Harris Avenue Shipyard

Remedial Investigation/ Feasibility Study Data Report

Prepared for

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List of Abbreviations and Acronyms

Acronym/ Abbreviation	**Definition**
All American	All American Marine, Inc.
ALS	ALS Environmental
AO	Agreed Order
APH	Air-phase petroleum hydrocarbon
AST	Aboveground storage tank
Bay	Bellingham Bay
BBS	Bellingham Bay Shipyards
bgs	Below ground surface
Cascade	Cascade Drilling
COC	Contaminant of concern
COI	Chemical of interest
cm	Centimeter
cPAH	Carcinogenic polycyclic aromatic hydrocarbon
CSL	Cleanup Screening Level
CSM	Conceptual Site Model
CUL	Cleanup level
CY	Cubic yards
DNR	Washington State Department of Natural Resources
Ecology	Washington State Department of Ecology
EIM	Environmental Information Management
HRA	Historical Research Associates, Inc.
HSA	Hollow Stem Auger
IDW	Investigation derived waste
LNAPL	Light non-aqueous phase liquid
MCI	Maritime Contractors, Inc.
MCUL	Minimum Cleanup Level
µg/L	Micrograms per liter
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
MLLW	Mean Lower Low Water
MTCA	Model Toxics Control Act

Acronym/ Abbreviation	**Definition**
PAF	Pacific American Fisheries
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PID	Photoionization detector
PMA	Port Management Agreement
Port	Port of Bellingham
ppm	Parts per million
PSDDA	Puget Sound Dredged Disposal Analysis
Puglia	Puglia Engineering
RETEC	The RETEC Group
RI/FS	Remedial Investigation/Feasibility Study
SAP/QAPP	Sampling and Analysis Plan and Quality Assurance Project Plan
Site	Harris Avenue Shipyard
SSI	Supplemental Site Investigation
SMS	Sediment Management Standards
SQS	Sediment Quality Standards
SVOC	Semivolatile organic compound
TBT	Tributyltin
TEQ	Toxicity Equivalency Quotient
TOC	Total organic carbon
TPH	Total petroleum hydrocarbons
USEPA	U.S. Environmental Protection Agency
UV	Ultraviolet
VOC	Volatile organic compound
WAC	Washington Administrative Code

1.0 Introduction

This document presents data collected from multiple environmental investigations conducted at the Harris Avenue Shipyard (Site) in Bellingham Bay (Bay), located at 201 Harris Avenue in Bellingham, Washington (Figure 1.1). Specifically, this document summarizes data from all investigations conducted under the jurisdiction of the Agreed Order (AO) between the Washington State Department of Ecology (Ecology) and the Port of Bellingham (Port) for cleanup of the Site, and some relevant previous investigations. Results from historical investigations conducted in both the sediment and uplands at the Site are presented, as well as results from the Supplemental Site Investigation (SSI) conducted between March and August 2011 per the Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan; Floyd|Snider 2011).

This document is being prepared in accordance with AO No. 7342. Per the AO, the data report presents the compilation of available information and data for the Site and makes general conclusions. A detailed Site evaluation, including definitions of cleanup standards, contaminants of concern (COCs), and remedial alternatives will be presented in the Site-Wide Remedial Investigation/Feasibility Study (RI/FS) in 2012.

1.1 BACKGROUND AND OVERVIEW

The Site is 1 of 12 sediment cleanup sites around the Bay coordinated by the Bellingham Bay Demonstration Pilot Project and was identified as high priority by Ecology in 2000 in a comprehensive strategy developed in cooperation with the Bellingham Bay Demonstration Pilot Team.[1]

The Port and Ecology entered into an initial AO (No. DE-03TCPBE-5670) in August 2003. The AO described the requirement to complete a final RI/FS for site sediments, pursuant to Washington Administrative Code (WAC) 173-340-350 and WAC 173-204-560.[2] On behalf of the Port, The RETEC Group (RETEC) completed a draft RI/FS for marine sediments in May 2004, which was then amended in January 2006. The RI/FS was conducted under Ecology's direction, consistent with the Washington State Model Toxics Control Act (MTCA) and the Sediment Management Standards (SMS). Work Plan development for the Draft Sediments RI/FS, and some sampling was initially done under the Voluntary Cleanup Program while negotiations proceeded toward finalizing the initial AO.

In October 2007, Ecology and the Port agreed to expand the scope of work performed at the Site to provide a Site-Wide RI/FS. This decision was in large part a natural progression, informed by the collection of information regarding source control at the Site and review of the draft sediment-focused work products.

A new AO (No. 7342) was signed between Ecology and the Port in March 2010 that governs completion of the upland and sediment RI/FS as one, site-wide process. The new AO was issued pursuant to the MTCA Revised Code of Washington 70.105D.050(1) and supersedes AO No. DE-03TCPBE-5670. A Final Site-Wide RI/FS Work Plan, as specified in Exhibit B of the AO, was finalized on January 19, 2011. The RI/FS Work Plan defined requirements for completion of

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[1] The Bellingham Bay Demonstration Pilot Team is a partnership of 14 federal, tribal, state, and local agencies that have developed a cooperative approach to expedite sediment cleanup, source control, and habitat restoration for sediment cleanup sites around the Bay.

[2] The upland portions of the Site were not included in the initial AO or addressed in the Sediments RI/FS.

the SSI and accompanying data report (Floyd|Snider 2011). This RI/FS Data Report presents the results of SSI field activities completed in March and August 2011, in context with historical data, as required by the RI/FS Work Plan. The Data Report is an interim deliverable in support of the Site-Wide RI/FS development.

1.2 SUPPLEMENTAL SITE INVESTIGATION OBJECTIVES

The objective of the SSI was to characterize upland Site conditions, address the upland and sediment data gaps identified in the RI/FS Work Plan, and better define the site-wide Conceptual Site Model (CSM) in order to better define a recommended cleanup alternative that will meet MTCA criteria and be consistent with the Port's goals for an active shipyard.

The SSI addressed data gaps identified in the uplands by collecting additional soil and groundwater samples and installing additional groundwater monitoring wells. To address data gaps in the marine sediments, bank/intertidal and nearshore sediment samples were collected.

1.2.1 Study Areas and Field Investigation Activities

The SSI included several field investigation activities to address data gaps and to better understand and confirm findings of known historical contamination in the uplands and nearshore sediments. In addition to the field investigation activities, historical research was completed to identify the potential for encountering cultural resources (archaeological and historical) during any ground-disturbing activities (further summarized below in Section 2.5).

The primary SSI work consisted of a utility survey, installation of exploratory Geoprobe borings and monitoring wells, two rounds of groundwater sampling, intertidal and nearshore sediment sampling and subsequent analytical laboratory testing of soil, groundwater, and sediment samples, and professional land survey of all locations.

For purposes of this field investigation and data presentation, study areas were defined at the Site, as summarized in the RI/FS Work Plan. These areas include the following and are shown on Figure 1.2:

- ***Northern Shoreline Area—***In general, the Northern Shoreline Area encompasses the waterfront area from the pier to the eastern property line, and north of the inner harbor line.
- ***Marine Railway and Sidetracks Area—***The Marine Railway and Sidetracks Area (termed the Marine Railway Area) is located in between the main pier and the finger pier. The marine railway is also connected to upland sidetracks where boats can be stored during work activities. This is one of the most heavily used areas for upland activities. Shipbuilding and launching activities were conducted in this Area during the 1940s and now the Area is used for sandblasting.
- ***Former Union Oil Aboveground Storage Tank Area—***The Former Union Oil Aboveground Storage Tank (AST) Area (known as the Former AST Area) is east of the Marine Railway Area. A former Union Oil AST was previously located here in the 1930s and 1940s. The tank, which contained approximately 100,000 gallons of bunker oil, was removed in the late-1940s or early-1950s.
- ***Paint Shop and Sandblast Shed (Former Joiner Shop) Area—***The Paint Shop and Sandblast Shed Area (referred to as the Paint Shop Area) is located in the

upland portion of the Site to the south of the Marine Railway Area. The joiner shop was formerly located in the area of the current paint shop and sandblast shed. This Area, along with the Marine Railway Area, was one of the most heavily used areas for upland activities and was used for painting and caulking as well as shipbuilding activities.

The specific field investigation activities completed within these study areas included the following, with specific locations shown on Figure 1.3:

- Advancement of 22 soil borings throughout the Site in the following areas: the Northern Shoreline Area (FS-01 to FS-09d), the Marine Railway Area (FS-10 and FS-11), the Former AST Area (FS-12 to FS-15), and the Paint Shop Area (FS-16 to FS-18) for collection of soil and select groundwater screening samples for chemical analyses using the analytical methods described below in Sections 4.3 and 5.2.4.
- Installation of five groundwater monitoring wells in the Northern Shoreline Area (MW-02A and MW-06 to MW-09) for collection of soil and groundwater samples for chemical analyses using the analytical methods described below in Section 5.2.4.
- Completion of a 72-hour tidal study at selected monitoring wells, described in Section 5.7.
- Archaeological monitoring of soil borings and monitoring well installation by a field archaeologist, described in Section 2.5.
- Collection and chemical analyses of groundwater samples from two rounds of groundwater monitoring (during dry and wet seasons) from monitoring wells (MW-1 through MW-09), described in Section 5.0.
- Installation of eight shallow soil borings by hand auger (HA-1 to HA-8) for collection of bank/intertidal samples and chemical analyses using the analytical methods described in Section 6.3.
- Contingency sampling of three nearshore surface sediment grab samples (SG-1, SG-3, and SG-4) for chemical analyses using the analytical methods described in Section 6.3.

All data collection and analysis activities were conducted in accordance with Appendix C of the RI/FS Work Plan, the Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP) (Floyd|Snider 2011).

1.3 REPORT ORGANIZATION

The data report is organized as follows:

- **Section 2.0—Site Description and Setting:** Provides information on the location, ownership, and current land use of the facility.
- **Section 3.0—Regulatory Process, Site Screening Criteria, and Site Chemicals of Interest:** Presents the current regulatory framework and MTCA requirements for the Site, as well as site screening levels. Presents a list of primary targeted Site Chemicals of Interest (COIs).
- **Section 4.0—Upland Soil Investigations and Analytical Results:** Presents the uplands soil investigation procedures including a description of field methods,

documentation procedures, and work plan deviations. Field activities described include soil sampling, groundwater monitoring well installation and soil sampling, and light non-aqueous phase liquid (LNAPL) Assessment sampling procedures. Presents laboratory analytical methods and a summary of analytical results including both current and historical investigations.

- **Section 5.0—Groundwater Investigations and Analytical Results:** Presents the uplands groundwater investigation procedures including a description of field methods, documentation procedures, and work plan deviations. Field activities described include groundwater monitoring, well development and sampling, and tidal study assessment procedures. Presents descriptions of laboratory analytical methods and a summary of groundwater analytical results and tidal study results including both current and historical investigations.
- **Section 6.0—Sediment Investigations and Analytical Results:** Presents the bank/intertidal and nearshore surface sediment contingency procedures including a description of field methods, documentation procedures, and work plan deviations. Field activities described include bank/intertidal and offshore sediment sampling. Presents descriptions of laboratory analytical methods and requirements, and a summary of sediment sampling results including both current and historical investigations.
- **Section 7.0—Site Summary:** Presents interpretation of the results of the SSI, incorporating the results of previous investigations relative to the nature and extent of contamination on the Site.
- **Section 8.0—Data Management and Validation:** Presents a summary of data quality objectives and compliance for all media sampled and Environmental Information Management information for both historical and current data.
- **Section 9.0—Next Steps and Schedule:** Discusses the next steps and schedule for the remaining tasks to be completed as part of the RI/FS process.
- **Section 10.0—References:** Presents the reference information for materials cited in this document.

2.0 Site Description and Setting

2.1 LOCATION, CURRENT SITE OWNERSHIP, AND SITE HISTORY

2.1.1 Location

Figure 1.2 shows the location of the Site at 201 Harris Avenue, within an industrial area of Bellingham, Washington. The Site consists of approximately 7 acres of upland and over-water operational area. The Site is bounded on the north and west sides by the Bay and on the south by Bellingham Marine Park and the Burlington Northern Rail lines.

Industrial properties, owned by the Port, are present to the east and southeast of the Site. The properties to the east include the Bellingham Cruise Terminal, operated by the Port as the southern terminus for the Alaska State ferry, and the former Arrowac Fisheries building, now leased by Puglia Engineering (Puglia).

2.1.2 Current Site Ownership

Current site activity is confined to two active upland and offshore lease areas, currently occupied by Puglia and All American Marine, Inc. (All American), as shown on Figure 2.1. An executed Port Management Agreement (PMA) in 1995 with Washington State Department of Natural Resources (DNR) granted primary property-management authority to the Port for multiple harbor-area parcels that were previously managed by DNR. These PMA Parcels (5, 6, and 9) are shown on Figure 2.1. As a result of the PMA, the Port currently manages these multiple harbor-area parcels for the State of Washington, including the aquatic and historical infill lands of the Puglia Lease Area (Port Lease Parcel A) and the All American Lease Area, which is a portion of PMA Parcel 6.

The Puglia Lease Area is operated as Fairhaven Shipyards and is subdivided into three parcels, identified as Port Lease Parcels A, B, and C, respectively, based on Port leasehold maps dated August 31, 2006.

- Port Lease Parcel A is primarily an offshore parcel composed of land owned by the State of Washington (but managed by the Port) and includes both aquatic lands and lands of harbor infill above the high waterline that are located between the inner and outer harbor lines. Port Lease Parcel A includes portions of PMA Parcels 6 and 9.
- Port Lease Parcel B is located to the south of Port Lease Parcel A and is an upland parcel that has been owned by the Port since 1966 and was previously leased by Bellingham Bay Shipyards (BBS).
- Port Lease Parcel C is an upland parcel owned by the Port and is located at the southeastern corner of the Site.

The All American Lease Area is located in the southwestern corner of the Site and is composed of land owned by the Port and a portion of PMA Parcel 6.

All American conducts all manufacturing operations within the lease area inside the Fabrication and Maintenance Building and currently does not conduct fabrication or repair activities near the shoreline area over-water or in-water. The interior portion of the facility is used only for the construction of aluminum passenger vessels. The exterior portion of the property is used for employee parking and the storage of aluminum on wood pallets. A limited quantity of used paints and oil, consisting of two storage drums, is currently stored in a small covered shed located in the northwest corner of the property outside of the Fabrication and Maintenance Building. All materials are currently stored in secondary containment in the storage shed. Once vessel fabrication activities are completed at the All American facility, the vessels are placed on a trailer and launched at the shipyard for testing before product delivery. All refueling of vessels occurs at the nearby Ferry Terminal facility.

As shown on Figure 2.1, there are aquatic lands located immediately to the west of the All American Lease Area (PMA Parcel 5). No shipyard operations are currently being performed by Puglia or All American within the PMA Parcel 5 area and no previous tenants have leased this area from the Port. In the 1940s, however, historical ship building activities are documented to have occurred in this area of PMA Parcel 5, and were investigated as part of the Draft Sediments RI/FS effort documented by RETEC in 2004. Results of the investigation did not indicate exceedances of cleanup criteria in this area (RETEC 2004).

2.1.3 Site History

The Site has been used by various entities for industrial purposes since the early-1900s. Shipyard activity began at the property in 1915 with Pacific American Fisheries (PAF). In May 1915, PAF leased the property from the State of Washington and then purchased it in 1916. After the purchase, PAF used the shipyard facilities to construct wooden fishing boats and cannery operations were conducted to the east of the shipyard at the present Arrowac Fisheries and Alaska Ferry Terminal properties.

In 1937, significant filling of the shoreline in west and north portions of the Site was performed, expanding the uplands by approximately 4 acres as shown on Figure 2.2. Nearly all of the Site property has been utilized at some point in the past for shipbuilding or repair. Maps from the Port’s archive files and reports of historical investigations at the Site indicate that shipway structures occupied the western and northern sides of the property in the 1940s. From 1942 to 1945, PAF subleased the property to the Northwestern Shipbuilding Company.

During the 1930s and 1940s, an AST for ship fuel was located near the main dock and operated by Union Oil (also known as Unocal). The bunker fuel tank had a reported capacity of 100,000 gallons and was removed in the late-1940s or early-1950s (RETEC 2004).

During World War II, PAF constructed wooden ships for use during the war. Salvaging of Liberty Ships was reportedly conducted in the post-war era on the north side of the Site (in the existing Parcel A).

In 1966, the PAF property, including the shipyard, was purchased by the Port. Since purchase of the land by the Port, the property has been leased by several different companies for use as a shipyard. Based on Port lease files and review of the RETEC investigations and Sediments RI/FS report, the following dates summarize the recent history of shipyard tenants and activities:

- 1968: Post Point Marine leases the property and changes their company name to Post Point Industries in June 1970.
- 1971: Associated Venture Capital purchases Post Point Industries and changes their company name to Fairhaven Shipyard.

- 1971: Weldit Corporation purchases Fairhaven Shipyard and changes their company name to Fairhaven Industries, Inc.
- 1982: Dry Dock No. 2 is replaced with the existing dry dock structure. Records indicate that approximately 25,000 cubic yards (CY) of sediment were dredged under an U.S. Army Corps of Engineers permit in 1982 to accommodate the existing dry dock structure. These sediments were generally removed from the southern end of the existing dry dock and were disposed of at an authorized open-water disposal site.
- 1985: Maritime Contractors, Inc. (MCI), acquires the existing Weldit lease. MCI establishes a new lease agreement with the Port in 1986.
- 1998: MCI terminates operations and sells company assets to BBS, who initiates a new lease agreement with the Port.
- 2002: Puglia and All American enter into leases with the Port, dividing the property into two separate operations.

2.2 CURRENT UPLAND AND OVER-WATER USE

The Site is currently zoned for water-dependent industrial use. The majority of the PAF buildings have been removed from the Site with the exception of the main office building and the pier building. The former joiner shop was used for a variety of activities including painting and caulking. The shipyard site operates on a pier, dry dock, marine railway, and various mobile and floating cranes in addition to using upland support service shops such as a machine shop, electrical shop, steel fabrication and mechanical shop, valve shop, sandblast shed and paint shop, and water treatment building.

An extensive network of utilities exists at the Site, including storm drains, sanitary sewer, natural gas, water, and electrical. A stormwater outfall located at the Site was plugged between 1994 and 1997, but was then extended with a diffuser and reactivated for discharge. Catch basins draining to this outfall were shared between the two site tenants. In 2004, stormwater drainage at the shipyard was reconfigured such that stormwater from primary industrial areas of the Site are now collected for discharge to the City of Bellingham’s publicly-owned treatment works.

Puglia currently provides dry-docking and mooring capabilities and other support services for vessels. The marine railway, located in the middle of the north side of the Site, was formerly connected to a series of sidetracks where boats were stored during work activities. The marine railway, sidetracks, and former joiner shop currently remain some of the most heavily used portions of upland property for existing shipyard operations. The sidetracks area is currently used for sandblasting and other maintenance and repair operations even though the sidetracks are no longer connected to the main marine railway line.

Current over-water shipyard activities are generally confined to the marine railway, dry dock, and pier areas on the north side of the Site.

All American uses two upland trailers for offices and a large upland warehouse (Fabrication and Maintenance Building) for vessel manufacturing activities. The Fabrication and Maintenance Building is located in the southwestern portion of the yard and was constructed in the 1970s. The building has a concrete slab and footing foundation. All American also shares part of the

Machine Shop building with Puglia for storage. All of the All American manufacturing activities are performed inside the Fabrication and Maintenance Building.

2.3 PHYSICAL SETTING

This section describes the physical setting that is specific to the Site, including geology, hydrogeology, marine environment, sea-level rise, substrate types present near the shoreline, and historical and archaeological cultural resources.

The shipyard property is low and flat, with an elevation less than 20 feet above the Mean Lower Low Water (MLLW) datum. The shoreline is armored with riprap and there are concrete block bulkheads on the north side of the property. Most of the upland area is covered with gravel; however, there is some asphalt and concrete in the area of the painting booths near the marine railway structure as a result of recent stormwater management site upgrades. The shoreline slopes are generally steep and reinforced with armor material (riprap and bulkheads) to approximate elevation 0 feet MLLW.

Mudline elevations in the aquatic site area range from approximate elevations 0 to -45 feet MLLW. Over-water site feature structures include the Main Pier, which houses the loft and pier shops, several smaller docks, one dry dock, and the Marine Railway Area as shown on Figure 1.2. The marine railway extends approximately 200 feet to the north from the shoreline, is timber pile-supported, and is generally elevated above the mudline except on the upland portion of the Site.

2.3.1 Geology

Test pit, soil boring, and monitoring well data collected during the Phase 2 Soil and Groundwater Investigation (RETEC 1998b) and from the SSI (Floyd|Snider 2011) indicated that beneath surficial gravel and asphalt the Site is generally covered by fill soils ranging in thickness and composition.

Historically, a fill project was completed in the 1930s contributing up to 15 feet of fill along the western extent of the shipyard. Fill material in this area was observed as being predominately sand and silty sand, but also included gravel and shell fragments. The presence of shell fragments indicate that dredged sediments were likely used as part of the fill material in the western and northern extent of the shipyard.

In general, the majority of the soil columns contained multiple lenses of sandy fills, containing low to moderate amounts of gravels. In the central and eastern portions of the shipyard the fill thickness appears to range between 3 to 10 feet. Anthropogenic debris was intermixed with sand and gravel in these areas as well. It should be noted that alluvial and/or tidally dredged fill sands were hard to distinguish from possible undisturbed and intact native sediments.

In general, underlying native soil consisting of silty sands was observed under the fill material throughout the shipyard, and in some areas was interbedded with silt and peat. A silt lens was identified below 10 feet in some locations, but did not appear to be a contiguous layer that would benefit as an aquitard.

2.3.2 Hydrogeology

Groundwater is first observed within sandy soils at depths ranging between 8 to 11 feet below ground surface (bgs) and extends to a minimum of at least 25 feet bgs (the deepest soil boring advanced at the Site). Groundwater potentiometric maps and presumed groundwater flow direction will be developed during the RI/FS based on the data collected during the SSI. Groundwater was determined to be tidally influenced with variable degrees of influence depending on well location and subsurface features. Further detail and results of the tidal study are discussed below in Section 5.7.

2.3.3 Marine Setting

For the majority of the main shipyard (Puglia lease area Parcel A and the western portion of Port Parcel 6) and Port Parcel 5 area, sediment surface elevations slope away from the shoreline (at approximate elevation 0 feet MLLW) to bottom elevations ranging from -30 to -35 feet MLLW. Slope grades in these areas range from 3H:1V at the steepest to as shallow as 12H:1V with shallow slopes generally located at the north end of the Site. Some eel grass beds are present in a shallow offshore area at the southern end of Port Parcel 5.

The sediment bathymetry contours around the existing dry dock are irregular compared to the general shipyard area. As documented in the investigation reports prepared by RETEC and in Port files, dredging was completed in 1982 in the area of the southern footprint of the existing dry dock to achieve required water depths to accommodate the structure. The footprint of this dredging event is still evident in the most current bathymetry data.

General sediment stratigraphy at the Site consists of a mixture of silt and sand to an approximate depth of 5 feet below the mudline. The underlying layer consists mainly of sand and gravel and provides a firm bottom beneath the upper recent sediment deposits. Gravelly material is also observed near the sediment surface in the previously dredged area at the existing dry dock and Main Pier. Silty sediment is observed in the southern portion of Parcel 5, in the vicinity of the eel grass beds.

Anthropogenic debris is observed within the main shipyard area, with the greatest abundance of debris located in the area immediately east of the pier building. In this area, metal cable, rope, shovels, and cobbles are prevalent. The presence of a debris pile, approximately 4-feet high and 6-feet in diameter, has also been identified in the area underneath the main pier beneath the loft and pier shops. The debris pile appears to consist of concrete or other material with a calcified coating.

For the purpose of the Site-Wide RI/FS and based on information provided by Ecology, an estimate of potential sea-level rise in the Bay over the next 100 years is approximately 2.4 feet above current mean sea level, with a low probability of a very high potential sea level rise of 50 inches (provided in a January 2008 report by the University of Washington and Ecology). While marine facilities typically are designed to operate at current sea level conditions, sea level rise will be considered during the RI/FS process.

2.4 CULTURAL RESOURCES

Historical Research Associates, Inc. (HRA) was retained by the Port to complete a cultural resources records and literature search and subsequent recommended archaeological monitoring for the SSI, as described in the RI/FS Work Plan (Floyd|Snider 2011).

Based on the results of the records search and literature review, and known archaeological sites in the vicinity of the Site, HRA recommended that archaeological monitoring be completed in the southeastern portion of the Site near the location of the original shoreline during monitoring well installation and soil boring activities associated with the SSI.

An HRA field archaeologist was present on March 14 and 16, 2011 during monitoring well installation and soil boring activities to observe fill soils overlaying the historical tidal flats, within low to medium probability zones for archaeological artifacts.

In general, HRA observed cultural materials including isolated metal, brick, and glass artifacts in the historical-period fill layers. As expected, these were largely isolated finds, and were not formally recorded as an archaeological site. In addition, Floyd|Snider observed what appeared to be an intact piling in close proximity to the original shoreline area. HRA also noted the presence of possible concrete foundations, buried approximately 6 feet bgs in the eastern portion of the surveyed area and approximately 1 to 2 feet bgs in the southern portion of the surveyed area.

The results are summarized in the *Cultural Resources Records Research and Literature Review Report* and the *Archaeological Monitoring Report* included in Appendix A. The reports in this appendix have been redacted from parties that should not have knowledge of sensitive-site location information.

3.0 Regulatory Process, Site Screening Criteria, and Site Chemicals of Interest

As described in Section 1.1, this RI/FS Data Report is being produced in accordance with the AO and provides a summary of all the available historical data and the data from the recent SSI. This document provides a brief evaluation of the data and includes site observations using screening criteria methods. The Site-Wide RI/FS will be developed in 2012 and will provide a more detailed evaluation of the Site including development of cleanup levels (CULs), COCs, and remedial alternatives for the Site.

This section identifies the methods for developing the screening levels that are used in this document and the targeted COIs.

3.1 REGULATORY PROCESS AND SCREENING CRITERIA

The primary cleanup regulations that apply to this Site are the MTCA Chapter 173-340 WAC and the SMS, Chapter 173-204 WAC.

Site screening criteria were developed in order to provide a better understanding of the key constituents at the Site and are used in this document to evaluate the data. Site-specific cleanup standards will be developed and established during the Site-Wide RI/FS in conjunction with Ecology, the Port, and other site stakeholders and responsible parties.

Site screening criteria are based on MTCA Method A and C Industrial CULs for soil, MTCA Method A and B CULs for groundwater, and SMS numerical criteria for sediments. Site screening criteria from the RI/FS Work Plan was updated to include site screening criteria for additional parameters that were added for new chemicals analyzed in the SSI. Site screening criteria are shown in the tables in Sections 4 through 6 for their respective media.

Historical chemical data and recent data from the SSI are compared to the site screening criteria as a screening tool to develop an understanding of environmental compliance status in upland and in-water media.

3.2 SITE CHEMICALS OF INTEREST

COIs selected for analysis in the SSI were based on review of historical chemical data in the upland soil and groundwater and intertidal/nearshore sediments, as discussed in the RI/FS Work Plan. COIs for upland soils were defined as metals and diesel-, gasoline-, and oil-range total petroleum hydrocarbons (TPH). Additional chemicals were also selected for soil and groundwater chemical analysis that were not previously analyzed for in soil and groundwater at the Site. These included semi-volatile organic compounds (SVOCs), volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), and tributyltin (TBT). The COIs for intertidal/nearshore sediments were defined as metals, SVOCs, TBT, and PCBs.

As described in Section 9.1 of the RI/FS Work Plan, although dioxins are not assumed to have originated from past or current operations at the Site, Ecology feels they may be comingled with other contaminants and could eventually become a COC later in the RI/FS process. As agreed to by Ecology, characterization of dioxins and furans is expected to take place after Ecology review of the Draft Site-Wide RI/FS and before preparation of the Final RI/FS.

3.3 SITE-SPECIFIC CLEANUP LEVELS AND CHEMICALS OF CONCERN

The Site-Wide RI/FS Work Plan presented a preliminary CSM based on the physical conditions at the Site, findings from previous investigations, potential sources of sediment contamination, and contaminant transport and exposure pathways and is shown on Figure 3.1. Development of the preliminary CSM assisted in identifying data gaps for the SSI.

As part of the Site-Wide RI/FS process, a revised CSM will be prepared for the Site and site-specific CULs will be developed. The CSM will include a comprehensive understanding of contaminants and sources, the nature and extent of contamination, fate and transport processes, and exposure pathways and receptors. The CULs will be based upon the remedial action objectives for the Site and will include an evaluation of the groundwater, soil, and sediment, their interactions with one another, and their relationship to the surface water of the Bay. The COIs will be evaluated relative to these site-specific CULs and the site COCs will be determined.

4.0 Upland Soil Investigations and Analytical Results

This section summarizes the previous uplands soil investigations and the results of the recently conducted SSI. Table 4.1 presents a Frequency of Exceedances table that summarizes the full set of soil analytical results from the SSI and all previous investigations. This table also shows the maximum concentrations per analyte and its ratio to the screening criteria. Table 4.2 presents the analytical results of detected constituents in all the soil samples.[3] Exceedances of the screening criteria in soil results are presented in Figures 4.1 through 4.3 and are summarized below. Refer to Appendix B for the full set of analytical results.

4.1 PREVIOUS INVESTIGATIONS

4.1.1 Pre-1998 Sampling and Ecology Inspections

Limited sampling of upland soil was performed prior to the initial work by RETEC beginning in 1998, as described below.

In March 1993, Ecology conducted a Solid and Hazardous Waste Inspection and noted sandblast grit and stained soil near the sandblast shed, former joiner shop, marine railway, and sidetracks areas. Later that year Ecology and MCI took grab samples at three upland locations (Soil 1, Soil 2, and Soil 3) and found detections of metals, SVOCs, PCBs, and TPH in surface soil down to 8 inches. Most concentrations were less than site screening criteria.

In 1993, MCI, a former tenant, excavated an unknown amount of petroleum-contaminated soil from the Marine Railway Area as an improvement action for stormwater control at the Site. Petroleum-contaminated soil from the marine railway was excavated as part of improvements to stormwater control at the shipyard. Soil was tested and designated non-hazardous, petroleum-contaminated soil.

4.1.2 RETEC Phase 2 Soil Sampling—1998

In April and May 1998, Environmental Site Assessment (ESA) Phase 2 sampling was conducted by RETEC in the upland areas of the Site to provide baseline information relative to a change in the leasehold at the property. As part of the Phase 2 investigation, RETEC installed five monitoring wells (MW-1, MW-2, MW-3, MW-4, and MW-5) to characterize potential soil contamination and define hydrogeologic properties at the facility, as described below in Section 5.1.1. Select soil samples were taken during well installation to analyze for metals, VOCs, and TPH contamination. Additionally, test pits were excavated and soil samples were taken for the same criteria as stated above. Arsenic was detected at several locations in exceedance of the MTCA Method C site screening criterion, mainly in the Northern Shoreline Area and Former AST Area but also in the Paint Shop Area at TP-4. The highest concentration of arsenic was found at TP-10, located in the upgradient edge of the Northern Shoreline Area.

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[3] In some cases, elevated concentrations of chemicals exceeded the range of the detector, requiring analysis with dilution to obtain valid results, which also resulted in a slightly elevated reporting limit for associated analytes and samples. Non-detect results that were greater than site screening criteria due to raised reporting limits were not flagged as exceedances. Refer to Appendix B for all current and historical results.

Contamination was present in soil samples collected at depth during the installation of MW-2 and in a test pit location located to the south of MW-2. Diesel-range TPH was detected in soil at 13,000 mg/kg and motor oil at 8,000 mg/kg in MW-2. Gasoline was detected at 240 mg/kg.

In general, soil sampling confirmed that metals, TPH, and polycyclic aromatic hydrocarbon (PAH) compounds are present in subsurface soil at concentrations exceeding MTCA Method A site screening criteria and, in some samples, greater than Method C industrial site screening criteria (Table 4.2; Figures 4.1 through 4.3). TPH was detected at several locations, including the Former AST Area, the Marine Railway Area, and the northwestern corner uplands area, with the highest concentration located in the Northern Shoreline Area. In the Former AST Area and Paint Shop Area, PAH compounds are thought to be related to the hydrocarbon contamination in those Areas. Other contamination in the Paint Shop Area is reported to be derived from coal tars or treated-wood debris generated during shipbuilding activity prior to its demolition (RETEC 1998b).

4.1.3 RETEC Uplands Source Control Sampling—August 2005

The RETEC working Draft Sediments RI/FS was completed for Ecology review in 2006 and incorporated results of supplemental uplands source control sampling performed in August 2005. As part of this investigation, soil samples were collected from borings located within the Marine Railway Area—a known area of contamination with elevated metals and TPH. Three upland soil locations (i.e., S-3, S-4, and S-5) were analyzed for VOCs, PCBs, SVOCs, TBT, metals, TPH (including diesel- and motor oil-range hydrocarbons and gasoline), and total organic carbon (TOC).

At upland soil sample S-5, located between the marine railway and the former Union Oil AST, diesel-range TPH, PAHs, and low-level gasoline-range TPH increased in concentration with depth, which was consistent with previous RETEC investigations (Table 4.2 and Figures 4.1 through 4.3). At S-3, located on the capped portion of the marine railway, TPH-diesel also exceeded site screening criteria for gasoline and diesel-range TPH down to 4 feet bgs. S-4, located directly west of the marine railway, had concentrations of gasoline-range TPH exceeding site screening criterion down to 8 feet bgs.

All three locations had elevated detections of copper, mercury, and zinc, which were consistent with previous Ecology and RETEC investigations and are thought to be due to the presence of sandblast grit. Mercury was detected at levels exceeding MTCA site screening criterion as was arsenic, which exceeded the site screening criterion at all three locations in soil down to 6 feet bgs.

4.2 SUPPLEMENTAL SITE INVESTIGATION—MARCH 2011

In accordance with the RI/FS Work Plan, upland soil investigation activities were conducted at the Site between March 14 and 17, 2011. Twenty-two soil borings were advanced via Geoprobe in the upland area to define the extent and depth of known and potentially unknown COIs in historical fill placed along the Northern Shoreline Area, Marine Railway Area, Former AST Area, and Paint Shop Area. Boring locations were determined based on interpretation and evaluation of existing analytical data, as well as recorded field conditions and site access. Additional step-out borings were completed in select locations to define vertical and horizontal extent of contamination. Select soil samples were also collected during monitoring well installation. The following section describes the work performed, including a description of field methods, analytical results, and any deviations from the RI/FS Work Plan.

4.2.1 Geoprobe Soil Sampling

4.2.1.1 Field Methods

Soil borings were advanced using direct-push technology (i.e., Geoprobe) by Cascade Drilling of Woodinville, Washington (Cascade) in accordance with the procedures described in the RI/FS Work Plan (Floyd|Snider 2011). Soil sample locations are shown on Figure 1.3. Boring logs are included in Appendix C. Representative photographs of soil boring advancement and sample collection are included in Appendix D.

Field screening with a photoionization detector (PID) was conducted to identify intervals with potential contamination and to identify appropriate sampling intervals for VOCs. Visual and olfactory observations of contamination such as sheen and odor were also monitored and documented on the boring logs, as discussed below. In general, at least two samples were collected in each soil boring location—one at approximately 2 to 4 feet bgs and one upon reaching the native layer (i.e., 8 to 10 feet bgs). Additional samples were collected when field screening techniques indicated hydrocarbon or other signs of contamination. Field decontamination and sample collection procedures were followed according to the methods described in the SAP/QAPP of the RI/FS Work Plan. Samples were delivered on ice to ALS Environmental (ALS) laboratory in Everett, Washington, under standard chain-of-custody procedures and analyzed using the analytical methods described below in Section 4.3.

4.2.1.2 Field Observations

Generally, fill consisting of gravelly to sandy soil with shell fragments was seen in most locations from ground surface down to approximately 7 feet bgs. Anthropogenic material such as wood, brick, plastic, and concrete debris were seen in many locations, primarily in the fill. Sandblast grit was also observed in many locations from surface down to 3 feet bgs. In most locations, dredged fill was identified approximately between 7 to 15 feet bgs. As noted above in Section 2.3.1, the dredged fill was difficult to distinguish from intact native soil found at greater depths ranging from approximately 8 to 25 feet bgs throughout the Site.

In addition to anthropogenic debris, hydrocarbon odors and/or odors from treated wood and the presence of moderate to heavy sheen were observed in the following borings (refer to Appendix C for monitoring well and boring logs):

- FS-01—moderate sheen and hydrocarbon odor between 8.75 and 9.1 feet bgs, and heavy sheen and strong asphalt-like odor from 24 to 25 feet bgs.
- FS-09—sheen and light to strong hydrocarbon odor 0.5 feet bgs down to approximately 18.5 feet bgs. A series of step-out borings were completed (FS-09a, -09c, and -09d) and similarly identified very strong naphthalene odor and sheen from the surface down to 19 feet bgs.
- FS-11—slight sheen and strong odor from 1 to 7 feet bgs.
- FS-12—slight blebs of sheen at 16 feet bgs.
- FS-14—hydrocarbon odor and slight sheen at 7.5 feet bgs.

- FS-15—moderate sheen and odor at 12 feet bgs.

4.2.2 Monitoring Well Installation Soil Sampling

4.2.2.1 Field Methods

Five monitoring wells (MW-02A and MW-06 through MW-09) were installed by Cascade using standard Hollow Stem Auger (HSA) techniques following the “Minimum Standards for Construction and Maintenance of Wells” from WAC 173-160 and procedures described in the RI/FS Work Plan (Floyd|Snider 2011). During installation, well construction details were recorded on monitoring well logs and are included in Appendix C.

Five new monitoring wells (MW-02A and MW-06 through MW-09) were installed along the Northern Shoreline Area to better assess the groundwater-to-surface water interface and to expand the network of wells for the 72-hour tidal study. Two of the five wells (MW-02A and MW-09) were replacement wells for MW-2 and MW-1; however, MW-1 was later located after the installation of MW-09 had already been completed. With the installation of five new groundwater wells, a network of eight wells is in place for monitoring along the northern shoreline and upgradient areas.

Split-spoon soil samples were collected during the installation of the five monitoring wells. Soil samples were collected every 2 feet using an 18-inch split-spoon sampler and were described and classified according to the Unified Soil Classification System (USCS) and photographed. Soil samples were documented on monitoring well logs and are included in Appendix C. Select photographs are included in Appendix D.

Field screening with a PID was conducted to identify intervals of potential contamination and to identify appropriate sampling intervals. Visual and olfactory observations of contamination such as sheen and odor were also monitored and documented on the monitoring well logs, as discussed below. Field decontamination and sample collection procedures were followed according to the methods described in the SAP/QAPP of the RI/FS Work Plan. Samples were delivered on ice to ALS under standard chain-of-custody procedures and analyzed for Site COIs using the analytical methods described below in Section 4.3.

4.2.2.2 Field Observations

As part of well installation and soil sample collection, field observations were recorded as described in Section 4.1.2. Similar to soil boring locations described above, fill consisting of gravelly to sandy soil with shell fragments was seen in most locations down to about 7 feet bgs. Anthropogenic materials such as wood, brick, plastic, and concrete debris were observed in many locations. Sandblast grit was also observed in many locations from the surface down to 3 feet bgs. Underlying intact native soil ranging from approximately 8 to 15 feet bgs consists of fine to coarse grained sand with silt and gravels and silty sands throughout the Site.

In addition to anthropogenic debris, hydrocarbon odors and the presence of sheen and LNAPL were observed in the following well locations (refer to Appendix C for details):

- MW-02A—sheen and strong to light petroleum odor from 6 to 13 feet bgs.
- MW-06—strong petroleum odor and sheen from approximately 9 to 10 feet bgs.

- MW-09—strong petroleum odor and heavy sheen at 5 feet bgs decreasing to slight odor and sheen at 13 feet bgs.

4.2.3 Analytical Methods

The soil samples collected for the SSI were analyzed for some or all of the following constituents using the analytical methods summarized below in accordance with Table C.1 of the SAP/QAPP in the RI/FS Work Plan (Floyd|Snider 2011):

- Metals (silver, arsenic, chromium, copper, lead, nickel, and zinc) by U.S. Environmental Protection Agency (USEPA) Method 6020.
- Mercury by USEPA Method 7471.
- TPH (diesel- and oil-range) by NWTPH-Dx with silica acid gel cleanup.
- TPH (gasoline-range) by NWTPH-Gx.
- VOCs by USEPA Method 8260.
- SVOCs by USEPA Method 8270.
- PCBs by USEPA Method 8082.
- TBT by Krone 1988.

4.2.4 LNAPL Assessment

Throughout soil sampling, locations were assessed for the presence and thickness of LNAPL. To assist in the identification of hydrocarbon zones and to verify field observations, two representative petroleum-saturated (i.e., heavy sheen and significant hydrocarbon odor) zone soil cores from soil boring FS-09 and Monitoring Well MW-09 were sent to PTS Laboratory in Santa Fe Springs, California, for digital ultraviolet (UV) imaging. The samples were also analyzed for moisture content and pore fluid saturation by API Method RP 40 and ASTM D2216, respectively.

Additionally, per Ecology’s request, in order to assess if any vapor risk exists on-site, two soil gas samples were collected at these locations when LNAPL was identified during drilling to assess if any vapor risk exists on-site. Ecology was immediately notified and each sample was collected in a pre-evacuated Summa Canister and sent to Air Toxics Laboratory in Folsom, California, for analysis of air-phase petroleum hydrocarbons (APHs) in ambient air and soil gas by the Massachusetts APH Department of Environmental Protection Method.

LNAPL sampling techniques are summarized in the SAP/QAPP of the Final RI/FS Work Plan (Floyd|Snider 2011) and analytical methods and results are described below.

4.2.4.1 Ultraviolet Photography Results

The results of the UV imaging are attached in Appendix E. In summary, both samples tested positive for NAPL, per the pore fluid saturation results and the UV imaging results. Specifically, the sample collected from 9 to 10 feet bgs at FS-09 had a pore fluid saturation of 11.2 percent NAPL. The sample collected from 3.5 to 4.5 feet bgs at MW-09 had a pore fluid saturation of 8.1 percent. Additionally, both samples show hydrocarbon fluorescence throughout the core sample, as indicated in the images contained in the laboratory package (Appendix E). The interpretation of the pore saturation and UV imaging will be discussed in the Site-Wide RI/FS.

4.2.4.2 Soil Gas Sampling Results

The results of the soil gas sampling are provided in Appendix E. As described below in Section 4.7, only one Summa Canister had sufficient vacuum to collect a sample. This sample was collected at MW-09 at 3.5 feet bgs. The results were non-detect for all APH target analytes and the C_9–C_{10} aromatic hydrocarbon ranges. There were detections of the C_5–C_8 aliphatic hydrocarbon ranges and the C_9–C_{12} aliphatic hydrocarbon ranges, with 86,000 and 36,000 micrograms per cubic meter (µg/m^3), respectively.

4.2.5 Investigation Derived Waste

All soil generated by soil boring installation and well construction was collected and transferred to new, Department of Transportation-approved 55-gallon steel drums. Drums were lidded, sealed, labeled with an indelible marker, and stored on-site while material profiling was conducted.

In May 2011, seven drums containing soil investigation derived waste (IDW) generated during the March 2011 field event were transported from the Site to Emerald Service’s recycling facility in Seattle, Washington, for disposal.

4.2.6 RI/FS Work Plan Deviations

As described above in Section 4.2.2.1, at the time of drilling, Monitoring Well MW-1 could not be located (i.e., it was initially thought inaccessible) and a monitoring well was installed in the same area as a replacement. MW-1 was subsequently found and the replacement well was named MW-09 and serves as an additional shoreline well in the monitoring network.

As part of the SSI, an existing groundwater monitoring well, MW-3, was unable to be located and therefore was unable to be sampled. Based on previous data available from this well and data collected from the recent investigation, it was decided that analytical data from this well (or a new well installed in its place) is not necessary for completion of the Site-Wide RI/FS. Ecology provided concurrence with this decision on April 21, 2011.

As described in Section 4.2.4.2 above, setup error prevented one of the Summa Canisters from being sampled.

No other deviations from the RI/FS Work Plan occurred during the upland soil investigation of the SSI.

4.2.7 Upland Soil Analytical Results

The data presented here are the results of the SSI conducted in 2011, and include samples taken during soil boring advancement and monitoring well installation. Laboratory analytical reports for the SSI are available in Appendix E on CD-ROM. Exceedances of analytes from previous investigations, as discussed earlier, are shown along with SSI exceedance data in Figures 4.1 through 4.3.

TPH (diesel, heavy oil, and gasoline ranges) was detected in 36 of 57 samples analyzed for TPH. Three locations exceeded MTCA Method A criterion for gasoline-range TPH (FS-01, MW-02A, and MW-09). Four locations exceeded MTCA Method A criterion for diesel-range hydrocarbons (FS-09, FS-09c, FS-11, and MW-09). Oil-range TPH exceeded at two locations (FS-17 and MW-02A). The highest gasoline-range TPH result was found at MW-02A at 7.5 feet bgs with a concentration of 280 mg/kg. The highest diesel- and oil-range TPH were also found at MW-02A with concentrations of 18,000 and 6,300 mg/kg, respectively (Figure 4.1).

There were detections of metals in all samples analyzed for metals; however, only four samples exceeded the site screening criteria. These exceedances were primarily of arsenic and occurred at FS-03, FS-12, FS-13, and MW-09 in soil ranging from 1.5 to 5 feet bgs (Figure 4.2). Mercury slightly exceeded MTCA A at FS-13.

Toxicity Equivalency Quotients (TEQs) for carcinogenic polycyclic aromatic hydrocarbons (cPAHs) were calculated according to MTCA (WAC 173-340-900, Table 708-1) in two ways: with non-detect values set to zero, and with non-detects set to one-half of the reporting limit. cPAHs were detected in 13 of 57 soil samples analyzed with a minimum TEQ of 0 mg/kg (non-detect equal to zero) and 0.07 mg/kg (non-detect equal to one half the reporting limit) in many of the locations. The maximum TEQ calculated was 7.8 mg/kg (both equal to zero and half the reporting limit) at FS-17 in the 6.5 to 7.5 feet bgs interval. Only 4 of the 57 analyzed exceeded the MTCA Method A site screening criteria of 2 mg/kg (FS-01, FS-09, FS-09c, and FS-17; Figure 4.3); none exceeded the MTCA Method C site screening criteria.

Multiple VOCs were detected in the 57 analyzed soil samples. Out of these detects, there were only three exceedances of MTCA Method A and all were of naphthalene at FS-09, FS-09a, and FS-09c in the range of 6.5 to 9.5 feet bgs. The highest naphthalene exceedance was at FS-09 with 160 mg/kg in the 8 to 8.5 feet bgs interval. There were no MTCA Method C site screening criteria exceedances.

PCBs were detected in 8 of 16 soil samples analyzed for PCBs. There were no exceedances of any of the site screening criteria.

4.2.8 Upland Soil Data Revisions

Upon review of the historical data, it was determined that several samples had incorrectly been included in previous reports as existing soil samples and have since either been removed from the database and subsequent analysis or placed in the correct media database. These changes are described below.

Soil sample “Marine Railway” had been identified as a pre-1998 sample location in the RI/FS Work Plan. Upon review of the 1998 Phase 2 Sampling Report, it became clear that this sample was sampled in May 1994 by MCI and Hart Crowser as part of the excavation for the Marine Railway Sumps, and the soil containing the sample was removed during this installation. Therefore, this sample location and its results are not included in this Data Report and will not be used in the RI/FS.

All the samples from the August 2005 sampling event conducted to assess source control, and included in Appendix P of the Draft Sediments RI/FS, were identified as soil samples in the database provided by RETEC. Upon further review, it was determined that the samples were collected in intertidal sediment, capped sediment, and upland soil. Based on that information, the samples collected at exposed intertidal locations S-1 and S-2 have been identified as sediment samples. Samples from the capped railway area location S-3 is still retained as upland soil data, as are samples from upland soil locations S-4 and S-5.

5.0 Groundwater Investigations and Analytical Results

This section summarizes the previous groundwater investigations and the results of the recently conducted SSI. Table 5.1 presents a Frequency of Exceedances table that summarizes the full set of monitoring well groundwater analytical results from the SSI and previous groundwater investigations. This table also shows the maximum concentrations per analyte. Table 5.2 presents the analytical results of detected COIs in groundwater samples taken from Site monitoring wells[4]. Exceedances of the screening criteria in groundwater results are presented in Figures 5.1 and 5.2. Refer to Appendix B for the full set of analytical results.

5.1 PREVIOUS INVESTIGATIONS

5.1.1 RETEC Phase 2 Sampling—1998

As mentioned in Section 4.1.2, during the Phase 2 upland sampling, RETEC installed five monitoring wells to define hydrogeologic properties at the facility including depth to groundwater, tidal influence on groundwater elevations, and hydraulic conductivity. Gasoline- and diesel-range hydrocarbons were detected in groundwater from MW-1, located downgradient of the former Union Oil AST, with diesel-range TPH exceeding site screening criterion with a concentration of 4,600 micrograms per liter (µg/L). Diesel-range TPH also exceeded site screening criterion in groundwater at MW-4, located north of the paint shop and sandblast shed at a concentration of 730 µg/L.

VOCs were generally not detected in groundwater during the Phase 2 sampling, with the exception of ethylbenzene, xylenes, and several alkylbenzenes at MW-1. Acetone was detected in the well downgradient from the former Union Oil AST, which was reported to be attributable to petroleum contamination. Dissolved metals were detected in several samples from monitoring wells. Concentrations of metals generally reflected natural background concentrations. Groundwater samples were reportedly very turbid as monitoring wells were not sampled using a low-flow sampling protocol (RETEC 1998b).

5.1.2 RETEC Uplands Source Control Sampling—August 2005

As part of this investigation, groundwater was collected from Well MW-4 located upgradient of the nearshore area. It was analyzed for total and dissolved metals, diesel- and oil-range TPH, PAHs, and PCBs. The well had no detections for PAHs, PCBs, or TPH. Dissolved metals were not detected or were much less than site screening criteria.

5.2 SUPPLEMENTAL SITE INVESTIGATION, MARCH–JULY 2011

Groundwater investigation activities were conducted at the Site between March 14 and 23, 2011 and on July 29, 2011. Groundwater screening samples were collected at select soil boring locations in the upland area during soil advancement via Geoprobe and at all monitoring wells (newly installed and existing) to define the extent and depth of chemicals. As described in

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[4] Due to some analytes in the analysis method exceeding the range of the detector, analysis at a dilution was required to obtain valid results, which also resulted in a slightly elevated reporting limit for some analytes and samples. Non-detect results that were greater than site screening criteria due to raised reporting limits were not flagged as exceedances. Refer to Appendix B for all current and historical results.

Section 1.2.2, soil borings were advanced along the Northern Shoreline Area to better assess the groundwater to surface water interface and to install additional monitoring wells to expand the network of monitoring wells for the 72-hour tidal study.

The following section describes the work performed during the SSI, including a description of field methods, analytical results, and any deviations from the RI/FS Work Plan.

5.2.1 Monitoring Well Installation

Five new monitoring wells (MW-02A and MW-06 through MW-09) were installed along the Northern Shoreline Area. Two of the five wells were intended to be replacement wells for MW-1 and MW-2. A replacement monitoring well (MW-02A) was installed for the existing well that could not be located (MW-2) along the Northern Shoreline Area; however, MW-1 was located after the replacement well had been installed. The replacement well was renamed MW-09. With the installation of five new groundwater wells, a network of eight wells is in place for groundwater monitoring along the Northern Shoreline Area and upgradient area.

5.2.1.1 Field Methods

Monitoring wells were installed following the “Minimum Standards for Construction and Maintenance of Wells” in WAC 173-160. All monitoring wells were completed by Cascade. Well locations are shown in Figure 1.3. The boreholes for the wells were drilled using standard HSA techniques. Auger boreholes were advanced using a 4-inch inner diameter auger. As summarized in Section 4.2.2.1, split-spoon soil samples were collected every 2 feet during completion of well drilling activities. The well screen placement was determined and adjusted in the field as work progresses based on soil samples collected and inferred groundwater elevations at each well location. The objective was to place the well screen within the permeable soils and, if possible, avoid lenses of silt or confining layers.

In general, monitoring wells were constructed with 5-foot screens set approximately 10 feet bgs. All wells were constructed of 2-inch diameter, flush-threaded, Schedule 40 polyvinyl chloride (PVC) well casings and screens. The sand filter pack was installed by pouring sand into the space between the well casing and auger as the auger was withdrawn. A weighted tape was used to monitor filter pack placement and depth during installation. The sand filter pack extended 3 feet above the top of the screened interval. A minimum 2-foot thick seal of hydrated bentonite chips was installed in the annular space immediately above the sand filter pack and hydrated with potable water. The remainder of the annular space was sealed with bentonite grout or hydrated bentonite chips to within 1 foot of the ground surface. The monitoring wells were secured with flush-to-ground steel protective monuments with expansion seals on the well casing to minimize the potential for surface water entering the monument.

Well development was completed by continuous pumping at a steady rate using a whale pump. Wells were developed using the described methodologies or equivalents of at least 48 hours following well installation. Well development equipment was decontaminated by pumping clean water through the pump and washing to the satisfaction of the field technical staff. Installed wells were labeled with a permanent marker on the well casing on the well cover of flush mounts.

On March 17, 2011, Pacific Surveying and Engineering, Inc. (PSE) surveyed all monitoring well locations. Horizontal data were reported in North American Datum of 1983 (NAD83), Washington State Plane North Elevation; vertical data were reported in North American Vertical Datum of 1988 (NAVD88). Monitoring well elevations were measured at ground surface and at the top of the well casing at the north-facing measuring point.

5.2.2 Monitoring Well Sampling

5.2.2.1 Field Methods

All eight monitoring wells were sampled and submitted for analyses to confirm the presence and concentration of COIs.

Groundwater samples were collected from existing and newly installed groundwater monitoring wells during two sampling events. The initial baseline groundwater monitoring event was conducted after well development and after the completion of the tidal study during a low tide cycle in the wet season on March 23 and 24, 2011. The second groundwater sampling event occurred 4 months later during the dry season on July 29, 2011.

Field decontamination and sample collection procedures were followed according to the methods described in the SAP/QAPP of the RI/FS Work Plan (Floyd|Snider 2011). Samples were delivered on ice to ALS in Everett, Washington under standard chain-of-custody procedures and analyzed for Site COIs using the analytical methods described below in Section 5.2.4.

During groundwater sampling, field water quality parameters (i.e., turbidity, dissolved oxygen, etc.) were recorded on groundwater sampling forms. Groundwater elevations measured prior to sample collection and any observations such as sheen and/or odor were also recorded.

5.2.3 Geoprobe Groundwater Screening Sampling

5.2.3.1 Field Methods

In addition to sampling groundwater from monitoring wells, groundwater screening samples were collected directly from soil boring locations with retractable temporary well screen samplers. The groundwater sample was collected as the pumped water began to clear. After collection, the polyethylene tubing was discarded and the screen and related equipment was decontaminated between uses. At most locations, the sample was collected between 5 to 10 feet below the groundwater surface. Salinity was measured at each boring location prior to sample collection. At all locations salinity was much less than 5,000 parts per trillion (ppt).

Groundwater screening samples and methods were followed per Appendix C in the RI/FS Work Plan (Floyd|Snider 2011). Samples were delivered on ice to ALS in Everett, Washington under standard chain-of-custody procedures and analyzed for Site COIs using the analytical methods described below in Section 5.2.4.

5.2.4 Analytical Methods

The groundwater samples were analyzed for some or all of the following constituents by the methods indicated below in accordance with the RI/FS Work Plan (Floyd|Snider 2011):

- Dissolved metals (arsenic, cadmium, chromium, copper, lead, nickel, silver, and zinc) by USEPA Method SW6020.
- Mercury (dissolved) by USEPA Method 7470.
- TPH (diesel and oil range) by NWTPH-Dx with silica acid gel cleanup.
- TPH (gasoline range) by NWTPH-Gx.
- PCBs by USEPA Method 8082.
- VOCs by USEPA Method 8260.
- SVOCs by USEPA Method 8270.

5.2.5 Tidal Study

Water levels were continually monitored for 72 hours using automated pressure transducers to assess tidal fluctuation and tidal efficiency in shallow wells and determine overall groundwater flow direction. In addition, conductivity was measured during the tidal study at MW-07 and MW-09. Tidal fluctuation data were used to calculate the tidal efficiency value in each well, as summarized in the table below. Tidal efficiency is a relative measure of tidal influence and is expressed as the ratio of feet of actual tidal change to feet of tidal change observed in a well. To determine the average groundwater elevation across the period of the tidal study, the tidal data were reduced using the Serfes method (Serfes 1991). Further analysis conductivity and relationship to salinity will be addressed in the RI/FS.

The RI/FS Work Plan proposed using eight wells, the five existing (MW-1 through MW-5) and three newly installed wells along the shoreline area (MW-02A, MW-06, and MW-09) to allow for a more rigorous determination of tidal influence on groundwater flow to be made; however, at the time of the tidal study, three existing wells (MW-1, MW-2, and MW-3) could not be located. The tidal study was completed using existing monitoring wells MW-4 and MW-5 as well as newly installed wells MW-02A, MW-06, MW-07, MW-08, and MW-09. Existing well MW-1 was subsequently located after completion of the tidal study and monitoring well installation. Due to its close proximity to MW-09 (located on the shoreline), it was determined that tidal data from MW-1 would not be necessary to complete the study. In addition, the pressure transducer installed in MW-06 malfunctioned and data was not properly stored from this monitoring well.

Floyd|Snider reviewed previous data from the 18-hour tidal study that was completed during the 1998 RETEC Phase 2 sampling event at five monitoring well locations (MW-1, MW-2, MW-3, MW-4, and MW-5). During this study, the tidal efficiency was greatest in MW-2 and it is had the greatest tidal influence due to the proximity to the shoreline. Tidal efficiencies in remaining wells did not vary directly with distance; for example, the tidal efficiency measured at MW-1 was twice that measured at MW-3, yet MW-1 and MW-3 are located at approximately the same distance (50 feet) away from the shoreline. Monitoring Well MW-4 (located in the center of the yard and approximately 220 feet away from the shoreline) had a tidal efficiency greater than both MW-1 and MW-3.

The table below summarizes the percentage of tidal efficiency in existing and newly installed monitoring wells. The tidal study graphs are shown in Appendix F. For all graphs, the mean tidal elevation was set to equal the mean groundwater elevation in each well. Predicted tide data for the Bay and Port Townsend were then translated around the mean tidal elevation axis to illustrate the difference between the peak elevations of the tide and the peak elevations of the groundwater in each monitoring well.

Overall Percentage of Tidal Efficiency on Monitoring Wells

Monitoring Well[1,2]	2011 Floyd|Snider Study	1998 RETEC Study
MW-1	-	9%
MW-2	-	40%
MW-02A	27%	-
MW-3	-	4%
MW-4	13%	19%
MW-5	6%	6%
MW-07	4%	-
MW-08	19%	-
MW-09	18%	-

Notes:
Percent of total tide calculated after mean height correction.
- Study not conducted.
1 Monitoring Wells MW-02A, MW-07, MW-08, and MW-09 were installed in 2011.
2 Monitoring Wells MW-1, MW-2, and MW-3 were unable to be located for the 2011 Floyd|Snider Tidal Study.

5.2.6 Investigation Derived Waste

All water generated by well construction, well development and groundwater sampling, and equipment decontamination activities was collected and transferred to new, Department of Transportation-approved 55-gallon steel drums. Drums were lidded, sealed, labeled with an indelible marker, and stored on-site while material profiling was conducted.

In May 2011 seven drums containing water IDW generated during the March 2011 field event were transported from the Site to Emerald Service’s recycling facility in Seattle, Washington for treatment.

Purge water resulting from the dry season groundwater sampling event described above is currently being stored in a secure location on-site and will be combined with any remaining IDW generated during future sampling efforts.

5.2.7 RI/FS Work Plan Deviations

Other than the deviations described above in Section 5.2.1 and Section 5.2.5 concerning MW-1 and MW-3, no other deviations from the RI/FS Work Plan occurred during the groundwater investigation of the SSI.

5.2.8 Monitoring Well Groundwater Analytical Results

The data presented here are the results of the SSI conducted in 2011 during two groundwater sampling events (wet and dry). Laboratory analytical reports for the SSI are available in Appendix E on CD-ROM. Analytical exceedance results of site screening criteria in previous investigations, as discussed earlier, are shown along with this SSI data in Figures 5.1 and 5.2.

5.2.8.1 Supplemental Site Investigation—Wet Season Sampling Event (March 2011)

Diesel-range TPH was detected and exceeded the site screening criterion at three monitoring wells (MW-1, MW-06, and MW-09). The highest exceedance of 3,500 µg/L occurred at MW-06. Oil-range TPH also exceeded the site screening criterion at MW-06 with a concentration of 1,200 µg/L (Figure 5.1). Gasoline-range TPH was detected at some locations but did not exceed the site screening criterion (Table 5.2).

There were detections of dissolved metals in all samples analyzed for metals, however only three exceedances of site screening criteria. These exceedances were all of dissolved arsenic and occurred at MW-1, MW-08, and MW-09, in groundwater ranging from 5 to 16 feet bgs. The highest concentration of arsenic was found at MW-1 with 23 µg/L (Figure 5.2).

5.2.8.2 Supplemental Site Investigation—Dry Season Sampling Event (July 2011)

Diesel-range TPH was detected in five locations but only exceeded site screening criterion in three monitoring wells (MW-1, MW-06, and MW-09) in the 6 to 16 feet bgs interval (refer to Figure 5.1). The highest exceedance of 1,900 µg/L occurred at MW-1. Oil-range TPH was also detected at MW-6, but at a concentration less than site screening criterion. Gasoline-range TPH was detected at some locations, but did not exceed site screening criterion (Table 5.2).

There were detections of dissolved metals in all samples analyzed for metals. These exceedances were all of dissolved arsenic and occurred at MW-1, MW-02A, MW-4, MW-06, MW-07, MW-08, and MW-09 in groundwater ranging from 5 to 16 feet bgs. The highest concentration of arsenic was found at MW-1 with 29 µg/L (Figure 5.2).

5.2.9 Geoprobe Groundwater Screening Analytical Results

Data from monitoring wells represent actual groundwater quality more accurately than data from Geoprobe samples, as water quality parameters (temperature, conductivity, pH, etc.) can be monitored for stabilization before sampling in order to ensure collection of a minimally disturbed sample. Additionally, the construction of the wells, including the surrounding sand packs, generally allows for the collection of samples with very low particulate loads (low turbidity). For this reason, the Geoprobe groundwater samples taken as part of the SSI are not compliance samples and are not intended to be compared to site screening criteria.

The intent of collecting groundwater samples during soil boring advancement was to provide general characterization and identify any unknown potential chemicals of interest in areas without monitoring wells. The data below confirms that no new COIs exist in groundwater in the areas sampled.

Table 5.3 presents a Frequency of Detects table that summarizes the Geoprobe groundwater analytical results from the SSI. This table also shows the maximum concentrations per analyte.

Table 5.4 presents the analytical results of detected COI in groundwater samples taken during soil boring advancement, as part of the SSI. Refer to Appendix B for the full set of analytical results.

TPH (diesel-, oil-, and gasoline-range) was detected in three of five samples analyzed for TPH. Gasoline- and diesel-range TPH were found at 13 to 17 feet bgs at FS-09. At FS-15, diesel-range TPH was detected with a concentration of 820 µg/L at 15 to 19 feet bgs. TPH was not detected at FS-07 or FS-17.

There were detections of six of the nine dissolved metals sampled (i.e., arsenic, chromium, copper lead, nickel, and zinc), with arsenic occurring the most at all five locations. FS-07 had the most detections of each of the previously mentioned metals with all six detected in the 12 to 16 feet bgs interval. The remaining three locations had detections of two of the six metals, as shown in Table 5.4.

6.0 Sediment Investigations and Analytical Results

This section summarizes previous sediment investigations and the results of the recently conducted SSI. Table 6.1 summarizes detections and exceedances of the site screening criteria in surface sediment samples collected during the SSI.[5] Table 6.2 presents detected analytes from all previous investigations in surface sediment.[6] Figures 6.1 through 6.3 illustrate exceedances of site screening criteria in surface sediments for all historical investigations and the SSI. The full set of bank/intertidal and nearshore surface sediment analytical results from the SSI and all historical sampling events are included in Appendix B. Note that, due to variations in methods and calculations in historical data versus current SSI analytical results, a Frequency of Exceedances table was not prepared for sediments.

6.1 PREVIOUS INVESTIGATIONS

6.1.1 Pre-1998 Sampling and Ecology Inspections

Limited sampling of sediment was performed prior to the initial work by RETEC, which began in 1998. In October 1993 Ecology collected offshore intertidal and subtidal sediment samples at three locations (Bell-40, Bell-20, and Bell-41, respectively) north of the shipyard area. Phenol and PCBs were reported in concentrations exceeding site screening criteria. Arsenic, copper, lead, TBT, and zinc also exceeded site screening criteria at each location (Cubbage 1993). Since depth information is unavailable for these samples, these are not considered further in this data report.

In June 1996, GeoEngineers collected three sediment samples along the under-pier area of the Main Pier as part of the pier-extension project (GeoEngineers 1996). All samples were in compliance with site screening criteria. Samples were analyzed for all sediment COIs except organotins.

6.1.2 RETEC Phase 2 Sediment and Uplands Sampling—1998

In March 1998, ESA Phase 2 sediment sampling was conducted in two primary areas—the Parcel 5 area and the marine shipyard area. RETEC completed a site survey, diver video survey, and grab sampling at 23 locations using a hydraulic Van Veen sampler. Primary grab samples were analyzed for metals and PCBs, and secondary analyses were completed for SVOCs and organotins. SMS exceedances were reported in samples collected east of the pier shops under the northern portion of the large dry dock. Samples were also collected from Parcel 5 area west of the Site; however, no SMS sediment quality standards or minimum cleanup level (MCUL) exceedances were reported in those samples. The grab samples were collected around areas of debris. Five samples were analyzed for SVOCs. Eight grab samples were analyzed for organotins in porewater.

In addition to the grab samples, cores were advanced using a vibracore sampler at four locations in areas of known contamination to delineate vertical extent. Core samples were

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[5] Due to some analytes in the analysis method exceeding the range of the detector, analysis at a dilution was required to obtain valid results, which also resulted in a slightly elevated reporting limit for some analytes and samples. Non-detect results that were greater than site screening criteria due to raised reporting limits, were not flagged as exceedances. Refer to Appendix B for all current and historical results.

[6] Historical sample analytical data without depth information were not included in the sediment results tables.

analyzed for metals, TOC and PCBs, with logs noting the presence of anthropogenic debris (RETEC 1998a).

6.1.3 RETEC Supplemental Bioassay Testing—2003

The initial RI/FS bioassay testing conducted in 2000 experienced quality control and holding time issues. The amphipod and juvenile polychaete tests were performed on sediment from two sample locations. Sediment was collected from an additional three sample locations for repeated larval tests. Therefore, supplemental bioassay sediment toxicity tests at different sample locations located around the northern and western boundary of the Site were conducted during the fall of 2003. As per SMS, these consisted of two acute tests and one chronic test. Amphipod *Ampelisca abdita (A. abdita)* and larval development of the mussel *Mytilus galloprovincialis* (M. galloprovincialis) were performed for acute bioassays; growth of the juvenile polychaete worm *Neanthes arenaceodentata (N. arenaceodentata)*, was measured for the chronic bioassay. Quality control failures required a second round of sediment collection and bioassay testing conducted in late-2003 and early-2004. Porewater was centrifuged and analyzed for interstitial ammonia and total sulfides.

In initial bioassay tests, two of the sampling locations exhibited significantly decreased survival of *A. abdita* compared to the control. No adverse effects were observed in the juvenile polychaetes *N. arenaceodentata* growth or survival or in larval development of *M. galloprovincialis* in any sample relative to the control. Initial SMS sediment quality standards (SQS) and Sediment Cleanup Screening Level (CSL) biological criteria failure were attributable to quality control failures; however, following a second round of sediment collection and additional bioassay testing, all 2003 bioassay testing locations passed SMS biological effects criteria.

6.1.4 RETEC Working Draft Sediments RI/FS—May 2004 (amended January 2006)

The RETEC working Draft Sediments RI/FS (RETEC 2004) was completed for Ecology review in May 2004 and later amended in January 2006 (RETEC 2006) to include the findings of a supplemental sediment source control evaluation that was conducted in 2005. The supplemental source control evaluation addressed the intertidal sediments and adjacent upland Marine Railway Area of the Site.

Principal investigation tasks conducted for this document included the collection of additional chemical data in the under-pier area, dry dock, and other areas with inadequate data to determine compliance with site screening criteria. Confirmatory biological testing on surface sediment was conducted in areas that exceeded site screening criteria for samples collected in 2000. Bioassay testing was not completed in areas where PCB concentrations exceeded the PCB site-specific bioaccumulation screening criterion of 6.0 parts per million (ppm) organic carbon, but were less than the SMS SQS PCB criterion of 12 ppm organic carbon. Human health and ecological risk assessments for PCBs were also conducted at the Site. The evaluation concluded that the proposed PCB CUL would not adversely affect ecological receptors.

Core samples were also collected to define the depth and thickness of contaminated sediments at the Site. Sediment deposition patterns were assessed using radioisotope profiles of cesium-137. Physical parameters (grain size, specific gravity, compressibility, etc.) were also analyzed to support the engineering analysis of the alternatives.

Additional core samples were collected in February 2004 as part of an effort to characterize sediment suitability for disposal at an open-water disposal site. This program was completed in accordance with the Puget Sound Dredged Disposal Analysis (PSDDA) program and the Dredged Material Management Plan. Regulatory agencies provided preliminary approval for disposal of approximately 12,000 CY of dredged sediment from the Site at an open-water disposal location in July 2006 and this disposal option was incorporated into the preferred remedial alternative recommended in the working Draft Sediments RI/FS.

6.1.5 RETEC Uplands Source Control Sampling—August 2005

The RETEC working Draft Sediments RI/FS was completed for Ecology review in 2006 and incorporated results of supplemental uplands source control sampling performed in August 2005. In addition to upland soils, two intertidal sediments in the Marine Railway Area were analyzed for Site contaminants. Intertidal samples (S-1 and S-2) were analyzed for VOCs, PCBs, SVOCs, TBT, metals, TPH including diesel- and motor oil range hydrocarbons and gasoline, and TOC.

Heavy metals including copper (up to 2,620 mg/kg), lead (up to 942 mg/kg), mercury (up to 26.2 mg/kg), zinc (1,690 mg/kg), and arsenic (up to 340 mg/kg) were detected at concentrations exceeding site screening criteria in the intertidal location S-2 in surface sediment down to 4 feet bgs. All metal concentrations were less than the SMS sediment quality standard values at nearby intertidal location S-1 in sediment down to 4 feet bgs.

TBT analytical results were compared to the former PSDDA program screening level of 0.073 mg/kg. TBT was detected in both intertidal samples (up to 3 mg/kg). TBT is believed to be localized in this area.

SVOCs were not detected at concentrations greater than SMS values either of the two intertidal sediment samples. PCBs and VOCs were not detected in any intertidal sediment samples at concentrations greater than site screening criteria.

6.2 SUPPLEMENTAL SITE INVESTIGATION MARCH—JULY 2011

Sediment investigation activities were conducted as part of the SSI to address data gaps in the bank/intertidal and nearshore marine sediments. Bank/intertidal samples were collected at the Site between March 16 and 22, 2011. Nearshore contingency sediment samples were collected on July 28, 2011 to further delineate uplands and shoreline transport pathways to sediment.

The following section describes the work performed, including a description of field methods, analytical results, and any deviations from the RI/FS Work Plan.

6.2.1 Bank/Intertidal Surface Sediment Sampling

Existing chemical data (from all previous investigations) indicated site screening criteria exceedances focusing on PCBs, metals, and SVOCs. Based on interpretation of these site screening criteria exceedances, additional samples were collected from the bank/intertidal area of the Site, as summarized below. Bank/intertidal sediment samples were collected at HA-1 through HA-8, as shown on Figure 1.3.

6.2.1.1 Field Methods

All bank/intertidal sediment samples were collected using a hand trowel to scoop the 0 to 12 centimeters (cms) surface sediment, as measured with a ruler. The sediment was visually classified and placed in a decontaminated stainless steel bowl and homogenized until the sediment was uniform in color and texture. The homogenized sediment was then carefully placed into glass jars, labeled, and stored on ice.

All field decontamination and sample collection procedures were followed according to the methods described in the SAP/QAPP of the RI/FS Work Plan (Floyd|Snider 2011). Samples were delivered on ice to ALS laboratory in Everett, Washington, under standard chain-of-custody procedures and analyzed using the analytical methods described below in Section 6.2.3.

The bank/intertidal locations (i.e., HA-1 through HA-8) were surveyed using a Trimble GeoXH portable differential global positioning system (GPS) capable of providing positions within approximately 1 meter (in real-time).

Bank/intertidal samples were photographed and select photos can be seen in Appendix D.

6.2.2 Nearshore Surface Sediment Contingency Sampling

Exceedances of screening levels were observed in the bank/intertidal sediment samples, therefore nearshore surface sediment contingency samples were coordinated with Ecology following receipt of the intertidal/bank analytical data. Contingency surface sediment samples were collected at SG-1, SG-3, and SG-4,[7] as shown on Figure 1.3. Field methods and analytical results are summarized below.

6.2.2.1 Field Methods

Nearshore contingency surface sediment samples were collected from the depth interval of 0 to 12 cm below mudline, and were collected using a 7-inch diver-assisted hand corer brought to the surface for sample processing. All sediment samples were visually classified and the total penetration of the sampler measured. The sediment descriptions, along with the sampling time, sampling coordinates, and diver notes were recorded on sample collection forms. Photographs of each sample were taken and select photographs can be seen in Appendix D.

The individual sediment samples were placed in a decontaminated stainless steel bowl and homogenized until the sediment was uniform in color and texture. The homogenized sediment was then carefully placed in to glass jars, labeled, and stored on ice.

All field decontamination and sample collection procedures were followed according to the methods described in the SAP/QAPP of the RI/FS Work Plan. Samples were delivered on ice to ALS laboratory in Everett, Washington, under standard chain-of-custody procedures and analyzed using the analytical methods described below in Section 6.2.3.

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[7] Proposed nearshore surface sediment contingency sample S-2 was not chosen to sample because all SMS criteria was met at the nearest bank/intertidal location, HA-5. Additionally, a nearby sediment location, HG-41, also met SMS site screening criteria for metals during RETEC’s RI/FS sampling in 2004.

6.2.3 Analytical Methods

The intertidal/bank sediment and nearshore contingency surface sediment samples collected for the SSI were analyzed for some or all of the following constituents by the methods indicated below in accordance with the RI/FS Work Plan (Floyd|Snider 2011):

- Metals (arsenic, cadmium, chromium, copper, lead, nickel, silver, and zinc) by USEPA Method SW6020.
- Mercury by USEPA 7471.
- TPH (diesel and oil range) by NWTPH-Dx with silica gel and acid cleanup.
- SVOCs by USEPA 8270.
- PCBs by USEPA 8082.
- TBT by Krone 1988.
- TOC by Plumb 1981.
- Percent solids by USEPA Method 160.3.

6.2.4 RI/FS Work Plan Deviations

No deviations from the RI/FS Work Plan occurred during the sediment investigation of the SSI.

6.2.5 Sediment Analytical Results

The data presented here are the results of the SSI conducted in 2011, including bank/intertidal surface sediments and nearshore surface sediment data. Laboratory analytical reports for the SSI are available in Appendix E on CD-ROM. Analytical results of previous investigations, as discussed earlier, are shown along with SSI data in Figures 6.1 through 6.3.

6.2.5.1 Bank/Intertidal Surface Sediment

There were detections of metals in all six bank/intertidal sediment samples (Samples HA-2 through HA-7), however only four exceeded site screening criteria[8]. Copper exceeded SMS CSL criterion at HA-2 and HA-3 with concentrations of 400 and 450 mg/kg, respectively. Zinc exceeded the SQS CSL criterion at HA-2, HA-3, and HA-4 with concentrations of 530, 690, and 620 mg/kg, respectively. Lead exceeded site screening criterion at HA-7 with a concentration of 580 mg/kg (refer to Table 6.1 and Figure 6.1).

There were detections of miscellaneous SVOCs and PCBs but no exceedances of the site screening criteria other than phenol, which slightly exceeded with a concentration of 0.5 mg/kg at SG-4. Detections of high molecular weight PAHs (HPAHs) were seen at HA-2 and HA-4. PCB Aroclors 1254 and 1260 were also detected at low concentrations at these two locations. None of these detections exceeded the site screening criteria.

Diesel- and oil-range TPH was analyzed at each bank/intertidal location but was not detected in any samples.

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[8] Per the RI/FS Work Plan, bank/intertidal Samples HA-1 and HA-8 were sampled but archived for potential future analysis pending results of the other six samples.

Per the RI/FS Work Plan, only six bank/intertidal samples (HA-2 through HA-7) were submitted for analysis. Samples HA-1 and HA-8 were archived for later analysis if determined necessary. Upon receipt of the analytical data, it was determined that the nearshore surface sediment contingency samples would be collected and analyzed for appropriate COIs in place of analyzing HA-1 and HA-8.

