59	U	0.0059	U
Aroclor 1260		0.015	U	0.004	U	**0.015**		0.0038	U	0.0039	U	**0.0025**	T	**0.0028**	T	**0.0068**		0.0039	U	**0.031**		**0.077**		**0.0056**		**0.94**		**0.014**	
Aroclor 1262		0.0038	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.004	U	0.0038	U	0.0039	U	0.0039	U	0.0038	U	0.0038	U	0.039	U	0.0039	U
Aroclor 1268		0.0038	U	0.004	U	0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.004	U	0.0038	U	0.0039	U	0.0039	U	0.0038	U	0.0038	U	0.039	U	0.0039	U
Total PCBs	0.0000787[e]	0.015	U	0.004	U	**0.015**		0.019	U	0.02	U	**0.0025**	**J**	**0.0028**	**J**	**0.0068**		0.0039	U	**0.031**		**0.077**		**0.0056**		**0.94**		**0.014**	
Select Detected Volatiles in mg/kg																													
1,1-Dichloroethene	0.0011	0.0029	U	0.001	U	0.072	U	0.18	U	0.0011	U	0.061	U	0.077	U	0.001	U	0.0013	U	0.0011	U	0.062	UJ			0.063	U	0.0011	U
1,2,3-Trichlorobenzene		0.014	U	0.0052	U	0.36	U	0.92	U	0.0053	U	0.31	U	0.38	U	0.0051	U	0.0064	U	0.0055	U	0.31	U			0.31	U	0.0054	U
1,2,4-Trichlorobenzene	0.0056	**0.0061**	**T**	**0.0046**	T	**0.27**	**T**	0.92	U	**0.0051**	T	**0.12**	**T**	**0.14**	**T**	**0.0063**		0.0064	U	0.0055	U	**0.062**	**T**			**0.11**	T	**0.0035**	T
1,2,4-Trimethylbenzene		**0.022**		0.001	U	0.072	U	0.18	U	0.0011	U	0.061	U	0.077	U	0.001	U	0.0013	U	0.0011	U	0.062	U			0.063	U	0.0011	U
1,2-Dichlorobenzene	2.33	**0.0054**		**0.0008**	T	0.072	U	**0.4**		**0.0008**	T	**0.16**		**0.35**		**0.0006**	T	0.0013	U	0.0011	U	0.062	U			0.063	U	**0.003**	
1,3,5-Trimethylbenzene		**0.0036**		0.001	U	0.072	U	0.18	U	0.0011	U	0.061	U	0.077	U	0.001	U	0.0013	U	0.0011	U	0.062	U			0.063	U	0.0011	U
1,3-Dichlorobenzene	0.011	**0.031**		**0.0043**		**0.15**		**2.6**		**0.008**		**2**		**2.3**		**0.0066**		0.0013	U	0.0011	U	**0.17**				**0.2**		**0.042**	
1,4-Dichlorobenzene	0.02	**0.053**		**0.0084**		**0.85**		**4.6**		**0.014**		**3.6**		**3.9**		**0.0077**		0.0013	U	0.0011	U	**0.28**				**0.32**		**0.071**	
2-Butanone		**0.0089**	T	0.0052	U	0.36	U	0.92	U	**0.006**		0.31	U	0.38	U	**0.0069**		0.0064	U	0.0055	U	0.31	U			0.31	U	0.0054	U
4-Isopropyltoluene		**0.013**		0.001	U	0.072	U	0.18	U	0.0011	U	0.061	U	0.077	U	0.001	U	0.0013	U	0.0011	U	0.062	U			0.063	U	0.0011	U
Acetone	24,100	**0.12**	J	0.0052	U	0.36	U	0.92	U	**0.06**		0.31	U	0.38	U	**0.051**		0.0064	U	**0.021**		0.31	U			0.31	U	**0.017**	J
Benzene	0.0064	**0.0056**		**0.0008**	T	0.072	U	0.18	U	**0.001**	T	0.061	U	**0.12**		0.001	U	0.0013	U	0.0011	U	0.062	U			0.063	U	0.0011	U
Bromomethane	7.08	0.0029	U	0.001	U	**0.051**	T	**0.16**	T	0.0011	U	**0.037**	T	0.077	U	0.001	U	0.0013	U	0.0011	U	**0.088**				0.063	UJ	0.0011	UJ
Carbon Disulfide	170	0.0029	U	**0.0057**		0.072	U	0.18	U	**0.062**		0.061	U	0.077	U	**0.024**		0.0013	U	**0.0045**		0.062	U			0.063	U	0.0011	U
Chlorobenzene	0.434	**0.22**		**0.061**		**0.72**		**12**		**0.14**		**1.7**		**3.2**		**0.059**		0.0013	U	0.0011	U	**1.7**	J			**0.64**		**0.011**	
cis-1,2-Dichloroethene		0.0029	U	**0.0006**	T	0.072	U	0.18	U	**0.0021**		0.061	U	**0.071**	T	**0.0016**		**0.0064**		0.0011	U	0.062	U			0.063	U	**0.0017**	
Ethylbenzene	0.056	**0.0022**	T	0.001	U	0.072	U	0.18	U	0.0011	U	0.061	U	0.077	U	0.001	U	0.0013	U	0.0011	U	0.062	U			0.063	U	0.0011	U
Iodomethane		0.0029	U	0.001	U	0.072	U	0.18	U	0.0011	U	**0.045**	JT	0.077	U	0.001	U	0.0013	U	0.0011	U	**0.062**	J			0.063	U	0.0011	U
Isopropylbenzene		**0.0026**	T	0.001	U	0.072	U	0.18	U	0.0011	U	0.061	U	0.077	U	0.001	U	0.0013	U	0.0011	U	0.062	U			0.063	U	0.0011	U
Methylene Chloride	4.46	**0.0062**		**0.0023**		**0.17**		0.37	U	**0.0025**		0.12	U	0.15	U	**0.0024**		**0.0023**	T	**0.0024**		0.12	UJ			0.13	U	**0.0041**	
Naphthalene	6.56	**1.4**		0.0052	U	0.36	U	**1.2**		0.0053	U	0.31	U	0.38	U	**0.0015**	T	0.0064	U	0.0055	U	0.31	U			0.31	U	0.0054	U
sec-Butylbenzene		0.0029	U	0.001	U	0.072	U	0.18	U	0.0011	U	0.061	U	0.077	U	0.001	U	0.0013	U	0.0011	U	0.062	U			0.063	U	0.0011	U
Tetrachloroethene	0.015	0.0029	U	0.001	U	0.072	U	0.18	U	0.0011	U	0.061	U	0.077	U	0.001	U	0.0013	U	0.0011	U	0.062	U			0.063	U	0.0011	U
Toluene	0.189	**0.0024**	T	0.001	U	0.072	U	**0.45**		0.0011	U	0.061	U	**0.074**	T	0.001	U	0.0013	U	0.0011	U	0.062	U			0.063	U	**0.0006**	T
trans-1,2-Dichloroethene	1.09	0.0029	U	0.001	U	0.072	U	0.18	U	0.0011	U	0.061	U	0.077	U	0.001	U	0.0013	U	0.0011	U	0.062	UJ			0.063	U	0.0011	U
Trichloroethene	0.0023	0.0029	U	0.001	U	0.072	U	0.18	U	0.0011	U	0.061	U	0.077	U	0.001	U	0.0013	U	0.0011	U	0.062	U			0.063	U	0.0011	U
Vinyl Chloride	0.0005[e]	0.0029	U	0.001	U	0.072	U	0.18	U	0.0011	U	0.061	U	0.077	U	0.001	U	**0.0044**		0.0011	U	0.062	UJ			0.063	U	0.0011	U
Total Xylenes	9[c]	**0.0074**	J	0.001	U	0.072	U	0.18	U	0.0011	U	0.061	U	0.077	U	0.001	U	0.0013	U	0.0011	U	0.062	U			0.063	U	0.0011	U

Notes:

a. Value provided is the Three-Phase Partitioning Model screening level calculated with MTCA equation 747-1 using the lowest surface water level for protection of human health considering food ingestion only (WAC 173-340-474). The cleanup levels provided are based on potential for groundwater migration to surface water.
b. Value based on regional natural background for Puget Sound (Ecology 1994).
c. MTCA Method A Soil Unrestricted Land Use Table Value.
d. Washington State Maximum Concentration of Contaminants for the Toxicity Characteristic Dangerous Waste (WAC 173-303-100).
e. The screening level is lower than the method PQL; MTCA defaults the screening level up to the PQL.
f. MTCA Method B Soil Unrestricted Land Use Direct Contact Formula Value, Carcinogen.

C = The chromotogram indicates the presence of PCBs, not DRO or RRO. Laboratory-reported results were updated to non-detect (U) for DRO/RRO.
J = Estimated value.
T = Value is between the MDL and MRL.
U = Not detected at the reporting limit indicated.
Bold = Detected value.
Shaded = Value exceeds the screening level.

Table 2b – 2013-2014 IAWP Soil Sample Analytical Results

Sample ID	MTCA	JT-US-27-S2		JT-US-27-S3		JT-US-27-S4		JT-US-28-S1		JT-US-28-S2		JT-US-28-S3		JT-US-29-S1		JT-US-29-S2		JT-US-30-S2		JT-US-30-S4		JT-US-31-S2		JT-US-31-S3		JT-US-31-S5		JT-US-32-S2	
Sampling Date	Method B Soil	3/11/2014		3/11/2014		3/11/2014		3/12/2014		3/12/2014		3/12/2014		3/11/2014		3/11/2014		3/12/2014		3/12/2014		3/12/2014		3/12/2014		3/12/2014		3/12/2014		
Depth in feet	Screening Level[a]	6.5 to 7.5		11 to 12		15 to 16		5 to 6		10 to 11		15.5 to 16.5		1.5 to 2.5		6 to 7		10.5 to 11.5		20 to 21		5 to 6		12 to 13		21 to 22		5 to 6		
Conventionals in %																													
Total Organic Carbon																													
Metals in mg/kg																													
Arsenic	7[b]																												
Cadmium	5.6																												
Chromium	2000[c]																												
Lead	250[c]																												
Mercury	0.146																												
TCLP Lead in mg/L	5[d]																												
TPH in mg/kg																													
Diesel Range Organics	2000[c]	74	U					**50**						**50**															
Lube Oil	2000[c]	150	U, C					**100**						**100**															
Electrical Insulating Oil	2000[c]																												
Gasoline Range Organics	30[c]	**30**						**20**						**20**															
PCBs in mg/kg																													
Aroclor 1016		2400	U	0.094	U	0.038	U	0.12	U	0.011	U	0.0039	U	0.02	U	0.019	U	0.0039	U	0.0038	U	0.15	U	0.019	U	0.0039	U	0.0038	U
Aroclor 1221		2400	U	0.094	U	0.038	U	0.12	U	0.011	U	0.0039	U	0.02	U	0.019	U	0.0039	U	0.0038	U	0.15	U	0.019	U	0.0039	U	0.0038	U
Aroclor 1232		2400	U	0.094	U	0.038	U	0.12	U	0.011	U	0.0039	U	0.02	U	0.019	U	0.0039	U	0.0038	U	0.15	U	0.019	U	0.0039	U	0.0038	U
Aroclor 1242		2400	U	0.094	U	0.038	U	0.12	U	0.011	U	0.0039	U	0.02	U	0.019	U	0.0039	U	0.0038	U	0.15	U	0.019	U	0.0039	U	0.0038	U
Aroclor 1248		2400	U	0.094	U	0.038	U	0.14	U	0.011	U	0.0039	U	0.02	U	0.019	U	0.0039	U	0.0038	U	0.15	U	0.019	U	0.0039	U	0.0038	U
Aroclor 1254		9400	U	0.094	U	0.038	U	2.3	U	0.029	U	0.0039	U	0.049	U	0.038	U	0.0039	U	0.0038	U	1.1	U	0.019	U	0.0078	U	0.028	U
Aroclor 1260		**30000**		**0.16**		**0.075**		**2**		**0.039**		**0.0023**	T	0.15	U	**0.12**		**0.0082**		**0.0061**		**3.7**		**0.035**		**0.024**		**0.076**	
Aroclor 1262		2400	U	0.094	U	0.038	U	0.12	U	0.011	U	0.0039	U	0.02	U	0.019	U	0.0039	U	0.0038	U	0.15	U	0.019	U	0.0039	U	0.0038	U
Aroclor 1268		2400	U	0.094	U	0.038	U	0.12	U	0.011	U	0.0039	U	0.02	U	0.019	U	0.0039	U	0.0038	U	0.15	U	0.019	U	0.0039	U	0.0038	U
Total PCBs	0.0000787[e]	**30000**		**0.16**		**0.075**		**2**		**0.039**		**0.0023**	**J**	0.15	U	**0.12**		**0.0082**		**0.0061**		**3.7**		**0.035**		**0.024**		**0.076**	
Select Detected Volatiles in mg/kg																													
1,1-Dichloroethene	0.0011	32	U	0.001	U	0.001	U	0.001	U	0.0043	U	0.0011	U	0.088	U	0.0009	U	0.001	U	0.0011	U	0.0011	U	0.001	U	0.0008	U	0.086	U
1,2,3-Trichlorobenzene		160	U	0.0051	U	0.0052	U	0.0048	U	0.022	U	0.0054	U	0.44	U	0.0044	U	0.0049	U	0.0054	U	0.0054	U	0.0051	U	0.0042	U	0.43	U
1,2,4-Trichlorobenzene	0.0056	160	U	**0.0032**	T	**0.038**		**0.0021**	T	0.022	U	0.0054	U	0.44	U	0.0044	U	0.0049	U	0.0054	U	0.0054	U	0.0051	U	0.0042	U	0.43	U
1,2,4-Trimethylbenzene		32	U	0.001	U	0.001	U	0.001	U	0.0043	U	0.0011	U	0.088	U	0.0009	U	0.001	U	0.0011	U	0.0011	U	0.001	U	0.0008	U	0.086	U
1,2-Dichlorobenzene	2.33	32	U	**0.006**		**0.0036**		0.001	U	0.0043	U	0.0011	U	0.088	U	0.0009	U	0.001	U	0.0011	U	0.0011	U	0.001	U	0.0008	U	0.086	U
1,3,5-Trimethylbenzene		32	U	0.001	U	0.001	U	0.001	U	0.0043	U	0.0011	U	0.088	U	0.0009	U	0.001	U	0.0011	U	0.0011	U	0.001	U	0.0008	U	0.086	U
1,3-Dichlorobenzene	0.011	32	U	**0.046**		**0.12**		**0.0005**	T	0.0043	U	0.0011	U	0.088	U	0.0009	U	0.001	U	0.0011	U	0.0011	U	0.001	U	0.0008	U	0.086	U
1,4-Dichlorobenzene	0.02	**19**	T	**0.067**		**0.095**		**0.0008**	T	0.0043	U	0.0011	U	0.088	U	0.0009	U	0.001	U	0.0011	U	**0.001**	T	0.001	U	0.0008	U	0.086	U
2-Butanone		160	U	0.0051	U	0.0052	U	0.0048	U	0.022	U	0.0054	U	0.44	U	0.0044	U	**0.0031**	T	0.0054	U	0.0054	U	0.0051	U	0.0042	U	0.43	U
4-Isopropyltoluene		32	U	0.001	U	0.001	U	**0.0055**		0.0043	U	0.0011	U	0.088	U	0.0009	U	0.001	U	0.0011	U	0.0011	U	0.001	U	0.0008	U	0.086	U
Acetone	24,100	160	U	**0.013**	J	**0.016**	J	**0.029**	J	**0.28**	J	**0.022**	J	0.44	U	**0.021**	J	**0.039**	J	**0.034**	J	0.052	J	**0.02**	J	0.0042	U	0.43	U
Benzene	0.0064	**170**		**0.018**		0.001	U	0.001	U	0.0043	U	0.0011	U	0.088	U	0.0009	U	0.001	U	0.0011	U	**0.02**		0.001	U	0.0008	U	0.086	U
Bromomethane	7.08	32	UJ	0.001	UJ	0.001	UJ	0.001	UJ	0.0043	UJ	0.0011	UJ	0.088	UJ	0.0009	UJ	0.001	UJ	0.0011	UJ	0.0011	UJ	0.001	UJ	0.0008	U	**0.092**	
Carbon Disulfide	170	32	U	**0.0027**		0.001	U	**0.0009**	T	**0.007**		**0.0043**		**0.061**	T	**0.002**		0.001	U	0.0011	U	**0.001**	T	**0.0007**	T	0.0008	U	0.086	U
Chlorobenzene	0.434	**3800**		**1.2**		**0.013**		0.001	U	0.0043	U	0.0011	U	0.088	U	0.0009	U	0.001	U	0.0011	U	**0.012**		0.001	U	0.0008	U	0.086	U
cis-1,2-Dichloroethene		32	U	**0.0008**	T	**0.0063**		0.001	U	0.0043	U	**0.001**	T	0.088	U	0.0009	U	**0.0015**		**0.015**		**0.01**		**0.014**		0.0008	U	**0.59**	
Ethylbenzene	0.056	32	U	0.001	U	0.001	U	0.001	U	0.0043	U	0.0011	U	0.088	U	0.0009	U	0.001	U	0.0011	U	0.0011	U	0.001	U	0.0008	U	0.086	U
Iodomethane		32	U	0.001	U	0.001	U	0.001	U	0.0043	U	0.0011	U	0.088	U	0.0009	U	0.001	U	0.0011	U	0.0011	U	0.001	U	0.0008	U	0.086	U
Isopropylbenzene		32	U	0.001	U	0.001	U	**0.0006**	T	0.0043	U	0.0011	U	0.088	U	0.0009	U	0.001	U	0.0011	U	0.0011	U	0.001	U	0.0008	U	0.086	U
Methylene Chloride	4.46	64	U	**0.0039**		**0.0039**		**0.0017**	T	0.0087	U	**0.0037**		0.18	U	**0.0023**		**0.0033**		**0.0036**		**0.0023**		**0.0024**		**0.0017**		0.17	U
Naphthalene	6.56	160	U	0.0051	U	0.0052	U	0.0048	U	0.022	U	0.0054	U	0.44	U	0.0044	U	0.0049	U	0.0054	U	0.0054	U	0.0051	U	0.0042	U	0.43	U
sec-Butylbenzene		32	U	0.001	U	0.001	U	**0.0015**		0.0043	U	0.0011	U	0.088	U	0.0009	U	0.001	U	0.0011	U	0.0011	U	0.001	U	0.0008	U	0.086	U
Tetrachloroethene	0.015	32	U	0.001	U	0.001	U	0.001	U	0.0043	U	0.0011	U	0.088	U	0.0009	U	**0.016**		0.0011	U	0.0011	U	0.001	U	0.0008	U	**2.7**	
Toluene	0.189	32	U	0.001	U	0.001	U	0.001	U	0.0043	U	0.0011	U	0.088	U	0.0009	U	0.001	U	0.0011	U	**0.0085**		0.001	U	0.0008	U	0.086	U
trans-1,2-Dichloroethene	1.09	32	U	0.001	U	0.001	U	0.001	U	0.0043	U	0.0011	U	0.088	U	0.0009	U	0.001	U	0.0011	U	0.0011	U	0.001	U	0.0008	U	0.086	U
Trichloroethene	0.0023	32	U	0.001	U	0.001	U	0.001	U	0.0043	U	0.0011	U	0.088	U	0.0009	U	**0.0039**		**0.0012**		**0.0024**		0.001	U	0.0008	U	**1.9**	
Vinyl Chloride	0.0005[e]	32	U	0.001	U	**0.0038**	J	0.001	U	0.0043	U	**0.032**	J	0.088	U	0.0009	U	0.001	U	**0.0041**	J	0.0011	U	**0.035**		0.0008	U	0.086	U
Total Xylenes	9[c]	32	U	0.001	U	0.001	U	**0.0008**	T	0.0043	U	0.0011	U	0.088	U	0.0009	U	0.001	U	0.0011	U	0.0011		0.001	U	0.0008	U	0.086	U

Notes:

a. Value provided is the Three-Phase Partitioning Model screening level calculated with MTCA equation 747-1 using the lowest surface water level for protection of human health considering food ingestion only (WAC 173-340-474). The cleanup levels provided are based on potential for groundwater migration to surface water.

b. Value based on regional natural background for Puget Sound (Ecology 1994).

c. MTCA Method A Soil Unrestricted Land Use Table Value.

d. Washington State Maximum Concentration of Contaminants for the Toxicity Characteristic Dangerous Waste (WAC 173-303-100).

e. The screening level is lower than the method PQL; MTCA defaults the screening level up to the PQL.

f. MTCA Method B Soil Unrestricted Land Use Direct Contact Formula Value, Carcinogen.

C = The chromotogram indicates the presence of PCBs, not DRO or RRO. Laboratory-reported results were updated to non-detect (U) for DRO/RRO.
J = Estimated value.
T = Value is between the MDL and MRL.
U = Not detected at the reporting limit indicated.
Bold = Detected value.
Shaded = Value exceeds the screening level.

Table 2b – 2013-2014 IAWP Soil Sample Analytical Results

Sample ID	MTCA	JT-US-32-S4		JT-US-33-S2		JT-US-33-S3		JT-US-33-S4		JT-US-33-S5		JT-US-34-S1		JT-US-34-S3		JT-US-35-S1		JT-US-35-S2		JT-US-36-S1		JT-US-36-S2		JT-US-37-S1		JT-US-37-S2		JT-US-38-S1	
Sampling Date	Method B Soil	3/12/2014		3/11/2014		3/11/2014		3/11/2014		3/11/2014		3/11/2014		3/11/2014		3/11/2014		3/12/2014		3/12/2014		3/12/2014		3/12/2014		3/12/2014		3/12/2014	
Depth in feet	Screening Level[a]	15.5 to 16.5		6.5 to 7.5		10 to 11		16 to 17		20 to 21		17 to 18		20 to 21		16 to 17		20 to 21		0.7 to 1.7		6 to 7		2 to 3		5 to 6		0.5 to 1.5	
Conventionals in %																													
Total Organic Carbon																													
Metals in mg/kg																													
Arsenic	7[b]																												
Cadmium	5.6																												
Chromium	2000[c]																												
Lead	250[c]																												
Mercury	0.146																												
TCLP Lead in mg/L	5[d]																												
TPH in mg/kg																													
Diesel Range Organics	2000[c]																			**50**									
Lube Oil	2000[c]																			**100**									
Electrical Insulating Oil	2000[c]																												
Gasoline Range Organics	30[c]																			**20**									
PCBs in mg/kg																													
Aroclor 1016		0.0039	U	0.0038	U	0.0038	U	0.0038	U	0.0039	U	0.0039	U	0.0056	U	0.0038	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.0038	U
Aroclor 1221		0.0039	U	0.0038	U	0.0038	U	0.0038	U	0.0039	U	0.0039	U	0.0056	U	0.0038	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.0038	U
Aroclor 1232		0.0039	U	0.0038	U	0.0038	U	0.0038	U	0.0039	U	0.0078	U	0.0056	U	0.0038	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.0038	U
Aroclor 1242		0.0039	U	0.0038	U	0.0038	U	0.0038	U	0.0039	U	0.0039	U	0.0056	U	0.0038	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.0038	U
Aroclor 1248		0.0039	U	0.0038	U	0.0038	U	0.0038	U	0.0039	U	0.0039	U	0.007	U	0.0096	U	0.004	U	0.0086		0.004	U	0.004	U	**0.028**		0.0094	U
Aroclor 1254		0.0039	U	0.0038	U	0.0076	U	0.0038	U	0.0039	U	0.078	U	0.42	U	0.048	U	0.004	U	0.012	U	0.004	U	0.004	U	0.3	U	0.076	U
Aroclor 1260		**0.0029**	T	**0.0045**		**0.017**		**0.0034**	T	**0.0032**	T	**0.26**		**1.6**		**0.15**		**0.0036**	T	**0.028**		**0.0072**		**0.0043**		**0.94**		**0.29**	
Aroclor 1262		0.0039	U	0.0038	U	0.0038	U	0.0038	U	0.0039	U	0.0039	U	0.0056	U	0.0038	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.0038	U
Aroclor 1268		0.0039	U	0.0038	U	0.0038	U	0.0038	U	0.0039	U	0.0039	U	0.0056	U	0.0038	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.0038	U
Total PCBs	0.0000787[e]	**0.0029**	**J**	**0.0045**		**0.017**		**0.0034**	**J**	**0.0032**	**J**	**0.26**		**1.6**		**0.15**		**0.0036**	**J**	**0.0366**		**0.0072**		**0.0043**		**0.968**		**0.29**	
Select Detected Volatiles in mg/kg																													
1,1-Dichloroethene	0.0011	0.0011	U	0.071	U	0.081	U	0.0011	U	0.0009	U	0.0016	U	0.0009	U	0.0012	U	0.0008	U	0.056	U	0.0011	U	0.059	U	0.061	U	3.4	U
1,2,3-Trichlorobenzene		0.0054	U	0.35	U	0.4	U	0.0053	U	0.0043	U	0.0081	U	0.0043	U	0.0059	U	0.0042	U	0.28	U	0.0055	U	0.3	U	0.31	U	17	U
1,2,4-Trichlorobenzene	0.0056	0.0054	U	0.35	U	0.4	U	0.0053	U	0.0043	U	0.0081	U	0.0043	U	0.0059	U	0.0042	U	0.28	U	0.0055	U	0.3	U	0.31	U	17	U
1,2,4-Trimethylbenzene		0.0011	U	0.071	U	0.081	U	0.0011	U	0.0009	U	0.0016	U	0.0009	U	0.0012	U	0.0008	U	0.056	U	0.0011	U	0.059	U	0.061	U	3.4	U
1,2-Dichlorobenzene	2.33	0.0011	U	0.071	U	0.081	U	0.0011	U	0.0009	U	0.0016	U	0.0009	U	0.0012	U	0.0008	U	0.056	U	0.0011	U	0.059	U	0.061	U	3.4	U
1,3,5-Trimethylbenzene		0.0011	U	0.071	U	0.081	U	0.0011	U	0.0009	U	0.0016	U	0.0009	U	0.0012	U	0.0008	U	0.056	U	0.0011	U	0.059	U	0.061	U	3.4	U
1,3-Dichlorobenzene	0.011	0.0011	U	**0.19**		0.081	U	0.0011	U	0.0009	U	0.0016	U	0.0009	U	0.0012	U	0.0008	U	0.056	U	0.0011	U	0.059	U	**0.11**		3.4	U
1,4-Dichlorobenzene	0.02	0.0011	U	**0.4**		0.081	U	0.0011	U	0.0009	U	0.0016	U	0.0009	U	0.0012	U	0.0008	U	0.056	U	0.0011	U	**0.38**		**0.73**		3.4	U
2-Butanone		0.0054	U	0.35	U	0.4	U	0.0053	U	0.0043	U	0.0081	U	0.0043	U	0.0059	U	0.0042	U	0.28	U	0.0055	U	0.3	U	0.31	U	17	U
4-Isopropyltoluene		0.0011	U	0.071	U	0.081	U	0.0011	U	0.0009	U	0.0016	U	0.0009	U	0.0012	U	0.0008	U	0.056	U	0.0011	U	0.059	U	0.061	U	3.4	U
Acetone	24,100	**0.019**	J	0.35	U	**0.68**	J	**0.03**	J	**0.016**	J	0.0081	U	0.0043	U	0.0059	U	**0.013**	J	0.28	U	**0.042**	J	0.3	U	**0.81**	J	17	U
Benzene	0.0064	**0.0014**		0.071	U	**0.64**		0.0011	U	0.0009	U	0.0016	U	0.0009	U	0.0012	U	0.0008	U	0.056	U	0.0011	U	0.059	U	0.061	U	3.4	U
Bromomethane	7.08	0.0011	U	0.071	U	0.081	U	0.0011	U	0.0009	U	0.0016	U	0.0009	U	0.0012	U	0.0008	U	0.056	U	0.0011	U	0.059	U	0.061	U	3.4	U
Carbon Disulfide	170	**0.0025**		0.071	U	0.081	U	**0.0037**		0.0009	U	0.0016	U	0.0009	U	**0.0018**		0.0008	U	0.056	U	0.0011	U	0.059	U	0.061	U	3.4	U
Chlorobenzene	0.434	0.0011	U	**2.7**		**0.33**		0.0011	U	0.0009	U	0.0016	U	0.0009	U	**0.0035**		0.0008	U	0.056	U	0.0011	U	**0.42**		**1.4**		3.4	U
cis-1,2-Dichloroethene		**0.0015**		0.071	U	**1.5**		**0.002**		0.0009	U	0.0016	U	0.0009	U	0.0012	U	0.0008	U	0.056	U	0.0011	U	0.059	U	0.061	U	3.4	U
Ethylbenzene	0.056	0.0011	U	0.071	U	0.081	U	0.0011	U	0.0009	U	0.0016	U	0.0009	U	0.0012	U	0.0008	U	0.056	U	0.0011	U	0.059	U	0.061	U	3.4	U
Iodomethane		0.0011	U	0.071	U	0.081	U	0.0011	U	0.0009	U	0.0016	U	0.0009	U	0.0012	U	0.0008	U	0.056	U	0.0011	U	0.059	U	0.061	U	3.4	U
Isopropylbenzene		0.0011	U	0.071	U	0.081	U	0.0011	U	0.0009	U	0.0016	U	0.0009	U	0.0012	U	0.0008	U	0.056	U	0.0011	U	0.059	U	0.061	U	3.4	U
Methylene Chloride	4.46	**0.0026**		0.14	U	0.16	U	**0.0031**		**0.0022**		0.0032	U	0.0017	U	**0.0032**		**0.0023**		0.11	U	**0.0023**		0.12	U	0.12	U	6.7	U
Naphthalene	6.56	0.0054	U	0.35	U	0.4	U	0.0053	U	0.0043	U	0.0081	U	0.0043	U	0.0059	U	0.0042	U	0.28	U	0.0055	U	0.3	U	**0.59**		**130**	
sec-Butylbenzene		0.0011	U	0.071	U	0.081	U	0.0011	U	0.0009	U	0.0016	U	0.0009	U	0.0012	U	0.0008	U	0.056	U	0.0011	U	0.059	U	0.061	U	3.4	U
Tetrachloroethene	0.015	0.0011	U	0.071	U	0.081	U	**0.0027**		0.0009	U	0.0016	U	0.0009	U	0.0012	U	0.0008	U	0.056	U	0.0011	U	0.059	U	0.061	U	3.4	U
Toluene	0.189	0.0011	U	0.071	U	0.081	U	0.0011	U	0.0009	U	0.0016	U	0.0009	U	0.0012	U	0.0008	U	0.056	U	0.0011	U	0.059	U	0.061	U	3.4	U
trans-1,2-Dichloroethene	1.09	0.0011	U	0.071	U	**0.12**		0.0011	U	0.0009	U	0.0016	U	0.0009	U	0.0012	U	0.0008	U	0.056	U	0.0011	U	0.059	U	0.061	U	3.4	U
Trichloroethene	0.0023	0.0011	U	0.071	U	**0.11**		0.0011	U	0.0009	U	0.0016	U	0.0009	U	0.0012	U	0.0008	U	0.056	U	0.0011	U	0.059	U	0.061	U	3.4	U
Vinyl Chloride	0.0005[e]	**0.015**		0.071	U	0.081	U	0.0011	U	0.0009	U	0.0016	U	0.0009	U	0.0012	U	0.0008	U	0.056	U	0.0011	U	0.059	U	0.061	U	3.4	U
Total Xylenes	9[c]	0.0011	U	0.071	U	0.081	U	0.0011	U	0.0009	U	0.0016	U	0.0009	U	0.0012	U	0.0008	U	0.056	U	0.0011	U	0.059	U	0.062		3.4	U

Notes:

a. Value provided is the Three-Phase Partitioning Model screening level calculated with MTCA equation 747-1 using the lowest surface water level for protection of human health considering food ingestion only (WAC 173-340-474). The cleanup levels provided are based on potential for groundwater migration to surface water.
b. Value based on regional natural background for Puget Sound (Ecology 1994).
c. MTCA Method A Soil Unrestricted Land Use Table Value.
d. Washington State Maximum Concentration of Contaminants for the Toxicity Characteristic Dangerous Waste (WAC 173-303-100).
e. The screening level is lower than the method PQL; MTCA defaults the screening level up to the PQL.
f. MTCA Method B Soil Unrestricted Land Use Direct Contact Formula Value, Carcinogen.