6.2.5.2 Nearshore Surface Sediment Analytical Results

Arsenic, chromium, copper, lead, mercury, nickel, and zinc were detected in all three samples (SG-1, SG-2, and SG-3) analyzed for metals; however there were no exceedances of site screening criteria. Cadmium and silver were not detected in any of the three locations. Similar to the bank/intertidal samples described above, there were detections of miscellaneous SVOCs and PCBs but no exceedances of site screening criteria. Most detections of SVOCs were seen at SG-4, which had detections of HPAHs and Aroclor 1260.

Diesel- and oil-range TPH was analyzed at SG-1 and SG-2. Diesel-range TPH was detected at 55 mg/kg and oil-range TPH was detected at 140 mg/kg.

7.0 Site Summary

This section provides a brief summary of results of the SSI, incorporating the results of previous investigations, relative to the nature and extent of COI exceedances on the Site.

7.1 NORTHERN SHORELINE AREA

The Northern Shoreline Area encompasses the waterfront area from the main pier to the eastern property line, and north of the inner harbor line (Figure 2.1). Metals and TPH were previously identified along the shoreline area between the loft and pier shops to the east beyond the dry dock; however, prior to the SSI, the full extent of TPH and metals had not been determined in this area and groundwater conditions had not been established along the shoreline. To fill data gaps in this area, nine soil borings (FS-01 through FS-09) were advanced along the Northern Shoreline Area to delineate the full extent of TPH and metals in soil, as shown in Figure 1.3. Four new monitoring wells (MW-02A and MW-06 through MW-08) were also installed in this area to identify COIs in groundwater.

The SSI identified a previously unknown source of TPH and naphthalene surrounding FS-09 and surrounding step-out borings. As described in Section 4.2.1, a creosote (or similar) treated piling was found during drilling when the Geoprobe casing drilled vertically down through the piling. The analytical results from samples taken directly from the piling and soil in surrounding step-out locations, identified cPAHs, naphthalene, and heavy diesel in concentrations exceeding site screening criteria in soil ranging from 8 to 9.5 feet bgs.

FS-01, located on the eastern end of the Northern Shoreline Area, had exceedances of site screening criteria for SVOCs and diesel-, oil-, and gas-range TPH in soil ranging from 14 to 25 feet bgs.

Moving west along the shoreline, TPH exceeding MTCA Method A site screening criterion was found in soils sampled during installation of MW-02A. Specifically, gasoline-, diesel-, and oil-range TPH all exceeded site screening criteria in depths ranging from 1 to 7.5 feet bgs. The concentrations found in this well were expected, as this was a replacement for Monitoring Well MW-2, located approximately 25 feet west of MW-02A. The results for MW-02A are similar to MW-2, with significant diesel-range TPH down to 7.5 feet bgs (Figure 4.1).

The SSI did not identify any new areas with significant metals concentrations and the results are consistent with those seen in previous investigations (i.e., metals, primarily arsenic, and to a lesser extent, cadmium and lead, exist in surface soils down to approximately 6 feet bgs in some locations).

The groundwater monitoring wells installed during the SSI provided additional data to the existing groundwater dataset and confirmed areas with known or suspected exceedances of site screening criteria. In general, groundwater exceedances of site screening criteria in the Northern Shoreline Area are primarily limited to dissolved arsenic and diesel-range TPH. Dissolved arsenic exceeded site screening criterion at all sampled shoreline wells, and TPH was found on the eastern portion of the Northern Shoreline Area at MW-1 and MW-06, in concentrations exceeding site screening criterion.

7.2 MARINE RAILWAY AREA

As described in Section 1.2.1, the Marine Railway Area is located between the main pier and the finger pier. The marine railway was historically connected to upland sidetracks where boats could be stored during work activities. The sidetracks are no longer connected to the main marine railway line and the area is currently used for sandblasting. Historically, shipbuilding and launching activities were conducted in this area during the 1940s and currently the area is used for sandblasting and is one of the most heavily used areas for upland activities.

Previous sampling completed by MCI and Hart Crowser confirmed TPH and metals in the Marine Railway Area. TPH was reported to be related to winch chain oiling and dripping. Sandblast grit and stained soil have been observed in this area throughout previous investigations.

Results of the SSI confirm the TPH identified in previous investigations. The soil sample taken at soil boring FS-11, adjacent to the capped marine railway, detected diesel-range TPH in a concentration exceeding site screening criterion. At FS-10, located upgradient, there were no indications of TPH during soil boring advancement, suggesting that TPH in the Marine Railway Area is isolated near the shoreline.

Metals were detected but there were no exceedances in either of the two borings, indicating that the extent of metals in this area is limited to arsenic in historical samples from surface down to 4 feet bgs. In general, the metals criteria exceedances are primarily limited to relatively low concentrations at the surface and relatively shallow soils (0 to 2 and 2 to 4 feet bgs) consistent with observed blasting grit and stained soil impacts in these areas.

7.3 FORMER AST AREA

As mentioned in Section 1.2.2, the Former AST Area is east of the Marine Railway Area. In the 1930s and 1940s an AST holding bunker oil was located here (as shown in Figure 1.2). Diesel and motor oil TPH have been detected at concentrations exceeding site screening criteria in samples collected in the Former AST Area in previous sampling events but was limited to a few samples and the extent of exceedances was not known.

For the SSI, four soil borings (FS-12 through FS-15) were advanced and one well was installed (MW-09) around, and downgradient of the former Union Oil AST to determine the extent of COIs in soil and groundwater.

The results of SSI sampling identified exceedances of the site screening criteria in soil for arsenic and diesel-range TPH. Specifically, FS-12 and FS-13, (located laterally and upgradient of the former Union Oil AST) had concentrations of arsenic exceeding site screening criterion in soil ranging from 2 to 5 feet bgs. At MW-09, located on the shoreline and downgradient of the former Union Oil AST, gasoline- and diesel-range TPH slightly exceeded site screening criteria in soils at 6 feet bgs. The area with the greatest concentrations of TPH identified in the Former AST Area is TP-15, located directly adjacent to the former Union Oil AST and sampled by RETEC in 1998. Diesel concentrations here were high in comparison to other sampled locations around the former Union Oil AST.

In groundwater, lo- level dissolved arsenic and diesel range TPH exceeded site screening criteria in MW-09. There were some detections of metals and diesel-range TPH in groundwater taken from soil boring FS-15 as well.

7.4 PAINT SHOP AREA

As described in Section 1.2.2, the paint shop and sandblast shed are located in the upland portion of the Site to the south of the Marine Railway Area. The joiner shop was formerly located in the area of the current paint shop and sandblast shed. This Area, along with the Marine Railway Area, was one of the most heavily used areas for upland activities and was used for painting and caulking as well as shipbuilding activities.

Anthropogenic debris, sandblast grit, and stained soil have been observed in test pit locations south of the paint shop and sandblast shed in previous investigations. Arsenic and cadmium exceeded site screening criteria in one test pit location taken by RETEC in 1998. SVOCs were detected at concentrations exceeding criteria at test pit location TP-4, just south of the sandblast shed. For groundwater, metals were detected in MW-4, located north of the paint shop and sandblast shed during groundwater sampling in 1998. Diesel-range TPH was also detected at concentrations greater than screening criterion in this well.

During the SSI, three soil borings (FS-16 through FS-18) were advanced in the upland area around the paint shop and sandblast shed to address upland data gaps and identify the presence of sandblast grit and anthropogenic debris. COI exceedances in this area were isolated to FS-17, where oil-range TPH, benzo(a)pyrene, and cPAHs exceeded site screening criteria in soil at 6.5 to 7.5 feet bgs. There was no evidence of sandblast grit or other anthropogenic debris in any of the borings in this area.

At MW-4, dissolved arsenic in groundwater only slightly exceeded site screening criteria in one of two sampling events. Diesel-range TPH was non-detect in both sampling events indicating that hydrocarbons are no longer present in the groundwater in this area.

7.5 BANK/INTERTIDAL AND MARINE SURFACE SEDIMENT

The 2006 RETEC Draft Sediments RI/FS presents detailed documentation of sediment cleanup criteria exceedances that focused on PCBs, metals, and SVOCs. Figures 6.1 through 6.3 provide summary documentation of these site screening exceedances for all previous sediment investigations (i.e., for surface sediment only) completed at the Site with analytical results of the SSI sampling activities.

Previous investigations identified metals exceedances primarily around Dry Dock No. 1 and the eastern main pier. Arsenic, copper, lead, mercury, and zinc were seen in surface sediment in concentrations exceeding site screening criteria in multiple grab samples on both the eastern and western side of the main pier. Under the main pier building copper and zinc exceeded in an RI/FS grab sample. On the western side of Dry Dock No. 1 there were SMS exceedances of copper in samples collected as part of RETEC's Phase 2 and RI/FS sampling.

For SVOCs, the distribution in surface sediments is similar to that of metals described above. Most detections and exceedances of SVOCs are located off Dry Dock No. 1 and the main pier. PAH compounds detected in concentrations greater than site screening criteria included fluoranthene, chrysene, fluorene, and phenanthrene. Phthalates measured in excess of site screening criteria included bis(2-ethylhexyl)phthalate and butylbenzylphthalate.

Miscellaneous extractables detected in excess of site screening criteria included benzyl alcohol at four sampling locations and dibenzofuran at one sampling location. The sample containing dibenzofuran also contained elevated PAH compounds, HG-39, located off the western side of Dry Dock No. 1 (refer to Figure 6.2).

Figure 6.3 summarizes the distribution of PCBs in surface sediments. Total PCBs in concentrations exceeding site screening criterion are seen in four samples. Two of the samples are located by the marine railway and under the main pier building. The other two samples are located to the east of the main shipyard pier.

Goals of the SSI in the bank/intertidal area and nearshore marine sediments were to adequately characterize the nature and extent of COIs within the intertidal area around the perimeter of the site. Data in this area assists in defining the nature and extent of contamination and potential upland to sediment contaminant transport pathways.

As described in Section 6.3.1, four of the six locations exceeded site screening criteria for metals. Copper exceeded site screening criterion at HA-2 and HA-3. Zinc exceeded SQS criterion at HA-2, HA-3, and HA-4, located between Dry Dock No. 1 and the eastern side of the Site boundary. Lead exceeded site screening criterion at HA-7, located on the northwestern shoreline area. The rest of the bank/intertidal samples and nearshore contingency samples had some detections but no exceedances of criteria for PCBs and SVOCs.

8.0 Data Management and Validation

A Compliance Screening, Tier I data quality review was performed on the TPH, VOC, SVOC, PCB, and metals data resulting from laboratory analysis. In addition, a summary review was performed on the TBT, Total Solids, and TOC data resulting from laboratory analysis. The analytical data were reviewed using guidance and quality control criteria documented in the analytical methods, Port of Bellingham Harris Avenue Shipyard Sampling and Analysis Plan/Quality Assurance Project Plan, *National Functional Guidelines for Inorganic Data Review* (USEPA 1994 and 2004), and *National Functional Guidelines for Organic Data Review* (USEPA 1999 and 2008).

A total of 41 soil, 8 sediment, 23 groundwater, and 8 field quality control water samples were submitted in multiple sample delivery groups for analysis. As was determined by the evaluation, the laboratory followed the specified analytical methods. Accuracy and precision were generally acceptable, and the analytical results are determined to be of acceptable quality for use as qualified in the data validation reports attached in Appendix G.

Analytical data from the SSI will be submitted in Ecology's Environmental Information Management (EIM) format following submittal of this document to Ecology.

Historical analytical data already submitted in the EIM format to date include the following:

- Groundwater Compliance Monitoring Data (5/30/91–8/30/06).
- Supplemental Site Investigation (Sediment Toxicity Assessment, 7/24/2003).
- Supplemental Sediment Investigation (Sediment Toxicity Assessment, 11/6/03).
- PSDDA Investigation (2/24/04).
- Working Draft Sediments RI/FS Intertidal Data (8/17/05).

Additional historical data will also be submitted in the EIM format following submittal of this document to Ecology and includes the following:

- Post Point WWTP Sampling (1988).
- MCI Sampling (1991).
- Bellingham Bay Sediments Sampling (6/1993).
- MCI Soil and Grit Sampling (8/1993) Cubbage Ecology Samples (10/1993).
- Geo Engineer Pier Samples (1/1996) Main Shipyard & Parcel 5 Area Sampling (3/23/1998-3/26/1998).
- Vadose and Saturated Zone Soils Sampling (4/27/2998–4/30/1998).
- Groundwater and Seep Sampling (5/14/1998).

9.0 Next Steps and Schedule

Review of all SSI and historical analytical data indicates that the data gaps indentified in the RIFS Work Plan have been filled and the data are sufficient for continuation to the Site-Wide RI/FS. The Site-Wide RI/FS will define and evaluate comprehensive site-wide remedial alternatives for upland and sediment remediation.

9.1 NEXT STEPS

Now that the SSI is completed, a Site-Wide RI/FS will be prepared to include both the sediment and upland portions of the Site. The Site-Wide RI/FS will incorporate Ecology's comments on this document. Primary remaining RI tasks include development of cleanup standards for the Site, definition of COCs, documentation of the nature and extent of contamination and overall compliance status, and preparation of a comprehensive CSM to reflect site-wide information. The CSM will include a comprehensive understanding of contaminants and sources, the nature and extent of contamination, fate and transport processes, and exposure pathways and receptors. In addition, the RI work will document source control status.

The RI work will conclude with an understanding of site conditions necessary for the Site-Wide FS to define remedial action objectives and remedial alternatives. To support the definition of remedial action objectives, the FS will define site units that can be characterized by specific physical and contaminant conditions. Remedial technologies will be identified and screened to determine applicability to the individual site units.

The Site-Wide FS will define and evaluate comprehensive site-wide remedial alternatives for upland and sediment remediation. Initially, remedial technologies will be screened and then packaged into alternatives for consideration. Alternative definition will include definition of the actions to be taken; development of Site-Wide RI/FS-level cost estimates for remedial alternatives, and a description of land use, navigation, and habitat considerations.

Alternatives will be evaluated using criteria in MTCA and SMS. All alternatives defined will achieve MTCA threshold requirements, and will be evaluated against other MTCA and SMS requirements including the requirement that the selected alternative uses "permanent solutions to the maximum extent practicable." Evaluation of alternatives will result in selection of a site-wide preferred alternative that meets MTCA and SMS requirements.

9.2 SCHEDULE

The following schedule is anticipated for development of the Site-Wide RI/FS and is consistent with the schedule presented in the AO:

Document	Date
Draft Site-Wide RI/FS Report	180 days from Ecology approval of the Data Report
Draft Site-Wide RI/FS Report for Public Review incorporating Ecology's comments	120 days from receipt of Ecology's final comments on the Draft RI/FS Report

Document	Date
Final Site-Wide RI/FS Report incorporating Ecology’s comments	90 days from the close of public comment period or receipt of Ecology’s comments in the event Ecology determines that changes are necessary due to public comment
Draft Cleanup Action Plan	90 days from Ecology approval of the Final RI/FS Report

10.0 References

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Remedial Investigation/ Feasibility Study Data Report

Tables

Table 4.1
Frequency of Exceedances for Soil—Current and Historical Analytical Results

										Soil Screening Criteria							
Parameter	Unit	Number of Results	Number of Detected Results	Percent Detected	Number of Non-detected Results	Percent Non-detected	Maximum Detected Value	Location of Maximum Detected Value	Depth of Maximum Detected Value	MTCA Method A[1]	MTCA Method C[2]	Number of Results that Exceed MTCA A	Percent of Detects that Exceed MTCA A	MTCA A Exceedance Ratio[3]	Number of Results that Exceed MTCA C	Percent of Detects that Exceed MTCA C	MTCA C Exceedance Ratio[3]
Total Petroleum Hydrocarbons																	
Gasoline Range Hydrocarbons	mg/kg	79	22	28%	57	72%	480	S-5	6-8 ft	100	NA	13	59%	4.8			
Diesel Range Hydrocarbons	mg/kg	84	44	52%	40	48%	18,000	MW-02A	7.5 ft	2,000	NA	15	34%	9			
Oil Range Hydrocarbons	mg/kg	84	33	39%	51	61%	8,000	MW-02	8.5 ft	2,000	NA	3	9%	4			
Metals																	
Antimony	mg/kg	33	12	36%	21	64%	70	TP-10	1.2 ft	NA	1,400						
Arsenic	mg/kg	85	83	98%	2	2%	1,240	TP-10	1.2 ft	20	1,050	21	25%	62	2	2.41%	1.2
Beryllium	mg/kg	23	14	61%	9	39%	0.6	TP-10	1.2 ft	NA	7,000						
Cadmium	mg/kg	85	23	27%	62	73%	12.6	TP-10	1.2 ft	2	NA	7	30%	6.3			
Chromium	mg/kg	85	85	100%			438	Soil 3	4–8 in	NA	NA						
Copper	mg/kg	85	85	100%			4,690	Soil 2	4–8 in	NA	140,000						
Lead	mg/kg	85	84	99%	1	1%	1,680	TP-8	0.9 ft	1,000	NA	2	2%	1.7			
Mercury	mg/kg	85	59	69%	26	31%	17.6	Soil 2	4–8 in	2	NA	6	10.17	8.8			
Nickel	mg/kg	85	85	100%			426	Soil 3	4–8 in	NA	70,000						
Selenium	mg/kg	23	1	4%	22	96%	8	MW-04	2.5 ft	NA	17,500						
Silver	mg/kg	85	7	8%	78	92%	3	TP-8; TP-10	0.9/1.2 ft	NA	17,500						
Thallium	mg/kg	23			23	100%				--	--						
Zinc	mg/kg	85	85	100%			12,600	TP-10	1.2 ft	NA	1,100,000						
Organometallics																	
Butyltin	mg/kg	6	5	83%	1	17%	3.5	Soil 2	4–8 in	NA	NA						
Dibutyltin	mg/kg	6	5	83%	1	17%	10	Soil 2	0–4 in	NA	NA						
Tributyltin	mg/kg	26	18	69%	8	31%	330	S-3	0–2 ft	NA	1,100						
Tetrabutyltin	mg/kg	6	2	33%	4	67%	0.11	Soil 2	0–4 in	NA	NA						
Nonionizable Organic Compounds																	
Aromatic Hydrocarbons																	
Naphthalene	mg/kg	93	18	19%	75	81%	160	FS-09	8–8.5 ft	5	70,000	6	33%	32			
Acenaphthylene	mg/kg	81	6	7%	75	93%	5.11	S-5	2–4 ft	NA	NA						
Acenaphthene	mg/kg	83	27	33%	56	67%	70	FS-09	8–8.5 ft	NA	210,000						
Fluorene	mg/kg	83	27	33%	56	67%	61	FS-09	8–8.5 ft	NA	140,000						
Phenanthrene	mg/kg	83	37	45%	46	55%	180	FS-09	8–8.5 ft	NA	NA						
Anthracene	mg/kg	83	24	29%	59	71%	24.5	S-3	0–2 ft	NA	1,100,000						
2-Methylnaphthalene	mg/kg	83	16	19%	67	81%	39	FS-09	8–8.5 ft	NA	14						
Total LPAH	mg/kg	79	39	49%	40	51%	492	FS-09	8–8.5 ft	NA	NA						
Fluoranthene	mg/kg	83	41	49%	42	51%	165	S-3	0–2 ft	NA	140,000						
Pyrene	mg/kg	83	43	52%	40	48%	155	S-5	2–4 ft	NA	110,000						
Benzo(a)anthracene	mg/kg	83	28	34%	55	66%	69.1	S-3	0–2 ft	NA	NA						
Chrysene	mg/kg	83	33	40%	50	60%	80.5	S-5	2–4 ft	NA	NA						
Benzo(b)fluoranthene	mg/kg	77	25	32%	52	68%	95.7	S-3	0–2 ft	NA	NA						
Benzo(k)fluoranthene	mg/kg	77	22	29%	55	71%	92	S-5	2–4 ft	NA	NA						
Benzofluoranthenes (total)	mg/kg	79	27	34%	52	66%	186	S-3	0–2 ft	NA	NA						
Benzo(a)pyrene	mg/kg	83	28	34%	55	66%	85.1	S-3	0–2 ft	2	NA	9	32%	42.6			
Indeno(1,2,3-cd)pyrene	mg/kg	83	22	27%	61	73%	23.9	S-3	0–2 ft	NA	NA						
Dibenzo(a,h)anthracene	mg/kg	83	13	16%	70	84%	6.91	S-3	0–2 ft	NA	NA						
Benzo(g,h,i)perylene	mg/kg	83	23	28%	60	72%	21.8	S-3	0–2 ft	NA	NA						
Total HPAH	mg/kg	79	39	49%	40	51%	792	S-3	0–2 ft	NA	NA						
Summed cPAH TEQ[4,5]	mg/kg	67	21	31%	46	69%	7.9	FS-17	6.5–7.5 ft	2	NA	7	33%	3.95			
Summed cPAH TEQ with One-half of the Detection Limits[4,6]	mg/kg	67	21	31%	46	69%	9.7	FS-09	8–8.5 ft	2	NA	7	33%	4.85			

Table 4.1
Frequency of Exceedances for Soil—Current and Historical Analytical Results

										Soil Screening Criteria							
Parameter	Unit	Number of Results	Number of Detected Results	Percent Detected	Number of Non-detected Results	Percent Non-detected	Maximum Detected Value	Location of Maximum Detected Value	Depth of Maximum Detected Value	MTCA Method A[1]	MTCA Method C[2]	Number of Results that Exceed MTCA A	Percent of Detects that Exceed MTCA A	MTCA A Exceedance Ratio[3]	Number of Results that Exceed MTCA C	Percent of Detects that Exceed MTCA C	MTCA C Exceedance Ratio[3]
Chlorinated Benzenes																	
1,2-Dichlorobenzene	mg/kg	83	1	1%	82	99%	0.011	FS-09A	6–7 ft	NA	320,000						
1,3-Dichlorobenzene	mg/kg	83			83	100%				--	--						
1,4-Dichlorobenzene	mg/kg	83			83	100%				--	--						
1,2,4-Trichlorobenzene	mg/kg	83			83	100%				--	--						
Hexachlorobenzene	mg/kg	73			73	100%				--	--						
Phthalate Esters																	
Dimethyl phthalate	mg/kg	79	2	3%	77	97%	0.23	Soil 2	0–4 in	NA	NA						
Diethylphthalate	mg/kg	73			73	100%				--	--						
Di-n-butyl phthalate	mg/kg	79	3	4%	76	96%	0.15	MW-02A	13.5 ft	NA	350,000						
Butyl benzyl phthalate	mg/kg	79	2	3%	77	97%	1	HAS-S-4	0–2 ft	NA	700,000						
bis(2-ethylhexyl)phthalate	mg/kg	82	14	17%	68	83%	35.9	HAS-S-4	2–4 ft	NA	70,000						
Di-n-octyl phthalate	mg/kg	73			73	100%				--	--						
Miscellaneous Nonionizable Organic Carbons																	
Dibenzofuran	mg/kg	82	16	20%	66	80%	47	FS-09	8–8.5 ft	NA	3,500						
Hexachlorobutadiene	mg/kg	83			83	100%				--	--						
N-Nitrosodiphenylamine	mg/kg	79	4	5%	75	95%	1.9	FS-09C	8.5–9.5 ft	NA	NA						
Polychlorinated Biphenyls (PCBs)																	
PCB Aroclor 1016	mg/kg	32			32	100%				--	--						
PCB Aroclor 1016/1242	mg/kg	6			6	100%				--	--						
PCB Aroclor 1221	mg/kg	32			32	100%				--	--						
PCB Aroclor 1232	mg/kg	32			32	100%				--	--						
PCB Aroclor 1242	mg/kg	32	1	3%	31	97%	0.018	MW-02A	7.5 ft	NA	NA						
PCB Aroclor 1248	mg/kg	38	1	3%	37	97%	0.072	FS-11	1-2 ft	NA	NA						
PCB Aroclor 1254	mg/kg	38	15	39%	23	61%	37.4	S-5	2–4 ft	NA	NA						
PCB Aroclor 1260	mg/kg	38	7	18%	31	82%	12.6	S-4	2–4 ft	NA	NA						
PCB Aroclor 1268	mg/kg	22	2	9%	20	91%	1.7	Soil 1	0–4 in	NA	NA						
Total PCBs (Aroclors)	mg/kg	38	19	50%	19	50%	37.4	S-5	2–4 ft	10	66	2	11%	3.74			
Ionizable Organic Compounds																	
Phenol	mg/kg	67			67	100%				--	--						
2-Methylphenol	mg/kg	67			67	100%				--	--						
2,4-Dimethylphenol	mg/kg	70	2	3%	68	97%	1.4	TP-15	6 ft	NA	70,000						
Pentachlorophenol	mg/kg	73	1	1%	72	99%	3.4	Soil 2	4–8 in	NA	18,000						
Benzyl alcohol	mg/kg	67			67	100%				--	--						
Benzoic acid	mg/kg	72	2	3%	70	97%	0.53	Soil 2	4–8 in	NA	14,000,000						
Other Semivolatile Organic Compounds																	
1-Methylnaphthalene	mg/kg	57	6	11%	51	89%	27	FS-09	8–8.5 ft	NA	NA						
2,3,4,6-Tetrachlorophenol	mg/kg	57			57	100%				--	--						
2,4,5-Trichlorophenol	mg/kg	67			67	100%				--	--						
2,4,6-Trichlorophenol	mg/kg	67			67	100%				--	--						
2,4-Dichlorophenol	mg/kg	67			67	100%				--	--						
2,4-Dinitrophenol	mg/kg	67			67	100%				--	--						
2,6-Dichlorophenol	mg/kg	57			57	100%				--	--						
2-Chloronaphthalene	mg/kg	67			67	100%				--	--						
2-Chlorophenol	mg/kg	67			67	100%				--	--						
2-Nitrophenol	mg/kg	67			67	100%				--	--						
4,6-Dinitro-o-cresol	mg/kg	67	1	1%	66	99%	1.7	FS-09C	8.5–9.5 ft	NA	180,000						
4-Chloro-3-methylphenol	mg/kg	67	1	1%	66	99%	0.43	S-3	2–4 ft	NA	NA						
4-Methylphenol	mg/kg	16	1	6%	15	94%	0.15	Soil 2	4–8 in	NA	17,500						
4-Nitrophenol	mg/kg	67			67	100%				--	--						
Acrylonitrile	mg/kg	63			63	100%				--	--						
Aniline	mg/kg	57			57	100%				--	--						

Table 4.1
Frequency of Exceedances for Soil—Current and Historical Analytical Results

										Soil Screening Criteria							
Parameter	Unit	Number of Results	Number of Detected Results	Percent Detected	Number of Non-detected Results	Percent Non-detected	Maximum Detected Value	Location of Maximum Detected Value	Depth of Maximum Detected Value	MTCA Method A^{1}	MTCA Method C^{2}	Number of Results that Exceed MTCA A	Percent of Detects that Exceed MTCA A	MTCA A Exceedance Ratio^{3}	Number of Results that Exceed MTCA C	Percent of Detects that Exceed MTCA C	MTCA C Exceedance Ratio^{3}
Other Semivolatile Organic Compounds (continued)																	
Azobenzene	mg/kg	57			57	100%				--	--						
bis(2-chloroethoxy)methane	mg/kg	67			67	100%				--	--						
Carbazole	mg/kg	76	17	22%	59	78%	11	FS-09	8–8.5 ft	NA	NA						
Hexachlorocyclopentadiene	mg/kg	67			67	100%				--	--						
Isophorone	mg/kg	67	1	1%	66	99%	0.11	MW-09	6–6.5 ft	NA	700,000						
m,p-Cresol (2:1 ratio)	mg/kg	57			57	100%				--	--						
N-Nitrosodimethylamine	mg/kg	57			57	100%				--	--						
N-Nitroso-di-n-propylamine	mg/kg	67			67	100%				--	--						
Other Volatile Organic Compounds																	
1,1,1,2-Tetrachloroethane	mg/kg	63			63	100%				--	--						
1,1,1-Trichloroethane	mg/kg	63			63	100%				--	--						
1,1,2,2-Tetrachloroethane	mg/kg	63			63	100%				--	--						
1,1,2-Trichloroethane	mg/kg	63			63	100%				--	--						
1,1,2-Trichlorotrifluoroethane	mg/kg	12	1	8%	11	92%	0.0058	MW-03	7.5 ft	NA	NA						
1,1-Dichloroethane	mg/kg	63			63	100%				--	--						
1,1-Dichloroethene	mg/kg	63			63	100%				--	--						
1,1-Dichloropropene	mg/kg	63			63	100%				--	--						
1,2,3-Trichlorobenzene	mg/kg	63			63	100%				--	--						
1,2,3-Trichloropropane	mg/kg	63			63	100%				--	--						
1,2,4-Trimethylbenzene	mg/kg	73	10	14%	63	86%	2.8	FS-11	1–2 ft	NA	NA						
1,2-Dibromo-3-chloropropane	mg/kg	63			63	100%				--	--						
1,2-Dibromoethane	mg/kg	63			63	100%				--	--						
1,2-Dichloroethane	mg/kg	63			63	100%				--	--						
1,2-Dichloropropane	mg/kg	63			63	100%				--	--						
1,3,5-Trimethylbenzene	mg/kg	73	5	7%	68	93%	0.34	TP-9	6 ft	NA	35,000						
1,3-Dichloropropane	mg/kg	63			63	100%				--	--						
2,2-Dichloropropane	mg/kg	63			63	100%				--	--						
2,4-Dinitrotoluene	mg/kg	67			67	100%				--	--						
2,6-Dinitrotoluene	mg/kg	67			67	100%				--	--						
2-Chlorotoluene	mg/kg	63			63	100%				--	--						
2-Hexanone	mg/kg	63			63	100%				--	--						
2-Nitroaniline	mg/kg	67			67	100%				--	--						
3,3'-Dichlorobenzidine	mg/kg	67			67	100%				--	--						
3-Nitroaniline	mg/kg	67			67	100%				--	--						
4-Bromophenyl phenyl ether	mg/kg	67			67	100%				--	--						
4-Chloroaniline	mg/kg	67			67	100%				--	--						
4-Chlorophenyl phenyl ether	mg/kg	67			67	100%				--	--						
4-Chlorotoluene	mg/kg	63			63	100%				--	--						
4-Nitroaniline	mg/kg	67			67	100%				--	--						
Acetone	mg/kg	73	13	18%	60	82%	0.25	TP-9	6 ft	NA	3,150,000						
Benzene	mg/kg	64			64	100%				--	--						
bis(2-chloroethyl)ether	mg/kg	67			67	100%				--	--						
bis(2-chloroisopropyl)ether	mg/kg	57			57	100%				--	--						
Bromobenzene	mg/kg	63			63	100%				--	--						
Bromochloromethane	mg/kg	63			63	100%				--	--						
Bromodichloromethane	mg/kg	63			63	100%				--	--						
Bromoform	mg/kg	63			63	100%				--	--						
Bromomethane	mg/kg	63			63	100%				--	--						
Carbon disulfide	mg/kg	69	4	6%	65	94%	0.054	FS-11	1–2 ft	NA	350,000						
Carbon tetrachloride	mg/kg	63			63	100%				--	--						
Chlorobenzene	mg/kg	63			63	100%				--	--						

Table 4.1
Frequency of Exceedances for Soil—Current and Historical Analytical Results

										Soil Screening Criteria							
Parameter	Unit	Number of Results	Number of Detected Results	Percent Detected	Number of Non-detected Results	Percent Non-detected	Maximum Detected Value	Location of Maximum Detected Value	Depth of Maximum Detected Value	MTCA Method A[1]	MTCA Method C[2]	Number of Results that Exceed MTCA A	Percent of Detects that Exceed MTCA A	MTCA A Exceedance Ratio[3]	Number of Results that Exceed MTCA C	Percent of Detects that Exceed MTCA C	MTCA C Exceedance Ratio[3]
Other Volatile Organic Compounds (continued)																	
Chloroethane	mg/kg	63			63	100%				--	--						
Chloroform	mg/kg	63			63	100%				--	--						
Chloromethane	mg/kg	63			63	100%				--	--						
cis-1,2-Dichloroethene	mg/kg	63			63	100%				--	--						
cis-1,3-Dichloropropene	mg/kg	63			63	100%				--	--						
Cymene	mg/kg	73	11	15%	62	85%	0.42	TP-9	6 ft	NA	NA						
Dibromochloromethane	mg/kg	63			63	100%				--	--						
Dibromomethane	mg/kg	63			63	100%				--	--						
Dichlorodifluoromethane	mg/kg	57			57	100%				--	--						
Ethylbenzene	mg/kg	67	4	6%	63	94%	0.22	TP-9	6 ft	6	350,000						
Hexachloroethane	mg/kg	67			67	100%				--	--						
iso-Propylbenzene	mg/kg	67	7	10%	60	90%	0.18	TP-9	6 ft	NA	350,000						
Methyl ethyl ketone	mg/kg	63	2	3%	61	97%	0.021	S-3	0–2 ft	NA	2,100,000						
Methyl iso butyl ketone	mg/kg	63			63	100%				--	--						
Methylene chloride	mg/kg	69	2	3%	67	97%	0.011	MW-01	10 ft	0.02	210,000						
Methyl-Tert-Butyl Ether	mg/kg	57			57	100%				--	--						
n-Butylbenzene	mg/kg	73	12	16%	61	84%	1.1	FS-11	1–2 ft	NA	NA						
Nitrobenzene	mg/kg	67			67	100%				--	--						
n-Propylbenzene	mg/kg	73	7	10%	66	90%	0.43	FS-11	1–2 ft	NA	350,000						
Pyridine	mg/kg	57			57	100%				--	--						
sec-Butylbenzene	mg/kg	73	8	11%	65	89%	0.71	FS-11	1–2 ft	NA	NA						
Styrene	mg/kg	63			63	100%				--	--						
tert-Butylbenzene	mg/kg	63	1	2%	62	98%	0.012	MW-02A	7.5 ft	NA	NA						
Tetrachloroethene	mg/kg	63			63	100%				--	--						
Toluene	mg/kg	64	1	2%	63	98%	0.033	FS-09A	6–7 ft	7	280,000						
trans-1,2-Dichloroethene	mg/kg	63			63	100%				--	--						
trans-1,3-Dichloropropene	mg/kg	63			63	100%				--	--						
Trichloroethene	mg/kg	63			63	100%				--	--						
Trichlorofluoromethane	mg/kg	63			63	100%				--	--						
Vinyl chloride	mg/kg	63			63	100%				--	--						
Xylene (meta & para)	mg/kg	67	8	12%	59	88%	0.31	TP-9	6 ft	NA	NA						
Xylene (ortho)	mg/kg	67	6	9%	61	91%	0.12	TP-9	6 ft	NA	NA						
Xylene (total)	mg/kg	57	2	4%	55	96%	0.108	FS-09C	8.5–9.5 ft	9	700,000						

Notes:

-- Criteria not identified since all results were non-detect.

Blank cells indicate zero (e.g., no analyte was detected and/or exceeded).

1 MTCA Method A Soil Criteria for Industrial Land Use.

2 MTCA Method C Soil Criteria for Industrial Land Use, Non-carcinogenic.

3 The exceedance ratio is the maximum detected value divided by the screening level criteria value.

4 Calculation of cPAH TEQ concentrations was performed using the California Environmental Protection Agency 2005 Toxic Equivalency Factors as presented in Table 708-2 of WAC 173-340-900.

5 Calculated using detected cPAH concentrations.

6 Calculated using detected cPAH concentrations plus one-half the detection limit for cPAHs that were not detected.

Abbreviations:

cPAH	Carcinogenic polycyclic aromatic hydrocarbon.
ft	Feet.
HPAH	High molecular weight polycyclic aromatic hydrocarbon.
LPAH	Low molecular weight polycyclic aromatic hydrocarbon.
MTCA	Model Toxics Control Act.
NA	Not available.
PCB	Polychlorinated biphenyl.
TEQ	Toxic Equivalency Quotient.

Table 4.2
Detected Analytes in Soil—Current and Historical Analytical Results

			Event	Floyd|Snider 2011 Supplemental Site Investigation																
			Location	FS-01				FS-02		FS-03		FS-04		FS-05		FS-06		FS-07		FS-08
			Sample ID	FS01-2.5-031411	FS01-14-031411	FS01-24-031411	FS01-24.8-031411	FS02-2.5-031611	FS02-18-031611	FS03-1.5-031611	FS03-11-031611	FS04-5-031611	FS04-11.5-031611	FS05-2.5-031611	FS05-13-031611	FS06-2.5-031611	FS06-19-031611	FS07-2-031611	FS07-12.5-031611	FS08-2-031511
			Sample Date	03/14/2011	03/14/2011	03/14/2011	03/14/2011	03/16/2011	03/16/2011	03/16/2011	03/16/2011	03/16/2011	03/16/2011	03/16/2011	03/16/2011	03/16/2011	03/16/2011	03/16/2011	03/16/2011	03/15/2011
			Sample Depth	2.5–3.5 ft	14–15 ft	24–24.8 ft	24.8–25 ft	2.5–3.5 ft	18–19 ft	1.5–2.5 ft	11–12 ft	5–6 ft	11.5–12.5 ft	2.5–3.5 ft	13–14 ft	2.5–3.5 ft	19–20 ft	2–3 ft	12.5–13.5 ft	2–3 ft
		Soil Screening Criteria																		
Parameter	**Unit**	**MTCA A[1]**	**MTCA C[2]**																	
Total Petroleum Hydrocarbons																				
Gasoline Range Hydrocarbons	mg/kg	100[3]	NA	4.5 J	**250 J**	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U
Diesel Range Hydrocarbons	mg/kg	2,000	NA	25 U	190	160	78	41	25 U	44	25 U	25 U	25 U	25 U	25 U	36	25 U	25 U	25 U	25 U
Oil Range Hydrocarbons	mg/kg	2,000/4,000[4]	NA	270	50 U	72	50 U	110	50 U	180	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
Metals																				
Antimony	mg/kg	NA	1,400	--	--	--	--	--	--	--	--	--		--	--	--	--	--	--	--
Arsenic	mg/kg	20	1,050	14	2.9	5.5	4.6	17	3.1	**82**	14	16	4.6	3.2	2.2	4.1	3.7	2.7	3.4	3.2
Beryllium	mg/kg	NA	7,000	--	--	--	--	--	--	--	--	--		--	--	--	--	--	--	--
Cadmium	mg/kg	2	NA	1 U	1 U	1 U	1 U	5 U	1 U	1.2	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chromium	mg/kg	NA	NA	41	40	51	39	50	32	49	40	48	42	29	36	34	34	27	37	69
Cobalt	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--		--	--	--	--	--	--	--
Copper	mg/kg	NA	140,000	130	24	26	21	930	19	460	160	95	15	11	23	38	23	13	19	23
Lead	mg/kg	1,000	NA	190	3.9	1.9	3.2	47	4.8	120	37	31	5.8	1.8	3	85	5.6	3.5	1.9	1.9
Mercury	mg/kg	2	NA	0.078	0.03	0.02 U	0.023	0.034	0.07	0.06	0.028	0.02 U	0.02 U	0.02	0.03	0.058	0.03	0.02 U	0.024	0.02
Molybdenum	mg/kg	NA	17,500	--	--	--	--	--	--	--	--	--		--	--	--	--	--	--	--
Nickel	mg/kg	NA	70,000	64	41	69	48	39	35	72	24	46	36	23	39	31	44	26	40	54
Selenium	mg/kg	NA	17,500	--	--	--	--	--	--	--	--	--		--	--	--	--	--	--	--
Silver	mg/kg	NA	17,500	0.34 U	0.36 U	0.35 U	0.35 U	1.7 U	0.39 U	0.33 U	0.36 U	0.33 U	0.35 U	0.35 U	0.37 U	0.34 U	0.39 U	0.33 U	0.37 U	0.33 U
Vanadium	mg/kg	NA	245	--	--	--	--	--	--	--	--	--		--	--	--	--	--	--	--
Zinc	mg/kg	NA	1,100,000	280	38	27	37	3,700	32	1,500	250	180	37	23	38	120	32	180	31	31
Organometallics																				
Butyltin	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibutyltin	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tributyltin	mg/kg	NA	1,100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrabutyltin	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nonionizable Organic Compounds																				
Aromatic Hydrocarbons																				
Naphthalene	mg/kg	5	70,000	0.01 UJ	0.01 U	0.91	0.081 J	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01
Acenaphthylene	mg/kg	NA	NA	0.1 U	0.1 U	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Acenaphthene	mg/kg	NA	210,000	0.1 U	0.15	3.8	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.41	0.1 U
Fluorene	mg/kg	NA	140,000	0.1 U	0.2	14	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.22	0.1 U
Phenanthrene	mg/kg	NA	NA	0.27	0.48	5.1	0.11	0.26	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1.1	0.1 U	0.1 U	0.1 U	0.1 U
Anthracene	mg/kg	NA	1,100,000	0.1 U	0.1 U	11	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.15	0.1 U	0.1 U	0.1 U	0.1 U
2-Methylnaphthalene	mg/kg	NA	14	0.1 U	0.63	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	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 LPAH	mg/kg	NA	NA	0.27	0.83	34.8	0.191 J	0.26	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1.25	0.1 U	0.1 U	0.63	0.01
Fluoranthene	mg/kg	NA	140,000	0.38	0.1 U	48	0.15	0.41	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1.3	0.1 U	0.1 U	0.1 U	0.1 U
Pyrene	mg/kg	NA	110,000	0.43	0.1 U	36	0.15	0.42	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1.4	0.1 U	0.1 U	0.1 U	0.1 U
Benzo(a)anthracene	mg/kg	NA	NA	0.17	0.1 U	9	0.1 U	0.17	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.52	0.1 U	0.1 U	0.1 U	0.1 U
Chrysene	mg/kg	NA	NA	0.24	0.1 U	14	0.1 U	0.18	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.67	0.1 U	0.1 U	0.1 U	0.1 U
Benzo(b)fluoranthene	mg/kg	NA	NA	0.25	0.1 U	4.3	0.1 U	0.14	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.49	0.1 U	0.1 U	0.1 U	0.1 U
Benzo(k)fluoranthene	mg/kg	NA	NA	0.23	0.1 U	4.5	0.1 U	0.17	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.61	0.1 U	0.1 U	0.1 U	0.1 U
Benzofluoranthenes (total)	mg/kg	NA	NA	0.48	0.1 U	8.8	0.1 U	0.31	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1.1	0.1 U	0.1 U	0.1 U	0.1 U
Benzo(a)pyrene	mg/kg	2	NA	0.24	0.1 U	**5.1**	0.1 U	0.18	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.62	0.1 U	0.1 U	0.1 U	0.1 U
Indeno(1,2,3-cd)pyrene	mg/kg	NA	NA	0.1 U	0.1 U	1	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.27	0.1 U	0.1 U	0.1 U	0.1 U
Dibenzo(a,h)anthracene	mg/kg	NA	NA	0.1 U	0.1 U	0.57	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Benzo(g,h,i)perylene	mg/kg	NA	NA	0.12	0.1 U	1.1	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.27	0.1 U	0.1 U	0.1 U	0.1 U
Total HPAH	mg/kg	NA	NA	2.06	0.1 U	124	0.3	1.67	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	6.15	0.1 U	0.1 U	0.1 U	0.1 U
Summed cPAH TEQ[5,6]	mg/kg	2	NA	0.31	0 U	**7.2**	0 U	0.23	0 U	0 U	0 U	0 U	0 U	0 U	0 U	0.82	0 U	0 U	0 U	0 U
Summed cPAH TEQ with One-half of the Detection Limits[5,7]	mg/kg	2	NA	0.32	0.08 U	**7.2**	0.076 U	0.24	0.08 U	0.08 U	0.076 U	0.08 U	0.076 U	0.08 U	0.08 U	0.82	0.08 U	0.08 U	0.076 U	0.08 U
Chlorinated Benzenes																				
1,2-Dichlorobenzene	mg/kg	NA	320,000	0.01 UJ	0.01 U	0.01 U	0.01 UJ	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Phthalate Esters																				
Dimethyl phthalate	mg/kg	NA	NA	0.1 U	0.1 U	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Di-n-butyl phthalate	mg/kg	NA	350,000	0.13 U	0.13 U	0.26 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U
Butyl benzyl phthalate	mg/kg	NA	700,000	0.1 U	0.1 U	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
bis(2-ethylhexyl)phthalate	mg/kg	NA	70,000	0.13 U	0.13 U	0.26 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U
Miscellaneous																				
Dibenzofuran	mg/kg	NA	3,500	0.1 U	0.1 U	3.5	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
N-Nitrosodiphenylamine	mg/kg	NA	NA	0.1 U	0.1 U	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Polychlorinated Biphenyls (PCBs)																				
PCB Aroclor 1242	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--		--	--	--	--	--	--	--
PCB Aroclor 1248	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--		--	--	--	--	--	--	--
PCB Aroclor 1254	mg/kg	NA	70	--	--	--	--	--	--	--	--	--		--	--	--	--	--	--	--
PCB Aroclor 1260	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--		--	--	--	--	--	--	--
PCB Aroclor 1268	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--		--	--	--	--	--	--	--
PCBs (Total, Aroclors)	mg/kg	10	66	--	--	--	--	--	--	--	--	--		--	--	--	--	--	--	--
Ionizable Organic Compounds																				
2,4-Dimethylphenol	mg/kg	NA	70,000	0.1 U	0.1 U	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Pentachlorophenol	mg/kg	NA	18,000	0.5 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Benzoic acid	mg/kg	NA	14,000,000	1 U	1 U	2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U

Table 4.2
Detected Analytes in Soil—Current and Historical Analytical Results

			Event	Floyd|Snider 2011 Supplemental Site Investigation																
			Location	FS-01				FS-02		FS-03		FS-04		FS-05		FS-06		FS-07		FS-08
			Sample ID	FS01-2.5-031411	FS01-14-031411	FS01-24-031411	FS01-24.8-031411	FS02-2.5-031611	FS02-18-031611	FS03-1.5-031611	FS03-11-031611	FS04-5-031611	FS04-11.5-031611	FS05-2.5-031611	FS05-13-031611	FS06-2.5-031611	FS06-19-031611	FS07-2-031611	FS07-12.5-031611	FS08-2-031511
			Sample Date	03/14/2011	03/14/2011	03/14/2011	03/14/2011	03/16/2011	03/16/2011	03/16/2011	03/16/2011	03/16/2011	03/16/2011	03/16/2011	03/16/2011	03/16/2011	03/16/2011	03/16/2011	03/16/2011	03/15/2011
			Sample Depth	2.5–3.5 ft	14–15 ft	24–24.8 ft	24.8–25 ft	2.5–3.5 ft	18–19 ft	1.5–2.5 ft	11–12 ft	5–6 ft	11.5–12.5 ft	2.5–3.5 ft	13–14 ft	2.5–3.5 ft	19–20 ft	2–3 ft	12.5–13.5 ft	2–3 ft
		Soil Screening Criteria																		
Parameter	**Unit**	**MTCA A[1]**	**MTCA C[2]**																	
Other Semivolatile Organic Compounds																				
1-Methylnaphthalene	mg/kg	NA	NA	0.1 U	0.48	0.22	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
4,6-Dinitro-o-cresol	mg/kg	NA	180,000	0.1 U	0.1 U	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
4-Chloro-3-methylphenol	mg/kg	NA	NA	0.1 U	0.1 U	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
4-Methylphenol	mg/kg	NA	17,500	--	--	--	--	--	--	--	--	--		--	--	--	--	--	--	--
Carbazole	mg/kg	NA	NA	0.1 U	0.18	1.1	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.18	0.1 U	0.1 U	0.35	0.1 U
Isophorone	mg/kg	NA	700,000	0.1 U	0.1 U	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Other Volatile Organic Compounds																				
1,1,2-Trichlorotrifluoroethane	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--		--	--	--	--	--	--	--
1,2,4-Trimethylbenzene	mg/kg	NA	NA	0.01 UJ	0.01	0.01 U	0.01 UJ	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
1,3,5-Trimethylbenzene	mg/kg	NA	35,000	0.01 UJ	0.01 U	0.01 U	0.01 UJ	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Acetone	mg/kg	NA	3,150,000	0.05 UJ	0.05 U	0.05 U	0.05 UJ	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Carbon disulfide	mg/kg	NA	350,000	0.01 UJ	0.01 U	0.01 U	0.01 UJ	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Cymene	mg/kg	NA	NA	0.01 UJ	0.02	0.01 U	0.01 UJ	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Ethylbenzene	mg/kg	6	350,000	0.01 UJ	0.01 U	0.01 U	0.01 UJ	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
iso-Propylbenzene	mg/kg	NA	350,000	0.01 UJ	0.01	0.01 U	0.01 UJ	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Methyl ethyl ketone	mg/kg	NA	2,100,000	0.05 UJ	0.05 U	0.05 U	0.05 UJ	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Methylene chloride	mg/kg	0.02	210,000	0.02 UJ	0.02 U	0.02 U	0.02 UJ	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
n-Butylbenzene	mg/kg	NA	NA	0.01 UJ	0.03	0.01 U	0.01 UJ	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
n-Propylbenzene	mg/kg	NA	350,000	0.01 UJ	0.01	0.01 U	0.01 UJ	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
sec-Butylbenzene	mg/kg	NA	NA	0.01 UJ	0.01 U	0.01 U	0.01 UJ	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
tert-Butylbenzene	mg/kg	NA	NA	0.01 UJ	0.01 U	0.01 U	0.01 UJ	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Toluene	mg/kg	7	280,000	0.01 UJ	0.01 U	0.01 U	0.01 UJ	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Xylene (meta & para)	mg/kg	NA	700,000	0.02 UJ	0.02 U	0.02 U	0.02 UJ	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Xylene (ortho)	mg/kg	NA	700,000	0.01 UJ	0.01 U	0.01 U	0.01 UJ	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Xylene (total)	mg/kg	9	700,000	0.02 UJ	0.02 U	0.02 U	0.02 UJ	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U

Notes:

-- Not analyzed.
Bold Detected exceedance of MTCA A and/or MTCA B Criteria.
1 MTCA Method A Soil Criteria for Industrial Land Use.
2 MTCA Method C Soil Criteria for Industrial Land Use, Non-carcinogenic.
3 The MTCA Method A cleanup level of 100 mg/kg was used because benzene was not detected, nor considered a chemical of concern at the site.
4 MTCA Method A Criteria for heavy oils/MTCA Method A Criteria for mineral oils.
5 Calculation of cPAH TEQ concentrations was performed using the California Environmental Protection Agency 2005 Toxic Equivalency Factors as presented in Table 708-2 of WAC 173-340-900.
6 Calculated using detected cPAH concentrations.
7 Calculated using detected cPAH concentrations plus one-half the detection limit for cPAHs that were not detected.

Abbreviations:

cPAH Carcinogenic polycyclic aromatic hydrocarbon.
Ecology Washington State Department of Ecology.
ft Feet.
HPAH High molecular weight poly cyclic aromatic hydrocarbon.
LPAH Low molecular weight polycyclic aromatic hydrocarbon.
MCI Maritime Contractors, Inc.
MTCA Model Toxics Control Act.
NA Not available.
PCB Polychlorinated biphenyl.
TEQ Toxic Equivalency Quotient.

Qualifiers:

J Estimated value.
JB Estimated due to blank contamination.
U Not detected.
UJ Not detected, estimated detection limit.

Table 4.2
Detected Analytes in Soil—Current and Historical Analytical Results

			Event	Flolyd|Snider 2011 Supplemental Site Investigation															
			Location	FS-08	FS-09		FS-09A	FS-09A(2)		FS-09B	FS-09C	FS-09D	FS-10		FS-11		FS-12		
			Sample ID	FS08-21-031511	FS09-8-031511	FS09-18.5-031511	FS09A-6-031711	FS09A(2)-5-031711	FS09A(2)-14-031711	FS09B-15-031711	FS09C-8.5-031711	FS09D-5-031711	FS10-2-031511	FS10-14-031511	FS11-2-031411	FS11-12.5-031411	FS12-2-031411	FS12-17-031411	FS12A-17-031411
			Sample Date	03/15/2011	03/15/2011	03/15/2011	03/17/2011	03/17/2011	03/17/2011	03/17/2011	03/17/2011	03/17/2011	03/15/2011	03/15/2011	03/14/2011	03/14/2011	03/14/2011	03/14/2011	03/14/2011
			Sample Depth	21–22 ft	8–8.5 ft	18.5–20 ft	6–7 ft	5–6 ft	14–15 ft	14–15 ft	8.5–9.5 ft	5–6 ft	2–3 ft	13–14 ft	1–2 ft	12.5–13.5 ft	2–3 ft	17–18 ft	17–18 ft
		Soil Screening Criteria																	
Parameter	Unit	MTCA A[1]	MTCA C[2]																
Total Petroleum Hydrocarbons																			
Gasoline Range Hydrocarbons	mg/kg	100[3]	NA	3 U	28 U	3 U	3 UJ	3 UJ	3 UJ	3 U	180 UJ	37 UJ	--	3 U	150 U	3 U	3 U	3 U	3 U
Diesel Range Hydrocarbons	mg/kg	2,000	NA	25 U	**5,300**	25 U	25 UJ	25 UJ	25 UJ	25 UJ	**3,700 J**	1700 J	--	25 U	**5,700**	25 U	120	25 U	25 U
Oil Range Hydrocarbons	mg/kg	2,000/4,000[4]	NA	50 U	520 J	50 U	50 UJ	50 UJ	50 UJ	50 UJ	100 UJ	50 UJ	--	50 U	1,200	50 U	210	50 U	50 U
Metals																			
Antimony	mg/kg	NA	1,400	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	mg/kg	20	1,050	3.6	3.2	3.3	--	--	--	--	--	--	3.4	9.2	7.2	4	**61**	5.1	4.4
Beryllium	mg/kg	NA	7,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	mg/kg	2	NA	1 U	1 U	1 U	--	--	--	--	--	--	1 U	1 U	1 U	1 U	1.5	1 U	1 U
Chromium	mg/kg	NA	NA	31	45	33	--	--	--	--	--	--	58	36	65	48	69	45	68
Cobalt	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	mg/kg	NA	140,000	18	24	15	--	--	--	--	--	--	24	22	310	32	410	21	30
Lead	mg/kg	1,000	NA	1.9	2.6	6.3	--	--	--	--	--	--	2.4	2.9	35	4.4	690	2.9	2.8
Mercury	mg/kg	2	NA	0.02 U	0.02 U	0.023	--	--	--	--	--	--	0.039	0.03	0.48	0.026	1.4	0.03	0.028
Molybdenum	mg/kg	NA	17,500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	mg/kg	NA	70,000	40	53	26	--	--	--	--	--	--	53	42	59	61	65	57	80
Selenium	mg/kg	NA	17,500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	mg/kg	NA	17,500	0.36 U	0.34 U	0.38 U	--	--	--	--	--	--	0.36 U	0.38 U	0.39 U	0.38 U	0.34 U	0.36 U	0.34 U
Vanadium	mg/kg	NA	245	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	mg/kg	NA	1,100,000	27	40	36	--	--	--	--	--	--	33	32	250	48	840	35	37
Organometallics																			
Butyltin	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibutyltin	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tributyltin	mg/kg	NA	1,100	--	--	--	--	--	--	--	--	--	0.0094 UY	0.004 U	1.3	0.003 U	--	--	--
Tetrabutyltin	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nonionizable Organic Compounds																			
Aromatic Hydrocarbons																			
Naphthalene	mg/kg	5	70,000	0.01 U	**160**	0.01 U	**6.9 J**	0.01 UJ	0.01 UJ	0.01 UJ	**40 J**	0.011 J	--	0.01 U	1.3	0.01 U	0.01 U	0.01 U	0.01 U
Acenaphthylene	mg/kg	NA	NA	0.1 U	10 U	0.1 U	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	1 UJ	0.2 UJ	--	0.1 U	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U
Acenaphthene	mg/kg	NA	210,000	0.1 U	70	0.1 U	0.14 J	0.1 UJ	0.3 J	0.13 J	29 J	0.2 UJ	--	0.1 U	0.98 J	0.1 U	0.1 U	0.1 U	0.1 U
Fluorene	mg/kg	NA	140,000	0.1 U	61	0.1 U	0.1 UJ	0.1 UJ	0.17 J	0.1 UJ	28 J	0.86 J	--	0.1 U	1.5 J	0.1 U	0.1 U	0.1 U	0.1 U
Phenanthrene	mg/kg	NA	NA	0.1 U	180	0.1 U	0.13 J	0.1 UJ	0.1 UJ	0.1 UJ	71 J	0.22 J	--	0.1 U	3.5 J	0.1 U	0.54	0.1 U	0.1 U
Anthracene	mg/kg	NA	1,100,000	0.1 U	21	0.1 U	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	6.1 J	0.2 UJ	--	0.1 U	0.36 J	0.1 U	0.1 U	0.1 U	0.1 U
2-Methylnaphthalene	mg/kg	NA	14	0.1 U	39	0.1 U	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	38 J	0.2 UJ	--	0.1 U	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U
Total LPAH	mg/kg	NA	NA	0.1 U	492	0.1 U	7.17 J	0.1 UJ	0.47 J	0.13 J	174.1 J	1.091 J	--	0.1 U	7.64 J	0.1 U	0.54	0.1 U	0.1 U
Fluoranthene	mg/kg	NA	140,000	0.1 U	110	0.1 U	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	31 J	0.2 UJ	--	0.1 U	0.72 J	0.1 U	0.66	0.1 U	0.1 U
Pyrene	mg/kg	NA	110,000	0.1 U	68	0.1 U	0.17 J	0.1 UJ	0.1 UJ	0.1 UJ	23 J	0.2 UJ	--	0.1 U	0.99 J	0.1 U	0.75	0.1 U	0.1 U
Benzo(a)anthracene	mg/kg	NA	NA	0.1 U	20	0.1 U	0.23 J	0.1 UJ	0.1 UJ	0.1 UJ	6 J	0.2 UJ	--	0.1 U	0.29 J	0.1 U	0.3	0.1 U	0.1 U
Chrysene	mg/kg	NA	NA	0.1 U	14	0.1 U	0.64 J	0.1 UJ	0.1 UJ	0.1 UJ	4.1 J	0.2 UJ	--	0.1 U	0.37 J	0.1 U	0.46	0.1 U	0.1 U
Benzo(b)fluoranthene	mg/kg	NA	NA	0.1 U	11	0.1 U	0.57 J	0.1 UJ	0.1 UJ	0.1 UJ	2.6 J	0.2 UJ	--	0.1 U	0.36 J	0.1 U	0.53	0.1 U	0.1 U
Benzo(k)fluoranthene	mg/kg	NA	NA	0.1 U	10 U	0.1 U	0.28 J	0.1 UJ	0.1 UJ	0.1 UJ	2.8 J	0.2 UJ	--	0.1 U	0.29 J	0.1 U	0.42	0.1 U	0.1 U
Benzofluoranthenes (total)	mg/kg	NA	NA	0.1 U	11	0.1 U	0.85 J	0.1 UJ	0.1 UJ	0.1 UJ	5.4 J	0.2 UJ	--	0.1 U	0.65 J	0.1 U	0.95	0.1 U	0.1 U
Benzo(a)pyrene	mg/kg	2	NA	0.1 U	10 U	0.1 U	0.47 J	0.1 UJ	0.1 UJ	0.1 UJ	**2.6 J**	0.2 UJ	--	0.1 U	0.39 J	0.1 U	0.43	0.1 U	0.1 U
Indeno(1,2,3-cd)pyrene	mg/kg	NA	NA	0.1 U	10 U	0.1 U	0.26 J	0.1 UJ	0.1 UJ	0.1 UJ	1 UJ	0.2 UJ	--	0.1 U	0.24 J	0.1 U	0.22	0.1 U	0.1 U
Dibenzo(a,h)anthracene	mg/kg	NA	NA	0.1 U	10 U	0.1 U	0.12 J	0.1 UJ	0.1 UJ	0.1 UJ	1 UJ	0.2 UJ	--	0.1 U	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U
Benzo(g,h,i)perylene	mg/kg	NA	NA	0.1 U	10 U	0.1 U	0.29 J	0.1 UJ	0.1 UJ	0.1 UJ	1 UJ	0.2 UJ	--	0.1 U	0.24 J	0.1 U	0.25	0.1 U	0.1 U
Total HPAH	mg/kg	NA	NA	0.1 U	223	0.1 U	3.03 J	0.1 UJ	0.1 UJ	0.1 UJ	72.1 J	0.2 UJ	--	0.1 U	3.89 J	0.1 U	4.02	0.1 U	0.1 U
Summed cPAH TEQ[5,6]	mg/kg	2	NA	0 U	**3.2**	0 U	0.62 J	0 UJ	0 UJ	0 UJ	**3.8 J**	0 UJ	--	0 U	0.51 J	0 U	0.58	0 U	0 U
Summed cPAH TEQ with One-half of the Detection Limits[5,7]	mg/kg	2	NA	0.076 U	**9.7**	0.076 U	0.62 J	0.076 UJ	0.076 UJ	0.08 UJ	**3.9 J**	0.15 UJ	--	0.076 U	0.52 J	0.076 U	0.59	0.08 U	0.076 U
Chlorinated Benzenes																			
1,2-Dichlorobenzene	mg/kg	NA	320,000	0.01 U	0.01 UJ	0.01 U	0.011 J	0.01 UJ	0.01 UJ	0.01 UJ	0.01 UJ	0.01 UJ	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Phthalate Esters																			
Dimethyl phthalate	mg/kg	NA	NA	0.1 U	10 U	0.1 U	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	1 UJ	0.2 UJ	--	0.1 U	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U
Di-n-butyl phthalate	mg/kg	NA	350,000	0.13 U	13 U	0.13 U	0.13 UJ	0.13 UJ	0.13 UJ	0.13 UJ	1.3 UJ	0.26 UJ	--	0.13 U	0.26 U	0.13 U	0.13 U	0.13 U	0.13 U
Butyl benzyl phthalate	mg/kg	NA	700,000	0.1 U	10 U	0.1 U	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	1 UJ	0.2 UJ	--	0.1 U	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U
bis(2-ethylhexyl)phthalate	mg/kg	NA	70,000	0.13 U	13 U	0.13 U	0.13 UJ	0.13 UJ	0.13 UJ	0.13 UJ	1.3 UJ	0.26 UJ	--	0.13 U	0.26 U	0.13 U	0.13 U	0.13 U	0.13 U
Miscellaneous																			
Dibenzofuran	mg/kg	NA	3500	0.1 U	47	0.1 U	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	20 J	0.2 UJ	--	0.1 U	0.57 J	0.1 U	0.1 U	0.1 U	0.1 U
N-Nitrosodiphenylamine	mg/kg	NA	NA	0.1 U	10 U	0.1 U	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	1.9 J	0.46 J	--	0.1 U	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U
Polychlorinated Biphenyls (PCBs)																			
PCB Aroclor 1242	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	0.0038 U	0.004 U	0.0039 U	0.004 U	--	--	--
PCB Aroclor 1248	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	0.0038 U	0.004 U	0.072	0.004 U	--	--	--
PCB Aroclor 1254	mg/kg	NA	70	--	--	--	--	--	--	--	--	--	0.0044	0.004 U	0.092	0.004 U	--	--	--
PCB Aroclor 1260	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	0.0038 U	0.004 U	0.035	0.004 U	--	--	--
PCB Aroclor 1268	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	0.0038 U	0.004 U	0.0039 U	0.004 U	--	--	--
PCBs (Total, Aroclors)	mg/kg	10	66	--	--	--	--	--	--	--	--	--	0.0044	0.004 U	0.199	0.004 U	--	--	--
Ionizable Organic Compounds																			
2,4-Dimethylphenol	mg/kg	NA	70,000	0.1 U	10 U	0.1 U	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	1 UJ	0.2 UJ	--	0.1 U	0.2 UJ	0.1 U	0.1 U	0.1 U	0.1 U
Pentachlorophenol	mg/kg	NA	18,000	0.5 U	50 U	0.5 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	5 UJ	1 UJ	--	0.5 U	1 UJ	0.5 U	0.5 U	0.5 U	0.5 U
Benzoic acid	mg/kg	NA	14,000,000	1 U	100 U	1 U	1 UJ	1 UJ	1 UJ	1 UJ	10 UJ	2 UJ	--	1 U	2 UJ	1 U	1 U	1 U	1 U

Table 4.2
Detected Analytes in Soil—Current and Historical Analytical Results

			Event	Flolyd|Snider 2011 Supplemental Site Investigation															
			Location	FS-08	FS-09		FS-09A	FS-09A(2)		FS-09B	FS-09C	FS-09D	FS-10		FS-11		FS-12		
			Sample ID	FS08-21-031511	FS09-8-031511	FS09-18.5-031511	FS09A-6-031711	FS09A(2)-5-031711	FS09A(2)-14-031711	FS09B-15-031711	FS09C-8.5-031711	FS09D-5-031711	FS10-2-031511	FS10-14-031511	FS11-2-031411	FS11-12.5-031411	FS12-2-031411	FS12-17-031411	FS12A-17-031411
			Sample Date	03/15/2011	03/15/2011	03/15/2011	03/17/2011	03/17/2011	03/17/2011	03/17/2011	03/17/2011	03/17/2011	03/15/2011	03/15/2011	03/14/2011	03/14/2011	03/14/2011	03/14/2011	03/14/2011
			Sample Depth	21–22 ft	8–8.5 ft	18.5–20 ft	6–7 ft	5–6 ft	14–15 ft	14–15 ft	8.5–9.5 ft	5–6 ft	2–3 ft	13–14 ft	1–2 ft	12.5–13.5 ft	2–3 ft	17–18 ft	17–18 ft
		Soil Screening Criteria																	
Parameter	Unit	MTCA A[1]	MTCA C[2]																
Other Semivolatile Organic Compounds																			
1-Methylnaphthalene	mg/kg	NA	NA	0.1 U	27	0.1 U	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	25 J	0.2 UJ	--	0.1 U	3.8 J	0.1 U	0.1 U	0.1 U	0.1 U
4,6-Dinitro-o-cresol	mg/kg	NA	180,000	0.1 U	10 U	0.1 U	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	1.7 J	0.2 UJ	--	0.1 U	0.2 UJ	0.1 U	0.1 U	0.1 U	0.1 U
4-Chloro-3-methylphenol				0.1 U	10 U	0.1 U	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	1 UJ	0.2 UJ	--	0.1 U	0.2 UJ	0.1 U	0.1 U	0.1 U	0.1 U
4-Methylphenol	mg/kg	NA	18,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbazole	mg/kg	NA	NA	0.1 U	11	0.1 U	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	3.9 J	0.2 UJ	--	0.1 U	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U
Isophorone	mg/kg	NA	700,000	0.1 U	10 U	0.1 U	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	1 UJ	0.2 UJ	--	0.1 U	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U
Other Volatile Organic Compounds																			
1,1,2-Trichlorotrifluoroethane	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trimethylbenzene	mg/kg	NA	NA	0.01 U	0.035 J	0.01 U	0.027 J	0.01 UJ	0.01 UJ	0.01 UJ	0.51 J	0.01 UJ	--	0.01 U	2.8	0.01 U	0.01 U	0.01 U	0.01 U
1,3,5-Trimethylbenzene	mg/kg	NA	35,000	0.01 U	0.01 UJ	0.01 U	0.01 UJ	0.01 UJ	0.01 UJ	0.01 UJ	0.01 UJ	0.01 UJ	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Acetone	mg/kg	NA	3,150,000	0.05 U	0.05 UJ	0.05 U	0.05 UJ	0.05 UJ	0.05 UJ	0.05 UJ	0.05 UJ	0.05 UJ	--	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Carbon disulfide	mg/kg	NA	350,000	0.01 U	0.01 UJ	0.01 U	0.01 UJ	0.01 UJ	0.01 UJ	0.01 UJ	0.01 UJ	0.01 UJ	--	0.01 U	0.054	0.01 U	0.01 U	0.01 U	0.01 U
Cymene	mg/kg	NA	NA	0.01 U	0.015 J	0.01 U	0.061 J	0.01 UJ	0.01 UJ	0.01 UJ	0.27 J	0.01 UJ	--	0.01 U	0.051	0.01 U	0.01 U	0.01 U	0.01 U
Ethylbenzene	mg/kg	6	350,000	0.01 U	0.01 UJ	0.01 U	0.014 J	0.01 UJ	0.01 UJ	0.01 UJ	0.037 J	0.01 UJ	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
iso-Propylbenzene	mg/kg	NA	350,000	0.01 U	0.01 UJ	0.01 U	0.01 UJ	0.01 UJ	0.01 UJ	0.01 UJ	0.053 J	0.01 UJ	--	0.01 U	0.04	0.01 U	0.01 U	0.01 U	0.01 U
Methyl ethyl ketone				0.05 U	0.05 UJ	0.05 U	0.05 UJ	0.05 UJ	0.05 UJ	0.05 UJ	0.05 UJ	0.05 UJ	--	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Methylene chloride	mg/kg	0.02	210,000	0.02 U	0.02 UJ	0.02 U	0.02 UJ	0.02 UJ	0.02 UJ	0.02 UJ	0.02 UJ	0.02 UJ	--	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
n-Butylbenzene	mg/kg	NA	NA	0.01 U	0.039 J	0.01 U	0.056 J	0.01 UJ	0.01 UJ	0.01 UJ	0.31 J	0.01 J	--	0.01 U	1.1	0.01 U	0.01 U	0.01 U	0.01 U
n-Propylbenzene	mg/kg	NA	350,000	0.01 U	0.01 UJ	0.01 U	0.01 UJ	0.01 UJ	0.01 UJ	0.01 UJ	0.05 J	0.01 UJ	--	0.01 U	0.43	0.01 U	0.01 U	0.01 U	0.01 U
sec-Butylbenzene	mg/kg	NA	NA	0.01 U	0.01 UJ	0.01 U	0.01 UJ	0.01 UJ	0.01 UJ	0.01 UJ	0.01 UJ	0.016 J	--	0.01 U	0.71	0.01 U	0.01 U	0.01 U	0.01 U
tert-Butylbenzene	mg/kg	NA	NA	0.01 U	0.01 UJ	0.01 U	0.01 UJ	0.01 UJ	0.01 UJ	0.01 UJ	0.01 UJ	0.01 UJ	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Toluene	mg/kg	7	280,000	0.01 U	0.01 UJ	0.01 U	0.033 J	0.01 UJ	0.01 UJ	0.01 UJ	0.01 UJ	0.01 UJ	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Xylene (meta & para)	mg/kg	NA	700,000	0.02 U	0.02 UJ	0.02 U	0.042 J	0.02 UJ	0.02 UJ	0.02 UJ	0.05 J	0.02 UJ	--	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Xylene (ortho)	mg/kg	NA	700,000	0.01 U	0.01 UJ	0.01 U	0.019 J	0.01 UJ	0.01 UJ	0.01 UJ	0.058 J	0.01 UJ	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Xylene (total)	mg/kg	9	700,000	0.02 U	0.02 UJ	0.02 U	0.061 J	0.02 UJ	0.02 UJ	0.02 UJ	0.108 J	0.02 UJ	--	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U

Notes:

--	Not analyzed.
Bold	Detected exceedance of MTCA A and/or MTCA B Criteria.
1	MTCA Method A Soil Criteria for Industrial Land Use.
2	MTCA Method C Soil Criteria for Industrial Land Use, Non-carcinogenic.
3	The MTCA Method A cleanup level of 100 mg/kg was used because benzene was not detected, nor considered a chemical of concern at the site.
4	MTCA Method A Criteria for heavy oils/MTCA Method A Criteria for mineral oils.
5	Calculation of cPAH TEQ concentrations was performed using the California Environmental Protection Agency 2005 Toxic Equivalency Factors as presented in Table 708-2 of WAC 173-340-900.
6	Calculated using detected cPAH concentrations.
7	Calculated using detected cPAH concentrations plus one-half the detection limit for cPAHs that were not detected.

Abbreviations:

cPAH	Carcinogenic polycyclic aromatic hydrocarbon.
Ecology	Washington State Department of Ecology.
ft	Feet.
HPAH	High molecular weight poly cyclic aromatic hydrocarbon.
LPAH	Low molecular weight polycyclic aromatic hydrocarbon.
MCI	Maritime Contractors, Inc.
MTCA	Model Toxics Control Act.
NA	Not available.
PCB	Polychlorinated biphenyl.
TEQ	Toxic Equivalency Quotient.

Qualifiers:

J	Estimated value.
JB	Estimated due to blank contamination.
U	Not detected.
UJ	Not detected, estimated detection limit.

Table 4.2

Detected Analytes in Soil—Current and Historical Analytical Results

Event				Floyd|Snider 2011 Supplemental Site Investigation															
Location				FS-13		FS-14		FS-15		FS-16		FS-17			FS-18		MW-02A		MW-06
Sample ID				FS13-4-031511	FS13-16-031511	FS14-7-031511	FS14-17-031511	FS15-13-031411	FS15-23-031411	FS16-2-031511	FS16-19-031511	FS17-6.5-031611	FS17-18-031611	FS17A-18-031611	FS18-3-031611	FS18-14-031611	MW02A-7.5-031511	MW02A-13.5-031511	MW06-10-031411
Sample Date				03/15/2011	03/15/2011	03/15/2011	03/15/2011	03/14/2011	03/14/2011	03/15/2011	03/15/2011	03/16/2011	03/16/2011	03/16/2011	03/16/2011	03/16/2011	03/15/2011	03/15/2011	03/14/2011
Sample Depth				4–5 ft	16–17 ft	7–8 ft	17–19 ft	13–14 ft	23–24 ft	2–2.5 ft	19–20 ft	6.5–7.5 ft	18–19 ft	18–19 ft	3–4 ft	14–15 ft	7.5 ft	13.5 ft	10 ft
		Soil Screening Criteria																	
Parameter	**Unit**	**MTCA A[1]**	**MTCA C[2]**																
Total Petroleum Hydrocarbons																			
Gasoline Range Hydrocarbons	mg/kg	100[3]	NA	3 U	3 U	19 U	3 U	55 U	3 U	3 U	3 U	1.5 U	3 U	3 U	3 U	3 U	**280 J**	3 U	85 J
Diesel Range Hydrocarbons	mg/kg	2,000	NA	990	25 U	440	25 U	950	25 U	25 U	25 U	1,200	25 U	25 U	25 U	25 U	**18,000**	25 U	1700
Oil Range Hydrocarbons	mg/kg	2,000/4,000[4]	NA	160 J	50 U	50 U	50 U	50 U	50 U	50 U	50 U	**5,400**	50 U	50 U	50 U	50 U	**6,300**	50 U	50 U
Metals																			
Antimony	mg/kg	NA	1,400	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	mg/kg	20	1,050	**45**	3.1	3.8	5.3	5.2	5	3.6	5.6	9.4	5.6	3.2	3	3.6	4.7	6.5	2.8
Beryllium	mg/kg	NA	7,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	mg/kg	2	NA	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.8	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chromium	mg/kg	NA	NA	60	46	45	43	41	45	38	32	50	50	41	25	31	36	56	45
Cobalt	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	mg/kg	NA	140,000	370	21	28	23	26	23	20	30	240	31	23	5.6	22	14	48	20
Lead	mg/kg	1,000	NA	170	2.6	2.7	2.9	16	2.2	2.1	3	710	2.9	2	1.2	33	3.2	7.2	2.3
Mercury	mg/kg	2	NA	2.7	0.03	0.029	0.03	0.02 U	0.022	0.02 U	0.021	0.097	0.024	0.028	0.02 U	0.03	0.033	0.074	0.02 U
Molybdenum	mg/kg	NA	17,500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	mg/kg	NA	70,000	52	69	66	59	52	62	38	51	57	100	44	17	29	32	76	45
Selenium	mg/kg	NA	17,500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	mg/kg	NA	17,500	0.35 U	0.34 U	0.35 U	0.35 U	0.36 U	0.35 U	0.33 U	0.35 U	0.39 U	0.36 U	0.36 U	0.34 U	0.39 U	0.36 U	0.42 U	0.34 U
Vanadium	mg/kg	NA	245	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	mg/kg	NA	1,100,000	750	36	36	40	44	34	30	33	1,700	35	26	17	32	45	71	34
Organometallics																			
Butyltin	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibutyltin	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tributyltin	mg/kg	NA	1,100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrabutyltin	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nonionizable Organic Compounds																			
Aromatic Hydrocarbons																			
Naphthalene	mg/kg	5	70,000	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.3	0.01 U	0.042
Acenaphthylene	mg/kg	NA	NA	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	2	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 U
Acenaphthene	mg/kg	NA	210,000	0.2 U	0.1 U	0.1 U	0.1 U	1.1	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 U	0.1 U	0.1 U	1.2 J	0.1 U	0.22 J
Fluorene	mg/kg	NA	140,000	0.2 U	0.1 U	0.46 J	0.1 U	1.1	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.58 J
Phenanthrene	mg/kg	NA	NA	0.34	0.1 U	1.2 J	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	6.3	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	2 J
Anthracene	mg/kg	NA	1,100,000	0.2 U	0.1 U	0.11 J	0.1 U	0.31	0.1 U	0.1 U	0.1 U	1	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 J
2-Methylnaphthalene	mg/kg	NA	14	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 U
Total LPAH	mg/kg	NA	NA	0.34	0.1 U	1.77 J	0.1 U	2.51	0.1 U	0.1 U	0.1 U	9.3	0.1 U	0.1 U	0.1 U	0.1 U	1.5 J	0.1 U	2.942 J
Fluoranthene	mg/kg	NA	140,000	0.43	0.1 U	0.1 U	0.1 U	0.4	0.1 U	0.1 U	0.1 U	8.2	0.1 U	0.1 U	0.1 U	0.11	1.4 J	0.1 U	0.1 U
Pyrene	mg/kg	NA	110,000	0.68	0.1 U	0.1 U	0.1 U	0.31	0.1 U	0.1 U	0.1 U	9.9	0.1 U	0.1 U	0.1 U	0.13	1.5 J	0.1 U	0.1 J
Benzo(a)anthracene	mg/kg	NA	NA	0.24	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	3.6	0.1 U	0.1 U	0.1 U	0.1 U	0.63 U	0.1 U	0.1 U
Chrysene	mg/kg	NA	NA	0.62	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	4.8	0.1 U	0.1 U	0.1 U	0.1 U	0.64 J	0.1 U	0.1 U
Benzo(b)fluoranthene	mg/kg	NA	NA	0.78	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	5.1	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 U
Benzo(k)fluoranthene	mg/kg	NA	NA	0.53	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	4.7	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 U
Benzofluoranthenes (total)	mg/kg	NA	NA	1.31	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	9.8	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 U
Benzo(a)pyrene	mg/kg	2	NA	0.45	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	**5.9**	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 U
Indeno(1,2,3-cd)pyrene	mg/kg	NA	NA	0.22	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	4.3	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 U
Dibenzo(a,h)anthracene	mg/kg	NA	NA	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1.7	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 U
Benzo(g,h,i)perylene	mg/kg	NA	NA	0.27	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	5.1	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 U
Total HPAH	mg/kg	NA	NA	4.22	0.1 U	0.1 U	0.1 U	0.71	0.1 U	0.1 U	0.1 U	53.3	0.1 U	0.1 U	0.1 U	0.24	3.54 J	0.1 U	0.1 J
Summed cPAH TEQ[5,6]	mg/kg	2	NA	0.63	0 U	0 U	0 U	0 U	0 U	0 U	0 U	**7.9**	0 U	0 U	0 U	0 U	0.0064 J	0 U	0 U
Summed cPAH TEQ with One-half of the Detection Limits[5,7]	mg/kg	2	NA	0.64	0.08 U	0.076 U	0.08 U	0.08 U	0.076 U	0.076 U	0.076 U	**7.9**	0.076 U	0.076 U	0.076 U	0.08 U	0.39 J	0.076 U	0.076 U
Chlorinated Benzenes																			
1,2-Dichlorobenzene	mg/kg	NA	320,000	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 UJ	0.01 U	0.01 U
Phthalate Esters																			
Dimethyl phthalate	mg/kg	NA	NA	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 U
Di-n-butyl phthalate	mg/kg	NA	350,000	0.26 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.65 U	0.13 U	0.13 U	0.13 U	0.13 U	0.65 U	0.15	0.13 U
Butyl benzyl phthalate	mg/kg	NA	700,000	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 U
bis(2-ethylhexyl)phthalate	mg/kg	NA	70,000	0.26 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.65 U	0.13 U	0.13 U	0.13 U	0.13 U	0.65 U	0.13 U	0.13 U
Miscellaneous																			
Dibenzofuran	mg/kg	NA	3500	0.2 U	0.1 U	0.12 J	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 U	0.1 U	0.1 U	0.97 J	0.1 U	0.1 U
N-Nitrosodiphenylamine	mg/kg	NA	NA	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.58 J
Polychlorinated Biphenyls (PCBs)																			
PCB Aroclor 1242	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	0.018	0.004 U	0.0039 U
PCB Aroclor 1248	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0039 U	0.004 U	0.0039 U
PCB Aroclor 1254	mg/kg	NA	70	--	--	--	--	--	--	--	--	--	--	--	--	--	0.01 J	0.004 U	0.0039 U
PCB Aroclor 1260	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0039 U	0.004 U	0.0039 U
PCB Aroclor 1268	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0039 U	0.004 U	0.0039 U
PCBs (Total, Aroclors)	mg/kg	10	66	--	--	--	--	--	--	--	--	--	--	--	--	--	0.028 J	0.004 U	0.0039 U
Ionizable Organic Compounds																			
2,4-Dimethylphenol	mg/kg	NA	70,000	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.15	0.1 U
Pentachlorophenol	mg/kg	NA	18,000	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	0.5 U
Benzoic acid	mg/kg	NA	14,000,000	2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U

Table 4.2
Detected Analytes in Soil—Current and Historical Analytical Results

			Event	Floyd|Snider 2011 Supplemental Site Investigation															
			Location	FS-13		FS-14		FS-15		FS-16		FS-17			FS-18		MW-02A		MW-06
			Sample ID	FS13-4-031511	FS13-16-031511	FS14-7-031511	FS14-17-031511	FS15-13-031411	FS15-23-031411	FS16-2-031511	FS16-19-031511	FS17-6.5-031611	FS17-18-031611	FS17A-18-031611	FS18-3-031611	FS18-14-031611	MW02A-7.5-031511	MW02A-13.5-031511	MW06-10-031411
			Sample Date	03/15/2011	03/15/2011	03/15/2011	03/15/2011	03/14/2011	03/14/2011	03/15/2011	03/15/2011	03/16/2011	03/16/2011	03/16/2011	03/16/2011	03/16/2011	03/15/2011	03/15/2011	03/14/2011
			Sample Depth	4–5 ft	16–17 ft	7–8 ft	17–19 ft	13–14 ft	23–24 ft	2–2.5 ft	19–20 ft	6.5–7.5 ft	18–19 ft	18–19 ft	3–4 ft	14–15 ft	7.5 ft	13.5 ft	10 ft
		Soil Screening Criteria																	
Parameter	Unit	MTCA A[1]	MTCA C[2]																
Other Semivolatile Organic Compounds																			
1-Methylnaphthalene	mg/kg	NA	NA	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 U
4,6-Dinitro-o-cresol	mg/kg	NA	180,000	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.52 U	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 U
4-Chloro-3-methylphenol				0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 U
4-Methylphenol	mg/kg	NA	18,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbazole	mg/kg	NA	NA	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1.4	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 U
Isophorone	mg/kg	NA	700,000	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U	0.1 U
Other Volatile Organic Compounds																			
1,1,2-Trichlorotrifluoroethane	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trimethylbenzene	mg/kg	NA	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 UJ	0.01 U	0.01 U
1,3,5-Trimethylbenzene	mg/kg	NA	35,000	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 UJ	0.01 U	0.01 U
Acetone	mg/kg	NA	3,150,000	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 UJ	0.05 U	0.05 U
Carbon disulfide	mg/kg	NA	350,000	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 UJ	0.01 U	0.01 U
Cymene	mg/kg	NA	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 UJ	0.01 U	0.3
Ethylbenzene	mg/kg	6	350,000	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 UJ	0.01 U	0.01 U
iso-Propylbenzene	mg/kg	NA	350,000	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 UJ	0.01 U	0.01 U
Methyl ethyl ketone				0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 UJ	0.05 U	0.05 U
Methylene chloride	mg/kg	0.02	210,000	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 UJ	0.02 U	0.02 U
n-Butylbenzene	mg/kg	NA	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.35	0.01 U	0.036
n-Propylbenzene	mg/kg	NA	350,000	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.016 J	0.01 U	0.01 U
sec-Butylbenzene	mg/kg	NA	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.36	0.01 U	0.01 U
tert-Butylbenzene	mg/kg	NA	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.012 J	0.01 U	0.01 U
Toluene	mg/kg	7	280,000	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 UJ	0.01 U	0.01 U
Xylene (meta & para)	mg/kg	NA	700,000	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 UJ	0.02 U	0.02 U
Xylene (ortho)	mg/kg	NA	700,000	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 UJ	0.01 U	0.01 U
Xylene (total)	mg/kg	9	700,000	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 UJ	0.02 U	0.02 U

Notes:

--	Not analyzed.
Bold	Detected exceedance of MTCA A and/or MTCA B Criteria.
1	MTCA Method A Soil Criteria for Industrial Land Use.
2	MTCA Method C Soil Criteria for Industrial Land Use, Non-carcinogenic.
3	The MTCA Method A cleanup level of 100 mg/kg was used because benzene was not detected, nor considered a chemical of concern at the site.
4	MTCA Method A Criteria for heavy oils/MTCA Method A Criteria for mineral oils.
5	Calculation of cPAH TEQ concentrations was performed using the California Environmental Protection Agency 2005 Toxic Equivalency Factors as presented in Table 708-2 of WAC 173-340-900.
6	Calculated using detected cPAH concentrations.
7	Calculated using detected cPAH concentrations plus one-half the detection limit for cPAHs that were not detected.

Abbreviations:

cPAH	Carcinogenic polycyclic aromatic hydrocarbon.
Ecology	Washington State Department of Ecology.
ft	Feet.
HPAH	High molecular weight poly cyclic aromatic hydrocarbon.
LPAH	Low molecular weight polycyclic aromatic hydrocarbon.
MCI	Maritime Contractors, Inc.
MTCA	Model Toxics Control Act.
NA	Not available.
PCB	Polychlorinated biphenyl.
TEQ	Toxic Equivalency Quotient.

Qualifiers:

J	Estimated value.
JB	Estimated due to blank contamination.
U	Not detected.
UJ	Not detected, estimated detection limit.

Table 4.2
Detected Analytes in Soil—Current and Historical Analytical Results

			Event	Floyd|Snider 2011 Supplemental Site Investigation									RETEC 2005 RI/FS Sampling							RETEC 1998 Vadose & Saturated Zone Sampling			
			Location	MW-06	MW-06	MW-07		MW-08		MW-09			S-3	S-3	S-4	S-4	S-4	S-4	S-5	S-5	S-5	S-5	B-1
			Sample ID	MW06-14.5-031411	MW06-14.5-031411-D	MW07-5.5-031511	MW07-14-031511	MW08-4-031411	MW08-13.5-031411	MW09-4-031411	MW09-6-031411	MW09-10-031411	HAS-S3-0-2	HAS-S3-2-4	HAS-S4-0-2	HAS-S4-2-4	HAS-S4-4-6	HAS-S4-6-8	HAS-S5-0-2	HAS-S5-2-4	HAS-S5-4-6	HAS-S5-6-8	B-1 6.5'
			Sample Date	03/14/2011	03/14/2011	03/15/2011	03/15/2011	03/14/2011	03/14/2011	03/14/2011	03/14/2011	03/14/2011	08/19/2005	08/19/2005	08/19/2005	08/19/2005	08/19/2005	08/19/2005	08/19/2005	08/19/2005	08/19/2005	08/19/2005	04/29/1998
			Sample Depth	14.5 ft	14.5 ft	5.5 ft	14 ft	4 ft	13.5 ft	4 ft	6–6.5 ft	10 ft	0–2 ft	2–4 ft	0–2 ft	2–4 ft	4–6 ft	6–8 ft	0–2 ft	2–4 ft	4–6 ft	6–8 ft	6.5 ft
		Soil Screening Criteria																					
Parameter	Unit	MTCA A[1]	MTCA C[2]																				
Total Petroleum Hydrocarbons																							
Gasoline Range Hydrocarbons	mg/kg	100[3]	NA	3 U	3 U	3 U	3 U	3 U	3 U	5.6	**230 J**	3.6 U	**310**	**270**	52	**120**	18	**120**	17	**210**	97	**480**	5.2 U
Diesel Range Hydrocarbons	mg/kg	2,000	NA	25 U	25 U	25 U	25 U	25 U	25 U	34	**2,600**	25 U	**2,600**	**6,300**	810	1,800	17	1,400	84	**3,800**	**2,800**	**5,700**	9.7
Oil Range Hydrocarbons	mg/kg	2,000/4,000[4]	NA	50 U	50 U	50 U	50 U	50 U	50 U	74	100 U	50 U	1,100	1,800	250	560	12 U	380	260	1,400	540	440	16
Metals																							
Antimony	mg/kg	NA	1,400	--	--	--	--	--	--	--	--	--	20	10 U	10 U	7	6 U	6 U	10 U	5 U	7 U	6 U	--
Arsenic	mg/kg	20	1,050	2.2	2.4	5.3	7.3	5.1	2.2	**30**	5.6	2.8	**340**	**70**	**50**	**35**	6	6	20	19	**30**	6	--
Beryllium	mg/kg	NA	7,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	mg/kg	2	NA	1 U	1 U	1 U	1 U	1 U	1 U	1.1	1 U	1 U	**4.1**	**7.2**	0.9	0.4	0.2 U	0.2 U	0.5 U	0.5	0.3 U	0.2 U	--
Chromium	mg/kg	NA	NA	30	31	29	62	33	23	49	33	36	55	42	40	33.1	40.9	39.1	57	41.2	54.9	41.8	--
Cobalt	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	mg/kg	NA	140,000	14	14	17	47	37	6.1	350	18	21	2,440	792	876	351	23.8	52.2	570	589	163	19.9	--
Lead	mg/kg	1,000	NA	2	2.1	3.8	6.2	9.6	1.2	180	3.1	3.1	451	156	160	68	4	13	122	197	40	3	--
Mercury	mg/kg	2	NA	0.02 U	0.02 U	0.02 U	0.056	0.02 U	0.02 U	0.55	0.02 U	0.029	**10**	**4.7**	0.42	0.17	0.05 U	0.15	0.43	**3.06**	0.11	0.05 U	--
Molybdenum	mg/kg	NA	17,500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	mg/kg	NA	70,000	35	36	28	77	27	18	53	32	44	62	64	48	21	39	34	57	73	54	40	--
Selenium	mg/kg	NA	17,500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	mg/kg	NA	17,500	0.37 U	0.36 U	0.34 U	0.39 U	0.33 U	0.38 U	0.35 U	0.37 U	0.39 U	0.9	0.8	0.8 U	0.3 U	0.4 U	0.3 U	0.8 U	0.3 U	0.4 U	0.3 U	--
Vanadium	mg/kg	NA	245	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	mg/kg	NA	1,100,000	26	28	39	69	130	17	790	36	39	3,960	4,210	1,560	511	41.3	88.5	411	400	180	35.5	--
Organometallics																							
Butyltin	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibutyltin	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tributyltin	mg/kg	NA	1,100	--	--	--	--	--	--	--	--	--	6.2	0.82	0.36 J	0.16	0.006 U	0.028 U	0.078	0.064	0.06	0.048 U	--
Tetrabutyltin	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nonionizable Organic Compounds																							
Aromatic Hydrocarbons																							
Naphthalene	mg/kg	5	70,000	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.078 U	0.085 U	0.073 U	0.075 U	0.082 U	0.082 U	0.072 U	0.075 U	0.77	**12**	--
Acenaphthylene	mg/kg	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.078 U	0.085 U	0.073 U	0.075 U	0.082 U	0.082 U	0.072 U	0.089 J	0.072 U	0.073 U	--
Acenaphthene	mg/kg	NA	210,000	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.52	0.1 U	0.27	0.21	0.073 U	0.075 U	0.082 U	0.082 U	0.072 U	0.097	0.11	4.1	--
Fluorene	mg/kg	NA	140,000	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1.6	0.1 U	0.18	0.095	0.073 U	0.075 U	0.082 U	0.082 U	0.072 U	0.24	0.46	4.1	--
Phenanthrene	mg/kg	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.14	0.91	0.1 U	0.88	1.1	0.073 U	0.075 U	0.082 U	0.082 U	0.34	0.73	1.1	8.4	--
Anthracene	mg/kg	NA	1,100,000	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.15	0.1 U	0.46	0.65	0.073 U	0.075 U	0.082 U	0.082 U	0.072 U	0.097	0.072 U	1.2	--
2-Methylnaphthalene	mg/kg	NA	14	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.67	0.1 U	0.078 U	0.085 U	0.073 U	0.075 U	0.082 U	0.082 U	0.072 U	0.15	0.18	3.7	--
Total LPAH	mg/kg	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.14	3.18	0.1 U	1.79	2.055	0.073 U	0.075 U	0.082 U	0.082 U	0.34	1.253 J	2.44	29.8	--
Fluoranthene	mg/kg	NA	140,000	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.19	0.22	0.1 U	3.1	3.7	0.11	0.17	0.082 U	0.12	0.6	1.8	0.44	6.1	--
Pyrene	mg/kg	NA	110,000	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.23	0.21	0.1 U	2.9	3	0.12	0.21	0.082 U	0.12	0.44	2.7	0.44	3.8	--
Benzo(a)anthracene	mg/kg	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1.3	1.2	0.073 U	0.075 U	0.082 U	0.082 U	0.21	0.88	0.12	0.89	--
Chrysene	mg/kg	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.12	0.1 U	0.1 U	1.5	1.3	0.073 U	0.079	0.082 U	0.082 U	0.32	1.4	0.16	0.75	--
Benzo(b)fluoranthene	mg/kg	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.12	0.1 U	0.1 U	1.8	1.4	0.073 U	0.075 U	0.082 U	0.082 U	0.33	1.5	0.16	0.62	--
Benzo(k)fluoranthene	mg/kg	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1.7	1.4	0.073 U	0.075 U	0.082 U	0.082 U	0.32	1.6	0.17	0.56	--
Benzofluoranthenes (total)	mg/kg	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.12	0.1 U	0.1 U	3.5	2.8	0.073 U	0.075 U	0.082 U	0.082 U	0.65	3.1	0.33	1.18	--
Benzo(a)pyrene	mg/kg	2	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.11	0.1 U	0.1 U	1.6	1.4	0.073 U	0.075 U	0.082 U	0.082 U	0.27	1	0.14	0.46	--
Indeno(1,2,3-cd)pyrene	mg/kg	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.45	0.42	0.073 U	0.075 U	0.082 U	0.082 U	0.1	0.31	0.072 U	0.074	--
Dibenzo(a,h)anthracene	mg/kg	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.13	0.14	0.073 U	0.075 U	0.082 U	0.082 U	0.072 U	0.075 U	0.072 U	0.073 U	--
Benzo(g,h,i)perylene	mg/kg	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.11	0.1 U	0.1 U	0.41	0.38	0.073 U	0.075 U	0.082 U	0.082 U	0.095	0.28	0.072 U	0.073 U	--
Total HPAH	mg/kg	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.88	0.43	0.1 U	14.89	14.34	0.23	0.459	0.082 U	0.24	2.685	11.47	1.63	13.254	--
Summed cPAH TEQ[5,6]	mg/kg	2	NA	0 U	0 U	0 U	0 U	0 U	0 U	0.12	0 U	0 U	**2.14**	1.87	0 U	8E-04	0 U	0 U	0.37	1.44	0.19	0.68	--
Summed cPAH TEQ with One-half of the Detection Limits[5,7]	mg/kg	2	NA	0.076 U	0.076 U	0.076 U	0.076 U	0.076 U	0.076 U	0.14	0.076 U	0.076 U	**2.14**	1.87	0.055 U	0.057	0.062 U	0.062 U	0.37	1.45	0.19	0.69	--
Chlorinated Benzenes																							
1,2-Dichlorobenzene	mg/kg	NA	320,000	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	--	--	--	--	--	--	--	--	--	--	
Phthalate Esters																							
Dimethyl phthalate	mg/kg	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.078 U	0.085 U	0.073 U	0.075 U	0.082 U	0.082 U	0.072 U	0.075 U	0.072 U	0.073 U	--
Di-n-butyl phthalate	mg/kg	NA	350,000	0.13 U	0.13 U	0.13 U	0.14 J	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.078 U	0.085 U	0.073 U	0.075 U	0.082 U	0.082 U	0.072 U	0.075 U	0.072 U	0.073 U	--
Butyl benzyl phthalate	mg/kg	NA	700,000	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.078 U	0.085 U	1	0.075 U	0.082 U	0.082 U	0.072 U	0.075 U	0.072 U	0.073 U	--
bis(2-ethylhexyl)phthalate	mg/kg	NA	70,000	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.52	0.24	0.073 U	0.18	0.082 U	0.082 U	0.072 U	0.44	0.072 U	0.073 U	--
Miscellaneous																							
Dibenzofuran	mg/kg	NA	3500	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.21	0.1 U	0.078 U	0.085 U	0.073 U	0.075 U	0.082 U	0.082 U	0.072 U	0.075 U	0.087	2.2	--
N-Nitrosodiphenylamine	mg/kg	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)																							
PCB Aroclor 1242	mg/kg	NA	NA	0.0039 U	0.0039 U	0.004 U	0.004 U	0.0039 U	0.0039 U	0.0038 U	0.0039 U	0.0038 U	0.039 U	0.043 U	0.037 U	0.038 U	0.041 U	0.041 U	0.036 U	0.038 U	0.036 U	0.036 U	--
PCB Aroclor 1248	mg/kg	NA	NA	0.0039 U	0.0039 U	0.004 U	0.004 U	0.0039 U	0.0039 U	0.0096 UY	0.0039 U	0.0038 U	0.039 U	0.043 U	0.037 U	0.038 U	0.041 U	0.041 U	0.036 U	0.038 U	0.036 U	0.036 U	--
PCB Aroclor 1254	mg/kg	NA	70	0.0039 U	0.0039 U	0.004 U	0.004 U	0.0039 U	0.0039 U	0.033	0.0039 U	0.0038 U	0.039 U	0.13	0.055 U	0.075 U	0.041 U	0.041 U	0.089	0.65	0.1	0.036 U	--
PCB Aroclor 1260	mg/kg	NA	NA	0.0039 U	0.0039 U	0.004 U	0.004 U	0.0039 U	0.0039 U	0.028	0.0039 U	0.0038 U	0.039 U	0.043 U	0.066	0.063	0.041 U	0.041 U	0.055 U	0.15 U	0.054 U	0.036 U	--
PCB Aroclor 1268	mg/kg	NA	NA	0.0039 U	0.0039 U	0.004 U	0.004 U	0.0039 U	0.0039 U	0.0038 U	0.0039 U	0.0038 U	--	--	--	--	--	--	--	--	--	--	--
PCBs (Total, Aroclors)	mg/kg	10	66	0.0039 U	0.0039 U	0.004 U	0.004 U	0.0039 U	0.0039 U	0.061	0.0039 U	0.0038 U	0.039 U	0.13	0.066	0.063	0.041 U	0.041 U	0.089	0.65	0.1	0.036 U	--
Ionizable Organic Compounds																							
2,4-Dimethylphenol	mg/kg	NA	70,000	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.078 U	0.085 U	0.073 U	0.075 U	0.082 U	0.082 U	0.072 U	0.075 U	0.072 U	0.073 U	--
Pentachlorophenol	mg/kg	NA	18,000	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.39 U	0.43 U	0.36 U	0.38 U	0.41 U	0.41 U	0.36 U	0.38 U	0.36 U	0.36 U	--
Benzoic acid	mg/kg	NA	14,000,000	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	--	--	--	--	--	--	--	--	--	--	--	--

Table 4.2
Detected Analytes in Soil—Current and Historical Analytical Results

			Event	Floyd|Snider 2011 Supplemental Site Investigation									RETEC 2005 RI/FS Sampling							RETEC 1998 Vadose & Saturated Zone Sampling			
			Location	MW-06	MW-06	MW-07		MW-08		MW-09			S-3	S-3	S-4	S-4	S-4	S-4	S-5	S-5	S-5	S-5	B-1
			Sample ID	MW06-14.5-031411	MW06-14.5-031411-D	MW07-5.5-031511	MW07-14-031511	MW08-4-031411	MW08-13.5-031411	MW09-4-031411	MW09-6-031411	MW09-10-031411	HAS-S3-0-2	HAS-S3-2-4	HAS-S4-0-2	HAS-S4-2-4	HAS-S4-4-6	HAS-S4-6-8	HAS-S5-0-2	HAS-S5-2-4	HAS-S5-4-6	HAS-S5-6-8	B-1 6.5'
			Sample Date	03/14/2011	03/14/2011	03/15/2011	03/15/2011	03/14/2011	03/14/2011	03/14/2011	03/14/2011	03/14/2011	08/19/2005	08/19/2005	08/19/2005	08/19/2005	08/19/2005	08/19/2005	08/19/2005	08/19/2005	08/19/2005	08/19/2005	04/29/1998
			Sample Depth	14.5 ft	14.5 ft	5.5 ft	14 ft	4 ft	13.5 ft	4 ft	6–6.5 ft	10 ft	0–2 ft	2–4 ft	0–2 ft	2–4 ft	4–6 ft	6–8 ft	0–2 ft	2–4 ft	4–6 ft	6–8 ft	6.5 ft
		Soil Screening Criteria																					
Parameter	Unit	MTCA A[1]	MTCA C[2]																				
Other Semivolatile Organic Compounds																							
1-Methylnaphthalene	mg/kg	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	2.5	0.1 U	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-o-cresol	mg/kg	NA	180,000	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-methylphenol				0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.39 U	0.43	0.36 U	0.38 U	0.41 U	0.41 U	0.36 U	0.38 U	0.36 U	0.36 U	--
4-Methylphenol	mg/kg	NA	18,000	--	--	--	--	--	--	--	--	--	0.078 U	0.085 U	0.073 U	0.075 U	0.082 U	0.082 U	0.072 U	0.075 U	0.072 U	0.073 U	--
Carbazole	mg/kg	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.12	0.1 U	0.091	0.085 U	0.073 U	0.075 U	0.082 U	0.082 U	0.072 U	0.12	0.072 U	0.31	--
Isophorone	mg/kg	NA	700,000	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.11	0.1 U	--	--	--	--	--	--	--	--	--	--	--
Other Volatile Organic Compounds																							
1,1,2-Trichlorotrifluoroethane	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.002 U
1,2,4-Trimethylbenzene	mg/kg	NA	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0019 U	0.0014 U	0.001 U	0.005 U	--	--	0.001 U	0.023 J	--	--	0.001 U
1,3,5-Trimethylbenzene	mg/kg	NA	35,000	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0012 U	0.0014 U	0.001 U	0.005 U	--	--	0.001 U	0.014 J	--	--	0.001 U
Acetone	mg/kg	NA	3,150,000	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.24	0.074	0.005 U	0.022 U	--	--	0.005 U	0.22 J	--	--	0.009 JB
Carbon disulfide	mg/kg	NA	350,000	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.006	0.0038	0.001 U	0.005 U	--	--	0.001 U	0.0031 J	--	--	0.001 U
Cymene	mg/kg	NA	NA	0.01 U	0.02	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0012 U	0.0014 U	0.001 U	0.005 U	--	--	0.001 U	0.0072 J	--	--	0.001 U
Ethylbenzene	mg/kg	6	350,000	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	--	--	--	--	--	--	--	--	--	--	--
iso-Propylbenzene	mg/kg	NA	350,000	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0013 J	0.0014 U	0.001 U	0.005 U	--	--	0.001 U	0.0025 J	--	--	--
Methyl ethyl ketone				0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.021	0.012	0.005 U	0.022 U	--	--	0.005 U	0.0056 U	--	--	--
Methylene chloride	mg/kg	0.02	210,000	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	--	--	--	--	--	--	--	--	--	--	0.002 U
n-Butylbenzene	mg/kg	NA	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.019	0.01 U	--	--	--	--	--	--	--	--	--	--	0.002 U
n-Propylbenzene	mg/kg	NA	350,000	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	--	--	--	--	--	--	--	--	--	--	0.001 U
sec-Butylbenzene	mg/kg	NA	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.017	0.01 U	0.0018 U	0.0014 U	0.001 U	0.005 U	--	--	0.001 U	0.0021 J	--	--	0.001 U
tert-Butylbenzene	mg/kg	NA	NA	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	--	--	--	--	--	--	--	--	--	--	--
Toluene	mg/kg	7	280,000	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	--	--	--	--	--	--	--	--	--	--	--
Xylene (meta & para)	mg/kg	NA	700,000	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.0026 J	0.0019 J	0.001 J	0.005 U	--	--	0.001 U	0.01 J	--	--	--
Xylene (ortho)	mg/kg	NA	700,000	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0022 J	0.0014 U	0.001 U	0.005 U	--	--	0.001 U	0.011 J	--	--	--
Xylene (total)	mg/kg	9	700,000	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	--	--	--	--	--	--	--	--	--	--	--

Notes:

-- Not analyzed.
Bold Detected exceedance of MTCA A and/or MTCA B Criteria.
1 MTCA Method A Soil Criteria for Industrial Land Use.
2 MTCA Method C Soil Criteria for Industrial Land Use, Non-carcinogenic.
3 The MTCA Method A cleanup level of 100 mg/kg was used because benzene was not detected, nor considered a chemical of concern at the site.
4 MTCA Method A Criteria for heavy oils/MTCA Method A Criteria for mineral oils.
5 Calculation of cPAH TEQ concentrations was performed using the California Environmental Protection Agency 2005 Toxic Equivalency Factors as presented in Table 708-2 of WAC 173-340-900.
6 Calculated using detected cPAH concentrations.
7 Calculated using detected cPAH concentrations plus one-half the detection limit for cPAHs that were not detected.

Abbreviations:

cPAH	Carcinogenic polycyclic aromatic hydrocarbon.
Ecology	Washington State Department of Ecology.
ft	Feet.
HPAH	High molecular weight poly cyclic aromatic hydrocarbon.
LPAH	Low molecular weight polycyclic aromatic hydrocarbon.
MCI	Maritime Contractors, Inc.
MTCA	Model Toxics Control Act.
NA	Not available.
PCB	Polychlorinated biphenyl.
TEQ	Toxic Equivalency Quotient.

Qualifiers:

J	Estimated value.
JB	Estimated due to blank contamination.
U	Not detected.
UJ	Not detected, estimated detection limit.

Table 4.2
Detected Analytes in Soil—Current and Historical Analytical Results

			Event	RETEC 1998 Vadose & Saturated Zone Sampling															RETEC 1998 Vadose & Saturated Zone Sampling		Ecology and MCI 1993 Sampling				
			Location	MW-01	MW-01	MW-02	MW-03	MW-04		MW-05	TP-3	TP-4	TP-6	TP-8	TP-9		TP-10	TP-13	TP-15		Soil 1		Soil 2	Soil 3	
			Sample ID	MW-1 10'	MW-1 10' Dup	MW-2 8.5'	MW-3 7.5'	MW-4 2.5'	MW-4 8'	MW-5 7.5'	TP-3 4'	TP-4 0.9'	TP-6 0.9'	TP-8 0.9'	TP-9 1.8'	TP-9 6'	TP-10 1.2'	TP-13 4'	TP-15 0.7'	TP-15 6'	1-A	1-B	2-B	3-A	3-B
			Sample Date	04/28/1998	04/28/1998	04/28/1998	04/28/1998	04/28/1998	04/28/1998	04/29/1998	04/27/1998	04/27/1998	04/27/1998	04/27/1998	04/30/1998	04/30/1998	04/27/1998	04/30/1998	04/27/1998	04/27/1998	08/01/1993	08/01/1993	08/01/1993	08/01/1993	08/01/1993
			Sample Depth	10 ft	10 ft	8.5 ft	7.5 ft	2.5 ft	8 ft	7.5 ft	4 ft	0.9 ft	0.9 ft	0.9 ft	1.8 ft	6 ft	1.2 ft	4 ft	0.7 ft	6 ft	0–4 in	4–8 in	4–8 in	0–4 in	4–8 in
		Soil Screening Criteria																							
Parameter	**Unit**	**MTCA A[1]**	**MTCA C[2]**																						
Total Petroleum Hydrocarbons																									
Gasoline Range Hydrocarbons	mg/kg	100[3]	NA	34	--	**240**	5.5 U	5.6 U	5.5 U	5.5 U	5.5 U	--	--	--	**230**	**170**	--	--	100	**470**	--	--	--	--	--
Diesel Range Hydrocarbons	mg/kg	2,000	NA	210	250	**13,000**	6.3	110	5.5 U	5.6 U	270	560	330	86	**12,000**	**2,600**	--	150	**4,300**	**4,200**	--	--	--	--	--
Oil Range Hydrocarbons	mg/kg	2,000/4,000[4]	NA	11 U	12	**8,000**	11 U	350	11 U	11 U	1,100	740	760	300	1,700	24	--	460	1,300	110	--	--	--	--	--
Metals																									--
Antimony	mg/kg	NA	1,400	5 U	5 U	6 U	5 U	7	5 U	5 U	6	40	20	60	5 U	6 U	70	10 U	5 U	5 U	8.4 J	3 UJ	3.3 J	10 J	30 U
Arsenic	mg/kg	20	1,050	8	7	11	6	**53**	8	11	9	**750**	**210**	**1,140**	8	10	**1,240**	**30**	**25**	**28**	**242**	21 UJ	**40.6**	**362**	63.4 UJ
Beryllium	mg/kg	NA	7,000	0.2	0.2	0.2	0.1 U	0.2	0.2	0.2	0.2	0.5 U	0.3	0.5 U	0.14	0.3	0.6	0.4	0.2	0.2	0.5 UJ	0.25 UJ	0.18 UJ	0.43 UJ	1 U
Cadmium	mg/kg	2	NA	0.2 U	0.2 U	1	0.2 U	1	0.2 U	0.2 U	0.4	**8.7**	**3.2**	**12**	0.2 U	0.2 U	**12.6**	0.9	0.4	0.2 U	1 J	0.34 J	0.49 J	**2.5** J	2 UJ
Chromium	mg/kg	NA	NA	44.1	39.6	35.4	34	44.7	38.5	59.5	116	76	81	83	37.6	49.7	81	53	58.7	55.6	50 J	95.3 J	52 J	77.3 J	438 J
Cobalt	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	mg/kg	NA	140,000	18.5	18.1	114	9.2	404	43.1	37	74	3180	696	2370	29.3	26.7	3550	1400	369	42.6	2660	288	4690	2140	694
Lead	mg/kg	1,000	NA	4	4	188	2 U	203	5	5	67	665	263	**1,680**	7	3	**1,210**	443	197	16	341 J	188 J	392 J	705 J	122 J
Mercury	mg/kg	2	NA	0.05 U	0.05 U	0.19	0.04 U	0.29	0.04 U	0.05 U	0.09	0.33	0.09	0.12	0.05 U	0.05 U	0.09	0.43	2.9	0.06	0.139	0.078	17.6	0.043 J	0.04 UJ
Molybdenum	mg/kg	NA	17,500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	mg/kg	NA	70,000	38	38	32	25	47	45	64	54	35	54	51	26.1	48	38	51	55	52	35.7 J	72.7 J	107 J	53.9 J	426 J
Selenium	mg/kg	NA	17,500	5 U	5 U	6 U	5 U	8	5 U	5 U	6 U	20 U	10 U	30 U	5 U	6 U	20 U	10 U	5 U	5 U	0.4 UJ	0.4 UJ	0.4 UJ	0.4 UJ	0.4 UJ
Silver	mg/kg	NA	17,500	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	2	1	3	0.3 U	0.3 U	3	1.2	0.3 U	0.3 U	0.86 UJ	0.3 U	0.3 U	1.5 UJ	0.3 U
Vanadium	mg/kg	NA	245	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	mg/kg	NA	1,100,000	31.7	32.5	281	24	900	50.5	40	491	8,470	3,710	10,100	49.1	43.9	12,600	439	164	70.3	2,740	299	925	5,250	684
Organometallics																									
Butyltin	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.5 J	0.11 J	3.5 J	0.18 J	0.05 U
Dibutyltin	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.6 J	0.3 J	8.1 J	0.29 J	0.05 U
Tributyltin	mg/kg	NA	1,100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.5	0.81	8.8	0.77 J	0.05 U
Tetrabutyltin	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.023 J	0.053 U	0.061 U	0.051 U	0.05 U
Nonionizable Organic Compounds																									
Aromatic Hydrocarbons					--	--	--	--	--	--	--	--	--	--											
Naphthalene	mg/kg	5	70,000	--	--	--	--	--	--	--	0.25 J	--	--	--	0.11 U	0.9	--	--	--	**62**	0.12 U	1.3	0.14 U	0.12 U	0.12 U
Acenaphthylene	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	0.11 U	0.12 U	--	--	--		0.12 U	0.15	0.18	0.12 U	0.12 U
Acenaphthene	mg/kg	NA	210,000	--	--	--	--	--	--	--	0.11 UJ	--	--	--	0.89	0.46	--	--	--	35	0.12 U	0.52	0.18	0.12 U	0.12 U
Fluorene	mg/kg	NA	140,000	--	--	--	--	--	--	--	0.3 J	--	--	--	3.8	1.3	--	--	--	28	0.12 U	0.19	0.21	0.12 U	0.12 U
Phenanthrene	mg/kg	NA	NA	--	--	--	--	--	--	--	2.9 J	--	--	--	4.5	2.3	--	--	--	84	0.31	1.2	3.1	0.46	0.12 U
Anthracene	mg/kg	NA	1,100,000	--	--	--	--	--	--	--	0.74 J	--	--	--	0.19	0.12 U	--	--	--	10	0.048 J	0.096 J	0.5	0.072 J	0.12 U
2-Methylnaphthalene	mg/kg	NA	14	--	--	--	--	--	--	--	0.25 J	--	--	--	3.2	3.2	--	--	--	31	0.12 U	0.5	0.26	0.12 U	0.12 U
Total LPAH	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		0.36 J	4 J	4.4	0.53 J	0.12 U
Fluoranthene	mg/kg	NA	140,000	--	--	--	--	--	--	--	5.9 J	--	--	--	0.44	0.17	--	--	--	37	0.69	1.8	5.3	1.2	0.05 J
Pyrene	mg/kg	NA	110,000	--	--	--	--	--	--	--	8.5 J	--	--	--	0.5	0.15	--	--	--	44	0.47	1.2	3.9	0.57	0.06 J
Benzo(a)anthracene	mg/kg	NA	NA	--	--	--	--	--	--	--	3.4 J	--	--	--	0.11 U	0.12 U	--	--	--	7.4	0.35	0.61	1.8	0.26	0.12 U
Chrysene	mg/kg	NA	NA	--	--	--	--	--	--	--	5.2 J	--	--	--	0.18	0.12 U	--	--	--	6.2	0.5	0.83	2.7	0.56	0.12 U
Benzo(b)fluoranthene	mg/kg	NA	NA	--	--	--	--	--	--	--	4.2 J	--	--	--	0.13	0.12 U	--	--	--	5.2	--	--	--	--	--
Benzo(k)fluoranthene	mg/kg	NA	NA	--	--	--	--	--	--	--	3.7 J	--	--	--	0.11 U	0.12 U	--	--	--	3.3	--	--	--	--	--
Benzofluoranthenes (total)	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		0.69	0.93	3.6 J	0.76 J	0.12 U
Benzo(a)pyrene	mg/kg	2	NA	--	--	--	--	--	--	--	**3.8 J**	--	--	--	0.11 U	0.12 U	--	--	--	**4.5**	0.32	0.57	1.7 J	0.29 J	0.12 U
Indeno(1,2,3-cd)pyrene	mg/kg	NA	NA	--	--	--	--	--	--	--	2.8 J	--	--	--	0.11 U	0.12 U	--	--	--	1.9	0.39	0.49	0.71 J	0.21 J	0.12 U
Dibenzo(a,h)anthracene	mg/kg	NA	NA	--	--	--	--	--	--	--	0.65 J	--	--	--	0.11 U	0.12 U	--	--	--	0.3	0.14	0.18	0.33 J	0.077 J	0.12 U
Benzo(g,h,i)perylene	mg/kg	NA	NA	--	--	--	--	--	--	--	2.8 J	--	--	--	0.11 U	0.12 U	--	--	--	1.9	0.37	0.43	0.51 J	0.18 J	0.12 U
Total HPAH	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		3.9	7	21 J	4.1 J	0.11 J
Summed cPAH TEQ[5,6]	mg/kg	2	NA	--	--	--	--	--	--	--	**5.3 J**	--	--	--	0.015	0 U	--	--	--	**6.4**	0.48	0.8	**2.4 J**	0.43 J	0 U
Summed cPAH TEQ with One-half of the Detection Limits[5,7]	mg/kg	2	NA	--	--	--	--	--	--	--	**5.3 J**	--	--	--	0.092	0.091 U	--	--	--	**6.4**	0.48	0.8	**2.4 J**	0.43 J	0.09 U
Chlorinated Benzenes																									
1,2-Dichlorobenzene	mg/kg	NA	320,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phthalate Esters																									
Dimethyl phthalate	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.12 U	0.13 U	0.17	0.12 U	0.12 U
Di-n-butyl phthalate	mg/kg	NA	350,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.12 U	0.13 U	0.14 U	0.066 J	0.12 U
Butyl benzyl phthalate	mg/kg	NA	700,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.115	0.13 U	0.14 U	0.12 U	0.12 U
bis(2-ethylhexyl)phthalate	mg/kg	NA	70,000	--	--	--	--	--	--	--	0.26	--	--	--	0.45 U	--	--	--	--	0.7	1.6	0.084	0.33 J	0.59	0.12 U
Miscellaneous																									
Dibenzofuran	mg/kg	NA	3,500	--	--	--	--	--	--	--	0.13	--	--	--	0.47	--	--	--	--	15	0.12 U	0.26	0.12	0.12 U	0.12 U
N-Nitrosodiphenylamine	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.12 U	0.13 U	0.29	0.12 U	0.12 U
Polychlorinated Biphenyls (PCBs)																									
PCB Aroclor 1242	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB Aroclor 1248	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.067 U	0.067 U	0.067 U	0.067 U	0.07 U
PCB Aroclor 1254	mg/kg	NA	70	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.27	0.067 U	4.8	0.13	0.07 U
PCB Aroclor 1260	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.27 U	0.067 U	1.7	0.067 U	0.07 U
PCB Aroclor 1268	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.7	0.13	0.067 U	0.067 U	0.07 U
PCBs (Total, Aroclors)	mg/kg	10	66	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.97	0.13	6.5	0.13	0.07 U
Ionizable Organic Compounds																									
2,4-Dimethylphenol	mg/kg	NA	70,000	--	--	--	--	--	--	--	0.34 U	--	--	--	1.4 U	--	--	--	--	1.4	--	--	--	--	--
Pentachlorophenol	mg/kg	NA	18,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.6 U	0.63 U	3.4	0.59 U	0.61 U
Benzoic acid	mg/kg	NA	14,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.2 U	1.3 U	0.53 J	1.2 U	1.2 U

Table 4.2
Detected Analytes in Soil—Current and Historical Analytical Results

			Event	RETEC 1998 Vadose & Saturated Zone Sampling															RETEC 1998 Vadose & Saturated Zone Sampling		Ecology and MCI 1993 Sampling				
			Location	MW-01	MW-01	MW-02	MW-03	MW-04		MW-05	TP-3	TP-4	TP-6	TP-8	TP-9		TP-10	TP-13	TP-15		Soil 1		Soil 2	Soil 3	
			Sample ID	MW-1 10'	MW-1 10' Dup	MW-2 8.5'	MW-3 7.5'	MW-4 2.5'	MW-4 8'	MW-5 7.5'	TP-3 4'	TP-4 0.9'	TP-6 0.9'	TP-8 0.9'	TP-9 1.8'	TP-9 6'	TP-10 1.2'	TP-13 4'	TP-15 0.7'	TP-15 6'	1-A	1-B	2-B	3-A	3-B
			Sample Date	04/28/1998	04/28/1998	04/28/1998	04/28/1998	04/28/1998	04/28/1998	04/29/1998	04/27/1998	04/27/1998	04/27/1998	04/27/1998	04/30/1998	04/30/1998	04/27/1998	04/30/1998	04/27/1998	04/27/1998	08/01/1993	08/01/1993	08/01/1993	08/01/1993	08/01/1993
			Sample Depth	10 ft	10 ft	8.5 ft	7.5 ft	2.5 ft	8 ft	7.5 ft	4 ft	0.9 ft	0.9 ft	0.9 ft	1.8 ft	6 ft	1.2 ft	4 ft	0.7 ft	6 ft	0–4 in	4–8 in	4–8 in	0–4 in	4–8 in
		Soil Screening Criteria																							
Parameter	Unit	MTCA A[1]	MTCA C[2]																						
Other Semivolatile Organic Compounds																									
1-Methylnaphthalene	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-o-cresol	mg/kg	NA	180,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-methylphenol	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Methylphenol	mg/kg	NA	17,500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbazole	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	mg/kg	NA	700,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Other Volatile Organic Compounds																									
1,1,2-Trichlorotrifluoroethane	mg/kg	NA	NA	0.002 U	0.0021 U	0.0021 U	0.0021 U	0.002 U	0 U	0.002 U	0.002 U	0.002 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0 U	0.0021 U	0.0021 U	0.0021 U	0.002 U	0.002 U	0.002 U	0 U
1,2,4-Trimethylbenzene	mg/kg	NA	NA	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0 U
1,3,5-Trimethylbenzene	mg/kg	NA	35,000	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0 U
Acetone	mg/kg	NA	3,150,000	0.009 JB	0.0086 JB	0.0086 JB	0.0086 JB	0.009 JB	0.01 JB	0.009 JB	0.009 JB	0.009 JB	0.0086 JB	0.0086 JB	0.0086 JB	0.0086 JB	0.0086 JB	0.01 JB	0.0086 JB	0.0086 JB	0.0086 JB	0.009 JB	0.009 JB	0.009 JB	0.01 JB
Carbon disulfide	mg/kg	NA	350,000	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0 U
Cymene	mg/kg	NA	NA	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0 U
Ethylbenzene	mg/kg	6	350,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
iso-Propylbenzene	mg/kg	NA	350,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl ethyl ketone	mg/kg	NA	2,100,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene chloride	mg/kg	0.02	210,000	0.011	--	0.0091 UJ	0.0031	--	0 U	0.002 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Butylbenzene	mg/kg	NA	NA	0.027	--	0.0091 UJ	0.002 U	0.002 U	0 U	0.002 U	0.002 U	--	--	--	--	0.56	--	--	--	0.2	--	--	--	--	--
n-Propylbenzene	mg/kg	NA	350,000	0.01	--	0.0045 UJ	0.001 U	0.001 U	0 U	0.001 U	0.001 U	--	--	--	--	0.38	--	--	--	0.056	--	--	--	--	--
sec-Butylbenzene	mg/kg	NA	NA	0.014	--	0.0045 UJ	0.001 U	0.001 U	0 U	0.001 U	0.001 U	--	--	--	--	0.3	--	--	--	0.068	--	--	--	--	--
tert-Butylbenzene	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	mg/kg	7	280,000	--	--	--	--	0.001 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Xylene (meta & para)	mg/kg	NA	700,000	--	--	--	--	0.002 U	--	--	0.002 U	--	--	--	--	0.31	--	--	--	0.048	--	--	--	--	--
Xylene (ortho)	mg/kg	NA	700,000	--	--	--	--	0.001 U	--	--	0.001 U	--	--	--	--	0.12	--	--	--	0.082	--	--	--	--	--
Xylene (total)	mg/kg	9	700,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

-- Not analyzed.
Bold Detected exceedance of MTCA A and/or MTCA B Criteria.
1 MTCA Method A Soil Criteria for Industrial Land Use.
2 MTCA Method C Soil Criteria for Industrial Land Use, Non-carcinogenic.
3 The MTCA Method A cleanup level of 100 mg/kg was used because benzene was not detected, nor considered a chemical of concern at the site.
4 MTCA Method A Criteria for heavy oils/MTCA Method A Criteria for mineral oils.
5 Calculation of cPAH TEQ concentrations was performed using the California Environmental Protection Agency 2005 Toxic Equivalency Factors as presented in Table 708-2 of WAC 173-340-900.
6 Calculated using detected cPAH concentrations.
7 Calculated using detected cPAH concentrations plus one-half the detection limit for cPAHs that were not detected.

Abbreviations:

cPAH	Carcinogenic polycyclic aromatic hydrocarbon.
Ecology	Washington State Department of Ecology.
ft	Feet.
HPAH	High molecular weight poly cyclic aromatic hydrocarbon.
LPAH	Low molecular weight polycyclic aromatic hydrocarbon.
MCI	Maritime Contractors, Inc.
MTCA	Model Toxics Control Act.
NA	Not available.
PCB	Polychlorinated biphenyl.
TEQ	Toxic Equivalency Quotient.

Qualifiers:

J	Estimated value.
JB	Estimated due to blank contamination.
U	Not detected.
UJ	Not detected, estimated detection limit.

Table 5.1
Frequency of Exceedances for Monitoring Well Groundwater—Current and Historical Analytical Results

Parameter	Unit	Number of Results	Number of Detected Results	Percent Detected	Number of Non-detected Results	Percent of Non-detected Results	Maximum Detected Value	Location of Maximum Detected Value	Depth of Maximum Detected value	Groundwater Screening Criteria		Number of Results that Exceed MTCA A	Percent of Detects that Exceed MTCA A	MTCA A Exceedance Ratio[3]	Number of Results that Exceed MTCA B	Percent of Detects that Exceed MTCA B	MTCA B Exceedance Ratio[3]
										MTCA A[1]	MTCA B[2]						
Total Petroleum Hydrocarbons																	
Gasoline Range Hydrocarbons	µg/L	25	8	32%	17	68%	1,000	MW-06	6–16 feet	1000	NA	1	13%	1			
Diesel Range Hydrocarbons	µg/L	25	11	44%	14	56%	4,600	MW-01	5–15 feet	500	NA	8	73%	9.2			
Oil Range Hydrocarbons	µg/L	25	2	8%	23	92%	1,200	MW-06	6–16 feet	1000	NA	1	50%	1.2			
Dissolved Metals																	
Antimony	µg/L	7			7	100%				--	--						
Arsenic	µg/L	25	20	80%	5	20%	29	MW-01	5–15 feet	5	4.8	9	45%	5.8	11	55%	6
Beryllium	µg/L	6			6	100%				--	--						
Cadmium	µg/L	25			25	100%				--	--						
Chromium	µg/L	25	13	52%	12	48%	2.9	MW-05	5–15 feet	50	NA						
Copper	µg/L	25	9	36%	16	64%	7.7	MW-02A	4–14 feet	NA	640						
Lead	µg/L	25	4	16%	21	84%	4	MW-02A	4–14 feet	15	NA						
Mercury	µg/L	25			25	100%				--	--						
Nickel	µg/L	25	17	68%	8	32%	30	MW-04	5–15 feet	NA	320						
Selenium	µg/L	6			6	100%				--	--						
Silver	µg/L	25			25	100%				--	--						
Thallium	µg/L	6			6	100%				--	--						
Zinc	µg/L	25	7	28%	18	72%	71	MW-02	4–14 feet	NA	4,800						
Total Metals																	
Antimony	µg/L	7	2	29%	5	71%	6	MW-02	4–14 feet	NA	6.4						
Arsenic	µg/L	7	7	100%			82	MW-04	5–15 feet	5	4.8	6	86%	16.4	6	86%	17.1
Beryllium	µg/L	6	3	50%	3	50%	9	MW-05	5–15 feet	NA	32						
Cadmium	µg/L	7	4	57%	3	43%	8	MW-05	5–15 feet	5	16	4	57%	1.6			
Chromium	µg/L	7	6	86%	1	14%	2,120	MW-05	5–15 feet	50	NA	6	86%	42.4			
Copper	µg/L	7	6	86%	1	14%	1,730	MW-05	5–15 feet	NA	640				1	17%	2.7
Lead	µg/L	7	7	100%			150	MW-05	5–15 feet	15	NA	6	86%	10			
Mercury	µg/L	7	5	71%	2	29%	4.6	MW-05	5–15 feet	2	NA	1	14%	2.3			
Nickel	µg/L	7	7	100%			3,810	MW-05	5–15 feet	NA	320				2	29%	11.9
Selenium	µg/L	6	1	17%	5	83%	6	MW-01	5–15 feet	NA	80						
Silver	µg/L	7			7	100%				--	--						
Thallium	µg/L	6			6	100%				--	--						
Zinc	µg/L	7	6	86%	1	14%	1,210	MW-05	5–15 feet	NA	4,800						
Nonionizable Organic Compounds																	
Aromatic Hydrocarbons																	
Naphthalene	µg/L	25	5	20%	20	80%	14	MW-01	5–15 feet	160	160						
Acenaphthylene	µg/L	19			19	100%				--	--						
Acenaphthene	µg/L	19	4	21%	15	79%	21	MW-01	5–15 feet	NA	960						
Fluorene	µg/L	19	4	21%	15	79%	15	MW-01	5–15 feet	NA	640						
Phenanthrene	µg/L	19	2	11%	17	89%	10	MW-01	5–15 feet	NA	NA						
Anthracene	µg/L	19			19	100%				--	--						
2-Methylnaphthalene	µg/L	19	4	21%	15	79%	63	MW-01	5–15 feet	NA	2				4	100%	31.5
Total LPAH	µg/L	18	6	33%	12	67%	51.5	MW-01	5–15 feet	NA	NA						
Fluoranthene	µg/L	19			19	100%				--	--						
Pyrene	µg/L	19			19	100%				--	--						
Benzo(a)anthracene	µg/L	19			19	100%				--	--						
Chrysene	µg/L	19			19	100%				--	--						
Benzo(b)fluoranthene	µg/L	19			19	100%				--	--						
Benzo(k)fluoranthene	µg/L	19			19	100%				--	--						
Benzofluoranthenes (total)	µg/L	18			18	100%				--	--						
Benzo(a)pyrene	µg/L	19			19	100%				--	--						
Indeno(1,2,3-cd)pyrene	µg/L	19			19	100%				--	--						
Dibenzo(a,h)anthracene	µg/L	19			19	100%				--	--						
Benzo(g,h,i)perylene	µg/L	19			19	100%				--	--						
Total HPAH	µg/L	18			18	100%				--	--						

Table 5.1
Frequency of Exceedances for Monitoring Well Groundwater—Current and Historical Analytical Results

Parameter	Unit	Number of Results	Number of Detected Results	Percent Detected	Number of Non-detected Results	Percent of Non-detected Results	Maximum Detected Value	Location of Maximum Detected Value	Depth of Maximum Detected value	Groundwater Screening Criteria		Number of Results that Exceed MTCA A	Percent of Detects that Exceed MTCA A	MTCA A Exceedance Ratio[3]	Number of Results that Exceed MTCA B	Percent of Detects that Exceed MTCA B	MTCA B Exceedance Ratio[3]
										MTCA A[1]	MTCA B[2]						
Nonionizable Organic Compounds (continued)																	
Aromatic Hydrocarbons (continued)																	
Summed cPAH TEQ[4,5]	µg/L	19			19	100%				--	--						
Summed cPAH TEQ with One-half of the Detection Limits[4,6]	µg/L	19			19	100%				--	--						
Chlorinated Benzenes																	
1,2-Dichlorobenzene	µg/L	18			18	100%				--	--						
1,3-Dichlorobenzene	µg/L	18			18	100%				--	--						
1,4-Dichlorobenzene	µg/L	18			18	100%				--	--						
1,2,4-Trichlorobenzene	µg/L	18			18	100%				--	--						
Hexachlorobenzene	µg/L	18			18	100%				--	--						
Phthalate Esters																	
Dimethyl phthalate	µg/L	18			18	100%				--	--						
Diethylphthalate	µg/L	18			18	100%				--	--						
Di-n-butyl phthalate	µg/L	18			18	100%				--	--						
Butyl benzyl phthalate	µg/L	18			18	100%				--	--						
bis(2-ethylhexyl)phthalate	µg/L	18			18	100%				--	--						
Di-n-octyl phthalate	µg/L	18			18	100%				--	--						
Miscellaneous																	
Dibenzofuran	µg/L	19	2	11%	17	89%	7.7	MW-01	5–15 feet	NA	16						
Hexachlorobutadiene	µg/L	18			18	100%				--	--						
N-Nitrosodiphenylamine	µg/L	18			18	100%				--	--						
Polychlorinated Biphenyls (PCBs)																	
PCB Aroclor 1016	µg/L	19			19	100%				--	--						
PCB Aroclor 1221	µg/L	19			19	100%				--	--						
PCB Aroclor 1232	µg/L	19			19	100%				--	--						
PCB Aroclor 1242	µg/L	19			19	100%				--	--						
PCB Aroclor 1248	µg/L	19			19	100%				--	--						
PCB Aroclor 1254	µg/L	19			19	100%				--	--						
PCB Aroclor 1260	µg/L	19			19	100%				--	--						
PCB Aroclor 1268	µg/L	18			18	100%				--	--						
PCBs (Total, Aroclors)	µg/L	18			18	100%				--	--						
Ionizable Organic Compounds																	
Phenol	µg/L	18			18	100%				--	--						
2-Methylphenol	µg/L	18			18	100%				--	--						
2,4-Dimethylphenol	µg/L	18			18	100%				--	--						
Pentachlorophenol	µg/L	18			18	100%				--	--						
Benzyl alcohol	µg/L	18			18	100%				--	--						
Benzoic acid	µg/L	18			18	100%				--	--						
Other Semivolatile Organic Compounds																	
1-Methylnaphthalene	µg/L	18	5	28%	13	72%	78	MW-01	5–15 feet	NA	NA						
2,3,4,6-Tetrachlorophenol	µg/L	18			18	100%				--	--						
2,4,5-Trichlorophenol	µg/L	18			18	100%				--	--						
2,4,6-Trichlorophenol	µg/L	18			18	100%				--	--						
2,4-Dichlorophenol	µg/L	18			18	100%				--	--						
2,4-Dinitrophenol	µg/L	18			18	100%				--	--						
2,6-Dichlorophenol	µg/L	18			18	100%				--	--						
2-Chloronaphthalene	µg/L	18			18	100%				--	--						
2-Chlorophenol	µg/L	18			18	100%				--	--						
2-Nitrophenol	µg/L	18			18	100%				--	--						
4,6-Dinitro-o-cresol	µg/L	18			18	100%				--	--						
4-Chloro-3-methylphenol	µg/L	18			18	100%				--	--						
4-Nitrophenol	µg/L	18			18	100%				--	--						
Acrylonitrile	µg/L	18			18	100%				--	--						

Table 5.1
Frequency of Exceedances for Monitoring Well Groundwater—Current and Historical Analytical Results

										Groundwater Screening Criteria							
Parameter	Unit	Number of Results	Number of Detected Results	Percent Detected	Number of Non-detected Results	Percent of Non-detected Results	Maximum Detected Value	Location of Maximum Detected Value	Depth of Maximum Detected value	MTCA A[1]	MTCA B[2]	Number of Results that Exceed MTCA A	Percent of Detects that Exceed MTCA A	MTCA A Exceedance Ratio[3]	Number of Results that Exceed MTCA B	Percent of Detects that Exceed MTCA B	MTCA B Exceedance Ratio[3]
Other Semivolatile Organic Compounds (continued)																	
Aniline	µg/L	18			18	100%				--	--						
Azobenzene	µg/L	18			18	100%				--	--						
bis(2-chloroethoxy)methane	µg/L	18			18	100%				--	--						
Carbazole	µg/L	18	4	22%	14	78%	25	MW-01	5–15 feet								
Hexachlorocyclopentadiene	µg/L	18			18	100%				--	--						
Isophorone	µg/L	18			18	100%				--	--						
m,p-Cresol (2:1 ratio)	µg/L	18	1	6%	17	94%	40	MW-06	6–16 feet	NA	NA						
N-Nitrosodimethylamine	µg/L	18			18	100%				--	--						
N-Nitroso-di-n-propylamine	µg/L	18			18	100%				--	--						
Other Volatile Organic Compounds																	
1,1,1,2-Tetrachloroethane	µg/L	18			18	100%				--	--						
1,1,1-Trichloroethane	µg/L	18			18	100%				--	--						
1,1,2,2-Tetrachloroethane	µg/L	18			18	100%				--	--						
1,1,2-Trichloroethane	µg/L	18			18	100%				--	--						
1,1-Dichloroethane	µg/L	18			18	100%				--	--						
1,1-Dichloroethene	µg/L	18			18	100%				--	--						
1,1-Dichloropropene	µg/L	18			18	100%				--	--						
1,2,3-Trichlorobenzene	µg/L	18			18	100%				--	--						
1,2,3-Trichloropropane	µg/L	18			18	100%				--	--						
1,2,4-Trimethylbenzene	µg/L	24	1	4%	23	96%	15	MW-01	5–15 feet	NA	NA						
1,2-Dibromo-3-chloropropane	µg/L	18			18	100%				--	--						
1,2-Dibromoethane	µg/L	18			18	100%				--	--						
1,2-Dichloroethane	µg/L	18			18	100%				--	--						
1,2-Dichloropropane	µg/L	18			18	100%				--	--						
1,3,5-Trimethylbenzene	µg/L	24	1	4%	23	96%	6.4	MW-01	5–15 feet	NA	80						
1,3-Dichloropropane	µg/L	18			18	100%				--	--						
2,2-Dichloropropane	µg/L	18			18	100%				--	--						
2,4-Dinitrotoluene	µg/L	18			18	100%				--	--						
2,6-Dinitrotoluene	µg/L	18			18	100%				--	--						
2-Chlorotoluene	µg/L	18			18	100%				--	--						
2-Hexanone	µg/L	18			18	100%				--	--						
2-Nitroaniline	µg/L	18			18	100%				--	--						
3,3'-Dichlorobenzidine	µg/L	18			18	100%				--	--						
3-Nitroaniline	µg/L	18			18	100%				--	--						
4-Bromophenyl phenyl ether	µg/L	18			18	100%				--	--						
4-Chloroaniline	µg/L	18			18	100%				--	--						
4-Chlorophenyl phenyl ether	µg/L	18			18	100%				--	--						
4-Chlorotoluene	µg/L	18			18	100%				--	--						
4-Nitroaniline	µg/L	18			18	100%				--	--						
Acetone	µg/L	24	14	58%	10	42%	14	MW-01	5–15 feet	NA	7,200						
Benzene	µg/L	24			24	100%				--	--						
bis(2-chloroethyl)ether	µg/L	18			18	100%				--	--						
bis(2-chloroisopropyl)ether	µg/L	18			18	100%				--	--						
Bromobenzene	µg/L	18			18	100%				--	--						
Bromochloromethane	µg/L	18			18	100%				--	--						
Bromodichloromethane	µg/L	18			18	100%				--	--						
Bromoform	µg/L	18			18	100%				--	--						
Bromomethane	µg/L	18			18	100%				--	--						
Carbon disulfide	µg/L	18			18	100%				--	--						
Carbon tetrachloride	µg/L	18			18	100%				--	--						
Chlorobenzene	µg/L	18	2	11%	16	89%	2.7	MW-09	5–15 feet	NA	160						
Chloroethane	µg/L	18			18	100%				--	--						
Chloroform	µg/L	18	2	11%	16	89%	1.2	MW-01	5–15 feet	NA	80						
Chloroform	µg/L	18	2	11%	16	89%	1.2	MW-08	6–16 feet	NA	80						

Table 5.1
Frequency of Exceedances for Monitoring Well Groundwater—Current and Historical Analytical Results

Parameter	Unit	Number of Results	Number of Detected Results	Percent Detected	Number of Non-detected Results	Percent of Non-detected Results	Maximum Detected Value	Location of Maximum Detected Value	Depth of Maximum Detected value	Groundwater Screening Criteria		Number of Results that Exceed MTCA A	Percent of Detects that Exceed MTCA A	MTCA A Exceedance Ratio[3]	Number of Results that Exceed MTCA B	Percent of Detects that Exceed MTCA B	MTCA B Exceedance Ratio[3]
										MTCA A[1]	MTCA B[2]						
Other Volatile Organic Compounds (continued)																	
Chloromethane	µg/L	18			18	100%				--	--						
cis-1,2-Dichloroethene	µg/L	18			18	100%				--	--						
cis-1,3-Dichloropropene	µg/L	18			18	100%				--	--						
Cymene	µg/L	24	6	25%	18	75%	120	MW-06	6–16 feet	NA	NA						
Dibromochloromethane	µg/L	18			18	100%				--	--						
Dibromomethane	µg/L	18			18	100%				--	--						
Dichlorodifluoromethane	µg/L	18			18	100%				--	--						
Ethylbenzene	µg/L	24	1	4%	23	96%	1.4	MW-01	5–15 feet	700	800						
Hexachloroethane	µg/L	18			18	100%				--	--						
iso-Propylbenzene	µg/L	24	5	21%	19	79%	3.4	MW-01	5–15 feet	NA	800						
Methyl ethyl ketone	µg/L	18			18	100%				--	--						
Methyl iso butyl ketone	µg/L	18			18	100%				--	--						
Methylene chloride	µg/L	18	7	39%	11	61%	2.5	MW-02A	4–14 feet	5	480						
Methyl-Tert-Butyl Ether	µg/L	18			18	100%				--	--						
n-Butylbenzene	µg/L	24	4	17%	20	83%	8.6	MW-01	5–15 feet	NA	NA						
Nitrobenzene	µg/L	18			18	100%				--	--						
n-Propylbenzene	µg/L	24	3	13%	21	88%	2.9	MW-01	5–15 feet	NA	800						
Pyridine	µg/L	18			18	100%				--	--						
sec-Butylbenzene	µg/L	24	4	17%	20	83%	1.8	MW-01	5–15 feet	NA	NA						
Styrene	µg/L	18			18	100%				--	--						
tert-Butylbenzene	µg/L	18			18	100%				--	--						
Tetrachloroethene	µg/L	18			18	100%				--	--						
Toluene	µg/L	24			24	100%				--	--						
trans-1,2-Dichloroethene	µg/L	18			18	100%				--	--						
trans-1,3-Dichloropropene	µg/L	18			18	100%				--	--						
Trichloroethene	µg/L	18			18	100%				--	--						
Trichlorofluoromethane	µg/L	18			18	100%				--	--						
Vinyl chloride	µg/L	18			18	100%				--	--						
Xylene (meta & para)	µg/L	24	2	8%	22	92%	6.6	MW-01	5–15 feet	NA	1,600						
Xylene (ortho)	µg/L	24	1	4%	23	96%	2.5	MW-01	5–15 feet	NA	1,600						
Xylene (total)	µg/L	18	1	6%	17	94%	2.1	MW-01	5–15 feet	1,000	1,600						

Notes:

-- Criteria not identified since all results were non-detect.
Blank cells indicate zero (e.g., no analyte was detected and/or exceeded).
1 MTCA Method A Criteria for Groundwater.
2 MTCA Method B Groundwater Criteria, Non-carcinogenic.
3 The exceedance ratio is the maximum detected value divided by the screening level criteria value.
4 Calculation of cPAH TEQ concentrations was performed using the California Environmental Protection Agency 2005 Toxic Equivalency Factors as presented in Table 708-2 of WAC 173-340-900.
5 Calculated using detected cPAH concentrations.
6 Calculated using detected cPAH concentrations plus one-half the detection limit for cPAHs that were not detected.

Abbreviations:

cPAH	Carcinogenic polycyclic aromatic hydrocarbon.
HPAH	High molecular weight polycyclic aromatic hydrocarbon.
LPAH	Low molecular weight polycyclic aromatic hydrocarbon.
MTCA	Model Toxics Control Act.
NA	Not available.
PCB	Polychlorinated biphenyl.
TEQ	Toxic Equivalency Quotient.
WAC	Washington Administrative Code.

Table 5.2
Detected Analytes in Monitoring Well Groundwater—Current and Historical Analytical Results

			Well	**MW-1**			**MW-02A**			
			Sample ID	**MW1-GW-072911**	**MW1-GW-032311**	**MW-1-98**	**MW2A-GW-072911**	**MW16B-GW-072911**	**MW02A-GW-032311**	**MW02A-GW-032311-D**
			Sample Date	**7/29/2011**	**3/23/2011**	**5/14/1998**	**7/29/2011**	**7/29/2011**	**3/23/2011**	**3/23/2011**
			Screen Interval	**5–15 ft**	**5–15 ft**	**5–15 ft**	**4–14 ft**	**4–14 ft**	**4–14 ft**	**4–14 ft**
Parameter	**Unit**	**MTCA A[1]**	**MTCA B[2]**							
Total Petroleum Hydrocarbons										
Gasoline Range Hydrocarbons	µg/L	800/1,000[3]	NA	770 J	730 J	580	50 U	50 U	50 U	50 U
Diesel Range Hydrocarbons	µg/L	500	NA	**1,900**	**1,400**	**4,600**	130 U	160	130 U	130 U
Oil Range Hydrocarbons[4]	µg/L	500	NA	250 U	250 U	500 U	250 U	250 U	250 U	250 U
Dissolved Metals										
Arsenic	µg/L	5	4.8	**29**	**23**	4	**8**	**7.4**	8.9 U	8.9 U
Chromium	µg/L	50	NA	1.6	1.4	5 U	1.6	1.7	3 U	3 U
Copper	µg/L	NA	640	2.7	2.6 U	2 U	7.7	5.8	13 U	13 U
Lead	µg/L	15	NA	0.62 U	0.73	1 U	0.62 U	0.62 U	3.3	4
Nickel	µg/L	NA	320	5.9	3.9	10 U	6.7	7.8	18	19
Zinc	µg/L	NA	4,800	8.3	3.9 U	4 U	38	43	20 U	20 U
Total Metals										
Antimony	µg/L	NA	6.4	--	--	3 J	--	--	--	--
Arsenic	µg/L	5	4.8	--	--	**34**	--	--	--	--
Beryllium	µg/L	NA	32	--	--	2	--	--	--	--
Cadmium	µg/L	5	16	--	--	2 U	--	--	--	--
Chromium	µg/L	50	NA	--	--	**205**	--	--	--	--
Copper	µg/L	NA	640	--	--	248	--	--	--	--
Lead	µg/L	15	NA	--	--	**116**	--	--	--	--
Mercury	µg/L	2	NA	--	--	0.4	--	--	--	--
Nickel	µg/L	NA	320	--	--	280	--	--	--	--
Selenium	µg/L	NA	80	--	--	6	--	--	--	--
Zinc	µg/L	NA	4,800	--	--	352	--	--	--	--
Nonionizable Organic Hydrocarbons										
Aromatic Hydrocarbons										
Naphthalene	µg/L	160	160	5.8	5.5	14	1 U	1 U	1 U	1.1
Acenaphthylene	µg/L	NA	NA	2 U	2 U	--	2 U	2 U	2 U	2 U
Acenaphthene	µg/L	NA	960	20	21	--	2 U	2 U	2 U	2 U
Fluorene	µg/L	NA	640	11	15	--	2 U	2 U	2 U	2 U
Phenanthrene	µg/L	NA	NA	2.4	10	--	2 U	2 U	2 U	2 U
Anthracene	µg/L	NA	4,800	2 U	2 U	--	2 U	2 U	2 U	2 U
2-Methylnaphthalene	µg/L	NA	2	**30**	**63**	--	2 U	2 U	2 U	2 U
Total LPAH	µg/L	NA	NA	39.2	51.5	--	2 U	2 U	2 U	1.1
Miscellaneous										
Dibenzofuran	µg/L	NA	16	5.6	7.7	--	2 U	2 U	2 U	2 U
Other Semivolatile Organic Compounds										
1-Methylnaphthalene	µg/L	NA	NA	54	78	--	2 U	2 U	2 U	2 U
Carbazole	µg/L	NA	NA	25	22	--	2 U	2 U	2 U	2 U

Table 5.2
Detected Analytes in Monitoring Well Groundwater—Current and Historical Analytical Results

			Well	**MW-1**			**MW-02A**			
			Sample ID	**MW1-GW-072911**	**MW1-GW-032311**	**MW-1-98**	**MW2A-GW-072911**	**MW16B-GW-072911**	**MW02A-GW-032311**	**MW02A-GW-032311-D**
			Sample Date	**7/29/2011**	**3/23/2011**	**5/14/1998**	**7/29/2011**	**7/29/2011**	**3/23/2011**	**3/23/2011**
			Screen Interval	**5–15 ft**	**5–15 ft**	**5–15 ft**	**4–14 ft**	**4–14 ft**	**4–14 ft**	**4–14 ft**
Parameter	**Unit**	**MTCA A[1]**	**MTCA B[2]**							
Other Volatile Organic Compounds										
1,2,4-Trimethylbenzene	µg/L	NA	NA	1 U	1 U	15	1 U	1 U	1 U	1 U
1,3,5-Trimethylbenzene	µg/L	NA	80	1 U	1 U	6.4	1 U	1 U	1 U	1 U
Acetone	µg/L	NA	7,200	14	2 U	9 JB	3.4	2.6	2 U	2 U
Chlorobenzene	µg/L	NA	160	1 U	1 U	--	1 U	1 U	1 U	1 U
Chloroform	µg/L	NA	80	1.2	1 U	--	1 U	1 U	1 U	1 U
Cymene	µg/L	NA	NA	2.2	3.2	4.5	1 U	1 U	1 U	1 U
Ethylbenzene	µg/L	700	800	1 U	1 U	1.4	1 U	1 U	1 U	1 U
iso-Propylbenzene	µg/L	NA	800	2.7	3	3.4	1 U	1 U	1 U	1 U
Methylene chloride	µg/L	5	480	1 U	1 U	--	2.5	1.6	1 U	1 U
n-Butylbenzene	µg/L	NA	NA	8.6	1 U	1.5	1 U	1 U	1 U	1 U
n-Propylbenzene	µg/L	NA	800	2.4	2.7	2.9	1 U	1 U	1 U	1 U
sec-Butylbenzene	µg/L	NA	NA	1.6	1.6	1.8	1 U	1 U	1 U	1 U
Xylene (meta & para)	µg/L	NA	1,600	2 U	2.1	6.6	2 U	2 U	2 U	2 U
Xylene (ortho)	µg/L	NA	1,600	1 U	1 U	2.5	1 U	1 U	1 U	1 U
Xylene (total)	µg/L	1,000	1,600	2 U	2.1	--	2 U	2 U	2 U	2 U

Notes:

--	Not analyzed.
Bold	Detected exceedance of MTCA A and/or MTCA B Criteria.
1	MTCA Method A Criteria for Groundwater.
2	MTCA Method B Groundwater Criteria, Non-carcinogenic.
3	MTCA A Criteria with detectable benzene/MTCA A Criteria with no detectable benzene.
4	May include heavy oils and/or mineral oils.

Abbreviations:

dup	Duplicate.
ft	Feet.
LPAH	Lower molecular weight polycyclic aromatic hydrocarbon.
MTCA	Model Toxics Control Act.
NA	Not available.

Qualifiers:

J	Estimated value.
JB	Estimated due to blank contamination.
U	Not detected.