C = The chromotogram indicates the presence of PCBs, not DRO or RRO. Laboratory-reported results were updated to non-detect (U) for DRO/RRO.
J = Estimated value.
T = Value is between the MDL and MRL.
U = Not detected at the reporting limit indicated.
Bold = Detected value.
Shaded = Value exceeds the screening level.

Table 2b – 2013-2014 IAWP Soil Sample Analytical Results

Sample ID	MTCA	JT-US-38-S2		JT-MW-100-S2		JT-MW-100-S3		JT-MW-200-S5		JT-MW-200-S6	
Sampling Date	Method B Soil	3/12/2014		3/13/2014		3/13/2014		3/13/2014		3/13/2014	
Depth in feet	Screening Level[a]	6.5 to 7.5		15 to 15.75		25 to 25.75		25 to 26		30 to 30.7	
Conventionals in %											
Total Organic Carbon											
Metals in mg/kg											
Arsenic	7[b]										
Cadmium	5.6										
Chromium	2000[c]										
Lead	250[c]										
Mercury	0.146										
TCLP Lead in mg/L	5[d]										
TPH in mg/kg											
Diesel Range Organics	2000[c]										
Lube Oil	2000[c]										
Electrical Insulating Oil	2000[c]										
Gasoline Range Organics	30[c]										
PCBs in mg/kg											
Aroclor 1016		0.0038	U	0.0038	U	0.004	U	0.0039	U	0.004	U
Aroclor 1221		0.0038	U	0.0038	U	0.004	U	0.0039	U	0.004	U
Aroclor 1232		0.0095	U	0.0038	U	0.004	U	0.0039	U	0.004	U
Aroclor 1242		0.0038	U	0.0038	U	0.004	U	0.0039	U	0.004	U
Aroclor 1248		0.0038	U	**0.015**		**0.0033**	T	0.0039	U	0.057	
Aroclor 1254		0.0057	U	**0.024**		**0.0044**		0.024	U	0.11	
Aroclor 1260		**0.012**		**0.0095**		0.004	U	**0.06**		**0.11**	
Aroclor 1262		0.0038	U	0.0038	U	0.004	U	0.0039	U	0.004	U
Aroclor 1268		0.0038	U	0.0038	U	0.004	U	0.0039	U	0.004	U
Total PCBs	0.0000787[e]	**0.012**		**0.0485**		**0.0077**	**J**	**0.06**		**0.277**	
Select Detected Volatiles in mg/kg											
1,1-Dichloroethene	0.0011	0.082	U	0.001	UJ	0.0009	UJ	0.0011	UJ	0.0009	UJ
1,2,3-Trichlorobenzene		0.41	U	0.0051	UJ	0.0043	UJ	0.0057	UJ	0.0045	UJ
1,2,4-Trichlorobenzene	0.0056	0.41	U	0.0051	UJ	0.0043	UJ	0.0057	UJ	0.0045	UJ
1,2,4-Trimethylbenzene		0.082	U	0.001	UJ	0.0009	UJ	0.0011	UJ	0.0009	UJ
1,2-Dichlorobenzene	2.33	0.082	U	0.001	UJ	0.0009	UJ	0.0011	UJ	0.0009	UJ
1,3,5-Trimethylbenzene		0.082	U	0.001	UJ	0.0009	UJ	0.0011	UJ	0.0009	UJ
1,3-Dichlorobenzene	0.011	**0.37**		**0.0027**	J	0.0009	UJ	0.0011	UJ	0.0009	UJ
1,4-Dichlorobenzene	0.02	**0.96**		**0.0024**	J	0.0009	UJ	0.0011	UJ	0.0009	UJ
2-Butanone		0.41	U	0.0051	UJ	0.0043	UJ	0.0057	UJ	0.0045	UJ
4-Isopropyltoluene		0.082	U	**0.024**	J	**0.027**	J	0.0011	UJ	0.0009	UJ
Acetone	24,100	**0.64**	J	**0.049**	J	**0.031**	J	**0.028**	J	**0.025**	J
Benzene	0.0064	0.082	U	**0.001**	JT	0.0009	UJ	0.0011	UJ	0.0009	UJ
Bromomethane	7.08	0.082	U	0.001	UJ	0.0009	UJ	0.0011	UJ	0.0009	UJ
Carbon Disulfide	170	0.082	U	**0.0064**	J	**0.0005**	JT	0.0011	UJ	0.0009	UJ
Chlorobenzene	0.434	**0.11**		**0.054**	J	0.0009	UJ	0.0011	UJ	0.0009	UJ
cis-1,2-Dichloroethene		0.082	U	**0.0011**	J	0.0009	UJ	0.0011	UJ	0.0009	UJ
Ethylbenzene	0.056	0.082	U	0.001	UJ	0.0009	UJ	0.0011	UJ	0.0009	UJ
Iodomethane		0.082	U	0.001	UJ	0.0009	UJ	0.0011	UJ	0.0009	UJ
Isopropylbenzene		0.082	U	0.001	UJ	0.0009	UJ	0.0011	UJ	0.0009	UJ
Methylene Chloride	4.46	0.16	U	**0.0068**	J	**0.0027**	J	**0.0027**	J	**0.005**	J
Naphthalene	6.56	0.41	U	0.0051	UJ	0.0043	UJ	0.0057	UJ	0.0045	UJ
sec-Butylbenzene		0.082	U	0.001	UJ	0.0009	UJ	0.0011	UJ	0.0009	UJ
Tetrachloroethene	0.015	0.082	U	**0.0013**	J	0.0009	UJ	0.0011	UJ	0.0009	UJ
Toluene	0.189	0.082	U	**0.0005**	JT	0.0009	UJ	0.0011	UJ	0.0009	UJ
trans-1,2-Dichloroethene	1.09	0.082	U	0.001	UJ	0.0009	UJ	0.0011	UJ	0.0009	UJ
Trichloroethene	0.0023	0.082	U	**0.0005**	JT	0.0009	UJ	0.0011	UJ	0.0009	UJ
Vinyl Chloride	0.0005[e]	0.082	U	0.001	UJ	0.0009	UJ	0.0011	UJ	0.0009	UJ
Total Xylenes	9[c]	0.082	U	0.001	UJ	0.0009	UJ	0.0011	UJ	0.0009	UJ

Notes:

a. Value provided is the Three-Phase Partitioning Model screening level calculated with MTCA equation 747-1 using the lowest surface water level for protection of human health considering food ingestion only (WAC 173-340-474). The cleanup levels provided are based on potential for groundwater migration to surface water.
b. Value based on regional natural background for Puget Sound (Ecology 1994).
c. MTCA Method A Soil Unrestricted Land Use Table Value.
d. Washington State Maximum Concentration of Contaminants for the Toxicity Characteristic Dangerous Waste (WAC 173-303-100).
e. The screening level is lower than the method PQL; MTCA defaults the screening level up to the PQL.
f. MTCA Method B Soil Unrestricted Land Use Direct Contact Formula Value, Carcinogen.

C = The chromotogram indicates the presence of PCBs, not DRO or RRO. Laboratory-reported results were updated to non-detect (U) for DRO/RRO.
J = Estimated value.
T = Value is between the MDL and MRL.
U = Not detected at the reporting limit indicated.
Bold = Detected value.
Shaded = Value exceeds the screening level.

Table 2c – 2013–2014 IAWP Soil Sample Analytical Results - Dioxins and Furans

Sample ID Depth in feet Sampling Date	MTCA Method B Screening Level[a]	JT-US-003-S2 7.5 to 8 1/2/14		JT-US-004-S2 7 to 7.5 1/2/14		JT-US-005-S2 10 to 10.5 1/2/14	
Dioxins in pg/g							
2,3,7,8-TCDD		0.287	U	0.303	U	0.518	U
1,2,3,7,8-PeCDD		0.599	U	**0.771**	T	**1.56**	
1,2,3,4,7,8-HxCDD		0.747	U	**0.332**	T	**0.445**	T
1,2,3,6,7,8-HxCDD		**0.803**	T	0.532	U	**1.13**	
1,2,3,7,8,9-HxCDD		**1.19**		**0.597**	T	**0.862**	T
1,2,3,4,6,7,8-HpCDD		4.95	U	3.15	U	3.53	U
OCDD		25.2	U	8.02	U	17.1	U
2,3,7,8-TCDF		**5.96**		**1.26**		**1.7**	
1,2,3,7,8-PeCDF		**2.16**	JL	**0.916**	T	**1.05**	JL
2,3,4,7,8-PeCDF		**1.55**		**1.12**		**1.56**	
1,2,3,4,7,8-HxCDF		**2.95**		**0.855**	T	**20.5**	
1,2,3,6,7,8-HxCDF		1.12	U	**0.831**	T	**2.51**	
1,2,3,7,8,9-HxCDF		**1.43**		**0.331**	T	**2.2**	
2,3,4,6,7,8-HxCDF		**1.05**		**0.932**	T	**1.02**	
1,2,3,4,6,7,8-HpCDF		**3.45**		**1.83**		**30.1**	
1,2,3,4,7,8,9-HpCDF		**2.55**		**0.322**	T	**32**	
OCDF		**38.1**		1.14	U	**204**	
Total TCDD		**4.28**	J	**10.9**	J	**20.9**	J
Total PeCDD		**4.82**	J	**10.1**		**21.8**	J
Total HxCDD		**9.37**	J	**9.17**	J	**17.2**	J
Total HpCDD		**12.4**	J	**6.76**		**8.76**	
Total TCDF		**23.5**	J	**29.1**	J	**27.1**	J
Total PeCDF		**11.2**	J	**14.2**	J	**27.6**	J
Total HxCDF		**10.8**	J	**7.4**	J	**54.5**	J
Total HpCDF		**8.44**	J	**2.91**		**125**	
TEQ Equivalent	0.049	**1.94**		**1.59**		**5.53**	

Values that exceed the screening level are shaded.
U = Not detected at the reporting limit indicated.
J = Estimated value.
T = Value is between the MDL and MRL.
TEQ = Toxicity Equivalency Quotient
JL = Analyte was positively identified and the value may be less than the reported estimate.
Bold = Detected value.
Shaded = Value exceeds the screening level.
a. Value provided is the Three-Phase Partitioning Model screening level calculated with MTCA equation 747-1 using the lowe surface water level for protection of human health considering food ingestion only (WAC 173-340-474). The cleanup levels pr are based on potential for groundwater migration to surface water.

Table 3a – Groundwater Analytical Results - PCBs, VOCs, Metals, and Conventionals

Sample ID	MTCA Method B	MTCA Method B	IP-14		JT-MW-IP-9		JT-MW-JT-3		JT-3		JT-4		JT-5		JT-5		JT-MW-JT-6	
Monitoring Well	Groundwater (V.I.)	Freshwater	IP-14		IP-9		JT-3		JT-3		JT-4		JT-5		JT-5		JT-6	
Sampling Date	Screening Levels	Screening Levels[a]	1/9/2014		1/8/2014		1/7/2014		11/26/2014		12/05/2014		3/18/2014		11/25/2014		1/7/14, 1/14/14	
Conventionals in mg/L																		
Alkalinity as Bicarbonate			**152**		**455**		**135**										**548**	
Alkalinity as Carbonate			1	U	1	U	1	U									1	U
Alkalinity as Hydroxide			1	U	1	U	1	U									1	U
Alkalinity, Total			**152**		**455**		**135**										**548**	
Chloride			**8.6**		**9.2**		**16.8**										**26.4**	
Nitrate			**0.1**		**0.1**												0.05	U
Nitrate																		
Nitrate-Nitrite as N																	0.05	U
Nitrite as N																	0.029	
Sulfate			0.5		0.1	U	1.1										0.1	U
Total Organic Carbon			2.2		10.5		6.61										20.4	
Total Suspended Solids									**4.9**		**122**	J	**119**		**3.2**			
Dissolved Metals in µg/L																		
Arsenic		0.098[b]	**24.7**		**5**		**22.7**		**28.6**		**37.5**				0.2	U	**15.2**	
Cadmium		40.5[c]	0.1	U	0.1	U	0.1	U	0.2	U	0.1	U			**0.2**		0.1	U
Chromium		50[d]	1	U	**1**		**1**		**1**		1	U			0.5	U	**2**	
Lead		15[d]	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U			**0.8**		0.1	U
Mercury		0.146	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U			0.1	U	0.1	U
Total Metals in µg/L																		
Arsenic		0.098[b]	**21.6**		**4.9**		**23**		**28.4**		**41**				**0.2**		**15.1**	
Cadmium		40.5[c]	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U			0.3		0.1	U
Chromium		50[d]	1	U	**2**		**1.2**		**1.7**		**8**	J			**0.7**		**3**	
Lead		15[d]	**0.6**		**0.1**		**0.2**		**0.3**		**2.3**	J			**2.4**		**0.8**	
Mercury		0.146	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U			0.1	U	0.1	U
TPH in µg/L																		
Diesel Range Organics		500[d]																
Lube Oil		500[d]																
Combine Diesel and Oil		500[d]																
Residual Range Organics		500[d]																
PCBs in µg/L																		
Aroclor 1016			0.25	U	2.5	U	0.01	U	0.01	U	0.01	U			0.01	U	0.01	U
Aroclor 1221			0.25	U	2.5	U	0.01	U	0.01	U	0.01	U			0.01	U	0.01	U
Aroclor 1232			0.25	U	2.5	U	0.035	U	0.01	U	0.01	U			0.01	U	0.04	U
Aroclor 1242			0.25	U	2.5	U	0.01	U	0.01	U	0.01	U			0.01	U	0.01	U
Aroclor 1248			0.75	U	2.5	U	0.01	U	0.015	U	0.01	U			0.01	U	0.01	U
Aroclor 1254			2.5	U	12	U	0.75	U	0.37		0.1	U			0.025	U	0.05	U
Aroclor 1260			**0.79**		**18**		**0.76**		**0.68**		**0.28**				**0.079**		**0.05**	
Aroclor 1262			0.25	U	2.5	U	0.01	U	0.01	U	0.01	U			0.01	U	0.01	U
Aroclor 1268			0.25	U	2.5	U	0.01	U	0.01	U	0.01	U			0.01	U	0.01	U
Total PCBs		0.000064[b]	**0.79**		**18**		**0.76**		**1.05**		**0.28**				**0.079**		**0.05**	
Select Detected Volatiles in µg/L																		
1,1-Dichloroethene	130.00	3.2[e]	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
1,2,3-Trichlorobenzene	-		**76**		**15**		**0.13**	T	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,2,4-Trichlorobenzene	39.18	2.03[c]	**960**		**130**		**0.86**		0.5	U	0.5	U	**0.13**	JT	0.5	U	0.5	U
1,2,4-Trimethylbenzene	28.44		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
1,2-Dichlorobenzene	2571.43	3,000	**110**		**4.7**		**0.13**	T	0.2	U	0.2	U	0.2	U	0.2	U	**0.12**	T
1,3,5-Trimethylbenzene	-		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
1,3-Dichlorobenzene	-	10	**580**		**15**		**0.83**		**0.36**		0.2	U	0.2	U	0.2	U	**1.3**	
1,4-Dichlorobenzene	4.85	21[c]	**670**		**33**		**1.7**		**1.3**		0.2	U	0.2	U	0.2	U	**2.7**	
2-Butanone	-		5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
4-Isopropyltoluene	-		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Acetone	-	6 x 10$^{6(f)}$	5	U	5	U	5	U	5	U	5	U	5	U	6.1	U	5	U
Benzene	2.40	5[d]	**13**		**11**		**0.97**		**0.57**		**0.11**	T	0.2	U	0.2	U	**4.4**	
Carbon Disulfide	400.00	2.26 x 10$^{4(f)}$	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Chlorobenzene	285.71	800	**1200**		**370**		**43**		**27**		0.2	U	0.2	U	0.47	U	**300**	
Chloromethane	152.82		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	UJ	0.5	U	0.5	U
cis-1,2-Dichloroethene	-		**0.82**		**0.91**		**0.16**	T	0.2	U	**0.31**		0.2	U	0.2	U	0.2	U
Ethylbenzene	2782.61	130	**0.15**	T	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.12**	T
Isopropylbenzene	-		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Methyl tert-Butyl Ether	610.00		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Naphthalene	8.93	4,710[f]	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
n-Butylbenzene	-		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
n-Propylbenzene	-		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
sec-Butylbenzene	-		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Tetrachloroethene	22.89	29	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Toluene	15584.42	520	**0.29**		**0.18**	T	**0.11**	T	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
trans-1,2-Dichloroethene	-	4,000	**0.11**	T	**0.38**		**0.11**	T	**0.12**	T	**0.12**	T	0.2	U	0.2	U	0.2	U
Trichloroethene	1.55	7	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Vinyl Chloride	0.35	1.6	**0.99**		**1.3**		**0.17**	T	**0.16**	T	**0.31**		0.2	U	0.2	U	**0.14**	T
Total Xylenes	-	1000[d]	**0.14**		**0.14**		0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	**0.17**	

Notes:

a. Clean Water Act S304 Freshwater Screening Level for Consumption of Organisms groundwater migration to surface water.

b. Screening level is lower than the method PQL; MTCA defaults the screening level up to the PQL.

c. MTCA Method B, Carcinogen, Surface Water Screening Level, standard formula value.

d. MTCA Method A Cleanup Levels for Groundwater.

e. National Toxics Rule 40 CFR 131 Freshwater Screening Level for Consumption of Organisms based on groundwater migration to surface water.

f. MTCA Method B, Non-Carcinogen, Surface Water Screening Level, standard formula value.

C = The chromatogram indicates the presence of PCBs, not DRO or RRO.

T = Value is between the MDL and MRL.

U = Not detected at indicated detection limit.

V.I. = Vapor Intrusion

Bolded = Detected value.

Shaded = Value exceeds the MTCA Method B Freshwater screening level.

Bolded Red = Value exceeds the MTCA Method B Groundwater Vapor Intrusion screening level.

Laboratory-reported results were updated to non-detect (U) for DRO/RRO.

Table 3a – Groundwater Analytical Results - PCBs, VOCs, Metals, and Conventionals

Sample ID	MTCA Method B	MTCA Method B	JT-6		JT-MW-JT-7		JT-7		JT-MW-JT-8		JT-MW-MW-8D		JT-MW-8		JT-9		JT-10		JT-MW-JT-11	
Monitoring Well	Groundwater (V.I.)	Freshwater	JT-6		JT-7		JT-7		JT-8		MW-8D		MW-8D		JT-9		JT-10		JT-11	
Sampling Date	Screening Levels	Screening Levels[a]	11/25/2014		1/7/14, 1/14/14		11/26/2014		1/8/2014		1/7/14, 1/14/14		3/18/2014		11/26/2014		11/25/2014		1/8/14, 1/14/14	
Conventionals in mg/L																				
Alkalinity as Bicarbonate					**562**				**94.5**		**165**								**380**	
Alkalinity as Carbonate					1	U			1	U	1	U							1	U
Alkalinity as Hydroxide					1	U			1	U	1	U							1	U
Alkalinity, Total					**562**				**94.5**		**165**								**380**	
Chloride					**17.3**				**2.8**		**8.7**								**18.2**	
Nitrate					0.01	U			**0.1**		0.01	U							0.01	U
Nitrate																				
Nitrate-Nitrite as N					0.01	U					0.01	U							0.01	U
Nitrite as N					0.01	U					0.01	U							0.01	U
Sulfate					**0.3**				0.6		0.1								0.1	U
Total Organic Carbon					**20.4**				4.77		1.8								**10.6**	
Total Suspended Solids			**68.6**				**56.2**						1	U	**19.5**		**11.3**			
Dissolved Metals in µg/L																				
Arsenic		0.098[b]	**17.5**		**20**		**25.2**		**23.2**		**4.8**				**37.9**		**12.1**		**18.2**	
Cadmium		40.5[c]	0.2	U	0.1	U	0.1	U	0.1	U	0.1	U			0.1	U	0.1	U	0.2	
Chromium		50[d]	**2**		**2**		**2**		**0.6**		1	U			1	U	**0.7**		1	U
Lead		15[d]	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U			0.1	U	**0.3**		**0.4**	
Mercury		0.146	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U			0.1	U	0.1	U	0.1	U
Total Metals in µg/L																				
Arsenic		0.098[b]	**16.4**		**20.3**		**23.8**		**20.6**		**4.5**				**36.9**		**20.7**		**18.5**	
Cadmium		40.5[c]	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U			0.1	U	0.1	U	**0.3**	
Chromium		50[d]	**2**		**2**		**2**		**1.1**		1	U			1	U	**1.7**		**1**	
Lead		15[d]	**0.1**		**0.3**		0.1	U	**1.4**		**0.2**				**0.3**		**3**		**3.9**	
Mercury		0.146	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U			0.1	U	0.1	U	0.1	U
TPH in µg/L																				
Diesel Range Organics		500[d]							3600	U, C										
Lube Oil		500[d]																		
Combine Diesel and Oil		500[d]																		
Residual Range Organics		500[d]							1400	U, C										
PCBs in µg/L																				
Aroclor 1016			0.01	U	0.01	U	0.01	U	20	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
Aroclor 1221			0.01	U	0.01	U	0.01	U	20	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
Aroclor 1232			0.01	U	0.012	U	0.01	U	20	U	0.035	U	0.01	U	0.01	U	0.01	U	0.025	U
Aroclor 1242			0.01	U	0.01	U	0.01	U	20	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
Aroclor 1248			0.01	U	0.01	U	0.01	U	20	U	0.01	U	0.015	U	0.02	U	0.01	U	0.01	U
Aroclor 1254			0.015	U	0.15	U	0.025	U	200	U	0.25	U	0.15	U	**0.24**		0.01	U	0.25	U
Aroclor 1260			**0.017**	JP	**0.17**		**0.025**		**280**		**0.49**		**0.18**		**0.46**		**0.013**		**0.91**	
Aroclor 1262			0.01	U	0.01	U	0.01	U	20	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
Aroclor 1268			0.01	U	0.01	U	0.01	U	20	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
Total PCBs		0.000064[b]	**0.017**	J	**0.17**		**0.025**		**280**		**0.49**		**0.18**		**0.7**		**0.013**		**0.91**	
Select Detected Volatiles in µg/L																				
1,1-Dichloroethene	130.00	3.2[e]	0.2	UJ	0.2	U	0.2	UJ	0.2	U	0.2	U	0.2	U	0.2	U	0.2	UJ	0.2	U
1,2,3-Trichlorobenzene	-		0.5	UJ	0.5	U	0.5	UJ	**1300**		0.5	U	0.5	U	**0.29**	T	0.5	UJ	0.5	U
1,2,4-Trichlorobenzene	39.18	2.03[c]	0.5	UJ	**0.58**		0.5	UJ	**9900**		**0.45**	T	0.5	UJ	0.25	U	0.5	UJ	0.5	U
1,2,4-Trimethylbenzene	28.44		0.2	UJ	0.2	U	0.23	UJ	**0.12**	T	0.2	U	0.2	U	0.2	U	0.2	UJ	0.2	U
1,2-Dichlorobenzene	2571.43	3,000	0.2	UJ	**0.08**	T	0.2	UJ	**800**		0.2	U	0.2	U	0.2	U	**0.14**	JT	**0.06**	T
1,3,5-Trimethylbenzene	-		0.2	UJ	0.2	U	0.2	UJ	0.2	U	0.2	U	0.2	U	0.2	U	0.2	UJ	0.2	U
1,3-Dichlorobenzene	-	10	**1.1**	J	**0.91**		**1.1**	J	**220**		0.2	U	0.2	U	0.2	U	**2.2**	J	**0.84**	
1,4-Dichlorobenzene	4.85	21[c]	**2.6**	J	**2.3**		**3.1**	J	**730**		0.2	U	0.2	U	0.2	U	**3.1**	J	**1.8**	
2-Butanone	-		5	UJ	5	U	5	UJ	**2.2**	T	5	U	5	U	5	U	5	UJ	5	U
4-Isopropyltoluene	-		0.2	UJ	0.2	U	0.2	UJ	0.2	U	0.2	U	0.2	U	0.2	U	0.2	UJ	0.2	U
Acetone	-	6 x 10[6(f)]	5	UJ	5	U	5	UJ	16	U	5	U	5	U	5	U	5	UJ	5	U
Benzene	2.40	5[d]	**5.5**	J	**0.63**		**1.2**	J	**1.5**		0.2	U	0.2	U	**0.36**		**0.58**	J	**4.8**	
Carbon Disulfide	400.00	2.26 x 10[4(f)]	0.2	UJ	0.2	U	0.2	UJ	0.2	U	0.2	U	0.2	U	0.2	U	0.31	JT	0.2	U
Chlorobenzene	285.71	800	**240**	J	**95**		**72**	J	**150**		**0.4**		**0.28**		**0.15**	T	**26**	J	**170**	
Chloromethane	152.82		0.5	UJ	0.5	U	0.5	UJ	0.5	U	0.5	U	0.5	UJ	**0.37**	T	0.5	UJ	0.5	U
cis-1,2-Dichloroethene	-		0.2	UJ	**0.13**	T	**0.13**	JT	0.28		0.2	U	0.2	U	**0.31**		**0.53**	J	0.2	U
Ethylbenzene	2782.61	130	**0.15**	JT	0.2	U	**0.36**	J	0.2	U	0.2	U	0.2	U	0.2	U	0.2	UJ	0.1	T
Isopropylbenzene	-		0.2	UJ	0.2	U	**0.12**	JT	0.2	U	0.2	U	0.2	U	0.2	U	0.2	UJ	0.2	U
Methyl tert-Butyl Ether	610.00		0.5	UJ	0.5	U	0.5	UJ	0.5	U	0.5	U	0.5	U	0.5	U	0.5	UJ	0.5	U
Naphthalene	8.93	4,710[f]	0.5	UJ	0.5	U	**4**	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	UJ	0.5	U
n-Butylbenzene	-		0.2	UJ	0.2	U	0.2	UJ	0.2	U	0.2	U	0.2	U	0.2	U	0.2	UJ	0.2	U
n-Propylbenzene	-		0.2	UJ	0.2	U	0.2	UJ	0.2	U	0.2	U	0.2	U	0.2	U	0.2	UJ	0.2	U
sec-Butylbenzene	-		0.2	UJ	0.2	U	0.2	UJ	0.2	U	0.2	U	0.2	U	0.2	U	0.2	UJ	0.2	U
Tetrachloroethene	22.89	29	0.2	UJ	0.2	U	0.2	UJ	**0.29**		0.2	U	0.2	U	0.2	U	0.2	UJ	0.2	U
Toluene	15584.42	520	0.2	UJ	0.2	U	0.32	UJ	**0.4**		0.2	U	0.2	U	0.39	U	0.2	UJ	0.2	U
trans-1,2-Dichloroethene	-	4,000	0.2	UJ	0.2	U	0.2	UJ	0.2	U	0.2	U	0.2	U	**0.44**		0.2	UJ	0.2	U
Trichloroethene	1.55	7	0.2	UJ	0.2	U	0.2	UJ	**0.17**	T	0.2	U	0.2	U	0.2	U	0.2	UJ	0.2	U
Vinyl Chloride	0.35	1.6	**0.21**	J	0.2	U	**0.16**	JT	**0.14**	T	0.2	U	0.2	U	**0.38**		**0.17**	JT	**0.15**	T
Total Xylenes	-	1000[d]	**0.11**	J	**0.29**	J	**0.84**	J	**0.38**	J	0.4	U	0.4	U	**1.45**		0.4	UJ	0.4	U

Notes:

a. Clean Water Act S304 Freshwater Screening Level for Consumption of Organisms groundwater migration to surface water.

b. Screening level is lower than the method PQL; MTCA defaults the screening level up to the PQL.

c. MTCA Method B, Carcinogen, Surface Water Screening Level, standard formula value.

d. MTCA Method A Cleanup Levels for Groundwater.

e. National Toxics Rule 40 CFR 131 Freshwater Screening Level for Consumption of Organisms based on groundwater migration to surface water.

f. MTCA Method B, Non-Carcinogen, Surface Water Screening Level, standard formula value.

C = The chromatogram indicates the presence of PCBs, not DRO or RRO.

T = Value is between the MDL and MRL.

U = Not detected at indicated detection limit.

V.I. = Vapor Intrusion

Bolded = Detected value.

Shaded = Value exceeds the MTCA Method B Freshwater screening level.

Bolded Red = Value exceeds the MTCA Method B Groundwater Vapor Intrusion screening level.

Laboratory reported results were updated to non-detect (U) for DRO/RRO.