Table 5.2
Detected Analytes in Monitoring Well Groundwater—Current and Historical Analytical Results

Well				MW-2	MW-3		MW-4				MW-5
Sample ID				MW-2-98	MW-3-98	MW-3-98 Dup	MW4-GW-072911	MW4-GW-032211	HAS-MW-4	MW-4-98	MW5-GW-072911
Sample Date				5/14/1998	5/14/1998	5/14/1998	7/29/2011	3/22/2011	8/17/2005	5/14/1998	7/29/2011
Screen Interval				4–14 ft	5–15 ft	5–15 ft	5–15 ft	5–15 ft	5–15 ft	5–15 ft	5–15 ft
Parameter	**Unit**	**MTCA A[1]**	**MTCA B[2]**								
Total Petroleum Hydrocarbons											
Gasoline Range Hydrocarbons	µg/L	800/1,000[3]	NA	250 U	250 U	250 U	50 U	50 U	250 U	250 U	50 U
Diesel Range Hydrocarbons	µg/L	500	NA	400	250 U	250 U	130 U	130 U	250 U	**730**	130 U
Oil Range Hydrocarbons[4]	µg/L	500	NA	500 U	500 U	500 U	250 U	250 U	500 U	500 U	250 U
Dissolved Metals											
Arsenic	µg/L	5	4.8	2	1 U	1 U	**6.6**	4.1	2	4	3.4
Chromium	µg/L	50	NA	5 U	5 U	5 U	0.71	0.59 U	5 U	5 U	2.9
Copper	µg/L	NA	640	3	2 U	2 U	3	2.6 U	2 U	4	5.6
Lead	µg/L	15	NA	5 U	1 U	1 U	0.62 U	0.62 U	2	1 U	0.62 U
Nickel	µg/L	NA	320	10 U	10 U	10 U	4.3	2.1	10 U	30	10
Zinc	µg/L	NA	4,800	71	4 U	4 U	3.9 U	3.9 U	6 U	4 U	7.3
Total Metals											
Antimony	µg/L	NA	6.4	6	1 U	1 U	--	--	50 U	1 U	--
Arsenic	µg/L	5	4.8	**24**	**12**	**12**	--	--	2	**82**	--
Beryllium	µg/L	NA	32	1 U	1 U	1 U	--	--	--	2	--
Cadmium	µg/L	5	16	5	5	6	--	--	2 U	2 U	--
Chromium	µg/L	50	NA	**255**	**149**	**151**	--	--	5 U	**176**	--
Copper	µg/L	NA	640	194	72	83	--	--	2 U	310	--
Lead	µg/L	15	NA	**72**	**41**	**47**	--	--	2	**102**	--
Mercury	µg/L	2	NA	0.3	0.1 U	0.2	--	--	0.1 U	0.6	--
Nickel	µg/L	NA	320	250	120	120	--	--	10	330	--
Selenium	µg/L	NA	80	5 U	1 U	2 U	--	--	--	5 U	--
Zinc	µg/L	NA	4,800	459	163	178	--	--	6 U	317	--
Nonionizable Organic Hydrocarbons											
Aromatic Hydrocarbons											
Naphthalene	µg/L	160	160	5 U	5 U	5 U	1 U	2 U	1 U	5 U	1 U
Acenaphthylene	µg/L	NA	NA	--	--	--	2 U	2 U	1 U	--	2 U
Acenaphthene	µg/L	NA	960	--	--	--	2 U	2 U	1 U	--	2 U
Fluorene	µg/L	NA	640	--	--	--	2 U	2 U	1 U	--	2 U
Phenanthrene	µg/L	NA	NA	--	--	--	2 U	2 U	1 U	--	2 U
Anthracene	µg/L	NA	4,800	--	--	--	2 U	2 U	1 U	--	2 U
2-Methylnaphthalene	µg/L	NA	2	--	--	--	2 U	2 U	1 U	--	2 U
Total LPAH	µg/L	NA	NA	--	--	--	2 U	2 U	--	--	2 U
Miscellaneous											
Dibenzofuran	µg/L	NA	16	--	--	--	2 U	2 U	1 U	--	2 U
Other Semivolatile Organic Compounds											
1-Methylnaphthalene	µg/L	NA	NA	--	--	--	2 U	2 U	--	--	2 U
Carbazole	µg/L	NA	NA	--	--	--	2 U	2 U	--	--	2 U

Table 5.2
Detected Analytes in Monitoring Well Groundwater—Current and Historical Analytical Results

			Well	MW-2	MW-3		MW-4				MW-5
			Sample ID	MW-2-98	MW-3-98	MW-3-98 Dup	MW4-GW-072911	MW4-GW-032211	HAS-MW-4	MW-4-98	MW5-GW-072911
			Sample Date	5/14/1998	5/14/1998	5/14/1998	7/29/2011	3/22/2011	8/17/2005	5/14/1998	7/29/2011
			Screen Interval	4–14 ft	5–15 ft	5–15 ft	5–15 ft	5–15 ft	5–15 ft	5–15 ft	5–15 ft
Parameter	**Unit**	**MTCA A[1]**	**MTCA B[2]**								
Other Volatile Organic Compounds											
1,2,4-Trimethylbenzene	µg/L	NA	NA	1 U	1 U	1 U	1 U	2 U	--	1 U	1 U
1,3,5-Trimethylbenzene	µg/L	NA	80	1 U	1 U	1 U	1 U	2 U	--	1 U	1 U
Acetone	µg/L	NA	7,200	5.9 JB	9.5 JB	8.6 JB	2.6	25 U	--	5.5 JB	3.9
Chlorobenzene	µg/L	NA	160	--	--	--	1 U	2 U	--	--	1 U
Chloroform	µg/L	NA	80	--	--	--	1 U	2 U	--	--	1 U
Cymene	µg/L	NA	NA	1 U	1 U	1 U	1 U	2 U	--	1 U	1 U
Ethylbenzene	µg/L	700	800	1 U	1 U	1 U	1 U	2 U	--	1 U	1 U
iso-Propylbenzene	µg/L	NA	800	1 U	1 U	1 U	1 U	2 U	--	1 U	1 U
Methylene chloride	µg/L	5	480	--	--	--	1.3	5 U	--	--	1.4
n-Butylbenzene	µg/L	NA	NA	1 U	1 U	1 U	1 U	2 U	--	1 U	1 U
n-Propylbenzene	µg/L	NA	800	1 U	1 U	1 U	1 U	2 U	--	1 U	1 U
sec-Butylbenzene	µg/L	NA	NA	1 U	1 U	1 U	1 U	2 U	--	1 U	1 U
Xylene (meta & para)	µg/L	NA	1,600	1 U	1 U	1 U	2 U	4 U	--	1 U	2 U
Xylene (ortho)	µg/L	NA	1,600	1 U	1 U	1 U	1 U	2 U	--	1 U	1 U
Xylene (total)	µg/L	1,000	1,600	--	--	--	2 U	4 U	--	--	2 U

Notes:

--	Not analyzed.
Bold	Detected exceedance of MTCA A and/or MTCA B Criteria.
1	MTCA Method A Criteria for Groundwater.
2	MTCA Method B Groundwater Criteria, Non-carcinogenic.
3	MTCA A Criteria with detectable benzene/MTCA A Criteria with no detectable benzene.
4	May include heavy oils and/or mineral oils.

Abbreviations:

dup	Duplicate.
ft	Feet.
LPAH	Lower molecular weight polycyclic aromatic hydrocarbon.
MTCA	Model Toxics Control Act.
NA	Not available.

Qualifiers:

J	Estimated value.
JB	Estimated due to blank contamination.
U	Not detected.

Table 5.2
Detected Analytes in Monitoring Well Groundwater—Current and Historical Analytical Results

			Well	MW-5		MW-06		MW-07	
			Sample ID	MW5-GW-032311	MW-5-98	MW6-GW-072911	MW06-GW-032211	MW7-GW-072911	MW07-GW-032311
			Sample Date	3/23/2011	5/14/1998	7/29/2011	3/22/2011	7/29/2011	3/23/2011
			Screen Interval	5–15 ft	5–15 ft	6–16 ft	6–16 ft	4–14 ft	4–14 ft
Parameter	**Unit**	**MTCA A[1]**	**MTCA B[2]**						
Total Petroleum Hydrocarbons									
Gasoline Range Hydrocarbons	µg/L	800/1,000[3]	NA	50 U	250 U	380	**1,000**	50	50 U
Diesel Range Hydrocarbons	µg/L	500	NA	130 U	250 U	**1,000**	**3,500**	230	130 U
Oil Range Hydrocarbons[4]	µg/L	500	NA	250 U	500 U	310	**1,200**	250 U	250 U
Dissolved Metals									
Arsenic	µg/L	5	4.8	2	1 U	**16**	4.6	**4.9**	4.4
Chromium	µg/L	50	NA	2	5 U	0.61	0.59 U	0.9	2.1
Copper	µg/L	NA	640	2.6 U	3	2.6 U	2.6 U	2.6 U	2.6 U
Lead	µg/L	15	NA	0.62 U	1 U	0.62 U	0.62 U	0.62 U	0.62 U
Nickel	µg/L	NA	320	4.5	10 U	2.2	1.7 U	4.5	5.5
Zinc	µg/L	NA	4,800	3.9 U	4 U	3.9 U	3.9 U	16	3.9 U
Total Metals									
Antimony	µg/L	NA	6.4	--	1 U	--	--	--	--
Arsenic	µg/L	5	4.8	--	**20**	--	--	--	--
Beryllium	µg/L	NA	32	--	9	--	--	--	--
Cadmium	µg/L	5	16	--	8	--	--	--	--
Chromium	µg/L	50	NA	--	**2,120**	--	--	--	--
Copper	µg/L	NA	640	--	**1,730**	--	--	--	--
Lead	µg/L	15	NA	--	**150**	--	--	--	--
Mercury	µg/L	2	NA	--	**4.6**	--	--	--	--
Nickel	µg/L	NA	320	--	3,810	--	--	--	--
Selenium	µg/L	NA	80	--	10 U	--	--	--	--
Zinc	µg/L	NA	4,800	--	1,210	--	--	--	--
Nonionizable Organic Hydrocarbons									
Aromatic Hydrocarbons									
Naphthalene	µg/L	160	160	1 U	5 U	1 U	2 U	1 U	1 U
Acenaphthylene	µg/L	NA	NA	2 U	--	2 U	4 U	2 U	2 U
Acenaphthene	µg/L	NA	960	2 U	--	2 U	4 U	5	2 U
Fluorene	µg/L	NA	640	2 U	--	2 U	4 U	2 U	2 U
Phenanthrene	µg/L	NA	NA	2 U	--	2 U	4 U	2 U	2 U
Anthracene	µg/L	NA	4,800	2 U	--	2 U	4 U	2 U	2 U
2-Methylnaphthalene	µg/L	NA	2	2 U	--	2 U	4 U	2 U	2 U
Total LPAH	µg/L	NA	NA	2 U	--	2 U	4 U	5	2 U
Miscellaneous									
Dibenzofuran	µg/L	NA	16	2 U	--	2 U	4 U	2 U	2 U
Other Semivolatile Organic Compounds									
1-Methylnaphthalene	µg/L	NA	NA	2 U	--	2.9	4 U	2 U	2 U
Carbazole	µg/L	NA	NA	2 U	--	2 U	4 U	2 U	2 U

Table 5.2
Detected Analytes in Monitoring Well Groundwater—Current and Historical Analytical Results

			Well	MW-5		MW-06		MW-07	
			Sample ID	**MW5-GW-032311**	**MW-5-98**	**MW6-GW-072911**	**MW06-GW-032211**	**MW7-GW-072911**	**MW07-GW-032311**
			Sample Date	**3/23/2011**	**5/14/1998**	**7/29/2011**	**3/22/2011**	**7/29/2011**	**3/23/2011**
			Screen Interval	**5–15 ft**	**5–15 ft**	**6–16 ft**	**6–16 ft**	**4–14 ft**	**4–14 ft**
Parameter	**Unit**	**MTCA A[1]**	**MTCA B[2]**						
Other Volatile Organic Compounds									
1,2,4-Trimethylbenzene	µg/L	NA	NA	1 U	1 U	1 U	2 U	1 U	1 U
1,3,5-Trimethylbenzene	µg/L	NA	80	1 U	1 U	1 U	2 U	1 U	1 U
Acetone	µg/L	NA	7,200	2 U	7.6 JB	4.9	25 U	6	2 U
Chlorobenzene	µg/L	NA	160	1 U	--	1 U	2 U	1 U	1 U
Chloroform	µg/L	NA	80	1 U	--	1 U	2 U	1 U	1 U
Cymene	µg/L	NA	NA	1 U	1 U	120	93	1 U	1 U
Ethylbenzene	µg/L	700	800	1 U	1 U	1 U	2 U	1 U	1 U
iso-Propylbenzene	µg/L	NA	800	1 U	1 U	1 U	2 U	1 U	1 U
Methylene chloride	µg/L	5	480	1 U	--	1.7	5 U	1.4	1 U
n-Butylbenzene	µg/L	NA	NA	1 U	1 U	1 U	2 U	1.3	1 U
n-Propylbenzene	µg/L	NA	800	1 U	1 U	1 U	2 U	1 U	1 U
sec-Butylbenzene	µg/L	NA	NA	1 U	1 U	1 U	2 U	1 U	1 U
Xylene (meta & para)	µg/L	NA	1,600	2 U	1 U	2 U	4 U	2 U	2 U
Xylene (ortho)	µg/L	NA	1,600	1 U	1 U	1 U	2 U	1 U	1 U
Xylene (total)	µg/L	1,000	1,600	2 U	--	2 U	4 U	2 U	2 U

Notes:

--	Not analyzed.
Bold	Detected exceedance of MTCA A and/or MTCA B Criteria.
1	MTCA Method A Criteria for Groundwater.
2	MTCA Method B Groundwater Criteria, Non-carcinogenic.
3	MTCA A Criteria with detectable benzene/MTCA A Criteria with no detectable benzene.
4	May include heavy oils and/or mineral oils.

Abbreviations:

dup	Duplicate.
ft	Feet.
LPAH	Lower molecular weight polycyclic aromatic hydrocarbon.
MTCA	Model Toxics Control Act.
NA	Not available.

Qualifiers:

J	Estimated value.
JB	Estimated due to blank contamination.
U	Not detected.

Table 5.2
Detected Analytes in Monitoring Well Groundwater—Current and Historical Analytical Results

			Well	**MW-08**		**MW-09**	
			Sample ID	**MW8-GW-072911**	**MW08-GW-032211**	**MW9-GW-072911**	**MW09-GW-032211**
			Sample Date	**7/29/2011**	**3/22/2011**	**7/29/2011**	**3/22/2011**
			Screen Interval	**6–16 ft**	**6–16 ft**	**5–15 ft**	**5–15 ft**
Parameter	**Unit**	**MTCA A[1]**	**MTCA B[2]**				
Total Petroleum Hydrocarbons							
Gasoline Range Hydrocarbons	µg/L	800/1,000[3]	NA	50 U	50 U	450 J	520 J
Diesel Range Hydrocarbons	µg/L	500	NA	130 U	130 U	**1,300**	**620**
Oil Range Hydrocarbons[4]	µg/L	500	NA	250 U	250 U	250 U	250 U
Dissolved Metals							
Arsenic	µg/L	5	4.8	**6.4**	4.8	**12**	**6.7**
Chromium	µg/L	50	NA	1.2	0.59 U	1.5	0.61
Copper	µg/L	NA	640	4.7	2.6 U	2.6 U	2.6 U
Lead	µg/L	15	NA	0.62 U	0.62 U	0.62 U	0.62 U
Nickel	µg/L	NA	320	5.1	1.7 U	2.5	1.8
Zinc	µg/L	NA	4,800	3.9 U	3.9 U	8.4	3.9 U
Total Metals							
Antimony	µg/L	NA	6.4	--	--	--	--
Arsenic	µg/L	5	4.8	--	--	--	--
Beryllium	µg/L	NA	32	--	--	--	--
Cadmium	µg/L	5	16	--	--	--	--
Chromium	µg/L	50	NA	--	--	--	--
Copper	µg/L	NA	640	--	--	--	--
Lead	µg/L	15	NA	--	--	--	--
Mercury	µg/L	2	NA	--	--	--	--
Nickel	µg/L	NA	320	--	--	--	--
Selenium	µg/L	NA	80	--	--	--	--
Zinc	µg/L	NA	4,800	--	--	--	--
Nonionizable Organic Hydrocarbons							
Aromatic Hydrocarbons							
Naphthalene	µg/L	160	160	1 U	2 U	1.2	2 U
Acenaphthylene	µg/L	NA	NA	2 U	2 U	2 U	2 U
Acenaphthene	µg/L	NA	960	2 U	2 U	2 U	2.2
Fluorene	µg/L	NA	640	2 U	2 U	2.6	3.2
Phenanthrene	µg/L	NA	NA	2 U	2 U	2 U	2 U
Anthracene	µg/L	NA	4,800	2 U	2 U	2 U	2 U
2-Methylnaphthalene	µg/L	NA	2	2 U	2 U	**4.2**	**4.1**
Total LPAH	µg/L	NA	NA	2 U	2 U	3.8	5.4
Miscellaneous							
Dibenzofuran	µg/L	NA	16	2 U	2 U	2 U	2 U
Other Semivolatile Organic Compounds							
1-Methylnaphthalene	µg/L	NA	NA	2 U	2 U	31	32
Carbazole	µg/L	NA	NA	2 U	2 U	2.3	2.7

Table 5.2
Detected Analytes in Monitoring Well Groundwater—Current and Historical Analytical Results

Well				MW-08		MW-09	
Sample ID				MW8-GW-072911	MW08-GW-032211	MW9-GW-072911	MW09-GW-032211
Sample Date				7/29/2011	3/22/2011	7/29/2011	3/22/2011
Screen Interval				6–16 ft	6–16 ft	5–15 ft	5–15 ft
Parameter	**Unit**	**MTCA A[1]**	**MTCA B[2]**				
Other Volatile Organic Compounds							
1,2,4-Trimethylbenzene	µg/L	NA	NA	1 U	2 U	1 U	2 U
1,3,5-Trimethylbenzene	µg/L	NA	80	1 U	2 U	1 U	2 U
Acetone	µg/L	NA	7,200	2 U	25 U	6.6	25 U
Chlorobenzene	µg/L	NA	160	1 U	2 U	1	2.7
Chloroform	µg/L	NA	80	1.2	2 U	1 U	2 U
Cymene	µg/L	NA	NA	1 U	2 U	1 U	2.9
Ethylbenzene	µg/L	700	800	1 U	2 U	1 U	2 U
iso-Propylbenzene	µg/L	NA	800	1 U	2 U	1.5	2
Methylene chloride	µg/L	5	480	1 U	5 U	1.2	5 U
n-Butylbenzene	µg/L	NA	NA	1 U	2 U	2.4	2 U
n-Propylbenzene	µg/L	NA	800	1 U	2 U	1 U	2 U
sec-Butylbenzene	µg/L	NA	NA	1 U	2 U	1.2	2 U
Xylene (meta & para)	µg/L	NA	1,600	2 U	4 U	2 U	4 U
Xylene (ortho)	µg/L	NA	1,600	1 U	2 U	1 U	2 U
Xylene (total)	µg/L	1,000	1,600	2 U	4 U	2 U	4 U

Notes:

--	Not analyzed.
Bold	Detected exceedance of MTCA A and/or MTCA B Criteria.
1	MTCA Method A Criteria for Groundwater.
2	MTCA Method B Groundwater Criteria, Non-carcinogenic.
3	MTCA A Criteria with detectable benzene/MTCA A Criteria with no detectable benzene.
4	May include heavy oils and/or mineral oils.

Abbreviations:

dup	Duplicate.
ft	Feet.
LPAH	Lower molecular weight polycyclic aromatic hydrocarbon.
MTCA	Model Toxics Control Act.
NA	Not available.

Qualifiers:

J	Estimated value.
JB	Estimated due to blank contamination.
U	Not detected.

Table 5.3
Frequency of Detects for Geoprobe Groundwater—Supplemental Site Investigation Analytical Results

Parameter	Unit	Number of Results	Number of Detected Results	Percent Detect	Number of Non-detected Results	Percent of Non-detect Results	Maximum Detected Value	Location of Maximum Detected Value	Depth of Maximum Detected Value
Total Petroleum Hydrocarbons									
Gasoline Range Hydrocarbons	µg/L	5	2	40%	3	60%	1,900	FS-09	13–17 feet
Diesel Range Hydrocarbons	µg/L	5	3	60%	2	40%	3,200	FS-09	13–17 feet
Oil Range Hydrocarbons	µg/L	5			5	100%			
Dissolved Metals									
Arsenic	µg/L	5	5	100%			47	FS-07	12–16 feet
Cadmium	µg/L	5			5	100%			
Chromium	µg/L	5	1	20%	4	80%	7	FS-07	12–16 feet
Copper	µg/L	5	2	40%	3	60%	9	FS-07	12–16 feet
Lead	µg/L	5	1	20%	4	80%	1	FS-07	12–16 feet
Mercury	µg/L	5			5	100%			
Nickel	µg/L	5	2	40%	3	60%	14	FS-07	12–16 feet
Silver	µg/L	5			5	100%			
Zinc	µg/L	5	3	60%	2	40%	27	FS-09	13–17 feet
Chlorinated Benzenes									
1,2-Dichlorobenzene	µg/L	5			5	100%			
1,3-Dichlorobenzene	µg/L	5			5	100%			
1,4-Dichlorobenzene	µg/L	5			5	100%			
1,2,4-Trichlorobenzene	µg/L	5			5	100%			
Volatile Organic Compounds									
1,1,1,2-Tetrachloroethane	µg/L	5			5	100%			
1,1,1-Trichloroethane	µg/L	5			5	100%			
1,1,2,2-Tetrachloroethane	µg/L	5			5	100%			
1,1,2-Trichloroethane	µg/L	5			5	100%			
1,1-Dichloroethane	µg/L	5			5	100%			
1,1-Dichloroethene	µg/L	5			5	100%			
1,1-Dichloropropene	µg/L	5			5	100%			
1,2,3-Trichlorobenzene	µg/L	5			5	100%			
1,2,3-Trichloropropane	µg/L	5			5	100%			
1,2,4-Trimethylbenzene	µg/L	5	2	40%	3	60%	12	FS-09	13–17 feet
1,2-Dibromo-3-chloropropane	µg/L	5			5	100%			
1,2-Dibromoethane	µg/L	5			5	100%			
1,2-Dichloroethane	µg/L	5			5	100%			
1,2-Dichloropropane	µg/L	5			5	100%			
1,3,5-Trimethylbenzene	µg/L	5			5	100%			
1,3-Dichloropropane	µg/L	5			5	100%			
2,2-Dichloropropane	µg/L	5			5	100%			
2-Chlorotoluene	µg/L	5			5	100%			
2-Hexanone	µg/L	5			5	100%			
4-Chlorotoluene	µg/L	5			5	100%			
Acetone	µg/L	5			5	100%			
Acrylonitrile	µg/L	5			5	100%			
Benzene	µg/L	5			5	100%			
Bromobenzene	µg/L	5			5	100%			
Bromochloromethane	µg/L	5			5	100%			
Bromodichloromethane	µg/L	5			5	100%			
Bromoform	µg/L	5			5	100%			
Bromomethane	µg/L	5			5	100%			
Carbon disulfide	µg/L	5			5	100%			
Carbon tetrachloride	µg/L	5			5	100%			
Chlorobenzene	µg/L	5			5	100%			
Chloroethane	µg/L	5			5	100%			
Chloroform	µg/L	5			5	100%			
Chloromethane	µg/L	5			5	100%			
cis-1,2-Dichloroethene	µg/L	5			5	100%			
cis-1,3-Dichloropropene	µg/L	5			5	100%			
Cymene	µg/L	5	2	40%	3	60%	2.6	FS-09	13–17 feet
Dibromochloromethane	µg/L	5			5	100%			
Dibromomethane	µg/L	5			5	100%			
Dichlorodifluoromethane	µg/L	5			5	100%			
Ethylbenzene	µg/L	5	2	40%	3	60%	3.2	FS-09	13–17 feet
Hexachlorobutadiene	µg/L	5			5	100%			
iso-Propylbenzene	µg/L	5	2	40%	3	60%	1.9	FS-09	13–17 feet
Methyl ethyl ketone	µg/L	5			5	100%			
Methyl iso butyl ketone	µg/L	5			5	100%			
Methylene chloride	µg/L	5			5	100%			
Methyl-Tert-Butyl Ether	µg/L	5			5	100%			
n-Butylbenzene	µg/L	5			5	100%			
n-Propylbenzene	µg/L	5	2	40%	3	60%	2	FS-09	13–17 feet
Naphthalene	µg/L	5	3	60%	2	40%	1,300	FS-09	13–17 feet
sec-Butylbenzene	µg/L	5			5	100%			
Styrene	µg/L	5			5	100%			
tert-Butylbenzene	µg/L	5			5	100%			
Tetrachloroethene	µg/L	5			5	100%			
Toluene	µg/L	5			5	100%			
trans-1,2-Dichloroethene	µg/L	5			5	100%			
trans-1,3-Dichloropropene	µg/L	5			5	100%			
Trichloroethene	µg/L	5			5	100%			
Trichlorofluoromethane	µg/L	5			5	100%			
Vinyl chloride	µg/L	5			5	100%			
Xylene (meta & para)	µg/L	5	2	40%	3	60%	2.6	FS-09	13–17 feet
Xylene (ortho)	µg/L	5	2	40%	3	60%	3.8	FS-09	13–17 feet
Xylene (total)	µg/L	5	2	40%	3	60%	6.3	FS-09	13–17 feet

Note:

Blank cells indicate zero (e.g., no analyte was detected and/or exceeded).

Table 5.4
Detected Analytes in Geoprobe Groundwater— Supplemental Site Investigation Analytical Results

	Location	FS-07	FS-09		FS-15	FS-17
	Sample ID	FS07-GW16-031611	FS09-GW17-031511	FS09A-GW17-031511 (dup)	FS15-GW19-031411	FS17-GW17-031611
	Sample Date	3/16/2011	3/15/2011	3/15/2011	3/14/2011	3/16/2011
	Sample Depth	12–16 ft	13–17 ft	13–17 ft	15–19 ft	13–17 ft
Total Petroleum Hydrocarbons						
Gasoline Range Hydrocarbons	µg/L	50 U	1,900	1,600	50 U	50 U
Diesel Range Hydrocarbons	µg/L	130 U	3,200	1,600	820	130 U
Oil Range Hydrocarbons	µg/L	250 U	250 U	250 U	250 U	250 U
Dissolved Metals						
Arsenic	µg/L	47	4.9	5.8	7	3.5
Chromium	µg/L	7	0.59 U	0.59 U	0.59 U	0.59 U
Copper	µg/L	9	2.6 U	2.6 U	3.6	2.6 U
Lead	µg/L	1	0.62 U	0.62 U	0.62 U	0.62 U
Nickel	µg/L	14	1.7 U	1.7 U	1.7 U	2.3
Zinc	µg/L	19	25	27	3.9 U	3.9 U
Volatile Organic Compounds						
1,2,4-Trimethylbenzene	µg/L	2 U	11	12	1 U	2 U
Cymene	µg/L	2 U	2.2	2.6	1 U	2 U
Ethylbenzene	µg/L	2 U	3.1	3.2	1 U	2 U
iso-Propylbenzene	µg/L	2 U	1.8	1.9	1 U	2 U
n-Propylbenzene	µg/L	2 U	1.8	2	1 U	2 U
Naphthalene	µg/L	2 U	1,100	1,300	1.5	2 U
Xylene (meta & para)	µg/L	4 U	2.5	2.6	2 U	4 U
Xylene (ortho)	µg/L	2 U	3.8	3.7	1 U	2 U
Xylene (total)	µg/L	4 U	6.3	6.3	2 U	4 U

Abbreviations:

dup Duplicate.
ft Feet.

Qualifier:

U Not detected.

Table 6.1
Detected Analytes in Surface Sediments— Supplemental Site Investigation Analytical Results

			Location	**HA-2**		**HA-3**	**HA-4**		**HA-5**		**HA-6**		**HA-7**		**SG-1**		**SG-3**	**SG-4**	
			Date	**03/16/2011**		**03/16/2011**	**03/17/2011**		**03/22/2011**		**03/22/2011**		**03/22/2011**		**07/28/2011**		**07/28/2011**	**07/28/2011**	
			Depth	**0–12 cm**		**0–12 cm**	**0–12 cm**		**0–12 cm**		**0–12 cm**		**0–12 cm**		**0–12 cm**		**0–12 cm**	**0–12 cm**	
		SMS Criteria		**Dry Weight**	**OC Normalized**	**Dry Weight**	**Dry Weight**	**OC Normalized**	**Dry Weight**	**OC Normalized**	**Dry Weight**	**OC Normalized**	**Dry Weight**	**OC Normalized**	**Dry Weight**	**OC Normalized**	**Dry Weight**	**Dry Weight**	**OC Normalized**
Parameter	**Unit**	**SQS**	**CSL**																
Conventionals																			
Total Organic Carbon	%	NA	NA	1.75	--	0.416	1.66	--	2.41	--	1.9	--	2.22	--	1.2	--	--	3.2	--
Total Solids	%	NA	NA	92.3	--	81.8	79.7	--	93.6	--	92.2	--	82.1	--	66	--	--	58	--
Metals								--											
Arsenic	mg/kg	57	93	39	--	50	26	--	21	--	30	--	9.7	--	3.8	--	21	17	--
Cadmium	mg/kg	5.1	6.7	1 U	--	1 U	1 U	--	1 U	--	1 U	--	1 U	--	1 U	--	1 U	1 U	--
Chromium	mg/kg	260	270	17	--	31	25	--	20	--	29	--	31	--	25	--	25	33	--
Copper	mg/kg	390	390	**400**	--	**450**	270	--	130	--	76	--	100	--	44	--	150	220	--
Lead	mg/kg	450	530	73	--	91	55	--	54	--	54	--	**580**	--	47	--	59	90	--
Mercury	mg/kg	0.41	0.59	0.02	--	0.02 U	0.032	--	0.25	--	0.02 U	--	0.02 U	--	0.03	--	0.033	0.09	--
Nickel	mg/kg	NA	NA	16	--	21	22	--	18	--	25	--	32	--	23	--	23	30	--
Silver	mg/kg	6.1	6.1	0.72	--	0.39 U	0.4 U	--	0.34 U	--	0.34 U	--	0.38 U	--	0.44 U	--	0.39 U	0.54 U	--
Zinc	mg/kg	410	410	**530**	--	**690**	**620**	--	220	--	280	--	190	--	64	--	290	400	--
Organometallics																			
Tributyltin	mg/kg	NA	NA	0.16	9.14	0.005	0.047	2.83	0.003 U	0.133	0.006	0.289	0.003 U	0.149 U	0.02	1.67	--	0.32	10
Low Molecular Weight Polycyclic Aromatic Hydrocarbons																			
Naphthalene	mg/kg	99	170	0.1 U	5.71	0.1 U	0.1 U	6.02 U	0.1 U	4.15	0.1 U	5.26 U	0.1 U	4.5 U	0.1 U	8.33 U	--	0.1 U	3.13
Acenaphthylene	mg/kg	66	66	0.1 U	5.71	0.1 U	0.1 U	6.02 U	0.1 U	4.15	0.1 U	5.26 U	0.1 U	4.5 U	0.1 U	8.33 U	--	0.1 U	3.13
Acenaphthene	mg/kg	16	57	0.1 U	5.71	0.1 U	0.1 U	6.02 U	0.1 U	4.15	0.1 U	5.26 U	0.1 U	4.5 U	0.1 U	8.33 U	--	0.18	5.63
Fluorene	mg/kg	23	79	0.1 U	5.71	0.1 U	0.1 U	6.02 U	0.1 U	4.15	0.1 U	5.26 U	0.1 U	4.5 U	0.1 U	8.33 U	--	0.21	6.56
Phenanthrene	mg/kg	100	480	0.16	9.14	0.1 U	0.73	44	0.1 U	4.15	0.1 U	5.26 U	0.1 U	4.5 U	0.12	10	--	1.1	34.4
Anthracene	mg/kg	220	1,200	0.1 U	5.71	0.1 U	0.1 U	6.02 U	0.1 U	4.15	0.1 U	5.26 U	0.1 U	4.5 U	0.1 U	8.33 U	--	0.41	12.8
2-Methylnaphthalene	mg/kg	38	64	0.1 U	5.71	0.1 U	0.1 U	6.02 U	0.1 U	4.15	0.1 U	5.26 U	0.1 U	4.5 U	0.1 U	8.33 U	--	0.77	24.1
Total LPAH	mg/kg	370	780	0.16	9.14	0.1 U	0.73	44	0.1 U	4.15	0.1 U	5.26 U	0.1 U	4.5 U	0.12	10	--	1.9	59.4
High Molecular Weight Polycyclic Aromatic Hydrocarbons																			
Fluoranthene	mg/kg	160	1,200	0.28	16	0.1 U	1.2	72.3	0.1 U	4.15 U	0.1 U	5.26 U	0.1 U	4.5 U	0.19	15.8	--	1.6	50
Pyrene	mg/kg	1,000	1,400	0.26	14.9	0.1 U	1.2	72.3	0.1 U	4.15 U	0.1 U	5.26 U	0.1 U	4.5 U	0.2	16.7	--	1.7	53.1
Benzo(a)anthracene	mg/kg	110	270	0.15	8.57	0.1 U	0.25	15.1	0.1 U	4.15 U	0.1 U	5.26 U	0.1 U	4.5 U	0.1 U	8.33 U	--	0.8	25
Chrysene	mg/kg	110	460	0.2	11.4	0.16	0.57	34.3	0.1 U	4.15 U	0.1 U	5.26 U	0.1 U	4.5 U	0.13	10.8	--	1.1	34.4
Benzo(b)fluoranthene	mg/kg	230	450	0.16	9.14	0.1 U	0.37	22.3	0.1 U	4.15 U	0.1 U	5.26 U	0.1 U	4.5 U	0.1 U	8.33 U	--	0.81	25.3
Benzo(k)fluoranthene	mg/kg	230	450	0.12	6.86	0.1 U	0.28	16.9	0.1 U	4.15 U	0.1 U	5.26 U	0.1 U	4.5 U	0.1 U	8.33 U	--	0.6	18.8
Benzofluoranthenes (total)	mg/kg	230	450	0.28	16	0.1 U	0.65	39.2	0.1 U	4.15 U	0.1 U	5.26 U	0.1 U	4.5 U	0.1 U	8.33 U	--	1.41	44.1
Benzo(a)pyrene	mg/kg	99	210	0.15	8.57	0.1 U	0.21	12.7	0.1 U	4.15 U	0.1 U	5.26 U	0.1 U	4.5 U	0.1 U	8.33 U	--	0.66	20.6
Indeno(1,2,3-cd)pyrene	mg/kg	34	88	0.1 U	5.71	0.1 U	0.14	8.43	0.1 U	4.15 U	0.1 U	5.26 U	0.1 U	4.5 U	0.1 U	8.33 U	--	0.17	5.31
Dibenzo(a,h)anthracene	mg/kg	12	33	0.1 U	5.71	0.1 U	0.1 U	6.02 U	0.1 U	4.15 U	0.1 U	5.26 U	0.1 U	4.5 U	0.1 U	8.33 U	--	0.1 U	3.13
Benzo(g,h,i)perylene	mg/kg	31	78	0.1 U	5.71	0.1 U	0.15	9.04	0.1 U	4.15 U	0.1 U	5.26 U	0.1 U	4.5 U	0.1 U	8.33 U	--	0.16	5
Total HPAH	mg/kg	960	5,300	1.32	75.4	0.16	4.37	263	0.1 U	4.15 U	0.1 U	5.26 U	0.1 U	4.5 U	0.52	43.3	--	7.6	238
Phthalate Esters																			
Dimethyl phthalate	mg/kg	53	53	0.1 U	5.71	0.1 U	0.1 U	6.02 U	0.1 U	4.15	0.1 U	5.26 U	0.1 U	4.5 U	0.1 U	8.33 U	--	0.1 U	3.13
Diethylphthalate	mg/kg	61	110	0.1 U	5.71	0.1 U	0.1 U	6.02 U	0.1 U	4.15	0.1 U	5.26 U	0.1 U	4.5 U	0.1 U	8.33 U	--	0.1 U	3.13
Di-n-butyl phthalate	mg/kg	220	1,700	0.13 U	7.43	0.13 U	0.13 U	7.83 U	0.13 U	5.39	0.13 U	6.84 U	0.13 U	5.86 U	0.13 U	10.8 U	--	0.13 U	4.06
Butyl benzyl phthalate	mg/kg	4.9	64	0.1 U	5.71	0.1 U	0.1 U	6.02 U	0.1 U	4.15	0.1 U	5.26 U	0.1 U	4.5 U	0.1 U	8.33 U	--	0.1 U	3.13
bis(2-ethylhexyl)phthalate	mg/kg	47	78	0.13 U	7.43	0.13 U	0.24	14.5	0.13 U	5.39	0.13 U	6.84 U	0.13 U	5.86 U	0.13 U	10.8 U	--	0.72	22.5
Di-n-octyl phthalate	mg/kg	58	4,500	0.1 U	5.71	0.1 U	0.1 U	6.02 U	0.1 U	4.15	0.1 U	5.26 U	0.1 U	4.5 U	0.1 U	8.33 U	--	0.1 U	3.13
Miscellaneous Nonionizable Organic Carbons																			
Dibenzofuran	mg/kg	15	58	0.1 U	5.71	0.1 U	0.1 U	6.02 U	0.1 U	4.15	0.1 U	5.26 U	0.1 U	4.5 U	0.1 U	8.33 U	--	0.1	3.13
Polychlorinated Biphenyls (PCBs)																			
PCB Aroclor 1242	mg/kg	12	65	0.0039 U	0.223	0.0053	0.0039 U	0.235 U	0.004 U	0.162	0.004 U	0.205 U	0.004 U	0.171 U	0 U	0.317 U	--	0 U	0.119
PCB Aroclor 1248	mg/kg	12	65	0.0039 U	0.223	0.0039 U	0.012 UY	0.723 UY	0.004 U	0.162	0.01 UY	0.511 UY	0.004 U	0.171 U	0 U	0.317 U	--	0.05 U	1.53
PCB Aroclor 1254	mg/kg	12	65	0.0058	0.331	0.0039 U	0.017	1.02	0.004 U	0.162	0.012 UY	0.632 UY	0.004 U	0.171 U	0.01	0.65	--	0.04 U	1.25
PCB Aroclor 1260	mg/kg	12	65	0.0077	0.44	0.0039 U	0.0073	0.44	0.004 U	0.162	0.006 UY	0.305 UY	0.004 U	0.171 U	0 U	0.317 U	--	0.1	3.13
PCB Aroclor 1268	mg/kg	12	65	0.0039 U	0.223	0.0039 U	0.0039 U	0.235 U	0.004 U	0.162	0.004 U	0.205 U	0.004 U	0.171 U	0 U	0.317 U	--	0 U	0.119
Total PCBs	mg/kg	12	65	0.0135	0.771	0.0053	0.0243	1.46	0.004 U	0.162	0.012 UY	0.632 UY	0.004 U	0.171 U	0.01	0.65	--	0.1	3.13

Table 6.1
Detected Analytes in Surface Sediments— Supplemental Site Investigation Analytical Results

			Location	**HA-2**		**HA-3**	**HA-4**		**HA-5**		**HA-6**		**HA-7**		**SG-1**		**SG-3**	**SG-4**	
			Date	**03/16/2011**		**03/16/2011**	**03/17/2011**		**03/22/2011**		**03/22/2011**		**03/22/2011**		**07/28/2011**		**07/28/2011**	**07/28/2011**	
			Depth	**0–12 cm**		**0–12 cm**	**0–12 cm**		**0–12 cm**		**0–12 cm**		**0–12 cm**		**0–12 cm**		**0–12 cm**	**0–12 cm**	
		SMS Criteria																	
Parameter	**Unit**	**SQS**	**CSL**	**Dry Weight**	**OC Normalized**	**Dry Weight**	**Dry Weight**	**OC Normalized**	**Dry Weight**	**OC Normalized**	**Dry Weight**	**OC Normalized**	**Dry Weight**	**OC Normalized**	**Dry Weight**	**OC Normalized**	**Dry Weight**	**Dry Weight**	**OC Normalized**
Ionizable Organic Compounds																			
Phenol	mg/kg	0.42	1.2	0.1 U	--	0.1 U	0.1 U	--	0.1 U	--	0.1 U	--	0.1 U	--	0.1 U	--	--	**0.5**	--
2,4-Dimethylphenol	mg/kg	0.029	0.029	0.1 U	--	0.1 U	0.1 U	--	0.1 U	--	0.1 U	--	0.1 U	--	0.1 U	--	--	0.1 U	--
Pentachlorophenol	mg/kg	0.36	0.69	0.5 U	--	0.5 U	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U	--	--	0.5 U	--
Benzyl alcohol	mg/kg	0.057	0.073	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 Petroleum Hydrocarbons																			
Diesel Range Hydrocarbons	mg/kg	NA	NA	25 UJ	--	25 UJ	25 UJ	--	25 U	--	25 U	--	25 U	--	25 U	--	--	55	--
Oil Range Hydrocarbons	mg/kg	NA	NA	50 UJ	--	50 UJ	63 UJ	--	50 U	--	50 U	--	50 U	--	50 U	--	--	140	--
Other Semivolatile Organic Compounds																			
1-Methylnaphthalene	mg/kg	NA	NA	0.1 U	--	0.1 U	0.1 U	--	0.1 U	--	0.1 U	--	0.1 U	--	0.1 U	--	--	0.48	--
4-Chloro-3-methylphenol	mg/kg	NA	NA	0.1 U	--	0.1 U	0.1 U	--	0.1 U	--	0.1 U	--	0.1 U	--	0.1 U	--	--	0.1 U	--
Carbazole	mg/kg	NA	NA	0.1 U	--	0.1 U	0.14	--	0.1 U	--	0.1 U	--	0.1 U	--	0.1 U	--	--	0.1 U	--

Notes:

-- Not analyzed.
Bold Detected exceedance of SMS Criteria.

Abbreviations:

cm Centimeter.
cPAH Carcinogenic polycyclic aromatic hydrocarbon.
CSL Cleanup Screening Level.
HPAH High molecular weight polycyclic aromatic hydrocarbon.
LPAH Low molecular weight polycyclic aromatic hydrocarbon.
NA Not available.
OC Organic carbon.
PCB Polychlorinated biphenyl.
SMS Sediment Management Standards.
SQS Sediment Quality Standards.

Qualifiiers:

U Not detected.
UJ Undetected and the reporting limit is an estimate.
UY Undetected with an estimated elevated reporting limit due to complex mixtures that overlap.

Table 6.2
Detected Analytes in Surface Sediments—Historical Analytical Results

				RETEC 2003 RI/FS Supplemental Sampling														
			Location	HB-1			HB-2			HB-3			HB-4			REF-1	REF-1	REF-1
			Sample ID	HB-1			HB-2			HB-3			HB-4			REF-1	REF-1	REF-1
			Date	07/24/2003	07/24/2003	11/06/2003	07/24/2003	07/24/2003	11/06/2003	07/24/2003	07/24/2003	11/06/2003	07/24/2003	07/24/2003	11/06/2003	07/24/2003	07/24/2003	11/06/2003
			Depth	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm
				DW	OCN	DW	DW	OCN	DW	DW	OCN	DW	DW	OCN	DW	DW	OCN	DW
		IS Criteria																
Parameter	**Unit**	**SQS**	**CSL**															
Conventionals																		
Total Organic Carbon	%	NA	NA	2.6	--	--	2.6	--	--	2.3	--	--	2.5	--	--	1.9	--	--
Total Solids	%	NA	NA	38.7	--	30.5	33	--	32.6	37.3	--	34.7	31.2	--	28.1	34.3	--	33.1
Total Solids (preserved)	%	NA	NA	34.1	--	32	30.8	--	31.2	35.1	--	33.2	23	--	26.4	31.3	--	31.4
Total Volatile Solids	%	NA	NA	6.6	--	--	8.4	--	--	7.5	--	--	9.1	--	--	7.5	--	--
Ammonia	mg/kg	NA	NA	19	--	41	54	--	26	16	--	19	34	--	50	12	--	15
Ammonia (total as nitrogen)	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfide	mg/kg	NA	NA	1,200	--	2,400	1,900	--	3,100	1,900	--	1,600	1,600	--	3,800	160	--	1,200
Metals																		
Antimony	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	mg/kg	57	93	10 U	--	--	10 U	--	--	10 U	--	--	20 U	--	--	10 U	--	--
Cadmium	mg/kg	5.1	6.7	0.9	--	--	0.7	--	--	1.5	--	--	1.2	--	--	0.6 U	--	--
Chromium	mg/kg	260	270	58	--	--	71	--	--	77	--	--	71	--	--	44	--	--
Copper	mg/kg	390	390	69.7	--	--	106	--	--	114	--	--	90.1	--	--	31.1	--	--
Lead	mg/kg	450	530	17	--	--	22	--	--	18	--	--	23	--	--	14	--	--
Mercury	mg/kg	0.41	0.59	0.2	--	--	0.3	--	--	0.3	--	--	0.3	--	--	0.1 U	--	--
Nickel	mg/kg	NA	NA	77	--	--	91	--	--	96	--	--	93	--	--	38	--	--
Silver	mg/kg	6.1	6.1	0.8 U	--	--	0.9 U	--	--	0.8 U	--	--	1 U	--	--	0.9 U	--	--
Zinc	mg/kg	410	410	104	--	--	145	--	--	129	--	--	151	--	--	81	--	--
Organometallics[1]																		
Dibutyltin as Cl	mg/kg	NA	NA	0.0061 J	--	--	0.0088 J	0.00005 UJ	--	0.0059 UJ	0.00005 UJ	--	0.0062 J	0.00005 UJ	--	0.006 UJ	--	--
Tributyltin as Cl	mg/kg	NA	NA	0.029 J	--	--	0.05	0.00002 U	--	0.036	0.00002 U	--	0.036	0.00002 U	--	0.006 U	--	--
Monobutyltin Trichloride	mg/kg	NA	NA	0.00005 UJ	--	--	--	0.00005 UJ	--	--	0.00005 UJ	--	--	0.00005 UJ	--	0.00007 J	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (by USEPA 8270)																		
Naphthalene	mg/kg	99	170	0.092	3.54	--	0.034	1.31	--	0.033	1.43	--	0.02 U	0.8 U	--	0.02 U	1.05 U	--
Acenaphthylene	mg/kg	66	66	0.031	1.19	--	0.02 U	0.769 U	--	0.02 U	0.87 U	--	0.02 U	0.8 U	--	0.02 U	1.05 U	--
Acenaphthene	mg/kg	16	57	0.02 U	0.769 U	--	0.02 U	0.769 U	--	0.02 U	0.87 U	--	0.02 U	0.8 U	--	0.02 U	1.05 U	--
Fluorene	mg/kg	23	79	0.032	1.23	--	0.02 U	0.769 U	--	0.02 U	0.87 U	--	0.02 U	0.8 U	--	0.02 U	1.05 U	--
Phenanthrene	mg/kg	100	480	0.17	6.54	--	0.078	3	--	0.093	4.04	--	0.29	11.6	--	0.02 U	1.05 U	--
Anthracene	mg/kg	220	1,200	0.078	3	--	0.042	1.62	--	0.032	1.39	--	0.13	5.2	--	0.02 U	1.05 U	--
2-Methylnaphthalene	mg/kg	38	64	0.027	1.04	--	0.02 U	0.769 U	--	0.02 U	0.87 U	--	0.02 U	0.8 U	--	0.02 U	1.05 U	--
Total LPAH	mg/kg	370	780	0.403	15.5	--	0.154	2.62	--	0.158	6.87	--	0.42	16.8	--	0.02 U	1.05 U	--
High Molecular Weight Polycyclic Aromatic Hydrocarbons (by USEPA 8270)																		
Fluoranthene	mg/kg	160	1,200	0.3	11.5	--	0.18	6.92	--	0.2	8.7	--	0.69	27.6	--	0.02 U	1.05 U	--
Pyrene	mg/kg	1,000	1,400	0.31	11.9	--	0.15	5.77	--	0.15	6.52	--	0.51	20.4	--	0.02 U	1.05 U	--
Benzo(a)anthracene	mg/kg	110	270	0.13	5	--	0.1	3.85	--	0.072	3.13	--	0.33	13.2	--	0.02 U	1.05 U	--
Chrysene	mg/kg	110	460	0.23	8.85	--	0.16	6.15	--	0.14	6.09	--	0.39	15.6	--	0.02 U	1.05 U	--
Benzo(b)fluoranthene	mg/kg	230	450	0.12	4.62	--	0.065	2.5	--	0.073	3.17	--	0.2	8	--	0.02 U	1.05 U	--
Benzo(k)fluoranthene	mg/kg	230	450	0.2	7.69	--	0.13	5	--	0.08	3.48	--	0.21	8.4	--	0.02 U	1.05 U	--
Benzofluoranthenes (total)	mg/kg	230	450	0.32	12.3	--	0.195	7.5	--	0.153	6.65	--	0.41	16.4	--	0.02 U	1.05 U	--
Benzo(a)pyrene	mg/kg	99	210	0.15	5.77	--	0.088	3.38	--	0.072	3.13	--	0.2	8	--	0.02 U	1.05 U	--
Indeno(1,2,3-cd)pyrene	mg/kg	34	88	0.097	3.73	--	0.044	1.69	--	0.048	2.09	--	0.086	3.44	--	0.02 U	1.05 U	--
Dibenzo(a,h)anthracene	mg/kg	12	33	0.021	0.808	--	0.02 U	0.769 U	--	0.02 U	0.87 U	--	0.035	1.4	--	0.02 U	1.05 U	--
Benzo(g,h,i)perylene	mg/kg	31	78	0.074	2.85	--	0.035	1.35	--	0.034	1.48	--	0.062	2.48	--	0.02 U	1.05 U	--
Total HPAH	mg/kg	960	5,300	1.632	62.8	--	0.952	36.6	--	0.869	37.8	--	2.713	109	--	0.02 U	1.05 U	--
Phthalate Esters (by USEPA 8270)																		
Dimethyl phthalate	mg/kg	53	53	0.02 U	0.769 U	--	0.02 U	0.769 U	--	0.02 U	0.87 U	--	0.02 U	0.8 U	--	0.02 U	1.05 U	--
Diethylphthalate	mg/kg	61	110	0.02 U	0.769 U	--	0.065	2.5	--	0.02 U	0.87 U	--	0.02 U	0.8 U	--	0.02 U	1.05 U	--
Di-n-butyl phthalate	mg/kg	220	1,700	0.02 U	0.769 U	--	0.02 U	0.769 U	--	0.02 U	0.87 U	--	0.02 U	0.8 U	--	0.02 U	1.05 U	--
Butyl benzyl phthalate	mg/kg	4.9	64	0.02 U	0.769 U	--	0.02 U	0.769 U	--	0.02 U	0.87 U	--	0.02 U	0.8 U	--	0.02 U	1.05 U	--
bis(2-ethylhexyl)phthalate	mg/kg	47	78	0.13 JB	5 JB	--	0.14 JB	5.38 JB	--	0.049 JB	2.13 JB	--	0.024 JB	0.96 JB	--	0.02 U	1.05 U	--
Di-n-octyl phthalate	mg/kg	58	4,500	0.02 U	0.769 U	--	0.02 U	0.769 U	--	0.02 U	0.87 U	--	0.02 U	0.8 U	--	0.02 U	1.05 U	--
Miscellaneous Nonionizable Organic Carbons (by USEPA 8270)																		
Dibenzofuran	mg/kg	15	58	0.037	1.42	--	0.02 U	0.769 U	--	0.02 U	0.87 U	--	0.02 U	0.8 U	--	0.02 U	1.05 U	--
Polychlorinated Biphenols (by USEPA 8081/8082)																		
PCB Aroclor 1242	mg/kg	12	65	0.02 U	0.769 U	--	0.019 U	0.731 U	--	0.019 U	0.826 U	--	0.02 U	0.8 U	--	0.02 U	1.05 U	--
PCB Aroclor 1248	mg/kg	12	65	0.02 U	0.769 U	--	0.019 U	0.731 U	--	0.019 U	0.826 U	--	0.02 U	0.8 U	--	0.02 U	1.05 U	--
PCB Aroclor 1254	mg/kg	12	65	0.02 U	0.769 U	--	0.019 U	0.731 U	--	0.019 U	0.826 U	--	0.02 U	0.8 U	--	0.02 U	1.05 U	--
PCB Aroclor 1260	mg/kg	12	65	0.02 U	0.769 U	--	0.019 U	0.731 U	--	0.019 U	0.826 U	--	0.02 U	0.8 U	--	0.02 U	1.05 U	--
PCB Aroclor 1268	mg/kg	12	65	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCBs (Total, Aroclors)	mg/kg	12	65	0.039 U	1.5 U	--	0.076 U	2.92 U	--	0.039 U	1.7 U	--	0.039 U	1.56 U	--	0.039 U	2.05 U	--

Table 6.2
Detected Analytes in Surface Sediments—Historical Analytical Results

				RETEC 2003 RI/FS Supplemental Sampling														
			Location	HB-1			HB-2			HB-3			HB-4			REF-1	REF-1	REF-1
			Sample ID	HB-1			HB-2			HB-3			HB-4			REF-1	REF-1	REF-1
			Date	07/24/2003	07/24/2003	11/06/2003	07/24/2003	07/24/2003	11/06/2003	07/24/2003	07/24/2003	11/06/2003	07/24/2003	07/24/2003	11/06/2003	07/24/2003	07/24/2003	11/06/2003
			Depth	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm
				DW	OCN	DW	DW	OCN	DW	DW	OCN	DW	DW	OCN	DW	DW	OCN	DW
		IS Criteria																
Parameter	Unit	SQS	CSL															
Ionizable Organic Compounds (by USEPA 8270)																		
Phenol	mg/kg	0.42	1.2	0.025	--	--	0.037	--	--	0.025	--	--	0.024	--	--	0.02 U	--	--
2,4-Dimethylphenol	mg/kg	0.029	0.029	0.02 U	--	--	0.02 U	--	--	0.02 U	--	--	0.02 U	--	--	0.02 U	--	--
Pentachlorophenol	mg/kg	0.36	0.69	0.13	--	--	0.098 U	--	--	0.099 U	--	--	0.099 U	--	--	0.099 U	--	--
Benzyl alcohol	mg/kg	0.057	0.073	0.02 U	--	--	0.02 U	--	--	0.02 U	--	--	0.02 U	--	--	0.02 U	--	--
Pesticide/Herbicides by (USEPA 8081)																		
p,p'-DDD	mg/kg	NA	NA	0.002 U	--	--	0.0019 U	--	--	0.0019 U	--	--	0.002 U	--	--	0.002 U	--	--
Other Semivolatile Organic Compounds (by USEPA 8270)																		
4-Methylphenol	mg/kg	670	670	0.13	--	--	0.095	--	--	0.17	--	--	0.12	--	--	0.02 U	--	--
Other Volatile Organic Compounds (by USEPA 8260)																		
Xylene (meta & para)	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	0.0023 U	--	--
Xylene (ortho)	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	0.0023 U	--	--
Grain Size																		
Clay	%	NA	NA	27.3	--	--	30.1	--	--	34.2	--	--	34.5	--	--	19.1	--	--
Silt	%	NA	NA	41.5	--	--	50.6	--	--	46	--	--	50.1	--	--	73.1	--	--
Sand	%	NA	NA	31	--	--	19	--	--	19	--	--	15	--	--	7.7	--	--
Gravel	%	NA	NA	0.7	--	--	0.9	--	--	1.4	--	--	0.2	--	--	--	--	--

Notes:

-- Not analyzed.
Bold Exceeds SQS.
1 Measurment basis is in wet weight.

Abbreviations:

Cl	Chlorine.
cm	Centimeter.
CSL	Cleanup Screening Level.
DDD	Dichlorodiphenyldichloroethane.
DW	Dry weight.
HPAH	High molecular weight polycyclic aromatic hydrocarbon.
LPAH	Low molecular weight polycyclic aromatic hydrocarbon.
mg/kg	Milligrams per kilogram.
NA	Not applicable.
OCN	Organic carbon normalized.
PCB	Polychlorinated biphenyl.
RI/FS	Remedial Investigation/Feasibility Study.
SMS	Sediment Management Standards.
SQS	Sediment Quality Standards.
USEPA	U.S. Environmental Protection Agency.

Qualifiers:

J	Estimated value.
JB	Estimated due to blank contamination.
U	Not detected.
UJ	Not detected and the reporting limit is an estimate.

Table 6.2
Detected Analytes in Surface Sediments—Historical Analytical Results

				2000 Olavine Sediment Sampling															
			Location	**HG-13**	**HG-30**						**HG-31**		**HG-32**		**HG-33**				**HG-34**
			Sample ID	**HG-13**	**HG-30**	**HG-30**	**HG-30 DIL**	**HG-30 DIL**	**HG-100**	**HG-100 DIL**	**HG-31**	**HG-31**	**HG-32**	**HG-32**	**HG-33**	**HG-33**	**HG-33 DIL**	**HG-33 DIL**	**HG-34**
			Date	**08/22/2000**	**08/22/2000**	**08/22/2000**	**08/22/2000**	**08/22/2000**	**08/22/2000**	**08/22/2000**	**08/22/2000**	**08/22/2000**	**08/31/2000**	**08/31/2000**	**08/31/2000**	**08/31/2000**	**08/31/2000**	**08/31/2000**	**08/23/2000**
			Depth	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**
				DW	**DW**	**OCN**	**DW**	**OCN**	**DW**	**DW**	**DW**	**OCN**	**DW**	**OCN**	**DW**	**OCN**	**DW**	**OCN**	**DW**
		SMS Criteria																	
Parameter	**Unit**	**SQS**	**CSL**																
Conventionals																			
Total Organic Carbon	%	NA	NA	--	3.6	--	--	--	5.8	--	2.5	--	1.1	--	1.2	--	--	--	2.3
Total Solids	%	NA	NA	--	58	--	--	--	57	--	84	--	52	--	68	--	--	--	38
Total Solids (preserved)	%	NA	NA	--	55	--	--	--	57	--	80	--	56	--	69	--	--	--	41
Total Volatile Solids	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Ammonia	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Ammonia (total as nitrogen)	mg/kg	NA	NA	--	17	--	--	--	20	--	2.7	--	18	--	14	--	--	--	14
Sulfide	mg/kg	NA	NA	--	1,100	--	--	--	2,500	--	250	--	640	--	600	--	--	--	1,900
Metals																			
Antimony	mg/kg	NA	NA	--	9 U	--	--	--	11	--	8	--	20 U	--	20 U	--	--	--	10 U
Arsenic	mg/kg	57	93	--	13	--	--	--	10	--	13	--	20 U	--	30	--	--	--	10 U
Cadmium	mg/kg	5.1	6.7	--	0.9	--	--	--	0.9	--	0.3	--	0.7 U	--	1	--	--	--	0.7
Chromium	mg/kg	260	270	--	32.4	--	--	--	36.2	--	30.6	--	10	--	32	--	--	--	70
Copper	mg/kg	390	390	--	149	--	--	--	**428**	--	107	--	115	--	**608**	--	--	--	76.3
Lead	mg/kg	450	530	--	143	--	--	--	151	--	65	--	27	--	129	--	--	--	22
Mercury	mg/kg	0.41	0.59	0.3	0.36	--	--	--	0.16	--	0.06 U	--	0.07 U	--	0.14	--	--	--	0.4
Nickel	mg/kg	NA	NA	--	33	--	--	--	45	--	38	--	9	--	28	--	--	--	90
Silver	mg/kg	6.1	6.1	--	0.5 U	--	--	--	0.5 U	--	0.4 U	--	1 U	--	1 U	--	--	--	0.8 U
Zinc	mg/kg	410	410	--	194	--	--	--	166	--	191	--	138	--	**536**	--	--	--	141
Organometallics[1]																			
Dibutyltin as Cl	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tributyltin as Cl	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Monobutyltin Trichloride	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (by USEPA 8270)																			
Naphthalene	mg/kg	99	170	--	0.13	3.61	0.19 U	5.28 U	0.13	0.12	0.02 U	0.8 U	0.022	2	0.056	4.67	0.059 U	4.92 U	0.13
Acenaphthylene	mg/kg	66	66	--	0.31	8.61	0.21	5.83	0.13	0.11	0.02 U	0.8 U	0.049	4.45	0.085	7.08	0.074	6.17	0.03
Acenaphthene	mg/kg	16	57	--	0.12	3.33	0.19 U	5.28 U	0.078	0.068	0.02 U	0.8 U	0.038	3.45	0.092	7.67	0.084	7	0.042
Fluorene	mg/kg	23	79	--	0.21	5.83	0.19 U	5.28 U		0.12	0.02 U	0.8 U	0.042	3.81	0.12	10	0.096	8	0.046
Phenanthrene	mg/kg	100	480	--	1.5	41.7	1.2	33.3	0.85	0.82	0.069	2.76	0.3	27.3	0.97	80.8	1	83.3	0.28
Anthracene	mg/kg	220	1,200	--	0.75	20.8	0.55	15.3	0.3	0.26	0.024	0.96	0.2	18.2	0.42	35	0.32	26.7	0.1
2-Methylnaphthalene	mg/kg	38	64	--	0.066	1.83	0.19 U	5.28 U	0.062	0.056 J	0.02 U	0.8 U	0.02 U	1.82 U	0.036	3	0.059 U	4.92 U	0.039
Total LPAH	mg/kg	370	780	--	3.02	83.9	1.96	54.4	1.608	1.498	0.093	3.72	0.651	59.2	1.743	145	1.574	131	0.628
High Molecular Weight Polycyclic Aromatic Hydrocarbons (by USEPA 8270)																			
Fluoranthene	mg/kg	160	1,200	--	4.3 J	119 J	5.9	**164**	1.6 J	1.6	0.15	6	0.58	52.7	1.6 J	133 J	2	**167**	0.52
Pyrene	mg/kg	1,000	1,400	--	3.2 J	88.9 J	6.4	178	2 J	1.9	0.18	7.2	0.52	47.2	1.5	125	2.4	200	0.46
Benzo(a)anthracene	mg/kg	110	270	--	1.9 J	52.8 J	2	55.6	0.81	0.68	0.066	2.64	0.43	39.1	--	100	1.2	100	0.19
Chrysene	mg/kg	110	460	--	2.1 J	58.3	2.1	58.3 J	--	0.97	0.11	4.4	0.63	57.3	1.5	**125**	1.7	**142**	0.24
Benzo(b)fluoranthene	mg/kg	230	450	--	2.9 J	80.6 J	1.6	44.4	1	0.76	0.068	2.72	0.37	33.6	--	91.7	1.1	91.7	0.22
Benzo(k)fluoranthene	mg/kg	230	450	--	1.5	41.7	2	55.6	1	0.82	0.096	3.84	0.41	37.3	1	83.3	0.74	61.7	0.21
Benzofluoranthenes (total)	mg/kg	230	450	--	4.4 J	122 J	3.6	100	2	1.58	0.164	6.56	0.78	70.9	2.1	175	1.84	153	0.43
Benzo(a)pyrene	mg/kg	99	210	--	2.2 J	61.1 J	1.8	50	0.88	0.79	0.066	2.64	0.28	25.5	0.87	72.5	0.9	75	0.16
Indeno(1,2,3-cd)pyrene	mg/kg	34	88	--	0.74	20.6	0.53	14.7	0.29	0.26	0.027	1.08	0.12	10.9	0.36	30	0.41	**34.2**	0.065
Dibenzo(a,h)anthracene	mg/kg	12	33	--	0.21	5.83	0.19 U	5.28 U	0.058	0.056 J	0.02 U	0.8 U	0.023	2.09	0.071	5.92	0.12 UJ	10 UJ	0.02 U
Benzo(g,h,i)perylene	mg/kg	31	78	--	0.63	17.5	0.44	12.2	0.27	0.24	0.022	0.88	0.078	7.09	0.23	19.2	0.4	**33.3**	0.059
Total HPAH	mg/kg	960	5,300	--	19.68 J	547 J	22.77	633	8.878 J	8.076 J	0.785	31.4	3.441	313	9.431 J	786 J	10.85	904	2.124
Phthalate Esters (by USEPA 8270)																			
Dimethyl phthalate	mg/kg	53	53	--	0.026	0.722	0.19 U	5.28 U	0.02 U	0.059 U	0.02 U	0.8 U	0.026	2.36	0.026	2.17	0.059 U	4.92 U	0.02 U
Diethylphthalate	mg/kg	61	110	--	0.019 U	0.528 U	0.19 U	5.28 U	0.02 U	0.059 U	0.02 U	0.8 U	0.02 U	1.82 U	0.02 U	1.67 U	0.059 U	4.92 U	0.02 U
Di-n-butyl phthalate	mg/kg	220	1,700	--	0.019 U	0.528 U	0.19 U	5.28 U	0.034	0.059 U	0.02 U	0.8 U	0.02 U	1.82 U	0.027	2.25	0.059 U	4.92 U	0.02 U
Butyl benzyl phthalate	mg/kg	4.9	64	--	0.019 U	0.528 U	0.19 U	5.28 U	0.02 U	0.059 U	0.02 U	0.8 U	0.036	3.27	0.049	4.08	0.059 U	4.92 U	0.02 U
bis(2-ethylhexyl)phthalate	mg/kg	47	78	--	1.6 J	44.4 J	2.4	**66.7**	0.33	0.26	0.05	2	0.26 JB	23.6 JB	0.53 JB	44.2 JB	0.61 JB	**50.8 JB**	0.19
Di-n-octyl phthalate	mg/kg	58	4,500	--	0.019 U	0.528 U	0.19 U	5.28 U	0.02 U	0.059 U	0.02 U	0.8 U	0.02 U	1.82 U	0.02 U	1.67 U	0.059 U	4.92 U	0.02 U
Miscellaneous Nonionizable Organic Carbons (by USEPA 8270)																			
Dibenzofuran	mg/kg	15	58	--	0.09	2.5	0.19 U	5.28 U	0.067	0.061	0.02 U	0.8 U	0.029	2.64	0.069	5.75	0.059 U	4.92 U	0.054
Polychlorinated Biphenols (by USEPA 8081/8082)																			
PCB Aroclor 1242	mg/kg	12	65	--	0.018 U	0.5 U	--	--	0.018 U	--	0.02 U	0.8 U	0.019 U	1.73 U	0.02 U	1.67 U	--	--	0.02 U
PCB Aroclor 1248	mg/kg	12	65	--	0.092 UJ	2.56 UJ	--	--	0.12 UJ	--	0.02 U	0.8 U	0.019 U	1.73 U	0.02 U	1.67 U	--	--	0.029 UJ
PCB Aroclor 1254	mg/kg	12	65	--	0.27 UJ	7.5 UJ	--	--	0.28	--	0.027 UJ	1.08 UJ	0.038	3.45	0.22	18.3	--	--	0.043
PCB Aroclor 1260	mg/kg	12	65	--	0.52	14.4	--	--	0.4	--	0.02 U	0.8 U	0.021 UJ	1.91 UJ	0.065 UJ	5.42 UJ	--	--	0.029
PCB Aroclor 1268	mg/kg	12	65	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCBs (Total, Aroclors)	mg/kg	12	65	--	0.52	**14.4**	--	--	0.68	--	0.039 U	1.56 U	0.038	3.45	0.22	**18.3**	--	--	0.072

Table 6.2
Detected Analytes in Surface Sediments—Historical Analytical Results

				2000 Olavine Sediment Sampling															
			Location	HG-13	HG-30						HG-31		HG-32		HG-33				HG-34
			Sample ID	HG-13	HG-30	HG-30	HG-30 DIL	HG-30 DIL	HG-100	HG-100 DIL	HG-31	HG-31	HG-32	HG-32	HG-33	HG-33	HG-33 DIL	HG-33 DIL	HG-34
			Date	08/22/2000	08/22/2000	08/22/2000	08/22/2000	08/22/2000	08/22/2000	08/22/2000	08/22/2000	08/22/2000	08/31/2000	08/31/2000	08/31/2000	08/31/2000	08/31/2000	08/31/2000	08/23/2000
			Depth	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm	0–12 cm
				DW	DW	OCN	DW	OCN	DW	DW	DW	OCN	DW	OCN	DW	OCN	DW	OCN	DW
		SMS Criteria																	
Parameter	Unit	SQS	CSL																
Ionizable Organic Compounds (by USEPA 8270)																			
Phenol	mg/kg	0.42	1.2	--	0.019 U	--	0.19 U	--	0.02 U	0.059 U	0.02 U	--	0.11	--	0.02 U		0.059 U		0.02 U
2,4-Dimethylphenol	mg/kg	0.029	0.029	--	**0.031**	--	0.19 U	--	0.022	0.059 U	0.02 U	--	0.02 U	--	0.02 U		0.059 U		0.02 U
Pentachlorophenol	mg/kg	0.36	0.69	--	0.095 U	--	0.95 U	--	0.098 U	0.29 U	0.098 U	--	0.2	--	0.21		0.29 U		0.099 U
Benzyl alcohol	mg/kg	0.057	0.073	--	0.019 U	--	0.19 U	--	0.02 U	0.059 U	0.02 U	--	**0.31**	--	0.02 U		0.059 U		0.02 U
Pesticide/Herbicides by (USEPA 8081)																			
p,p'-DDD	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Other Semivolatile Organic Compounds (by USEPA 8270)																			
4-Methylphenol	mg/kg	670	670	--	0.12	--	0.19 U	--	0.1	0.075	0.02 U	--	0.021	--	0.071	--	0.059 U	--	0.26
Other Volatile Organic Compounds (by USEPA 8260)																			
Xylene (meta & para)	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Xylene (ortho)	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Grain Size																			
Clay	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silt	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sand	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gravel	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

-- Not analyzed.
Bold Exceeds SQS.
1 Measurment basis is in wet weight.

Abbreviations:

Cl Chlorine.
cm Centimeter.
CSL Cleanup Screening Level.
DDD Dichlorodiphenyldichloroethane.
DW Dry weight.
HPAH High molecular weight polycyclic aromatic hydrocarbon.
LPAH Low molecular weight polycyclic aromatic hydrocarbon.
mg/kg Milligrams per kilogram.
NA Not applicable.
OCN Organic carbon normalized.
PCB Polychlorinated biphenyl.
RI/FS Remedial Investigation/Feasibility Study.

SQS Sediment Quality Standards.
USEPA U.S. Environmental Protection Agency.

Qualifiers:

J Estimated value.
JB Estimated due to blank contamination.
U Not detected.
UJ Not detected and the reporting limit is an estimate.

Table 6.2
Detected Analytes in Surface Sediments—Historical Analytical Results

				2000 Olavine Sediment Sampling															
			Location	**HG-34**	**HG-35**		**HG-36**		**HG-37**		**HG-38**		**HG-39**						**HG-40**
			Sample ID	**HG-34**	**HG-35**		**HG-36**		**HG-37**		**HG-38**		**HG-39**	**HG-39**	**HG-200**	**HG-200**	**HG-200 DIL**	**HG-200 DIL**	**HG-40**
			Date	**08/23/2000**	**08/22/2000**	**08/22/2000**	**08/31/2000**	**08/31/2000**	**08/31/2000**	**08/31/2000**	**08/22/2000**	**08/22/2000**	**08/22/2000**	**08/22/2000**	**08/22/2000**	**08/22/2000**	**08/22/2000**	**08/22/2000**	**08/31/2000**
			Depth	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**
				OCN	**DW**	**OCN**	**DW**	**OCN**	**DW**	**OCN**	**DW**	**OCN**	**DW**	**OCN**	**DW**	**OCN**	**DW**	**OCN**	**DW**
		SMS Criteria																	
Parameter	**Unit**	**SQS**	**CSL**																
Conventionals																			
Total Organic Carbon	%	NA	NA	--	2.2	--	2	--	1.1	--	3	--	0.9	--	1.4	--	--	--	0.29
Total Solids	%	NA	NA	--	38	--	53	--	84	--	54	--	78	--	76	--	--	--	91
Total Solids (preserved)	%	NA	NA	--	40	--	46	--	52	--	55	--	78	--	76	--	--	--	87
Total Volatile Solids	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ammonia	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ammonia (total as nitrogen)	mg/kg	NA	NA	--	16	--	16	--	12	--	18	--	11	--	8.9	--	--	--	7.3
Sulfide	mg/kg	NA	NA	--	1,600	--	1,700	--	1,600	--	2,100	--	910	--	950	--	--	--	42
Metals																			
Antimony	mg/kg	NA	NA	--	10 U	--	20 U	--	10 U	--	10	--	7 U	--	7 U	--	--	--	10 U
Arsenic	mg/kg	57	93	--	10 U	--	20 U	--	10 U	--	30	--	7 U	--	7	--	--	--	20
Cadmium	mg/kg	5.1	6.7	--	0.9	--	1.9	--	0.5	--	0.9	--	0.5	--	0.4	--	--	--	0.5 U
Chromium	mg/kg	260	270	--	71	--	23	--	15.8	--	44	--	27.3	--	31.3	--	--	--	22
Copper	mg/kg	390	390	--	84.3	--	69.7	--	74	--	**959**	--	99.9	--	**657**	--	--	--	96.3
Lead	mg/kg	450	530	--	19	--	10	--	10	--	49	--	18	--	33	--	--	--	30
Mercury	mg/kg	0.41	0.59	--	0.24	--	0.11	--	0.1	--	0.16	--	0.13	--	0.06	--	--	--	0.05 U
Nickel	mg/kg	NA	NA	--	91	--	27	--	19	--	43	--	25	--	23	--	--	--	19
Silver	mg/kg	6.1	6.1	--	0.8 U	--	1 U	--	0.6 U	--	0.6 U	--	0.4 U	--	0.4 U	--	--	--	0.8 U
Zinc	mg/kg	410	410	--	126	--	127	--	90	--	**901**	--	184	--	372	--	--	--	233
Organometallics[1]																			
Dibutyltin as Cl	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tributyltin as Cl	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Monobutyltin Trichloride	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (by USEPA 8270)																			
Naphthalene	mg/kg	99	170	5.65	0.098	4.45	0.06	3	0.059	5.36	0.039	1.3	0.04	4.44	0.028	2	0.045 U	3.21 U	0.019 U
Acenaphthylene	mg/kg	66	66	1.3	0.02 U	0.909 U	0.042	2.1	0.022	2	0.022	0.733	0.025	2.78	0.015 J	1.07 J	0.045 U	3.21 U	0.019 U
Acenaphthene	mg/kg	16	57	1.83	0.019 J	0.863 J	0.038	1.9	0.037	3.36	0.058	1.93	0.07	7.78	0.051	3.64	0.045 U	3.21 U	0.019 U
Fluorene	mg/kg	23	79	2	0.053	0.241	0.05	2.5	0.055	5	0.049	1.63	0.42	**46.7**	0.072	5.14	0.058	4.14	0.019 U
Phenanthrene	mg/kg	100	480	12.2	0.22	10	0.35	17.5	0.47	42.7	0.34	11.3	1.3	**144**	0.62	44.3	0.58	41.4	0.019 U
Anthracene	mg/kg	220	1,200	4.35	0.2	9.09	0.3	15	0.14	12.7	0.1	3.33	0.97	108	0.33	23.6	0.29	20.7	0.019 U
2-Methylnaphthalene	mg/kg	38	64	1.7	0.029	1.32	0.029	1.45	0.036	3.27	0.031	1.03	0.16	17.8	0.018	1.29	0.045 U	3.21 U	0.019 U
Total LPAH	mg/kg	370	780	27.3	0.59 J	26.8 J	0.84	42	0.783	71.2	0.608	20.3	2.825	314	1.116 J	79.7 J	0.928	66.3	0.019 U
High Molecular Weight Polycyclic Aromatic Hydrocarbons (by USEPA 8270)																			
Fluoranthene	mg/kg	160	1,200	22.6	0.3	13.6	0.87	43.5	0.58	52.7	0.55	18.3	0.98	109	1.2	85.7	1.2	85.7	0.019 U
Pyrene	mg/kg	1,000	1,400	20	0.24	10.9	0.72	36	0.54	49.1	0.53	17.7	1	111	1.2 J	85.7 J	0.89	63.6	0.019 U
Benzo(a)anthracene	mg/kg	110	270	8.26	0.12	5.45	0.63	31.5	0.22	20	0.26	8.67	0.32	35.6	0.56	40	0.48	34.3	0.019 U
Chrysene	mg/kg	110	460	10.4	0.18	8.18	1.1	55	0.36	32.7	0.34	11.3	0.52	57.8	0.57	40.7	0.62	44.3	0.019 U
Benzo(b)fluoranthene	mg/kg	230	450	9.56	0.11	5	0.48	24	0.24	21.8	0.29	9.67	0.24	26.7	0.57	40.7	0.41	29.3	0.019 U
Benzo(k)fluoranthene	mg/kg	230	450	9.13	0.13	5.91	0.45	22.5	0.3	27.3	0.25	8.33	0.23	25.6	0.44	31.4	0.42	30	0.019 U
Benzofluoranthenes (total)	mg/kg	230	450	18.7	0.24	10.9	0.93	46.5	0.54	49	0.54	18	0.47	52.2	1.01	72.1	0.83	59.3	0.019 U
Benzo(a)pyrene	mg/kg	99	210	6.96	0.088	4	0.34	17	0.26	23.6	0.22	7.33	0.16	17.8	0.4	28.6	0.36	25.7	0.019 U
Indeno(1,2,3-cd)pyrene	mg/kg	34	88	2.83	0.034	1.55	0.11	5.5	0.094	8.55	0.092	3.07	0.048	5.33	0.12	8.57	0.12	8.57	0.019 U
Dibenzo(a,h)anthracene	mg/kg	12	33	0.87 U	0.02 U	0.909 U	0.024	1.2	0.02	1.82	0.019 J	0.633 J	0.019 U	2.11 U	0.029	2.07	0.045 U	3.21 U	0.019 U
Benzo(g,h,i)perylene	mg/kg	31	78	2.57	0.03	1.36	0.072	3.6	0.06	5.45	0.076	2.53	0.039	4.33	--	6.43	0.09	6.43	0.019 U
Total HPAH	mg/kg	960	5,300	92.3	1.232	56	4.796	240	2.674	243	2.627 J	87.6 J	3.537	393	5.179 J	370 J	4.59	328	0.019 U
Phthalate Esters (by USEPA 8270)																			
Dimethyl phthalate	mg/kg	53	53	0.87 U	0.02 U	0.909 U	0.019 U	0.95 U	0.068	6.18	0.02 U	0.667 U	0.019 U	2.11 U	0.015 U	1.07 U	0.045 U	3.21 U	0.019 U
Diethylphthalate	mg/kg	61	110	0.87 U	0.02 U	0.909 U	0.019 U	0.95 U	0.019 U	1.73 U	0.02 U	0.667 U	0.019 U	2.11 U	0.015 U	1.07 U	0.045 U	3.21 U	0.019 U
Di-n-butyl phthalate	mg/kg	220	1,700	0.87 U	0.02 U	0.909 U	0.019 U	0.95 U	0.019 U	1.73 U	0.021	0.7	0.019 U	2.11 U	0.015 U	1.07 U	0.045 U	3.21 U	0.019 U
Butyl benzyl phthalate	mg/kg	4.9	64	0.87 U	0.02 U	0.909 U	0.019 U	0.95 U	0.019 U	1.73 U	0.23	**7.67**	0.019 U	2.11 U	0.015 U	1.07 U	0.045 U	3.21 U	0.019 U
bis(2-ethylhexyl)phthalate	mg/kg	47	78	8.26	0.2	9.09	0.43 JB	21.5 JB	0.45 JB	40.9 JB	0.54	18	0.071	7.89	0.072	5.14	0.057	4.07	0.089 JB
Di-n-octyl phthalate	mg/kg	58	4,500	0.87 U	0.02 U	0.909 U	0.019 U	0.95 U	0.019 U	1.73 U	0.02 U	0.667 U	0.019 U	2.11 U	0.015 U	1.07 U	0.045 U	3.21 U	0.019 U
Miscellaneous Nonionizable Organic Carbons (by USEPA 8270)																			
Dibenzofuran	mg/kg	15	58	2.35	0.043	1.95	0.039	1.95	0.032	2.91	0.035	1.17	0.14	**15.6**	0.042	3	0.045 U	3.21 U	0.019 U
Polychlorinated Biphenols (by USEPA 8081/8082)																			
PCB Aroclor 1242	mg/kg	12	65	0.87 U	0.02 U	0.909 U	0.019 U	0.95 U	0.019 U	1.73 U	0.02 U	0.667 U	0.018 U	2 U	0.018 U	1.29 U	--	--	0.019 U
PCB Aroclor 1248	mg/kg	12	65	1.26 UJ	0.034 UJ	1.55 UJ	0.019 U	0.95 U	0.019 U	1.73 U	0.02 U	0.667 U	0.018 U	2 U	0.018 U	1.29 U	--	--	0.019 U
PCB Aroclor 1254	mg/kg	12	65	1.87	0.025	1.14	0.022	1.1	0.019	1.73	0.02 U	0.667 U	0.021	2.33	0.018 U	1.29 U	--	--	0.0096 J
PCB Aroclor 1260	mg/kg	12	65	1.26	0.02 U	0.909 U	0.019 U	0.95 U	0.019 U	1.73 U	0.02 U	0.667 U	0.018 U	2 U	0.018 U	1.29 U	--	--	0.019 U
PCB Aroclor 1268	mg/kg	12	65	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCBs (Total, Aroclors)	mg/kg	12	65	3.13	0.025	1.14	0.022	1.1	0.019	1.73	0.039 U	1.3 U	0.021	2.33	0.037 U	2.64 U	--	--	0.0096 J

Table 6.2
Detected Analytes in Surface Sediments—Historical Analytical Results

				2000 Olavine Sediment Sampling															
			Location	**HG-34**	**HG-35**		**HG-36**		**HG-37**		**HG-38**		**HG-39**						**HG-40**
			Sample ID	**HG-34**	**HG-35**		**HG-36**		**HG-37**		**HG-38**		**HG-39**	**HG-39**	**HG-200**	**HG-200**	**HG-200 DIL**	**HG-200 DIL**	**HG-40**
			Date	**08/23/2000**	**08/22/2000**	**08/22/2000**	**08/31/2000**	**08/31/2000**	**08/31/2000**	**08/31/2000**	**08/22/2000**	**08/22/2000**	**08/22/2000**	**08/22/2000**	**08/22/2000**	**08/22/2000**	**08/22/2000**	**08/22/2000**	**08/31/2000**
			Depth	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**
				OCN	**DW**	**OCN**	**DW**	**OCN**	**DW**	**OCN**	**DW**	**OCN**	**DW**	**OCN**	**DW**	**OCN**	**DW**	**OCN**	**DW**
		SMS Criteria																	
Parameter	**Unit**	**SQS**	**CSL**																
Ionizable Organic Compounds (by USEPA 8270)																			
Phenol	mg/kg	0.42	1.2	--	0.02 U	--	0.019 U	--	0.027	--	0.02 U	--	0.019 U	--	0.015 U	--	0.045 U	--	0.019 U
2,4-Dimethylphenol	mg/kg	0.029	0.029	--	0.02 U	--	0.019 U	--	0.019 U	--	0.02 U	--	0.019 U	--	0.015 U	--	0.045 U	--	0.019 U
Pentachlorophenol	mg/kg	0.36	0.69	--	0.1 U	--	0.095 U	--	0.096 U	--	0.098 U	--	0.097 U	--	0.076 U	--	0.23 U	--	0.094 U
Benzyl alcohol	mg/kg	0.057	0.073	--	0.02 U	--	**0.17**	--	0.019 U	--	**0.076**	--	0.019 U	--	0.015 U	--	0.045 U	--	0.019 U
Pesticide/Herbicides by (USEPA 8081)																			
p,p'-DDD	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Other Semivolatile Organic Compounds (by USEPA 8270)																			
4-Methylphenol	mg/kg	670	670	--	0.25	--	0.12	--	0.087	--	0.1	--	0.034	--	0.03	--	0.045 U	--	0.019 U
Other Volatile Organic Compounds (by USEPA 8260)																			
Xylene (meta & para)	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Xylene (ortho)	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Grain Size																			
Clay	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silt	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sand	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gravel	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

--	Not analyzed.
Bold	Exceeds SQS.
1	Measurment basis is in wet weight.