Table 3a – Groundwater Analytical Results - PCBs, VOCs, Metals, and Conventionals

Sample ID	MTCA Method B	MTCA Method B	JT-11		JT-MW-JT-12		JT-12		JT-MW-SRW-1		SRW-1		SRW-2		SRW-3	
Monitoring Well	Groundwater (V.I.)	Freshwater	JT-11		JT-12		JT-12		SRW-1		SRW-1		SRW-2		SRW-3	
Sampling Date	Screening Levels	Screening Levels[a]	12/05/2014		1/8/2014		11/25/2014		1/7/14, 1/14/14		11/25/2014		11/25/2014		12/05/2014	
Conventionals in mg/L																
Alkalinity as Bicarbonate					**141**				**35.4**							
Alkalinity as Carbonate					1	U			159							
Alkalinity as Hydroxide					1	U			1	U						
Alkalinity, Total					**141**				**195**							
Chloride					**38.4**				**12.2**							
Nitrate					**0.1**				0.01	U						
Nitrate																
Nitrate-Nitrite as N									0.01	U						
Nitrite as N									0.01	U						
Sulfate					**0.7**				**0.8**							
Total Organic Carbon					**5.17**				**2.52**							
Total Suspended Solids			**2.2**				**58.6**				**12.4**		**12.2**		**3**	
Dissolved Metals in µg/L																
Arsenic		0.098[b]	**14.9**		**12**		**20.8**		0.2	U	0.2	U	**0.5**		**0.2**	
Cadmium		40.5[c]	0.2		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Chromium		50[d]	**1**		1	U	1	U	0.5	U	0.5	U	0.5	U	0.5	U
Lead		15[d]	**0.2**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Mercury		0.146	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Total Metals in µg/L																
Arsenic		0.098[b]	**15**		**13.2**		**21.2**		**0.2**		**0.5**		**0.9**		**0.4**	
Cadmium		40.5[c]	**0.2**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Chromium		50[d]	**1.2**		**0.8**		**2**		0.5	U	**1.6**		**2.7**		**0.5**	
Lead		15[d]	**1.2**		**0.1**		**0.4**		0.1	U	**0.4**		**0.5**		**0.2**	
Mercury		0.146	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
TPH in µg/L																
Diesel Range Organics		500[d]														
Lube Oil		500[d]														
Combine Diesel and Oil		500[d]														
Residual Range Organics		500[d]														
PCBs in µg/L																
Aroclor 1016			0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
Aroclor 1221			0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
Aroclor 1232			0.01	U	0.015	U	0.01	U	0.02	U	0.01	U	0.01	U	0.01	U
Aroclor 1242			0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
Aroclor 1248			0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
Aroclor 1254			0.03	U	0.012	U	0.01	U	0.05	U	0.01	U	0.2	U	**0.011**	
Aroclor 1260			**0.1**	J	**0.018**		0.01	U	**0.13**		**0.011**		**0.88**		**0.041**	
Aroclor 1262			0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
Aroclor 1268			0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
Total PCBs		0.000064[b]	**0.1**	J	**0.018**		0.01	U	**0.13**		**0.011**		**0.88**		**0.052**	
Select Detected Volatiles in µg/L																
1,1-Dichloroethene	130.00	3.2[e]	0.2	U	0.2	U	0.2	UJ	0.2	U	0.2	UJ	0.2	UJ	0.2	UJ
1,2,3-Trichlorobenzene	-		0.5	U	0.5	U	0.5	UJ	0.5	U	0.5	UJ	0.5	UJ	0.5	UJ
1,2,4-Trichlorobenzene	39.18	2.03[c]	0.5	U	0.5	U	0.5	UJ	0.5	U	0.5	UJ	0.5	UJ	0.5	UJ
1,2,4-Trimethylbenzene	28.44		0.2	U	0.2	U	0.2	UJ	0.2	U	0.2	UJ	0.2	UJ	0.2	UJ
1,2-Dichlorobenzene	2571.43	3,000	0.2	U	**0.19**	T	**0.2**	J	0.2	U	0.2	UJ	0.2	UJ	0.2	UJ
1,3,5-Trimethylbenzene	-		0.2	U	0.2	U	0.2	UJ	0.2	U	0.2	UJ	0.2	UJ	0.2	UJ
1,3-Dichlorobenzene	-	10	**0.74**		**1.1**		**1.2**	J	0.2	U	0.2	UJ	0.2	UJ	0.2	UJ
1,4-Dichlorobenzene	4.85	21[c]	**1.3**		**1.5**		**2**	J	0.2	U	0.2	UJ	0.2	UJ	0.2	UJ
2-Butanone	-		5	UJ	5	U	5	UJ	5	U	5	UJ	5	UJ	5	UJ
4-Isopropyltoluene	-		0.2	U	0.2	U	0.2	UJ	0.2	U	0.2	UJ	0.2	UJ	0.2	UJ
Acetone	-	6 x 10[6(f)]	5	UJ	5	U	5	UJ	5	U	5	UJ	5	UJ	6.3	UJ
Benzene	2.40	5[d]	**5.6**		**0.42**		**0.53**	J	0.2	U	0.2	UJ	0.2	UJ	0.2	UJ
Carbon Disulfide	400.00	2.26 x 10[a(f)]	0.2	U	0.2	U	0.2	UJ	0.2	U	0.2	UJ	0.2	UJ	0.2	UJ
Chlorobenzene	285.71	800	**160**	J	**42**		**46**	J	**0.12**	T	0.2	UJ	**0.32**	J	0.2	UJ
Chloromethane	152.82		0.5	UJ	0.5	U	0.5	UJ	0.5	U	0.5	UJ	0.5	UJ	0.5	UJ
cis-1,2-Dichloroethene	-		0.2	U	**0.25**		**0.26**	J	0.2	U	0.2	UJ	0.2	UJ	0.2	UJ
Ethylbenzene	2782.61	130	**0.11**	T	0.2	U	0.2	UJ	0.2	U	0.2	UJ	0.2	UJ	0.2	UJ
Isopropylbenzene	-		0.2	U	0.2	U	0.2	UJ	0.2	U	0.2	UJ	0.2	UJ	0.2	UJ
Methyl tert-Butyl Ether	610.00		0.5	U	0.5	U	0.5	UJ	0.5	U	0.5	UJ	0.5	UJ	0.5	UJ
Naphthalene	8.93	4,710[f]	0.5	U	0.5	U	0.5	UJ	0.5	U	0.5	UJ	0.5	UJ	0.5	UJ
n-Butylbenzene	-		0.2	U	0.2	U	0.2	UJ	0.2	U	0.2	UJ	0.2	UJ	0.2	UJ
n-Propylbenzene	-		0.2	U	0.2	U	0.2	UJ	0.2	U	0.2	UJ	0.2	UJ	0.2	UJ
sec-Butylbenzene	-		0.2	U	0.2	U	0.2	UJ	0.2	U	0.2	UJ	0.2	UJ	0.2	UJ
Tetrachloroethene	22.89	29	0.2	U	0.2	U	0.2	UJ	0.2	U	0.2	UJ	0.2	UJ	0.2	UJ
Toluene	15584.42	520	0.2	U	0.2	U	0.2	UJ	0.2	U	0.2	UJ	0.2	UJ	0.2	UJ
trans-1,2-Dichloroethene	-	4,000	0.2	U	**0.13**	T	**0.22**	J	0.2	U	0.2	UJ	0.2	UJ	0.2	UJ
Trichloroethene	1.55	7	0.2	U	0.2	U	0.2	UJ	0.2	U	0.2	UJ	0.2	UJ	0.2	UJ
Vinyl Chloride	0.35	1.6	**0.11**	T	**0.21**		**0.21**	J	0.2	U	0.2	UJ	0.2	UJ	0.2	UJ
Total Xylenes	-	1000[d]	0.4	U	**0.32**	J	0.4	UJ	0.4	U	0.4	UJ	0.4	UJ	0.4	UJ

Notes:

a. Clean Water Act S304 Freshwater Screening Level for Consumption of Organisms groundwater migration to surface water.

b. Screening level is lower than the method PQL; MTCA defaults the screening level up to the PQL.

c. MTCA Method B, Carcinogen, Surface Water Screening Level, standard formula value.

d. MTCA Method A Cleanup Levels for Groundwater.

e. National Toxics Rule 40 CFR 131 Freshwater Screening Level for Consumption of Organisms based on groundwater migration to surface water.

f. MTCA Method B, Non-Carcinogen, Surface Water Screening Level, standard formula value.

C = The chromatogram indicates the presence of PCBs, not DRO or RRO.

T = Value is between the MDL and MRL.

U = Not detected at indicated detection limit.

V.I. = Vapor Intrusion

Bolded = Detected value.

Shaded = Value exceeds the MTCA Method B Freshwater screening level.

Bolded Red = Value exceeds the MTCA Method B Groundwater Vapor Intrusion screening level.

Laboratory reported results were updated to non-detect (U) for DRO/RRO.

Table 3a – Groundwater Analytical Results - PCBs, VOCs, Metals, and Conventionals

Sample ID	MTCA Method B	MTCA Method B	JT-MW-100		MW-100		JT-MW-200		MW-200		MW-4-GW		HC-MW-1-GW		HC-MW-2-GW		HC-MW-3-GW	
Monitoring Well	Groundwater (V.I.)	Freshwater	MW-100		MW-100		MW-200		MW-200		MW-4		HC-MW-1		HC-MW-2		HC-MW-3	
Sampling Date	Screening Levels	Screening Levels[a]	3/18/14		12/05/2014		3/18/2014		11/26/2014		12/23/2014		12/23/2014		12/24/2014		12/24/2014	
Conventionals in mg/L																		
Alkalinity as Bicarbonate																		
Alkalinity as Carbonate																		
Alkalinity as Hydroxide																		
Alkalinity, Total																		
Chloride																		
Nitrate																		
Nitrate																		
Nitrate-Nitrite as N																		
Nitrite as N																		
Sulfate																		
Total Organic Carbon																		
Total Suspended Solids			**45.2**		**21.3**		**25.6**		**47.6**		**44.9**		**67.2**		**13.6**		**46.1**	
Dissolved Metals in µg/L																		
Arsenic		0.098[b]			**9**				**8**		**0.7**		**0.6**		**0.5**		**0.6**	
Cadmium		40.5[c]			0.1	U			0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Chromium		50[d]			1	U			0.5	U	1	U	1	U	0.5	U	1	U
Lead		15[d]			0.1	U			0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Mercury		0.146			0.1	U			0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Total Metals in µg/L																		
Arsenic		0.098[b]			**9.3**				**6.5**		**0.4**		**0.7**		**0.5**		**0.7**	
Cadmium		40.5[c]			0.1	U			0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Chromium		50[d]			0.5	U			**2.1**		1	U	1	U	1	U	1	U
Lead		15[d]			**0.2**				**0.8**		0.1	U	**1.4**		**0.2**		0.1	U
Mercury		0.146			0.1	U			0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
TPH in µg/L																		
Diesel Range Organics		500[d]									**680**		**400**		100	U	**2200**	
Lube Oil		500[d]									**290**		**360**		200	U	**830**	
Combine Diesel and Oil		500[d]									**970**		**760**		200	U	**3030**	
Residual Range Organics		500[d]																
PCBs in µg/L																		
Aroclor 1016			0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
Aroclor 1221			0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
Aroclor 1232			0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
Aroclor 1242			0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
Aroclor 1248			0.012	U	0.01	U	0.01	U	0.01	U	0.12	U	0.01	U	0.01	U	0.01	U
Aroclor 1254			0.4	U	0.05	U	0.04	U	1	UJ	0.4	U	0.025	U	0.01	U	0.01	U
Aroclor 1260			**1.1**		**0.062**		**0.057**		**2.5**		**1.6**	J	**0.031**		0.01	U	0.01	U
Aroclor 1262			0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
Aroclor 1268			0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
Total PCBs		0.000064[b]	**1.1**		**0.062**		**0.057**		**2.5**		**1.6**	J	**0.031**		0.01	U	0.01	U
Select Detected Volatiles in µg/L																		
1,1-Dichloroethene	130.00	3.2[e]	0.2	U	0.2	U	0.2	U	0.2	UJ	0.2	U	0.2	U	0.2	U	0.2	U
1,2,3-Trichlorobenzene	-		0.5	U	0.5	U	**15**		**0.27**	JT	0.5	U	0.5	U	0.5	U	0.5	U
1,2,4-Trichlorobenzene	39.18	2.03[c]	0.5	U	0.5	U	**100**	**J**	**1.9**	J	0.5	U	0.5	U	0.5	U	0.5	U
1,2,4-Trimethylbenzene	28.44		0.2	U	0.2	U	0.2	U	0.2	UJ	0.2	U	0.2	U	0.2	U	0.2	U
1,2-Dichlorobenzene	2571.43	3,000	0.2	U	0.2	U	**5.3**		0.2	UJ	0.2	U	**0.4**		0.2	U	0.2	U
1,3,5-Trimethylbenzene	-		0.2	U	**0.21**		0.2	U	0.2	UJ	0.2	U	0.2	U	0.2	U	0.2	U
1,3-Dichlorobenzene	-	10	0.2	U	0.2	U	**1.1**		0.2	UJ	**0.6**		**2.1**		0.2	U	0.2	U
1,4-Dichlorobenzene	4.85	21[c]	**0.17**	T	**0.13**	T	**4**		0.2	UJ	**0.71**		**3.7**		0.2	U	0.2	U
2-Butanone	-		5	U	5	UJ	**2.6**	T	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ
4-Isopropyltoluene	-		**4.2**		0.2	U	0.2	U	0.2	UJ	0.2	U	0.2	U	0.2	U	0.2	U
Acetone	-	6 x 10[6(f)]	**33**		5	UJ	**46**		5	UJ	**2.2**	T	5	U	5	U	**3.6**	T
Benzene	2.40	5[d]	**0.84**		**0.3**		**1.5**		0.2	UJ	**0.15**	T	**0.13**	T	0.2	U	0.2	U
Carbon Disulfide	400.00	2.26 x 10[4(f)]	**0.18**	T	**0.39**		**0.1**	T	0.2	UJ	**0.29**		0.2	U	0.2	U	**0.17**	T
Chlorobenzene	285.71	800	**16**		**3.2**		**1.4**		**0.32**	J	**3.3**		**29**		0.2	U	0.2	U
Chloromethane	152.82		0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	0.5	U	0.5	U	**1.6**		**0.87**	
cis-1,2-Dichloroethene	-		**0.17**	T	0.2	U	0.2	U	0.2	UJ	0.2	U	**0.12**	T	0.2	U	**0.13**	T
Ethylbenzene	2782.61	130	0.2	U	**0.18**	T	0.2	U	0.2	UJ	0.2	U	0.2	U	0.2	U	0.2	U
Isopropylbenzene	-		0.2	U	0.2	U	0.2	U	0.2	UJ	0.2	U	0.2	U	0.2	U	0.2	U
Methyl tert-Butyl Ether	610.00		**0.13**	T	0.5	U	0.5	U	0.5	UJ	0.5	U	**0.12**	T	0.5	U	0.5	U
Naphthalene	8.93	4,710[f]	0.5	U	**0.9**		**0.19**	T	**0.28**	JT	0.63	U	0.5	U	0.5	U	0.5	U
n-Butylbenzene	-		0.2	U	0.2	U	0.2	U	0.2	UJ	0.2	U	0.2	U	0.2	U	0.2	U
n-Propylbenzene	-		0.2	U	0.2	U	0.2	U	0.2	UJ	0.2	U	0.2	U	0.2	U	0.2	U
sec-Butylbenzene	-		0.2	U	0.2	U	0.2	U	0.2	UJ	0.2	U	0.2	U	0.2	U	0.2	U
Tetrachloroethene	22.89	29	0.2	U	0.2	U	0.2	U	0.2	UJ	0.2	U	0.2	U	0.2	U	0.2	U
Toluene	15584.42	520	**0.36**		**0.16**	T	**0.62**		0.2	UJ	0.2	U	0.2	U	0.2	U	0.2	U
trans-1,2-Dichloroethene	-	4,000	0.2	U	0.2	U	0.2	U	0.2	UJ	0.2	U	0.2	U	0.2	U	0.2	U
Trichloroethene	1.55	7	0.2	U	0.2	U	0.2	U	0.2	UJ	0.2	U	0.2	U	0.2	U	0.2	U
Vinyl Chloride	0.35	1.6	**0.58**		0.2	U	0.2	U	0.2	UJ	0.2	U	**0.22**		0.2	U	0.2	U
Total Xylenes	-	1000[d]	0.4	U	0.4	U	**0.15**	T	0.4	UJ	0.4	U	0.4	U	0.4	U	0.4	U

Notes:

a. Clean Water Act S304 Freshwater Screening Level for Consumption of Organisms groundwater migration to surface water.

b. Screening level is lower than the method PQL; MTCA defaults the screening level up to the PQL.

c. MTCA Method B, Carcinogen, Surface Water Screening Level, standard formula value.

d. MTCA Method A Cleanup Levels for Groundwater.

e. National Toxics Rule 40 CFR 131 Freshwater Screening Level for Consumption of Organisms based on groundwater migration to surface water.

f. MTCA Method B, Non-Carcinogen, Surface Water Screening Level, standard formula value.

C = The chromatogram indicates the presence of PCBs, not DRO or RRO.

T = Value is between the MDL and MRL.

U = Not detected at indicated detection limit.

V.I. = Vapor Intrusion

Bolded = Detected value.

Shaded = Value exceeds the MTCA Method B Freshwater screening level.

Bolded Red = Value exceeds the MTCA Method B Groundwater Vapor Intrusion screening level.

Laboratory reported results were updated to non-detect (U) for DRO/RRO.

Table 3a – Groundwater Analytical Results - PCBs, VOCs, Metals, and Conventionals

Sample ID	MTCA Method B	MTCA Method B	IW-5D-GW		IW-5S-GW		JT-MW-01S-GW		JT-MW-02S-GW		JT-MW-03D-GW		JT-MW-04D-GW		JT-MW-05S-GW		JT-MW-06D-GW	
Monitoring Well	Groundwater (V.I.)	Freshwater	IW-5D		IW-5S		JT-MW-01S		JT-MW-02S		JT-MW-03D		JT-MW-04D		JT-MW-05S		JT-MW-06D	
Sampling Date	Screening Levels	Screening Levels[a]	12/23/2014		12/24/2014		12/23/2014		12/24/2014		12/24/2014		12/23/2014		12/23/2014		12/23/2014	
Conventionals in mg/L																		
Alkalinity as Bicarbonate																		
Alkalinity as Carbonate																		
Alkalinity as Hydroxide																		
Alkalinity, Total																		
Chloride																		
Nitrate																		
Nitrate																		
Nitrate-Nitrite as N																		
Nitrite as N																		
Sulfate																		
Total Organic Carbon																		
Total Suspended Solids			1	U	**171**		**178**		**16.2**		**31.5**		**34.2**		**238**		**9.9**	
Dissolved Metals in µg/L																		
Arsenic		0.098[b]					**10.6**		**12.9**		**6**		**4.7**		**48.9**		**2.1**	
Cadmium		40.5[c]					0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Chromium		50[d]					**1.2**		0.5	U	0.5	U	0.5	U	**2.1**		0.5	U
Lead		15[d]					**0.3**		**3.4**		0.1	U	0.1	U	**0.6**		0.1	U
Mercury		0.146					0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Total Metals in µg/L																		
Arsenic		0.098[b]					**10.6**		**15.3**		**6.2**		**5.1**		**50.8**		**2.1**	
Cadmium		40.5[c]					0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Chromium		50[d]					**3.8**		1	U	**1**		**3**		**4**		1	U
Lead		15[d]					**5.6**		**9.3**		**0.4**		**1**		**9.6**		**1**	
Mercury		0.146					0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
TPH in µg/L																		
Diesel Range Organics		500[d]																
Lube Oil		500[d]																
Combine Diesel and Oil		500[d]																
Residual Range Organics		500[d]																
PCBs in µg/L																		
Aroclor 1016			0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
Aroclor 1221			0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
Aroclor 1232			0.01	U	0.025	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
Aroclor 1242			0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
Aroclor 1248			0.01	U	0.01	U	0.01	UJ	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
Aroclor 1254			0.075	U	**0.06**		0.01	UJ	0.01	U	0.01	U	**0.025**		0.01	U	0.01	U
Aroclor 1260			**0.11**		**0.098**		0.01	UJ	0.01	U	**0.019**		**0.034**		0.01	U	0.01	U
Aroclor 1262			0.01	U	0.01	U	0.01	UJ	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
Aroclor 1268			0.01	U	0.01	U	0.01	UJ	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
Total PCBs		0.000064[b]	**0.11**		**0.158**		0.01	UJ	0.01	U	**0.019**		**0.059**		0.01	U	0.01	U
Select Detected Volatiles in µg/L																		
1,1-Dichloroethene	130.00	3.2[e]	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
1,2,3-Trichlorobenzene	-		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,2,4-Trichlorobenzene	39.18	2.03[c]	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,2,4-Trimethylbenzene	28.44		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
1,2-Dichlorobenzene	2571.43	3,000	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
1,3,5-Trimethylbenzene	-		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
1,3-Dichlorobenzene	-	10	0.2	U	0.2	U	**0.26**		0.2	U	0.2	U	0.2	U	**0.64**		**0.11**	T
1,4-Dichlorobenzene	4.85	21[c]	0.2	U	0.2	U	**0.81**		0.2	U	0.2	U	0.2	U	**2.1**		**0.15**	T
2-Butanone	-		5	UJ	**1**	JT	**0.94**	JT	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ
4-Isopropyltoluene	-		0.2	U	**0.31**		**0.29**		0.2	U	0.2	U	0.2	U	**1.2**		**2.2**	
Acetone	-	6 x 10[6(f)]	5	U	**13**		**7.5**		5	U	**3.2**	T	5	U	5	U	5	U
Benzene	2.40	5[d]	0.2	U	**0.21**		**0.37**		**0.23**		0.2	U	0.2	U	**0.16**	T	0.2	U
Carbon Disulfide	400.00	2.26 x 10[4(f)]	0.2	U	**0.28**		**0.85**		0.2	U	0.2	U	0.2	U	0.2	U	**0.13**	T
Chlorobenzene	285.71	800	0.2	U	0.2	U	**44**		0.2	U	0.2	U	**0.18**	T	**17**		**1.2**	
Chloromethane	152.82		0.5	U	0.5	U	**0.44**	T	1.3		**1.4**		**0.98**		**0.67**		**0.85**	
cis-1,2-Dichloroethene	-		0.2	U	**8**		**0.11**	T	0.2	U	0.2	U	0.2	U	**0.1**	T	0.2	U
Ethylbenzene	2782.61	130	0.2	U	**4**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Isopropylbenzene	-		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Methyl tert-Butyl Ether	610.00		0.5	U	0.5	U	**0.49**	T	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Naphthalene	8.93	4,710[f]	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
n-Butylbenzene	-		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
n-Propylbenzene	-		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
sec-Butylbenzene	-		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Tetrachloroethene	22.89	29	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Toluene	15584.42	520	0.2	U	**0.66**		0.2	U	0.2	U	**0.64**		**2.4**		**0.1**	T	0.2	U
trans-1,2-Dichloroethene	-	4,000	0.2	U	**0.44**		**0.18**	T	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Trichloroethene	1.55	7	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Vinyl Chloride	0.35	1.6	0.2	U	**3.7**		**0.19**	T	**0.15**	T	0.2	U	0.2	U	**0.19**	T	0.2	U
Total Xylenes	-	1000[d]	0.4	U	**8.1**		0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U

Notes:

a. Clean Water Act S304 Freshwater Screening Level for Consumption of Organisms groundwater migration to surface water.

b. Screening level is lower than the method PQL; MTCA defaults the screening level up to the PQL.

c. MTCA Method B, Carcinogen, Surface Water Screening Level, standard formula value.

d. MTCA Method A Cleanup Levels for Groundwater.

e. National Toxics Rule 40 CFR 131 Freshwater Screening Level for Consumption of Organisms based on groundwater migration to surface water.

f. MTCA Method B, Non-Carcinogen, Surface Water Screening Level, standard formula value.

C = The chromatogram indicates the presence of PCBs, not DRO or RRO.

T = Value is between the MDL and MRL.

U = Not detected at indicated detection limit.

V.I. = Vapor Intrusion

Bolded = Detected value.

Shaded = Value exceeds the MTCA Method B Freshwater screening level.

Bolded Red = Value exceeds the MTCA Method B Groundwater Vapor Intrusion screening level.

Laboratory reported results were updated to non-detect (U) for DRO/RRO.

Table 3a – Groundwater Analytical Results - PCBs, VOCs, Metals, and Conventionals

Sample ID	MTCA Method B	MTCA Method B	JT-MW-07S-GW		JT-MW-08S-GW	
Monitoring Well	Groundwater (V.I.)	Freshwater	JT-MW-07S		JT-MW-08S	
Sampling Date	Screening Levels	Screening Levels[a]	12/23/2014		12/23/2014	
Conventionals in mg/L						
Alkalinity as Bicarbonate						
Alkalinity as Carbonate						
Alkalinity as Hydroxide						
Alkalinity, Total						
Chloride						
Nitrate						
Nitrate						
Nitrate-Nitrite as N						
Nitrite as N						
Sulfate						
Total Organic Carbon						
Total Suspended Solids			**72.8**		**114**	
Dissolved Metals in µg/L						
Arsenic		0.098[b]	**0.7**		**3.6**	
Cadmium		40.5[c]	0.1	U	0.1	U
Chromium		50[d]	1	U	0.5	U
Lead		15[d]	0.1	U	**0.2**	
Mercury		0.146	0.1	U	0.1	U
Total Metals in µg/L						
Arsenic		0.098[b]	**0.7**		**4**	
Cadmium		40.5[c]	0.1	U	0.1	
Chromium		50[d]	1	U	**6**	
Lead		15[d]	**2**		**7.6**	
Mercury		0.146	0.1	U	0.1	U
TPH in µg/L						
Diesel Range Organics		500[d]	**970**			
Lube Oil		500[d]	**560**			
Combine Diesel and Oil		500[d]	**1530**			
Residual Range Organics		500[d]				
PCBs in µg/L						
Aroclor 1016			0.01	U	0.01	U
Aroclor 1221			0.01	U	0.01	U
Aroclor 1232			0.01	U	0.01	U
Aroclor 1242			0.01	U	0.01	U
Aroclor 1248			0.01	U	0.015	U
Aroclor 1254			0.01	U	**0.042**	
Aroclor 1260			0.01	U	**0.046**	
Aroclor 1262			0.01	U	0.01	U
Aroclor 1268			0.01	U	0.01	U
Total PCBs		0.000064[b]	0.01	U	**0.088**	
Select Detected Volatiles in µg/L						
1,1-Dichloroethene	130.00	3.2[e]	0.2	U	0.2	U
1,2,3-Trichlorobenzene	-		0.5	U	0.5	U
1,2,4-Trichlorobenzene	39.18	2.03[c]	0.5	U	0.5	U
1,2,4-Trimethylbenzene	28.44		0.2	U	0.2	U
1,2-Dichlorobenzene	2571.43	3,000	**0.3**		0.2	U
1,3,5-Trimethylbenzene	-		0.2	U	0.2	U
1,3-Dichlorobenzene	-	10	**1.5**		0.2	U
1,4-Dichlorobenzene	4.85	21[c]	**2.3**		0.2	U
2-Butanone	-		5	UJ	**2**	JT
4-Isopropyltoluene	-		**3.2**		0.2	U
Acetone	-	6 x 10$^{6(f)}$	5	U	**12**	
Benzene	2.40	5[d]	0.2	U	0.2	U
Carbon Disulfide	400.00	2.26 x 10$^{4(f)}$	**0.55**		0.2	U
Chlorobenzene	285.71	800	**12**		0.2	U
Chloromethane	152.82		0.5	U	**0.44**	T
cis-1,2-Dichloroethene	-		0.2	U	0.2	U
Ethylbenzene	2782.61	130	0.2	U	0.2	U
Isopropylbenzene	-		**0.33**		0.2	U
Methyl tert-Butyl Ether	610.00		0.5	U	0.5	U
Naphthalene	8.93	4,710[f]	0.5	U	0.5	U
n-Butylbenzene	-		**0.12**	T	0.2	U
n-Propylbenzene	-		**0.25**		0.2	U
sec-Butylbenzene	-		**0.5**		0.2	U
Tetrachloroethene	22.89	29	0.2	U	0.2	U
Toluene	15584.42	520	**0.29**		0.2	U
trans-1,2-Dichloroethene	-	4,000	0.2	U	0.2	U
Trichloroethene	1.55	7	0.2	U	0.2	U
Vinyl Chloride	0.35	1.6	**0.14**	T	0.2	U
Total Xylenes	-	1000[d]	0.4	U	0.4	U

Notes:

a. Clean Water Act S304 Freshwater Screening Level for Consumption of Organisms groundwater migration to surface water.

b. Screening level is lower than the method PQL; MTCA defaults the screening level up to the PQL.

c. MTCA Method B, Carcinogen, Surface Water Screening Level, standard formula value.

d. MTCA Method A Cleanup Levels for Groundwater.

e. National Toxics Rule 40 CFR 131 Freshwater Screening Level for Consumption of Organisms based on groundwater migration to surface water.

f. MTCA Method B, Non-Carcinogen, Surface Water Screening Level, standard formula value.

C = The chromatogram indicates the presence of PCBs, not DRO or RRO.

T = Value is between the MDL and MRL.

U = Not detected at indicated detection limit.

V.I. = Vapor Intrusion

Bolded = Detected value.

Shaded = Value exceeds the MTCA Method B Freshwater screening level.

Bolded Red = Value exceeds the MTCA Method B Groundwater Vapor Intrusion screening level.

Laboratory reported results were updated to non-detect (U) for DRO/RRO.

Table 3b – Groundwater Analytical Results – Semivolatile Organic Compounds

Monitoring Well Sampling Date	MTCA Method B Freshwater Screening Levels[a]	HC-MW-7S 2/24/2015		Monitoring Well Sampling Date	MTCA Method B Freshwater Screening Levels[a]	HC-MW-7S 2/24/2015	
Semivolatiles in µg/L				**Semivolatiles in µg/L**			
1,2,4-Trichlorobenzene		1	U	Benzo(a)pyrene		1	U
1,2-Dichlorobenzene		1	U	Benzo(g,h,i)perylene		1	U
1,3-Dichlorobenzene		1	U	Benzoic Acid		20	U
1,4-Dichlorobenzene	21	**1.4**		Benzyl Alcohol		2	U
1-Methylnaphthalene	151[b]	**1.6**		bis(2-Chloroethoxy) Methane		1	U
2,2'-Oxybis(1-Chloropropane)		1	U	Bis-(2-Chloroethyl) Ether		1	U
2,4,5-Trichlorophenol		5	U	bis(2-Ethylhexyl)phthalate		3	U
2,4,6-Trichlorophenol		3	U	Butylbenzylphthalate		1	U
2,4-Dichlorophenol		3	U	Carbazole		1	U
2,4-Dimethylphenol		3	U	Chrysene		1	U
2,4-Dinitrophenol		20	U	Dibenz(a,h)anthracene		1	U
2,4-Dinitrotoluene		3	U	Dibenzofuran		1	U
2,6-Dinitrotoluene		3	U	Diethylphthalate		1	U
2-Chloronaphthalene		1	U	Dimethylphthalate		1	U
2-Chlorophenol		1	U	Di-n-Butylphthalate		1	U
2-Methylnaphthalene		1	U	Di-n-Octyl phthalate		1	U
2-Methylphenol		1	U	Fluoranthene		1	U
2-Nitroaniline		3	U	Fluorene		1	U
2-Nitrophenol		3	U	Hexachlorobenzene		1	U
3,3'-Dichlorobenzidine		5	U	Hexachlorobutadiene		3	U
3-Nitroaniline		3	U	Hexachlorocyclopentadiene		5	UJ
4,6-Dinitro-2-Methylphenol		10	U	Hexachloroethane		2	U
4-Bromophenyl-phenylether		1	U	Indeno(1,2,3-cd)pyrene		1	U
4-Chloro-3-methylphenol		3	U	Isophorone		1	U
4-Chloroaniline		5	U	Naphthalene		1	U
4-Chlorophenyl-phenylether		1	U	Nitrobenzene		1	U
4-Methylphenol		**10**		N-Nitroso-Di-N-Propylamine		1	U
4-Nitroaniline		3	U	N-Nitrosodiphenylamine		1	U
4-Nitrophenol		10	U	Pentachlorophenol		10	U
Acenaphthene		1	U	Phenanthrene		1	U
Acenaphthylene		1	U	Phenol		1	U
Anthracene		1	U	Pyrene		1	U
Benzo(a)anthracene		1	U	Total Benzofluoranthenes		2	U

Notes:

a. Clean Water Act S304 Freshwater Screening Level for Consumption of Organisms groundwater migration to surface water.

b. MTCA Method B, Carcinogen, Surface Water Screening Level, standard formula value.

Bolded = Detected value

Shaded = Value exceeds the MTCA Method B Freshwater screening level.

Laboratory reported results were updated to non-detect (U) for DRO/RRO

C = The chromatogram indicates the presence of PCBs, not DRO or RRO.

T = Value is between the MDL and MRL.

U - Not detected at indicated detection limit.