Abbreviations:

Cl	Chlorine.
cm	Centimeter.
CSL	Cleanup Screening Level.
DDD	Dichlorodiphenyldichloroethane.
DW	Dry weight.
HPAH	High molecular weight polycyclic aromatic hydrocarbon.
LPAH	Low molecular weight polycyclic aromatic hydrocarbon.
mg/kg	Milligrams per kilogram.
NA	Not applicable.
OCN	Organic carbon normalized.
PCB	Polychlorinated biphenyl.
RI/FS	Remedial Investigation/Feasibility Study.
SMS	
SQS	Sediment Quality Standards.
USEPA	U.S. Environmental Protection Agency.

Qualifiers:

J	Estimated value.
JB	Estimated due to blank contamination.
U	Not detected.
UJ	Not detected and the reporting limit is an estimate.

Table 6.2
Detected Analytes in Surface Sediments—Historical Analytical Results

				2000 Olavine Sediment Sampling								RETEC Phase 2 1998 Shipyard Sampling							
			Location	**HG-41**		**HG-42**				**HG-44**		**HG-1**	**HG-2**		**HG-3**		**HG-4**		**HG-5**
			Sample ID	**HG-41**	**HG-41**	**HG-42**	**HG-42**	**HG-42 DIL**	**HG-42 DIL**	**HG-44**	**HG-44**	**HG-1A**	**HG-2A**	**HG-2A**	**HG-3A**	**HG-3A**	**HG-4A**	**HG-4A**	**HG-5A**
			Date	**08/22/2000**	**08/22/2000**	**08/23/2000**	**08/23/2000**	**08/23/2000**	**08/23/2000**	**11/09/2000**	**11/09/2000**	**03/23/1998**	**03/24/1998**	**03/24/1998**	**03/23/1998**	**03/23/1998**	**03/24/1998**	**03/24/1998**	**03/24/1998**
			Depth	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–10 cm**	**0–10 cm**	**0–10 cm**	**0–10 cm**	**0–10 cm**	**0–10 cm**	**0–10 cm**	**0–10 cm**
				DW	**OCN**	**DW**	**OCN**	**DW**	**OCN**	**DW**	**OCN**	**DW**	**DW**	**OCN**	**DW**	**OCN**	**DW**	**OCN**	**DW**
		SMS Criteria																	
Parameter	**Unit**	**SQS**	**CSL**																
Conventionals																			
Total Organic Carbon	%	NA	NA	2.4	--	2.4	--	--	--	1.5	--	1.4	2.9	--	3.2	--	3.2	--	2.2
Total Solids	%	NA	NA	47	--	62	--	--	--	62	--	71.5	62	--	48.4	--	51.2	--	41.5
Total Solids (preserved)	%	NA	NA	48	--	63	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Volatile Solids	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ammonia	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ammonia (total as nitrogen)	mg/kg	NA	NA	24	--	35	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfide	mg/kg	NA	NA	2,600	--	2,700	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals																			
Antimony	mg/kg	NA	NA	10 U	--	21	--	--	--	20 U	--	--	20 UJ	--	--	--	--	--	6 UJ
Arsenic	mg/kg	57	93	10	--	**158**	--	--	--	20 U	--	--	20 U	--	--	--	--	--	11
Cadmium	mg/kg	5.1	6.7	0.5	--	2.4	--	--	--	0.7 U	--	--	0.7 U	--	--	--	--	--	0.8
Chromium	mg/kg	260	270	46	--	42.7	--	--	--	28	--	--	42	--	--	--	--	--	77.7
Copper	mg/kg	390	390	238	--	**669**	--	--	--	372	--	--	207	--	--	--	--	--	68.8
Lead	mg/kg	450	530	58	--	168	--	--	--	15	--	--	**512**	--	--	--	--	--	25
Mercury	mg/kg	0.41	0.59	0.3	--	0.16	--	--	--	0.13	--	--	0.09 J	--	--	--	--	--	0.32 J
Nickel	mg/kg	NA	NA	49	--	40	--	--	--	32	--	--	40	--	--	--	--	--	91
Silver	mg/kg	6.1	6.1	0.7 U	--	0.5 U	--	--	--	1 U	--	--	1 U	--	--	--	--	--	0.5
Zinc	mg/kg	410	410	267	--	**1,620**	--	--	--	155	--	--	226	--	--	--	--	--	117
Organometallics[1]																			
Dibutyltin as Cl	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tributyltin as Cl	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Monobutyltin Trichloride	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (by USEPA 8270)																			
Naphthalene	mg/kg	99	170	0.044	1.83	0.064	2.67	0.062	2.58	0.052	3.47		0.023	0.79	--	--	--	--	0.11
Acenaphthylene	mg/kg	66	66	0.076	3.17	0.038	1.58	0.059 U	2.46 U	0.02 U	1.33 U		0.036	1.24	--	--	--	--	0.024
Acenaphthene	mg/kg	16	57	0.059	2.46	0.22	9.17	0.19	7.92	0.02 U	1.33 U		0.037	1.28	--	--	--	--	0.041
Fluorene	mg/kg	23	79	0.072	3	0.27	11.3	0.22	9.17	0.022	1.47		0.043	1.48	--	--	--	--	0.064
Phenanthrene	mg/kg	100	480	0.74	30.8	2.3 J	95.8 J	2.8	**117**	0.17	11.3		0.37	12.76	--	--	--	--	0.51
Anthracene	mg/kg	220	1,200	0.32	13.3	0.76	31.7	0.72	30	0.054	3.6		0.22	7.59	--	--	--	--	0.14
2-Methylnaphthalene	mg/kg	38	64	0.036	1.5	0.039	1.63	0.059 U	2.46 U	0.031	2.07		0.019 U	0.66 U	--	--	--	--	0.035
Total LPAH	mg/kg	370	780	1.311	54.6	3.652 J	152 J	3.992	166	0.298	19.9		0.73	25.14	--		--	--	0.89
High Molecular Weight Polycyclic Aromatic Hydrocarbons (by USEPA 8270)																			
Fluoranthene	mg/kg	160	1,200	1.3	54.2	3.1 J	129 J	3	125	0.34	22.7	--	1.3	44.83	--	--	--	--	0.85
Pyrene	mg/kg	1,000	1,400	1.5	62.5	2.1 J	87.5 J	2.5	104	0.39	26	--	2	68.97	--	--	--	--	0.91
Benzo(a)anthracene	mg/kg	110	270	0.61	25.4	1.1	45.8	1	41.7	0.12	8	--	0.71	24.48	--	--	--	--	0.3
Chrysene	mg/kg	110	460	1	41.7	1.1	45.8	1.2	50	0.17	11.3	--	0.95	32.76	--	--	--	--	0.4
Benzo(b)fluoranthene	mg/kg	230	450	0.92	38.3	1.3	54.2	0.91	37.9	0.12	8	--	0.59	20.34	--	--	--	--	0.27
Benzo(k)fluoranthene	mg/kg	230	450	0.67	27.9	0.89	37.1	0.78	32.5	0.094	6.27	--	0.54	18.62	--	--	--	--	0.22
Benzofluoranthenes (total)	mg/kg	230	450	1.59	66.3	2.19	91.3	1.69	70.4	0.214	14.3	--	--	--	--	--	--	--	--
Benzo(a)pyrene	mg/kg	99	210	0.61	25.4	0.79	32.9	0.74	30.8	0.1	6.67	--	0.52	17.93	--	--	--	--	0.24
Indeno(1,2,3-cd)pyrene	mg/kg	34	88	0.25	10.4	0.31	12.9	0.34	14.2	0.062	4.13	--	0.25	8.62	--	--	--	--	0.12
Dibenzo(a,h)anthracene	mg/kg	12	33	0.054	2.25	0.067	2.79	0.074	3.08	0.02 U	1.33 U	--	0.095	3.28	--	--	--	--	0.051
Benzo(g,h,i)perylene	mg/kg	31	78	0.21	8.75	0.25	10.4	0.3	12.5	0.061	4.07	--	0.23	7.93	--	--	--	--	0.12
Total HPAH	mg/kg	960	5,300	7.124	297	11.007 J	459 J	10.844	452	1.457	97.1	--	7.2	247.76	--	--	--	--	3.5
Phthalate Esters (by USEPA 8270)																			
Dimethyl phthalate	mg/kg	53	53	0.028	1.17	0.02 U	0.833 U	0.059 U	2.46 U	0.02 U	1.33 U	--	0.019 U	0.66 U	--		--	--	0.02 U
Diethylphthalate	mg/kg	61	110	0.02 U	0.833 U	0.02 U	0.833 U	0.059 U	2.46 U	0.02 U	1.33 U	--	0.019 U	0.66 U	--	--	--	--	0.02 U
Di-n-butyl phthalate	mg/kg	220	1,700	0.02 U	0.833 U	0.02 U	0.833 U	0.059 U	2.46 U	0.045 JB	3 JB	--	0.019 U	0.66 U	--	--	--	--	0.02 U
Butyl benzyl phthalate	mg/kg	4.9	64	0.033	1.38	0.02 U	0.833 U	0.059 U	2.46 U	0.02 U	1.33 U	--	0.019 U	0.66 U	--	--	--	--	0.02 U
bis(2-ethylhexyl)phthalate	mg/kg	47	78	0.33	13.8	0.14	5.83	0.15	6.25	0.25	16.7	--	0.14	4.83	--	--	--	--	0.15
Di-n-octyl phthalate	mg/kg	58	4,500	0.02 U	0.833 U	0.02 U	0.833 U	0.059 U	2.46 U	0.2	13.3	--	0.019 U	0.66 U	--	--	--	--	0.02 U
Miscellaneous Nonionizable Organic Carbons (by USEPA 8270)																			
Dibenzofuran	mg/kg	15	58	0.041	1.71	0.14	5.83	0.12	5	0.02 U	1.33 U	--	0.026	0.9	--	--	--	--	0.052
Polychlorinated Biphenols (by USEPA 8081/8082)																			
PCB Aroclor 1242	mg/kg	12	65	0.02 U	0.833 U	0.02 U	0.833 U	--	--	0.02 U	1.33 U	--	0.017 U	0.59 U	0.018 U	0.56 U	0.018 U	0.56 U	0.019 U
PCB Aroclor 1248	mg/kg	12	65	0.032 UJ	1.33 UJ	0.023 UJ	0.958 UJ	--	--	0.02 U	1.33 U	--	0.017 U	0.59 U	0.018 U	0.56 U	0.018 U	0.56 U	0.019 U
PCB Aroclor 1254	mg/kg	12	65	0.058	2.42	0.051	2.13	--	--	0.21	14	--	0.028 U	0.97 U	0.68	21.25	1.8	56.25	0.026 U
PCB Aroclor 1260	mg/kg	12	65	0.04	1.67	0.034	1.42	--	--	0.02 U	1.33 U	--	0.044	1.52	0.12	3.75	0.018 U	0.56 U	0.019 U
PCB Aroclor 1268	mg/kg	12	65	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCBs (Total, Aroclors)	mg/kg	12	65	0.098	4.09	0.085	3.55	--	--	0.21	**14**	--	0.044	1.52	0.8	**25**	1.8	**56.25**	0.038 U

Table 6.2
Detected Analytes in Surface Sediments—Historical Analytical Results

				2000 Olavine Sediment Sampling								RETEC Phase 2 1998 Shipyard Sampling							
			Location	**HG-41**		**HG-42**				**HG-44**		**HG-1**	**HG-2**		**HG-3**		**HG-4**		**HG-5**
			Sample ID	**HG-41**	**HG-41**	**HG-42**	**HG-42**	**HG-42 DIL**	**HG-42 DIL**	**HG-44**	**HG-44**	**HG-1A**	**HG-2A**	**HG-2A**	**HG-3A**	**HG-3A**	**HG-4A**	**HG-4A**	**HG-5A**
			Date	**08/22/2000**	**08/22/2000**	**08/23/2000**	**08/23/2000**	**08/23/2000**	**08/23/2000**	**11/09/2000**	**11/09/2000**	**03/23/1998**	**03/24/1998**	**03/24/1998**	**03/23/1998**	**03/23/1998**	**03/24/1998**	**03/24/1998**	**03/24/1998**
			Depth	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–12 cm**	**0–10 cm**	**0–10 cm**	**0–10 cm**	**0–10 cm**	**0–10 cm**	**0–10 cm**	**0–10 cm**	**0–10 cm**
				DW	**OCN**	**DW**	**OCN**	**DW**	**OCN**	**DW**	**OCN**	**DW**	**DW**	**OCN**	**DW**	**OCN**	**DW**	**OCN**	**DW**
		SMS Criteria																	
Parameter	**Unit**	**SQS**	**CSL**																
Ionizable Organic Compounds (by USEPA 8270)																			
Phenol	mg/kg	0.42	1.2	0.02 U	--	0.02 U	--	0.059 U	--	0.02 U	--	--	0.019 U	--	--	--	--	--	0.046
2,4-Dimethylphenol	mg/kg	0.029	0.029	0.02 U	--	0.02 U	--	0.059 U	--	0.02 U	--	--	0.019 U	--	--	--	--	--	0.02 U
Pentachlorophenol	mg/kg	0.36	0.69	0.12	--	0.098 U	--	0.29 U	--	0.099 U	--	--	0.094 U	--	--	--	--	--	0.098 U
Benzyl alcohol	mg/kg	0.057	0.073	0.02 U	--	0.05	--	0.059 U	--	**0.11**	--	--	0.019 U	--	--	--	--	--	0.02 U
Pesticide/Herbicides by (USEPA 8081)																			
p,p'-DDD	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Other Semivolatile Organic Compounds (by USEPA 8270)																			
4-Methylphenol	mg/kg	670	670	0.066	--	0.062	--	0.059 U	--	0.073	--	--	0.02	--	--	--	--	--	0.18
Other Volatile Organic Compounds (by USEPA 8260)																			
Xylene (meta & para)	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Xylene (ortho)	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Grain Size																			
Clay	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silt	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sand	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gravel	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

--	Not analyzed.
Bold	Exceeds SQS.
1	Measurment basis is in wet weight.

Abbreviations:

Cl	Chlorine.
cm	Centimeter.
CSL	Cleanup Screening Level.
DDD	Dichlorodiphenyldichloroethane.
DW	Dry weight.
HPAH	High molecular weight polycyclic aromatic hydrocarbon.
LPAH	Low molecular weight polycyclic aromatic hydrocarbon.
mg/kg	Milligrams per kilogram.
NA	Not applicable.
OCN	Organic carbon normalized.
PCB	Polychlorinated biphenyl.
RI/FS	Remedial Investigation/Feasibility Study.
SMS	
SQS	Sediment Quality Standards.
USEPA	U.S. Environmental Protection Agency.

Qualifiers:

J	Estimated value.
JB	Estimated due to blank contamination.
U	Not detected.
UJ	Not detected and the reporting limit is an estimate.

Table 6.2
Detected Analytes in Surface Sediments—Historical Analytical Results

				RETEC Phase 2 1998 Shipyard Sampling															
			Location	HG-5	HG-6	HG-7		HG-8		HG-9		HG-10		HG-11		HG-12		HG-13	
			Sample ID	HG-5A	HG-6A	HG-7A		HG-8A		HG-9A		HG-10A		HG-11A		HG-12A		HG-13A	
			Date	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998
			Depth	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm
				OCN	DW	DW	OCN	DW	OCN	DW	OCN	DW	OCN	DW	OCN	DW	OCN	DW	OCN
		SMS Criteria																	
Parameter	**Unit**	**SQS**	**CSL**																
Conventionals																			
Total Organic Carbon	%	NA	NA	--	2.1	1.7	--	2.8	--	2.2	--	2.4	--	1.8	--	2	--	2	--
Total Solids	%	NA	NA	--	40.5	43.1	--	57.2	--	38.5	--	50.8	--	40.4	--	41.2	--	36	--
Total Solids (preserved)	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Volatile Solids	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ammonia	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ammonia (total as nitrogen)	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfide	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals																			
Antimony	mg/kg	NA	NA	--	--	--	--	--	--	--	--	9 UJ	--	--	--	6 UJ	--	7 UJ	--
Arsenic	mg/kg	57	93	--	--	--	--	--	--	--	--	23	--	--	--	15	--	16	--
Cadmium	mg/kg	5.1	6.7	--	--	--	--	--	--	--	--	0.8	--	--	--	3.6	--	1.2	--
Chromium	mg/kg	260	270	--	--	--	--	--	--	--	--	46.4	--	--	--	70.7	--	81.2	--
Copper	mg/kg	390	390	--	--	--	--	--	--	--	--	***397***	--	--	--	311	--	152	--
Lead	mg/kg	450	530	--	--	--	--	--	--	--	--	29	--	--	--	26	--	28	--
Mercury	mg/kg	0.41	0.59	--	--	--	--	--	--	--	--	0.14 J	--	--	--	0.2 J	--	0.41 J	--
Nickel	mg/kg	NA	NA	--	--	--	--	--	--	--	--	47	--	--	--	80	--	94	--
Silver	mg/kg	6.1	6.1	--	--	--	--	--	--	--	--	0.6 U	--	--	--	0.3 U	--	0.5	--
Zinc	mg/kg	410	410	--	--	--	--	--	--	--	--	290	--	--	--	250	--	199	--
Organometallics^1																			
Dibutyltin as Cl	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tributyltin as Cl	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Monobutyltin Trichloride	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (by USEPA 8270)																			
Naphthalene	mg/kg	99	170	5	--	--	--	--	--	--	--	0.061	2.54	--	--	--	--	--	--
Acenaphthylene	mg/kg	66	66	1.09	--	--	--	--	--	--	--	0.02 U	0.83 U	--	--	--	--	--	--
Acenaphthene	mg/kg	16	57	1.86	--	--	--	--	--	--	--	0.16	6.67	--	--	--	--	--	--
Fluorene	mg/kg	23	79	2.91	--	--	--	--	--	--	--	0.11	4.58	--	--	--	--	--	--
Phenanthrene	mg/kg	100	480	23.18	--	--	--	--	--	--	--	0.43	17.92	--	--	--	--	--	--
Anthracene	mg/kg	220	1,200	6.36	--	--	--	--	--	--	--	0.1	4.17	--	--	--	--	--	--
2-Methylnaphthalene	mg/kg	38	64	1.59	--	--	--	--	--	--	--	0.066	2.75	--	--	--	--	--	--
Total LPAH	mg/kg	370	780	40.41	--	--	--	--	--	--	--	0.86	35.88	--	--	--	--	--	--
High Molecular Weight Polycyclic Aromatic Hydrocarbons (by USEPA 8270)																			
Fluoranthene	mg/kg	160	1,200	38.64	--	--	--	--	--	--	--	0.65	27.08	--	--	--	--	--	--
Pyrene	mg/kg	1,000	1,400	41.36	--	--	--	--	--	--	--	0.79	32.92	--	--	--	--	--	--
Benzo(a)anthracene	mg/kg	110	270	13.64	--	--	--	--	--	--	--	0.29	12.08	--	--	--	--	--	--
Chrysene	mg/kg	110	460	18.18	--	--	--	--	--	--	--	0.38	15.83	--	--	--	--	--	--
Benzo(b)fluoranthene	mg/kg	230	450	12.27	--	--	--	--	--	--	--	0.32	13.33	--	--	--	--	--	--
Benzo(k)fluoranthene	mg/kg	230	450	10	--	--	--	--	--	--	--	0.26	10.83	--	--	--	--	--	--
Benzofluoranthenes (total)	mg/kg	230	450	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	mg/kg	99	210	10.91	--	--	--	--	--	--	--	0.3	12.5	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	mg/kg	34	88	5.45	--	--	--	--	--	--	--	0.18	7.5	--	--	--	--	--	--
Dibenzo(a,h)anthracene	mg/kg	12	33	2.32	--	--	--	--	--	--	--	0.077	3.21	--	--	--	--	--	--
Benzo(g,h,i)perylene	mg/kg	31	78	5.45	--	--	--	--	--	--	--	0.17	7.08	--	--	--	--	--	--
Total HPAH	mg/kg	960	5,300	158.23	--	--	--	--	--	--	--	3.4	142.38	--	--	--	--	--	--
Phthalate Esters (by USEPA 8270)																			
Dimethyl phthalate	mg/kg	53	53	0.91 U	--	--	--	--	--	--	--	0.02 U	0.83 U	--	--	--	--	--	--
Diethylphthalate	mg/kg	61	110	0.91 U	--	--	--	--	--	--	--	0.02 U	0.83 U	--	--	--	--	--	--
Di-n-butyl phthalate	mg/kg	220	1,700	0.91 U	--	--	--	--	--	--	--	0.028	1.17	--	--	--	--	--	--
Butyl benzyl phthalate	mg/kg	4.9	64	0.91 U	--	--	--	--	--	--	--	1.5	**62.5**	--	--	--	--	--	--
bis(2-ethylhexyl)phthalate	mg/kg	47	78	6.82	--	--	--	--	--	--	--	1.4	**58.33**	--	--	--	--	--	--
Di-n-octyl phthalate	mg/kg	58	4,500	0.91 U	--	--	--	--	--	--	--	0.02 U	0.83 U	--	--	--	--	--	--
Miscellaneous Nonionizable Organic Carbons (by USEPA 8270)																			
Dibenzofuran	mg/kg	15	58	2.36	--	--	--	--	--	--	--	0.094	3.92	--	--	--	--	--	--
Polychlorinated Biphenols (by USEPA 8081/8082)																			
PCB Aroclor 1242	mg/kg	12	65	0.86 U	--	0.019 U	1.12 U	0.019 U	0.68 U	0.019 U	0.86 U	0.02 U	0.83 U	0.019 U	1.06 U	0.019 U	0.95 U	0.019 U	0.95 U
PCB Aroclor 1248	mg/kg	12	65	0.86 U	--	0.019 U	1.12 U	0.019 U	0.68 U	0.019 U	0.86 U	0.02 U	0.83 U	0.019 U	1.06 U	0.019 U	0.95 U	0.019 U	0.95 U
PCB Aroclor 1254	mg/kg	12	65	1.18 U	--	0.11	6.47	0.65	23.21	0.056 U	2.55 U	0.02 U	0.83 U	0.032	1.78	0.058	2.9	0.025 U	1.25 U
PCB Aroclor 1260	mg/kg	12	65	0.86 U	--	0.13 U	7.65 U	0.1	3.57	0.019 U	0.86 U	0.02 U	0.83 U	0.019 U	1.06 U	0.046 U	2.3 U	0.019 U	0.95 U
PCB Aroclor 1268	mg/kg	12	65	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCBs (Total, Aroclors)	mg/kg	12	65	1.73 U	--	0.11	6.47	0.75	**26.79**	0.056 U	2.55 U	0.039 U	1.63 U	0.032	1.78	0.058	2.9	0.039 U	1.95 U

Table 6.2
Detected Analytes in Surface Sediments—Historical Analytical Results

				RETEC Phase 2 1998 Shipyard Sampling															
			Location	HG-5	HG-6	HG-7		HG-8		HG-9		HG-10		HG-11		HG-12		HG-13	
			Sample ID	HG-5A	HG-6A	HG-7A		HG-8A		HG-9A		HG-10A		HG-11A		HG-12A		HG-13A	
			Date	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998
			Depth	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm
				OCN	DW	DW	OCN	DW	OCN	DW	OCN	DW	OCN	DW	OCN	DW	OCN	DW	OCN
		SMS Criteria																	
Parameter	**Unit**	**SQS**	**CSL**																
Ionizable Organic Compounds (by USEPA 8270)																			
Phenol	mg/kg	0.42	1.2		--	--	--	--	--	--	--	0.021	--	--	--	--	--	--	--
2,4-Dimethylphenol	mg/kg	0.029	0.029		--	--	--	--	--	--	--	0.02 U	--	--	--	--	--	--	--
Pentachlorophenol	mg/kg	0.36	0.69		--	--	--	--	--	--	--	0.098 U	--	--	--	--	--	--	--
Benzyl alcohol	mg/kg	0.057	0.073		--	--	--	--	--	--	--	0.027	--	--	--	--	--	--	--
Pesticide/Herbicides by (USEPA 8081)																			
p,p'-DDD	mg/kg	NA	NA		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Other Semivolatile Organic Compounds (by USEPA 8270)																			
4-Methylphenol	mg/kg	670	670		--	--	--	--	--	--	--	0.16	--	--	--	--	--	--	--
Other Volatile Organic Compounds (by USEPA 8260)																			
Xylene (meta & para)	mg/kg	NA	NA		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Xylene (ortho)	mg/kg	NA	NA		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Grain Size																			
Clay	%	NA	NA		--	--	--	--		--	--	--	--	--	--	--	--	--	--
Silt	%	NA	NA		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sand	%	NA	NA		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gravel	%	NA	NA		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

--	Not analyzed.
Bold	Exceeds SQS.
1	Measurment basis is in wet weight.

Abbreviations:

Cl	Chlorine.
cm	Centimeter.
CSL	Cleanup Screening Level.
DDD	Dichlorodiphenyldichloroethane.
DW	Dry weight.
HPAH	High molecular weight polycyclic aromatic hydrocarbon.
LPAH	Low molecular weight polycyclic aromatic hydrocarbon.
mg/kg	Milligrams per kilogram.
NA	Not applicable.
OCN	Organic carbon normalized.
PCB	Polychlorinated biphenyl.
RI/FS	Remedial Investigation/Feasibility Study.
SMS	
SQS	Sediment Quality Standards.
USEPA	U.S. Environmental Protection Agency.

Qualifiers:

J	Estimated value.
JB	Estimated due to blank contamination.
U	Not detected.
UJ	Not detected and the reporting limit is an estimate.

Table 6.2
Detected Analytes in Surface Sediments—Historical Analytical Results

				RETEC Phase 2 1998 Shipyard Sampling																
			Location	HG-14		HG-15		HG-16		HG-17		HG-18		HG-19		HG-20		HG-21		HG-22
			Sample ID	HG-14A	HG-14A	HG-15A	HG-15A	HG-16A	HG-16A	HG-17A	HG-17A	HG-18A	HG-18A	HG-19A	HG-19A	HG-20A	HG-20A	HG-21A	HG-21A	HG-22A
			Date	03/23/1998	03/23/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/23/1998	03/23/1998	03/23/1998	03/23/1998	03/23/1998	03/23/1998	03/23/1998	03/23/1998	03/24/1998
			Depth	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm
				DW	OCN	DW	OCN	DW	OCN	DW	OCN	DW	OCN	DW	OCN	DW	OCN	DW	OCN	DW
		SMS Criteria																		
Parameter	Unit	SQS	CSL																	
Conventionals																				
Total Organic Carbon	%	NA	NA	2.4	--	1.8	--	2	--	2	--	2.1	--	2.2	--	3.9	--	0.72	--	1.1
Total Solids	%	NA	NA	35.2	--	47.6	--	37.5	--	37.9	--	36.3	--	37.7	--	21.1	--	73.9	--	62.7
Total Solids (preserved)	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Volatile Solids	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ammonia	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ammonia (total as nitrogen)	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfide	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals																				
Antimony	mg/kg	NA	NA	--	--	--	--	7 UJ	--	6 UJ	--	7 UJ	--	7 UJ	--	10 UJ	--	3 UJ	--	--
Arsenic	mg/kg	57	93	--	--	--	--	14	--	10	--	17	--	14	--	10	--	3	--	--
Cadmium	mg/kg	5.1	6.7	--	--	--	--	0.8	--	0.9	--	1	--	0.9	--	1.2	--	0.1 U	--	--
Chromium	mg/kg	260	270	--	--	--	--	89.5	--	83	--	83.6	--	75.8	--	74	--	28.6	--	--
Copper	mg/kg	390	390	--	--	--	--	65.7	--	69.6	--	99.2	--	136	--	99.4	--	15.2	--	--
Lead	mg/kg	450	530	--	--	--	--	18	--	16	--	22	--	29	--	23	--	7	--	--
Mercury	mg/kg	0.41	0.59	--	--	--	--	0.28 J	--	0.25 J	--	0.28 J	--	0.31 J	--	0.18 J	--	0.04 J	--	--
Nickel	mg/kg	NA	NA	--	--	--	--	105	--	99	--	99	--	85	--	80	--	16.8	--	--
Silver	mg/kg	6.1	6.1	--	--	--	--	0.7	--	0.5	--	0.5	--	0.5	--	0.8 U	--	0.2 U	--	--
Zinc	mg/kg	410	410	--	--	--	--	116	--	116		136	--	150	--	128	--	28.3	--	--
Organometallics[1]																				
Dibutyltin as Cl	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tributyltin as Cl	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Monobutyltin Trichloride	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (by USEPA 8270)																				
Naphthalene	mg/kg	99	170	--	--	--	--	0.046	2.3	--		0.13	10.95	0.21	9.55	0.1	2.56	0.02 U	2.78 U	--
Acenaphthylene	mg/kg	66	66	--	--	--	--	0.02 U	1 U	--	--	0.048	2.29	0.057	2.59	0.034 U	0.87 U	0.02 U	2.78 U	--
Acenaphthene	mg/kg	16	57	--	--	--	--	0.02 U	1 U	--	--	0.047	2.24	0.073	3.32	0.038	0.97	0.02 U	2.78 U	--
Fluorene	mg/kg	23	79	--	--	--	--	0.02 U	1 U	--	--	0.13	6.19	0.09	4.09	0.08	2.05	0.02 U	2.78 U	--
Phenanthrene	mg/kg	100	480	--	--	--	--	0.059	2.95	--	--	0.58	27.62	0.59	26.82	0.39	10	0.02 U	2.78 U	--
Anthracene	mg/kg	220	1,200	--	--	--	--	0.022	1.1	--	--	0.048	18.1	0.2	9.09	0.25	6.41	0.02 U	2.78 U	--
2-Methylnaphthalene	mg/kg	38	64	--	--	--	--	0.02 U	1 U	--	--	0.062	2.95	0.069	3.14	0.04	1.03	0.02 U	2.78 U	--
Total LPAH	mg/kg	370	780	--	--	--	--	0.13	6.35	--	--	1.4	67.38	1.2	55.45	0.86	22	0.02 U	2.78 U	--
High Molecular Weight Polycyclic Aromatic Hydrocarbons (by USEPA 8270)																				
Fluoranthene	mg/kg	160	1,200	--	--	--	--	0.1	5	--	--	0.72	34.29	1	45.45	0.78	20	0.042	5.83	--
Pyrene	mg/kg	1,000	1,400	--	--	--	--	0.1	5	--	--	0.87	41.43	1.2	54.55	0.84	21.54	0.043	5.97	--
Benzo(a)anthracene	mg/kg	110	270	--	--	--	--	0.039	1.95	--	--	0.27	12.86	0.45	20.45	0.31	7.95	0.02	2.78	--
Chrysene	mg/kg	110	460	--	--	--	--	0.067	3.35	--	--	0.4	19.05	0.67	30.45	0.46	11.79	0.026	3.61	--
Benzo(b)fluoranthene	mg/kg	230	450	--	--	--	--	0.04	2	--	--	0.26	12.38	0.48	21.82	0.29	7.44	0.02 U	2.78 U	--
Benzo(k)fluoranthene	mg/kg	230	450	--	--	--	--	0.047	2.35	--	--	0.27	12.86	0.44	20	0.25	6.41	0.02 U	2.78 U	--
Benzofluoranthenes (total)	mg/kg	230	450	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	mg/kg	99	210	--	--	--	--	0.047	2.35	--	--	0.25	11.9	0.42	19.09	0.26	6.67	0.02 U	2.78 U	--
Indeno(1,2,3-cd)pyrene	mg/kg	34	88	--	--	--	--	0.028	1.4	--	--	0.13	6.19	0.22	10	0.13	3.33	0.02 U	2.78 U	--
Dibenzo(a,h)anthracene	mg/kg	12	33	--	--	--	--	0.02 U	1 U	--	--	0.055	2.62	0.097	4.41	0.052	1.33	0.02 U	2.78 U	--
Benzo(g,h,i)perylene	mg/kg	31	78	--	--	--	--	0.033	1.65	--	--	0.12	5.71	0.19	8.64	0.11	2.82	0.02 U	2.78 U	--
Total HPAH	mg/kg	960	5,300	--	--	--	--	0.5	25.05	--	--	3.3	159.29	5.2	234.86	3.5	89.28	0.13	18.19	--
Phthalate Esters (by USEPA 8270)																				
Dimethyl phthalate	mg/kg	53	53	--	--	--	--	0.076	3.8	--	--	0.023	1.1	0.036	1.64	0.034 U	0.87 U	0.02 U	2.78 U	--
Diethylphthalate	mg/kg	61	110	--	--	--	--	0.02 U	1 U	--	--	0.019 U	0.9 U	0.02 U	0.91 U	0.034 U	0.87 U	0.02 U	2.78 U	--
Di-n-butyl phthalate	mg/kg	220	1,700	--	--	--	--	0.02 U	1 U	--	--	0.019 U	0.9 U	0.02 U	0.91 U	0.038	0.97	0.02 U	2.78 U	--
Butyl benzyl phthalate	mg/kg	4.9	64	--	--	--	--	0.02 U	1 U	--	--	0.019 U	0.9 U	0.02 U	0.91 U	0.034 U	0.87 U	0.02 U	2.78 U	--
bis(2-ethylhexyl)phthalate	mg/kg	47	78	--	--	--	--	0.044	2.2	--	--	0.17	8.1	0.46	20.91	0.18	4.62	0.02 U	2.78 U	--
Di-n-octyl phthalate	mg/kg	58	4,500	--	--	--	--	0.02 U	1 U	--	--	0.019 U	0.9 U	0.02 U	0.91 U	0.034 U	0.87 U	0.02 U	2.78 U	--
Miscellaneous Nonionizable Organic Carbons (by USEPA 8270)																				
Dibenzofuran	mg/kg	15	58	--	--	--	--	0.02 U	1 U	--	--	0.11	5.24	0.11	5	0.062	1.59	0.02 U	2.78 U	--
Polychlorinated Biphenols (by USEPA 8081/8082)																				
PCB Aroclor 1242	mg/kg	12	65	0.019 U	0.79 U	0.019 U	1.06 U	0.02 U	1 U	0.02 U	1 U	0.019 U	0.9 U	0.019 U	0.86 U	0.02 U	0.51 U	0.018 U	2.5 U	0.019 U
PCB Aroclor 1248	mg/kg	12	65	0.019 U	0.79 U	0.019 U	1.06 U	0.02 U	1 U	0.02 U	1 U	0.019 U	0.9 U	0.019 U	0.86 U	0.02 U	0.51 U	0.018 U	2.5 U	0.019 U
PCB Aroclor 1254	mg/kg	12	65	0.041	1.71	0.095	5.28	0.049 U	2.45 U	0.028 U	1.4 U	0.048 U	2.29 U	0.081	3.68	0.035 U	0.9 U	0.018 U	2.5 U	0.019
PCB Aroclor 1260	mg/kg	12	65	0.019 U	0.79 U	0.019 U	1.06 U	0.02 U	1 U	0.02 U	1 U	0.019 U	0.9 U	0.019 U	0.86 U	0.02 U	0.51 U	0.018 U	2.5 U	0.019 U
PCB Aroclor 1268	mg/kg	12	65	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCBs (Total, Aroclors)	mg/kg	12	65	0.041	1.71	0.095	5.28	0.049 U	2.45 U	0.039 U	1.95 U	0.048 U	2.29 U	0.081	3.68	0.039 U	1 U	0.037 U	5.14 U	0.019

Table 6.2
Detected Analytes in Surface Sediments—Historical Analytical Results

				RETEC Phase 2 1998 Shipyard Sampling																
			Location	HG-14		HG-15		HG-16		HG-17		HG-18		HG-19		HG-20		HG-21		HG-22
			Sample ID	HG-14A	HG-14A	HG-15A	HG-15A	HG-16A	HG-16A	HG-17A	HG-17A	HG-18A	HG-18A	HG-19A	HG-19A	HG-20A	HG-20A	HG-21A	HG-21A	HG-22A
			Date	03/23/1998	03/23/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/24/1998	03/23/1998	03/23/1998	03/23/1998	03/23/1998	03/23/1998	03/23/1998	03/23/1998	03/23/1998	03/24/1998
			Depth	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm
				DW	OCN	DW	OCN	DW	OCN	DW	OCN	DW	OCN	DW	OCN	DW	OCN	DW	OCN	DW
		SMS Criteria																		
Parameter	**Unit**	**SQS**	**CSL**																	
Ionizable Organic Compounds (by USEPA 8270)																				
Phenol	mg/kg	0.42	1.2	--	--	--	--	0.02 U	--	--	--	0.043	--	0.071	--	0.048	--	0.023	--	--
2,4-Dimethylphenol	mg/kg	0.029	0.029	--	--	--	--	0.02 U	--	--	--	0.019 U	--	0.02 U	--	0.034 U	--	0.02 U	--	--
Pentachlorophenol	mg/kg	0.36	0.69	--	--	--	--	0.098 U	--	--	--	0.097 U	--	0.099 U	--	0.17 U	--	0.099 U	--	--
Benzyl alcohol	mg/kg	0.057	0.073	--	--	--	--	0.02 U	--	--	--	0.019 U	--	0.02 U	--	0.034 U	--	0.02 U	--	--
Pesticide/Herbicides by (USEPA 8081)																				
p,p'-DDD	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Other Semivolatile Organic Compounds (by USEPA 8270)																				
4-Methylphenol	mg/kg	670	670	--	--	--	--	0.21	--	--	--	0.56	--	0.45	--	0.34	--	0.02 U	--	--
Other Volatile Organic Compounds (by USEPA 8260)																				
Xylene (meta & para)	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Xylene (ortho)	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Grain Size																				
Clay	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silt	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sand	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gravel	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

--	Not analyzed.
Bold	Exceeds SQS.
1	Measurment basis is in wet weight.

Abbreviations:

Cl	Chlorine.
cm	Centimeter.
CSL	Cleanup Screening Level.
DDD	Dichlorodiphenyldichloroethane.
DW	Dry weight.
HPAH	High molecular weight polycyclic aromatic hydrocarbon.
LPAH	Low molecular weight polycyclic aromatic hydrocarbon.
mg/kg	Milligrams per kilogram.
NA	Not applicable.
OCN	Organic carbon normalized.
PCB	Polychlorinated biphenyl.
RI/FS	Remedial Investigation/Feasibility Study.
SMS	
SQS	Sediment Quality Standards.
USEPA	U.S. Environmental Protection Agency.

Qualifiers:

J	Estimated value.
JB	Estimated due to blank contamination.
U	Not detected.
UJ	Not detected and the reporting limit is an estimate.

Table 6.2
Detected Analytes in Surface Sediments—Historical Analytical Results

				RETEC 1998 Phase 2 Shipyard Sampling										
			Location	HG-22	HG-23		HV-3		HV-4		HV-6		HV-8	
			Sample ID	HG-22A	HG-23A	HG-23A	HV-3A 0-10	HV-3A 0-10	HV-4A 0-10 Rep 1	HV-4A 0-10 Rep 1	HV-6A 0-10	HV-6A 0-10	HV-8A 0-10	HV-8A 0-10
			Date	03/24/1998	03/24/1998	03/24/1998	03/26/1998	03/26/1998	03/26/1998	03/26/1998	03/26/1998	03/26/1998	03/26/1998	03/26/1998
			Depth	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm
				OCN	DW	OCN	DW	OCN	DW	OCN	DW	OCN	DW	OCN
		SMS Criteria												
Parameter	**Unit**	**SQS**	**CSL**											
Conventionals														
Total Organic Carbon	%	NA	NA	--	2	--	2.6	--	1.8	--	1.9	--	1.3 J	--
Total Solids	%	NA	NA	--	36.9	--	39.1	--	70.9	--	51.7	--	80.6	--
Total Solids (preserved)	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--
Total Volatile Solids	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--
Ammonia	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--
Ammonia (total as nitrogen)	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--
Sulfide	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--
Metals														
Antimony	mg/kg	NA	NA	--	--	--	17 J	--	7 UJ	--	13 J	--	4 J	--
Arsenic	mg/kg	57	93	--	--	--	18	--	21	--	21	--	10	--
Cadmium	mg/kg	5.1	6.7	--	--	--	1.6	--	0.5	--	0.7	--	0.3	--
Chromium	mg/kg	260	270	--	--	--	79.3 J	--	35.5 J	--	63.5 J	--	35.8 J	--
Copper	mg/kg	390	390	--	--	--	286	--	199	--	69.4	--	37	--
Lead	mg/kg	450	530	--	--	--	49	--	74	--	32	--	10	--
Mercury	mg/kg	0.41	0.59	--	--	--	0.25 J	--	**0.42 J**	--	**0.51 J**	--	0.03 J	--
Nickel	mg/kg	NA	NA	--	--	--	96	--	30	--	75.7	--	29.1	--
Silver	mg/kg	6.1	6.1	--	--	--	0.4 U	--	0.4 U	--	0.3 U	--	0.2 U	--
Zinc	mg/kg	410	410	--	--	--	276	--	266	--	134	--	37	--
Organometallics[1]														
Dibutyltin as Cl	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--
Tributyltin as Cl	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--
Monobutyltin Trichloride	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (by USEPA 8270)														
Naphthalene	mg/kg	99	170	--	--	--	--	--	--	--	--		--	--
Acenaphthylene	mg/kg	66	66	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	mg/kg	16	57	--	--	--	--	--	--	--	--	--	--	--
Fluorene	mg/kg	23	79	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	mg/kg	100	480	--	--	--	--	--	--	--	--	--	--	--
Anthracene	mg/kg	220	1,200	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	mg/kg	38	64	--	--	--	--	--	--	--	--	--	--	--
Total LPAH	mg/kg	370	780	--	--	--	--	--	--	--	--	--	--	--
High Molecular Weight Polycyclic Aromatic Hydrocarbons (by USEPA 8270)														
Fluoranthene	mg/kg	160	1,200	--	--	--	--	--	--	--	--	--	--	--
Pyrene	mg/kg	1,000	1,400	--	--	--	--	--	--	--	--	--	--	--
Benzo(a)anthracene	mg/kg	110	270	--	--	--	--	--	--	--	--	--	--	--
Chrysene	mg/kg	110	460	--	--	--	--	--	--	--	--	--	--	--
Benzo(b)fluoranthene	mg/kg	230	450	--	--	--	--	--	--	--	--	--	--	--
Benzo(k)fluoranthene	mg/kg	230	450	--	--	--	--	--	--	--	--	--	--	--
Benzofluoranthenes (total)	mg/kg	230	450	--	--	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	mg/kg	99	210	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	mg/kg	34	88	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,h)anthracene	mg/kg	12	33	--	--	--	--	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	mg/kg	31	78	--	--	--	--	--	--	--	--	--	--	--
Total HPAH	mg/kg	960	5,300	--	--	--	--	--	--	--	--	--	--	--
Phthalate Esters (by USEPA 8270)														
Dimethyl phthalate	mg/kg	53	53	--	--	--	--	--	--	--	--	--	--	--
Diethylphthalate	mg/kg	61	110	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	mg/kg	220	1,700	--	--	--	--	--	--	--	--	--	--	--
Butyl benzyl phthalate	mg/kg	4.9	64	--	--	--	--	--	--	--	--	--	--	--
bis(2-ethylhexyl)phthalate	mg/kg	47	78	--	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	mg/kg	58	4,500	--	--	--	--	--	--	--	--	--	--	--
Miscellaneous Nonionizable Organic Carbons (by USEPA 8270)														
Dibenzofuran	mg/kg	15	58	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenols (by USEPA 8081/8082)														
PCB Aroclor 1242	mg/kg	12	65	1.73 U	0.019 U	0.95 U	0.02 U	0.77 UJ	0.026 U	1.44 UJ	0.019 U	1 UJ	0.018 U	1.38 U
PCB Aroclor 1248	mg/kg	12	65	1.73 U	0.019 U	0.95 U	0.02 U	0.77 UJ	0.02 U	1.11 UJ	0.019 U	1 UJ	0.018 U	1.38 U
PCB Aroclor 1254	mg/kg	12	65	1.73	0.03 U	1.5 U	0.25	9.62 J	0.6	33.3 J	0.019 U	1 UJ	0.011 J	0.85 J
PCB Aroclor 1260	mg/kg	12	65	1.73 U	0.019 U	0.95 U	0.02 U	0.77 UJ	0.7	38.9 J	0.073 U	3.84 UJ	0.018 U	1.38 U
PCB Aroclor 1268	mg/kg	12	65	--	--	--	--	--	--	--	--	--	--	--
PCBs (Total, Aroclors)	mg/kg	12	65	1.73	0.039 U	1.95 U	0.25	9.62 J	1.3	**72.2 J**	0.073 U	3.84 UJ	0.011 J	0.85 J

Table 6.2
Detected Analytes in Surface Sediments—Historical Analytical Results

				RETEC 1998 Phase 2 Shipyard Sampling										
			Location	HG-22	HG-23		HV-3		HV-4		HV-6		HV-8	
			Sample ID	HG-22A	HG-23A	HG-23A	HV-3A 0-10	HV-3A 0-10	HV-4A 0-10 Rep 1	HV-4A 0-10 Rep 1	HV-6A 0-10	HV-6A 0-10	HV-8A 0-10	HV-8A 0-10
			Date	03/24/1998	03/24/1998	03/24/1998	03/26/1998	03/26/1998	03/26/1998	03/26/1998	03/26/1998	03/26/1998	03/26/1998	03/26/1998
			Depth	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm
				OCN	DW	OCN	DW	OCN	DW	OCN	DW	OCN	DW	OCN
		SMS Criteria												
Parameter	**Unit**	**SQS**	**CSL**											
Ionizable Organic Compounds (by USEPA 8270)														
Phenol	mg/kg	0.42	1.2	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	mg/kg	0.029	0.029	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	mg/kg	0.36	0.69	--	--	--	--	--	--	--	--	--	--	--
Benzyl alcohol	mg/kg	0.057	0.073	--	--	--	--	--	--	--	--	--	--	--
Pesticide/Herbicides by (USEPA 8081)														
p,p'-DDD	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--
Other Semivolatile Organic Compounds (by USEPA 8270)														
4-Methylphenol	mg/kg	670	670	--	--	--	--	--	--	--	--	--	--	--
Other Volatile Organic Compounds (by USEPA 8260)														
Xylene (meta & para)	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--
Xylene (ortho)	mg/kg	NA	NA	--	--	--	--	--	--	--	--	--	--	--
Grain Size														
Clay	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--
Silt	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--
Sand	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--
Gravel	%	NA	NA	--	--	--	--	--	--	--	--	--	--	--

Notes:

--	Not analyzed.
Bold	Exceeds SQS.
1	Measurment basis is in wet weight.

Abbreviations:

Cl	Chlorine.
cm	Centimeter.
CSL	Cleanup Screening Level.
DDD	Dichlorodiphenyldichloroethane.
DW	Dry weight.
HPAH	High molecular weight polycyclic aromatic hydrocarbon.
LPAH	Low molecular weight polycyclic aromatic hydrocarbon.
mg/kg	Milligrams per kilogram.
NA	Not applicable.
OCN	Organic carbon normalized.
PCB	Polychlorinated biphenyl.
RI/FS	Remedial Investigation/Feasibility Study.
SMS	
SQS	Sediment Quality Standards.
USEPA	U.S. Environmental Protection Agency.

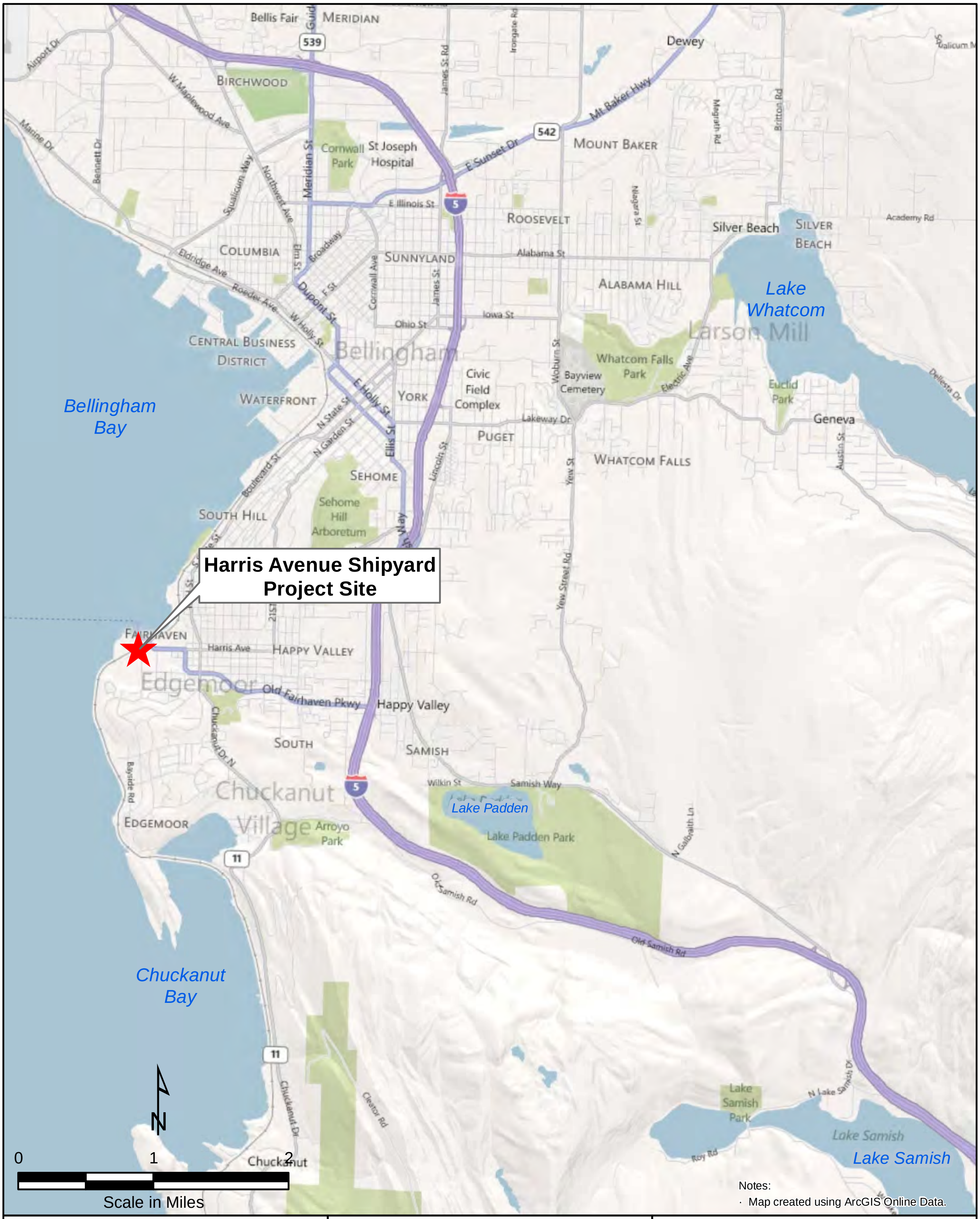
Qualifiers:

J	Estimated value.
JB	Estimated due to blank contamination.
U	Not detected.
UJ	Not detected and the reporting limit is an estimate.

Harris Avenue Shipyard

Remedial Investigation/ Feasibility Study Data Report

Figures



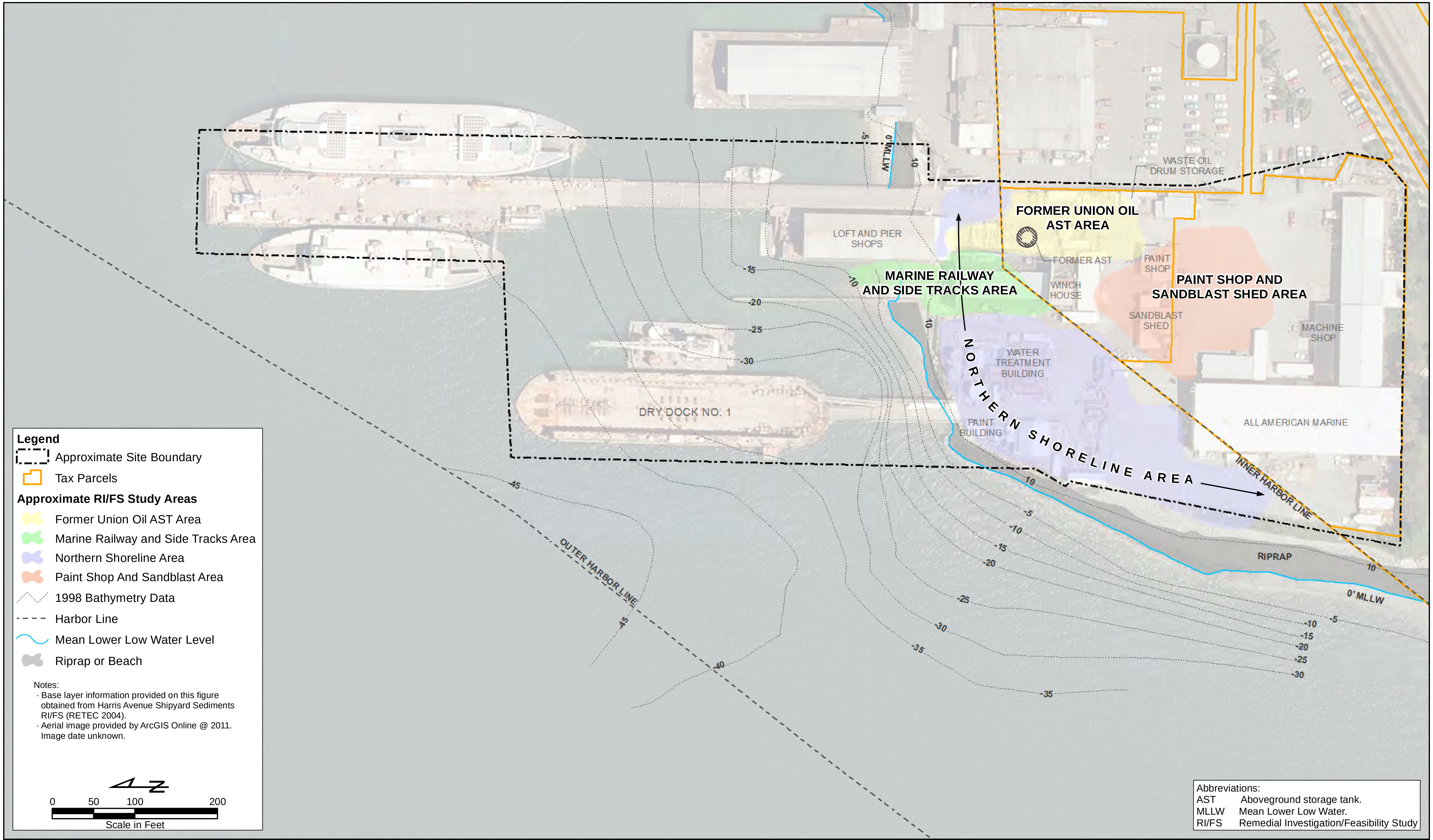
Notes:
- Map created using ArcGIS Online Data.

Remedial Investigation/
Feasibility Study Data Report
Harris Avenue Shipyard
Bellingham, Washington

Figure 1.1
Vicinity Map

FLOYD | SNIDER
strategy ▪ science ▪ engineering

Path: F:\projects\POB-HARRIS\GIS\MXD\RIFS Data Report\Figure 1.1 (Vicinity Map).mxd
Date: 11/11/2011



Notes:
- Base layer information provided on this figure obtained from Harris Avenue Shipyard Sediments RI/FS (RETEC 2004).
- Aerial image provided by ArcGIS Online @ 2011. Image date unknown.

Abbreviations:

AST	Aboveground storage tank.
MLLW	Mean Lower Low Water.
RI/FS	Remedial Investigation/Feasibility Study

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Harris Avenue Shipyard
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Figure 1.2
Site Map

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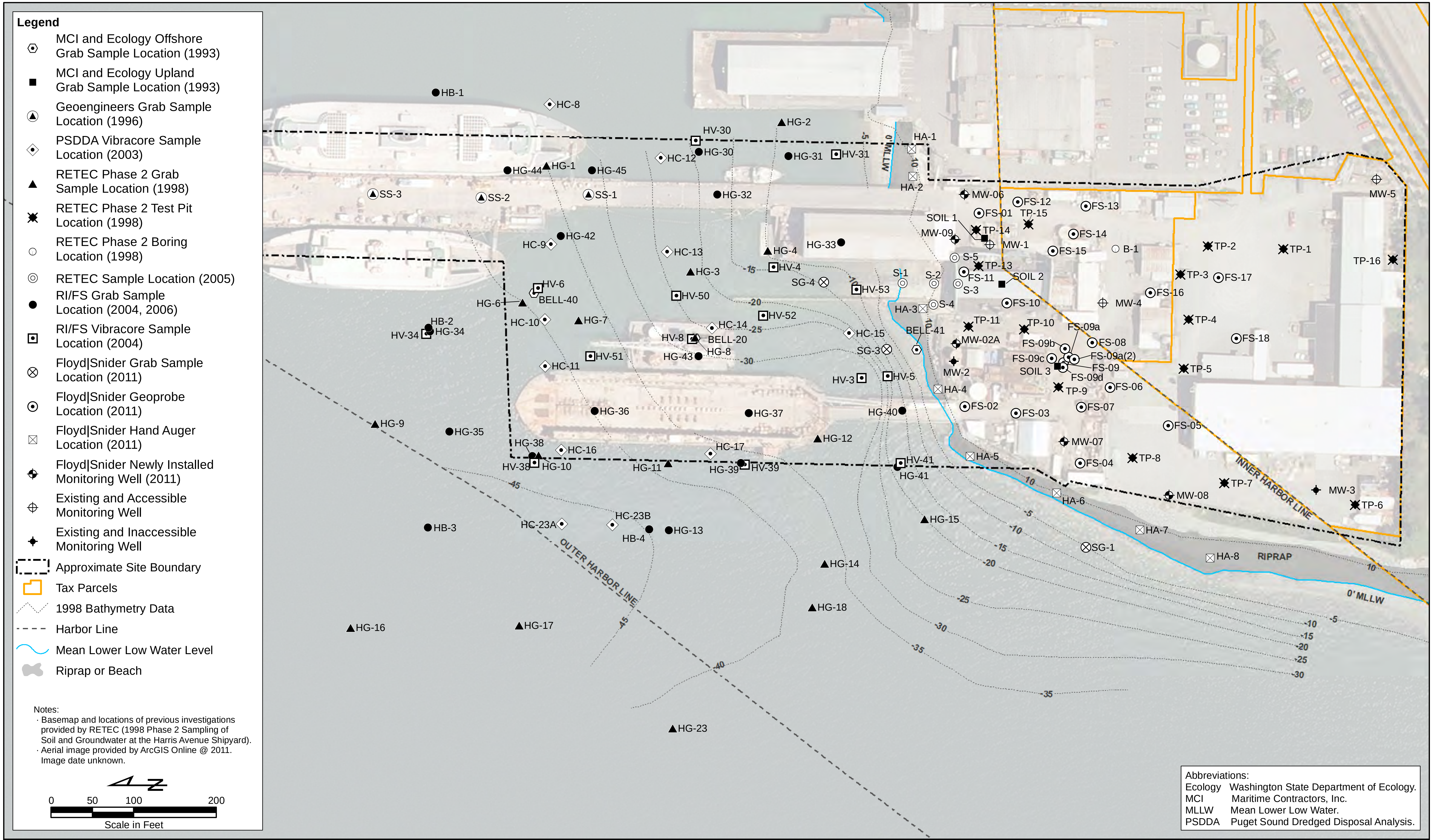
12/1/2011



Legend

- ⊙ MCI and Ecology Offshore Grab Sample Location (1993)
- ■ MCI and Ecology Upland Grab Sample Location (1993)
- ▲ Geoengineers Grab Sample Location (1996)
- ◇ PSDDA Vibracore Sample Location (2003)
- ▲ RETEC Phase 2 Grab Sample Location (1998)
- ✱ RETEC Phase 2 Test Pit Location (1998)
- ○ RETEC Phase 2 Boring Location (1998)
- ◎ RETEC Sample Location (2005)
- ● RI/FS Grab Sample Location (2004, 2006)
- ⊡ RI/FS Vibracore Sample Location (2004)
- ⊗ Floyd|Snider Grab Sample Location (2011)
- ⊙ Floyd|Snider Geoprobe Location (2011)
- ☒ Floyd|Snider Hand Auger Location (2011)
- ✦ Floyd|Snider Newly Installed Monitoring Well (2011)
- ⊕ Existing and Accessible Monitoring Well
- ✦ Existing and Inaccessible Monitoring Well
- ▭ Approximate Site Boundary
- ▭ Tax Parcels
- 1998 Bathymetry Data
- Harbor Line
- Mean Lower Low Water Level
- Riprap or Beach

Notes:
- Basemap and locations of previous investigations provided by RETEC (1998 Phase 2 Sampling of Soil and Groundwater at the Harris Avenue Shipyard).
- Aerial image provided by ArcGIS Online @ 2011. Image date unknown.

0 50 100 200
Scale in Feet

Abbreviations:

Ecology	Washington State Department of Ecology.
MCI	Maritime Contractors, Inc.
MLLW	Mean Lower Low Water.
PSDDA	Puget Sound Dredged Disposal Analysis.

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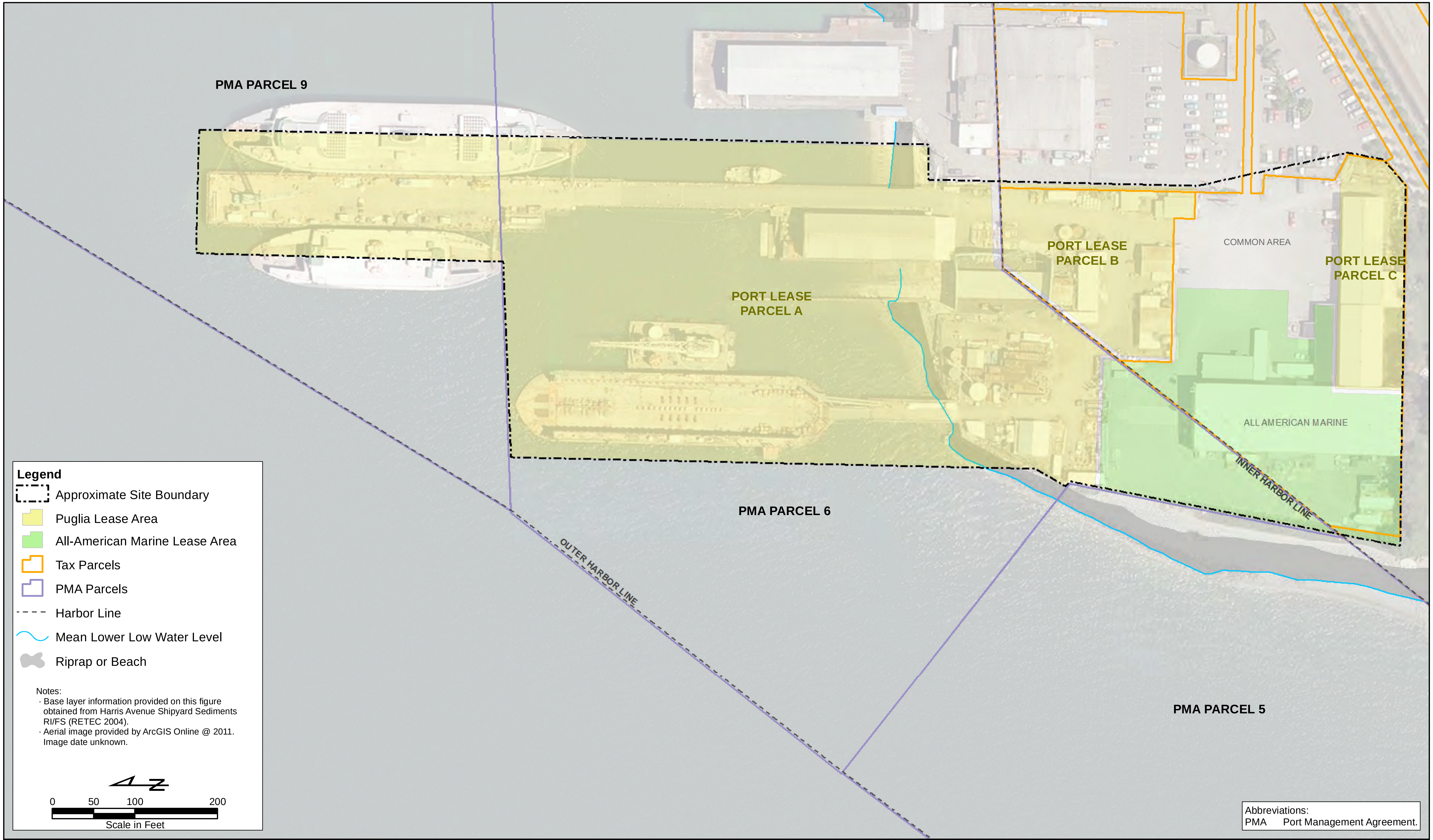
Bellingham, Washington

Figure 1.3
Sample Locations

F:\projects\POB-HARRIS\GIS\MXD\RIFS Data Report\Figure 1.3 (Sample Locations).mxd
11/29/2011



Notes:
- Base layer information provided on this figure obtained from Harris Avenue Shipyard Sediments RI/FS (RETEC 2004).
- Aerial image provided by ArcGIS Online @ 2011. Image date unknown.

Abbreviations:
PMA Port Management Agreement.

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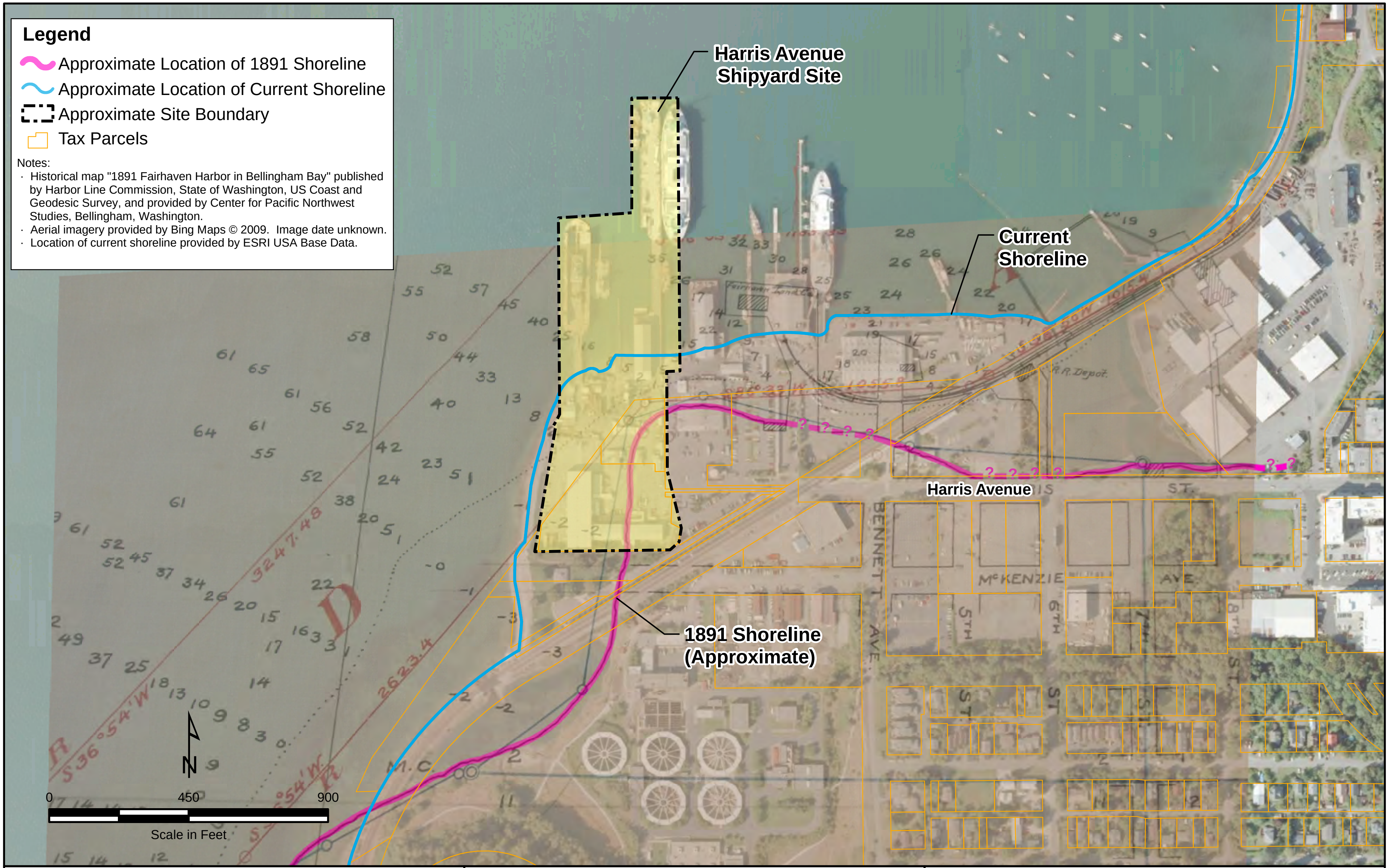
Bellingham, Washington

Figure 2.1
Site Parcel Boundaries and Lease Areas

F:\projects\POB-HARRIS\GIS\MXD\RIFS Data Report\Figure 2.1 (Site Parcel Boundaries and Lease Areas).mxd
12/1/2011



Legend

- 〰 Approximate Location of 1891 Shoreline
- 〰 Approximate Location of Current Shoreline
- ⬚ Approximate Site Boundary
- ▭ Tax Parcels

Notes:

- Historical map "1891 Fairhaven Harbor in Bellingham Bay" published by Harbor Line Commission, State of Washington, US Coast and Geodesic Survey, and provided by Center for Pacific Northwest Studies, Bellingham, Washington.
- Aerial imagery provided by Bing Maps © 2009. Image date unknown.
- Location of current shoreline provided by ESRI USA Base Data.