Table 4a – Sediment Sample Analytical Results

Sample ID	SCO	CSL	JT-SS-01-S1		JT-SS-01-S2		JT-SS-02-S1		JT-SS-03-S1		JT-SS-03-S2		JT-SS-04-S1		JT-SS-05-S1		JT-SS-05-S2		JT-SS-06		JT-SS-07		JT-SS-08		JT-SS-09		JT-SS-10	
Sampling Date	Screening	Screening	1/14/2014		1/14/2014		1/14/2014		1/14/2014		1/14/2014		1/14/2014		1/14/2014		1/14/2014		01/12/2015		01/12/2015		01/12/2015		01/12/2015		01/12/2015	
Depth in feet	Levels	Levels	0 to 1		1 to 2		0 to 1		0 to 1		1 to 1.5		0 to 1		0 to 1		1 to 2		0 to 0.33		0 to 0.33		0 to 0.33		0 to 0.33		0 to 0.33	
Conventionals in %																												
Total Organic Carbon			**3.16**		**0.293**		**0.422**		**0.776**		**0.178**		**1.13**		**3.48**		**1.62**		**3.1**		**2.17**		**1.38**		**6.23**		**1.96**	
Preserved Total Solids																			**43.14**		**58.24**		**58.65**		**22.31**		**48.79**	
Total Solids			**58.42**		**82.81**		**85.72**		**78.76**		**84.85**		**82.92**		**71.48**		**77.35**		**44.02**		**57.23**		**59.3**		**22.22**		**48.88**	
Conventionals in mg/kg																												
Sulfide																			**516**		**227**		**352**		**2500**		**547**	
Ammonia (NH3) as Nitrogen (N)																			**25.4**		**14.8**		**19.5**		**109**		**34.4**	
Metals in mg/kg																												
Arsenic	14	120	**11.7**		**4.7**		**7.1**		**17.2**		**12.5**		**71.8**		**23.5**		**13**		**23.3**		**17.3**		**20.8**		**25.8**		**62.7**	
Cadmium	2.1	5.4	**0.9**		0.1	U	**0.3**		**0.3**		0.1	U	**0.7**		**0.8**		**0.6**		**1**		**0.7**		**0.7**		**2**		**1.4**	
Chromium	72	88	**37.8**		**19.4**		**23.8**		**23.2**		**20.8**		**30.8**		**32.2**		**29.6**		**40**		**38.7**		**76.9**		**72**		**55.2**	
Lead	360	1300	**108**		**2.3**		**17.8**		**24.3**		**4.7**		**68.2**		**126**		**115**		**188**		**203**		**132**		**296**		**169**	
Mercury	0.66	0.8	**0.24**	J	0.03	U	**0.06**		**0.12**		0.02	U	**0.08**		**0.21**		**0.34**		**0.5**		**0.58**		**0.26**		**1**		**0.67**	
PCBs in mg/kg																												
Aroclor 1016			0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.0039	U	0.004	U	0.0039	U	0.0039	U	0.0083	U	0.004	U	0.0039	U	0.004	U	0.0039	U
Aroclor 1221			0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.0039	U	0.004	U	0.0039	U	0.0039	U	0.0083	U	0.004	U	0.0039	U	0.004	U	0.0039	U
Aroclor 1232			0.0038	U	0.0094	U	0.0039	U	0.0038	U	0.0039	U	0.004	U	0.0039	U	0.0039	U	0.0083	U	0.004	U	0.0039	U	0.004	U	0.0039	U
Aroclor 1242			0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.0039	U	0.004	U	0.0039	U	0.0039	U	0.0083	U	0.004	U	0.0039	U	0.004	U	0.0039	U
Aroclor 1248			**0.064**		0.0038	U	**0.037**		0.047	U	0.0077	U	**0.013**		**0.082**		**0.15**		**0.14**		**0.66**		**0.091**		**0.089**		**0.18**	
Aroclor 1254			**0.15**		**0.0072**		**0.072**		**0.29**		**0.046**		**0.029**	JP	**0.14**		**0.16**		**0.28**		**0.73**		**0.17**		**0.3**		**0.48**	
Aroclor 1260			**0.069**		0.0081	U	**0.024**		**0.056**		0.012	U	**0.016**		**0.07**		**0.095**		**0.38**		**0.25**		**0.14**		**0.29**		**0.2**	
Aroclor 1262			0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.0039	U	0.004	U	0.0039	U	0.0039	U	0.0083	U	0.004	U	0.0039	U	0.004	U	0.0039	U
Aroclor 1268			0.0038	U	0.0038	U	0.0039	U	0.0038	U	0.0039	U	0.004	U	0.0039	U	0.0039	U	0.0083	U	0.004	U	0.0039	U	0.004	U	0.0039	U
Total PCBs	0.11	2.5	**0.283**		**0.0072**		**0.133**		**0.346**		**0.046**		**0.058**	J	**0.292**		**0.405**		**0.8**		**1.64**		**0.401**		**0.679**		**0.86**	
Selected Detected Volatiles in µg/kg																												
1,2,4-Trimethylbenzene			1.6	U	1.1	U	1.4	U	1.3	U	1.1	U	1.2	U	**1.4**	T	1.4	U	**9.4**		**1.5**	T	**1.1**	T	7.5	U	2	U
1,3,5-Trimethylbenzene			1.6	U	1.1	U	1.4	U	1.3	U	1.1	U	1.2	U	2.2	U	1.4	U	**4.2**		1.9	U	2	U	7.5	U	2	U
1,3-Dichlorobenzene			1.6	U	1.1	U	1.4	U	**2**		1.1	U	**1.6**		**1.6**	T	1.4	U	2.4	U	1.9	U	**2**		7.5	U	2	U
1,4-Dichlorobenzene			1.6	U	1.1	U	1.4	U	**1.4**		1.1	U	**0.9**	T	2.2	U	1.4	U	2.4	U	1.9	U	**1.2**	T	7.5	U	2	U
2-Butanone			7.9	U	**3.3**	T	6.8	U	6.3	U	5.6	U	5.9	U	16		**4**	T	**11**	T	9.4	U	**12**		**320**		**18**	
4-Isopropyltoluene			1.6	U	1.1	U	1.4	U	1.3	U	1.1	U	1.2	U	2.2	U	**0.8**	T	**1.3**	T	1.9	U	2	U	7.5	U	2	U
Acetone			**35**		**27**		**28**		**32**		**20**		**20**		**110**		**28**		12	U	9.4	U	**84**		**1800**		**120**	
Benzene			1.6	U	**0.7**	T	0.9	T	**1.2**	T	**1.1**	T	1.2	U	**2.2**	T	1.4	U	2.4	U	**14**		2	U	7.5	U	2	U
Carbon Disulfide			**4.5**		**9.9**		**3.6**		**2.3**		**3.1**		**7**		**4.2**		**2.3**		**7.2**		**45**		**5.2**		**110**		**12**	
Chlorobenzene			1.6	U	1.1	U	1.4	U	**1.2**	T	1.1	U	**0.7**	T	**1.5**	T	1.4	U	2.4	U	1.9	U	**3.1**		7.5	U	2	U
cis-1,2-Dichloroethene			1.6	U	**0.6**	T	1.4	U	1.3	U	**0.7**	T	1.2	U	2.2	U	1.4	U	2.4	U	1.9	U	2	U	7.5	U	2	U
Ethylbenzene			1.6	U	1.1	U	1.4	U	1.3	U	1.1	U	1.2	U	2.2	U	1.4	U	2.4	U	**5.2**		2	U	7.5	U	2	U
Methyl ethyl ketone			7.9	U	**3.3**	T	6.8	U	6.3	U	5.6	U	5.9	U	**16**		**4**	T										
p-Isopropyltoluene			1.6	U	1.1	U	1.4	U	1.3	U	1.1	U	1.2	U	2.2	U	**0.8**	T										
n-Butylbenzene			1.6	U	1.1	U	1.4	U	1.3	U	1.1	U	1.2	U	2.2	U	1.4	U	2.4	U	**1.1**	T	2	U	7.5	U	2	U
n-Propylbenzene			1.6	U	1.1	U	1.4	U	1.3	U	1.1	U	1.2	U	2.2	U	1.4	U	2.4	U	**2.4**		2	U	7.5	U	2	U
m, p-Xylene			1.6	U	1.1	U	1.4	U	1.3	U	1.1	U	1.2	U	2.2	U	1.4	U	**1.3**	T	**4.3**		2	U	7.5	U	2	U
O-Xylene			1.6	U	1.1	U	1.4	U	1.3	U	1.1	U	1.2	U	2.2	U	1.4	U	2.4	U	**2.3**		2	U	7.5	U	2	U
Toluene			**1**	T	**0.7**	T	1.4	U	**0.7**	T	1.1	U	1.2	U	**2.8**		**0.8**	T	**1.3**	T	**16**		**1.1**	T	**5.8**	T	**1.1**	T

Notes:
U = Not detected at the reporting limit indicated.
J = Estimated value.
T = Value is between the MDL and MRL.
P = Confirmation criteria exceeded. Relative percent difference is greater than 40 percent between the two analytical results.
Shaded = value exceeds Ecology sediment management standards (SMS) sediment cleanup objective (SCO) screening level.
CSL = cleanup screening level.
Bolded = Detected value
Shaded = Value exceeds the CSL

Table 4b – Sediment Sample Analytical Results - Other

Study Name	SCO	CSL	Marco Shipyard Sediment Monitoring, 1990						Chemicals in Salmon Bay Sediments - Phase II																					
Location ID	Screening	Screening	MARCO90W-1		MARCO90W-2		MARCO90W-3		SBAY1A		SBAY1B		SBAY1C		SBAY2A		SBAY2B		SBAY2C		SBAY3A		SBAY3B		SBAY3C		SBAY4A		SBAY4B		SBAY4C		SBAY4D	
Sample ID	Levels	Levels	W-1		W-2		W-3		95268230		95268231		95268232		95268233		95268234		95268235		95268236		95268237		95268238		95268239		95268240		95268241		95268242	
Sampling Date			4/3/1990		4/3/1990		4/3/1990		6/26/1995		6/26/1995		6/26/1995		6/26/1995		6/26/1995		6/26/1995		6/26/1995		6/26/1995		6/26/1995		6/26/1995		6/27/1995		6/27/1995		6/27/1995	
Sample Depth			0 to 0.05 m		0 to 0.05 m		0 to 0.05 m		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Metals in mg/kg																																		
Antimony			0.5	U	0.5	U	0.5	U																										
Arsenic	14	120	**10.8**		**27**		**40.9**		**38.5**		**210**		**27.9**		**20**		**5**		**34.1**		**9.51**		**44.4**		**31.9**		**17.7**		**30.7**		**5.65**		**10.2**	
Beryllium			0.5	U	0.5	U	0.5	U																										
Cadmium	2.1	5.4	**0.8**		**1**		**1.2**		**1.3**	J	**3.22**		**1.2**	J	**0.4**	J	**0.59**	J	**0.62**	J	0.3	U	**1.2**	J	**0.69**	J	**0.42**	J	**0.88**	J	0.3	U	0.3	U
Chromium	72	88	**21.2**		**21**		**25.9**		**61**		**99.2**		**101**		**51.2**		**18.3**		**53.4**		**34.9**		**87.9**		**68.3**		**75.1**		**114**		**36.4**		**36.8**	
Copper			**63.5**		**159**		**287**		**317**		**2000**		**629**		**358**		**88.3**		**268**		**92.2**		**318**		**539**		**354**		**565**		**85.2**		**207**	
Lead	360	1300	**58**		**99.3**		**70.3**		**441**		**534**		**208**		**107**		**151**		**131**		**66.4**		**314**		**193**		**137**		**219**		**28.7**		**100**	
Mercury	0.66	0.8	**1.88**		**0.74**		**0.71**		**2.2**	E	**5**	E	**1.1**	E	**0.63**	E	**0.11**	E	**0.61**	E	**0.26**	E	**1.8**	E	**1**	J	**1.5**	E	**1.1**	E	**0.18**	J	**0.65**	E
Mercury-AVS																																		
Nickel			**11.9**		**11.7**		**15.9**		**44.6**		**60.2**		**80**		**43.8**		**26.2**		**45.8**		**32.7**		**65.8**		**52.1**		**62.5**		**93.7**		**44.2**		**38.3**	
Zinc			**146**		**170**		**502**		**530**		**2020**		**492**		**311**		**225**		**646**		**147**		**619**		**462**		**319**		**459**		**136**		**206**	
PCBs in mg/kg																																		
Aroclor 1016									0.093	U	0.12	U	0.12	U	0.091	U	0.05	U	0.1	U	0.054	U	0.12	U	0.11	U	0.11	U	0.115	U	0.055	U	0.088	U
Aroclor 1221									0.093	U	0.12	U	0.12	U	0.091	U	0.05	U	0.1	U	0.054	U	0.12	U	0.11	U	0.11	U	0.115	U	0.055	U	0.088	U
Aroclor 1232									0.093	U	0.12	U	0.12	U	0.091	U	0.05	U	0.1	U	0.054	U	0.12	U	0.11	U	0.11	U	0.115	U	0.055	U	0.088	U
Aroclor 1242									0.093	U	0.16		0.12	U	0.091	U	0.05	U	0.1	U	0.054	U	0.12	U	0.11	U	0.11	U	0.115	U	0.055	U	0.088	U
Aroclor 1248									0.093	U	0.12	U	0.12	U	0.091	U	0.05	U	0.1	U	0.054	U	0.12	U	0.11	U	0.11	U	0.115	U	0.055	U	0.088	U
Aroclor 1254									**0.25**		**0.8**		**0.41**	J	**0.20**		**0.052**		**0.14**		0.054	U	**0.11**	J	**0.24**		**0.21**		**0.28**		**0.052**	J	**0.13**	
Aroclor 1260									**0.15**		**0.5**		**0.45**		**0.19**	J	0.05	U	0.1	U	0.054	U	0.12	U	**0.18**		**0.15**		**0.22**	J	0.055	U	**0.10**	
Total PCBs	0.11	2.5							**0.40**		**1.46**		**0.86**	J	**0.39**	J	**0.052**		**0.14**		0.054	U	**0.11**	J	**0.42**		**0.36**		**0.50**	J	**0.052**	J	**0.23**	

Notes:
Shaded =Ecology sediment management standards (SMS) sediment cleanup objective (SCO) screening level exceedance.
Bolded = Detected value
Outlined = Value exceeds the CSL

B = Analyte detected in sample and method blank and the reported result is sample concentration without blank correction or associated quantitation limit
CSL = cleanup screening level.
E = Reported result is an estimate because it exceeds calibration range.
J = Estimated value.
JL = Analyte was positively identified and the value may be less than the reported estimate.
JT = Analyte was positively identified and the reported result is an estimate below the associated quantitation limit but above the MDL
NA = Not available.
NJ = There is evidence that the analyte is present in the sample AND the reported result for the tentatively identified analyte is an estimate .
P = Confirmation criteria exceeded. Relative percent difference is greater than 40 percent between the two analytical results
T = Value is between the MDL and MRL.
U = Not detected at the reporting limit indicated.

Table 4b – Sediment Sample Analytical Results - Other

Study Name	Chemicals in Salmon Bay Sediments - Phase II																
Location ID	SBAY4E	SBAY4F	SBAY5A	SBAY5B	SBAY5C	SBAY6A	SBAY6B	SBAY6C	SBAY6D	SBAY7A	SBAY7B	SBAY7C	SBAY7D	SBAY8A	SBAY8B	SBAY8C	SALMII961A
Sample ID	95268243	95268244	95268245	95268246	95268247	95268248	95268249	95268250	95268251	95268252	95268253	95268254	95268255	95268256	95268257	95268258	8230
Sampling Date	6/27/1995	6/27/1995	6/27/1995	6/26/1995	6/26/1995	6/27/1995	6/27/1995	6/27/1995	6/27/1995	6/26/1995	6/26/1995	6/27/1995	6/27/1995	6/26/1995	6/26/1995	6/26/1995	6/26/1996
Sample Depth	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0 to 0.1 m
Metals in mg/kg																	
Antimony																	
Arsenic	**24.4**	**82.8**	**39.3**	**1.6**	**19.2**	**13.3**	**41.2**	**10.2**	**24.2**	**82.5**	**18.2**	**6.21**	**6.83**	**19.1**	**9.79**	**34.5**	**42**
Beryllium																	
Cadmium	**1.3** J	**1.7** J	**0.81** J	0.3 U	**0.64** J	**1.6** J	**1.8** J	**0.49** J	**0.56** J	**1.2** J	**0.33** J	**0.45** J	0.3 U	**1** J	**0.48** J	**2.2** J	**1.5** JT
Chromium	**78.8**	**65.2**	**62.3** J	**13.6** J	**70.3** J	**60.3** J	**376** J	**39.8** J	**49.9** J	**63.4** J	**52.2** J	**23.8** J	**25** J	**48.1** J	**29.9** J	**80.8** J	**61** NJ
Copper	**436**	**1230**	**340**	**7.73**	**310**	**246**	**2210**	**128**	**244**	**709**	**107**	**52.7**	**335**	**197**	**87.8**	**702**	**324**
Lead	**250**	**444**	**175** J	**3.5** J	**147** J	**190** J	**74.5** J	**65.3** J	**101** J	**254** J	**36.7** J	**169** J	**41.1** J	**186** J	**146** J	**298** J	**413** NJ
Mercury	**1.6** E	**4** E	**0.86** E	**0.01** E	**0.77** E	**0.78** E	**0.18** E	**0.42** E	**0.71** E	**0.77** E	**0.052** E	**0.071** E	**0.097** E	**0.91** E	**0.35** E	**1.5** E	**2.2** J
Mercury-AVS																	
Nickel	**68.3**	**49.4**	**48.4**	**21.8**	**71.5**	**55.8**	**484**	**42.1**	**56.2**	**45.6**	**61.7**	**29.6**	**29.3**	**40.9**	**33**	**64.8**	**46**
Zinc	**562**	**921**	**388**	**27.3**	**302**	**403**	**207**	**183**	**283**	**1140**	**210**	**99.5**	**185**	**350**	**205**	**778**	**516**
PCBs in mg/kg																	
Aroclor 1016	0.16 U	0.096 U	0.085 U	0.048 U	0.12 U	0.14 U	0.063 U	0.06 U	0.15 U	0.09 U	0.059 U	0.053 U	0.053 U	0.084 U	0.055 U	0.12 U	0.093 U
Aroclor 1221	0.16 U	0.096 U	0.085 U	0.048 U	0.12 U	0.14 U	0.063 U	0.06 U	0.15 U	0.09 U	0.059 U	0.053 U	0.053 U	0.084 U	0.055 U	0.12 U	0.093 U
Aroclor 1232	0.16 U	0.096 U	0.085 U	0.048 U	0.12 U	0.14 U	0.063 U	0.06 U	0.15 U	0.09 U	0.059 U	0.053 U	0.053 U	0.084 U	0.055 U	0.12 U	0.093 U
Aroclor 1242	0.16 U	0.096 U	0.085 U	0.048 U	0.12 U	0.14 U	0.063 U	0.06 U	0.15 U	0.09 U	0.059 U	0.053 U	0.053 U	0.084 U	0.055 U	0.12 U	0.093 U
Aroclor 1248	0.16 U	0.096 U	0.085 U	0.048 U	0.12 U	0.14 U	0.063 U	0.06 U	0.15 U	0.09 U	0.059 U	0.053 U	0.053 U	0.084 U	0.055 U	0.12 U	0.093 U
Aroclor 1254	**0.49**	**0.63**	**0.21**	0.048 U	**0.35**	**0.26** J	**0.11**	**0.12**	**0.2**	9 U	**0.19**	0.053 U	**0.036** J	**0.18**	**0.062**	**0.48**	**0.25**
Aroclor 1260	**0.38**	**0.92**	**0.15**	0.048 U	0.12 U	0.14 U	0.063 U	0.06 U	0.15 U	**7.6**	0.059 U	0.053 U	0.053 U	**0.13**	0.055 U	**0.42**	**0.15**
Total PCBs	**0.87**	**1.55**	**0.36**	0.048 U	**0.35**	**0.26** J	**0.11**	**0.12**	**0.2**	**7.6**	**0.19**	0.053 U	**0.036** J	**0.31**	**0.062**	**0.9**	**0.4**

Notes:
Shaded =Ecology sediment management standards (SMS) sediment cleanup objective (SCO) screening level exceedance.
Bolded = Detected value
Outlined = Value exceeds the CSL

B = Analyte detected in sample and method blank and the reported result is sample concentration without blank correction or associated quantitation limit
CSL = cleanup screening level.
E = Reported result is an estimate because it exceeds calibration range.
J = Estimated value.
JL = Analyte was positively identified and the value may be less than the reported estimate.
JT = Analyte was positively identified and the reported result is an estimate below the associated quantitation limit but above the MDL

NJ = There is evidence that the analyte is present in the sample AND the reported result for the tentatively identified analyte is an estimate .
P = Confirmation criteria exceeded. Relative percent difference is greater than 40 percent between the two analytical results
T = Value is between the MDL and MRL.
U = Not detected at the reporting limit indicated.

Table 4b – Sediment Sample Analytical Results - Other

Study Name	Salmon Bay Phase II																							
Location ID	SALMII961B	SALMII961C	SALMII962A	SALMII962B	SALMII962C	SALMII963A	SALMII963B	SALMII963C	SALMII964A	SALMII964B	SALMII964C	SALMII964D	SALMII964E	SALMII964F	SALMII965A	SALMII965B	SALMII965C	SALMII966A	SALMII966B	SALMII966C	SALMII966D
Sample ID	8231	8232	8233	8234	8235	8236	8237	8238	8239	8240	8241	8242	8243	8244	8245	8246	8247	8248	8249	8250	8251
Sampling Date	6/26/1996	6/26/1996	6/26/1996	6/26/1996	6/26/1996	6/26/1996	6/26/1996	6/26/1996	6/26/1996	6/27/1996	6/27/1996	6/27/1996	6/27/1996	6/27/1996	6/26/1996	6/26/1996	6/26/1996	6/27/1996	6/27/1996	6/27/1996	6/27/1996
Sample Depth	0 to 0.1 m	0 to 0.1 m	0 to 0.1 m	0 to 0.1 m	0 to 0.1 m	0 to 0.1 m	0 to 0.1 m	0 to 0.1 m	0 to 0.1 m	0 to 0.1 m	0 to 0.1 m	0 to 0.1 m	0 to 0.1 m	0 to 0.1 m	0 to 0.1 m	0 to 0.1 m	0 to 0.1 m	0 to 0.1 m	0 to 0.1 m	0 to 0.1 m	0 to 0.1 m
Metals in mg/kg																					
Antimony																					
Arsenic	**210**	**28**	**20**	**5**	**34**	**9.5**	**44**	**32**	**18**	**31**	**5.7**	**10**	**24**	**83**	**39**	**1.6**	**19**	**13**	**41**	**10**	**24**
Beryllium																					
Cadmium	**3.2**	**1.2** JT	**0.4** JT	**0.59** JT	**0.62** JT	0.3 U	**1.2** JT	**0.69** JT	**0.42** JT	**0.88** JT	0.3 U	0.3 U	**1.3** JT	**1.7** JT	**0.81** JT	0.3 U	**0.64** JT	**1.6** JT	**1.8** JT	**0.49** JT	**0.56** JT
Chromium	**99**	**101**	**51**	**18**	**53**	**35**	**88**	**68**	**75**	**114**	**36**	**37**	**79**	**65**	**62** NJ	**14** NJ	**70** NJ	**60** NJ	**376** NJ	**40** NJ	**50** NJ
Copper	**2000**	**629**	**358**	**88**	**268**	**92**	**318**	**539**	**354**	**565**	**85**	**207**	**436**	**1230**	**340**	**7.7**	**310**	**246**	**2210**	**128**	**244**
Lead	**534**	**208**	**107**	**151**	**131**	**66**	**314**	**193**	**137**	**219**	**29**	**100**	**250**	**444**	**175** NJ	**3.5** J	**147** NJ	**190** NJ	**75** NJ	**65** NJ	**101** NJ
Mercury	**5** J	**1.1** J	**0.63** J	**0.11** J	**0.61** J	**0.26** J	**1.8** J	**1** J	**1.5** J	**1.1** J	**0.18** J	**0.65** J	**1.6** J	**4** J	**0.86** J	**0.01** J	**0.77** J	**0.78** J	**0.18** J	**0.42** J	**0.71** J
Mercury-AVS																					
Nickel	**60**	**80**	**44**	**26**	**46**	**33**	**66**	**52**	**63**	**94**	**44**	**38**	**68**	**49**	**48**	**22**	**72**	**56**	**484**	**42**	**56**
Zinc	**2020**	**492**	**311**	**225**	**646**	**147**	**619**	**462**	**319**	**459**	**136**	**206**	**562**	**921**	**388**	**27**	**302**	**403**	**207**	**183**	**283**
PCBs in mg/kg																					
Aroclor 1016	0.12 U	0.12 U	0.091 U	0.05 U	0.1 U	0.054 U	0.12 U	0.11 U	0.11 U	0.12 U	0.055 U	0.088 U	0.16 U	0.096 U	0.085 U	0.048 U	0.12 U	0.14 U	0.063 U	0.06 U	0.15 U
Aroclor 1221	0.12 U	0.12 U	0.091 U	0.05 U	0.1 U	0.054 U	0.12 U	0.11 U	0.11 U	0.12 U	0.055 U	0.088 U	0.16 U	0.096 U	0.085 U	0.048 U	0.12 U	0.14 U	0.063 U	0.06 U	0.15 U
Aroclor 1232	0.12 U	0.12 U	0.091 U	0.05 U	0.1 U	0.054 U	0.12 U	0.11 U	0.11 U	0.12 U	0.055 U	0.088 U	0.16 U	0.096 U	0.085 U	0.048 U	0.12 U	0.14 U	0.063 U	0.06 U	0.15 U
Aroclor 1242	**0.16**	0.12 U	0.091 U	0.05 U	0.1 U	0.054 U	0.12 U	0.11 U	0.11 U	0.12 U	0.055 U	0.088 U	0.16 U	0.096 U	0.085 U	0.048 U	0.12 U	0.14 U	0.063 U	0.06 U	0.15 U
Aroclor 1248	0.12 U	0.12 U	0.091 U	0.05 U	0.1 U	0.054 U	0.12 U	0.11 U	0.11 U	0.12 U	0.055 U	0.088 U	0.16 U	0.096 U	0.085 U	0.048 U	0.12 U	0.14 U	0.063 U	0.06 U	0.15 U
Aroclor 1254	**0.8**	**0.41** J	**0.20**	**0.052**	**0.14**	0.054 U	**0.11** J	**0.24**	**0.21**	**0.28**	**0.052** J	**0.13**	**0.49**	**0.63**	**0.21**	0.048 U	**0.35**	**0.26** J	**0.11**	**0.12**	**0.2**
Aroclor 1260	**0.5**	**0.45**	**0.19** J	0.05 U	0.1 U	0.054 U	0.12 U	**0.18**	**0.15**	**0.22** J	0.055 U	**0.10**	**0.38**	**0.92**	**0.15**	0.048 U	0.12 U	0.14 U	0.063 U	0.06 U	0.15 U
Total PCBs	**1.46**	**0.86** J	**0.39** J	**0.052**	**0.14**	0.054 U	**0.11** J	**0.42**	**0.36**	**0.5** J	**0.052** J	**0.23**	**0.87**	**1.55**	**0.36**	0.048 U	**0.35**	**0.26** J	**0.11**	**0.12**	**0.2**

Notes:
Shaded =Ecology sediment management standards (SMS) sediment cleanup objective (SCO) screening level exceedance.
Bolded = Detected value
Outlined = Value exceeds the CSL

B = Analyte detected in sample and method blank and the reported result is sample concentration without blank correction or associated quantitation limit
CSL = cleanup screening level.
E = Reported result is an estimate because it exceeds calibration range.
J = Estimated value.
JL = Analyte was positively identified and the value may be less than the reported estimate.
JT = Analyte was positively identified and the reported result is an estimate below the associated quantitation limit but above the MDL

NJ = There is evidence that the analyte is present in the sample AND the reported result for the tentatively identified analyte is an estimate .
P = Confirmation criteria exceeded. Relative percent difference is greater than 40 percent between the two analytical results
T = Value is between the MDL and MRL.
U = Not detected at the reporting limit indicated.

Table 4b – Sediment Sample Analytical Results - Other

Study Name	Salmon Bay Phase II								Salmon Bay Phase III		Lake Union Sediment Quality Study		
Location ID	SALMII967A	SALMII967B	SALMII967C	SALMII967D	SALMII968A	SALMII968B	SALMII968C	SALIII975A2	SBAY10A2	SBAY1B3	FWLKUN-21689-10	FWLKUN-21689-8	FWLKUN-21689-9
Sample ID	8252	8253	8254	8255	8256	8257	8258	97218294	97218310	97218281	21689-10	21689-8	21689-9
Sampling Date	6/27/1996	6/27/1996	6/27/1996	6/27/1996	6/26/1996	6/26/1996	6/26/1996	5/21/1997	5/19/1997	5/21/1997	7/30/2001	7/30/2001	7/30/2001
Sample Depth	0 to 0.1 m	0 to 0.1 m	0 to 0.1 m	0 to 0.1 m	0 to 0.1 m	0 to 0.1 m	0 to 0.1 m	0 to 0.24 m	NA	NA	0 to 10 cm	0 to 10 cm	0 to 10 cm
Metals in mg/kg													
Antimony									4 U	**79.8**	**0.37** JTG	0.573 UJG	0.615 UJG
Arsenic	**83**	**18**	**6.2**	**6.8**	**19**	**9.8**	**34**	**31**	3 U	**209**	**6.4**	**3.76**	**3.71**
Beryllium									**0.28**	**0.39**	**0.099** T	**0.2**	**0.149**
Cadmium	**1.2** JT	**0.33** JT	**0.45** JT	0.3 U	**1** JT	**0.48** JT	**2** JT	**1.6**	**0.45**	**3.67**	**0.248**	**0.085** T	**0.2**
Chromium	**63** NJ	**52** NJ	**24** NJ	**25** NJ	**48** NJ	**30** NJ	**81** NJ	**80**	**42.8**	**102**	**14**	**27.8**	**26.1**
Copper	**709**	**107**	**53**	**335**	**197**	**88**	**682**	**570**	**27.9**	**2010**	**163** JL	**17.8** B	**43.8** JL
Lead	**254** NJ	**37** NJ	**169** NJ	**41** NJ	**186** NJ	**146** NJ	**298** NJ	**250**	**58.7**	**525**	**13.4**	**7.58**	**18.7**
Mercury	**0.77** J	**0.052** J	**0.071** J	**0.097** J	**0.91** J	**0.35** J	**1.5** J	**2**			**0.091** T	**0.038** T	**0.13** T
Mercury-AVS											**0.014** B	**0.014** B	0.0337 U
Nickel	**46**	**62**	**30**	**29**	**41**	**33**	**64**	**62**	**39**	**62.4**	**14.1** J	**31.8** J	**26.9** J
Zinc	**1140**	**210**	**100**	**185**	**350**	**205**	**777**	**550**	**89.6**	**2010**	**68.7**	**49.2**	**65.9**
PCBs in mg/kg													
Aroclor 1016	0.09 U	0.059 U	0.053 U	0.053 U	0.084 U	0.055 U	0.12 U			0.14 UJ	0.0025 U	0.0025 U	0.0025 U
Aroclor 1221	0.09 U	0.059 U	0.053 U	0.053 U	0.084 U	0.055 U	0.12 U			0.14 UJ	0.005 U	0.005 U	0.005 U
Aroclor 1232	0.09 U	0.059 U	0.053 U	0.053 U	0.084 U	0.055 U	0.12 U			0.14 UJ	0.005 U	0.005 U	0.005 U
Aroclor 1242	0.09 U	0.059 U	0.053 U	0.053 U	0.084 U	0.055 U	0.12 U			0.14 UJ	0.0025 U	0.0025 U	0.0025 U
Aroclor 1248	0.09 U	0.059 U	0.053 U	0.053 U	0.084 U	0.055 U	0.12 U			0.14 UJ	0.0025 U	0.0025 U	0.0025 U
Aroclor 1254	9 U	**0.19**	0.053 U	**0.036** J	**0.18**	**0.062**	**0.49**			**0.96** J	**0.00993**	**0.00343**	**0.0129**
Aroclor 1260	**7.6**	0.059 U	0.053 U	0.053 U	**0.13**	0.055 U	**0.395**			**0.5** J	**0.00933**	**0.00747**	**0.0117**
Total PCBs	**7.6**	**0.19**	0.053 U	**0.036** J	**0.31**	**0.062**	**0.885**			**1.46** J	**0.01926**	**0.0109**	**0.0246**

Notes:
Shaded =Ecology sediment management standards (SMS) sediment cleanup objective (SCO) screening level exceedance.
Bolded = Detected value
Outlined = Value exceeds the CSL

B = Analyte detected in sample and method blank and the reported result is sample concentration without blank correction or associated quantitation limit
CSL = cleanup screening level.
E = Reported result is an estimate because it exceeds calibration range.
J = Estimated value.
JL = Analyte was positively identified and the value may be less than the reported estimate.
JT = Analyte was positively identified and the reported result is an estimate below the associated quantitation limit but above the MDL

NJ = There is evidence that the analyte is present in the sample AND the reported result for the tentatively identified analyte is an estimate .
P = Confirmation criteria exceeded. Relative percent difference is greater than 40 percent between the two analytical results
T = Value is between the MDL and MRL.
U = Not detected at the reporting limit indicated.

Table 5 – Sediment Toxicity Bioassay Test Results

Biological Test/Endpoint	JT-SS-06	JT-SS-08	JT-SS-10	Sediment Cleanup Objective	Cleanup Screening Level (CSL)
Hyalella azteca					
28-day mortality [a]	17.5[c]	15[c]	8.8	$M_T - M_C > 10\%$	$M_T - M_C > 25\%$
28-day growth [b]	–28	–15.6	*12.5*	$M_T - M_C > 25\%$	$M_T - M_C > 40\%$
Chironomus dilutus					
10-day mortality [a]	3.7	8.7	2.5	$M_T - M_C > 20\%$	$M_T - M_C > 30\%$
10-day growth [b]	*19.7*	*23.8*	*25.4*	$M_T - M_C > 20\%$	$M_T - M_C > 30\%$

Notes:

a) Result values represent absolute percentage difference between test group and control group means ($Mean_{Test} - Mean_{Control}$)

b) Result values represent absolute percentage difference between test group and control group means ($Mean_{Control} - Mean_{Test}$)

c) Exceeded SCO criteria, but results were not statistically significant, so SCO was not exceeded.

Italics indicate sample result was statistically significantly different from the control results.

Shaded values failed to meet the sediment cleanup objective (SCO), but met the cleanup screening level (CSL) criteria and were statistically significant ($p > 0.05$)

Table 7 – Potential Applicable or Relevant and Appropriate Requirements

Authority	Resource	Implementing Laws/Regulations	ARAR?	Applicability
Contaminant-Specific ARARs				
State	Soil	Washington State Model Toxics Control Act [RCW 70.105D; Chapter 173-340 WAC]	Yes	The MTCA soil cleanup levels are applicable.
State	Groundwater	Washington State Model Toxics Control Act [RCW 70.105D; Chapter 173-340 WAC]	Yes	The MTCA groundwater cleanup levels are applicable.
State	Sediment	Washington State Model Toxics Control Act [RCW 70.105D; Chapter 173-204 WAC]	Yes	The SMS are applicable.
Action-Specific ARARs				
Federal/ State	Surface water	Federal Water Pollution Control Act--National Pollution Discharge Elimination System [CWA; 33 USC § 1342, Section 402] and Implementing Regulations Washington State Construction Stormwater General Permit [RCW 90.48]	Yes	The NPDES program establishes requirements for point source discharges, including stormwater runoff. These requirements would be applicable for any point source discharge of stormwater during construction or following cleanup.
Federal	Surface water	Federal Water Pollution Control Act--Water Quality Certification [CWA; 33 USC § 1341, Section 401] and Implementing Regulations	No	Section 401 of the CWA provides that applicants for a permit to conduct any activity involving potential discharges into waters or wetlands shall obtain certification from the state that discharges will comply with applicable water quality standards. No discharges are expected to waters or wetlands of the state.
State	Surface water	Hydraulic Code [RCW 77.55; Chapter 220-110 WAC]	No	The Hydraulic Code requires that any construction activity that uses, diverts, obstructs, or changes the bed or flow of state waters must be done under the terms of a Hydraulics Project Approval permit issued by the WDFW. These activities are not expected for the proposed alternatives.
Federal/ State	Solid waste	Transportation of Hazardous Materials [49 CFR Parts 105 to 177] [Chapter 446-50 WAC]	Yes	Transportation of hazardous waste or materials is required to meet state and federal requirements. This requirement is potentially applicable to alternatives that involve the off-site transport of impacted soil.
Federal/ State	Solid waste	Resource Conservation and Recovery Act [42 USC § 6901 et seq.], Subtitle C – Hazardous Waste Management [40 CFR Parts 260 to 279] Dangerous Waste Regulations [Chapter 173-303 WAC]	Yes	Subtitle C of RCRA pertains to the management of hazardous waste. Off-site disposal of impacted soil meeting hazardous waste criteria may require disposal at a Subtitle C landfill. These requirements are applicable to the remediation alternatives that involve off-site disposal of impacted soil.

Table 7 – Potential Applicable or Relevant and Appropriate Requirements

Authority	Resource	Implementing Laws/Regulations	ARAR?	Applicability
Federal	Solid waste	Resource Conservation and Recovery Act [42 USC § 6901 et seq.], Subtitle D – Managing Municipal and Solid Waste [40 CFR Parts 257 and 258]	Yes	Subtitle D of RCRA establishes a framework for management of non-hazardous solid waste. These regulations establish guidelines and criteria from which states develop solid waste regulations. These requirements are applicable to the remediation alternatives that involve off-site disposal of impacted soil.
State	Solid waste	Washington State Solid Waste Handling Standards [RCW 70.95; Chapter 173-350 WAC]	Yes	Washington State Solid Waste Handling Standards apply to facilities and activities that manage solid waste. The regulations set minimum functional performance standards for proper handling and disposal of solid waste; describe responsibilities of various entities; and stipulate requirements for solid waste handling facility location, design, construction, operation, and closure. These requirements are applicable to remediation alternatives that involve off-site disposal of impacted soil.
Federal/ State	Solid waste	Land Disposal Restrictions [40 CFR Part 268] [Chapter 173-303-140 WAC]	Yes	Best management practices for dangerous wastes are required to meet state and federal requirements. These requirements are applicable to the remediation alternatives that involve off-site disposal of soil classified as dangerous waste.
Federal	Air	Clean Air Act [42 USC § 7401 et seq.; 40 CFR Part 50]	Yes	The federal Clean Air Act creates a national framework designed to protect ambient air quality by limiting air emissions.
State	Air	Washington Clean Air Act and Implementing Regulations [Chapter 173-400-040(8) WAC]	Yes	These regulations require the owner or operator of a source of fugitive dust to take reasonable precautions to prevent fugitive dust from becoming airborne and to maintain and operate the source to minimize emissions. These regulations are applicable to all alternatives during construction.
State	Groundwater	Minimum Standards for Construction and Maintenance of Water Wells [RCW 18.104; Chapter 173-160 WAC]	Yes	Washington State has developed minimum standards for constructing water and monitoring wells, and for decommissioning wells. These regulations are applicable to all alternatives prior to construction.
Federal	Endangered species, critical habitats	Endangered Species Act [16 USC §§ 1531 - 1544] and Implementing Regulations	No	The ESA protects species of fish, wildlife, and plants that are listed as threatened or endangered with extinction. It also protects designated critical habitat for listed species. The ESA outlines procedures for federal agencies to follow when taking actions that may jeopardize listed species, including consultation with resource agencies. No threatened or endangered species or habitat areas are expected to be impacted by the remediation alternatives.
State	Remedy construction	Washington Industrial Safety and Health Act [RCW 49.17; Chapter 296-24 WAC]	Yes	Site worker and visitor health and safety requirements established by the WISHA are to be met during implementation of the remedial action.
State/Local	Remedy construction	State Environmental Policy Act [43.21 RCW, Chapter 197-11 WAC]	Yes	A SEPA review is likely required for local permitting and pursuant to MTCA.
Local	Remedy construction	City of Seattle Ordinances	Yes	Appropriate substantive requirements are to be met for implementation of the remedial action (for example, Grading Code SMC 22.170).

Table 7 – Potential Applicable or Relevant and Appropriate Requirements

Authority	Resource	Implementing Laws/Regulations	ARAR?	Applicability
Location-Specific ARARs				
State	Public lands	Public Lands Management [RCW 79.02]	No	Activities on public lands are restricted, regulated, or proscribed. The remediation alternatives do not occur on public lands.
State	Aquatic lands	Aquatic Lands Management – Washington State [RCW 79.90; Chapter 332-30 WAC]	No	The Aquatic Lands Management law develops criteria for managing state-owned aquatic lands. Aquatic lands are to be managed to promote uses and protect resources as specified in the regulations. Remediation areas are not on aquatic lands.
Federal/ State	Historic areas	Archaeological and Historic Preservation Act [16 USC § 469, 470 et seq.; 36 CFR Parts 65 and 800] [RCW 24.34, 27.44, 27.48, and 27.53; Chapters 25-46 and 25-48 WAC]	No	Actions must be taken to preserve and recover significant artifacts, preserve historic and archaeological properties and resources, and minimize harm to national landmarks. There are no known historic or archaeological sites in the vicinity of the remediation areas.
State	Shorelines and surface water	Shoreline Management Act of 1971 [RCW 90.58] and Implementing Regulations	Yes	Actions are prohibited within 200 feet of shorelines of statewide significance unless permitted. Remediation alternatives occur within 200 feet of the Lake Washington Ship Canal.
State	Wetlands	Shoreline Management Act of 1971 [RCW 90.58] and Implementing Regulations	No	The construction or management of property in wetlands is required to minimize potential harm, avoid adverse effects, and preserve and enhance wetlands. The remediation alternatives do not occur within delineated wetlands.

Notes:
ARAR = applicable or relevant and appropriate requirements
CFR = Code of Federal Regulations
CWA = Clean Water Act
ESA = Endangered Species Act
MTCA = Model Toxics Control Act
NPDES = National Pollution Discharge Elimination System
RCRA = Resource Conservation and Recovery Act
RCW == Revised Code of Washington
SEPA = State Environmental Policy Act
SMC = Seattle Municipal Code
SMS = Sediment Management Standards
USC = United States Code
WAC = Washington Administrative Code
WDFW = Washington State Department of Fish and Wildlife
WISHA = Washington Industrial Safety and Health Act

Table 8 - Remediation Technology Screening

General Response Action	Remediation Technology	Description	Implementability	Reliability	Relative Cost	Screening Comments	Technology Retained?
Institutional Controls	Governmental and proprietary controls; enforcement and permit tools; information devices	Physical and administrative measures to control access or exposure to contaminated soil and groundwater. Placement of an environmental covenant on the property.	Technically implementable.	Reliable conventional administrative measures.	Low capital and O&M cost.	Does not accomplish remedial action objection as stand-alone alternative. Applicable in combination with other technologies.	Yes
Natural Recovery	Monitored Natural Attenuation (MNA)	Naturally occurring physical, chemical, and biological processes that reduce contaminant mobility or concentration.	Technically implementable, but timeframe may not be acceptable for source areas and/or hot spots.	May not be effective for treatment of source areas and/or hot spots because of high concentrations. Not effective for PCBs.	Negligible capital cost. Low O&M cost.	Very long remediation timeframe for organic compounds compared with other applicable technologies. Applicable in combination with other technologies. Not applicable for PCBs.	Yes
In Situ Treatment	Enhanced bioremediation	Enhanced biodegradation through addition of nutrients and electron acceptors to stimulate microbial growth and breakdown of contaminants.	Technically implementable. Permits required.	Established technology. Effective for some of the site contaminants at lower concentrations. Not effective for PCBs.	Moderate capital and O&M costs. Likely to require multiple applications.	Potential very low effectiveness in the source areas or for PCBs.	No
	Chemical oxidation	Injection of chemicals to degrade or destroy contaminants in place.	Technically implementable. Permits required.	Established technology. Effective for some of the site contaminants, but not for PCBs. Presence of organics in soil may increase the required chemical oxidant application rates.	Moderate capital and O&M costs. Likely to require multiple applications.	Potential very low effectiveness in the source areas and/or hot spots for all contaminants of concern. Retained for treatment of residual diesel impacts.	Yes
	Soil vapor extraction (SVE)	Removal of volatile contaminants through vacuum extraction in the vadose (unsaturated) zone of subsurface. Could be used in conjunction with other technologies including air sparging.	Difficult to implement. A pilot study and installation would be highly invasive due to permanent structures.	Moisture content, organic content, and air permeability (shallow vadose zone) conditions at the site would negatively affect SVE effectiveness. Not effective for most of the COCs.	High capital cost. Moderate to high O&M costs.	Soil conditions are not likely conducive to vapor extraction. Not likely effective to address PCBs and other non-volatile COCs.	No
	Air sparging	Removal of volatile contaminants through mass transfer to air that is injected into the ground. Oxygen introduced through the induced air flow may promote biodegradation of organic compounds.	Difficult to implement. A pilot study and installation would be highly invasive due to permanent structures. An SVE system or similar necessary for gas capture.	Not effective for PCBs.	High capital cost. Moderate to high O&M costs.	Not effective for PCBs. Requires off-gas capture and treatment, such as an SVE system.	No
	Thermal treatment	Application of heat by subsurface steam injection, electrical resistive heating, or other method to remove strippable contaminants. Volatilized compounds captured and treated at surface.	Difficult to implement. A pilot study and installation would be highly invasive due to permanent structures. The proximity of the site to surface water poses further complications. May require off-gas treatment.	Established technology, but limited effectiveness for PCBs. May also increase contaminant mobility.	High capital and O&M costs.	High cost. Limited effectiveness for PCBs.	No
	Soil flushing	A surfactant or solvent solution is applied to soil in place to remove leachable contaminants. The solution and leached contaminants are recovered from the underlying aquifer and treated.	Difficult to implement. Requires capture and treatment of injected solution and leached contaminants. Regulatory concerns over complete capture of leached contaminants, which may make permitting difficult. The proximity of the site to surface water poses further complications.	Not effective for recovery of site contaminants due to conditions at the site and nature of the contaminants. Soil flushing is a developing technology, and evidence supporting effectiveness is limited.	High capital and O&M costs.	Difficult to implement. High cost.	No
	Treatment wall	A water-permeable wall is installed as permanent, semi-permanent, or replaceable across the path of groundwater flow and contaminant plume.	Technically implementable.	Established technology that is currently being used at the site. Effective for the site contaminants. Will need to be replaced in the future.	Moderate capital cost. Low O&M cost.	Moderate cost. Technically implementable, proven by historical use at the site and adjacent site.	Yes
Soil Removal	Soil removal	Removal of impacted soil using common excavation techniques. Excavated soil treated on site or sent off site for disposal.	Technically implementable, but limited due to extent of contamination potentially throughout the site, including beneath several permanent structures, and depth of contamination in saturated zone.	Effective for all site soil contaminants.	Moderate capital costs. Negligible O&M cost.	Commonly used established technology effective for all site soil contaminants.	Yes
Off-Site Management	Land disposal	Disposal of impacted soil at an off-site, lined, permitted landfill.	Technically implementable. Impacted soil requires profiling and must meet land disposal requirements.	Effective for site soil contaminants.	Moderate to high capital cost. Negligible O&M cost.	Common disposal option for excavated soil.	Yes

Table 9 – Remediation Alternatives Evaluation

Selection Criteria	Alternative 1: Interim Action, Natural Attenuation with Institutional Controls, and Compliance Monitoring	Alternative 2: Interim Action, Hot Spot Excavation with Institutional Controls, and Compliance Monitoring	Alternative 3: Interim Action, Treatment Wall with Institutional Controls, and Compliance Monitoring	Alternative 4: Interim Action, Excavation of Soil Exceeding CULs with Institutional Controls, and Compliance Monitoring	Alternative 5: Interim Action, Hot Spot Excavation with Institutional Controls, and Compliance Monitoring, and Treatment Wall Construction Contingency
Threshold Requirements: WAC 173-340-360(2)(a)					
Protect Human Health and the Environment	Protective of human health. Ecological protectiveness unknown. Assuming IA is completed and property remains capped with impervious surfaces, human exposure is reduced. Additional data are needed to assess whether contamination located away from IA area is impacting adjacent surface water and sediment.	Protective of human health. Ecological protectiveness unknown. Assuming IA is completed and property remains capped with impervious surfaces, removal of contaminated hot spot material eliminates direct-contact risk to human receptors in, but residual contamination likely remains beneath impervious cap. Additional data are needed to assess whether contamination located away from IA area is impacting adjacent surface water and sediment.	Protective. Removal of contaminated material in interim action area and reduces contaminant mass migration to adjacent surface water and sediment, reducing potential risk to ecological receptors. Residual contamination at interim action area and hot spot contamination capped with impervious surfaces and human exposure reduced. Protective of ecological health in adjacent surface water while treatment wall in place.	Protective. Removal of all accessible contaminated material eliminates direct-contact risk to human receptors and greatly reduces risk of migration to ecological receptors in adjacent surface water. Any residual contamination below buildings would be capped by impervious surfaces. Inaccessible soil exceeding cleanup levels may remain in the AOC and leaching of contaminants may impact the adjacent surface water body.	Protective. Removal of contaminated material, reduces contaminant mass migration to adjacent surface water and sediment, and reduces potential risk to ecological receptors. Residual contamination capped by impervious surfaces and human exposure reduced. Protective of ecological health in adjacent surface water while treatment wall in place.
Comply with Cleanup Standards	Unknown. Impacts to hot spot soil, groundwater, and sediment would remain after interim action and natural attenuation is not expected within a reasonable time frame. It is not known whether groundwater contamination is impacting adjacent surface water or whether capping can contain contaminants.	Unknown. Impacts to soil (residual), groundwater, and sediment would likely remain even after interim action and hot spot removal, and natural attenuation is not expected within a reasonable time frame. It is not known whether groundwater contamination is impacting adjacent surface water or whether capping can contain groundwater contaminants.	Complies. Upland soil exceeding cleanup levels that remain after interim action would be contained by pavement cap. Treatment wall would treat groundwater contamination, eliminating migration to the Ship Canal. Cleanup actions that involve containment can be deemed to meet cleanup standards if requirements set out in WAC 173-340-740(6)(f) are met.	Likely complies. Following removal, no accessible contaminated soil exceeding cleanup levels would remain in the AOC. Material left in place above cleanup levels will be contained by capping although it may still be in contact with groundwater.	Complies. Residual upland soil exceeding cleanup levels would be contained by pavement cap. Treatment wall would treat groundwater contamination, eliminating migration to the Ship Canal. Cleanup actions that involve containment can be deemed to meet cleanup standards if requirements set out in WAC 173-340-740(6)(f) are met.
Comply with Applicable State and Federal Laws	Unknown. ARARs are judged to be attainable and do not affect the alternative selection process (see Table 7).	Complies. ARARs are judged to be attainable and do not affect the alternative selection process (see Table 7).	Complies. ARARs are judged to be attainable and do not affect the alternative selection process (see Table 7).	Complies. ARARs are judged to be attainable and do not affect the alternative selection process (see Table 7).	Complies. ARARs are judged to be attainable and do not affect the alternative selection process (see Table 7).
Provide for Compliance Monitoring	Provides for compliance monitoring in accordance with WAC 173-340-410 as described in Section 7.2.1.	Provides for compliance monitoring in accordance with WAC 173-340-410 as described in Section 7.2.2.	Provides for compliance monitoring in accordance with WAC 173-340-410 as described in Section 7.2.3.	Provides for compliance monitoring in accordance with WAC 173-340-410 as described in Section 7.2.4.	Provides for compliance monitoring in accordance with WAC 173-340-410 as described in Section 7.2.5.
Other Requirements: WAC 173-340-360(2)(b)					
Use Permanent Solutions to the Maximum Extent Practicable	Does not use permanent solutions to the extent provided by other alternatives (see Table 10).	Uses permanent solutions, but leaves residual contamination. Alternative 2 is less permanent than Alternatives 4 and 5 (see Table 10).	Provides more permanence than Alternative 1, but requires ongoing O&M. However, it does not use permanent solutions to the extent provided in Alternatives 2, 4, and 5 (see Table 10).	Uses permanent solutions, However, inaccessible soil exceeding cleanup levels may remain in the AOC and leaching of contaminants may impact the adjacent surface water body. Although this alternative provides the most permanent solution, it is not practicable (see Table 10).	Uses permanent solutions to the extent provided in Alternatives 2 and 3, but is less permanent than Alternative 4 (see Table 10).

Table 9 – Remediation Alternatives Evaluation

Selection Criteria	Alternative 1: Interim Action, Natural Attenuation with Institutional Controls, and Compliance Monitoring	Alternative 2: Interim Action, Hot Spot Excavation with Institutional Controls, and Compliance Monitoring	Alternative 3: Interim Action, Treatment Wall with Institutional Controls, and Compliance Monitoring	Alternative 4: Interim Action, Excavation of Soil Exceeding CULs with Institutional Controls, and Compliance Monitoring	Alternative 5: Interim Action, Hot Spot Excavation with Institutional Controls, and Compliance Monitoring, and Treatment Wall Construction Contingency
Provide for a Reasonable Restoration Time Frame	Provides a reasonable restoration time frame to mitigate direct-contact exposure risk to human receptors. However, contaminated soil and groundwater will remain in the AOC and could migrate to the adjacent surface water body. Natural attenuation processes are not expected to occur within a reasonable time frame.	Provides a reasonable restoration time frame to mitigate direct-contact exposure risk to human receptors. However, soil exceeding cleanup levels will likely remain in the AOC and leaching of contaminants may impact the adjacent surface water body. The work could be completed within one construction season.	Provides a reasonable restoration time frame to mitigate exposure risk to receptors. The work could be completed within one construction season.	Provides a reasonable restoration time frame to mitigate exposure risk to receptors. The work could be completed within one construction season.	Provides a reasonable restoration time frame to mitigate exposure risk to receptors. The work could be completed within one construction season.
Consider Public Concerns	This criterion will be addressed during the public comment period for the RI/FS and Draft Cleanup Action Plan.				
Action-Specific Requirements: WAC 173-340-360(2)(c) through (h)					
Groundwater Cleanup Actions, WAC 173-340-360(2)(c)	Does not currently comply. There is only one well near the point of compliance away from the IA area containing PCBs above CULs. Additional data are needed to assess COC concentrations at the point of compliance.	Unknown. Areas of contamination will still exist away from the interim action area and hot spots. Additional data are needed to assess COC concentrations at the point of compliance.	Complies. Groundwater COC concentrations will be reduced due to interim action area removal, and impacts from residual contamination and hot spot areas will likely be reduced by the treatment wall to below CULs at the point of compliance.	Likely complies. Groundwater COC concentrations will likely be reduced by source removal to below CULs at the point of compliance.	Complies. Groundwater COC concentrations will likely be reduced by source removal and the treatment wall to below CULs at the point of compliance.
Cleanup Actions for Soil at Current or Potential Future Residential Areas and for Soil at Schools and Child Care Centers, WAC 173-340-360(2)(d)	Not applicable. The site is not in a residential area.				
Institutional Controls, WAC 173-340-360(2)(e)	Does not currently comply. Alternative 1 relies on institutional controls and monitoring to maintain the existing treatment wall and asphalt cap, which would comply once additional investigation provides evidence for incomplete contaminant transport pathway to adjacent aquatic environment.	Complies. Alternative 2 will require institutional controls depending on the amount of contaminated soil remaining in other areas of the site and beneath buildings; it does not rely primarily on institutional controls and monitoring.	Complies. Alternative 3 will require institutional controls; it does not rely primarily on institutional controls and monitoring.	Alternative 4 may require institutional controls depending on the amount of contaminated soil remaining beneath buildings; it does not rely primarily on institutional controls and monitoring.	Complies. Alternative 5 will require institutional controls depending on the amount of contaminated soil remaining in other areas of the site and beneath buildings; it does not rely primarily on institutional controls and monitoring.
Releases and Migration, WAC 173-340-360(2)(f)	Does not currently comply. Reduces infiltration and releases with existing asphalt cap, but does not address potential contaminant migration from the AOCs. Need to provide evidence of incomplete transport pathway to adjacent aquatic environment.	Does not currently comply. Alternative 2 minimizes releases and migration with existing asphalt cap and removal of contaminated material, but does not address potential migration of residual COCs to the Ship Canal.	Complies. Alternative 3 prevents releases and migration of COCs by maintaining the existing asphalt cap and construction of a treatment wall adjacent to the Ship Canal.	Likely complies. Alternative 4 minimizes releases and migration of COCs by removing accessible contaminated material and capping remaining contaminated material.	Complies. Alternative 5 prevents releases and migration by removing contaminated material and construction of a treatment wall adjacent to the Ship Canal.

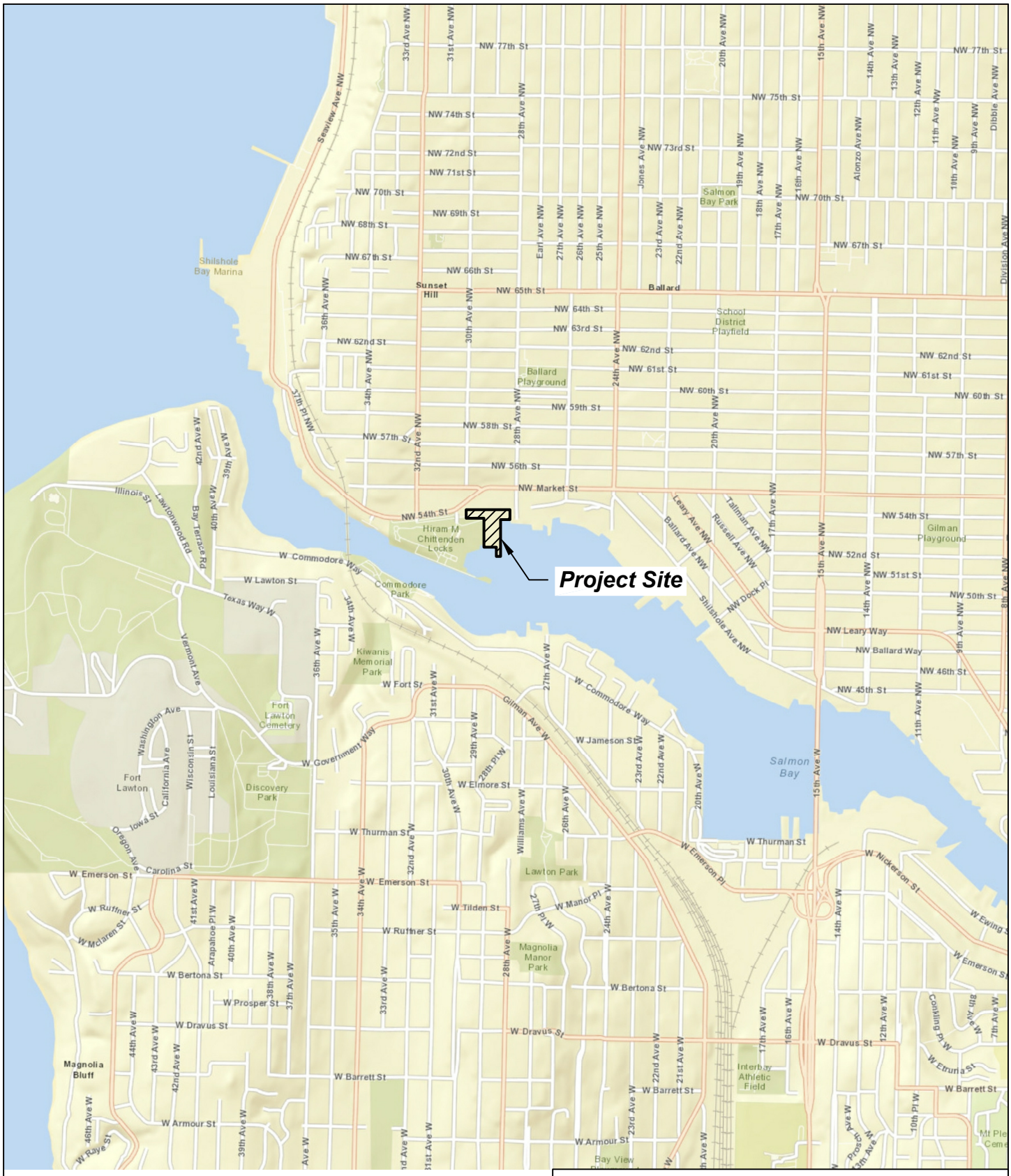
Table 9 – Remediation Alternatives Evaluation

Selection Criteria	Alternative 1: Interim Action, Natural Attenuation with Institutional Controls, and Compliance Monitoring	Alternative 2: Interim Action, Hot Spot Excavation with Institutional Controls, and Compliance Monitoring	Alternative 3: Interim Action, Treatment Wall with Institutional Controls, and Compliance Monitoring	Alternative 4: Interim Action, Excavation of Soil Exceeding CULs with Institutional Controls, and Compliance Monitoring	Alternative 5: Interim Action, Hot Spot Excavation with Institutional Controls, and Compliance Monitoring, and Treatment Wall Construction Contingency
Dilution and Dispersion, WAC 173-340-360(2)(g)	Complies due to removal of interim action hot spot. Alternative 1 does not solely rely on dilution and dispersion.	Complies. Alternative 2 does not rely on dilution and dispersion.	Complies. Alternative 3 does not rely on dilution and dispersion.	Complies. Alternative 4 does not rely on dilution and dispersion.	Complies. Alternative 5 does not rely on dilution and dispersion.
Remediation Levels, WAC 173-340-360(2)(h)	Not applicable. The alternatives do not involve remediation levels.				