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Figure 2.2
1891 Harbor Line Commission Map

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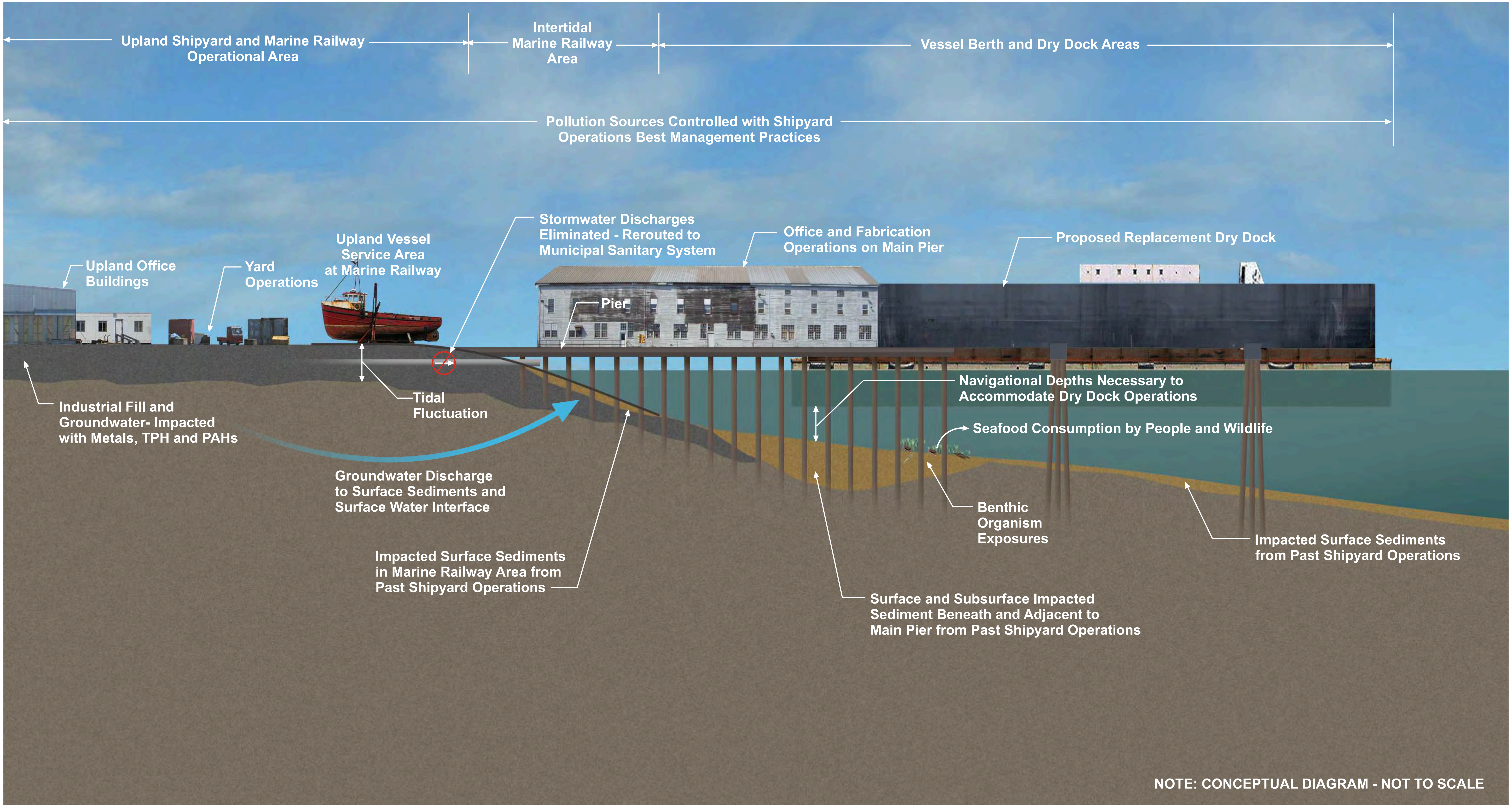

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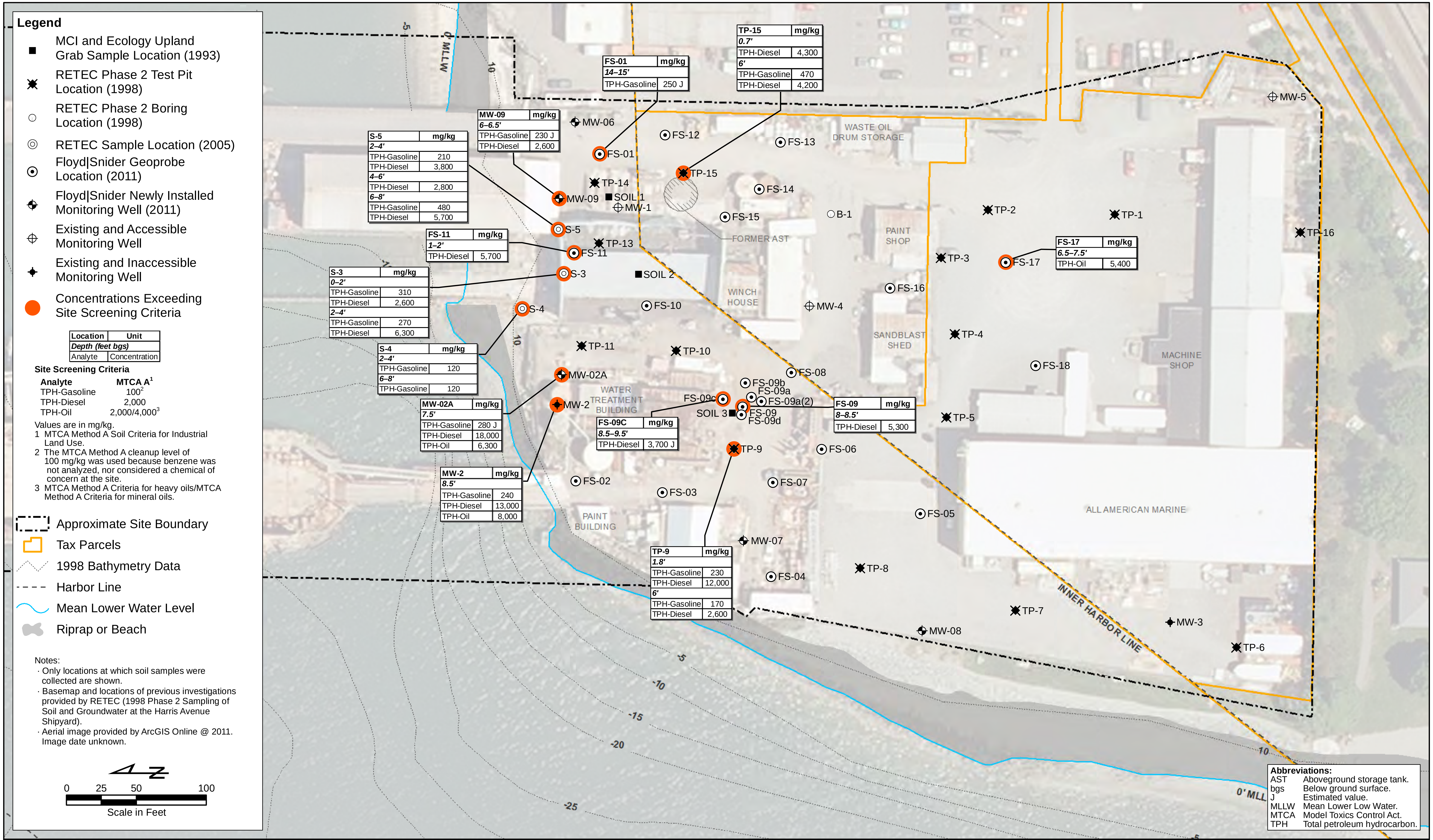
Figure 3.1
Preliminary Conceptual Site Model

g:projects/clients/floydsnider/harrisavenue/Figure 3.1.cdr



S-5	mg/kg
2–4′	
TPH-Gasoline	210
TPH-Diesel	3,800
4–6′	
TPH-Diesel	2,800
6–8′	
TPH-Gasoline	480
TPH-Diesel	5,700

MW-09	mg/kg
6–6.5′	
TPH-Gasoline	230 J
TPH-Diesel	2,600

FS-01	mg/kg
14–15′	
TPH-Gasoline	250 J

TP-15	mg/kg
0.7′	
TPH-Diesel	4,300
6′	
TPH-Gasoline	470
TPH-Diesel	4,200

FS-11	mg/kg
1–2′	
TPH-Diesel	5,700

S-3	mg/kg
0–2′	
TPH-Gasoline	310
TPH-Diesel	2,600
2–4′	
TPH-Gasoline	270
TPH-Diesel	6,300

FS-17	mg/kg
6.5–7.5′	
TPH-Oil	5,400

S-4	mg/kg
2–4′	
TPH-Gasoline	120
6–8′	
TPH-Gasoline	120

MW-02A	mg/kg
7.5′	
TPH-Gasoline	280 J
TPH-Diesel	18,000
TPH-Oil	6,300

FS-09C	mg/kg
8.5–9.5′	
TPH-Diesel	3,700 J

FS-09	mg/kg
8–8.5′	
TPH-Diesel	5,300

MW-2	mg/kg
8.5′	
TPH-Gasoline	240
TPH-Diesel	13,000
TPH-Oil	8,000

TP-9	mg/kg
1.8′	
TPH-Gasoline	230
TPH-Diesel	12,000
6′	
TPH-Gasoline	170
TPH-Diesel	2,600

Site Screening Criteria

Analyte	MTCA A[1]
TPH-Gasoline	100[2]
TPH-Diesel	2,000
TPH-Oil	2,000/4,000[3]

Values are in mg/kg.

1 MTCA Method A Soil Criteria for Industrial Land Use.

2 The MTCA Method A cleanup level of 100 mg/kg was used because benzene was not analyzed, nor considered a chemical of concern at the site.

3 MTCA Method A Criteria for heavy oils/MTCA Method A Criteria for mineral oils.

Notes:
- Only locations at which soil samples were collected are shown.
- Basemap and locations of previous investigations provided by RETEC (1998 Phase 2 Sampling of Soil and Groundwater at the Harris Avenue Shipyard).
- Aerial image provided by ArcGIS Online @ 2011. Image date unknown.

Abbreviations:

AST	Aboveground storage tank.
bgs	Below ground surface.
J	Estimated value.
MLLW	Mean Lower Low Water.
MTCA	Model Toxics Control Act.
TPH	Total petroleum hydrocarbon.

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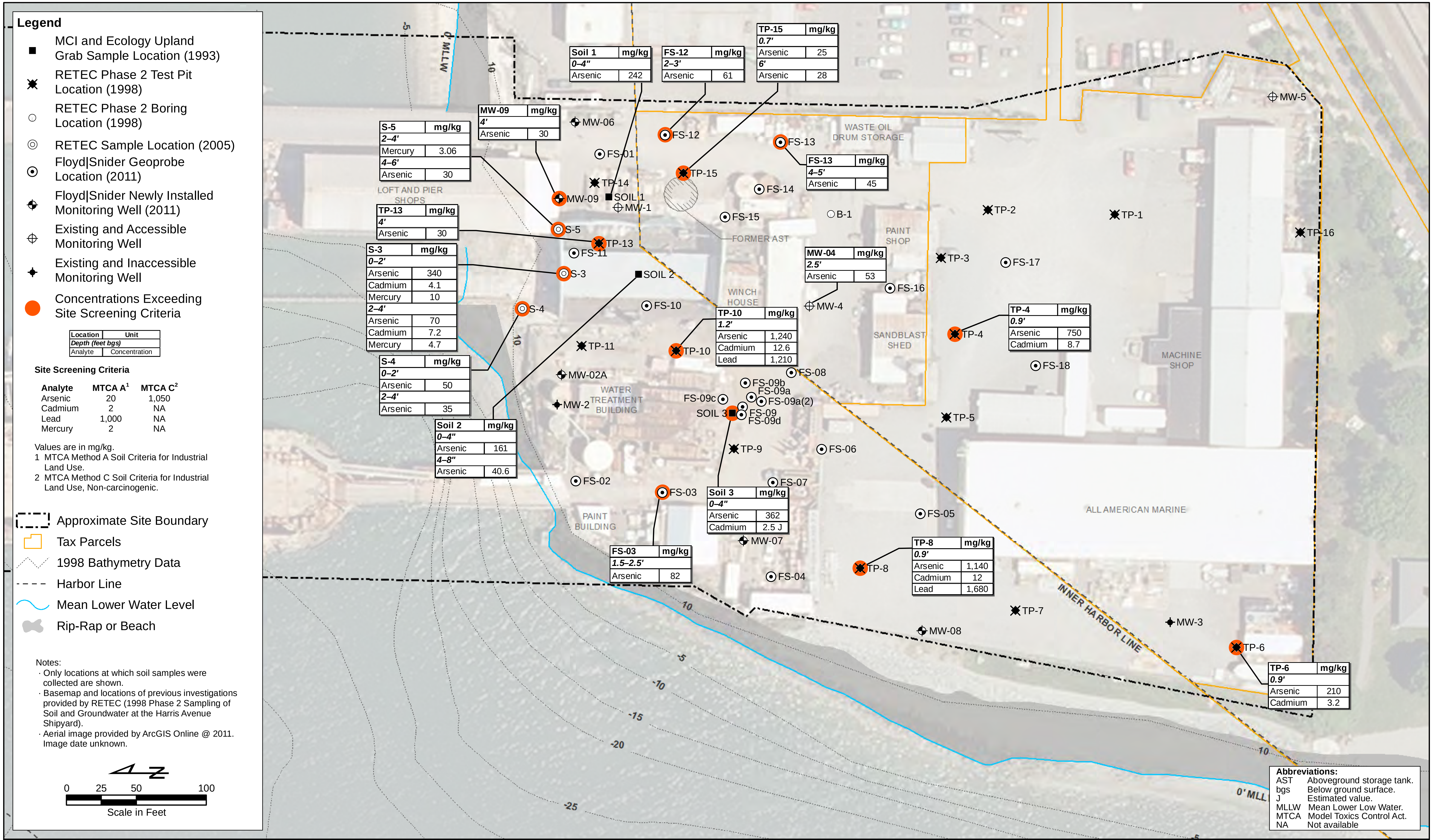
Bellingham, Washington

Figure 4.1
TPH Exceedances in Upland Soil

F:\projects\POB-HARRIS\GIS\MXD\RIFS Data Report\Figure 4.1 (TPH Excds in Upland Soil).mxd
11/29/2011



Legend

- ■ MCI and Ecology Upland Grab Sample Location (1993)
- ✱ RETEC Phase 2 Test Pit Location (1998)
- ○ RETEC Phase 2 Boring Location (1998)
- ◎ RETEC Sample Location (2005)
- ⊙ Floyd|Snider Geoprobe Location (2011)
- ⊕ Floyd|Snider Newly Installed Monitoring Well (2011)
- ⊕ Existing and Accessible Monitoring Well
- ✦ Existing and Inaccessible Monitoring Well
- ● Concentrations Exceeding Site Screening Criteria

Location	Unit
Depth (feet bgs)	
Analyte	Concentration

Site Screening Criteria

Analyte	MTCA A[1]	MTCA C[2]
Arsenic	20	1,050
Cadmium	2	NA
Lead	1,000	NA
Mercury	2	NA

Values are in mg/kg.

1 MTCA Method A Soil Criteria for Industrial Land Use.

2 MTCA Method C Soil Criteria for Industrial Land Use, Non-carcinogenic.

- Approximate Site Boundary
- Tax Parcels
- 1998 Bathymetry Data
- Harbor Line
- Mean Lower Water Level
- Rip-Rap or Beach

Notes:

· Only locations at which soil samples were collected are shown.

· Basemap and locations of previous investigations provided by RETEC (1998 Phase 2 Sampling of Soil and Groundwater at the Harris Avenue Shipyard).

· Aerial image provided by ArcGIS Online @ 2011. Image date unknown.

0 25 50 100

Scale in Feet

Abbreviations:

AST	Aboveground storage tank.
bgs	Below ground surface.
J	Estimated value.
MLLW	Mean Lower Low Water.
MTCA	Model Toxics Control Act.
NA	Not available

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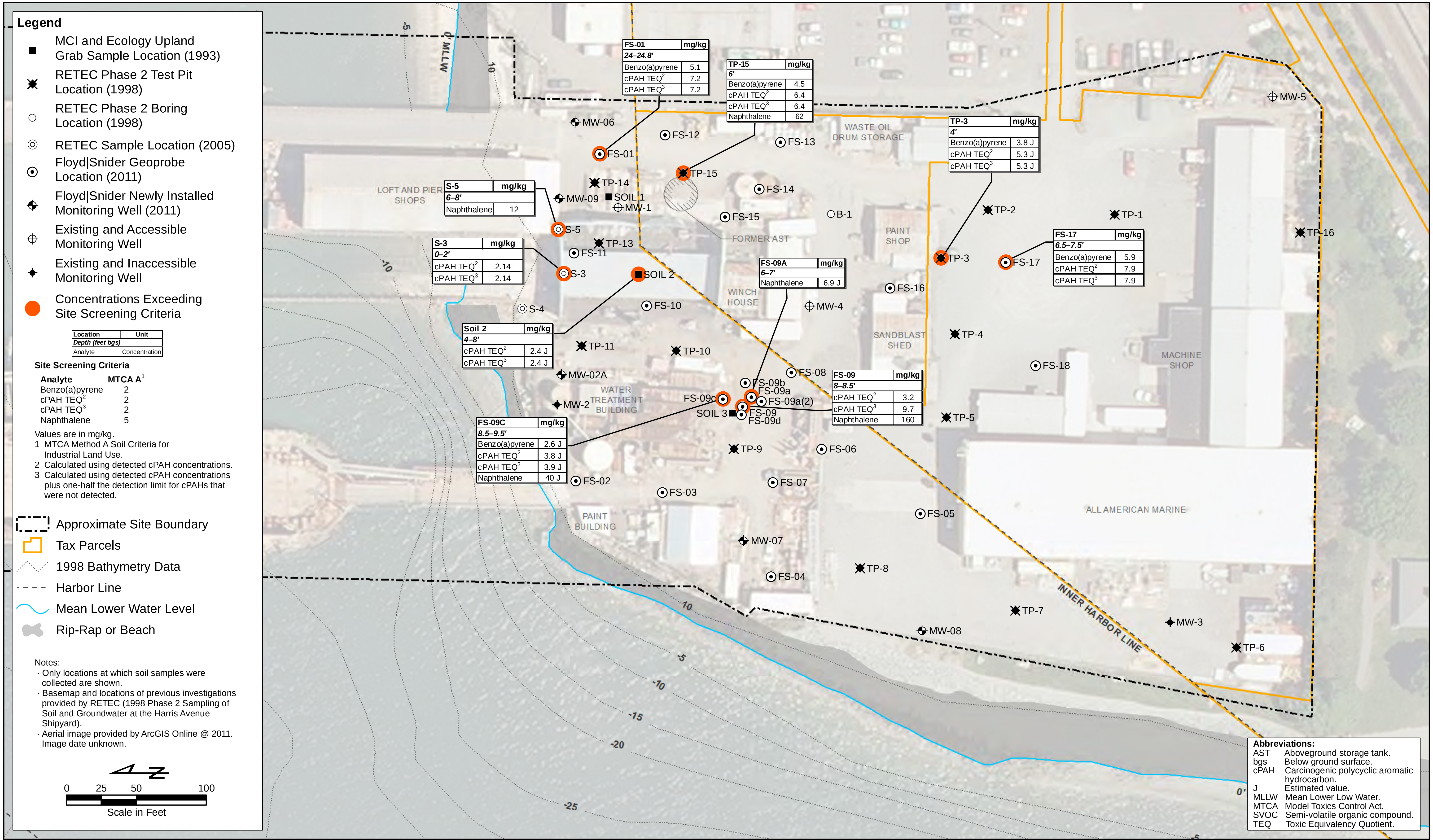
Harris Avenue Shipyard
Bellingham, Washington

Figure 4.2
Metal Exceedances in Upland Soil

F:\projects\POB-HARRIS\GIS\MXD\RIFS Data Report\Figure 4.2 (Metal Excds in Upland Soil).mxd
11/29/2011



FS-01	mg/kg
24–24.8'	
Benzo(a)pyrene	5.1
cPAH TEQ^2	7.2
cPAH TEQ^3	7.2

TP-15	mg/kg
6'	
Benzo(a)pyrene	4.5
cPAH TEQ^2	6.4
cPAH TEQ^3	6.4
Naphthalene	62

TP-3	mg/kg
4'	
Benzo(a)pyrene	3.8 J
cPAH TEQ^2	5.3 J
cPAH TEQ^3	5.3 J

S-5	mg/kg
6–8'	
Naphthalene	12

S-3	mg/kg
0–2'	
cPAH TEQ^2	2.14
cPAH TEQ^3	2.14

FS-09A	mg/kg
6–7'	
Naphthalene	6.9 J

FS-17	mg/kg
6.5–7.5'	
Benzo(a)pyrene	5.9
cPAH TEQ^2	7.9
cPAH TEQ^3	7.9

Soil 2	mg/kg
4–8'	
cPAH TEQ^2	2.4 J
cPAH TEQ^3	2.4 J

FS-09	mg/kg
8–8.5'	
cPAH TEQ^2	3.2
cPAH TEQ^3	9.7
Naphthalene	160

FS-09C	mg/kg
8.5–9.5'	
Benzo(a)pyrene	2.6 J
cPAH TEQ^2	3.8 J
cPAH TEQ^3	3.9 J
Naphthalene	40 J

Legend

- ■ MCI and Ecology Upland Grab Sample Location (1993)
- ✱ RETEC Phase 2 Test Pit Location (1998)
- ○ RETEC Phase 2 Boring Location (1998)
- ◎ RETEC Sample Location (2005)
- ⊙ Floyd|Snider Geoprobe Location (2011)
- ⊕ Floyd|Snider Newly Installed Monitoring Well (2011)
- ⊕ Existing and Accessible Monitoring Well
- ✦ Existing and Inaccessible Monitoring Well
- ● Concentrations Exceeding Site Screening Criteria

Location	Unit
Depth (feet bgs)	
Analyte	Concentration

Site Screening Criteria

Analyte	MTCA A[1]
Benzo(a)pyrene	2
cPAH TEQ^2	2
cPAH TEQ^3	2
Naphthalene	5

Values are in mg/kg.
1 MTCA Method A Soil Criteria for Industrial Land Use.
2 Calculated using detected cPAH concentrations.
3 Calculated using detected cPAH concentrations plus one-half the detection limit for cPAHs that were not detected.

- Approximate Site Boundary
- Tax Parcels
- 1998 Bathymetry Data
- Harbor Line
- Mean Lower Water Level
- Rip-Rap or Beach

Notes:
- Only locations at which soil samples were collected are shown.
- Basemap and locations of previous investigations provided by RETEC (1998 Phase 2 Sampling of Soil and Groundwater at the Harris Avenue Shipyard).
- Aerial image provided by ArcGIS Online @ 2011. Image date unknown.

N

0 25 50 100
Scale in Feet

Abbreviations:

AST	Aboveground storage tank.
bgs	Below ground surface.
cPAH	Carcinogenic polycyclic aromatic hydrocarbon.
J	Estimated value.
MLLW	Mean Lower Low Water.
MTCA	Model Toxics Control Act.
SVOC	Semi-volatile organic compound.
TEQ	Toxic Equivalency Quotient.

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Harris Avenue Shipyard
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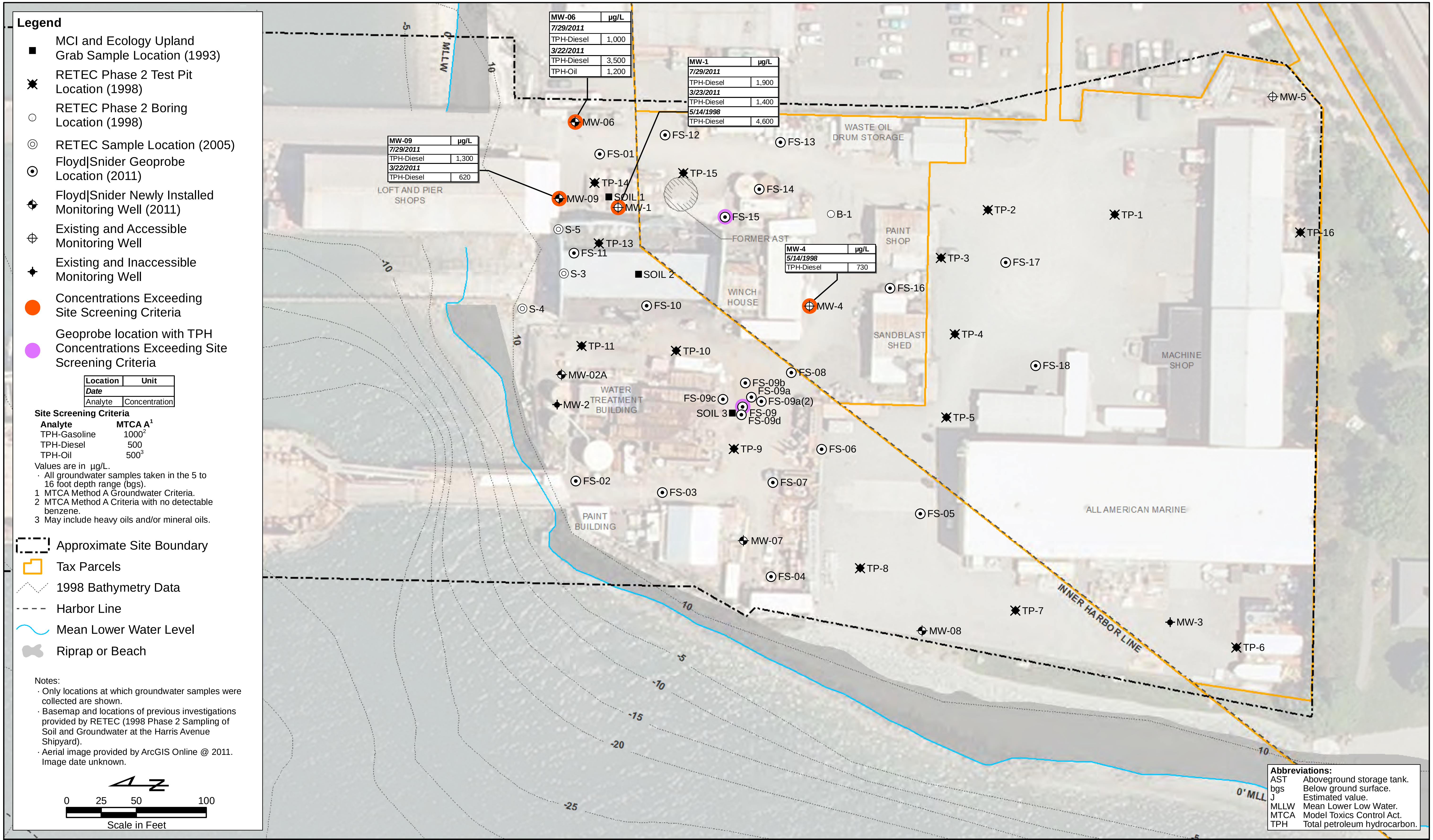
Figure 4.3
SVOC Exceedances in Upland Soil

F:\projects\POB-HARRIS\GIS\MXD\RIFS Data Report\Figure 4.3 (SVOC Excds in Upland Soil).mxd
11/29/2011



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Bellingham, Washington

Figure 5.1
TPH Exceedances in Groundwater

F:\projects\POB-HARRIS\GIS\MXD\RIFS Data Report\Figure 5.1 (TPH Excds in Groundwater).mxd
11/29/2011

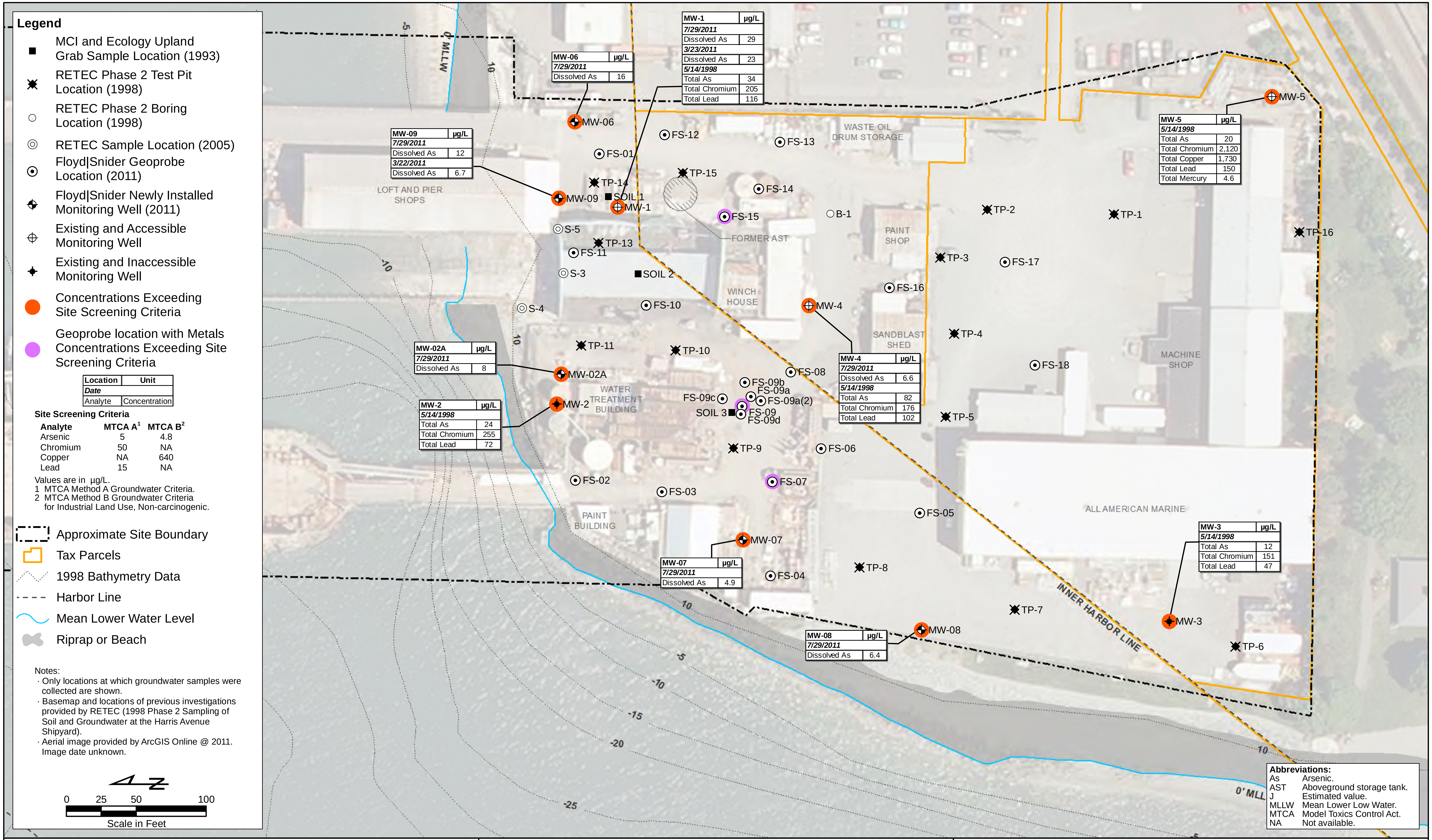

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Figure 5.2
Metal Exceedances in Groundwater

F:\projects\POB-HARRIS\GIS\MXD\RIFS Data Report\Figure 5.2 (Metal Excds in Groundwater).mxd
11/29/2011

Legend

⊙	MCI and Ecology Offshore Grab Sample Location (1993)
▲	Geoengineers Grab Sample Location (1996)
◇	PSDDA Vibracore Sample Location (2003)
▲	RETEC Phase 2 Grab Sample Location (1998)
◎	RETEC Sample Location (2005)
●	RI/FS Grab Sample Location (2004, 2006)
⊡	RI/FS Vibracore Sample Location (2004)
⊗	Floyd|Snider Grab Sample Location (2011)
☒	Floyd|Snider Hand Auger Location (2011)
●	Concentrations Exceeding Site Screening Criteria

Location	Unit
Analyte	Concentration

SMS Site Screening Criteria

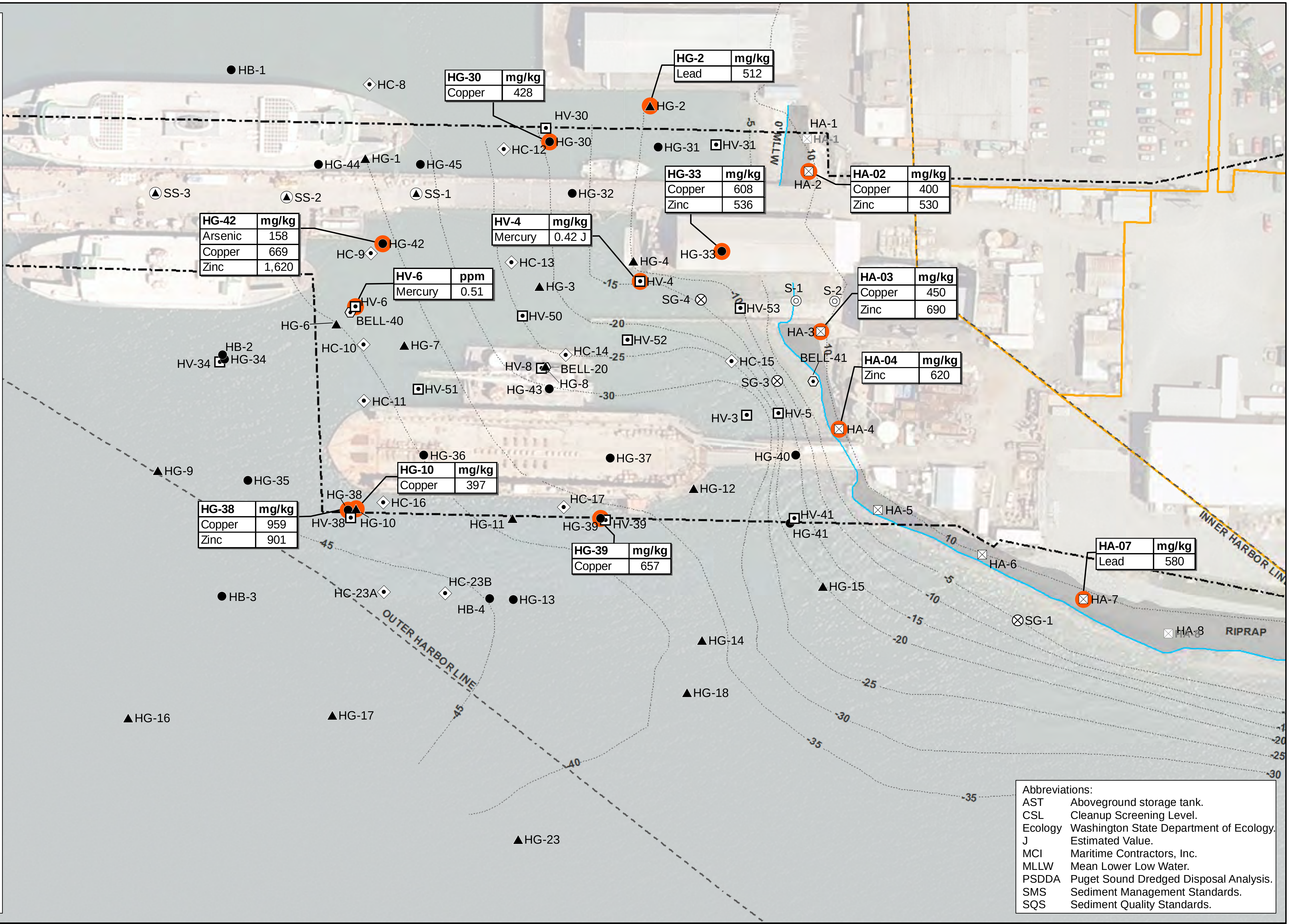
Analyte	SQS	CSL
Arsenic	57	93
Copper	390	390
Lead	450	530
Mercury	0.41	0.59
Zinc	410	410

Values are in mg/kg

⬚	Approximate Site Boundary
▭	Tax Parcels
⋰	1998 Bathymetry Data
- - - -	Harbor Line
∼	Mean Lower Low Water Level
▨	Riprap or Beach

Notes:
- Basemap and locations of previous investigations provided by RETEC (1998 Phase 2 Sampling of Soil and Groundwater at the Harris Avenue Shipyard).
- Aerial image provided by ArcGIS Online @ 2011. Image date unknown.

0 50 100 200
Scale in Feet



Abbreviations:

AST	Aboveground storage tank.
CSL	Cleanup Screening Level.
Ecology	Washington State Department of Ecology.
J	Estimated Value.
MCI	Maritime Contractors, Inc.
MLLW	Mean Lower Low Water.
PSDDA	Puget Sound Dredged Disposal Analysis.
SMS	Sediment Management Standards.
SQS	Sediment Quality Standards.

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Remedial Investigation/Feasibility Study Data Report
Harris Avenue Shipyard
Bellingham, Washington

Figure 6.1
Metal Exceedances in Surface Sediments

Legend

⊙	MCI and Ecology Offshore Grab Sample Location (1993)
▲	Geoengineers Grab Sample Location (1996)
◇	PSDDA Vibracore Sample Location (2003)
▲	RETEC Phase 2 Grab Sample Location (1998)
◎	RETEC Sample Location (2005)
●	RI/FS Grab Sample Location (2004, 2006)
⊡	RI/FS Vibracore Sample Location (2004)
⊗	Floyd|Snider Grab Sample Location (2011)
☒	Floyd|Snider Hand Auger Location (2011)
●	Concentrations Exceeding Site Screening Criteria

Location	Unit
Analyte	Concentration

SMS Site Screening Criteria

Analyte	SQS	SCL
BEHP	47	78
Butyl benzyl phthalate	4.9	6.4
Dibenzofuran	15	58
Fluorene	23	79
Fluoranthene	160	1,200
Phenanthrene	100	480
Benzyl alcohol[1]	0.057	0.073
2,4-Dimethylphenol[1]	0.029	0.029
Phenol[1]	0.42	1.2

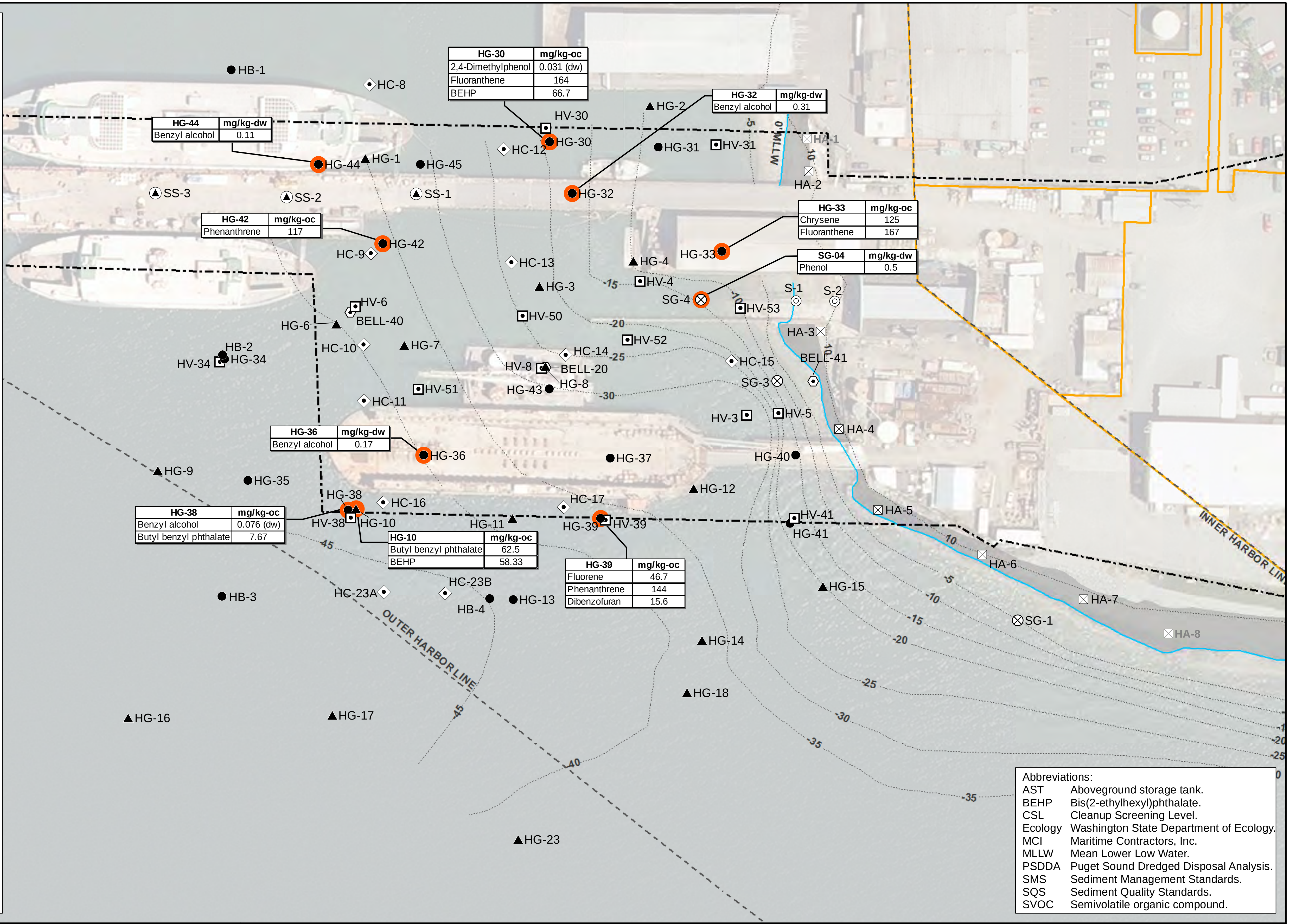
Values are in mg/kg-oc (organic carbon normalized).

[1] These values are in mg/kg-dw (dry weight).

⬚	Approximate Site Boundary
🟧	Tax Parcels
⋰	1998 Bathymetry Data
- - -	Harbor Line
〰	Mean Lower Low Water Level
▨	Riprap or Beach

Notes:

- Basemap and locations of previous investigations provided by RETEC (1998 Phase 2 Sampling of Soil and Groundwater at the Harris Avenue Shipyard).
- Aerial image provided by ArcGIS Online @ 2011. Image date unknown.



HG-30	mg/kg-oc
2,4-Dimethylphenol	0.031 (dw)
Fluoranthene	164
BEHP	66.7

HG-32	mg/kg-dw
Benzyl alcohol	0.31

HG-44	mg/kg-dw
Benzyl alcohol	0.11

HG-33	mg/kg-oc
Chrysene	125
Fluoranthene	167

SG-04	mg/kg-dw
Phenol	0.5

HG-42	mg/kg-oc
Phenanthrene	117

HG-36	mg/kg-dw
Benzyl alcohol	0.17

HG-38	mg/kg-oc
Benzyl alcohol	0.076 (dw)
Butyl benzyl phthalate	7.67

HG-10	mg/kg-oc
Butyl benzyl phthalate	62.5
BEHP	58.33

HG-39	mg/kg-oc
Fluorene	46.7
Phenanthrene	144
Dibenzofuran	15.6

Abbreviations:

AST	Aboveground storage tank.
BEHP	Bis(2-ethylhexyl)phthalate.
CSL	Cleanup Screening Level.
Ecology	Washington State Department of Ecology.
MCI	Maritime Contractors, Inc.
MLLW	Mean Lower Low Water.
PSDDA	Puget Sound Dredged Disposal Analysis.
SMS	Sediment Management Standards.
SQS	Sediment Quality Standards.
SVOC	Semivolatile organic compound.

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Figure 6.2
SVOC Exceedances in Surface Sediments

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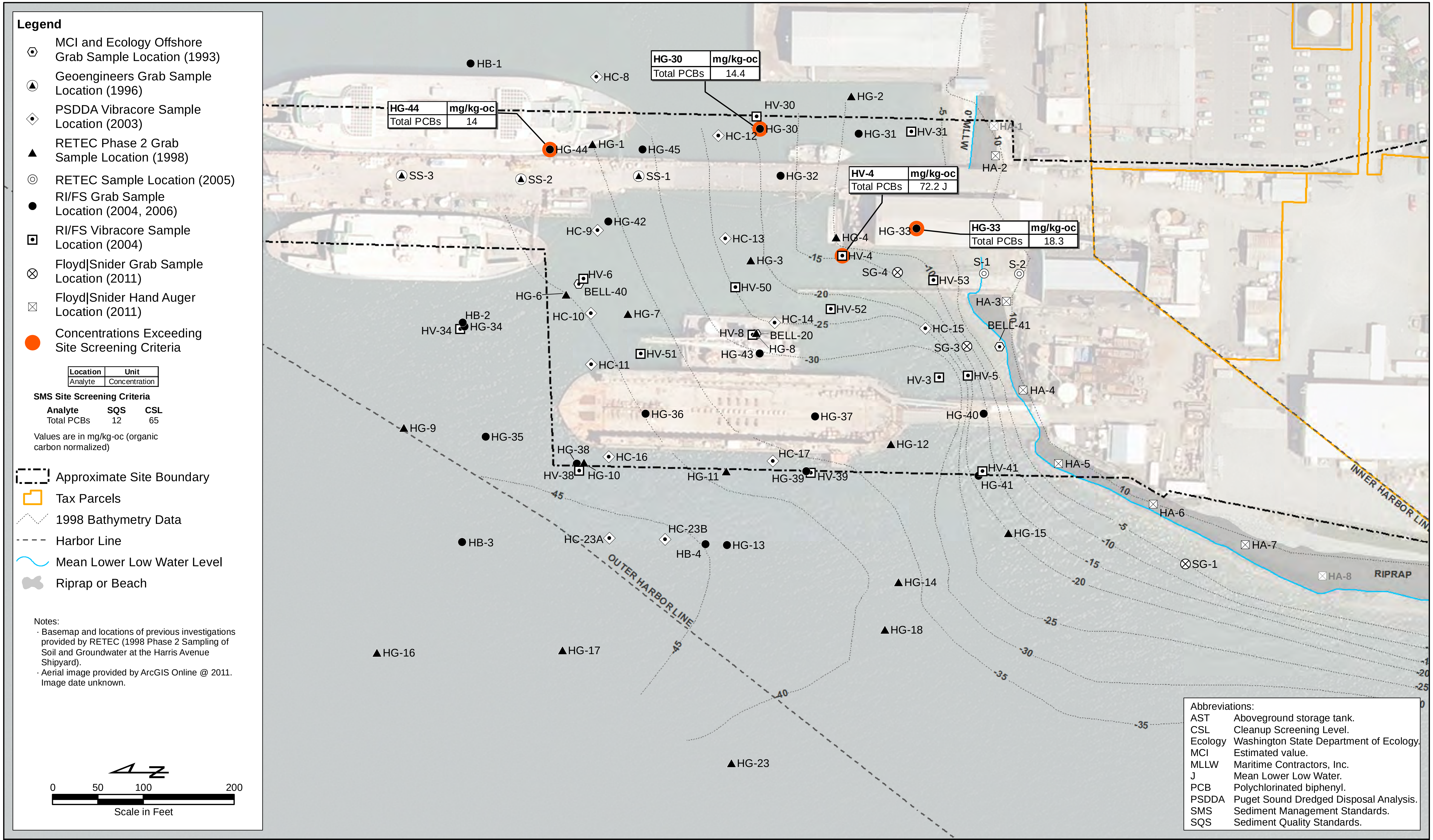
11/29/2011



Notes:

- Basemap and locations of previous investigations provided by RETEC (1998 Phase 2 Sampling of Soil and Groundwater at the Harris Avenue Shipyard).
- Aerial image provided by ArcGIS Online @ 2011. Image date unknown.

Abbreviations:

AST	Aboveground storage tank.
CSL	Cleanup Screening Level.
Ecology	Washington State Department of Ecology.
MCI	Estimated value.
MLLW	Maritime Contractors, Inc.
J	Mean Lower Low Water.
PCB	Polychlorinated biphenyl.
PSDDA	Puget Sound Dredged Disposal Analysis.
SMS	Sediment Management Standards.
SQS	Sediment Quality Standards.

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Remedial Investigation/Feasibility Study Data Report
Harris Avenue Shipyard
Bellingham, Washington

Figure 6.3
Total PCB Exceedances in Surface Sediments

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11/29/2011

Harris Avenue Shipyard

Remedial Investigation/ Feasibility Study Data Report

Appendix A
Cultural Resources Reports

Public Report

Cultural Resources Records Research and Literature Review for the Proposed Harris Avenue Shipyard Supplemental Site Investigation, Whatcom County, Washington

Submitted to

Floyd|Snider
601 East Union Street
Seattle, Washington

Submitted by

HRA
HISTORICAL RESEARCH ASSOCIATES, INC.

Jennifer Gilpin, M.A.
Dawn Vogel, M.A.
Shari Maria Silverman, M.A.
Seattle, Washington

March 1, 2011

Executive Summary

The Harris Avenue Shipyard Site-Wide Remedial Investigation/Feasibility Study (RI/FS) Project (the Project) is located at 102 Harris Avenue in the former town of Fairhaven, which is now the southwest portion of Bellingham, Washington. The shipyard is located in the southeast quadrant of Section 2, Township 37 North, Range 2 East (Willamette Meridian). The Harris Avenue Shipyard is one of twelve sediment cleanup sites around Bellingham Bay, coordinated by the Bellingham Bay Demonstration Pilot Project (the Pilot). The shipyard consists of approximately 7 acres of filled and paved industrial lands. Current activity is located in two active upland and offshore lease areas. The site as a whole has been used for industrial purposes (e.g., canning, ship building, marine repair) since the early 1900s, and portions of the Project area have been filled in significantly.

Floyd|Snider contracted Historical Research Associates, Inc. (HRA) to perform a literature and archival search for recorded cultural resources in the vicinity of the Project area, to assess the potential for encountering archaeological materials during the planned Supplemental Site Investigation as specified in the Final RI/FS Work Plan (Floyd|Snider 2011), and to recommend the best course for future cultural resources activities in the Project area.

HRA focused on an assessment of the nearby recorded archaeological sites and historic-period above-ground structures, as presented in the WISAARD database, but also referred to historic-period maps and other literature about the cultural context of the Project area. Given the archaeologically sensitive nature of this locale – in particular, the southeastern portion of the shipyard, which was along the original shoreline – HRA recommends, as a precaution, targeted archaeological monitoring of well installation and soil sampling in the southeastern portion of the Project area during the Supplemental Site Investigation. HRA also recommends that an architectural historian formally record and evaluate the PAF structures, and any other structures 50 years or older (e.g., the World War II shipways) with regards to their eligibility for listing in the Nation Register of Historic Places prior to the direct and indirect effects posed by future, more invasive, stages of remediation at the Shipyard.

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List of Tables

1.0 Project Description

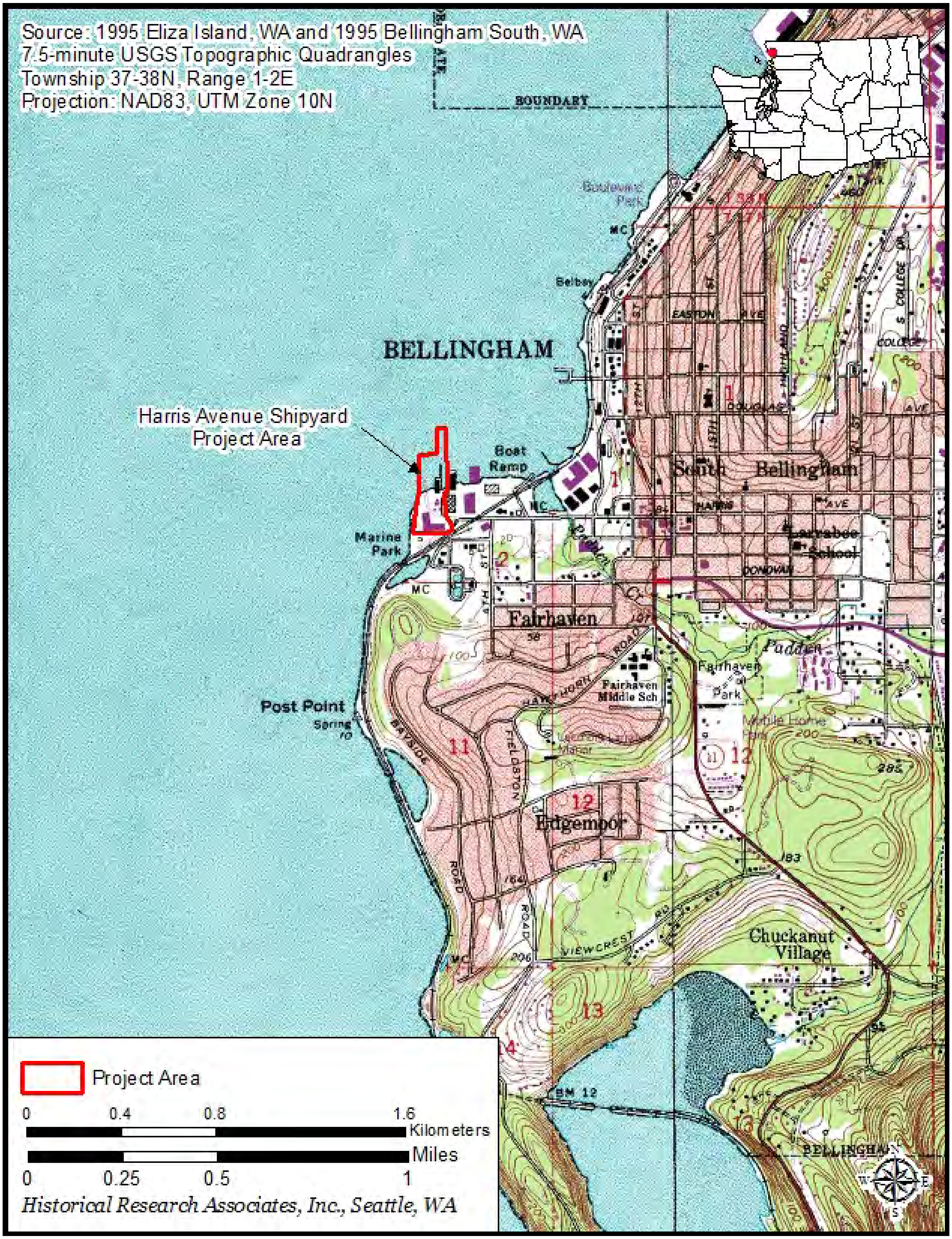
The Harris Avenue Shipyard Site-Wide Remedial Investigation/Feasibility Study (RI/FS) Project (the Project), is located at 102 Harris Avenue in the former town of Fairhaven, which is now the southwest portion of Bellingham, Washington. The shipyard is located in the southeast quadrant of Section 2, Township 37 North, Range 2 East (Willamette Meridian, Figure 1). The Harris Avenue Shipyard is one of twelve sediment cleanup sites around Bellingham Bay, coordinated by the Bellingham Bay Demonstration Pilot Project (the Pilot). The Pilot has been described as "a collaborative effort to find a way to achieve multiple goals in Bellingham Bay through comprehensive strategic environmental planning and well-integrated projects that encompass contaminated sediment cleanup, sediment disposal, habitat restoration, source control, and shoreline property management" (Dugas and Larson 1999:1).

In 2003, the Port of Bellingham (Port) and the Washington State Department of Ecology (Ecology) entered into an Agreed Order (AO) (No. DE-03TCPBE-5670), which described the requirement for a RI/FS for site sediments at the Project area, which Ecology had identified as high priority during the Pilot study. A draft RI/FS was completed for marine sediments in 2004, and amended in 2006. In 2007, the Port and Ecology expanded the scope to a Site-Wide RI/FS, and a new AO (No. 7342) was signed in 2010. For additional background to the Project, including previous environmental investigations, please see Floyd|Snider (2011:1-1, 4-1 to 4-4).

Floyd|Snider contracted Historical Research Associates, Inc. (HRA) to perform a literature and archival search for recorded cultural resources in the vicinity of the Project area, to assess the potential for encountering archaeological materials during the RI/FS study, and to recommend the best course for future cultural resources activities in the Project area. This report contains sections detailing the Project area and regulatory context (Sub-sections 1.1, 1.2); methods used and repositories consulted during research (Section 2.0); the results of archival and background contextual research on the Project area (Sections 3.0 and 4.0); observations made during an on-site visit to the Project area (Section 5.0); conclusions and recommendations for future cultural resources work (Section 6.0); and cited references (Section 7.0). Since this is a public version of HRA’s report, information related to the specific locations of and details about archaeological sites has been redacted in order to comply with RCW 42.56.300 Archaeological Site Public Disclosure Exemption.

1.1 Project Area

The Harris Avenue Shipyard, located on Post Point, at 102 Harris Avenue, Bellingham, Washington, consists of approximately seven acres of filled and paved industrial lands. Current activity is located in two active upland and offshore lease areas: the first (operated by Puglia Engineering) is separated into three parcels, while the second (operated by All American Marine, Inc.) consists of one parcel. The site as a whole has been used for industrial purposes (e.g., canning, ship building, marine repair) since the early 1900s, and portions of the Project area have been filled in significantly (see Section 4.3).



Source: 1995 Eliza Island, WA and 1995 Bellingham South, WA
7.5-minute USGS Topographic Quadrangles
Township 37-38N, Range 1-2E
Projection: NAD83, UTM Zone 10N

Historical Research Associates, Inc., Seattle, WA

Figure 1. Map depicting Project Area location.

Activities proposed for the Project include advancing a minimum of eighteen (18) soil borings in upland areas, nine (9) soil borings in shoreline areas, two (2) borings in the marine railway area, four (4) soil borings around the former Union Soil Aboveground Storage Tank (AST), and three (3) borings around the paint shop and sandblast shed; the excavation of five (5) new monitoring wells in upland areas and five (5) new wells in shoreline areas; and eight (8) hand auger samples of bank/intertidal sediments, along with assorted hand samples of nearshore sediments. These bores are proposed to be limited to fill soils overlaying historical tide flats, in low probability zones for intact archaeological materials (Floyd|Snider 2011:2-7).

Monitoring wells will be drilled using a 4-inch ID auger, using "standard hollow-stem auger techniques," in which split-spoon soil samples will be collected every 2 feet (ft). Soil bore samples will be continuously collected using direct-push technology and a 4-ft sampler. Bank and/or intertidal sediment samples will be collected by hand, using an auger or trowel to scoop up to 12 centimeters (cm) of sediment. Nearshore marine samples will be collected, as needed, by a diver using a 7-inch hand corer excavating up to 12 cm into the sediment column (Floyd|Snider 2011:C-17, C-20-22).

1.2 Regulatory Context

Historic properties compliance for the Project needs to consider Washington State laws, regulations, and programs. These include regulations for the consideration of cultural resources under the State Environmental Policy Act (SEPA) (WAC Chapter 197-11); RCW Chapter 27.44, Indian Graves and Records, which provides for the protection of Indian graves, making it a Class C felony to disturb such sites; and RCW Chapter 27.53, Archaeological Sites and Resources, which addresses the conservation, preservation, and protection of archaeological remains. This law prohibits disturbance of an archaeological site without a permit from the State Department of Archaeology and Historic Preservation (DAHP). The agency administers the Washington Heritage Register, which identifies and documents significant historic and prehistoric resources throughout Washington at the state level.

2.0 Background Research

Background research was conducted by HRA Project Archaeologist Jennifer Gilpin, M.A., and HRA Research Historian Dawn Vogel, M.A. Ms. Gilpin gathered information about previously conducted cultural resource surveys, archaeological sites, cemeteries, and Historic Register properties using DAHP's online database, the Washington Information System for Architectural and Archaeological Records Data (WISAARD). The statewide predictive model layer on DAHP's WISAARD was also reviewed as part of the assessment of the likelihood of identifying cultural resources within the project area.

Additional information on the prehistoric through historic-period cultural context was obtained by Ms. Gilpin and Ms. Vogel through research at the Seattle Public Library, University of Washington's Libraries, Western Washington University's online digital map archives, and HRA's in-house library. Sources referenced at these repositories were used to compile land use history and applicable environmental data.

HRA examined the United States Surveyor General's (USSG) General Land Office (GLO) maps, available online through the United States Department of the Interior's Bureau of Land Management website, to locate nearby historical features that might have left durable archaeological remains. These nineteenth- and early twentieth-century maps indicate locations of then extant historical structures, trails, and features. Although such structures are often no longer present, the maps indicate where historic period activities may have taken place. HRA also examined historic maps produced by the United States Coast and Geodetic Survey and Sanborn Company Fire Insurance Maps to examine the changes in coastline topography and Project area development over the past 150 years. Using ESRI ArcGIS10® software, HRA georeferenced a series of historic-period maps, and these maps are presented in Appendix A.

3.0 Archival Research Results

3.1 Previous Cultural Resource Studies and Cultural Resources

Twenty-five previous cultural resources studies have been conducted in the vicinity of the project area (Table 1). These studies have ranged in scope from a construction monitoring plan targeting a business development in downtown Fairhaven (NWAA 2004), to the larger-scale cultural resources assessment associated with the overall Bellingham Bay Demonstration Project, with the latter report presenting a wide-ranging summary of the prehistory and history of the coastline (Dugas and Larson 1999; Lewarch and Larson 1999). The *Bellingham Bay Demonstration Pilot Project Report*, along with two other cultural resources reports (DeJoseph and Hicks 2006; Salo 1989), was conducted within or covers the immediate vicinity of the Project area.

Table 1. Previous Cultural Resource Studies Conducted in the Vicinity of the Project Area.

Author(s) and Date	Report Title	Within Project Area?
Turbeville 1977	*Illustrated Inventory of Historic Bellingham Buildings, 1852-1915*	No
Sullivan 1981	*County Survey and Planning Program, 1980 Planning Report, Whatcom County*	No
Salo 1989	*Permit Application OYB-I-012456, Port of Bellingham, Alaska Ferries Terminal, Prehistoric Cultural Resource Reconnaissance*	Adjacent and possibly within
Hicks 1992	*Cultural Resources Assessment of Two Parcels of Land in the Fairhaven Area of Bellingham, Washington*	No
Croes et al. 1996	*Cultural Resource Report, Nooksack Salmon Enhancement Association/Nooksack Basin Recovery, Phase III Project, Whatcom County, Washington*	No
Dugas and Larson 1999	*Bellingham Bay Demonstration Pilot Project, Whatcom County Cultural Resource Overview*	Yes
Lewarch and Larson 1999	*Re: Review Comments by M. Leland Stilson, Department of Natural Resources, on the LAAS Bellingham Bay Demonstration Pilot Project, Whatcom County, Cultural Resource Overview*	Yes
NWAA 2004	*Cultural Resources Construction Monitoring and Management Plan for the Harris Square Project*	No

Author(s) and Date	**Report Title**	**Within Project Area?**
Shong 2004	*Results of Archaeological Monitoring for the Harris Square Development in the Fairhaven District, Bellingham, Washington*	No
Wessen 2005	*An Archaeological Survey and Evaluation of the Taylor Dock Uplands Park, Bellingham, Washington*	No
Bush 2005	*Archaeological Investigation Report: Parcel #: 370201-009026-0000 and 370201-013024-0000, Bellingham, Washington*	No
NWAA 2005	*Cultural Resources Construction Monitoring and Discovery Plan for the Waldron Development Project, Fairhaven District, City of Bellingham, Whatcom County, Washington*	No
Shong and Miss 2005	*Cultural Resources Assessment of the McKenzie Square Apartment Project in the Historic Fairhaven District of Bellingham, Whatcom County, Washington*	No
Shong and Miss 2006	*Cultural Resources Assessment of the 11th Street Office Building in the Fairhaven District of Bellingham, Whatcom County, Washington*	No
DeJoseph and Hicks 2006	*Cultural Resources Assessment for the City of Bellingham Post Point Wastewater Treatment Plant Alternative Outfall Project, Whatcom County, Washington*	Adjacent
Reid et al. 2006	*Cultural Resource Assessment of the Property at 1314 Old Fairhaven Parkway in Bellingham, Whatcom County, Washington*	No
Bush and Ferry 2006	*Archaeological Investigation Report: Harris and 15th Streets, Fairhaven, Bellingham, Washington*	No
Gilpin 2007a	*Cultural Resources Assessment for the City of Bellingham Post Point Lagoon Restoration Project, Whatcom County, Washington*	No
Gilpin 2007b	*Supplemental Work for a Cultural Resources Assessment for the City of Bellingham Post Point Lagoon Restoration Project, Whatcom County, Washington*	No
Mather and Gilpin 2007	*Results of Archaeological Monitoring for the Post Point Alternative Outfall Pipe Replacement Project, Bellingham, Whatcom County, Washington*	Adjacent
Bush 2009	*Re: Historic Properties Recommendations for Parcels #370201 – 009026-0000 and 37201-013024-0000*	No
Baldwin and Bialas 2009	*An Archaeological Assessment of the Parkway Gardens Residential Project at TPN# 3702124155500000 and 3702124155370000, Bellingham, Washington*	No
Wessen 2009	*An Archaeological Survey and Historic Property Assessment of the Pattle Point Trestle Project Area, Boulevard Park, Bellingham, Washington*	No
Meidinger et al. 2010	*Archaeological Monitoring Report: Parcels #370201 – 009026-0000 and 37201-013024-0000, Whatcom County, Washington*	No
Wessen 2010a	*An Archaeological Survey of the Boulevard/Cornwall Overwater Pedestrian Walkway Project Area, Bellingham, Washington*	No

*NRHP-National Register of Historic Places
ł-Author's Opinion

Results obtained from the majority of these local surveys indicate a high degree of historic interference with native or Holocene landscapes in the Fairhaven area. Nonetheless, the potential remains for buried prehistoric and historic-period archaeological deposits to be encountered. Table 2 presents the archaeological sites recorded in the vicinity of (but not within) the Project area.

Table 2. Previously Recorded Archaeological Sites in the Vicinity of the Project Area.

Author(s) and Date	Title	Cultural Resource Identified	Eligibility Status*
Edris and Walker 1970	*Western Washington State College Archaeological Field Forms/ Site Survey Form for Site 45WH71*	Lithic Scatter	Undetermined
Grabert 1972	*Western Washington State College Archaeological Field Forms/ Site Survey Form for Site 45WH41*	Prehistoric Midden	Unevaluated
Grabert et al. 1973; Bush and Ferry 2005; Reed and Campbell 2008; Reed et al. 2010	*Western Washington State College Archaeological Field Forms/ Site Survey Form for Site 45WH47*	Prehistoric Midden; some historic components recorded in 2005	Undetermined
Gaston and Swanson 1974a	*Western Washington State College Archaeological Field Forms/ Site Survey Form for Site 45WH56*	Prehistoric Midden	Undetermined
Grabert and Grabert 1975	*Western Washington State College Archaeological Field Forms/ Site Survey Form for Site 45WH60*	Possible Early Historic Debris Scatter	Undetermined
Shong 2004	*State of Washington Archaeological Site Inventory Form for Site 45WH732*	Remains of Historic Saloon structure and associated artifacts	Not Eligible †
Gilpin 2007c	*Site 45WH769*	Intact and historically-disturbed precontact shell midden; potentially historic-period shell midden	Undetermined
Wessen 2009b	*Site 45WH846*	207 piling bases and two concrete blocks	Not Eligible †
Wessen 2010b	*Site 45WH861, North Boulevard Park Piling Complex*	62 pilings, in poor condition and present in irregular spacing	Not Eligible (Woolwage 2010)

*NRHP-National Register of Historic Places
†-Author's Opinion

3.2 Historic Resources

Two historic-period structures have been inventoried in the immediate vicinity of the Project area, although they were declared not eligible for listing in the NRHP (Hansen 1989). Warehouses 7, 10, and possibly 9 of the Pacific American Fisheries (PAF) were recorded in 1989 by Dames and Moore. These warehouses, since demolished, were located directly adjacent to the southeast portion of the Project area, within approximately 200 m. Warehouse 7, located directly east of the southeast portion of the Project area, was built in 1913, constructed of hollow-tile masonry block walls with a brick parapet over a poured concrete foundation. Warehouse 10, located to the east and across a railroad spur from Warehouse 7, was built in

1943. It was designed by architect B. W. Huntoon as a five-sided structure, to accommodate the two railroad spurs and the main line running on all sides. At the time of their recording, Warehouse 10 retained more integrity than Warehouse 7 (Dames and Moore 1989a, 1989b, Thompson 1989).

In the vicinity of (but not within) the Project area, five historic structures and two historic districts are listed on the NRHP and/or WHR (Table 3).

Table 3. Previously Recorded Historic Properties within 1.6 km of the Project Area.

Author(s) and Date	Resource (Trinomial/ID)	Construction Date	Register
Courtois 1988	Wardner House (a.k.a. "Wardner's Castle, 45WH180)	1890	WHR/NRHP
Schneider 1969	Gamwell House (45WH181)	1890-92	WHR/NRHP
Douglas 1973	Terminal Building (45WH182)	1889	WHR
Douglas n.d.	Larrabee House (a.k.a. Lairmont Manor, Mt. St. Mary's Novitiate, 45WH183)	1915	WHR/NRHP
Vandermeer 1981	Bellingham Public Library – Fairhaven Branch (45WH210)	1904	WHR/NRHP
Potter 1976	Fairhaven Historic District (45WH1146/DT00021)	late 1800s to mid-1900s	NRHP/WHR
Pinyard and Felber 2009	South Hill Historic District (DT00227)	late 1800s to mid-1900s	NRHP

3.3 Cemeteries

One historic-period cemetery – Grave Yard Point – is located in the vicinity of the Project area. In 1889, two years after the establishment of Bayview Cemetery, in Bellingham, remains from Grave Yard Point were exhumed for reinterment. Among the individuals interred in Grave Yard Point may have been Lyman A. Cutlar (often misspelled as "Cutler"), a central figure of the "Pig War" that took place in 1859 on San Juan Island – and that almost erupted into a full-blown conflict between the United States and Great Britain (DAHP 2011; Jordan 1974).

3.4 DAHP Predictive Model Analysis

DAHP's predictive model is based on statewide information, using large-scale factors. Information on geology, soils, site types, landforms, and from GLO maps, was used to establish or predict probabilities for cultural resources throughout the state. DAHP's model uses five probability levels: Low Risk, Moderately Low Risk, Moderate Risk, High Risk, and Very High Risk.

The DAHP predictive model map for the Project Area shows that the portions of the Project area located on land are considered to have a high potential for archaeological resources, and survey is recommended. The portions of the coastline, just offshore, are considered low probability, likely due to the multiple episodes of filling along the Bay coastline and the erosional effects of the local tides and waves.

4.0 General Cultural Context

4.1 Pre-contact Period

Several regional chronological sequences have been postulated for the northern Puget Sound, outlining the progression of cultural change after end of the last glaciation and the beginning of the Holocene (Ames and Maschner 1999; Blukis Onat 1987; Hollenbeck 1987; Mierendorf 1986). Blukis Onat (1987) and Mierendorf (1986) developed similar sequences, each addressing changes in settlement, subsistence, and technology through the Holocene in the area now encompassed by the San Juan, Whatcom, Skagit, and Snohomish counties. A summary of this sequence is presented in Table 4. Blukis Onat (1987) and Mierendorf (1986) begin their sequences approximately 13,000 years ago, and the contents of their chronological periods present a gradual, progressive model of cultural evolutionary adaptations. Through these periods, peoples in the Project area would have adapted from generalized mobile foragers to highly organized, marine-based specialists. The lifeways of Native American peoples within the region of the Project area that were observed ethnographically were the result of gradually increasing regional economic specialization, population fluctuation (due in part to introduced Euroamerican diseases), and the combination of incoming Euroamerican populations and technological pressures (DeJoseph and Hicks 2006:6).

Table 4. Northern Puget Sound Cultural Sequence (from DeJoseph and Hicks 2006:6; based on Blukis Onat 1987 and Mierendorf 1986).

Sequence	Description
Generalized Resource Development – Post-Glacial Settlement *13,000-6,000 BP* *Adjustment to Post-Glacial Environment* *8,000-6,000 BP*	Highly mobile groups exploit local resources of subalpine/subarctic environment until ~8,000 BP, then intensify use of local resources as climate becomes warmer and drier in lower elevations. Short-term occupation sites located above modern sea level. Lanceolate projectile points, basalt knives, and cobble tools dominate tool assemblages. Terrestrial and littoral environments are exploited, with possible harvest of anadromous fish resources.
Specialized Resource Development – Developmental Coast Salish *6,000-2,500 BP*	Semi-permanent and seasonal occupation sites appear. Tool assemblages diversify to include groundstone and chipped stone tools, bone and antler tools, and harpoons. There is an intensification of terrestrial, littoral, and marine resources. Shell midden sites appear around 4,000 BP.
Specialized Resource Management – Established Coast Salish *2,500-250 BP*	Similarly to the previous period, semi-permanent and seasonal occupation sites persist. Storage of food sources, expanded land mammal and marine resource use, and development of upriver fishing areas develop. Complex social structures emerge. Modern climactic conditions become established.
Cultural Conflict – Euroamerican Contact *250-150 BP*	European trade goods appear but in traditional use contexts. Regional and local land use practices change dramatically due to Euroamerican contact. There is evidence for population decrease at this time. The horse is introduced in this period.

By approximately 6,000 to 2,500 years ago, sea level stabilization enabled the socio-economic development of the cultural groups known collectively as the Coast Salish. Highly productive intertidal marine resource zones were accessed by native groups, who began to rely more heavily on marine and estuary resources, notably shellfish and salmon. The abundance of faunal and floral resources in marine and inland areas created increasing and more stable populations along the coast, who in turn left archaeological sites with a variety of material remains (Ames and Maschner 1999). This suggested economic diversification is linked to changing environmental conditions. For instance, the increase in the appearance of woodworking technologies (from smaller artifacts to physical structures) during this period may be associated with exploitation of mature cedar forests (Hebda and Matthewes 1984). Many archaeological sites recorded in the region may be representative of this increasingly intensive cultural period.

4.2 Ethnographic Period

The Project area is located within the traditional territories of the Lummi Nation and Nooksack Indian Tribe. Suttles (1951) presents Lummi traditional lands as encompassing the San Juan Islands and the shoreline of Washington from Whitehorn to Chuckanut Bay. By the ethnographic period, in the mid-nineteenth century, the Lummi were recorded as one of several Coast Salish groups (including the Lummi, Sooke, Songhees, the Saanich, Semiahmoo, and the Samish) living in the region of Washington and British Columbia who spoke different dialects of what was identified as the Northern Straits language (Suttles 1990:456). The Nooksack peoples spoke a dialect of Coast Salish that was not understood by speakers of the Northern Straits dialects, and their territories centered around the Nooksack River valley, extending from the Fraser River (in modern-day British Columbia) to the Skagit River, and from Bellingham Bay to Mount Baker (Ruby and Brown 1992). Both the Lummi and Nooksack groups followed a seasonal habitation cycle, with established winter villages and more temporary camps close to major resource locales (Suttles 1990).

Winter villages were composed of one to several cedar plank houses, made of cedar boards lashed to large posts by ropes made from inner cedar bark. Religious ceremonies were held in the main winter house during these months, while satellite structures housed curing facilities for salmon and other fishes and meats. Time was taken during the two to four months of poor winter weather to repair tools and manufacture new objects for use during the year (Ruby and Brown 1992; Smith 1950; Suttles 1990).

As was common with Coast Salish and other Native groups in the Pacific Northwest, the Lummi and Nooksack traveled to seasonal camps in the uplands during the spring, summer, and fall to fish, hunt, gather plant resources, visit, and trade (Suttles 1990). Salmon, meats, berries, and other foodstuffs were cured and dried through the summer and early fall. Native root crops that were relied on by local groups included camas (*Camassia quamash*), onion (*Allium* spp.), and Indian (or wild) carrot (more commonly Gairdner's Yampah [*Perideridia gairdneri*]). Larger mammals, such as deer, elk, mountain goats, and cougars, were all valued for their meat and skins. Plants were collected by the Lummi and Nooksack not only for food (e.g., berries and roots were processed, dried, and stored for later consumption), but functional (e.g., clothing, rope, and building materials) and medicinal purposes (Haeberlin and Gunther 1930; Ruby and Brown 1992).

Within the vicinity of the Project area, Lummi and Nooksack economies, again as was the norm among Coast Salish groups, would have focused on salmon runs and multiple floral and faunal resources within highly productive intertidal zones. Shellfish were generally steamed and dried for winter storage. Salmon not stored away for the winter were traded inland for baskets and basket-making raw materials, toolstone, and other items. Groups continued such trade with

Euroamerican settlers, exchanging salmon for textiles, metal tools, and rope for fishing nets (Suttles 1990). Frequent contact between the Lummi, Nooksack, and neighboring peoples allowed for not only trade and economic interaction, but also social networking. Although the North Cascades are perhaps the most potentially isolating topographic element between the coastal and interior peoples, trails were established through the region well before the arrival of the first Euroamericans (Mierendorf 1986).

As with tribes everywhere in the Pacific Northwest, the traditional ways of life enjoyed by the groups residing in the vicinity of the Project area were severely curtailed, even before Euroamerican settlement began in earnest in the 1850s. Epidemics of smallpox and other infectious diseases preceded the introduction of Euroamerican goods, including guns and other iron tools, changing the dynamic of traditional life and decimating entire villages (Boyd 1999). Once gold was discovered on the Fraser River in 1858 and thousands of white miners streamed into the region, native groups became drastically outnumbered. The Lummi were able to retain their principal village and fish weir sites when they signed the Point Elliott Treaty in 1855, establishing the Lummi Reservation (Suttles 1990: 471). Under this Treaty, the Nooksack were also assigned to the Lummi Reservation, located at the mouth of the Nooksack River; however, in 1973 they gained Federal recognition and were able to establish their own reservation at Deming (Ruby and Brown 1992).

After the establishment of the reservation system, much of the native cultures, languages, and social structures was suppressed. Although many native families chose to live off the reservation, residing in their traditional village sites and claiming homesteads of their own, incoming settlers brought additional pressures (Tremaine 1975). Missionary groups entered the region in the late 1800s and banned such cultural practices as the potlatch. Inevitably, the Lummi and Nooksack, along with other Native groups in the region, faced the decision of whether to participate in the white man's economy. Many found work supplying the Hudson's Bay Company with fish and meat, tasks at which they were already expert. Others participated in the new economies of logging, fur trapping, farming, and sailing (Suttles 1990:470-471).

4.3 Historic Literature and Map Analysis

In 1792, Captain George Vancouver landed in Puget Sound (at present-day Everett) to claim the land for King George III of Great Britain. Joseph Whidbey, a member of Vancouver's party, first surveyed the bay, named 'Bellingham' on Vancouver's chart. Soon afterward, Britain and America were contesting ownership of what are now the states of Washington, Oregon, and Idaho. The argument over the ownership of Puget Sound lands continued for decades, and it was not until 1872, nearly one hundred years after Vancouver's landing, that the Emperor of Germany finally settled the boundary dispute, giving the United States title to the Pacific Northwest lands below the 49th parallel (Schwantes 1996:188).

In the mid-nineteenth century, Euroamerican settlers in Whatcom County encountered dense stands of Douglas fir from shore to mountain. The resulting timber industry flourished, and cleared lands were soon settled and farming established. With the discovery of coal deposits around Bellingham Bay in the early 1850s, mining became an additional industry in Whatcom County for several decades. Mining was enabled at first by expanding Euroamerican settlement in the region, but additionally in the early 1900s by Chinese immigrant labor. By the late 1800s, as fewer areas of uncut timber were available, fishing became the county's primary economy.

One outcome of the fishing industry included a rise in cannery businesses, with more than 12 canneries operating in the county by the end of the 1800s (DeJoseph and Hicks 2006:7).

Fairhaven, the neighborhood to the east of the project area, was first established in 1853 on a 146-acre land claim donation. In 1883, Daniel Harris, owner of the land claim, filed a town plat and then sold the townsite to the Fairhaven & Southern Railway and the Fairhaven Land Company, who immediately sought to develop the town. High-priced lots were sold under the premise that the town would be a terminus for the continental railroad (Edson 1968; Shong 2004). But although the town was linked to settlements north and south by the Great Northern, Northern Pacific and Bellingham, and British Columbia Railroads, a link to the east did not come (Potter 1976). Instead, Fairhaven became a manufacturing town, prospering off the region's fishing, coal, and timber resources (Edson 1968; Shong 2004). The 1900-1901 Bellingham City Directory reported that "Fairhaven is the most notable manufacturing city in the state, having the largest shingle mill and the largest salmon cannery in the world" (qtd. in Carhart 1926:77-78).