Table 10 – Disproportionate Cost Analysis

DCA Criterion	Alternative 1: Interim Action, Natural Attenuation with Institutional Controls, and Compliance Monitoring	Alternative 2: Interim Action, Hot Spot Excavation with Institutional Controls, and Compliance Monitoring	Alternative 3: Interim Action, Treatment Wall with Institutional Controls, and Compliance Monitoring	Alternative 4: Interim Action, Excavation of Soil Exceeding CULs with Institutional Controls, and Compliance Monitoring	Alternative 5: Interim Action, Hot Spot Excavation, Treatment Wall with Institutional Controls, and Compliance Monitoring
Protectiveness	Assuming the interim action is completed, partial source control reduces human exposure to contamination in soil and groundwater through institutional controls prohibiting disturbance of subsurface capped with impervious surfaces. May not be protective of ecological health in adjacent surface water, additional data necessary to evaluate this potential. Deed restriction required indefinitely for current/future tenants.	Assuming the interim action is completed, removes most of the known contaminant mass. Residual contamination capped by impervious surfaces, which reduces human exposure. Unknown ecological protectiveness because of residual impacts under buildings or beyond interim action area and hot spot boundaries. Additional data necessary to evaluate potential impacts to adjacent aquatic environment.	Assuming the interim action is completed, reduces contaminant mass migration to adjacent surface water and sediment. Residual contamination around interim action areas and hot spots capped by impervious surfaces. Human exposure reduced. Protective of ecological health in adjacent surface water while treatment wall is in place.	Assuming the interim action is completed, removes all accessible contaminant mass in soil and groundwater immediately. Residual contaminants, if present beneath permanent structures, may be capped by impervious surfaces. Human exposure removed except for potential exposure to residual impacts. Alternative 4 is the most protective of the five alternatives.	Assuming the interim action is completed, removes most of the known contaminant mass. Residual contamination capped by impervious surfaces. Human exposure is reduced. Reduces contaminant mass migration to adjacent surface water and sediment. While treatment wall is in place, protectiveness is achieved for groundwater downgradient of the treatment wall.
Permanence	Provides permanent reduction in volume of contaminated material through interim action removal. Risk of contaminant migration from residual contamination within and outside of Interim Action Area.. Groundwater quality would be monitored and the treatment wall may need to be maintained for many years.	Provides permanent reduction in volume of contaminated material through interim action removal and excavation of contaminant hot spot areas. Risk of contaminant migration due to residual contamination. Groundwater quality would be monitored and the treatment wall may need to be maintained for many years.	Provides permanent reduction in volume of contaminated material through interim action removal. Low risk of contaminant mobility because there would be in situ treatment before groundwater discharge into the Ship Canal. In situ treatment of groundwater will significantly reduce potential groundwater toxicity through chemical and physical processes while the treatment wall is in place and properly maintained.	Very low risk of mobility of residual contaminants. Provides permanent reduction in volume of contaminated material through excavation. Does not address contamination under existing structures.	Low risk of contaminant mobility because there would be in situ treatment before groundwater discharge into the Ship Canal. In situ treatment of groundwater will significantly reduce potential groundwater toxicity through chemical and physical processes while the treatment wall is in place and properly maintained. Provides permanent reduction in volume of contaminated material through excavation of contaminant hot spot areas.
Cost	$427,000	$1,910,000	$5,490,000	$14,800,000	$1,910,000 (w/o wall) $6,730,000 (w/ wall)
Effectiveness over the Long Term	Possibly effective for the interim action area contamination. Off-site disposal in an engineered, lined, and monitored facility. Landfills are a proven technology and are expected to be effective over the long term. Not effective at treating PCBs and metals in hot spot areas. Potentially not effective at treating diesel impacts.	Permanently remediates interim action area and contaminant hot spots where accessible, but residual contaminant mass will likely remain. Off-site disposal in an engineered, lined, and monitored facility. Landfills are a proven technology and are expected to be effective over the long term.	Remediates groundwater while treatment wall is in place and maintained. Does not directly reduce contaminant mass in source areas. Requires O&M to maintain long-term effectiveness.	Permanently remediates soil and removes potential groundwater contaminant source area. Off-site disposal in an engineered, lined, and monitored facility that is expected to be effective over the long term.	Remediates contaminant hot spots where accessible, but residual contaminant mass is likely to remain. Disposes contaminated soil off site in an engineered, lined, and monitored facility. Treatment wall remediates groundwater while in place, but requires O&M to maintain long-term effectiveness.
Management of Short-Term Risks	Moderate short-term risks associated with interim action area waste	Moderate short-term risks associated with waste excavation, over-the-road	Moderate short-term risks associated with waste excavation during treatment	Moderate to high short-term risks associated with waste excavation,	Moderate short-term risks associated with waste excavation, over-the-road

	excavation, over-the-road transport to landfill, and construction impacts to local businesses. Low short-term risks associated with implementing institutional controls.	transport to landfill, and construction impacts to local businesses. Low short-term risks associated with implementing institutional controls.	wall installation, over-the-road transport to landfill, and construction impact to local businesses.	over-the-road transport to landfill, and construction impact to local businesses. High short-term risk associated with large scale and long duration.	transport to landfill, and construction impact to local businesses. Increased complexity would result in more impacts to local businesses.
Technical and Administrative Implementability	Implementable. Uses typical construction practices and equipment for the interim action removal. Impacts to businesses on site would be moderate. Requires additional investigation to determine potential impact to adjacent surface water. Requires administrative structure, permits, institutional controls, and environmental covenant.	Implementable. Uses typical construction practices and equipment for source control. Impacts to businesses on site would be moderate. Requires additional investigation to determine potential impact to adjacent surface water. Requires additional characterization to delineate extent of hot spots. Requires permits, institutional controls, and environmental covenant.	Implementable. Uses typical construction practices and equipment, as well as treatment material handling. Construction impacts to businesses on site would be significant. Requires future maintenance, permitting, and additional characterization for design. Requires permits, institutional controls, and environmental covenant.	Implementable. Uses typical construction practices and equipment, although extensively impacts businesses on site, likely requiring closure of the facility for an extended period of time and rerouting of public sewer line. Requires permits and environmental covenant.	Implementable. Uses typical construction practices and equipment, as well as treatment material handling. Requires additional characterization to delineate impacts and future maintenance and permitting. Requires permits, institutional controls, and environmental covenants.
Consideration of Public Concerns	This criterion will be addressed during the public comment period for the RI/FS and Draft Cleanup Action Plan.				



Source: Base map prepared from ArcGIS Online, 2013.

0 2000 4000

Approximate Scale in Feet

N

Jacobson Terminal
Seattle, Washington

Vicinity Map

17800-43 10/13

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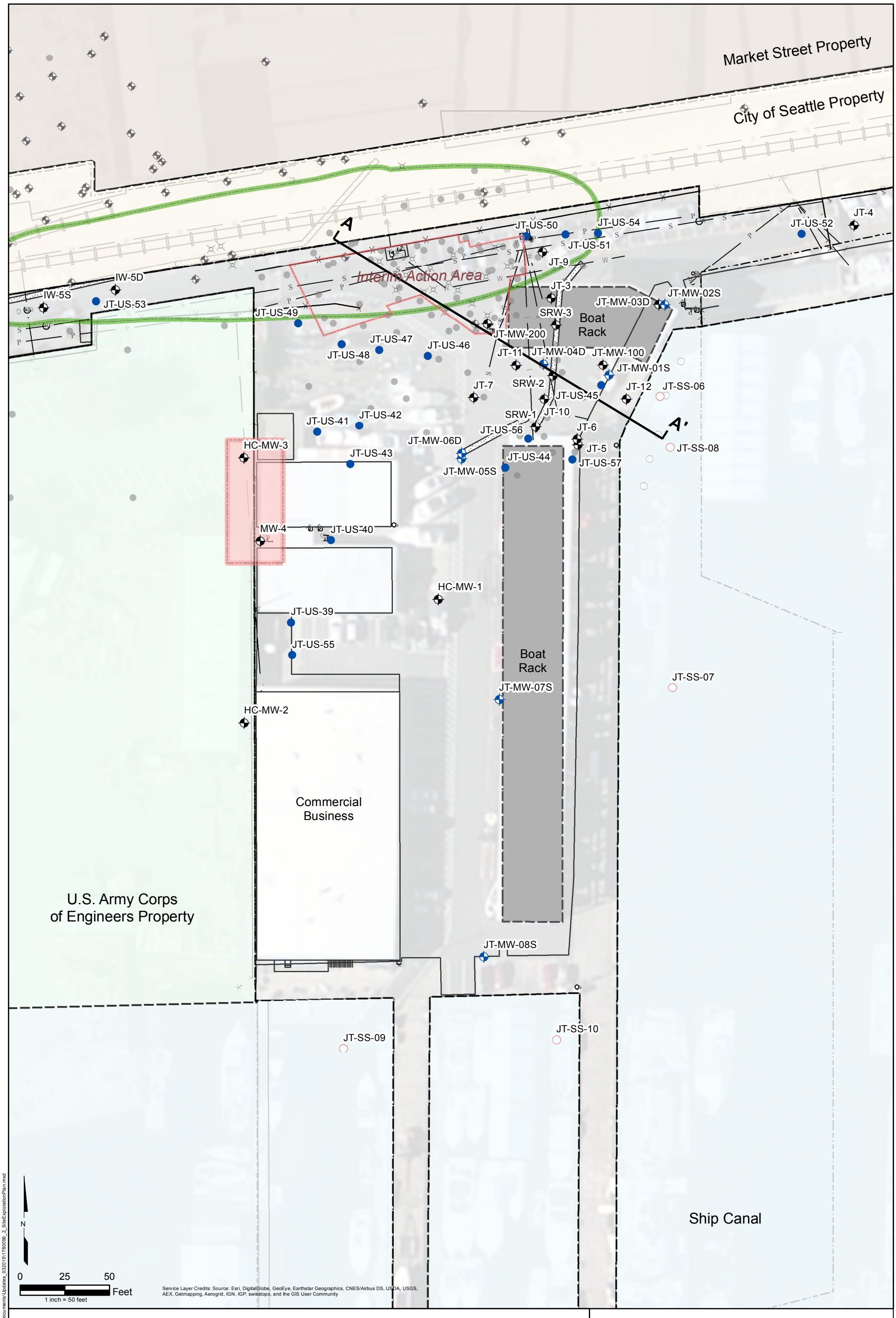
Figure
1

EAL 10/13/13 1780043-001.dwg



Notes:
1. Base map prepared from AutoCAD file 020030-02.dwg by Aspect Consulting, 10/18/13.
2. Utility locations are approximate.

L:\Notebooks\1780056_Jacobson Terminal Property RI-FS\GIS\Documents\Updates_032015\1780056_2_SiteExplorationPlan.mxd

Jacobson Terminals
Seattle, Washington

Site Plan and Sampling Locations

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Figure
2

A West

A' East

JT-US-30 | JT-US-18 | JT-US-17 | MW-8D | SP-22 | SP-19 & SP-19(b) | IP-4 | JT-US-27 | JT-US-19 | JT-US-35 | IP-5 | JT-US-20 | SP-4 & SP-4(b) | SP-44 | SP-43 | IP-1 & IP-1(b) | SP-6 | SP-46 | SP-36 | IP-3 | SP-37 | SP-47 | SP-48 | JT-8 | SP-38 | MW-200 | JT-US-8 | SP-29 | JT-US-07 | JT-11 | JT-MW-4D | SP-53 | MW-100 | JT-MW-1S | JT-US-45 | JT-6 | JT-5 | JT-US-57 | JT-12 | JT-SS-03

Elevation in Feet

30 25 20 15 10 5 0 -5

Asphalt Pavement

Bulkhead

Ground Surface Survey

Estimated Maximum Water Level

Estimated Minimum Water Level

Salmon Bay

Slightly gravelly, silty SAND with discontinuous Silt layers (FILL)

Wood debris FILL

Sewer Backfill

10-inch-Diameter Sanitary Sewer

Slightly silty SAND

SAND and silty SAND

SILT and CLAY

SILT and sandy SILT

Organic SILT

SAND

MW-8D Selected Exploration

Sample

Screened Interval

Approximate Area of PCB Concentrations above Method A Industrial Cleanup (10 mg/kg)

Approximate Area of PCB Concentrations above Method A Unrestricted Cleanup Level (1 mg/kg)

Approximate Area of PCB Concentrations above Method B Surface Water Protection Screening Level (0.000079 mg/kg) and PQL

Iron/GAC Groundwater Treatment Wall

Geologic Contact (Approximate)

Horizontal Scale in Feet
0 15 30

Vertical Scale in Feet
0 5 10
Vertical Exaggeration x 3

Notes:

1. Contacts between soil units are based upon interpolation between borings and represent our interpretation of subsurface conditions based on currently available data.
2. Cross section developed from AutoCAD files provided by Aspect, dated 12/2005.
3. Elevation shown in City of Seattle vertical datum.

Jacobson Terminals
Seattle, Washington

Generalized Geologic Cross Section A-A'

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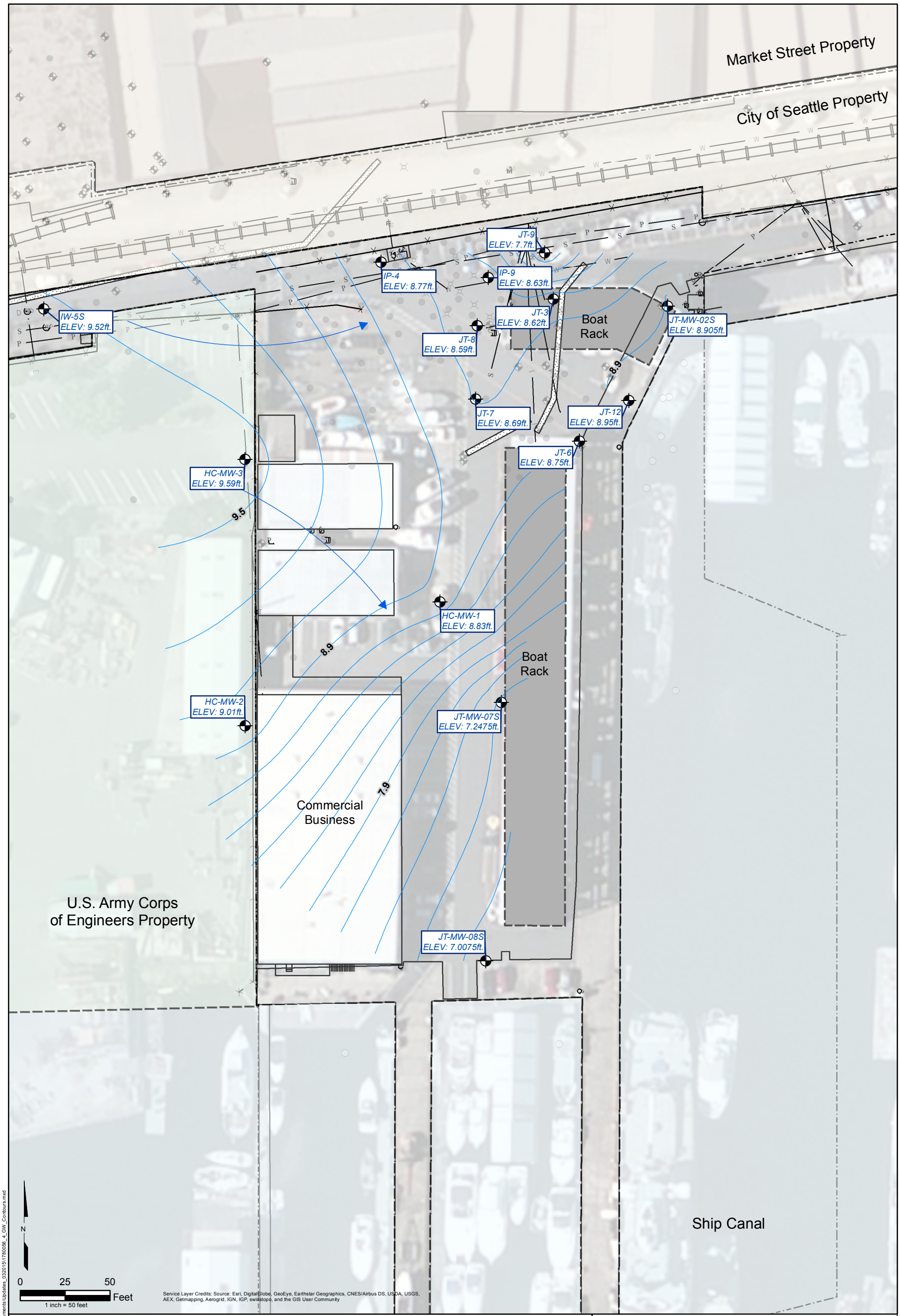
Figure **3**

EAL 04/6/15 1780056-001 (XSec).dwg



Monitoring Well

Groundwater Contours (0.2ft. interval)

Inferred Groundwater Flow Direction

JT-MW-07S
DTW: 7.24ft

Well ID

Depth to water (ft)
below top of casing (TOC)

- Fence Line
- Property Boundary
- U — Utility Line
- W — Water Line
- S — Sanitary Sewer Line
- P — Overhead Power
- Historical Soil Boring
- Historical Sediment Sample
- Injection Well
- Existing Monitoring Wells

Notes:
1. Base map prepared from AutoCAD file 020030-02.dwg by Aspect Consulting, 10/18/13.
2. Utility locations are approximate.
3. Elevations shown in City of Seattle datum.

Jacobson Terminals
Seattle, Washington

Shallow Groundwater Elevation Contours
April 2015

17800-56 4/15

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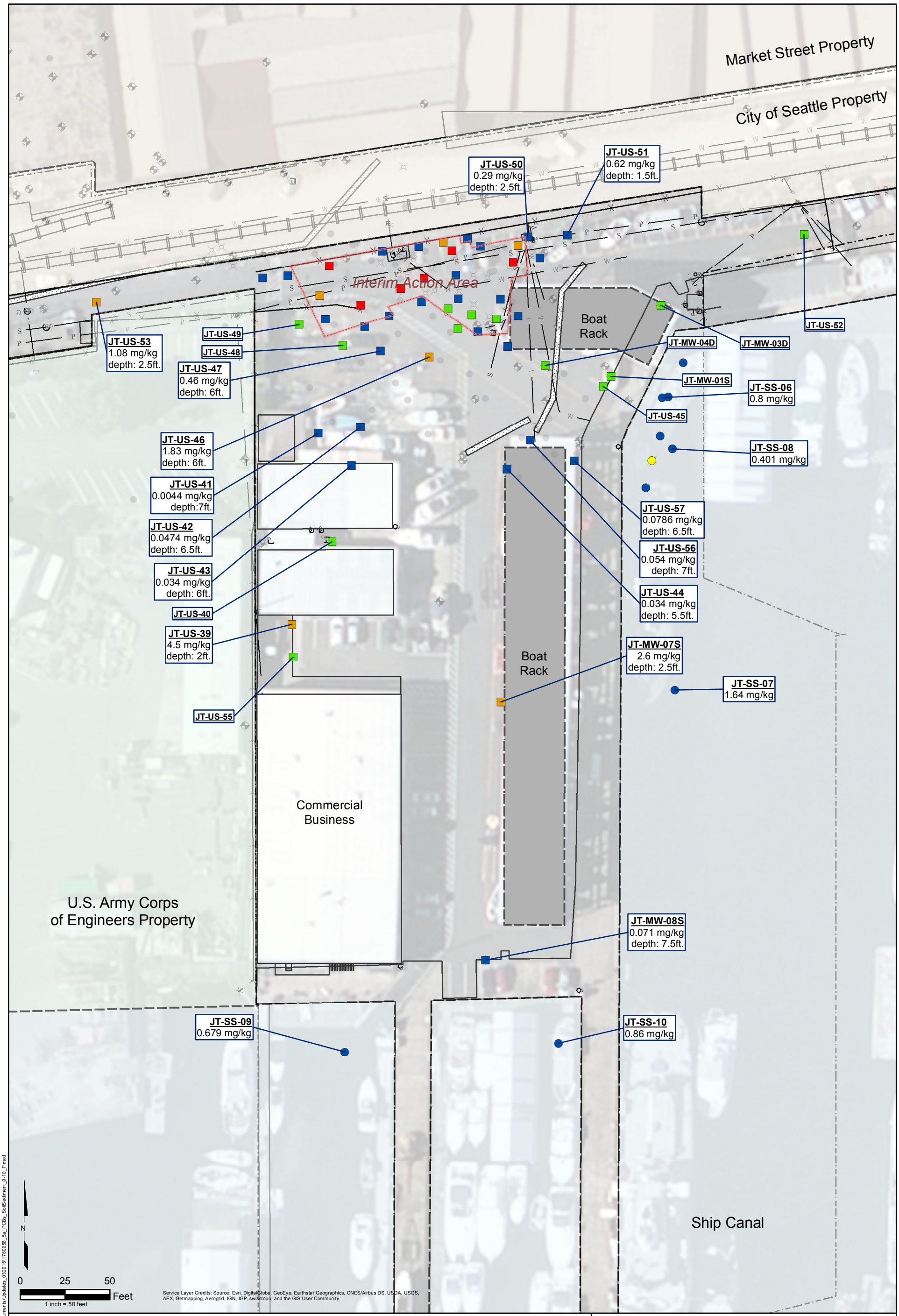
Figure
4

L:\Notebooks\17800\56_Jacobson Terminal Property RI-FS\GIS\Documents\Updates_032015\17800\56_4_GW_Contours.mxd



Soil Samples
- Above Method B Surface Water Protection Screening Level (0.0000787 mg/kg)
- Above Method A (1 mg/kg)
- Above Method A Industrial (10 mg/kg)
- Non-detect

Sediment Samples
- Below SCO Screening Level (0.11 mg/kg)
- Above SCO Screening Level (0.11 mg/kg)

Location ID: JT-US-39
Concentration: 4.5 mg/kg
Depth (upper) of sample: depth: 2.25 ft.

- Fence Line
- Property Boundary
- Utility Line
- Water Line
- Sanitary Sewer Line
- Overhead Power
- Historical Soil Boring
- Historical Sediment Sample
- Injection Well
- Existing Monitoring Wells

Notes:
1. Base map prepared from AutoCAD file 020030-02.dwg by Aspect Consulting, 10/08/13.
2. Utility locations are approximate.
3. Sample locations presented on figure but not identified were collected during the 2013-14 RI and are identified in the 2014 Interim Action Work Plan (IAWP).
4. Highest concentration within depth interval presented.

Jacobson Terminals
Seattle, Washington

Total PCBs in Soil (0–10 feet bgs) and Sediment

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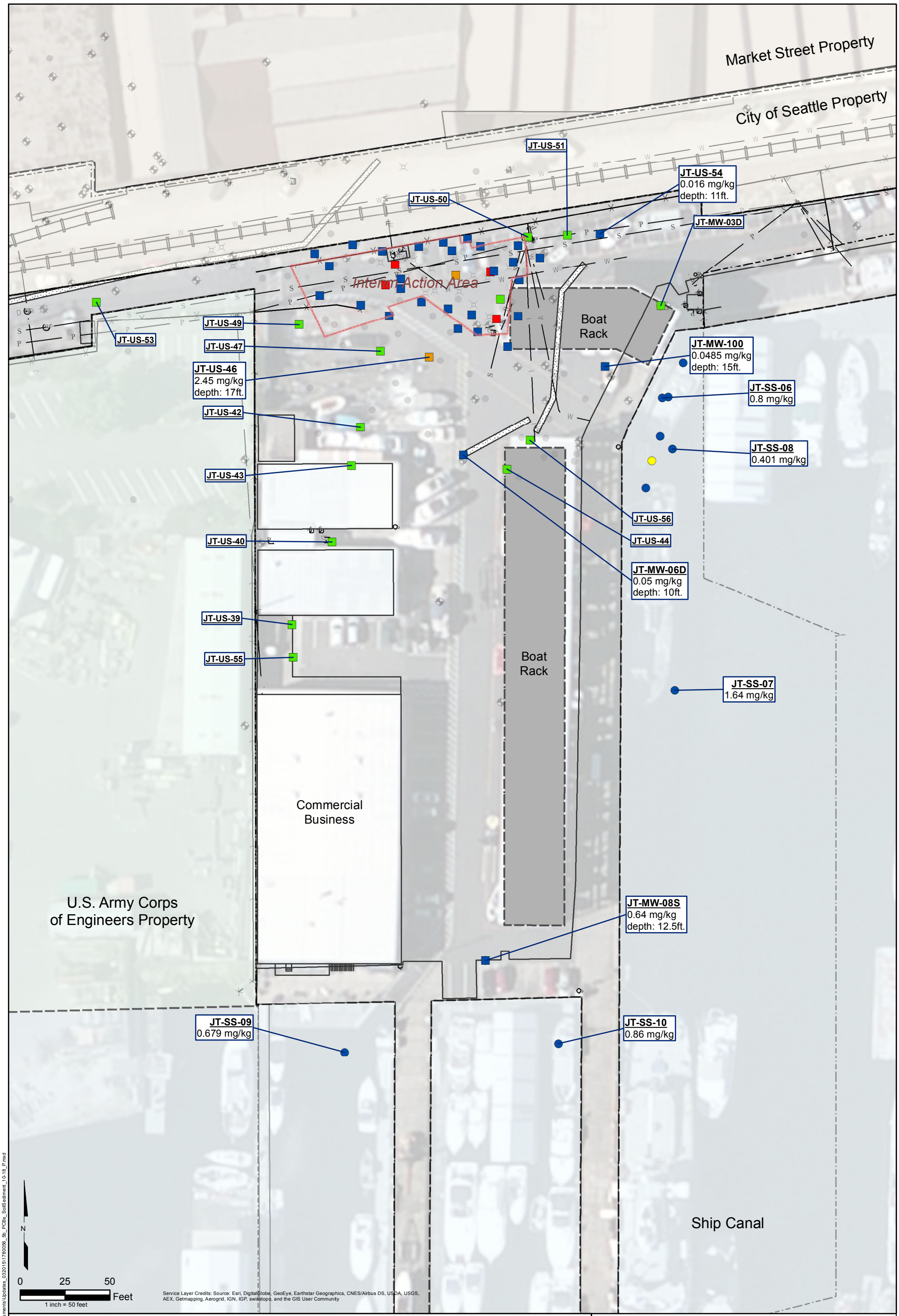
Figure **5a**

L:\Notebooks\17800\56_Jacobson Terminal Property RI-FS\GIS\Documents\Updates_032015\17800\56_5a_PCBs_SoilSediment_0-10_P.mxd



Soil Samples
- Above Method B Surface Water Protection Screening Level (0.0000787 mg/kg)
- Above Method A (1 mg/kg)
- Above Method A Industrial (10 mg/kg)
- Non-detect

Sediment Samples
- Below SCO Screening Level (0.11 mg/kg)
- Above SCO Screening Level (0.11 mg/kg)

Location ID: JT-MW-08S
Concentration: 0.64 mg/kg
Depth (upper) of sample: depth: 12.5ft.

- Fence Line
- Property Boundary
- Utility Line
- Water Line
- Sanitary Sewer Line
- Overhead Power
- Historical Soil Boring
- Historical Sediment Sample
- Injection Well
- Existing Monitoring Wells

Notes:
1. Base map prepared from AutoCAD file 020030-02.dwg by Aspect Consulting, 10/08/13.
2. Utility locations are approximate.
3. Sample locations presented on figure but not identified were collected during the 2013-14 RI and are identified in the 2014 Interim Action Work Plan (IAWP).
4. Highest concentration within depth interval presented.

Jacobson Terminals
Seattle, Washington

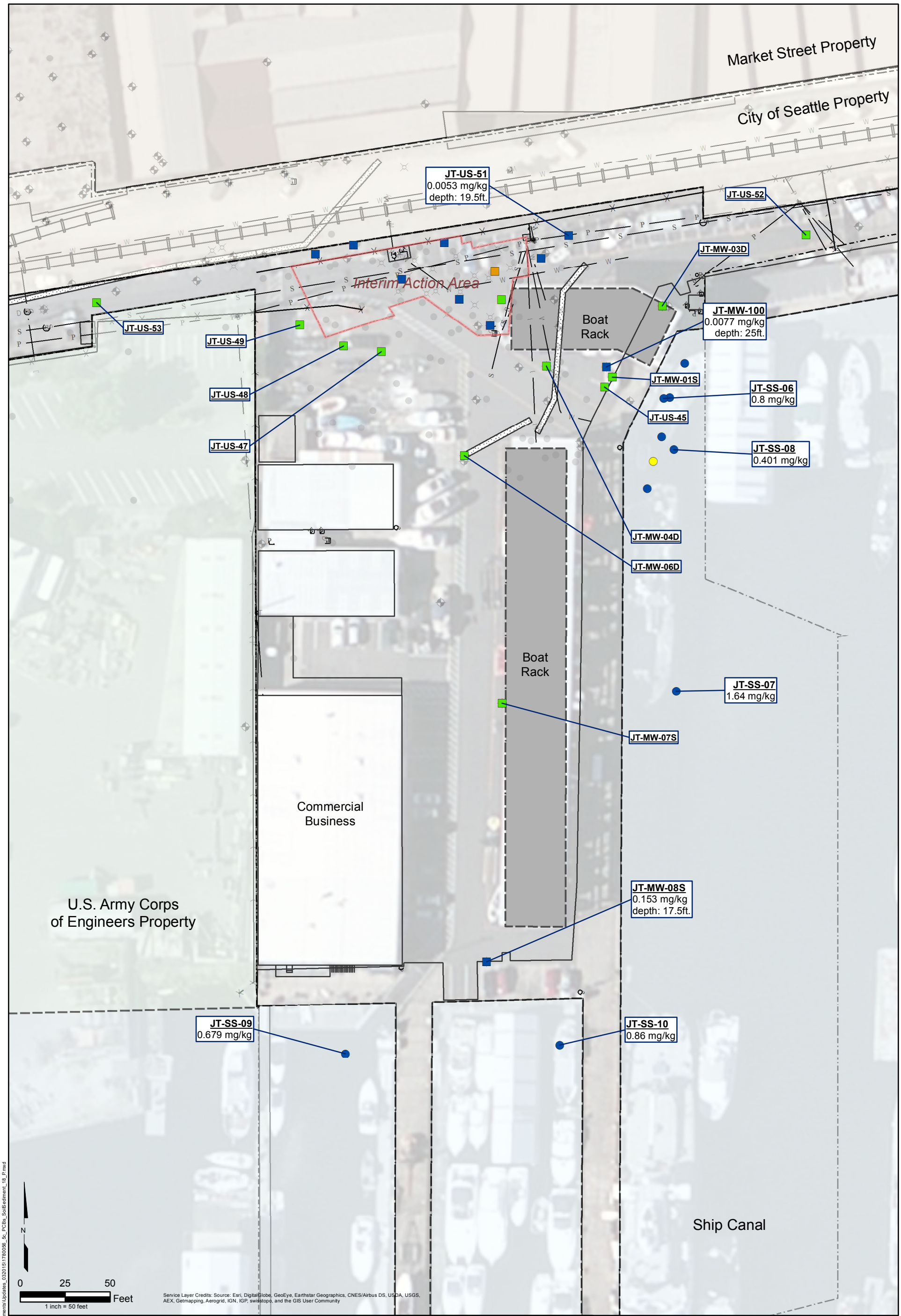
Total PCBs in Soil (10–18 feet bgs) and Sediment

17800-56 4/15

HARTCROWSER

Figure **5b**

L:\Notebooks\17800\56_Jacobson Terminal Property RI-FS\GIS\Documents\Updates_032015\17800\56_5b_PCBs_SoilSediment_10-18_P.mxd



Soil Samples
- Above Method B Surface Water Protection Screening Level (0.0000787 mg/kg)
- Above Method A (1 mg/kg)
- Above Method A Industrial (10 mg/kg)
- Non-detect

Sediment Samples
- Below SCO Screening Level (0.11 mg/kg)
- Above SCO Screening Level (0.11 mg/kg)

Location ID: JT-MW-08S
Concentration: 0.153 mg/kg
Depth (upper) of sample: depth: 17.5ft.

- Fence Line
- Property Boundary
- Utility Line
- Water Line
- Sanitary Sewer Line
- Overhead Power
- Historical Soil Boring
- Historical Sediment Sample
- Injection Well
- Existing Monitoring Wells

Notes:
1. Base map prepared from AutoCAD file 020030-02.dwg by Aspect Consulting, 10/08/13.
2. Utility locations are approximate.
3. Sample locations presented on figure but not identified were collected during the 2013-14 RI and are identified in the 2014 Interim Action Work Plan (IAWP).
4. Highest concentration within depth interval presented.