In 1903, Fairhaven merged with Bellingham, officially becoming South Bellingham, but retaining the historic Fairhaven name for the neighborhood (Carhart 1926). The Fairhaven shoreline did not originally extend as far to the north and west as it does presently. Sawmills, desirous of being as near to the water as possible, used pilings on the tide flats to extend their holdings toward the deeper water of Bellingham Bay. Over time, the tide flats were filled in, first with waste wood and later with earth. Beginning in 1899, Deadman's Point, a 60 foot tall bluff near the Fairhaven waterfront, was gradually removed and used to fill in the tidelands, a process which took a number of years (Courtney 1950:70, 72; Van Miert 2004:233). Figure 2 shows the approximate location of the Project area overlain on a 1966 map, showing areas of filled or otherwise unconsolidated ground (Washington Surveying and Rating Bureau 1966).

During the last decade of the nineteenth century, historic maps of the Fairhaven area do not extend as far west as the Project area. Appendix A presents a series of historic-period maps, showing the approximate location of the Project area: the majority of the Project area was located in the near-shore, tidal zone. After the town's consolidation with Bellingham in 1903, subsequent maps show fish processing facilities along the expanding shoreline and in the vicinity of the Project area (Figure 3). In 1904, the Pacific American Fisheries Co. occupied a large property several hundred feet east of the Project area, while the Washington Packing Co.'s Salmon Cannery and the offices of the Fairhaven Land Company occupied a dock directly to the east of the Project area. The shoreline had not changed drastically from the 1891 shoreline at this point, so most of the Project area was still a part of Bellingham Bay. The Hackett Cold Storage Co. occupies a small space at the eastern edge of the Project area. This map also shows a hill to the southeast of the Project area designated as "being removed by hydraulic process" (Sanborn 1904).

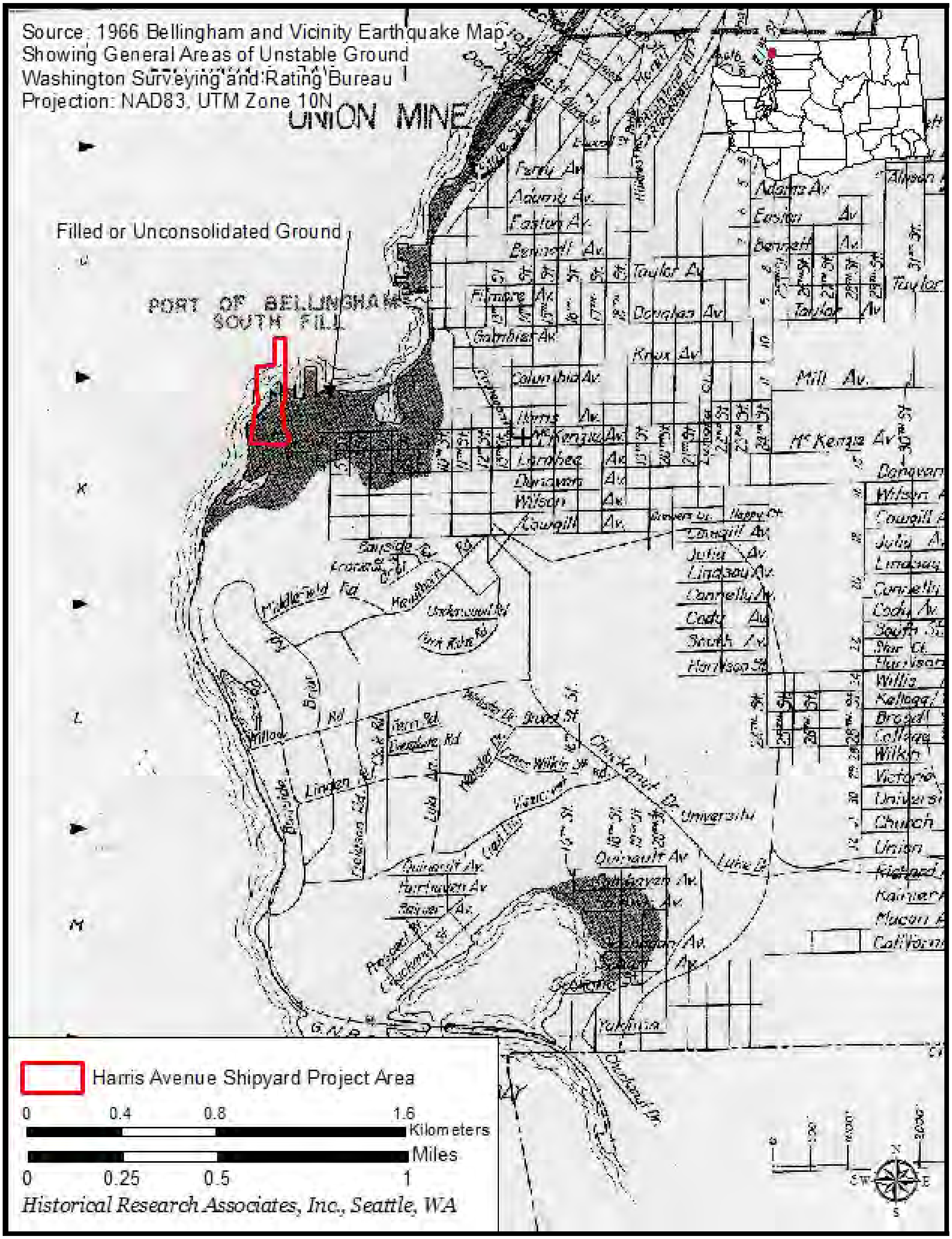


Figure 2. Project Area overlain onto Bellingham and Vicinity Earthquake Map, Washington Surveying and Rating Bureau (1966), showing areas of filled or unconsolidated ground.

By 1913, the shoreline had not changed much, but new docks and companies lined its edges. The Bellingham Canning Co.'s Salmon Cannery occupied a smaller dock to the west of where the Washington Packing Co. and Fairhaven Land Company dock had formerly been. Hackett Cold Storage remained in the easternmost portion of the Project area, although this company was noted as not being in operation. The map also shows the edge of a steep bluff, located at the same place as the hill on the 1904 map. This bluff appears to be about half the width it was on the earlier map. Harris Avenue extends through the center of the hill, running east to west. Also of interest are projected lines for the shoreline, which closely mirror the present day shoreline (Sanborn 1913).

The 1950 Sanborn map does not show the entirety of the South Bellingham shoreline, though the shoreline clearly extended farther north and west than in 1913. The land and docks that were shown on the map were occupied almost entirely by the Pacific American Fisheries, Inc. Their holdings included cannery buildings and a ship yard, the latter of which appears to be at the easternmost edge of the Project area, replacing the Hackett Cold Storage building. A new wharf north of the shoreline is similar in shape to the present-day eastern-most pier (with loft and pier shops) within the Project area, though the current dock has been extended farther north (Sanborn 1950).

The Hackett Cold Storage Co. was a Boston-based company that constructed their facility in Fairhaven in 1903. The *Fairhaven Times* for May 16, 1903, mentioned that the company would lease land at Dead Man's Point from the Fairhaven Land Co. to construct a cold storage and shipping plant for fresh fish (*Fairhaven Times* 1903a). This building was to be "a two story building, 150x200 feet,… divided into suitable rooms and equipped with refrigerating machinery large enough to maintain suitable temperature in a structure capable of treating and storing 150 carloads of fish" (New Plant and Improvements 1903:245). Machinery for the plant arrived in Bellingham in July of 1903, and construction began the next month (*Fairhaven Times* 1903b; *The Weekly Blade* 1903a). Although the facility was not fully complete until after October of 1904, by October of 1903, the citizens of Fairhaven were able to throw an "impromptu celebration" on the roof of the Hackett building, where they celebrated the consolidation of Fairhaven with Whatcom to form Bellingham (New Plant and Improvements 1904:154; *The Weekly Blade* 1903b).

The Pacific American Fisheries Company (PAF) came to Bellingham in 1899, when the Chicago-based company Deming and Gould purchased the Fairhaven holdings of the Franco American North Pacific Canning Company, which had declared bankruptcy after only a single season of operations. PAF expanded the operations of this cannery almost immediately, building a second cannery facility to the west of the original Franco American cannery, which was on pilings near the Ocean Dock. Although the company changed ownership a few times in the early years of the twentieth century, by 1905 the cannery was in PAF's hands and the company was well on their way to productive operations in the Bellingham area (Radke 2002).

In addition to their cannery facilities, PAF also built a shipyard at Commercial Point. The company purchased additional land and the holdings of the Hackett Cold Storage Co. in 1915, which expanded their holdings into the Project area. In order to enable access to the shipyards, PAF cut a road through the hill that stood between their holdings and the western shoreline, thus extending Harris Avenue to the shipyard (Figure 4). The dirt removed from the hill was placed behind bulkheads in Bellingham Bay, extending the shoreline with this fill. The shipyard opened

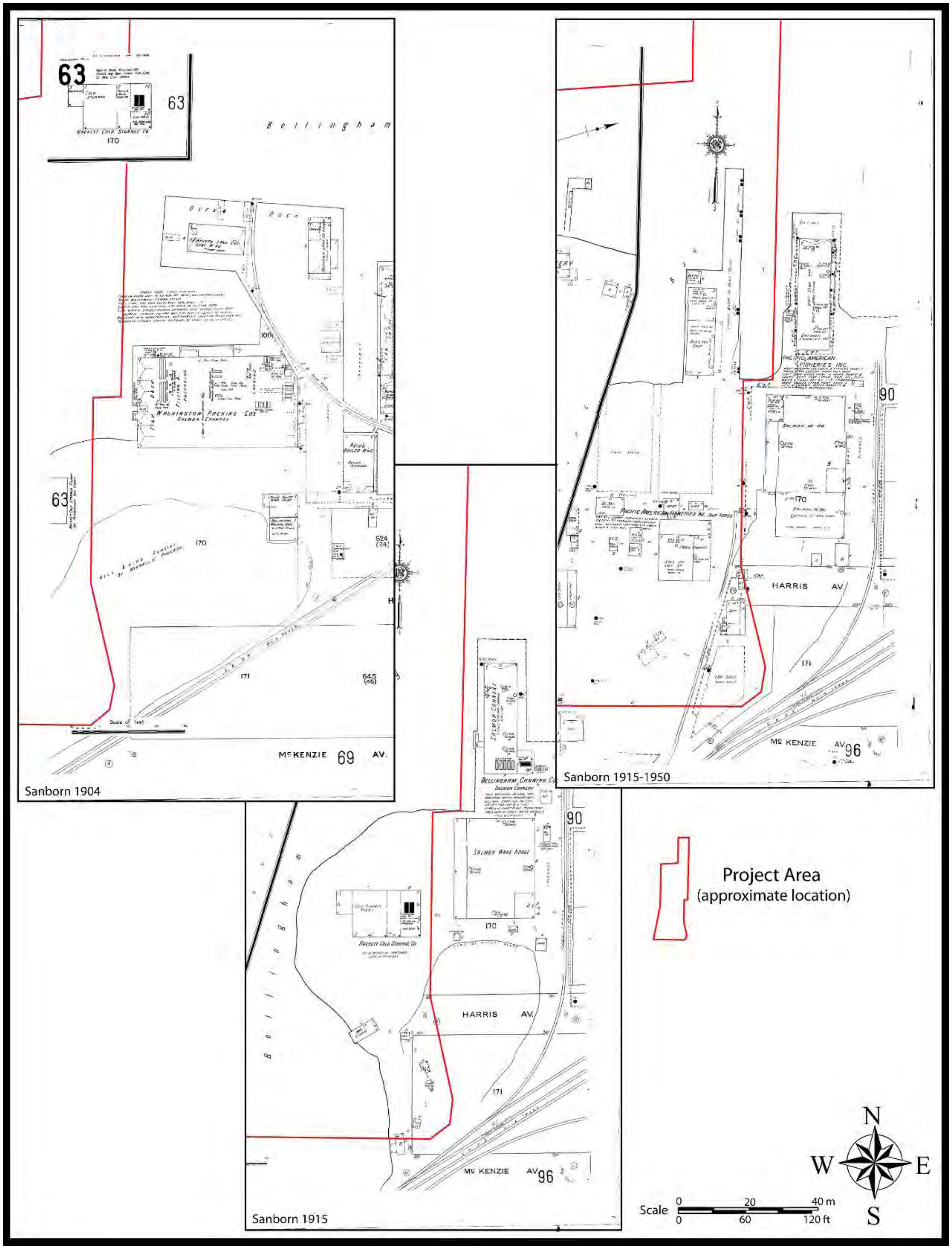
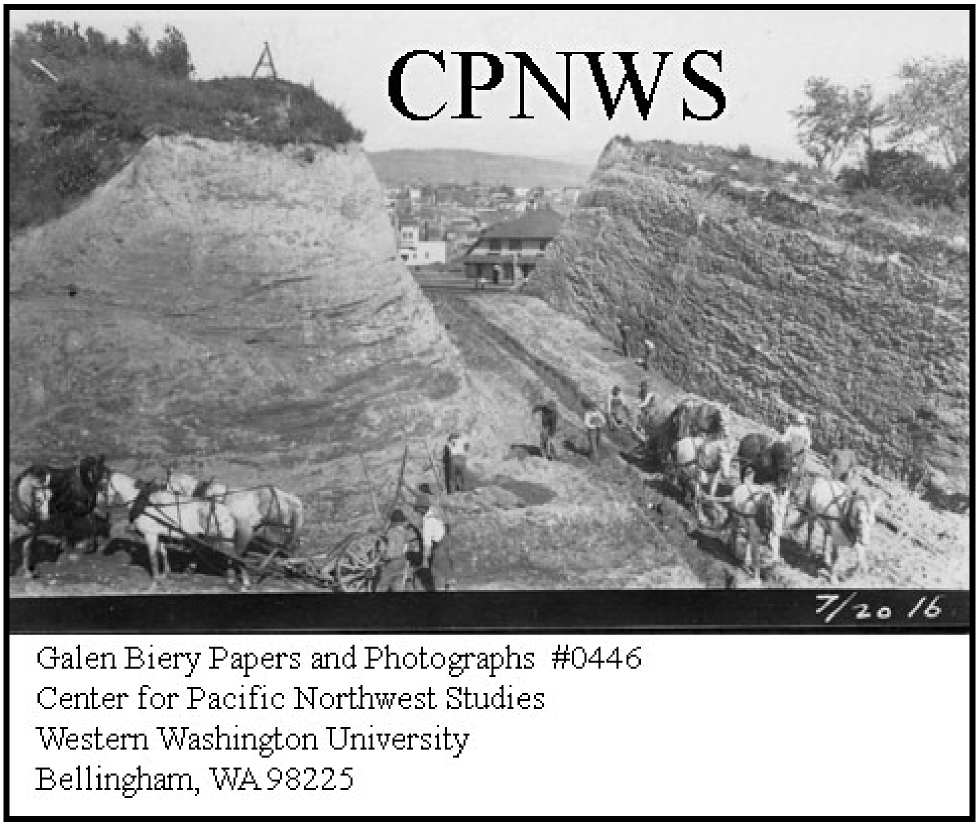


Figure 3. Figure showing the approximate location of the Project area overlaid onto Sanborn Fire Insurance Maps from 1904 through 1950.



Galen Biery Papers and Photographs #0446
Center for Pacific Northwest Studies
Western Washington University
Bellingham, WA 98225

Figure 4. Photograph from early 1900s showing "Construction of Harris Avenue" (Unknown Photographer 1900-1920. Image ID Number 446 from the Galen Biery Papers and Photographs Collection, Center for Pacific Northwest Studies, Western Washington University, Bellingham, Washington, 98225-9123).

in 1916, and PAF built oceangoing wooden steamers for their own use as well as for the Emergency Fleet Corporation of the U.S. Shipping Board during World War I. The shipyard closed in 1919, as the government no longer required wooden steamers, and a conversion to a shipyard producing steel ships was too expensive (Radke 2002:105-106, 111).

A 1933 fire at the Bellingham PAF cannery destroyed a warehouse, commissary building, and dock. The warehouse was one of the oldest structures in this portion of PAF's holdings (Radke 2002:142). Further difficulties for the company came in the form of legislation to ban the use of fish traps in the waters of Washington State. PAF shifted their fish catching activities to Alaska. The facilities in Bellingham were still used to outfit Alaska fishing operations, for the handling and storage of salmon, and for boat building and maintenance activities (Courtney 1950:97-100; Dames & Moore ca. 1989).

Despite the decreased salmon catch in the years that followed this legislation, the company increased their Bellingham holdings in the late 1930s, when PAF purchased the holdings of the Bellingham Canning Company at Commercial Point. This cannery was larger than that of PAF, and they moved the salmon packing activities to the larger facility, using their old cannery as a warehouse. Additionally, PAF completed the removal of the hill that had been bisected by Harris Avenue, and used this fill to expand their former shipyard, which again became operational. The shipyard was leased to the Northwest Shipbuilding Company in 1941, and once again used to construct ships for the American World War II effort (Radke 2002). A dry dock from this era of the Project area's use is still located in the northwest portion of the Project area (See Section 5.0).

Alaskan fishermen were no longer allowed to use fish traps after 1959, and PAF began the process of phasing out their Bellingham facilities. The Port of Bellingham purchased the Pacific American Corporation's holdings in Bellingham in 1966 in order to expand their own ocean shipping terminal. As of 2002, only a single building from the PAF complex remained standing—a brick office building that dated to the 1930s, and had been remodeled to serve as a bus and train station (Gilliland 1989:77; Radke 2002:168-169; Whatcom Museum of History and Art 1970:14, 61).

5.0 Results of Field Visit to Project Area

HRA geoarchaeologist Shari Maria Silverman visited the Project area on February 17, 2011. She was escorted around the Project area by Puglia safety officer Lisa Gouin. Before meeting with Gouin, Puglia employee Joel Underwood escorted Silverman to the Port's Shop and Loft offices. During their brief walk, Underwood discussed some Project area history. Underwood indicated that the Port of Bellingham owns historic images of the shipyard, and keeps them onsite (Underwood, personal communication with Silverman, February 17, 2011).

The field visit provided evidence that the shipyard uses both old and new equipment throughout the Project area (Table 5; Figures 5 through 8). Much of the information in Table 5 (Locations A through C, and E through H [Figure 9]) comes from unverified verbal sources (i.e., Gouin and Underwood, personal communication, February 17, 2011). The mobile dry dock (D [Figure 9]) is assumed to be the one discussed in Floyd|Snider (2011:2-3). Less historical information was provided to Silverman about the American Marine portion of the Project area (J through L [Figure 9]). Online assessor data was inconclusive as to the dates of various structures in the Project area: if and when the RI/FS may include above-ground developments or disturbances, this historical information should be researched and confirmed. Buildings and structures not listed in Table 5 include numerous small paint buildings and water tanks on the southwest portion of the property. Their ages are all uncertain.

Table 5. Buildings and Structures Observed During the Field Visit, Aside from Modern Paint Sheds and Buildings.

Location on Map	Feature		Possible Age or Era
	Current Use	Past Use	
A	Loft and shops (Figures 5 and 7)	P & A wooden ship building area	1929 (Gouin, personal communication, February 17, 2011)
B	Floating dry dock (stationary) with ramp and pier	Same (Repaired World War II [WWII]ships there)	WWII (Gouin, personal communication, February 17, 2011 [age of ramp and pier are unknown])
C	Marine rails (Figure 7)	Marine rails	Used before all infilling occurred (Underwood, personal communication, February 17, 2011)
D	Floating dry dock (mobile) (Figure 8)	Unknown applicability	Unknown; possibly 1982 (Floyd|Snider (2011:2-3).
E	Barge crane (mobile)	Barge crane (mobile)	60 years old (Gouin, personal communication, February 17, 2011)
F	Main pier (Figure 8)	Main pier	Northern section: 1996 Southern portion: 1950s (Floyd|Snider 2011:2-5).
G	Finger dock	Unknown applicability	Unknown, but unstable
H	Port of Bellingham Harris Shipyard Offices	AROAC Building	Current building recent (age unknown); original building burned down (Gouin, personal communication, February 17, 2011); pilings might be original
I	Warehouses	AROAC warehouses	Unknown
J	Fabrication and maintenance trailer	Unknown	Unknown
K	Machine shop and other	Unknown	Unknown
L	Unknown (Figure 6)	Unknown	Unknown

The Project area consists of bay, pier, or hardpacked/paved land surfaces. However, there are two small beach locations where shovel probes may be possible: areas 1 and 2 depicted on Figure 9. Both of these locations are 60 m north of the approximate 1891 original shoreline, in the bay (Table 6). Therefore, they consist of an indeterminate amount of fill soils. Shell was visible on the beach between the AROAC building (H [Figure 9]) and the main pier (F [Figure 9]), but these could have originated either from natural or cultural sources. No additional cultural features, other than those associated with the shipyard, such as the rails (G [Figure 9]), were observed in the exposed soil.

Table 6. Locations Where Subsurface Investigations Are Possible.

Location on Map	Description	Relationship to Infilled Area
1	Beach between AROAC and main pier	60 m (200 ft) north of approximate 1891 shoreline (Floyd/Snider 2011:Figure 2.2)
2	Beach between main pier and finger dock	60 m (200 ft) northwest of approximate 1891 shoreline (Floyd/Snider 2011:Figure 2.2)

Figure 5. Photograph showing southern end of shops and loft (A). Photograph faces north.

Figure 6. Photograph showing leased American Marine Shipyard (L) (southern Project area).

Figure 7. Marine rails (G) southwest of shops and loft (A).

Figure 8. Photograph showing main pier (F) (northern Project area) with mobile floating dry dock (D) in right (east) background.

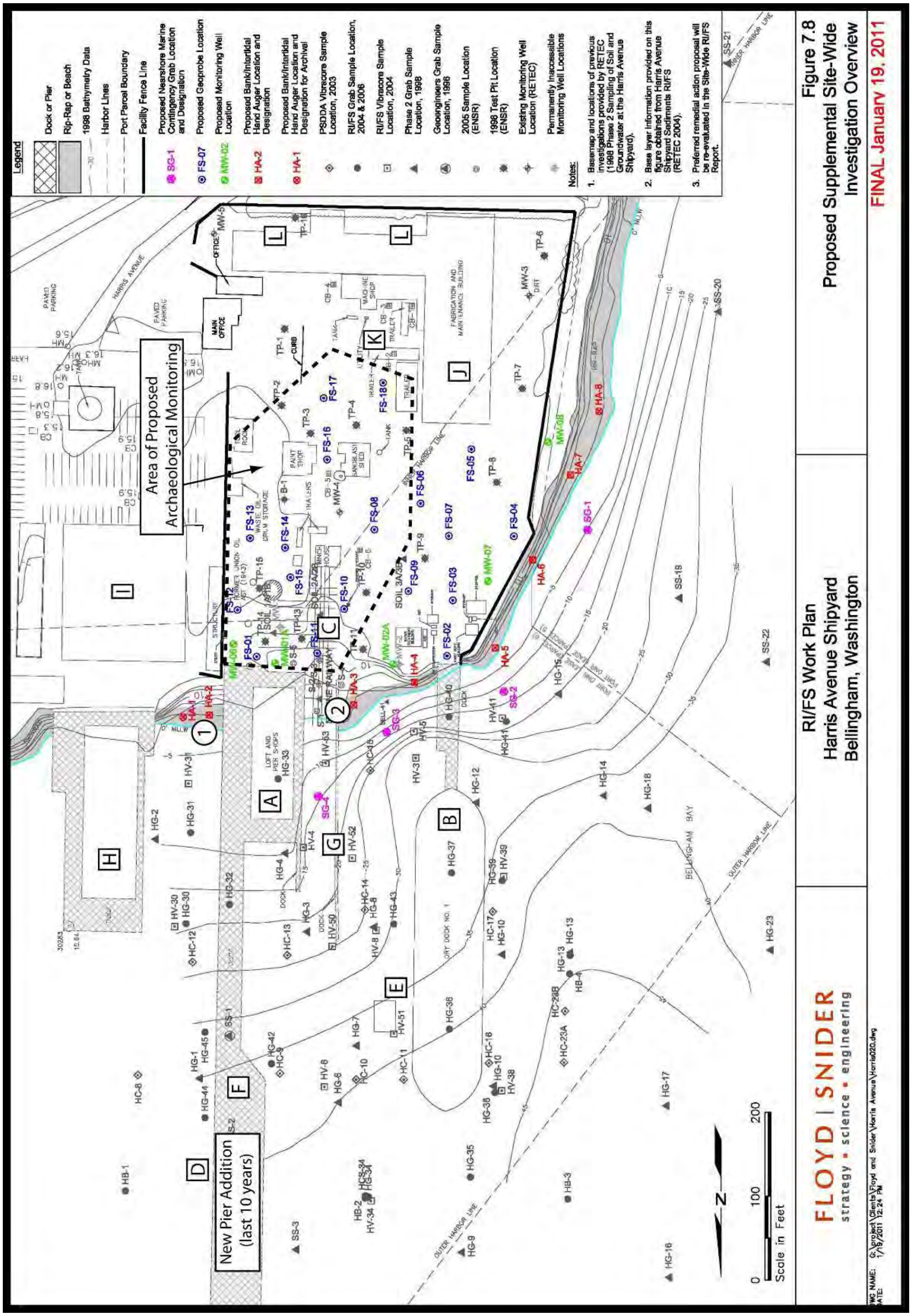


Figure 9. Locations of buildings and structures, and potential subsurface investigations.

6.0 Conclusions and Recommendations

At the request of Floyd|Snider, HRA conducted a literature search ahead of the proposed Supplemental Site Investigation at the Harris Avenue Shipyard, regarded as a high priority portion of the Bellingham Bay Demonstration Pilot Project. HRA focused on an assessment of the nearby recorded archaeological sites and historic-period above-ground structures, as presented in the WISAARD database, but also referred to historic-period maps and other literature on the cultural context of the Project area.

6.1 Anticipated Finds

6.1.1 Pre-Contact to Ethnographic-Period

HRA anticipates that intact or redeposited archaeological materials may be observed in the Project area, beneath what may be shallower fill, and particularly in the southeast quadrant. This part of the Project area is behind or near the native shoreline (Appendix A maps).

6.1.2 Historic-Period Materials

HRA anticipates that isolated historic-period archaeological materials, such as glass (both window and bottle glass), cans and fragments, cannery machinery, and assorted tools will be observed in historic-period fill, in the southern portion of the Project area. Multiple historic-period archaeological features are also likely, given the number of structures that have been raised, demolished, and altered within the Project area.

6.2 Recommendations

Given the archaeologically sensitive nature of the vicinity of the Project area – in particular, the southeastern portion of the shipyard, which was along the original shoreline – HRA recommends, as a precaution, targeted archaeological monitoring of well installation and soil sampling in the southeastern portion of the Project area. Figure 9 (in Section 5.0) shows the areas recommended for archaeological monitoring.

As stated in the RI/FS Work Plan (FloydSnider 2011), the currently-proposed soil testing work will target fill sediments, which have the potential to contain archaeological materials. Isolated pre-contact to historic-period finds, observed in what are most likely dredged or graded soils, will in most cases not retain integrity or contribute new information to history (other than an association with the PAF).

The amount of paved and/or otherwise hardened surfaces in the Project area preclude the usual Phase I archaeological survey, which relies on a pedestrian survey and excavation utilizing hand tools. However, the field reconnaissance identified two potential locations for shovel probes (Figure 9). These locations are situated on the beach, in the middle and eastern portions of the Project area, where fill sediments are likely thinner. Proposed sediment testing in these areas would not exceed 12 cm below surface; therefore, shovel probes are not necessary at this time, but may be recommended prior to future remedial activities.

Recording above-ground and archaeological structures and features is not necessary for the proposed initial stages of soil testing, but is recommended to take place before the direct and indirect effects posed by future, more invasive, stages of remediation at the shipyard. Subsurface components of the shipways may have to be recorded upon ground disturbing activities associated with later stages of Project area remediation. Taking into account the number of historic-period above-ground structures on-site, HRA recommends that an architectural historian formally record and evaluate the PAF structures, and any other structures 45 years or older (e.g., the World War II shipways) with regards to their eligibility for listing in the NRHP. If these structures have already been recorded, and the Port has retained these records, HRA recommends that these records be updated as necessary, and that they be submitted to the DAHP in the form of an NRHP eligibility nomination. Extant historic-period features, at this point limited to the shipways tracks in the middle portion of the Project area, should also be recorded on an HPI form or an archaeological site inventory form, as appropriate.

6.3 Accidental Discovery of Archaeological Resources

In the event that archaeological deposits or materials are inadvertently discovered during construction in any portion of the Project area, ground-disturbing activities will be halted immediately. The project contacts at the Port and Floyd|Snider should be contacted. The Port should then contact Ecology, DAHP and the interested Tribes (the Nooksack Indian Tribe and Lummi Nation). The interested parties will be invited to attend an on-site inspection with a Professional Archaeologist contracted by the Prot. The Professional Archaeologist will examine and assess the materials and, if they are found to be intact, potentially significant (i.e., part of a larger site), or otherwise potentially eligible for the NRHP, the involved parties will consult about how to proceed. The archaeologist will document the discovery in a report submitted to DAHP, and this report will be referenced in the Site RI/FS report. Due to confidentiality concerns regarding archaeological sites (per Chapter 27.53 RCW), the report will not be included in the Site RI/FS report (Floyd|Snider 2011:2-7).

6.4 Discovery of Human Remains

If ground disturbing activities encounter human skeletal remains during the course of construction, then all activity that may cause further disturbance to those remains **must** cease, and the area of the find must be secured and protected from further disturbance. The project contacts at the Port, Ecology, and Floyd|Snider should be contacted. The Port will report the findings to the Whatcom County Medical Examiner (ME) and City of Bellingham Police Department in the most expeditious manner possible, and they will also contact DAHP and authorized Tribal representatives. The remains should be covered and should not be touched, moved, or further disturbed.

The ME will assume jurisdiction over the human skeletal remains and make a determination of whether those remains are forensic or non-forensic. If the ME determines the remains are non-forensic, then they will report that finding to the DAHP, who will then take jurisdiction over those remains. The State Physical Anthropologist will make a determination of whether the remains are Indian or Non-Indian and report that finding to any appropriate cemeteries and the affected tribes. The DAHP will then handle all consultation with the affected parties as to the future preservation, excavation, and disposition of the remains, which may include the development of a site treatment plan with a Professional Archaeologist (Floyd|Snider 2011:2-7).

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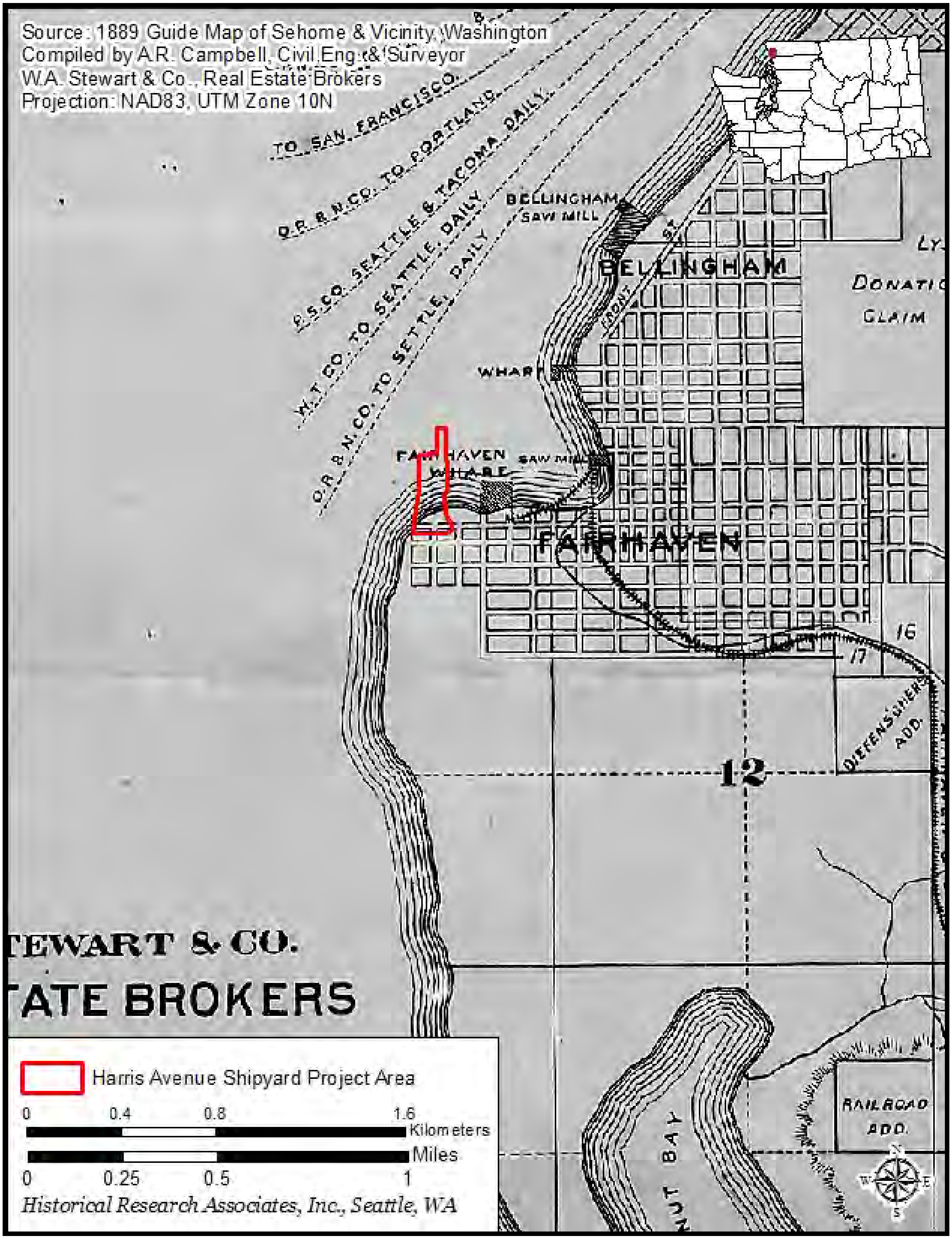
HRA
HISTORICAL RESEARCH ASSOCIATES, INC.

Appendix A

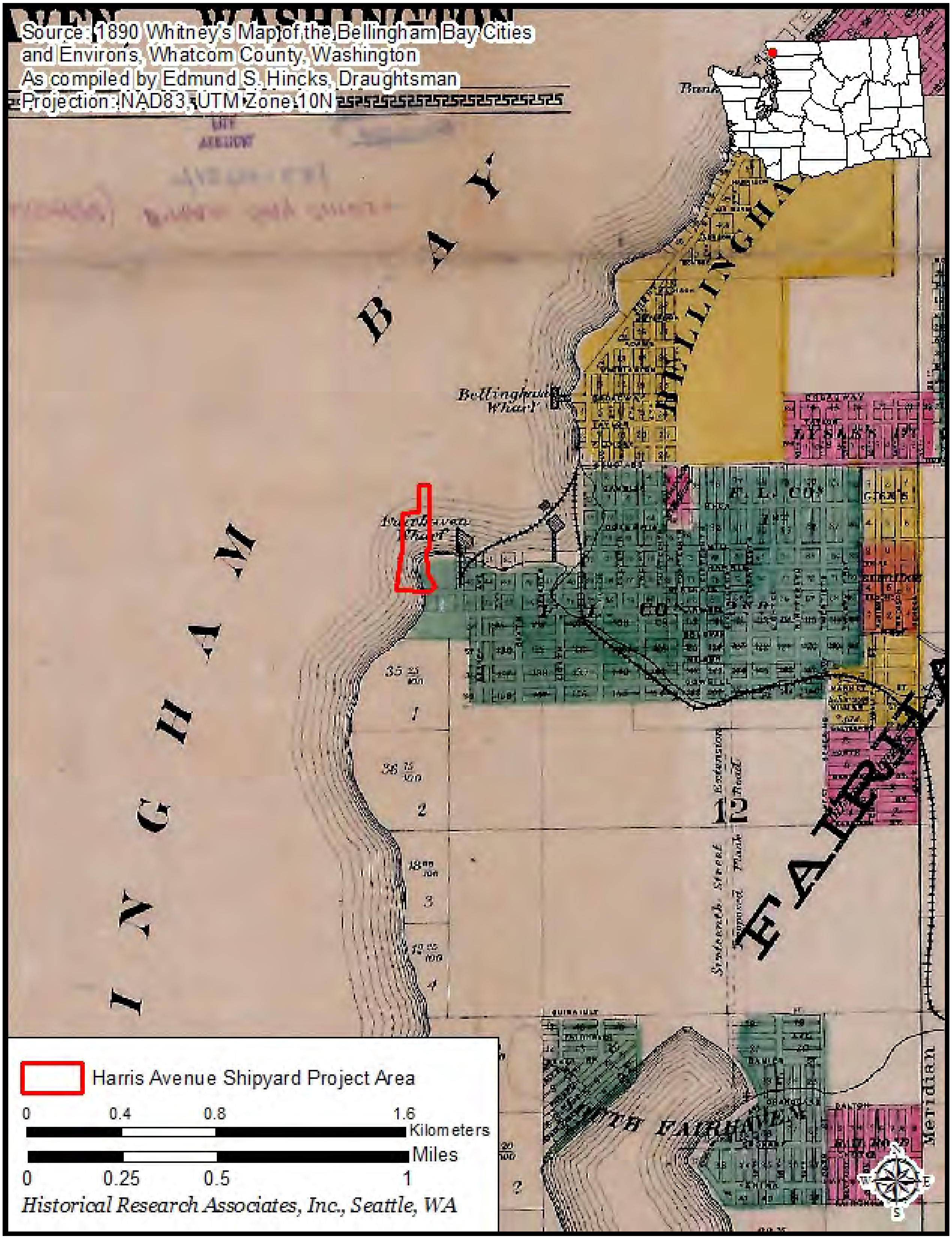
Historic Period Maps Showing the Changes in Shoreline Topography Through Time



Source: 1889 Guide Map of Sehome & Vicinity, Washington
Compiled by A.R. Campbell, Civil Eng. & Surveyor
W.A. Stewart & Co., Real Estate Brokers
Projection: NAD83, UTM Zone 10N

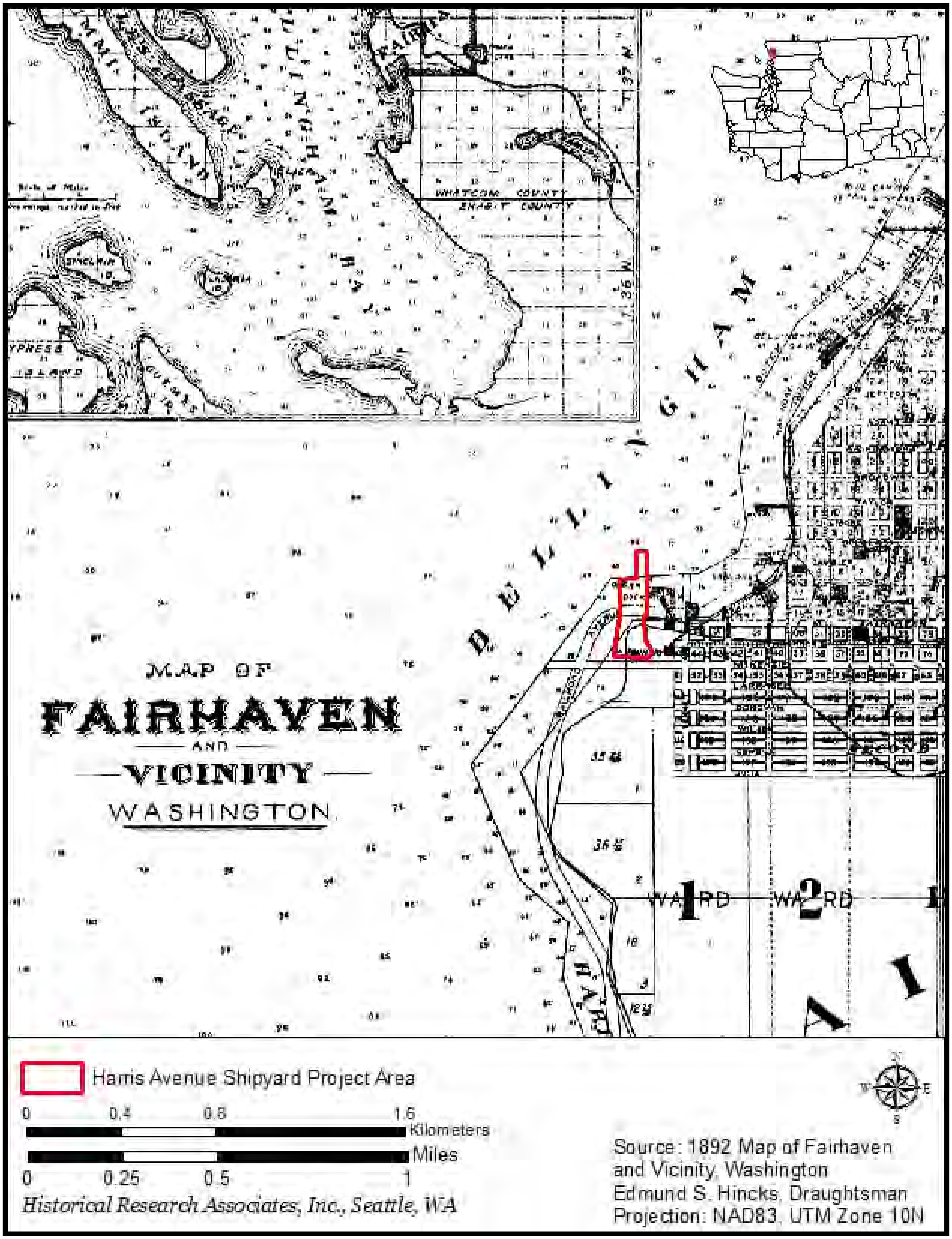
🟥 Harris Avenue Shipyard Project Area

Historical Research Associates, Inc., Seattle, WA



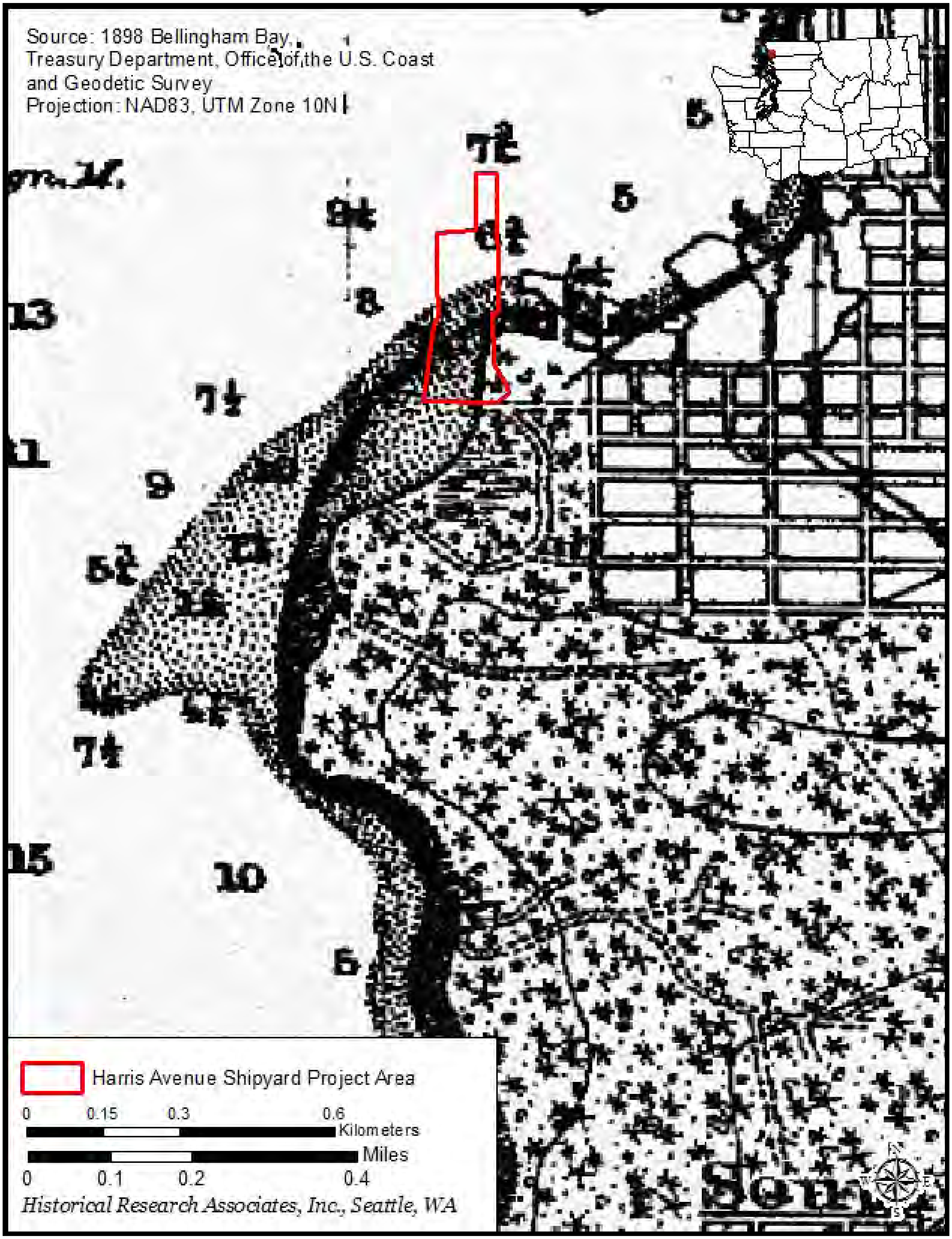
Source: 1890 Whitney's Map of the Bellingham Bay Cities and Environs, Whatcom County, Washington
As compiled by Edmund S. Hincks, Draughtsman
Projection: NAD83, UTM Zone 10N

Historical Research Associates, Inc., Seattle, WA



Historical Research Associates, Inc., Seattle, WA

Source: 1892 Map of Fairhaven and Vicinity, Washington
Edmund S. Hincks, Draughtsman
Projection: NAD83, UTM Zone 10N


Source: 1898 Bellingham Bay, Treasury Department, Office of the U.S. Coast and Geodetic Survey
Projection: NAD83, UTM Zone 10N
Harris Avenue Shipyard Project Area
0
0.15
0.3
0.6
Kilometers
Miles
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0.1
0.2
0.4
Historical Research Associates, Inc., Seattle, WA
N
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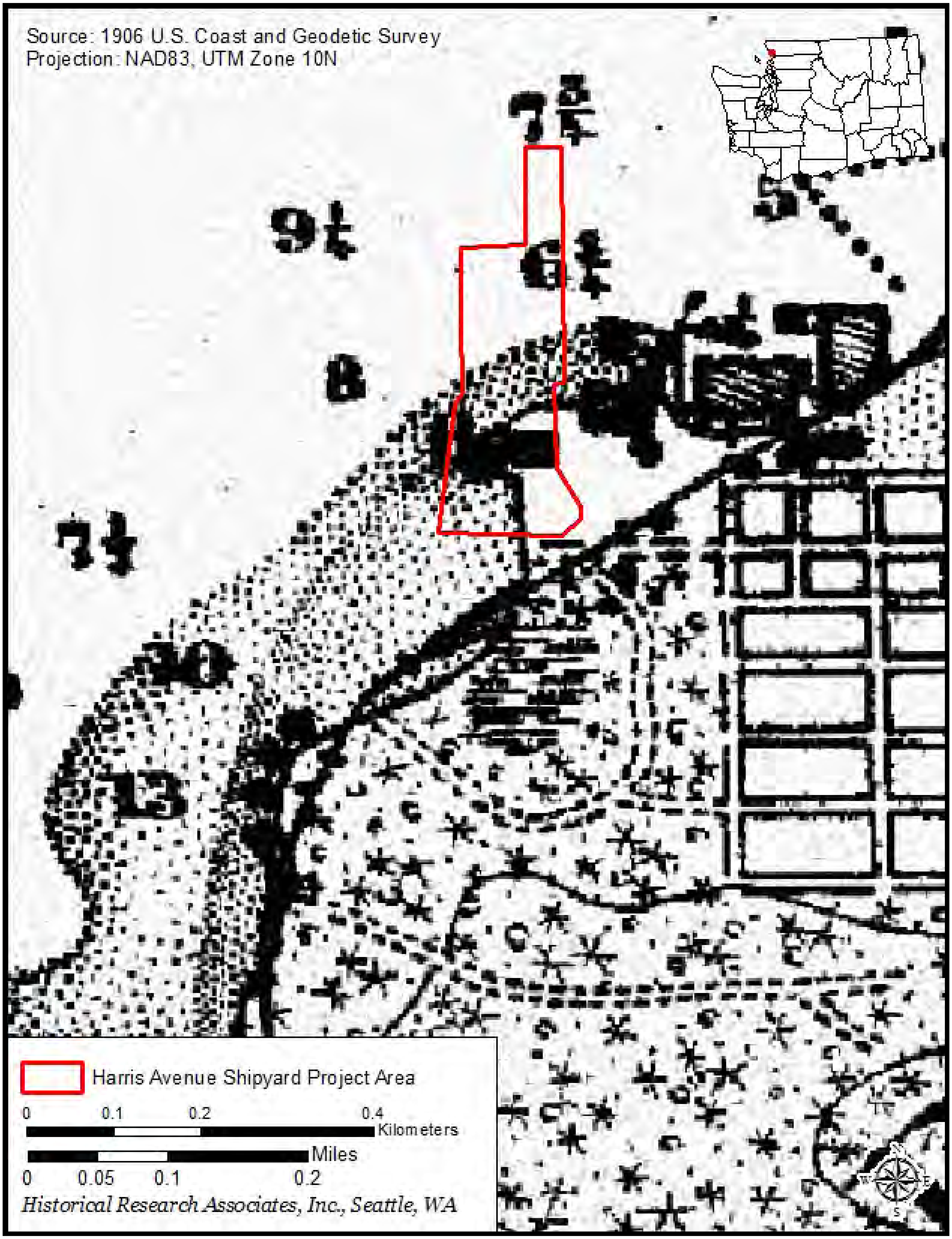
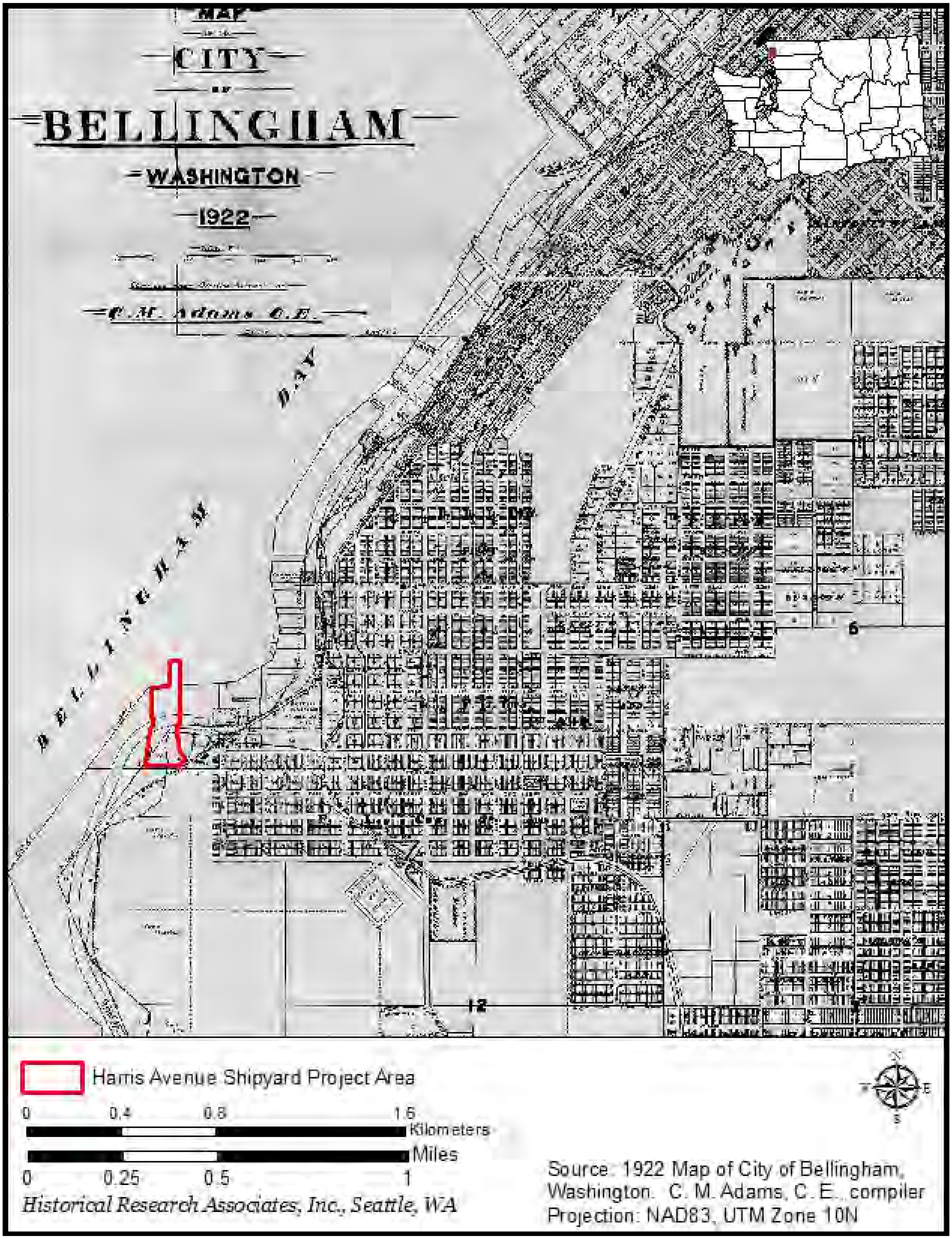


Historical Research Associates, Inc., Seattle, WA



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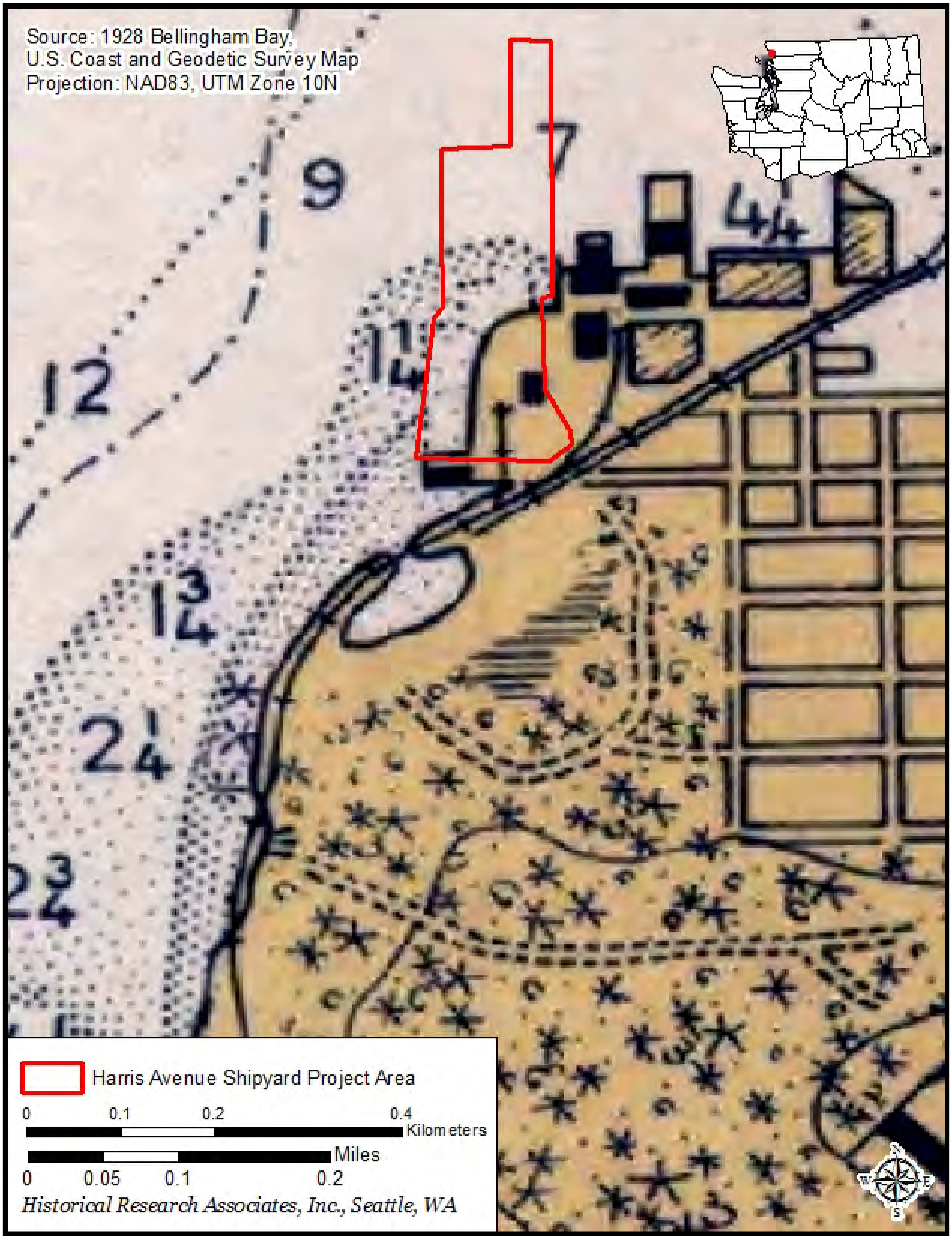
Source: 1922 Map of City of Bellingham, Washington. C. M. Adams, C. E., compiler
Projection: NAD83, UTM Zone 10N



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REDACTED Archaeological Monitoring for the Proposed Harris Avenue Shipyard Supplemental Site Investigation, Whatcom County, Washington

Submitted to

Floyd|Snider
601 East Union Street
Seattle, Washington

Submitted by

HISTORICAL RESEARCH ASSOCIATES, INC.

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Seattle, Washington

August 24, 2011

Executive Summary

The Harris Avenue Shipyard Site-Wide Remedial Investigation/Feasibility Study (RI/FS) Project is occurring at 201 Harris Avenue in Bellingham, in the southeast quadrant of Section 2, Township 37 North, Range 2 East (Willamette Meridian). The Harris Avenue Shipyard is one of twelve sediment cleanup sites around Bellingham Bay coordinated by the Bellingham Bay Demonstration Pilot Project.

In 2003, the Port of Bellingham (Port) and the Washington State Department of Ecology (Ecology) entered into an Agreed Order (AO) (No. DE-03TCPBE-5670), which described the requirement for a RI/FS for site sediments at the project area, which Ecology had identified as high priority during the Pilot study. A draft RI/FS was completed for marine sediments in 2004, and amended in 2006. In 2007, the Port and Ecology expanded the scope to a Site-Wide RI/FS, and a new AO (No. 7342) was signed in 2010. In February, 2011, Floyd|Snider contracted Historical Research Associates, Inc. (HRA), to perform a literature and archival search for recorded cultural resources in the vicinity of the project area (Gilpin et al. 2011). Due to the proximity of several pre-contact archaeological sites to the project area, and the historic-period presence of the Pacific American Fisheries (PAF) facility within the project area, HRA recommended targeted monitoring of soil sampling activities. HRA performed archaeological monitoring March 14 through 16, 2011 at the request of Floyd|Snider. HRA observed cultural materials including isolated metal, brick, and glass artifacts in the historic-period fill layers; these were expected and largely isolated finds, and they were not formally recorded as an archaeological site. HRA also noted buried concrete foundations: Floyd|Snider technicians had previously observed these concrete features in late 2010, during excavations to locate existing utilities. While observing soil sampling, when HRA was not present, Floyd|Snider technicians also observed a potentially in-situ wood piling close to the historic-period shoreline, dated to circa 1913.

The wood piling may be part of a larger structure, for instance a bulkhead or one of the historic-period shipways. Additional research into the historic-period development of the shipyard suggests that several of the bores were drilled through concrete shipway foundations, and the earliest of these structures were shown on maps to be constructed in the early 1900s. The southernmost soil sampling bores that contained concrete appear to correspond with the locations of structures shown on early maps of the PAF shipyard; if these concrete remnants are in fact intact foundations, they may represent some of the only archaeological remains associated with PAF.

The origin and integrity of these buried wood and concrete features is ultimately uncertain, given the limited exposures provided by soil borings and utility excavations. HRA recommends that, as recommended remedial activities take place in the project area–presumably involving the more wide-spread excavation of contaminated sediments–archaeological monitoring take place, as feasible, in the locations where these features were observed in the bore samples. Further exposure of the features will provide an opportunity to assess their composition, potential origin, and integrity. Although no prehistoric archaeological materials were observed during monitoring, the southeastern portion of the project area (the approximate location of the historic-period shoreline) remains moderately sensitive due to the proximity of recorded shell midden sites. HRA also recommends archaeological monitoring of contaminated soil removal, concentrating in the southeastern portion of the project area, and at the approximate interface between historic-period fill and undisturbed native soils (to around a 3 foot depth in the native soils).

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1.0 Introduction

The Harris Avenue Shipyard Site-Wide Remedial Investigation/Feasibility Study (RI/FS) Project (Project) is occurring at 201 Harris Avenue in the former town of Fairhaven, which is now the southwest portion of Bellingham, Washington. The shipyard is located in the southeast quadrant of Section 2, Township 37 North, Range 2 East (Willamette Meridian; Figure 1). The Harris Avenue Shipyard is one of twelve sediment cleanup sites around Bellingham Bay coordinated by the Bellingham Bay Demonstration Pilot Project (the Pilot). The Pilot has been described as "a collaborative effort to find a way to achieve multiple goals in Bellingham Bay through comprehensive strategic environmental planning and well-integrated projects that encompass contaminated sediment cleanup, sediment disposal, habitat restoration, source control, and shoreline property management" (Dugas and Larson 1999:1).

In 2003, the Port of Bellingham (Port) and the Washington State Department of Ecology (Ecology) entered into an Agreed Order (AO) (No. DE-03TCPBE-5670), which described the requirement for a RI/FS for site sediments at the project area, which Ecology had identified as high priority during the Pilot study. A draft RI/FS was completed for marine sediments in 2004, and amended in 2006. In 2007, the Port and Ecology expanded the scope to a Site-Wide RI/FS, and a new AO (No. 7342) was signed in 2010. Additional background information related to the AO process and previous environmental investigations completed at the shipyard are summarized in the RI/FS Work Plan (Floyd|Snider 2011).

In February 2011, Floyd|Snider contracted Historical Research Associates, Inc. (HRA), to perform a literature and archival search for recorded cultural resources in the vicinity of the project area, to assess the potential for encountering archaeological materials during the RI/FS study, and to recommend the best course for future cultural resources activities in the project area (Gilpin et al. 2011). Due to the proximity of several pre-contact archaeological sites to the project area, and the historic-period presence of the Pacific American Fisheries (PAF) facility, HRA recommended targeted monitoring of soil sample borings and the drilling of certain monitoring wells (Figure 9 in Gilpin et al. 2011:30, 32-33).

HRA performed archaeological monitoring on March 14 through 16, 2011, at the request of Floyd|Snider. This report, prepared to the standards set forth by the Washington Department of Archaeology and Historic Preservation (DAHP), includes a brief description of the Project (Section 1.0); a brief summary of the environmental and cultural contexts for the project area (Section 2.0), although the reader is asked to refer back to the literature search (Gilpin et al. 2011) for much of this context; the procedures that were followed during monitoring activities (Section 3.0); the results of monitoring activities (Section 4.0); and the conclusions of the study (Section 5.0), including an inadvertent discovery plan for the Project, which outlines steps to be taken in the event that archaeological materials or human remains are observed after full-time monitoring was completed; and the relevant bibliographic references (Section 6.0).

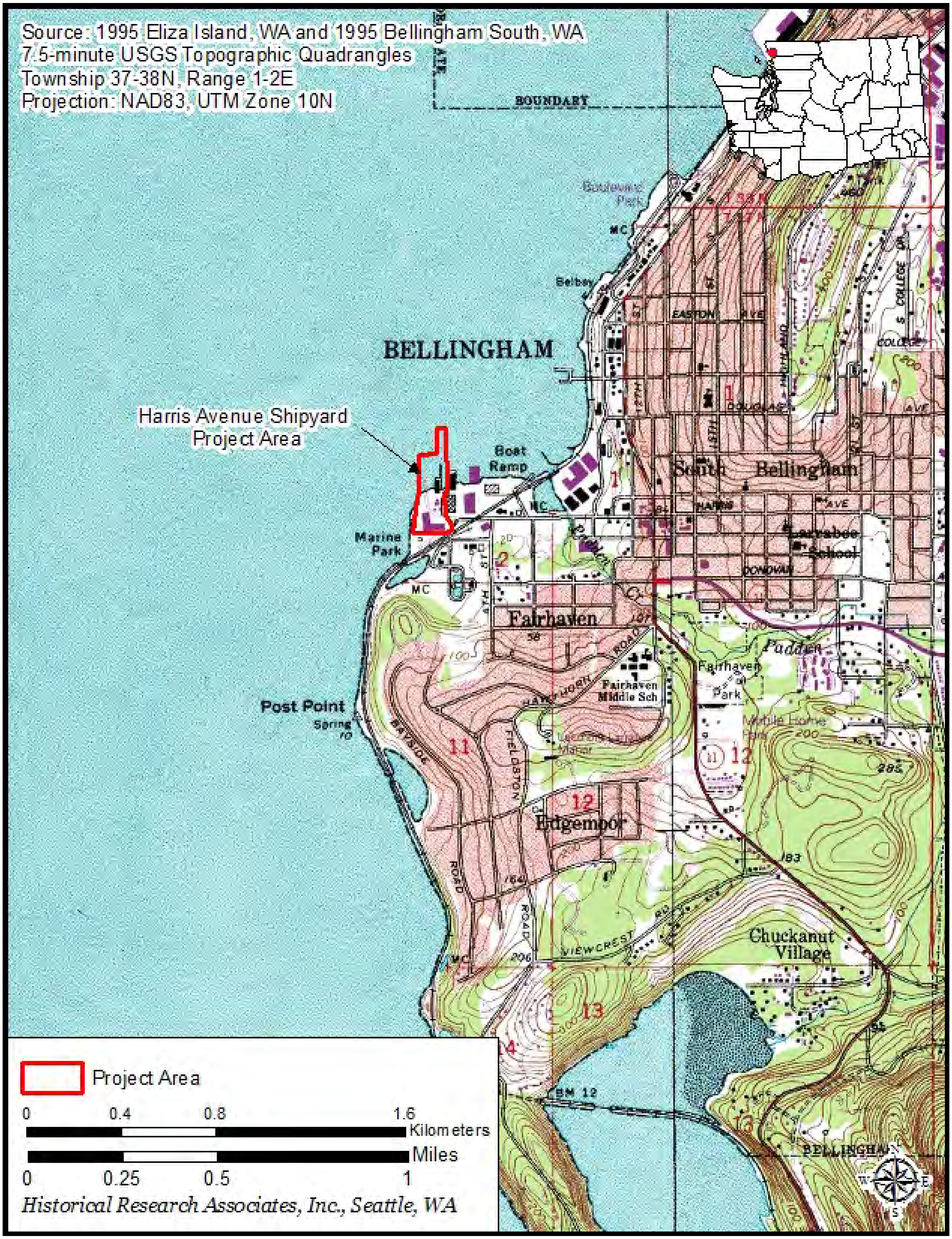

Figure 1. Map depicting project area location.

1.1 Project Area

The Harris Avenue Shipyard located on Post Point, at 201 Harris Avenue, Bellingham, Washington, consists of approximately 7 acres of filled and paved industrial lands. Current activity is located in two active upland and offshore lease areas: the first (operated by Puglia Engineering) is separated into three parcels, while the second (operated by All American Marine, Inc.) consists of one parcel. The site as a whole has been used for industrial purposes, including canning, ship building, and marine repair, since the early 1900s, and portions of the project area have been filled in significantly (see Gilpin et al. 2011, Section 4.3).

Floyd|Snider proposed to conduct a minimum of eighteen soil borings in upland areas, nine soil borings in shoreline areas, two borings in the marine railway area, four soil borings around the former Union Soil Aboveground Storage Tank (AST), and three borings around the paint shop and sandblast shed; the excavation of five new monitoring wells in upland areas and five new wells in shoreline areas; and eight hand auger samples of bank/intertidal sediments, along with assorted hand samples of nearshore sediments. These borings are proposed to be limited to fill soils overlaying historical tide flats, in low probability zones for intact archaeological materials (Floyd|Snider 2011:2-7).

Gilpin et al. (2011) recommended archaeological monitoring of the drilling of eleven soil borings and two monitoring wells in the southeastern and eastern portions of the project area that have the highest potential for containing cultural deposits based on the literature search and review of archaeological sites in close proximity to the shipyard (2011:30-33).

2.0 Summaries of Environmental and Cultural Context

The following paragraphs provide a brief environmental history for the project area, as well as a summary of the cultural context. Complete information about the historic context of the Harris Avenue Shipyard project area is summarized in Gilpin et al. (2011), although additional research has been added here, based on findings during archaeological monitoring.

2.1 Environmental Context

The project area is located in the intertidal zone to approximately 5 meters (m) above mean sea level, on the north and west-facing promontory currently known as Post Point (see Figure 1). Currently, the project area is almost entirely paved or otherwise covered with hard-packed gravels (Figure 2), with little to no vegetation–outside of small weeds and shrubs–that can be considered part of the native community. As will be summarized below, the shipyard has undergone dramatic topographic changes since the early 1900s, during its use for increasingly complex industrial purposes.

Figure 2. Overview of the southern portion of the project area, looking west toward the GeoProbe drill at sample location FS-17.

The soils in the project area have been mapped by the United States Department of Agriculture (Soil Survey) as "urban," meaning paved or otherwise inaccessible. As will be described below, the soils are known to contain at least several feet of fill. However, to the south and east of the project area (within an approximate 0.5 kilometer [km] radius), the Everett-Urban Land and Squalicum-Urban Land complexes are mapped. These soils were formed (respectively) on moraines and terraces from loess and volcanic ash over glacial outwash, and on hillslopes from volcanic ash, loess, and slope alluvium over glacial drift. The northwest-trending, shallow Padden Creek Valley is occupied by sediments in the Urban Land-Whatcom-Labounty complex. The Whatcom segment of these sediments was formed in hillslopes, while the Labounty component tends to form in depressions; both parent materials include volcanic ash and loess over glaciomarine deposits (Soil Survey Staff 2011).

The sediments in this vicinity reflect past environmental influences in the vicinity of the project area, most obviously glacial and volcanic activity. Upon the entrance of humans into Northwest Washington, presumed by most researchers to have taken place by approximately 13,000 to 12,000 years ago, the vicinity of the project area was likely free of its glacial ice cover. At its peak, the Cordilleran Ice Sheet extended as far south as Centralia, Washington, measured 4,000 feet in thickness, and depressed elevations across Puget Sound (Dethier et al. 1995; Porter and Swanson 1998). After approximately 17,000 years ago, continental glaciers in northwestern Washington receded rapidly northward, leaving proglacial lakes and depositing glacial till, drift, and outwash sediments over a majority of the area (Booth et al. 2004). Landforms of Puget Sound responded through rapid isostatic rebound, taking the next several thousand years to achieve equilibrium with sea levels (Beechie et al. 2001; Dethier et al. 1995; Thorson 1981; Waitt and Thorson 1982).

A recent Master's thesis (Gowan 2007) presents an updated coastline reconstruction for southwestern British Columbia and, likely, northwestern Washington. Gowan suggests that, due to the weight of the Cordilleran Ice Sheet, the project area would have been underwater until sometime between 13,500 and 11,000 years ago. Upon glacial retreat, sea levels in the area may have been much lower than present, for the next 7,000 to 9,000 years, making the coastline an indeterminate distance away from the project area (Gowan 2007). This supports nicely the hypothesis put forth by Lewarch and Larson that sites predating 5,800 years ago are likely located offshore (1999:4-5). Climatically, this was probably a warm, dry period with relatively high summer temperatures and more frequent summer droughts than currently recorded. These conditions produced a relatively open canopy of Douglas fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), and red alder (*Alnus rubra*) in a developing parkland forest (Barnosky et al. 1987; Brubaker 1991; Whitlock 1992). By approximately 5,000 to 3,000 years ago, Gowan suggests that the coastline has settled in its approximate location (Gowan 2007). So too had the climate settled into its current maritime regime, with a higher proportion of western hemlock and western red cedar relative to the once dominant Douglas fir, red alder, and various grasslands (Franklin and Dyrness 1973).

2.2 Cultural Context and Anticipated Archaeological Materials

2.2.1 Prehistoric to Ethnographic Periods

As stated above, many researchers now believe that humans were moving through and inhabiting Northern Puget Sound, and perhaps the vicinity of the project area, by approximately 12,000 years ago. Through generalized chronological periods developed by Blukis Onat (1987) and Mierendorf (1986) (Table 1), peoples in the vicinity of Northwest Washington would have adapted from generalized mobile foragers to highly organized, marine-based specialists.

With regards to the period of Euroamerican contact (oftentimes also referred to as the "ethnographic period," the project area is located within the traditional territories of the Lummi Nation and likely the Nooksack Indian Tribe and Samish Tribe. These groups followed a seasonal habitation cycle, with established winter villages and more temporary camps close to major resource locales; several villages are known to have existed around Bellingham Bay, but none are recorded to have been located in the vicinity of the project area (Suttles 1951, 1990).

However, the Bellingham Bay coastline contains numerous shell midden sites, which are one archaeological indication of more stable use and processing of resources. Several examples of likely prehistoric shell midden sites (45WH41, 45WH47, 45WH56, and 45WH769) are located in the vicinity. Although most of these archaeological midden sites remain undated, researchers at Western Washington University in 2008 analyzed the assemblage from 1970s-era excavations at 45WH47, a precontact shell midden site. They determined that the artifacts–and specifically a ground stone labret, obsidian microblade, quartz crystal artifact, and sandstone abraders–date the site to approximately 3,200 to 2,400 years ago (Bush 2005; Reed and Campbell 2008:5; Reed et al. 2010:5).

Table 1. Northern Puget Sound Cultural Sequence (from DeJoseph and Hicks 2006:6; based on Blukis Onat 1987 and Mierendorf 1986).

Sequence	Description
Generalized Resource Development – Post-Glacial Settlement *13,000-6,000 BP* *Adjustment to Post-Glacial Environment* *8,000-6,000 BP*	Highly mobile groups exploit local resources of subalpine/subarctic environment until ~8,000 years before present (BP), then intensify use of local resources as climate becomes warmer and drier in lower elevations. Short-term occupation sites located on river terraces or in inland areas above modern sea level. Lanceolate projectile points, basalt knives, and cobble tools dominate tool assemblages. Terrestrial and littoral environments are exploited, with possible harvest of anadromous fish resources.
Specialized Resource Development – Developmental Coast Salish *6,000-2,500 BP*	Semi-permanent and seasonal occupation sites appear along coastlines and in inland areas. Tool assemblages diversify to include groundstone and chipped stone tools, bone and antler tools, and harpoons. There is an intensification of terrestrial, littoral, and marine resources. Shell midden sites appear around 4,000 BP.
Specialized Resource Management – Established Coast Salish *2,500-250 BP*	Similarly to the previous period, semi-permanent and seasonal occupation sites persist. Storage of food sources, expanded land mammal and marine resource use, and development of upriver fishing areas develop. Complex social structures emerge. Modern climactic conditions become established.
Cultural Conflict – Euroamerican Contact *250-150 BP*	European trade goods appear but in traditional use contexts. Regional and local land use practices change dramatically due to Euroamerican contact. There is evidence for population decrease at this time. The horse is introduced in this period.

Additional examples of shell midden sites are found to the south of the project area (Barg and Owens 2007; Campbell and Meidenger 2006; Gaston and Swanson 1974). Organic samples extracted from shell midden sites 45WH758 and 45WH763 returned calibrated radiocarbon dates of approximately AD 1240-1420 and AD 610-780 (45WH758; Barg and Owens 2007) and 2,660-2,320 years ago (45WH763; Campbell and Meidenger 2006). Therefore, Site 45WH763 may represent an encampment dating to the end of the Developmental Coast Salish period (see Section 2.2.1, Table 1), a time of stabilized sea levels and highly productive intertidal marine resources. No dates are available for 45WH55, but it may be associated with 45WH763 (Campbell and Meidenger 2006).

Given the proximity of the several shell midden sites, HRA anticipated that additional deposits of intact or redeposited midden may be observed in the project area, behind or near the native shoreline (see Gilpin et al. 2001), and archaeological monitoring was recommended for this area of the shipyard (Gilpin et al. 2011:32).

HRA noted that isolated and/or disturbed pre-contact to ethnographic period finds may also be found in the historic-period fill itself, as portions of these sediments were likely obtained from nearby grading projects (Gilpin et al. 2011:31).

2.2.2 Historic-Period

Beginning in the mid-1800s, the land containing the project area was commonly known as Poe's Point, so named because it was on Alonzo Marion Poe's claim. Poe is credited as one of the founders of Olympia, Washington, and moved to Bellingham Bay in 1853. In addition to being a county official, he was a civil engineer by profession, platting Whatcom in 1858 and surveying the first trail to the Fraser River during the gold rush of the same year (Edson 1968).