Jacobson Terminals
Seattle, Washington

Total PCBs in Soil (18+ feet bgs) and Sediment

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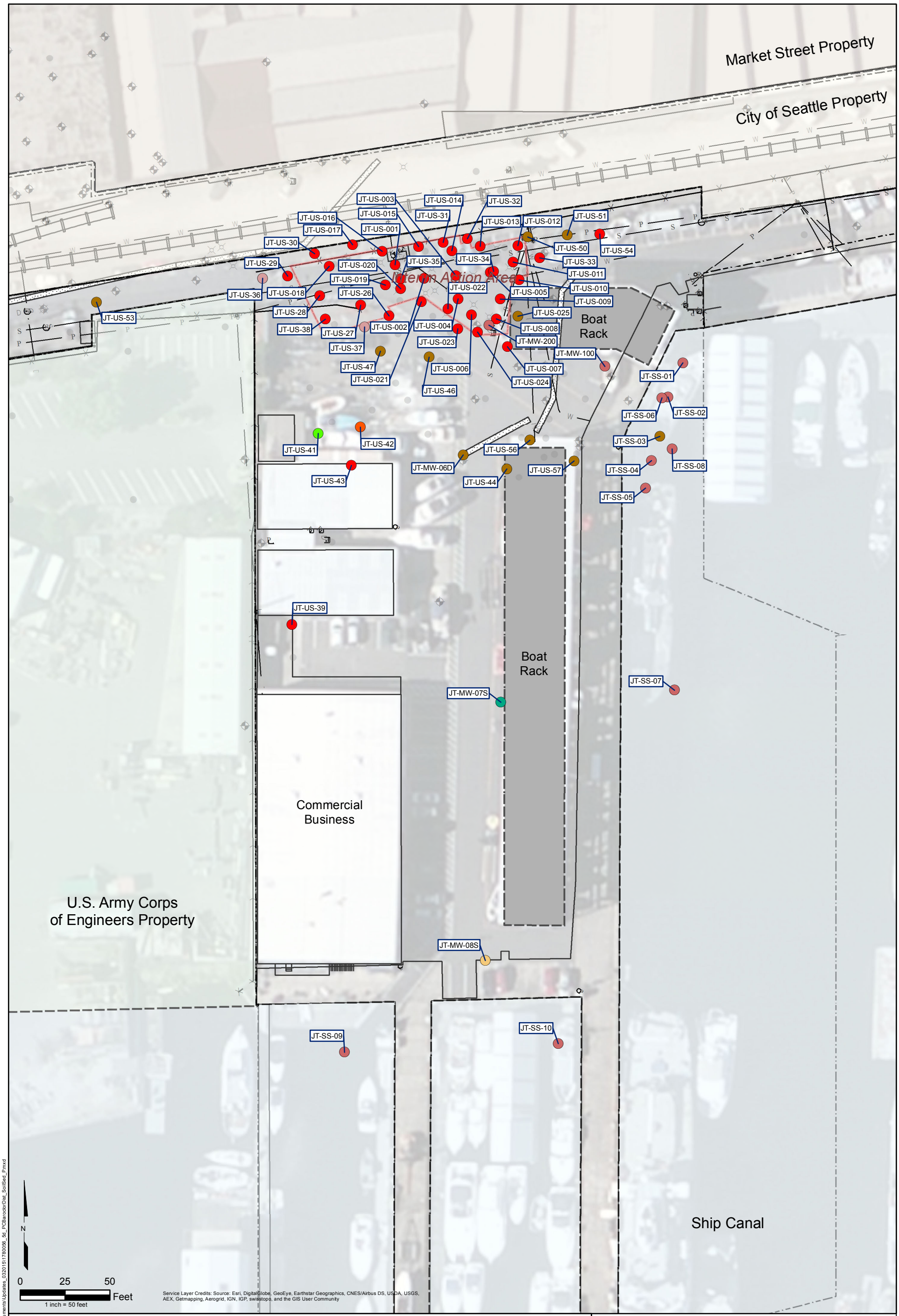
Figure **5c**

L:\Notebooks\17800\56_Jacobson Terminal Property RI-FS\GIS\Documents\Updates_032015\17800\56_5c_PCBs_SoilSediment_18_P.mxd



PCB-Aroclor 1260 (38 explorations)
PCB-Aroclors 1242, 1254, 1260 (1 exploration)
PCB-Aroclors 1248, 1254, 1260 (11 explorations)
PCB-Aroclors 1248, 1260 (2 explorations)
PCB-Aroclors 1254, 1260 (11 explorations)
PCB-Aroclors 1254, 1260, 1262 (1 exploration)
PCB-Aroclor 1254 (1 exploration)
PCB-Aroclors 1254, 1262 (1 exploration)

Fence Line
Property Boundary
U — Utility Line
W — Water Line
S — Sanitary Sewer Line
P — Overhead Power
Historical Soil Boring
Historical Sediment Sample
Injection Well
Existing Monitoring Wells

Notes:
1. Base map prepared from AutoCAD file 020030-02.dwg by Aspect Consulting, 10/08/13.
2. Utility locations are approximate.

Jacobson Terminals
Seattle, Washington

PCB Aroclor Distribution in Soil and Sediment

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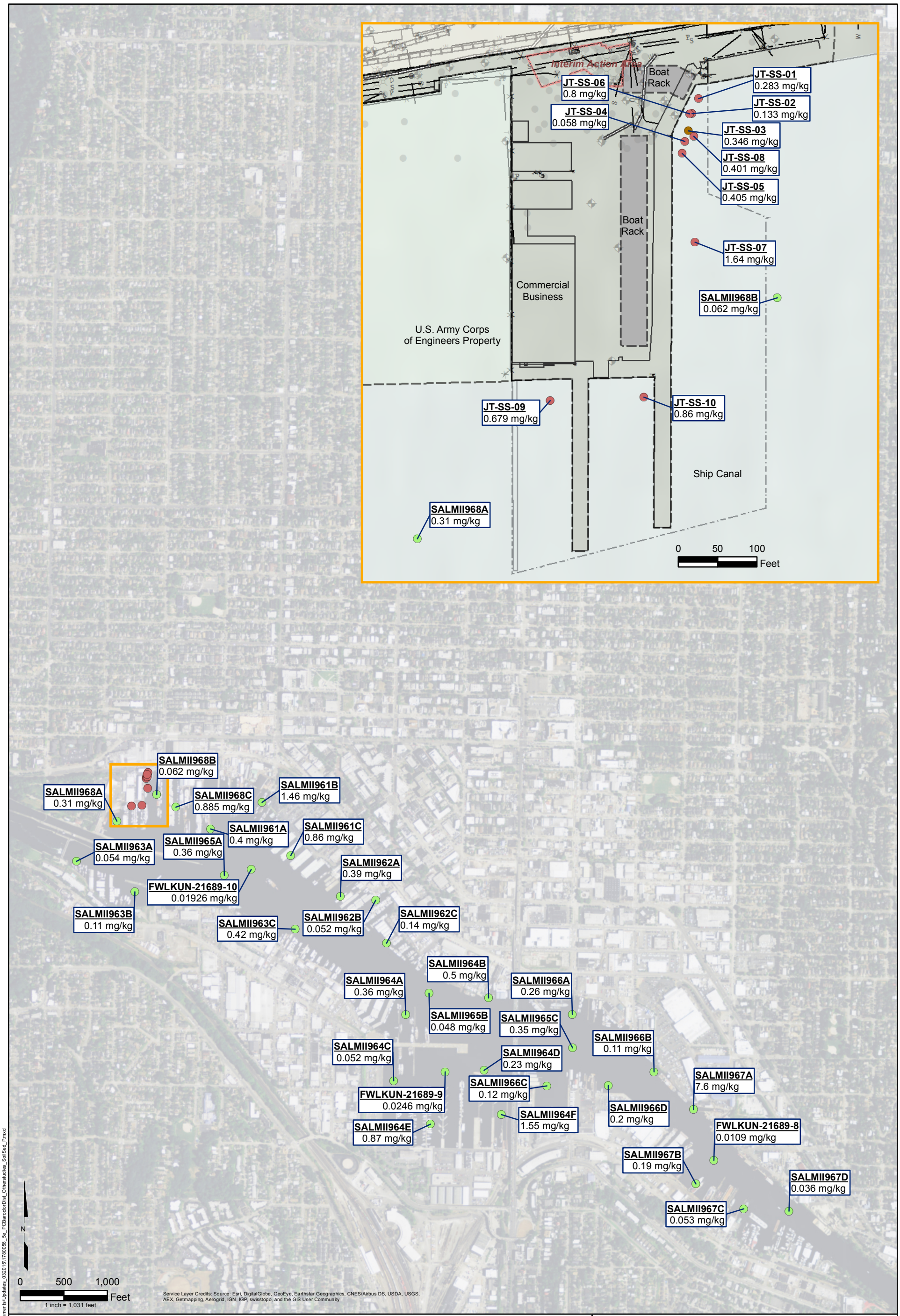
HARTCROWSER

Figure
5d

L:\Notebooks\17800\56_Jacobson Terminal Property RI-FS\GIS\Documents\Updates_032015\17800\56_5d_PCBarocloDist_SoilSed_P.mxd



PCB-Aroclor 1248, 1254, 1260 (9 explorations)
PCB-Aroclors 1254, 1260 (1 exploration)
PCB-Aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260 (32 explorations)

Location ID **JT-US-39**
Concentration 4.5 mg/kg

Fence Line
Property Boundary
U Utility Line
W Water Line
S Sanitary Sewer Line
P Overhead Power
Historical Soil Boring
Historical Sediment Sample
Injection Well
Existing Monitoring Wells

Notes:
1. Base map prepared from AutoCAD file 020030-02.dwg by Aspect Consulting, 10/08/13.
2. Utility locations are approximate.
3. Sample locations presented on figure but not identified were collected during the 2013-14 RI and are identified in the 2014 Interim Action Work Plan (IAWP).
4. Highest concentration within depth interval presented.

Jacobson Terminals
Seattle, Washington

Total PCBs in Sediment (Salmon Bay)

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Figure
5e

L:\Notebooks\17800\56_Jacobson Terminal Property RI-FS\GIS\Documents\Updates_032015\17800056_5e_PCBarcoderDist_Otherstudies_SoilSed_P.mxd

Market Street Property

City of Seattle Property

JT-US-46
1,2,4-Trichlorobenzene: 0.0036U mg/kg
1,4-Dichlorobenzene: 0.0011 mg/kg
depth: 6ft.

JT-US-51

JT-US-50

JT-MW-03D

Interim Action Area

JT-US-49

JT-US-53

Boat Rack

JT-US-52

JT-MW-04D

JT-US-48
1,2,4-Trichlorobenzene: 0.0047U mg/kg
1,4-Dichlorobenzene: 0.0019 mg/kg
depth: 6.5ft.

JT-MW-01S

JT-SS-06
1,2,4-Trichlorobenzene: 12U mg/kg
1,4-Dichlorobenzene: 0.0024U mg/kg

JT-US-47

JT-US-45

JT-US-41
1,2,4-Trichlorobenzene: 0.0041U mg/kg
1,4-Dichlorobenzene: 0.0014 mg/kg
depth: 7ft.

JT-US-42

JT-US-57

JT-US-43

JT-US-56

JT-SS-08
1,2,4-Trichlorobenzene: 9.9U mg/kg
1,4-Dichlorobenzene: 0.0012T mg/kg

JT-US-44

JT-US-40

JT-US-39

JT-SS-07
1,2,4-Trichlorobenzene: 9.4U mg/kg
1,4-Dichlorobenzene: 0.0019U mg/kg

JT-US-55

Boat Rack

JT-MW-07S

Commercial Business

U.S. Army Corps of Engineers Property

JT-MW-08S

JT-SS-10
1,2,4-Trichlorobenzene: 10U mg/kg
1,4-Dichlorobenzene: 0.002U mg/kg

JT-SS-09
1,2,4-Trichlorobenzene: 37U mg/kg
1,4-Dichlorobenzene: 0.0075U mg/kg

Ship Canal

N

0 25 50 Feet

1 inch = 50 feet

Color Indicates:

1,2,4-Trichlorobenzene top — Above Screening Level
1,4-Dichlorobenzene bottom — Below Screening Level

Non-detect (soil)
Non-detect (sediment)

Screening Levels
1,2,4-Trichlorobenzene = 0.0056 mg/kg
1,4-Dichlorobenzene = 0.2 mg/kg

Location ID — **JT-US-41**
Concentration — 1,2,4-Trichlorobenzene: 0.0041U mg/kg; 1,4-Dichlorobenzene: 0.0014 mg/kg
Depth (upper) of sample — depth: 7.25ft.

Fence Line
Property Boundary
U Utility Line
W Water Line
S Sanitary Sewer Line
P Overhead Power
Historical Soil Boring
Historical Sediment Sample
Injection Well
Existing Monitoring Wells

Notes:
1. Base map prepared from AutoCAD file 020030-02.dwg by Aspect Consulting, 10/08/13.
2. Utility locations are approximate.
3. Sample locations presented on figure but not identified were collected during the 2013-14 RI and are identified in the 2014 Interim Action Work Plan (IAWP).
4. Highest concentration within depth interval presented.

Jacobson Terminals
Seattle, Washington

Chlorinated Benzenes in Soil (0 – 10 feet bgs) and Sediment

17800-56 2/16

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Figure **6a**

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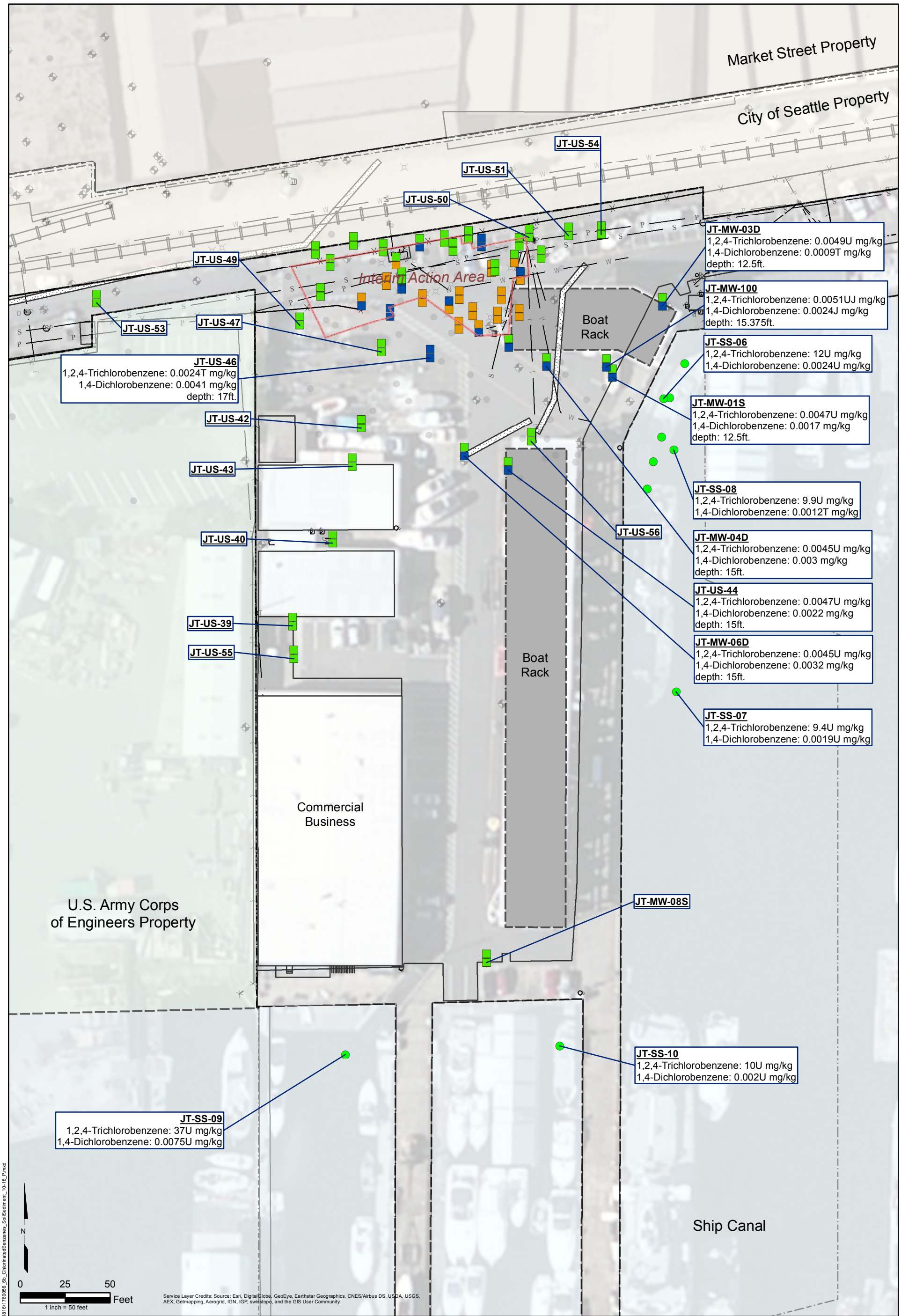


Color Indicates:

1,2,4-Trichlorobenzene top — Above Screening Level
1,4-Dichlorobenzene bottom — Below Screening Level

Non-detect (soil)
Non-detect (sediment)

Screening Levels
1,2,4-Trichlorobenzene = 0.0056 mg/kg
1,4-Dichlorobenzene = 0.2 mg/kg

Location ID — JT-MW-06D
Concentration — 1,2,4-Trichlorobenzene: 0.0045U mg/kg; 1,4-Dichlorobenzene: 0.0032 mg/kg
Depth (upper) of sample — depth: 15.75ft.

Fence Line
Property Boundary
Utility Line
Water Line
Sanitary Sewer Line
Overhead Power
Historical Soil Boring
Historical Sediment Sample
Injection Well
Existing Monitoring Wells

Notes:
1. Base map prepared from AutoCAD file 020030-02.dwg by Aspect Consulting, 10/08/13.
2. Utility locations are approximate.
3. Sample locations presented on figure but not identified were collected during the 2013-14 RI and are identified in the 2014 Interim Action Work Plan (IAWP).
4. Highest concentration within depth interval presented.

Jacobson Terminals
Seattle, Washington

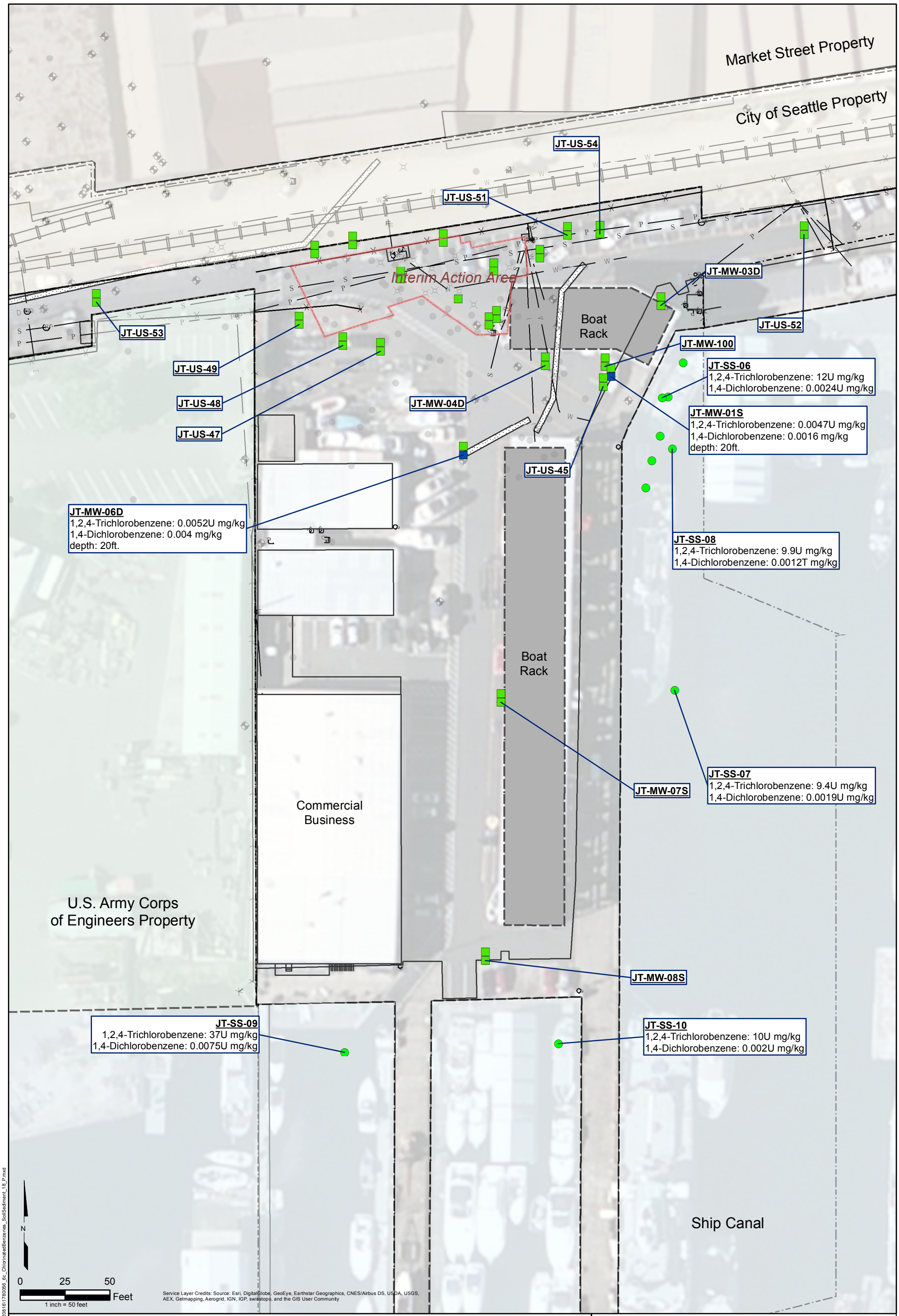
Chlorinated Benzenes in Soil (10 – 18 feet bgs) and Sediment

17800-56 2/16

HARTCROWSER

Figure 6b

C:\GIS_WORKING\17800056_Jacobson\GIS\Documents\Updates_020816\17800056_6b_ChlorinatedBenzenes_SoilSediment_10-18_P.mxd



Color Indicates:

1,2,4-Trichlorobenzene top — Above Screening Level
1,4-Dichlorobenzene bottom — Below Screening Level

Non-detect (soil)
Non-detect (sediment)

Screening Levels
1,2,4-Trichlorobenzene = 0.0056 mg/kg
1,4-Dichlorobenzene = 0.2 mg/kg

Location ID: JT-MW-06D
Concentration: 1,2,4-Trichlorobenzene: 0.0052U mg/kg; 1,4-Dichlorobenzene: 0.004 mg/kg
Depth (upper) of sample: depth: 20.75ft.

Fence Line
Property Boundary
Utility Line
Water Line
Sanitary Sewer Line
Overhead Power
Historical Soil Boring
Historical Sediment Sample
Injection Well
Existing Monitoring Wells

Notes:
1. Base map prepared from AutoCAD file 020030-02.dwg by Aspect Consulting, 10/08/13.
2. Utility locations are approximate.
3. Sample locations presented on figure but not identified were collected during the 2013-14 RI and are identified in the 2014 Interim Action Work Plan (IAWP).
4. Highest concentration within depth interval presented.

Jacobson Terminals
Seattle, Washington

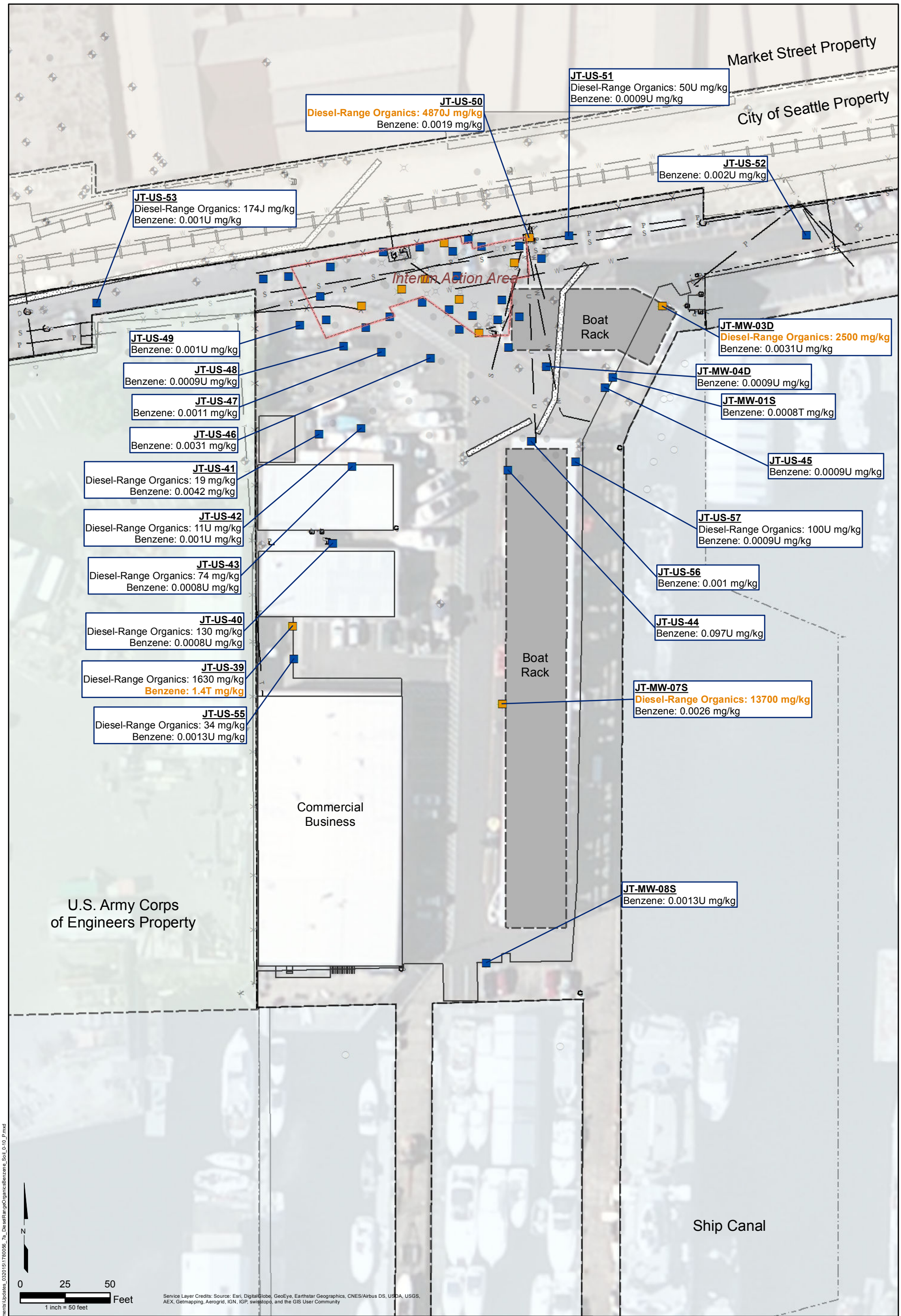
Chlorinated Benzenes in Soil (18+ feet bgs) and Sediment

17800-56 2/16

HARTCROWSER

Figure **6c**

C:\GIS_WORKING\17800056_Jacobson\GIS\Documents\Updates_020816\17800056_6c_ChlorinatedBenzenes_SoilSediment_18_P.mxd



Soil Sample, Below Screening Level

Soil Sample, Above Screening Levels for combined Oil and Diesel-Range Organics (2000 mg/kg), or Benzene (0.0064 mg/kg)

Results in orange exceed screening level for combined Oil and Diesel-Range Organics of 2000 mg/kg

Location ID: JT-MW-07S
Concentration: Diesel-Range Organics: 13700 mg/kg
Depth (upper) of sample: Benzene: 0.0026 mg/kg

Results in orange exceed screening level for Benzene of 0.0064 mg/kg

- Fence Line
- Property Boundary
- Utility Line
- Water Line
- Sanitary Sewer Line
- Overhead Power
- Historical Soil Boring
- Historical Sediment Sample
- Injection Well
- Existing Monitoring Wells

Notes:
1. Base map prepared from AutoCAD file 020030-02.dwg by Aspect Consulting, 10/08/13.
2. Utility locations are approximate.
3. Sample locations presented on figure but not identified were collected during the 2013-14 RI and are identified in the 2014 Interim Action Work Plan (IAWP).
4. Highest concentration within depth interval presented.

Jacobson Terminals
Seattle, Washington

Oil and Diesel-Range Organics (Combined) and Benzene in Soil: 0 – 10 feet bgs

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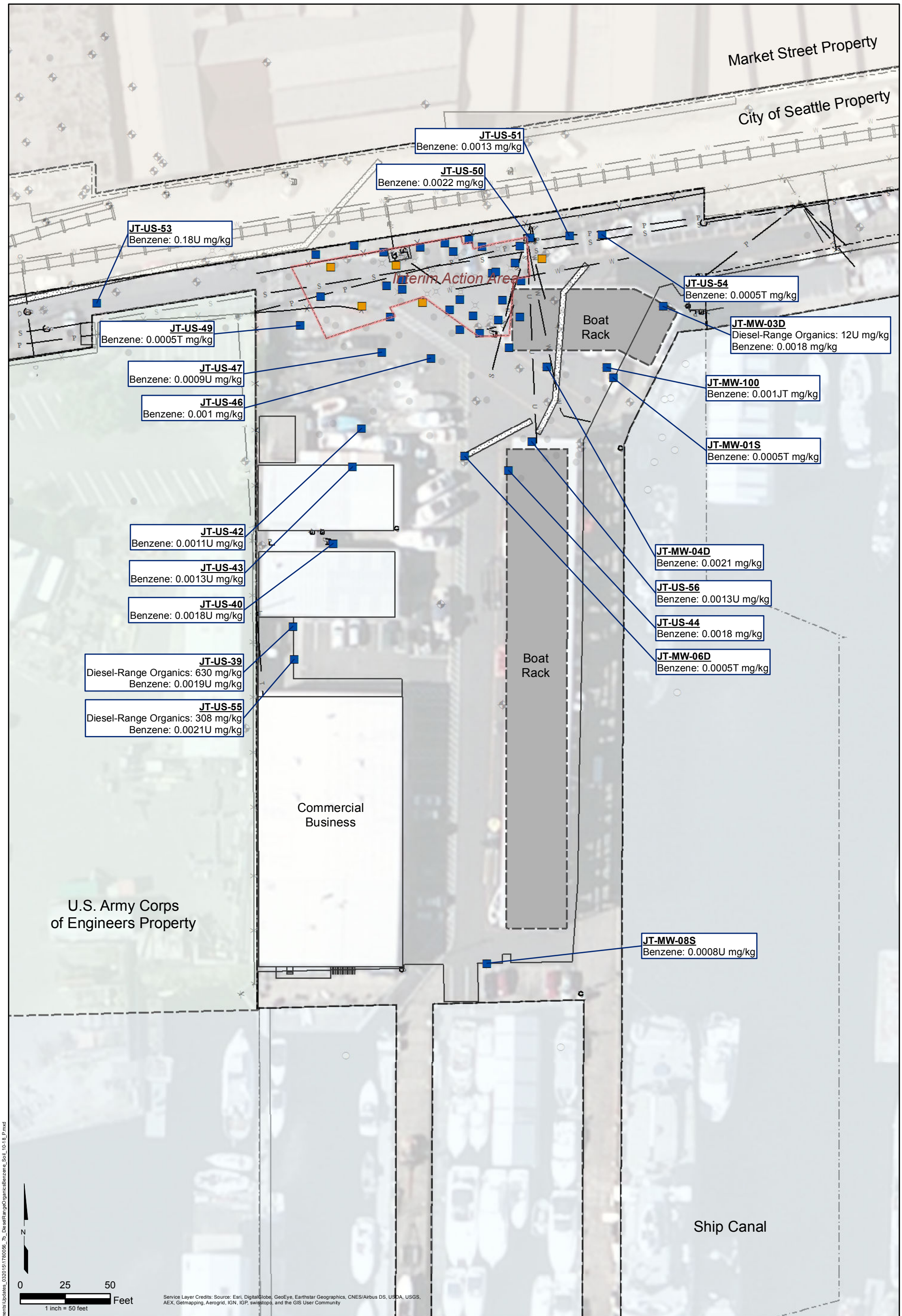
HARTCROWSER

Figure **7a**

L:\Notebooks\17800\56_Jacobson Terminal Property RI-FS\GIS\Documents\Updates_032015\17800\56_7a_DieselRangeOrganicsBenzene_Soil_0-10_P.mxd



Soil Sample, Below Screening Level

Soil Sample, Above Screening Levels for combined Oil and Diesel-Range Organics (2000 mg/kg), or Benzene (0.0064 mg/kg)

Results in orange exceed screening level for combined Oil and Diesel-Range Organics of 2000 mg/kg

Location ID: JT-US-39
Concentration: Diesel-Range Organics: 630 mg/kg
Depth (upper) of sample: Benzene: 0.0019U mg/kg

Results in orange exceed screening level for Benzene of 0.0064 mg/kg

- Fence Line
- Property Boundary
- Utility Line
- Water Line
- Sanitary Sewer Line
- Overhead Power
- Historical Soil Boring
- Historical Sediment Sample
- Injection Well
- Existing Monitoring Wells

Notes:
1. Base map prepared from AutoCAD file 020030-02.dwg by Aspect Consulting, 10/08/13.
2. Utility locations are approximate.
3. Sample locations presented on figure but not identified were collected during the 2013-14 RI and are identified in the 2014 Interim Action Work Plan (IAWP).
4. Highest concentration within depth interval presented.

Jacobson Terminals
Seattle, Washington

Oil and Diesel-Range Organics (Combined) and Benzene in Soil: 10 – 18 feet bgs

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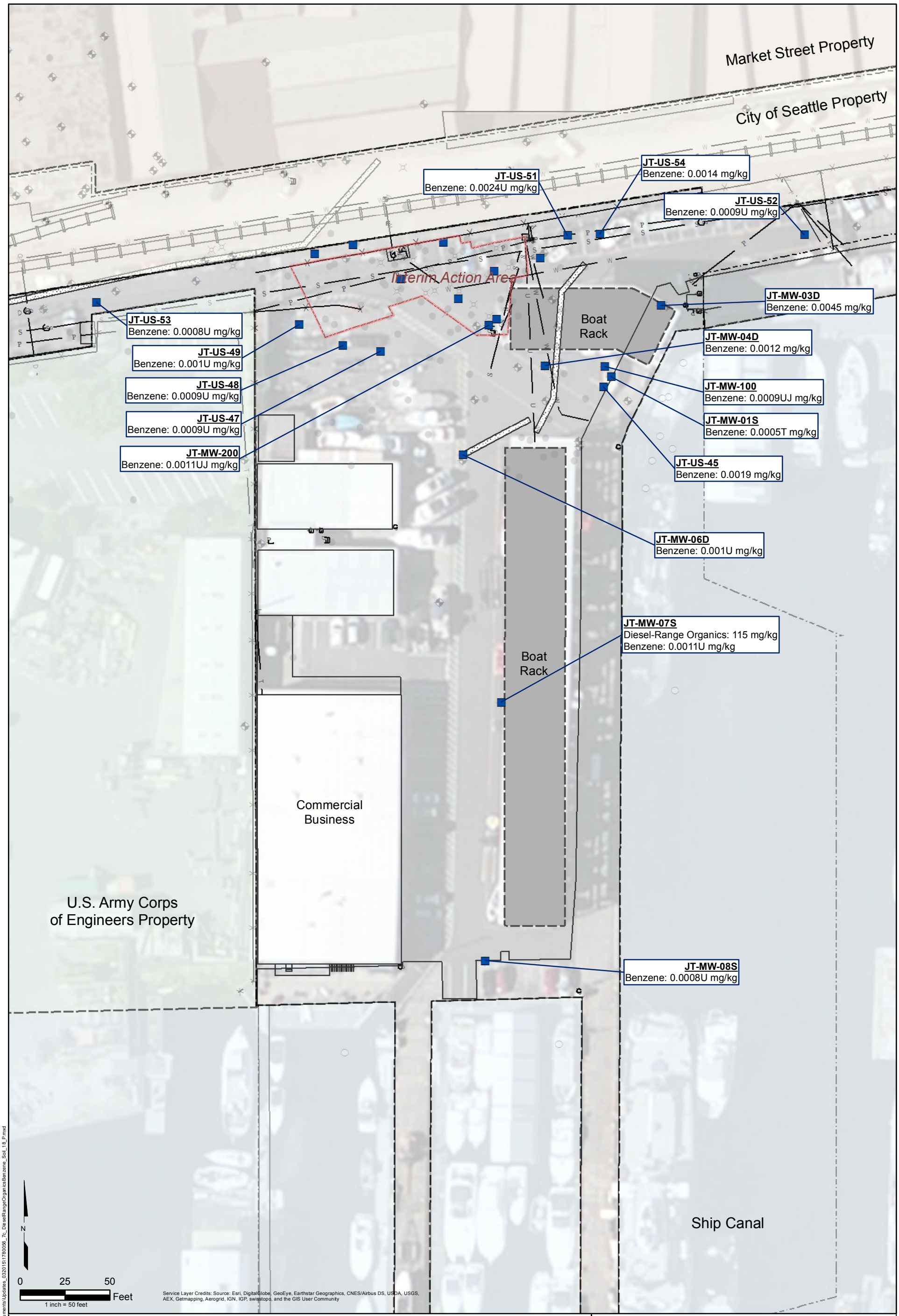
HARTCROWSER

Figure **7b**

L:\Notebooks\17800\56_Jacobson Terminal Property RI-FS\GIS\Documents\Updates_032015\17800\56_7b_DieselRangeOrganicsBenzene_Soil_10-18_P.mxd



Soil Sample, Below Screening Level

Soil Sample, Above Screening Levels for combined Oil and Diesel-Range Organics (2000 mg/kg), or Benzene (0.0064 mg/kg)

Results in orange exceed screening level for combined Oil and Diesel-Range Organics of 2000 mg/kg

Location ID: JT-US-39
Concentration: Diesel-Range Organics: 630 mg/kg
Depth (upper) of sample: Benzene: 0.0019U mg/kg

Results in orange exceed screening level for Benzene of 0.0064 mg/kg

- Fence Line
- Property Boundary
- U — Utility Line
- W — Water Line
- S — Sanitary Sewer Line
- P — Overhead Power
- Historical Soil Boring
- Historical Sediment Sample
- Injection Well
- Existing Monitoring Wells

N

Notes:
1. Base map prepared from AutoCAD file 020030-02.dwg by Aspect Consulting, 10/08/13.
2. Utility locations are approximate.
3. Sample locations presented on figure but not identified were collected during the 2013-14 RI and are identified in the 2014 Interim Action Work Plan (IAWP).
4. Highest concentration within depth interval presented.

Jacobson Terminals
Seattle, Washington

Oil and Diesel-Range Organics (Combined) and Benzene in Soil: 18+ feet bgs

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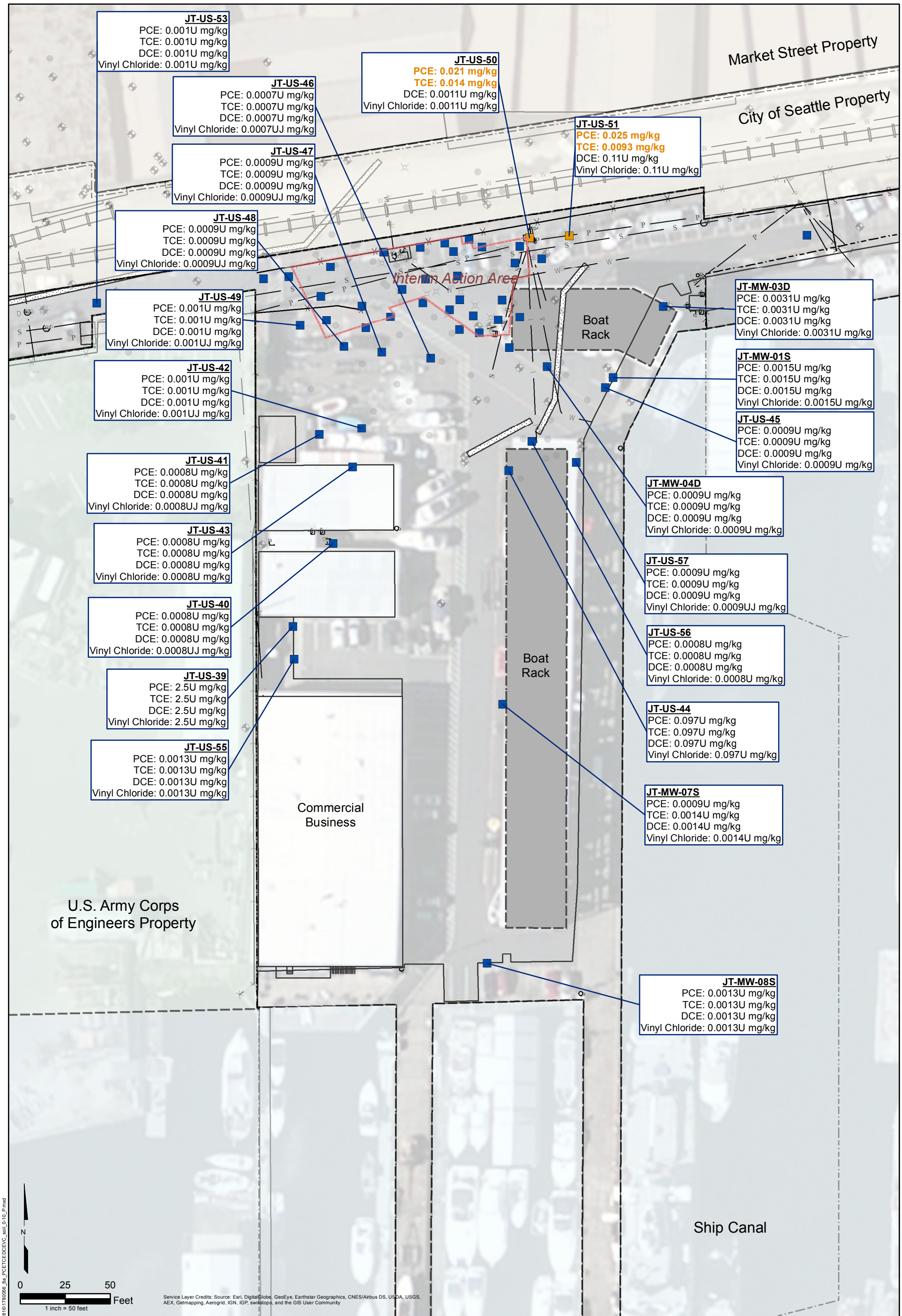
HARTCROWSER

Figure
7c

L:\Notebooks\17800\56_Jacobson Terminal Property RI-FS\GIS\Documents\Updates_032015\17800\56_7c_DieselRangeOrganicsBenzene_Soil_18_P.mxd



-Soil Samples-

- Below Screening Criteria
- Above Screening Criteria

Screening Levels

PCE = Tetrachloroethene: 0.015 mg/kg
DCE = 1,1-Dichloroethene: 0.0011 mg/kg
TCE = Trichloroethene: 0.0023 mg/kg
Vinyl Chloride: 0.0005 mg/kg

Location Name → **JT-US-51**
PCE: 0.11 mg/kg
TCE: 0.0093 mg/kg
DCE: 0.0009U mg/kg
Vinyl Chloride: 0.0009U mg/kg

Results in orange exceed soil screening level.

- Fence Line
- Property Boundary
- Utility Line
- Water Line
- Sanitary Sewer Line
- Overhead Power
- Historical Soil Boring
- Historical Sediment Sample
- Injection Well
- Existing Monitoring Wells

Notes:
1. Base map prepared from AutoCAD file 020030-02.dwg by Aspect Consulting, 10/08/13.
2. Utility locations are approximate.
3. Sample locations presented on figure, but not identified were collected during the 2013-14 RI and are identified in the 2014 Interim Action Work Plan (IAWP).
4. Highest concentration within depth interval presented.

Jacobson Terminals
Seattle, Washington

PCE, TCE, DCE, and Vinyl Chloride in Soil (0 – 10 feet bgs)

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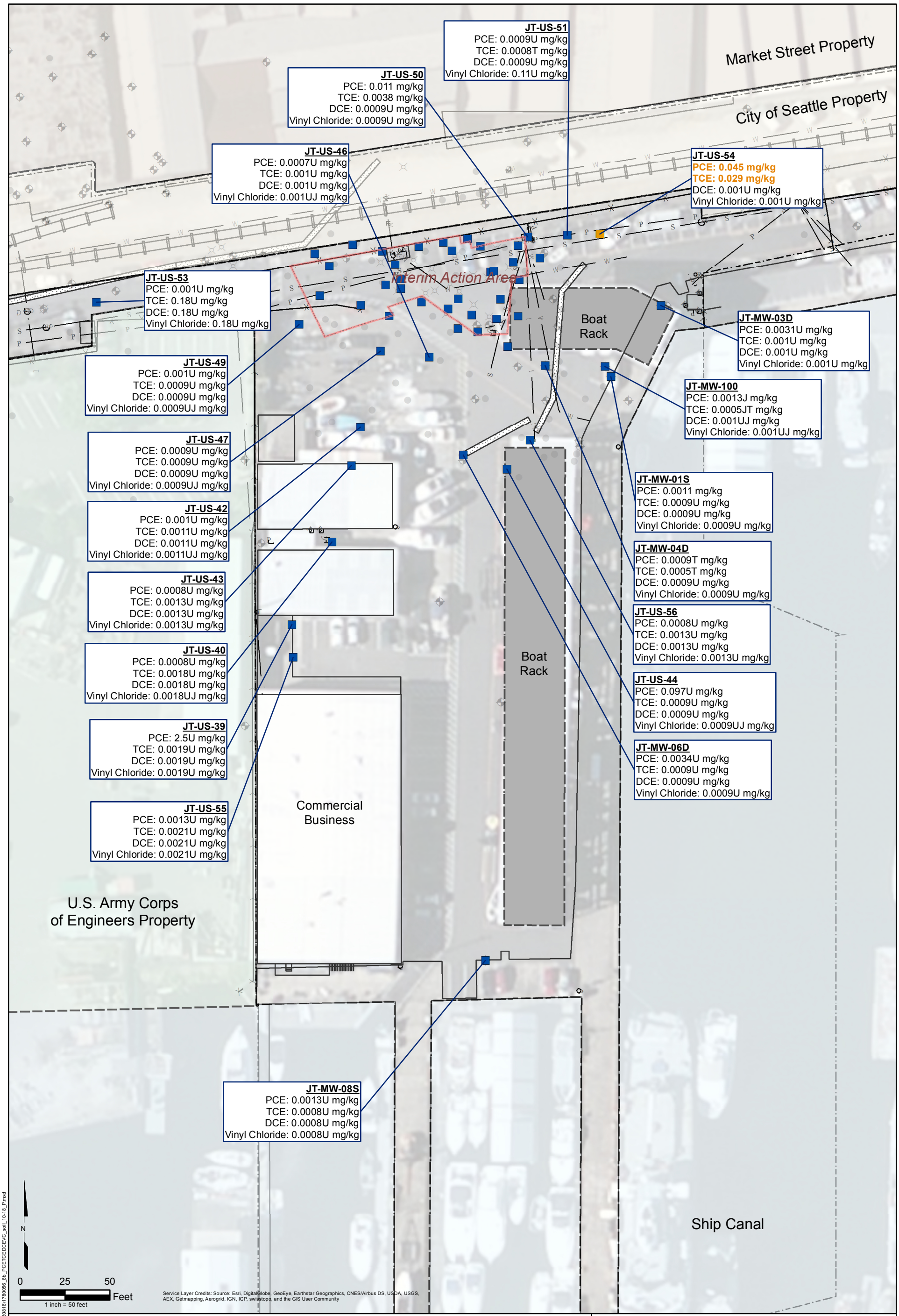
HARTCROWSER

Figure **8a**

C:\GIS_WORKING\17800056_Jacobson\GIS\Documents\Updates_020816\1780056_8a_PCETCEDCEVC_soil_0-10_P.mxd



Soil Samples
- Below Screening Criteria
- Above Screening Criteria

Screening Levels
PCE = Tetrachloroethene: 0.015 mg/kg
DCE = 1,1-Dichloroethene: 0.0011 mg/kg
TCE = Trichloroethene: 0.0023 mg/kg
Vinyl Chloride: 0.0005 mg/kg

Location Name → **JT-US-54**
PCE: 0.045 mg/kg
TCE: 0.029 mg/kg
DCE: 0.001U mg/kg
Vinyl Chloride: 0.001U mg/kg
Results in orange exceed soil screening level.

- Fence Line
- Property Boundary
- Utility Line
- Water Line
- Sanitary Sewer Line
- Overhead Power
- Historical Soil Boring
- Historical Sediment Sample
- Injection Well
- Existing Monitoring Wells

Notes:
1. Base map prepared from AutoCAD file 020030-02.dwg by Aspect Consulting, 10/08/13.
2. Utility locations are approximate.
3. Sample locations presented on figure but not identified were collected during the 2013-14 RI and are identified in the 2014 Interim Action Work Plan (IAWP).
4. Highest concentration within depth interval presented.

Jacobson Terminals
Seattle, Washington

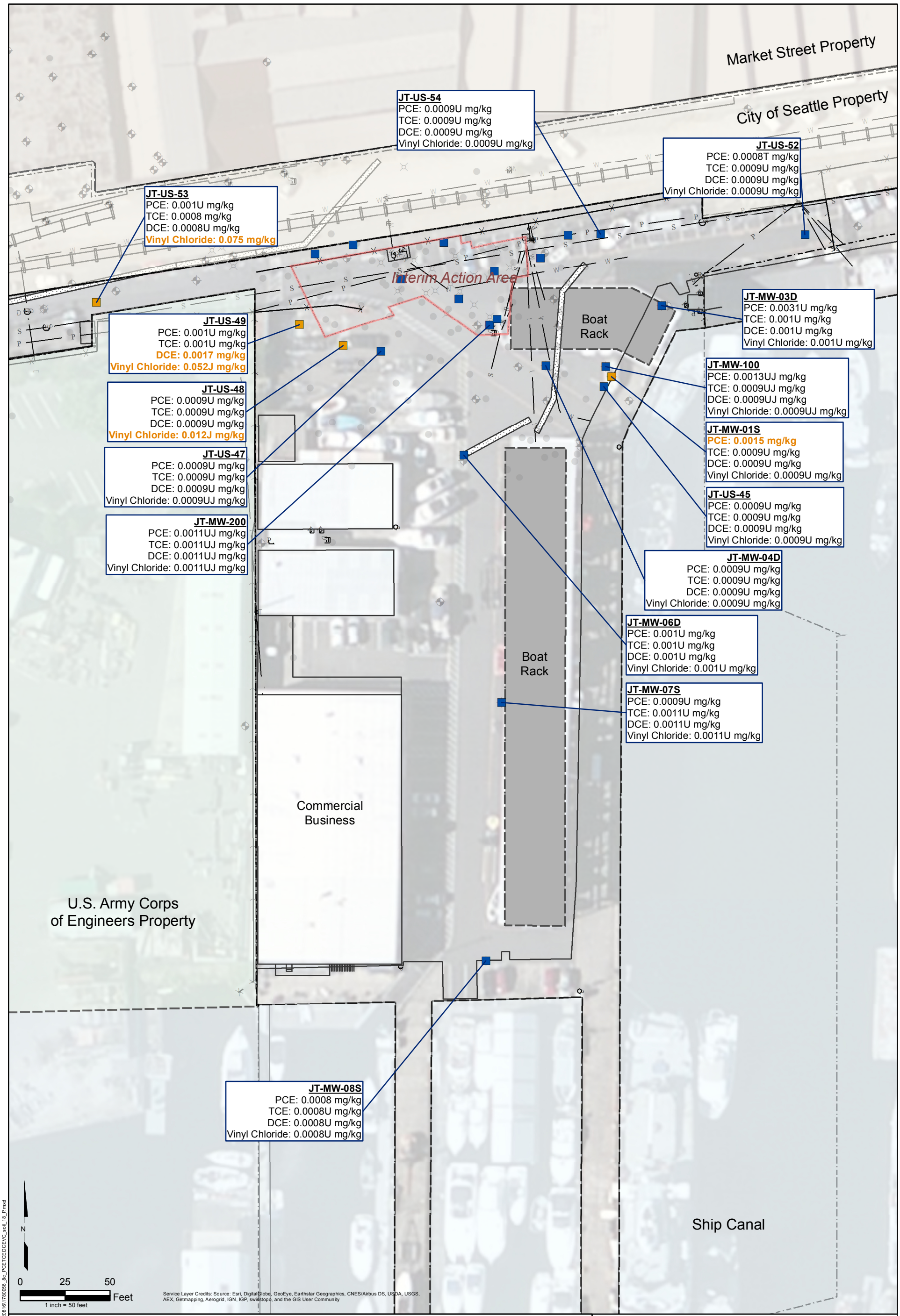
PCE, TCE, DCE, and Vinyl Chloride in Soil (10 – 18 feet bgs)

17800-56 2/16

HARTCROWSER

Figure **8b**

C:\GIS_WORKING\17800056_Jacobson\GIS\Documents\Updates_020816\17800056_8b_PCETCEDCEVC_soil_10-18_P.mxd



Soil Samples

- Below Screening Criteria
- Above Screening Criteria

Screening Levels

PCE = Tetrachloroethene: 0.015 mg/kg
DCE = 1,1-Dichloroethene: 0.0011 mg/kg
TCE = Trichloroethene: 0.0023 mg/kg
Vinyl Chloride: 0.0005 mg/kg

Location Name → **JT-US-52**
PCE: 0.002T mg/kg
TCE: 0.0009U mg/kg
DCE: 0.0009U mg/kg
Vinyl Chloride: 0.0009U mg/kg

Results in orange exceed soil screening level.

- Fence Line
- Property Boundary
- Utility Line
- Water Line
- Sanitary Sewer Line
- Overhead Power
- Historical Soil Boring
- Historical Sediment Sample
- Injection Well
- Existing Monitoring Wells

Notes:
1. Base map prepared from AutoCAD file 020030-02.dwg by Aspect Consulting, 10/08/13.
2. Utility locations are approximate.
3. Sample locations presented on figure but not identified were collected during the 2013-14 RI and are identified in the 2014 Interim Action Work Plan (IAWP).
4. Highest concentration within depth interval presented.

Jacobson Terminals
Seattle, Washington

PCE, TCE, DCE, and Vinyl Chloride in Soil (18+ feet bgs)

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HARTCROWSER

Figure **8c**

C:\GIS_WORKING\17800056_Jacobson\GIS\Documents\Updates_020816\17800056_8c_PCETCEDCEVC_soil_18_P.mxd

Market Street Property

City of Seattle Property

JT-US-50
70 mg/kg
depth: 2.75ft.

JT-US-51
2350 mg/kg
depth: 1.75ft.

JT-MW-03D
79.9 mg/kg
depth: 5.75ft.

Interim Action Area

Boat Rack

JT-US-53
2.8 mg/kg
depth: 7.75ft.

JT-MW-01S
3.1 mg/kg
depth: 8.25ft.

JT-US-45
2.4 mg/kg
depth: 7.75ft.

JT-US-41
2.2 mg/kg
depth: 7.25ft.

JT-SS-06
188 mg/kg

JT-US-42
2.8 mg/kg
depth: 6.75ft.

JT-SS-08
132 mg/kg

JT-US-44
9.2 mg/kg
depth: 5.75ft.

JT-US-43
12.7 mg/kg
depth: 6.25ft.

JT-US-39
3.7 mg/kg
depth: 2.25ft.

Boat Rack

JT-SS-07
203 mg/kg

JT-MW-07S
1770 mg/kg
depth: 3.25ft.

Commercial Business

U.S. Army Corps of Engineers Property

JT-SS-09
296 mg/kg

JT-MW-08S
15.8 mg/kg
depth: 8.25ft.

JT-SS-10
169 mg/kg

Ship Canal

N

0 25 50 Feet

1 inch = 50 feet

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Soil Samples
- Below Method A Unrestricted (250 mg/kg)
- Above Method A Unrestricted (250 mg/kg)

Sediment Samples
- Below SCO Screening Level (360 mg/kg)

Location ID **JT-MW-08S**
Concentration 15.8 mg/kg
Depth (upper) of sample depth: 8.25ft.

- Fence Line
- Property Boundary
- Utility Line
- Water Line
- Sanitary Sewer Line
- Overhead Power
- Historical Soil Boring
- Historical Sediment Sample
- Injection Well
- Existing Monitoring Wells

Notes:
1. Base map prepared from AutoCAD file 020030-02.dwg by Aspect Consulting, 10/08/13.
2. Utility locations are approximate.
3. Sample locations presented on figure but not identified were collected during the 2013-14 RI and are identified in the 2014 Interim Action Work Plan (IAWP).
4. Highest concentration within depth interval presented.

Jacobson Terminals
Seattle, Washington

Lead in Soil (0 – 10 feet bgs) and Sediment

17800-56 4/15

HARTCROWSER

Figure **9a**

L:\Notebooks\17800\56_Jacobson Terminal Property RI-FS\GIS\Documents\Updates_032015\17800\56_9a_Lead_SoilSediment_0-10_P.mxd

Market Street Property

City of Seattle Property

Interim Action Area

Boat Rack

JT-MW-01S
2 mg/kg
depth: 13.25ft.

JT-SS-06
188 mg/kg

JT-SS-08
132 mg/kg

JT-US-40
11.2 mg/kg
depth: 10.25ft.

JT-US-44
3.4 mg/kg
depth: 15.25ft.

JT-US-39
11.1 mg/kg
depth: 12.75ft.

JT-SS-07
203 mg/kg

Boat Rack

Commercial Business

U.S. Army Corps of Engineers Property

JT-MW-08S
26.7 mg/kg
depth: 13.25ft.

JT-SS-09
296 mg/kg

JT-SS-10
169 mg/kg

Ship Canal

N

0 25 50 Feet

1 inch = 50 feet

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Soil Samples
- Below Method A Unrestricted (250 mg/kg)
- Above Method A Unrestricted (250 mg/kg)

Sediment Samples
- Below SCO Screening Level (360 mg/kg)

Location ID **JT-US-40**
Concentration 11.2 mg/kg
Depth (upper) of sample depth: 10.25ft.

- Fence Line
- Property Boundary
- Utility Line
- Water Line
- Sanitary Sewer Line
- Overhead Power
- Historical Soil Boring
- Historical Sediment Sample
- Injection Well
- Existing Monitoring Wells

Notes:
1. Base map prepared from AutoCAD file 020030-02.dwg by Aspect Consulting, 10/08/13.
2. Utility locations are approximate.
3. Sample locations presented on figure but not identified were collected during the 2013-14 RI and are identified in the 2014 Interim Action Work Plan (IAWP).
4. Highest concentration within depth interval presented.

Jacobson Terminals
Seattle, Washington

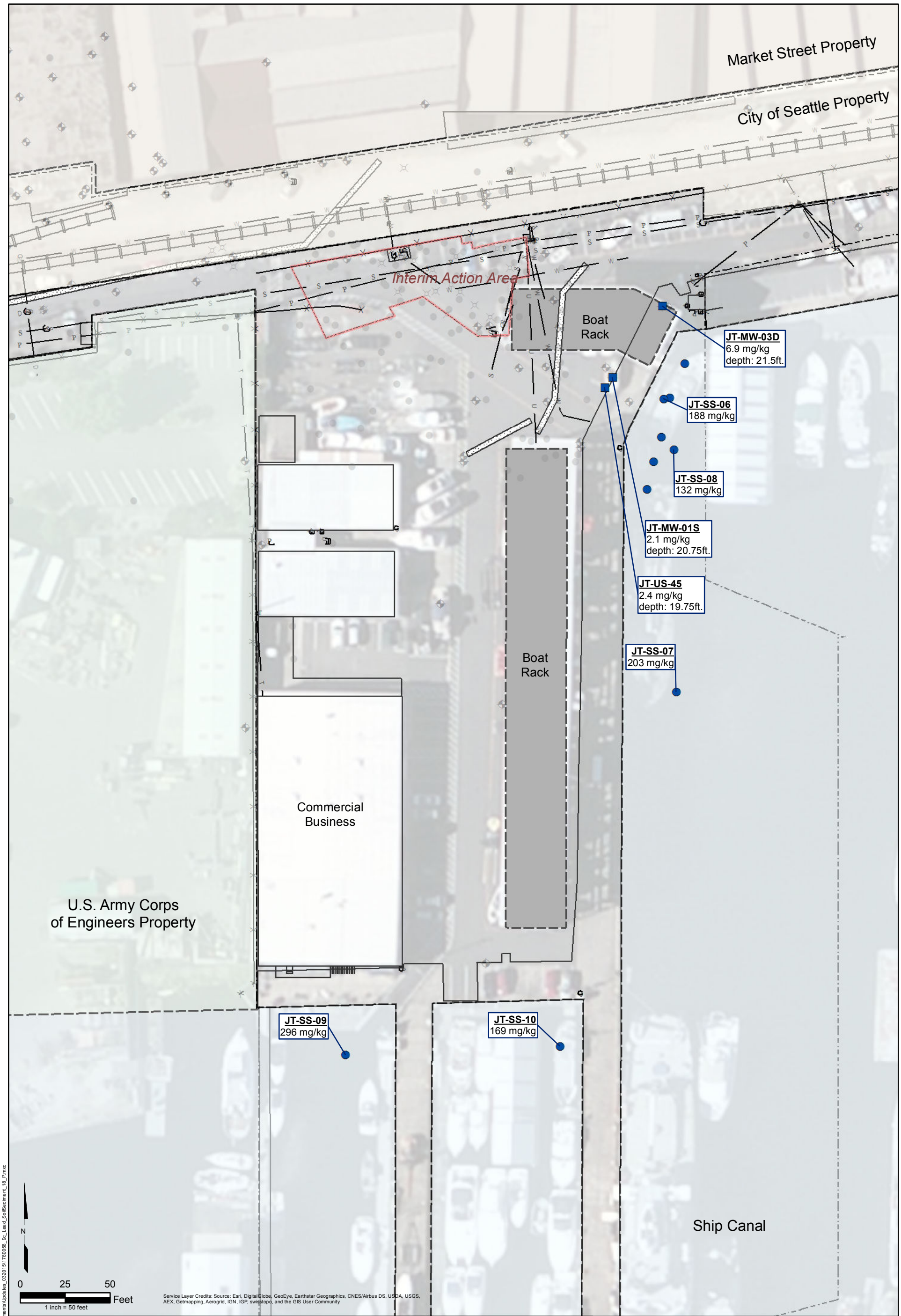
Lead in Soil (10 – 18 feet bgs) and Sediment

17800-56 4/15

HARTCROWSER

Figure **9b**

L:\Notebooks\17800\56_Jacobson Terminal Property RI-FS\GIS\Documents\Updates_032015\17800\56_9b_Lead_SoilSediment_10-18_P.mxd



Soil Samples
- Below Method A Unrestricted (250 mg/kg)
- Above Method A Unrestricted (250 mg/kg)

Sediment Samples
- Below SCO Screening Level (360 mg/kg)

Location ID: JT-MW-01S
Concentration: 2.1 mg/kg
Depth (upper) of sample: depth: 20.75ft.

- Fence Line
- Property Boundary
- Utility Line
- Water Line
- Sanitary Sewer Line
- Overhead Power
- Historical Soil Boring
- Historical Sediment Sample
- Injection Well
- Existing Monitoring Wells

Notes:
1. Base map prepared from AutoCAD file 020030-02.dwg by Aspect Consulting, 10/08/13.
2. Utility locations are approximate.
3. Sample locations presented on figure but not identified were collected during the 2013-14 RI and are identified in the 2014 Interim Action Work Plan (IAWP).
4. Highest concentration within depth interval presented.

Jacobson Terminals
Seattle, Washington

Lead in Soil (18+ feet bgs) and Sediment

17800-56 4/15

HARTCROWSER

Figure
9c

L:\Notebooks\17800\56_Jacobson Terminal Property RI-FS\GIS\Documents\Updates_032015\17800\56_9c_Lead_SoilSediment_18_P.mxd