Much of the project area was intertidal land until after the turn of the twentieth century. In the 1890s, the entire commercial shoreline of Fairhaven, including Poe's Point, was owned by developer Nelson Bennett's Fairhaven Land Company. Bennett was one of a handful of men responsible for promoting real estate speculation around the bay in anticipation of the selection of Fairhaven as the western headquarters of the Great Northern Railway, which proved to be a failed promise. During Fairhaven Land Company's early period of ownership of Poe's Point, the tide flats were filled in, first with waste wood and later with earth. In 1899, the 60-foot hill near the Fairhaven waterfront, which appears to have been located in the southeast portion of the project area, began to gradually be removed. The spoils were used to fill in the tidelands, a process which took a number of years (Courtney 1950:70, 72; Van Miert 2004:233).

Following the railroad balk and a subsequent era of depression, Fairhaven managed to refocus and develop into a viable small community based, economically, around its port. In 1903, Hackett Cold Storage Company of Boston leased a portion of Commercial Point, as it was then known, from the Fairhaven Land Company at the eastern edge of the project area. They constructed a $150,000 cold storage and fresh fish shipping plant consisting of a 2 ½-story factory and three associated outbuildings (Fairhaven Times 1903a and 1903b). The 1904 and 1913 Sanborn Fire Insurance Maps of Bellingham indicate that the facility's primary structure was of heavy construction, likely reinforced concrete, to hold the immense weight of refrigeration and ice-making machinery and equipment (Sanborn 1904 and 1913). The latter map also notes that the facility was no longer in operation beginning in 1907, a fact confirmed by the absence of a Hackett Cold Storage Company listing in annual Polk's Directories published between, and including, those years (Sanborn 1913-1950; Polk's Bellingham City Directories 1907-1913).

In early 1915, Pacific American Fisheries, Inc. (PAF), which operated from an increasingly large complex on the waterway directly east of the project area, announced plans to expand their shipyard. Later that year, they purchased the easternmost section of Commercial Point containing the Hackett Cold Storage facility and the tall, abutting hill. Extensive preparation of the site was required prior to development and use of the land by PAF. This included removing or reducing the hill and increasing the area of the site (Jewell 2008; Radke 2002:106). PAF's development efforts were described as follows in the company's magazine, *The Shield*:

> The yard proper was built by leveling of a great portion of the Point and throwing the debris behind the bulkheading in the Bay. A street was cut through the hill, making an easy entrance to the yard. The main offices and gate are at the end of this cut, while the planer building, molding loft and storeroom were built out on the five-acre dock the company erected….The five ways of the yard are on the northwest front of the yard property….The extreme south side of the yard is the lumber yards, with docking facilities at one end for the largest steamers. The paint shops, blacksmith shops and store houses are located near the Great Northern tracks on the east. The yard is crisscrossed with railway tracks throughout, and trackage is provided to the end of the pier, where the sheer legs handle the installation of the heavier portions of machinery (Pacific American Fisheries 1918).

The cut made through the hill became an extension of Harris Avenue, and the excavated material was used as fill to broaden the new shipyard grounds.

The shipyard opened in 1916, and PAF specialized in building wooden steamships (steamers) for their own shipping needs and those of the U.S. Shipping Board during World War I. By 1917, the shipyard had more than doubled from its original size, and had the capacity to have five ships under construction simultaneously. The shipyard closed in 1919 after the last government ship was completed, and PAF sold its ship-building machinery and equipment to the Bellingham Junk Company the following year. The shipyard continued to be used for boat repairs and storage (Jewell 2008).

In 1937, PAF completed the dredging of the area around Commercial Point and backfilled again to further expand the shipyard. During World War II, Commercial Point was used for the construction of U.S. Army tugboats and freighter vessels by Northwestern Shipyard Company of Seattle, which leased the shipyard from PAF. After 1959, PAF began phasing out their Bellingham facilities. In 1966, the Port of Bellingham acquired PAF's holdings in Bellingham, including the shipyard, in order to expand their own operations (Gilliland 1989:77; Jewell 2008; Radke 2002:168-169; Whatcom Museum of History and Art 1970:14, 61). Since the 1970s, Commercial Point has been Fairhaven Shipyard, serving both public and private interests and uses.

Construction History of the Project Area

Historic-period maps, showing the development of the shipyard over time, have been overlain with the soil sampling bore locations monitored by HRA and by Floyd|Snider. As noted, development of the general area prior to the twentieth century was limited to expansion of Poe's Point, achieved by filling the tidelands with waste wood and excavated earth from the large, neighboring hill. Hackett Cold Storage Company began leasing a portion of Commercial Point in 1903 that included the project area. They built a 2 ½-story factory of heavy construction that was used for large-scale refrigeration and the production of ice. According to the 1904 Sanborn, the Hackett facility also included three 1-story outbuildings adjacent to the main structure. Their uses are not identified and they are not present on the 1913 Sanborn (Sanborn 1904 and 1913).

PAF's development of the site into a shipyard began in 1915 and included cutting an extension of Harris Avenue into the hill, using the excavated material as fill to expand the grounds, and construction of a number of buildings and structures associated with their new shipbuilding operation. A site drawing of the shipyard dated 1917 shows a 3-story main shop building with an attached band saw shed; 2-story boiler house; engine house; blacksmith shop; 2-story paint shop; dry lumber storage shed; 2-story mixed-use building with ships' tackle storage and a mould loft; 3 derricks; and 5 plank shipways on solid ground or sand fill (B.W. Huntoon, sketch, July 1917, Pacific American Fisheries Commercial Point Shipyard, Pacific American Fisheries Records, Sub-Series V. Property Records 1875-1967, Box 28, Center for Pacific Northwest Studies, Bellingham, Washington [CPNWS]). Based on a comparison of the Huntoon sketch and Sanborn maps, it does not look as though any of the former Hackett plant was retained or reused by PAF. Huntoon's survey notebook of Commercial Point, however, contains an entry from 1916 noting a plan to move part of the cold storage building south 130 feet (B.W. Huntoon, survey notebook, 18 April 1916, PAF survey on Commercial Point, Pacific American Fisheries Records, Sub-Series VI. Engineering Records 1888-1973, Box 41, CPNWS). Based on this information, it appears that the Hackett site was mostly demolished, some building materials were salvaged or structures moved, and any remains (e.g. foundations) were buried by the fill dirt used to expand the point.

Continued expansion of the shipyard occurred from the late 1930s through the following decade. Site drawings dating to the mid-twentieth century show additional shipways, shops and storage sheds, as well as some change to the general layout of buildings (B.W. Huntoon, map, 6 November 1943, Northwestern Shipbuilding Company Commercial Point Shipyard, Pacific American Fisheries Records, Sub-Series V. Property Records 1875-1967, Box 28, CPNWS; Harold L. Bean, plat plan, September 1944, Pacific American Fisheries Commercial Point Shipyard, Pacific American Fisheries Records, Sub-Series V. Property Records 1875-1967, Box 28, CPNWS). Aerial photographs of the project area from 1950 and 1963 appear to be identical and are consistent with the 1913-1950 Sanborn (City of Bellingham 1950, 1963; Sanborn 1913-1950). The primary structures of this time period are still present today.

HRA anticipated that isolated historic-period archaeological materials would be observed in the historic-period fill. These materials–which were anticipated to include glass, cans and fragments, cannery machinery, and assorted tools–may have been intentionally deposited during the filling episodes, or were already present in the graded and/or dredged fill sediments and redeposited during later fill episodes. Multiple historic-period archaeological features, such as building foundation remnants or shipways, were also anticipated, given the number of structures that have been raised, demolished, and altered within the project area (Gilpin et al. 2011:32).

3.0 Field Methods

3.1 Soil Sampling

Groundwater monitoring wells were installed using a truck-mounted, 4-inch ID auger (Figure 3), using "standard hollow-stem auger techniques," in which split-spoon soil samples were collected every 2 feet (ft) to a proposed depth of approximately 15 ft below ground surface (bgs). Additionally, soil samples were continuously collected using a direct-push Geoprobe® and a 5 ft, clear plastic sampler (Figure 4). Floyd|Snider environmental technicians recorded the soil consistencies and both natural and anthropogenic inclusions on standardized boring logs. Soil samples were taken from fill and potential native sediments, both in contaminated and non-contaminated contexts.

Figure 3. View of truck-mounted auger used to install groundwater monitoring wells at the Harris Avenue Shipyard**.**

Figure 4. View of Geoprobe®, direct-push technology drill, with shipway rails and WWII-era drydock in background.

3.2 Archaeological Monitoring

Archaeological monitoring at the Harris Avenue Shipyard was performed by Project Archaeologist Jennifer Gilpin, M.A., who is 40-hour HAZWOPER (Hazardous Waste Operations) trained. Appropriate Personal Protective Equipment (PPE) was worn, including hard hat, safety goggles, hearing protection, steel-toed rubber boots, washable rain gear, and nitrile gloves. Prior to drilling, Ms. Gilpin performed a quick reconnaissance of each proposed probe location, to ascertain if features or archaeological materials were visible on the surface. During the drilling process, Ms. Gilpin examined the excavated soils, watching for prehistoric or historic-period artifacts or layers/lenses of organic material or shell, and organically enriched midden soils that might indicate past human use. Ms. Gilpin recorded characteristics of the soil column, as shown in the split-spoon samplers (from monitoring wells) and in the clear plastic liners (from the Geoprobe®).

Daily activities were recorded on a Daily Record Form and in a field notebook. For each boring and/or groundwater monitoring well location that was monitored, Ms. Gilpin recorded the general soil consistencies and inclusions (e.g., gravelly sand, clayey silts with some peat), along with a general depth (in feet), any cultural materials observed, and initial interpretations of the sediments–for instance, if the layer should be considered fill, dredged materials, or possibly "intact" native sediments. Overview photographs of the project area, along with detailed photographs of particular sampling locations, work in progress, sediment columns, and any cultural materials, were promptly logged in a field notebook. In addition, Ms. Gilpin noted the locations that had been monitored on a map of proposed soil sampling locations prepared by Floyd|Snider.

4.0 Results

HRA monitored the advancement of twelve soil borings and installation of two monitoring wells. Three additional monitoring wells were installed during the time that HRA was monitoring boring locations; therefore, archaeological monitoring did not occur at these locations. However, these wells (MW-08, MW-07, and MW-02A) were located along the modern shoreline, outside of the portion of the project area recommended for archaeological monitoring. HRA periodically checked in with Lisa Meoli, the Floyd|Snider technician who was overseeing the excavation of these wells. Ms. Meoli (who holds a BA in archaeology) reported that a wire nail was observed in MW-02A, but no other cultural materials or anthropogenic sediments were observed during well installation. On March 17, 2011, Floyd|Snider technicians advanced additional step-out soil borings to delineate an area of contamination approximately 5 ft south of FS-09. It was noted that at one step-out boring location (FS-09a) an entire 10-ft section of the sample liner was filled with wood (see below).

The majority of the soil columns contained multiple lenses of sandy fills, of varying colors (yellowish-brown to olive-gray), containing low to moderate amounts of gravels. Some lenses of possible fill were likely dredged from alluvial or tidal locations as they closely resembled sediments from such environments (and were hard to distinguish from the possible undisturbed and "native" tidal sediments in this location).

Although much of the project area fill appears to consist of relatively sterile sands and gravels, at least one lens of fill (shown as the darkest black layer in Figure 5) contained slag, much charcoal, heat-affected rocks, and two small, tubular ferrous fragments. Taken together, this suggests an industrial source for this fill layer. The most likely intact native sediments were observed in borings FS-09 and FS-18, in which dark gray sands and silts interbedded with thin lenses of peat (generally below 10 ft; Figure 6) suggest a low energy depositional environment (e.g., a lagoon or other protected wetland).

Woody debris–generally of a fibrous consistency–was observed in several probes, which again was not unexpected, given the variety of fill sources. In MW-06, the split-spoon bored into a larger piece of wood, overlying what was likely dredged fill or potentially intact native gray sands. It is unknown if the larger piece was simply a fragment of driftwood included in the fill, or perhaps a piling or remnant of an historic-period bulkhead. A vertically-oriented fragment of wood was observed by Floyd|Snider technicians directly below the surface in FS-09a (Figure 7). The wood was creosote-treated and extended to approximately 10 ft below surface (filling the sampler); at this depth, the boring was refused. The orientation of the wood grains, in addition to its length, suggest that this piece of wood is vertically oriented, and that it could be an intact piling or other wooden structural element (e.g., a supporting post within a bulkhead).

Figure 5. Overview of FS-15 soil samples, showing the layers of fill overlying potentially dredged and finally possibly intact native sediments at the base. The samples are oriented from left (uppermost sample) to right (lowermost sample), with the upper limit of each sample located towards the viewer.

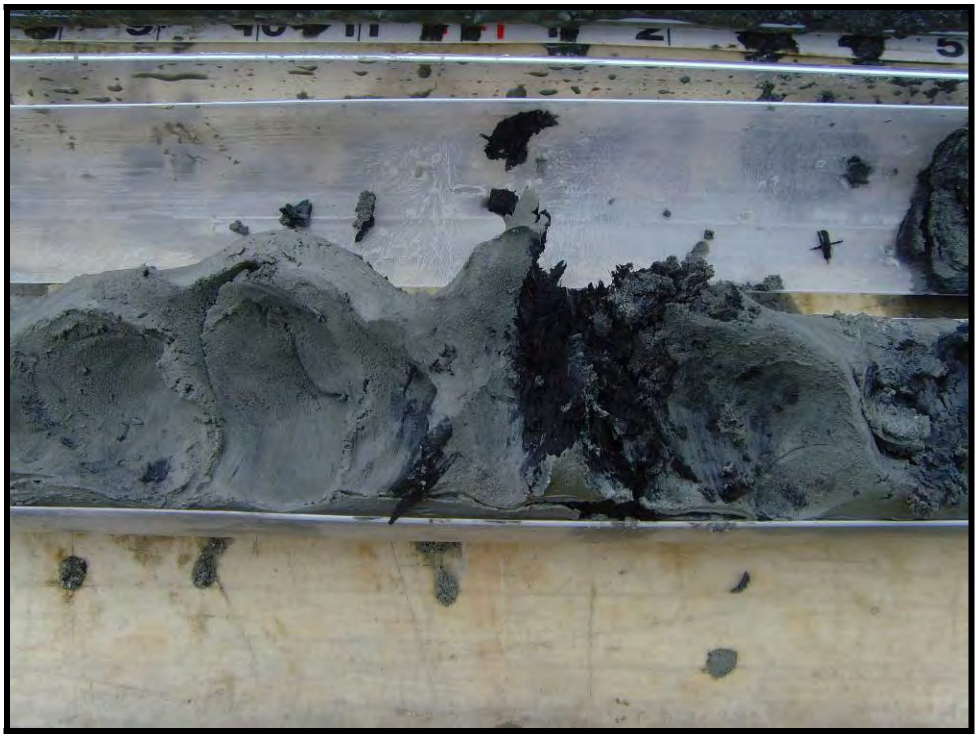

Figure 6. Fibrous peat layer observed at approximately 18 ft below surface in FS-09.

Figure 7. Overview of creosote-soaked potential piling in sample liner from FS-09a.

Fragments of red, fine-grained brick were observed in probes FS-12 (in the northeast portion of the monitored area) and possibly in FS-17 (in the southwest portion of the monitored area); the fragment observed at the latter location contained a large inclusion of quartz and may have been modified by heat (or may be in fact a quartz fragment with oxidized sediments adhering). A small fragment of colorless flat glass was also observed in fill sediments in FS-18, while a 2.25-inch square (cut) nail was seen in the upper 5 ft of FS-13 (along the eastern portion of the surveyed area).

Interestingly, several probes in the eastern and southern portions of the surveyed area contained a layer of pale gray, chalky to gravelly compacted material (Figure 8). This was interpreted to be concrete, potentially a series of pads or foundations. Although differential recovery rates in the sample tubes makes determining an absolute depth difficult, the potential foundations in the southern and western portions of the surveyed area (FS-08, FS-17, and FS-18) appear to be located more shallowly than those in the eastern portion of the surveyed area.

Figure 8. Overview of possible concrete foundation layer observed in FS-14, approximately 6 ftbs (pale gray to white layer in second tube from left).

Given the small diameter of the sampling liner, and the spacing of sample probes, it is uncertain if the observed concrete represents in-situ features, or merely fragments incorporated into the fill. Three observations support the hypothesis that at least a few of the concrete layers represent intact features. First, both FS-14 and FS-16 overlay a thin lens of finely-crushed shell, which could have been used to level the ground surface, or was simply a natural deposit. Secondly, the similar depths of each layer suggest horizontal continuity over time.

Thirdly, Floyd|Snider had previously observed buried concrete features in the vicinity during utility excavation work in late 2010 (Figure 9). Five concrete skids were observed, measuring approximately 10 ft wide (north-south); the exposure did not allow Floyd|Snider to estimate their length. Shipyard staff had concluded that the foundations were part of shipways constructed in the 1970s.

Figure 9. Overview of concrete exposed during utility excavations at the project area, approximately 2 ftbs.

In comparing the sampling locations to the historic-period Sanborn maps, historic-period sketches of the shipyard, and aerial photographs taken through the past century, hypotheses can be formulated about the origins of the potential wood piling in FS-09a and the concrete layers observed in at least five probes and in utility excavations. Although no piers or pilings are denoted on the 1913 map in the vicinity of FS-09a, the probe is located very close to the shoreline, as depicted at that date. It is possible that the wood is a remnant of a bulkhead constructed during one of the phases of filling the shipyard.

FS-13 and FS-14 appear to be within the location of the Hackett Cold Storage Company building on the 1913 Sanborn. FS-16, which also contained potential concrete at approximately 6 ftbgs, was placed to the south of this former structure. The remaining borings that contained concrete at approximately 1 to 2 ftbgs are also south and southwest of the structure. Soil bores FS-08, FS-13, and FS-14 correspond well with shipway structures shown on the 1917 Huntoon sketch, while bores FS-17 and FS-18 appear to be situated in the former location of the PAF's "Shipyard Shops" and "Boiler House."

In comparison, by 1944 (Bean sketch map), soil bores FS-16 and FS-17 are now at the location of the "Joiner Shop," and it is uncertain if this is the same structure as the former "Shipyard

Shops." The fact that FS-18 is shown away from the "Boiler House" is indicative only of the uncertainties in mapping. However, the 1944 sketch shows fewer shipways rails at the location of bores FS-13 and FS-14.

By the 1913-1950 Sanborn, the Hackett building is gone, replaced by shipways in that portion of the project area. FS-09a is located in the middle of the westernmost shipway; it is also possible that the piling forms a part of the foundation for the shipways. FS-08 is also located in the westernmost shipway, and the layer or concrete perhaps reflects another component to the shipway. Boring FS-18, however, remains outside of any mapped structure at this date. FS-17 and FS-16, however, are both located in the "Carpenter Shop" of the PAF shipyards.

By the 1950 and 1963 aerials, however, soil bores FS-08, FS-13, and FS-14 again appear to be situated at the location of shipway structures, while FS-16 and FS-17 are located at above-ground structures (likely the Joiner Shop). FS-18 is shown on cleared ground. By 1988, the Joiner Shop and Boiler Room have been removed (City of Bellingham 1988).

In summary, from the present research, the concrete observed in bores FS-08, FS-13, and FS-14 can tentatively be associated with shipways that are present on shipyard maps as early 1917, and more certainly by the mid-1900s. These were the concrete foundations exposed during excavation for utility locates in late 2010. The concrete associated with FS-16, FS-17, and FS-18 is potentially related to former above-ground historic-period structures at the shipyard, including the "Shipyard Shops," "Joiner Shop," and "Boiler House." These structures were built by the PAF–of themselves, the concrete foundations, as an archaeological site, would likely not contribute additional information to the historic record about the PAF.

The map and photograph overlays are of course approximated, so these are merely relative locations. Due to the uncertainty that the concrete pieces represent foundations that are intact, or just inclusions in a fill deposit, an archaeological site form has not been prepared for this potential suite of resources. The same applies to the wooden potential piling: further exposure of this feature is desirable to establish its context and potentially its purpose. The other cultural materials observed were located in fill layers, with uncertain provenience and origin, and they were therefore also not recorded.

5.0 Conclusions and Recommendations

5.1 Archaeology

HRA conducted archaeological monitoring of the Supplemental Site Investigation that entailed soil sampling and groundwater monitoring well installation activities at the Harris Avenue Shipyard from March 13 to 16, 2011. HRA observed cultural materials including isolated metal, brick, and glass artifacts in the historic-period fill layers; these were expected and largely isolated finds, and they have not been formally recorded as an archaeological site. It is unlikely that these materials would in the future require formal recording as an archaeological site, given their isolated nature, mixed context, and uncertain origin.

Floyd|Snider technicians observed what could be an intact piling or some other wooden structural element; for instance, a portion of one of the bulkheads used to contain fill in the project area. HRA also noted the presence of buried concrete features. The nature and origin of these concrete foundations is ultimately uncertain, given that the exposure observed by HRA consisted of moderately to widely-spaced soil borings measuring less than 4 inches in diameter. However, if these are intact foundations, they may represent some of the only archaeological remains associated with the Hackett Cold Storage Company, and with PAF.

HRA recommends that, prior to their formal recording as an archaeological site, and certainly prior to an evaluation as to their eligibility for listing in the National Register of Historic Places, further exposure of the features is desirable. This exposure could be accomplished, as feasible and as necessary, during archaeological monitoring of soil remediation or removal activities that are recommended based on these preliminary stages of the Project. HRA recommends that, as future remedial activities take place in the project area–presumably involving the more wide-spread excavation of contaminated soils–archaeological monitoring take place in the vicinity of FS-09a (the potentially intact piling) and the locations where concrete was observed in boring locations. At that time, the features may be exposed to a greater degree, and a more accurate assessment of their integrity and origin can be undertaken. As appropriate, an archaeological site inventory form would then be completed.

Although no prehistoric archaeological materials were observed, the project area (and particularly the southeastern portion) remains moderately sensitive due to the proximity of recorded shell midden sites. HRA recommends archaeological monitoring of contaminated soil removal, concentrating in the approximate interface between historic-period fill and undisturbed native soils, to around a 3 ft depth in the native soils.

5.2 Inadvertent Discovery Plan

5.2.1 Archaeological Resources

In the event that archaeological deposits or materials (including but not limited to intact deposits of midden sediments; clusters of fire modified rock, charcoal, or other evidence of fire-related activities; faunal remains in association with stone chips or tools; concentrations of or potentially in-situ historic-period artifacts; and precontact or historic-period features, such as hearth remnants) are inadvertently discovered during construction in any portion of the project area, ground-disturbing activities will be halted immediately.

The project contacts at the Port and Floyd|Snider should be contacted. The Port should then contact Ecology, DAHP and the interested Tribes (the Nooksack Indian Tribe and Lummi Nation). The interested parties will be invited to attend an on-site inspection with a Professional Archaeologist contracted by the Port. The Professional Archaeologist will examine and assess the materials and, if they are found to be intact, potentially significant (i.e., part of a larger site), or otherwise potentially eligible for the NRHP, the involved parties will consult about how to proceed. The archaeologist will document the discovery in a report submitted to DAHP, and this report will be referenced in the Site RI/FS. Due to confidentiality concerns regarding archaeological sites (per Chapter 27.53 RCW), the report will not be included in the Site-Wide RI/FS (Floyd|Snider 2011:2-7).

5.2.2 Human Remains

If ground disturbing activities encounter human skeletal remains during the course of construction, then all activity that may cause further disturbance to those remains **must** cease, and the area of the find must be secured and protected from further disturbance. The project contacts at the Port, Ecology, and Floyd|Snider should be contacted. The Port will report the findings to the Whatcom County Medical Examiner (ME) and City of Bellingham Police Department in the most expeditious manner possible, and they will also contact DAHP and authorized Tribal representatives. The remains should be covered and should not be touched, moved, or further disturbed.

The ME will assume jurisdiction over the human skeletal remains and make a determination of whether those remains are forensic or non-forensic. If the ME determines the remains are non-forensic, then they will report that finding to the DAHP, who will then take jurisdiction over those remains. The State Physical Anthropologist will make a determination of whether the remains are Indian or Non-Indian and report that finding to any appropriate cemeteries and the affected tribes. The DAHP will then handle all consultation with the affected parties as to the future preservation, excavation, and disposition of the remains, which may include the development of a site treatment plan with a Professional Archaeologist (Floyd|Snider 2011:2-7).

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HISTORICAL RESEARCH ASSOCIATES, INC.

Appendix A

Observations from Archaeological Monitoring

Table A-1. Observations During Archaeological Monitoring by Locations.

Well/Probe ID	Observed	Final Depth (ftbs)	Sediments Observed	Cultural Materials (outside of fill and contamination)
FS-11	3/14/11	20	0-5 ftbs: ~2 ft concrete over reddish-brown sandy fill with some clam and mussel shell. <0.75 ft black greasy silts, probably oil-stained (NOT midden), over creosote-treated woody debris (fill) 5-10 ftbs: Transition to gray to dark gray silts and sands (fill) 10-15 ftbs: Increasingly fine gray silty sands (dark gray and very moist to wet by base) (fill?) 15-20 ftbs: <1 ft olive-gray sands with some crushed shell over ~0.5 ft dark gray sands, slightly silty, with some crushed and larger shell fragments. Over olive-gray fine silty sands, moist. Possibly native or possibly dredged beach sediments?	Wood debris in fill (possible waste materials in fill)
MW-09	3/14/2011	15	~2-4 ftbs: Gray to olive-brown gravelly sands with some shell overlying gray silty sands, gravels with little to no shell (fill) ~6-8 ftbs: Continued silty sands, mottled with yellowish-brown to dark grayish-brown. Increasingly gravelly with some woody debris (fill) ~8-10 ftbs: Possibly native gray to olive-gray silty fine sands ~12.5-14 ftbs: Dark gray fine silty sands with little shell and some wood. Contaminated – possible native	None
MW-06	3/14/2011	20	0-8 ftbs (2 samples): Same brown to dark brown gravelly sands ~8-10 ftbs: Begin to alternate sandy with silty matrix, but still fill. Large chunk of wood (auger bored through) overlying gravelly gray sands ~12-20 ftbs: Dark gray silts and silty sands, wet, with gravel in some lenses and crushed shell in one sandy lens. Possible native, or dredged?	Woody debris at ~8-10 ft – large enough to be part of driftwood or piling (uncertain provenience, cut across grain)

Well/Probe ID	Observed	Final Depth (ftbs)	Sediments Observed	Cultural Materials (outside of fill and contamination)
FS-01	3/14/2011	25	0-5 ftbs: Gravelly sands to sandy gravels – dark yellowish brown to dark brown in color (fill) 5-10 ftbs: Upper third of bore is dark brown, likely continued fill while lower 2/3 are gray sands to olive-brown fine sandy silts. Likely dredged fill by ~8 ftbs? 10-15 ftbs: Alternating gray and dark grayish-brown silty sands with fewer gravels than above 15-20 ftbs: Continuing alternating bands of gray and dark grayish-brown fine sandy silts and silty sands, with increasingly coarse-grained sands at base. "Boulder pit" (i.e., layer of large and dense gravels) at ~15 ftbs, but few produced in core 20-25 ftbs: Increasingly coarse sands, olive-gray to dark gray. Visible oil slick in dark gray (almost black) somewhat silty sands at ~24 ftbs. At base, sudden transition to olive-brown gravelly silty sands. This basal layer appears like it could be "native" and undisturbed, based on observations elsewhere	None
FS-12	3/14/2011	20	0-5 ftbs: Gravelly sands to sandy gravels, yellowish-brown to brown (fill) 5-10 ftbs: Continued fill, yellowish-brown transitioning to olive-gray gravelly sands. Rose-colored quartzite chunk ~7 ftbs, fibrous woody debris ~9 ftbs 10-15 ftbs: Continued gravelly yellowish-brown sands, overlying ~1.5 ft of gray silty coarse sands. ~14-15 ftbs, red brick chunks (0.5 to 3 cm in size) in gray to olive-gray silty sands 15-20 ftbs: Gray to olive-gray silty sands to ~18 ftbs, then transition to dense olive-gray to brown fine sandy silts. Possibly native?	Fibrous woody debris ~9 ftbs (possible waste materials) Brick chunks ~14-15 ftbs (red, fine-grained)

Well/Probe ID	Observed	Final Depth (ftbs)	Sediments Observed	Cultural Materials (outside of fill and contamination)
FS-15	3/14/2011	25	0-5 ftbs: Dark yellowish-brown alternating with dark gray gravelly sands. Black, stained greasy sediments at very bottom of this sample. Much charcoal and likely slag. No shell or other indication of precontact midden 5-10 ftbs: Continuing with black, greasy matrix to ~7 ftbs. Piece of feldspar at first resembles shell fragment. Weathered slag also present. A few crushed shell pieces, charcoal fragments (diffuse and blocky), and possible nail fragments (see column to right). Possible industrial dump/rake out? 10-15 ftbs: Bands, ~1-2 ft thick, of olive-gray to brown and gray-brown gravelly silty sands 15-20 ftbs: Continuing bands, ~1-2 ft thick, of olive-gray to brown and grayish-brown gravelly silty sands. Gray sands have some angular fragments of shell 20-25 ftbs: Continued gravelly olive-brown sediments, possibly intact native by ~23 ftbs with dark grayish-brown silty sands, containing more rounded gravels.	~5-7 ftbs: x2 small (<2 cm by 4 mm thick) ferrous nail fragments, hollowed. In dark, charcoal- and slag-rich (potential rake-out)
FS-13	3/15/2011	20	0-5 ftbs: Very little recovery. ~15 cm each of dark brown to light yellowish-brown and gray to olive-brown gravelly sands (fill). Approximately 2-4 ftbs, reddish-brown fill, contains square/cut nail, oxidation stripped from pointed end 5-10 ftbs: Continued gravelly fill, with possible concrete layer ~6-8 ftbs (pale gray, chalky, possibly crushed rock pad). By ~9-10 ftbs, hit olive-brown slightly gravelly sands. Possible dredged fill? Appears "native" but very shallow 10-15 ftbs: Continued moderately gravelly fine to medium silty sands, mottled with orange and gray to olive-gray (dense). Also possibly a "native" dredge 15-20 ftbs: Continued, same as above, but saturated. ~18 ftbs, gravelly compacted/dense gray silty fine sands. Uncertain – gravels appear angular but may be result of bore breakage	~2-4 ftbs: 2.25-inch square nail ~6-8 ftbs: pale gray concrete layer

Well/Probe ID	Observed	Final Depth (ftbs)	Sediments Observed	Cultural Materials (outside of fill and contamination)
FS-14	3/15/2011	20	0-5 ftbs: Dark brown to dark yellowish-brown gravelly fill with plastic fragments (likely PVC) at very base 5-10 ftbs: Additional PVC in sluff or at upper portion of sample. ~6 ftbs, concrete pad/foundation directly over finely crushed shell (mussel, clam). Dark yellowish-brown and dark gray silty gravelly sands. Layers of historic-period building and fill? 10-15 ftbs: Dark olive-brown silty somewhat gravelly sands with similar gleyed (gray) and oxidized (yellowish-brown) mottles to what has been seen in other bores 15-20 ftbs: Continued sediments, similar to 10-15 ftbs, possibly native and undisturbed	~4-5 ftbs: Curved white PVC/plastic (likely pipe) fragments ~6 ftbs: Concrete pad/foundation
FS-16	3/15/2011	20	0-5 ftbs: Dark gray to dark olive-brown (yellowish too) gravelly sands (fill) 5-10 ftbs: Same as above, to ~6 ftbs, then boulder over dark olive-brown sands, with a thin lens of crushed clam and mussel shell. Boulder potentially another concrete pad with larger inclusion? Gravelly coarse sands from ~8-10 ftbs 10-15 ftbs: ~1 ft dark olive-brown coarse sandy gravels, wet, with crushed shell overlying ~1.5 ft dark gray silty sands, increasingly gravelly. Then ~1.5 ft gravelly olive-brown medium sands overlying ~1 ft dark olive-gray to brown mediums sands (beach sands). Possible dredge, but appear like "native" beach sands 15-20 ftbs: Refusal – lots of rock and coarse sandy gravels (possible outwash?)	~6 ftbs: Boulder, or potential concrete fragment?
FS-09	3/15/2011	20	0-5 ftbs: Gravelly sands with some black sandblast residue to ~1 ftbs, then ~1.5 ft light olive-brown sands with some crushed shell. ~2 inches gleyed silts, overlying ~1 ft dark gray sandy silts and more gleyed silty sands (fill) 5-10 ftbs: Continued fill layers, with some charcoal and unburnt wood in gleyed/oxidized silty sands (~6-8 ftbs). Some gravels 10-15 ftbs: Gray gravelly silty sands, contaminated (smells). Fibrous peat at very base, black (decomposing, likely contaminated as well) 15-20 ftbs: ~3 ft continued gravelly coarse sands, then ~1 ft silts. Another layer of decomposing veg/fibrous peat at ~17-18 ftbs. Overlying gray increasingly gravelly sands with some crushed shell. Appears native, ponded sediments?	None

Well/Probe ID	Observed	Final Depth (ftbs)	Sediments Observed	Cultural Materials (outside of fill and contamination)
FS-08	3/15/2011	20	0-5 ftbs: Pale gray gravels, possible foundation/pad at ~1-2 ftbs. Dark brown to olive-brown coarse gravelly sands below 5-10 ftbs: Continued dark brown to olive-brown sands with thin lens of darker, possibly organic staining – NO charcoal observed, possibly diffuse? Coarse olive-brown sands with gravels in lower half of sample (fill) 10-15 ftbs: Gray silty sands down to coarse olive-brown sands. ~14-15 ftbs, dark gray medium to coarse sands (fill) 15-20 ftbs: First try no recovery, rocks (in gray silty matrix). Second try, large gravels at ~15 ftbs, overlying olive-brown silty gravelly sands and then dark gray coarse sands at depth	~1-2 ftbs: Possible foundation/crushed rock pad
FS-10	3/15/2011	15	Started out with bad recovery and refusal by 5-10 ft, so moved <1m to south 0-5 ftbs: Dark brown to olive-brown gravelly sands, grading by ~4 ft to gray and olive-brown mottled silty fine sands with gravels (fill) 5-10 ftbs: Better return, dark brown gravelly sands. Transition to olive-gray silty sands with rounded gravels by ~7 ft. Alternates with gray sandy (many gravels) and pockets of greenish-gray clay. Possibly dredged? 10-15 ftbs: Continue olive-brown silty coarse sands with gravels. Last few feet coarse gray sandy gravels (resemble beach, so possibly native?)	None
FS-17	3/16/2011	20	0-5 ftbs: Gravelly fill (~1ft) over at least 8-inch cement or concrete pad/foundation. Overlies continued yellowish-brown gravelly fill with ~4 ft recovery in all 5-10 ftbs: Yellowish-brown gravelly sands over very dark brown sands containing possible brick, glass sherd, and fibrous woody debris. Overlies medium to coarse olive-gray sands, then gray, sandy gravels. Approximately 1 ft of olive-brown sands with gravels, increasingly moist at base 10-15 ftbs: Coarse silty sands with many gravels, moist to wet 15-20 ftbs: Saturated grayish-brown coarse sandy gravels, alternating with gravels (subangular). Possibly outwash, so may be "intact" native?	~2 ftbs: cement pad/foundation ~6-7 ftbs: Fibrous woody debris and pale orangey-red brick (large quartz inclusion – possible heat affect? Or quartz with oxidized sediments adhering?); <1 cm square flat colorless glass sherd

Well/Probe ID	Observed	Final Depth (ftbs)	Sediments Observed	Cultural Materials (outside of fill and contamination)
FS-18	3/16/2011	15	0-5 ftbs: Dark brown fill over thinner (than other probes) concrete pad/foundation. Possible brick staining below, in dark brown sandy horizon. Apparently bedded olive-brown and gray sands, at base gray sands have horizontally bedded clam shell fragments – appear "native" but possibly dredged 5-10 ftbs: ~2.5 ft recovery, slough over additional sandy debris between chunks of quartzite. Gravelly layer hard to push through 10-15 ftbs: Coarse olive-brown sands with gravel. ~14 ftbs, darker gray color, some inclusions of fibrous peat in silts. Above fine-grained basalt and quartzite gravels. Fine crushed shell in dark gray silty sands	~1-2 ftbs: Thin (~4 inch) concrete pad/foundation?

Harris Avenue Shipyard

Remedial Investigation/ Feasibility Study Data Report

Appendix B

Current and Historical Data Tables

(on CD-ROM)

Harris Avenue Shipyard

Remedial Investigation/ Feasibility Study Data Report

Appendix C
Boring Logs and Monitoring Well Logs

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Boring ID: FS-01

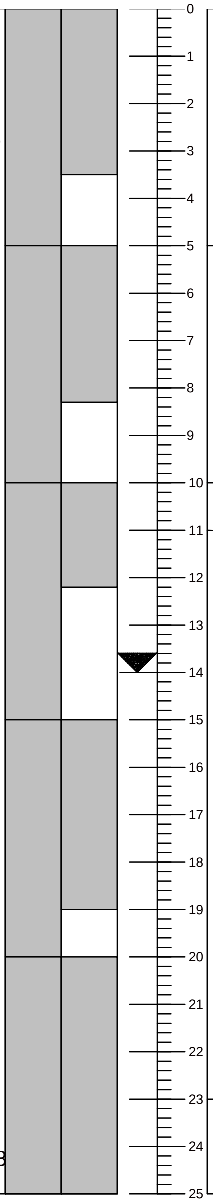
Drill Date: 3/14/2011
Logged By: Kristin Anderson
Drilled By: Eli Floyd/Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: Direct Push 2"x5' core
Boring Diameter: 2"
Boring Depth (ft bgs): 25'
Groundwater ATD (ft bgs): 14'

Coordinate system: NAD83/98
Ground Surface Elevation: 14.46; NAVD88
Latitude/Northing: 632230.63
Longitude/Easting: 1234614.39
Boring Location: See below.

Client: Port of Bellingham
Project: POB-Harris
Task: 4000
Address: Fairhaven Shipyard
Bellingham, Wa

Remarks: Boring located in the Former Union Oil AST Area.

PID (ppm)	SHEEN	SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
0.1					GW	Brown well graded small angular GRAVEL with fine sand, dry. (FILL)
		FS01-2.5 -031411				
28.9					SP	Dark brown poorly graded medium to coarse SAND, trace gravels, dry. Sandblast grit throughout.
30.3						
					SM	Dark brown to dark gray silty fine SAND, trace small gravels, moist. Hydrocarbon odor and moderate sheen.
	Moderate sheen				ML	Gray SILT with small gravels, wet. Hydrocarbon odor, no sheen.
40		FS01-14 -031411				
						Shell fragments throughout.
1.4						
						Same as above. No shell fragments.
						Same as above.
8.8						
					GW-GM	Gray GRAVEL with silt and fine to medium sand.
	NAPL Droplets moderate sheen	FS01-24.8 -031411				Becoming black with heavy sheen on core and NAPL droplets. Stront asphalt-like odor and moderate sheen.



Notes:
FT BGS = feet below ground surface
ppm = parts per million

--- Dashed contact line in soil description indicates a gradational contact
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Boring ID: FS-02

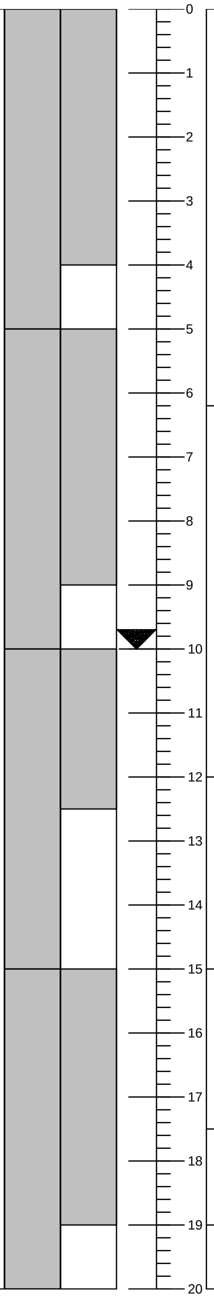
Drill Date: 3/16/2011
Logged By: Kristin Anderson
Drilled By: Eli Floyd/Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: Direct Push 2"x5' core
Boring Diameter: 2"
Boring Depth (ft bgs): 20'
Groundwater ATD (ft bgs): 10'

Client: Port of Bellingham
Project: POB-Harris
Task: 4000
Address: Fairhaven Shipyard
Bellingham, Wa

Coordinate system: NAD83/98
Ground Surface Elevation: 14.79; NAVD88
Latitude/Northing: 632247.74
Longitude/Easting: 1234380.75
Boring Location: See below.

Remarks: Boring located in the Northern Shoreline Area.

PID (ppm)	OIL INDICAT.	SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
0.0					SW	Dark brown well graded medium SAND with gravels, trace silt, dry. Some sandblast grit at 1.5 and from 2 to 2.5' bgs.
0.0		FS02-2.5 -031611				
0.0						
					SM	Light brown becoming gray silty fine SAND with orange speckles. No odor and no sheen. Wet at 10' bgs.
0.0						
0.0						
0.0					GW	Gray well graded GRAVEL with silt and sand, wet.
					SM	Brown silty SAND with some gravel. Wet. Gray, less saturated and decreasing gravels. Shell fragments at 16.5' bgs.
0.0						
0.0		FS02-14 -031611			SP/SM	Gray, poorly graded fine SAND, wet. Grading to gray silty SAND. No odor and no sheen.



Notes:
FT BGS = feet below ground surface
ppm = parts per million
--- Dashed contact line in soil description indicates a gradational contact
USCS = Unified Soil Classification System
▼ = denotes groundwater table

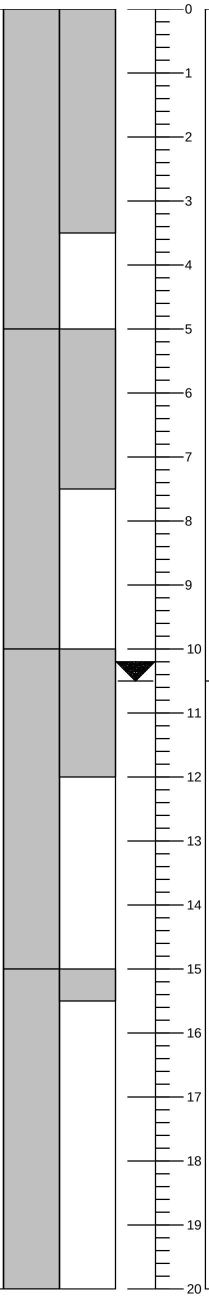
Boring ID: FS-03

Drill Date: 3/16/2011
Logged By: Kristin Anderson
Drilled By: Eli Floyd/Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: Direct Push 2"x5' core
Boring Diameter: 2"
Boring Depth (ft bgs): 20'
Groundwater ATD (ft bgs): 10.5'

Coordinate system: NAD83/98
Ground Surface Elevation: 15.07; NAVD88
Latitude/Northing: 632185.90
Longitude/Easting: 1234372.52
Boring Location: See below.

Client: Port of Bellingham
Project: POB-Harris
Task: 4000
Address: Fairhaven Shipyard
Bellingham, Wa

Remarks: Boring located in the Northern Shoreline Area.



PID (ppm)	OIL INDICAT.	SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
0.0					SW	Gray-brown well graded medium SAND with small gravels, trace silt. Dry.
0.0		FS03-2.5 -031611				
						Shell fragments and silts clasts and 3.5'.
0.4						Same as above. Grades to gray brown and gravel diameter increases with depth.
0.3					SP-SM	Brown poorly graded fine SAND with silt, wet. Becomes coarser with depth and small gravels throughout.
						Same as above. Poor recovery.
		FS03-11 -031611				

Notes:
FT BGS = feet below ground surface
ppm = parts per million
--- Dashed contact line in soil description indicates a gradational contact
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▼ = denotes groundwater table

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Boring ID: FS-04

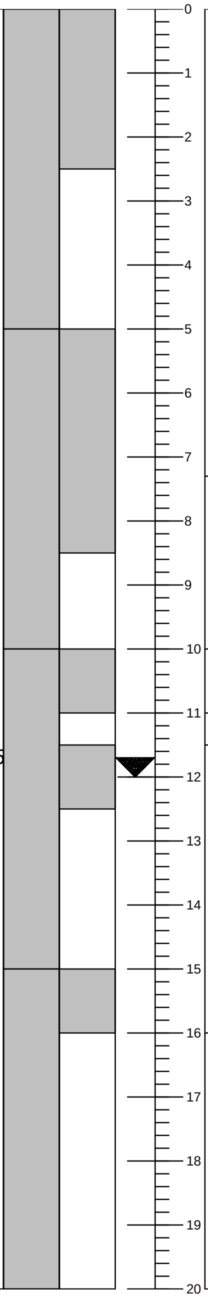
Drill Date: 3/16/2011
Logged By: Kristin Anderson
Drilled By: Eli Floyd/Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: Direct Push 2"x5' core
Boring Diameter: 2"
Boring Depth (ft bgs): 20'
Groundwater ATD (ft bgs): 12.0'

Coordinate system: NAD83/98
Ground Surface Elevation: 14.54; NAVD88
Latitude/Northing: 632108.13
Longitude/Easting: 1234312.29
Boring Location: See below.

Client: Port of Bellingham
Project: POB-Harris
Task: 4000
Address: Fairhaven Shipyard
Bellingham, Wa

Remarks: Boring located in the Northern Shoreline Area.

PID (ppm)	OIL INDICAT.	SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
					SW	Grayish brown well graded medium to coarse SAND with gravel, trace silt. Wood fragments from 1 to 1.25'. No odor.
0.1						
0.0						
		FS04-5 -031611				Same as above.
0.1						
						At 7' bgs, 3" lense of gray SILT.
					SP	Grayish brown poorlly graded coarse SAND with gravel, trace silt.
0.0						
						Grades to fine at 8.25'.
					SW/SM	Grayish brown well graded medium and coarse SAND with gravel, moist. Becoming brown silty SAND with some gravels.
						No recovery.
		FS04-11.5 -031611			SP-SM	
0.1						Brown poorly graded SAND with silt and gravel. Large wood fragment throughout starting at 12' and wet.
0.0						Same as above.



Notes:
FT BGS = feet below ground surface
ppm = parts per million

--- Dashed contact line in soil description indicates a gradational contact
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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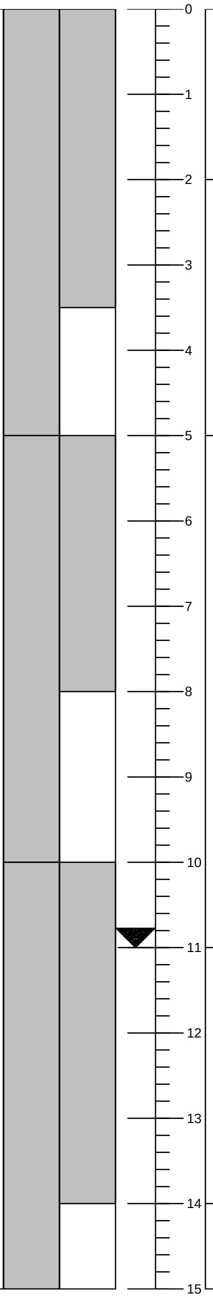
Boring ID: FS-05

Drill Date: 3/16/2011
Logged By: Kristin Anderson
Drilled By: Eli Floyd/Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: Direct Push 2"x5' core
Boring Diameter: 2"
Boring Depth (ft bgs): 15'
Groundwater ATD (ft bgs): 11'

Coordinate system: NAD83/98
Ground Surface Elevation: 15.02; NAVD88
Latitude/Northing: 632001.26
Longitude/Easting: 1234357.39
Boring Location: See below.

Client: Port of Bellingham
Project: POB-Harris
Task: 4000
Address: Fairhaven Shipyard
Bellingham, Wa

Remarks: Boring located in the Northern Shoreline Area.
No PID readings as PID was malfunctioning.



PID (ppm)	OIL INDICAT.	SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
				0	SW	Brown well graded medium to coarse SAND with gravels. Dry.
		FS05-2.5 -031611		2	SP	Brown poorly graded fine SAND, moist. Becoming coarser with depth. Shell fragments at 3.75'.
				5	SW	Brown well graded SAND with gravels. Interbedded lenses of coarse and fine, moist. Same as above.
		FS05-13 -031611		11	SW-SM	Grayish brown well graded SAND with silt and gravel, wet. 3" lense of black organic matter at 12'.
				14		

Notes:
FT BGS = feet below ground surface
ppm = parts per million
--- Dashed contact line in soil description indicates a gradational contact
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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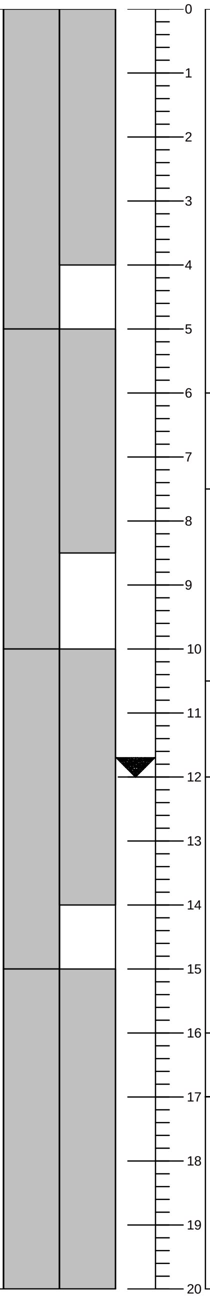
Boring ID: FS-06

Drill Date: 3/16/2011
Logged By: Erin Murray
Drilled By: Eli Floyd/Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: Direct Push 2"x5' core
Boring Diameter: 2"
Boring Depth (ft bgs): 20'
Groundwater ATD (ft bgs): 12'

Coordinate system: NAD83/98
Ground Surface Elevation: 15.73; NAVD88
Latitude/Northing: 632071.82
Longitude/Easting: 1234403.53
Boring Location: See below.

Client: Port of Bellingham
Project: POB-Harris
Task: 4000
Address: Fairhaven Shipyard
Bellingham, Wa

Remarks: Boring located in the Northern Shoreline Area.



PID (ppm)	OIL INDICAT.	SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
					GW-GM	Dark brown to medium gray well graded GRAVEL with fine silt and fine and medium sand. Moist. (FILL)
0.0						
						Sandblast grit from 1 to 1.2' bgs.
0.0						
		FS06-2.5 -031611				
						Becoming siltier with depth.
1.1						
						Same as above.
1.0					SM/ML	Medium gray silty fine SAND and SILT, trace small gravels. Moist.
0.0					SW-SM	Medium brown well graded fine to coarse SAND with silt, trace small gravels. Moist. No odor.
						Same as above.
					GW-GM	Medium brown well graded GRAVEL with silt and fine to coarse sand. Moist.
					SW-SM	Brown to gray well graded SAND with silty and small to coarse gravels. Wet.
1.1						
0.0						Same as above. Large gravels.
					SM	Gray silty fine SAND, trace coarse gravels.
0.0					SP-SM	Grades to poorly graded fine SAND with silt. Wet. Shell debris throughout.
0.0		FS06-19 -031611				

Notes:
FT BGS = feet below ground surface
ppm = parts per million
--- Dashed contact line in soil description indicates a gradational contact
USCS = Unified Soil Classification System
▼ = denotes groundwater table

Boring ID: FS-07

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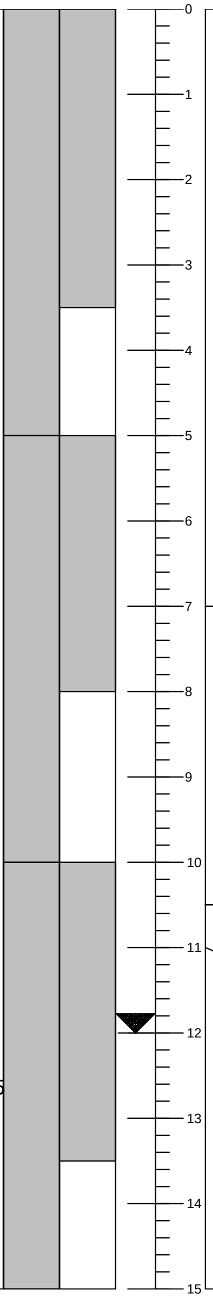
Drill Date: 3/16/2011
Logged By: Kristin Aderson
Drilled By: Eli Floyd/Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: Direct Push 2"x5' core
Boring Diameter: 2"
Boring Depth (ft bgs): 15'
Groundwater ATD (ft bgs): 12'

Client: Port of Bellingham
Project: POB-Harris
Task: 4000
Address: Fairhaven Shipyard
Bellingham, Wa

Coordinate system: NAD83/98
Ground Surface Elevation: 15.45; NAVD88
Latitude/Northing: 632106.71
Longitude/Easting: 1234379.69
Boring Location: See below.

Remarks: Boring located in the Northern Shoreline Area.



PID (ppm)	OIL INDICAT.	SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
					SW	Dark brown medium to coarse SAND with gravel and trace silt. Dry. Sandblast grit from 0.75' to 1' bgs.
0.1						
		FS07-2 -031611				
0.0						
						Same as above. Very trace silt from 6' to 7' bgs.
0.0						
					SW-SM	Brown well graded fine to coarse SAND with silt and gravel. No odor.
					SM	Grading to silty SAND, moist.
					SP	Gray poorly graded coarse SAND with gravel, trace silt. Wet.
		FS07-12.5 -031611				
0.0						

Notes:
FT BGS = feet below ground surface
ppm = parts per million
--- Dashed contact line in soil description indicates a gradational contact
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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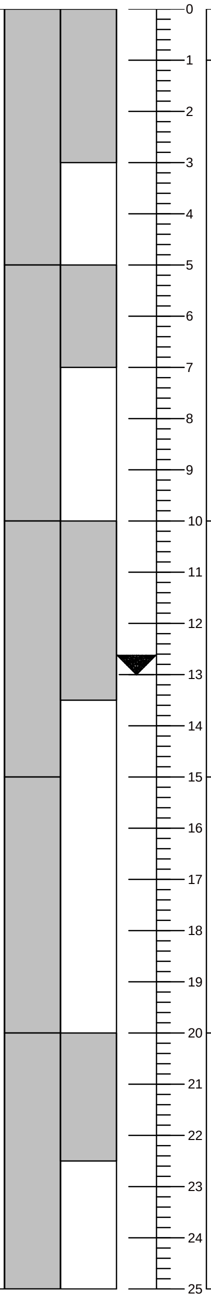
Boring ID: FS-08

Drill Date: 3/15/2011
Logged By: Kristin Aderson
Drilled By: Eli Floyd/Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: Direct Push 2"x5' core
Boring Diameter: 2"
Boring Depth (ft bgs): 25'
Groundwater ATD (ft bgs): 13'

Client: Port of Bellingham
Project: POB-Harris
Task: 4000
Address: Fairhaven Shipyard
Bellingham, Wa

Coordinate system: NAD83/98
Ground Surface Elevation: 15.22; NAVD88
Latitude/Northing: 632093.44
Longitude/Easting: 1234458.01
Boring Location: See below.

Remarks: Boring located in the Northern Shoreline Area.



PID (ppm)	OIL INDICAT.	SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
0.0					SW-SM	Asphalt surfacing. Dark brown well graded coarse SAND with silt and gravel, moist.
		FS08-2 -031511			SW	Brown well graded coarse SAND with gravel, trace silt. No odor.
0.0						
0.3						Same as above. Organic lense at 6' bgs.
					SM	Brown grading to gray fine silty SAND with small gravels. Moist.
0.4						Wet at 13' bgs.
						No recovery.
					SM	Brown fine silty SAND with small gravels and (trace coarse). Wet.
0.1		FS08-21 -031511				Grades to coarse SAND.

Notes:
FT BGS = feet below ground surface
ppm = parts per million

--- Dashed contact line in soil description indicates a gradational contact
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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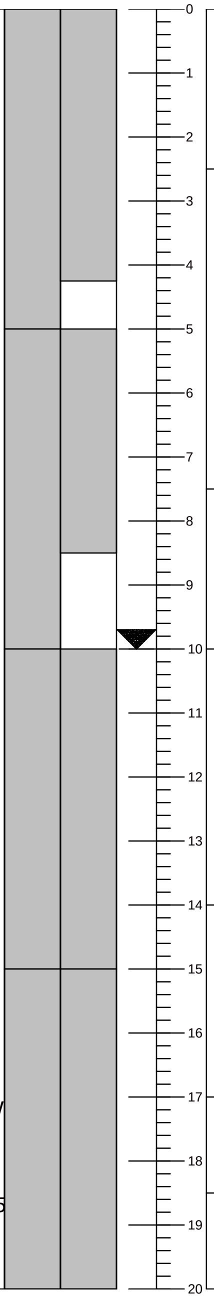
Boring ID: FS-09

Drill Date: 3/15/2011
Logged By: Kristin Anderson
Drilled By: Eli Floyd/Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: Direct Push 2"x5' core
Boring Diameter: 2"
Boring Depth (ft bgs): 20'
Groundwater ATD (ft bgs): 10'

Coordinate system: NAD83/98
Ground Surface Elevation: 15.23; NAVD88
Latitude/Northing: 632128.44
Longitude/Easting: 1234433.64
Boring Location: See below.

Client: Port of Bellingham
Project: POB-Harris
Task: 4000
Address: Fairhaven Shipyard
Bellingham, Wa

Remarks: Boring located in the Northern Shoreline Area.



PID (ppm)	SHEEN	SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
					SW	Brown well graded fine and medium SAND with gravel, dry to moist. Sandblast grit at 1' bgs. Slight hydrocarbon odor.
93.4					SM	Dark brown to gray silty SAND with rounded gravels, moist. No sheen. Strong hydrocarbon odor at 4.5' bgs. Same as above. Charred wood and brick fragments at 7' bgs.
178.9	Brown oily heavy sheen	FS09-8 -031511			SW	Gray well graded medium and coarse SAND with gravel, trace silt. Strong hydrocarbon odor and NAPL 8' bgs.
0.4					SW-SM	Gray-brown well graded medium and coarse SAND with silt and gravel, wet. Sheen on core and strong hydrocarbon odor.
5.3					SP	Gray poorly graded fine grading to coarse SAND with trace silt, wet. Moderate hydrocarbon odor. Sheen on core at 16' bgs.
		FS09-GW 17 031511			ML	Gray SILT, very soft, wet. Woody lense at 18' bgs. Moderate hydrocarbon odor.
		FS09-18.5 031511			SM	Gray coarse silty SAND with large rounded gravels, wet. No sheen and no odor.

Notes:
FT BGS = feet below ground surface
ppm = parts per million

--- Dashed contact line in soil description indicates a gradational contact
USCS = Unified Soil Classification System
▼ = denotes groundwater table

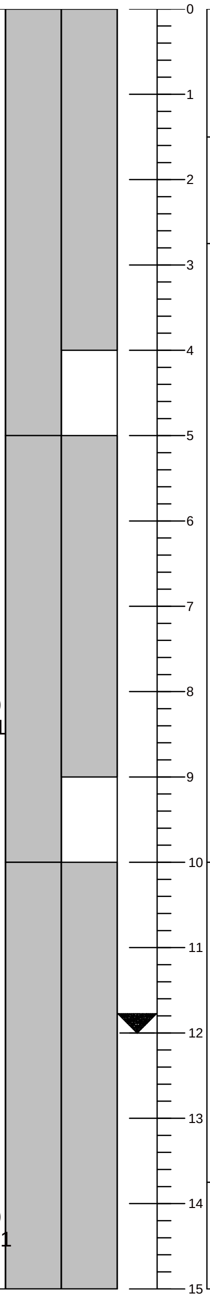
Boring ID: FS-09a(2)

Drill Date: 3/17/2011
Logged By: Erin Murray
Drilled By: Eli Floyd/Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: Direct Push 2"x5' core
Boring Diameter: 2"
Boring Depth (ft bgs): 15'
Groundwater ATD (ft bgs): 12'

Coordinate system: NAD83/98
Ground Surface Elevation: 15.23; NAVD88
Latitude/Northing: NA
Longitude/Easting: NA
Boring Location: See below.

Client: Port of Bellingham
Project: POB-Harris
Task: 4000
Address: Fairhaven Shipyard
Bellingham, Wa

Remarks: Boring located in the Northern Shoreline Area 10 feet south of FS-09.
This boring was located 5' south of FS-09a to avoid going through pilings that were encountered there.



PID (ppm)	SHEEN	SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
					GW	Gray well graded GRAVEL with fine silty sand, dry. Sandblast grit from 1.0' to 1.2' bgs (FILL).
0.3					SP	Light gray poorly graded fine to medium SAND. Little to no silt. No gravels. Dry.
					SM	Brown sity fine SAND with few small to large gravels. Dry.
0.5						
						Same as above.
0.1						
						Coarsening with depth. Moist.
		FS09a(2)-5-031511				
0.1					SW	Medium gray well graded fine and medium SAND, few gravels, moist to wet. No odor and no sheen.
						Wet at 12' bgs.
		FS09a(2)-14-031511			SW-SM	Gray well graded fine to coarse SAND with silt, wet.

Notes:
FT BGS = feet below ground surface
ppm = parts per million

--- Dashed contact line in soil description indicates a gradational contact
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Boring ID: FS-09b

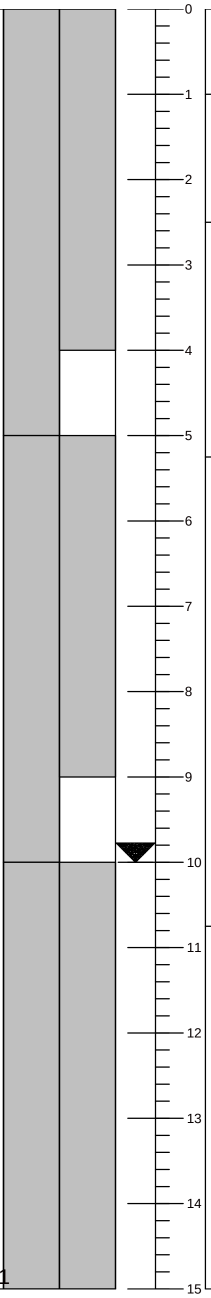
Drill Date: 3/17/2011
Logged By: Erin Murray
Drilled By: Eli Floyd/Cascade Drilling

Coordinate system: NAD83/98
Ground Surface Elevation: 15.23; NAVD88
Latitude/Northing: NA
Longitude/Easting: NA
Boring Location: See below.

Drill Type: Direct Push Geoprobe
Sample Method: Direct Push 2"x5' core
Boring Diameter: 2"
Boring Depth (ft bgs): 15'
Groundwater ATD (ft bgs): 10'

Client: Port of Bellingham
Project: POB-Harris
Task: 4000
Address: Fairhaven Shipyard
Bellingham, Wa

Remarks: Boring located in the Northern Shoreline Area 15' east of FS-09.



PID (ppm)	SHEEN	SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
					GW	Medium brown well graded GRAVEL with silt, little sand, dry (FILL). Sandblast grit from 0.5 to 0.8' bgs.
0.1					SP	Light gray poorly gradede fine to medium SAND, little silt, dry to moist. No odor and no sheen.
					SM	Dark brown and mottled silty fine SAND, trace large gravels, moist. Slight odor with no sheen.
0.1					SW-SM	Dark brown well graded SAND with silt and gravels, moist. No odor and no sheen.
0.8		FS09b-15-031511			SW	Medium gray well graded SAND, trace silt, wet. No odor and no sheen.

Notes:
FT BGS = feet below ground surface
ppm = parts per million

--- Dashed contact line in soil description indicates a gradational contact
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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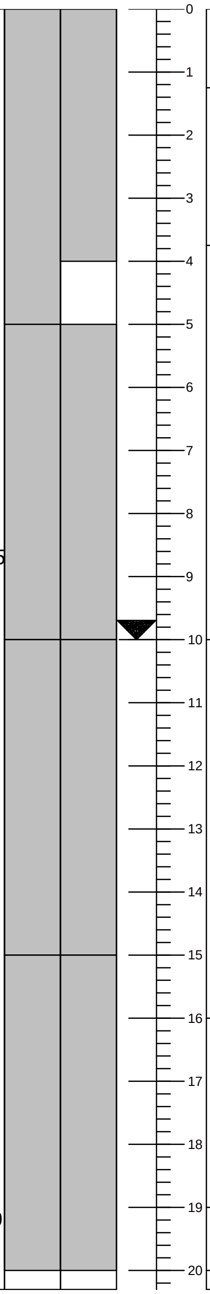
Boring ID: FS-09c

Drill Date: 3/17/2011
Logged By: Erin Murray
Drilled By: Eli Floyd/Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: Direct Push 2"x5' core
Boring Diameter: 2"
Boring Depth (ft bgs): 20'
Groundwater ATD (ft bgs): 10'

Coordinate system: NAD83/98
Ground Surface Elevation: 15.23; NAVD88
Latitude/Northing: NA
Longitude/Easting: NA
Boring Location: See below.

Client: Port of Bellingham
Project: POB-Harris
Task: 4000
Address: Fairhaven Shipyard
Bellingham, Wa

Remarks: Boring located in the Northern Shoreline Area approximately 12' east of FS-09.



PID (ppm)	SHEEN	SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
				0 1	GW	Gray well graded GRAVEL with fine silt, dry (FILL).
28.1				2 3	SP	Light gray to brown poorly graded fine and medium SAND, some silt, dry. Scattered shell fragments.
37.2 11.7 29.7 68.5		FS09c-8.5 -031711		4 5 6 7 8 9	SM	Brown silty fine SAND withn coarse gravels. Strong naphthalene and hydrocarbon odor present starting at 5' bgs. Same as above. Odor increasing.
1.1 1.2				10 11 12 13 14 15	SW-SM	Dark gray well graded fine to medium SAND with silt and gravel, wet. Strong hydrocarbon and naphthalene odor. Same as above. No gravel.
0.3				16 17 18	SM/ML	Dark gray silty fine SAND with SILT, soft. Moist. Moderate odor.
0.4		FS09c-19 -031711		19 20	SW-SM	Gray medium to coarse well graded SAND with silt and large gravels. No odor.

Notes:
FT BGS = feet below ground surface
ppm = parts per million
--- Dashed contact line in soil description indicates a gradational contact
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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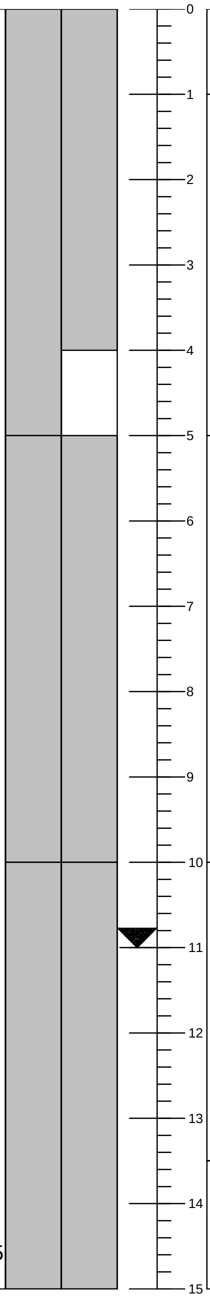
Boring ID: FS-09d

Drill Date: 3/17/2011
Logged By: Lisa Meoli
Drilled By: Eli Floyd/Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: Direct Push 2"x5' core
Boring Diameter: 2"
Boring Depth (ft bgs): 15'
Groundwater ATD (ft bgs): 11'

Coordinate system: NAD83/98
Ground Surface Elevation: 15.23; NAVD88
Latitude/Northing: NA
Longitude/Easting: NA
Boring Location: See below.

Client: Port of Bellingham
Project: POB-Harris
Task: 4000
Address: Fairhaven Shipyard
Bellingham, Wa

Remarks: Boring located in the Northern Shoreline Area approximately 5' west of FS-09.



PID (ppm)	SHEEN	SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
				0	GW	Brown well graded GRAVEL with sand, dry. Sandblast grit.
				1	SP	Light brown poorly graded fine SAND, trace silt, dry. Shell fragments throughout.
				2		
				3		Coarsening with depth. Rounded gravels. Slight hydrocarbon odor.
				4		
		FS09d-5 -031711		5	SM	Dark gray and mottled silty SAND, dry. Moderate hydrocarbon odor.
				6		Small gravels increasing with depth.
53.1				7		
				8		
				9		At 9' bgs, 1-inch lense of tar-like sandy material. Slight odor.
122.2	Sheen			10 ▼	SP	Dark gray poorly graded fine SAND, dry to wet. Strong hydrocarbon odor and sheen.
				11		Wet. Coarsening with depth.
	Slight sheen			12		
6.2				13		
					SM	Grading to dark gray silty SAND, wet. No odor and no sheen.
		FS09c-15 -031711		14		
				15		

Notes:
FT BGS = feet below ground surface
ppm = parts per million
--- Dashed contact line in soil description indicates a gradational contact
USCS = Unified Soil Classification System
▼ = denotes groundwater table

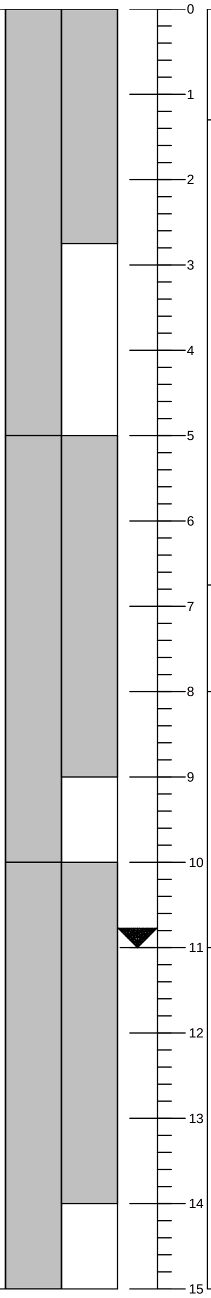
Boring ID: FS-10

Drill Date: 3/15/2011
Logged By: Erin Murray
Drilled By: Eli Floyd/Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: Direct Push 2"x5' core
Boring Diameter: 2"
Boring Depth (ft bgs): 15'
Groundwater ATD (ft bgs): 11'

Client: Port of Bellingham
Project: POB-Harris
Task: 4000
Address: Fairhaven Shipyard
Bellingham, Wa

Coordinate system: NAD83/98
Ground Surface Elevation: 13.33; NAVD88
Latitude/Northing: 632197.02
Longitude/Easting: 1234505.89
Boring Location: See below.

Remarks: Boring located in the Marine Railway Area.



PID (ppm)	SHEEN	SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
					GP-GM	Brown poorly graded small GRAVEL with silt and fine sand, moist (FILL). Sandblast grit top 2 inches.
0.0		FS10-2 -031511			SM	Light to medium brown silty fine SAND with gravels, moist (FILL). Orange oxidation. Same as above.
0.0					SP	Medium gray poorly graded medium SAND, moist. Few fine to coarse gravels. Silt clasts scattered.
					SM	Tan silty fine SAND with rounded gravels, moist. Same as above.
0.0		FS10-14 031511			SP	Gray poorly graded medium and coarse SAND with gravels, wet.

Notes:
FT BGS = feet below ground surface
ppm = parts per million
--- Dashed contact line in soil description indicates a gradational contact
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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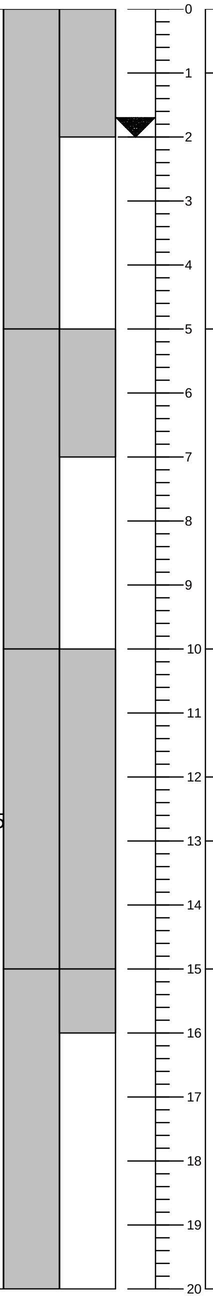
Boring ID: FS-11

Drill Date: 3/14/2011
Logged By: Erin Murray
Drilled By: Eli Floyd/Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: Direct Push 2"x5' core
Boring Diameter: 2"
Boring Depth (ft bgs): 20'
Groundwater ATD (ft bgs): 2'

Coordinate system: NAD83/98
Ground Surface Elevation: 10.59; NAVD88
Latitude/Northing: 632249.09
Longitude/Easting: 1234543.67
Boring Location: See below.

Client: Port of Bellingham
Project: POB-Harris
Task: 4000
Address: Fairhaven Shipyard
Bellingham, Wa

Remarks: Boring located in the Marine Railway Area, near shoreline.



PID (ppm)	SHEEN	SAMPLE ID	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
			SP	Light brown to black poorly graded medium SAND with wood debris, dry (FILL).
0.5	Slight sheen	FS11-02 -031411	GW	Dark gray to black well graded GRAVEL with sand, wet. Slight sheen. Creosote like consistency and strong odor. Sandblast grit and wood debris scattered throughout.
2.4	Slight sheen		SP-SM	Black to medium gray poorly graded fine SAND with silt, wet. Slight sheen.
0.9			SP/SM	Light brown to gray poorly graded fine SAND grading to silty fine SAND, moist. Slight odor.
		FS10-12.5 -031411	ML	Gray SILT, stiff, moist.
0.1			SW-SM	Medium gray SAND with silt and rounded gravels, wet. Shell fragments throughout.
			SP	Brown poorly graded fine and medium SAND with fine rounded gravels, moist.

Notes:
FT BGS = feet below ground surface
ppm = parts per million

--- Dashed contact line in soil description indicates a gradational contact
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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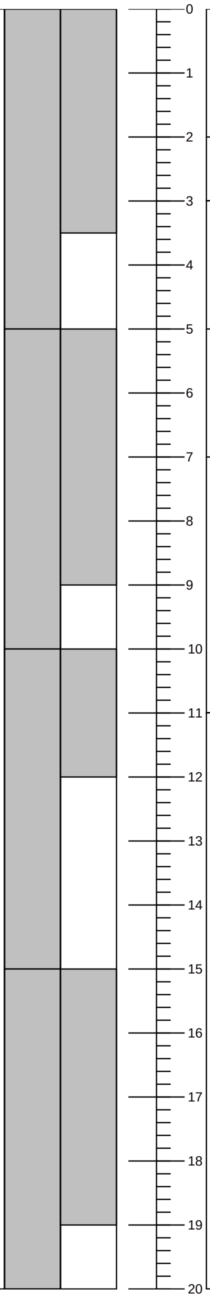
Boring ID: FS-12

Drill Date: 3/14/2011
Logged By: Kristin Anderson
Drilled By: Eli Floyd/Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: Direct Push 2"x5' core
Boring Diameter: 2"
Boring Depth (ft bgs): 20'
Groundwater ATD (ft bgs): NA

Client: Port of Bellingham
Project: POB-Harris
Task: 4000
Address: Fairhaven Shipyard
Bellingham, Wa

Coordinate system: NAD83/98
Ground Surface Elevation: 15.92; NAVD88
Latitude/Northing: 632183.88
Longitude/Easting: 1234627.99
Boring Location: See below.

Remarks: Boring located in the Former Union Oil AST Area.



PID (ppm)	SHEEN	SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
				0	SW	Dark brown SAND with gravel and silt, dry. No sheen and no odor.
		FS12-02 -031411		2	SM	Brown silty fine SAND, moist.
0.0				3	ML	Grading to brown soft SILT with sand, some gravels, moist.
				5	SM/ML	Interbedded lenses of silty SAND with gravel and SILT.
0.0				7	SP	Gray poorly graded fine SAND with gravel, trace silt, moist. Some large cobbles. Wood chunk at 7' bgs. No odor no sheen.
				10		Same as above. Increasing silt content with depth.
0.8		FS12-17 -031411		11	SM	Grades to gray silty SAND, wet. Red brick fragment at 12' bgs. No odor and no sheen.
0.0	Slight blebs of sheen			15	SM	Same as above. Gravelly pocket at 16' bgs. Very slight blebs of sheen.

Notes:
FT BGS = feet below ground surface
ppm = parts per million
--- Dashed contact line in soil description indicates a gradational contact
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Boring ID: FS-13

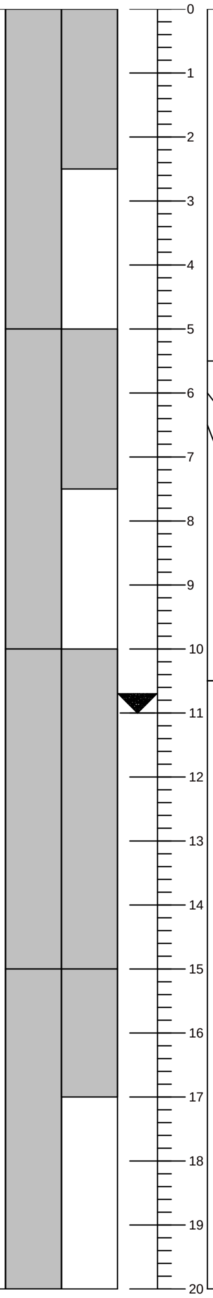
Drill Date: 3/15/2011
Logged By: Kristin Anderson
Drilled By: Eli Floyd/Cascade Drilling

Coordinate system: NAD83/98
Ground Surface Elevation: 16.50; NAVD88
Latitude/Northing: 632101.29
Longitude/Easting: 1234622.88
Boring Location: See below.

Drill Type: Direct Push Geoprobe
Sample Method: Direct Push 2"x5' core
Boring Diameter: 2"
Boring Depth (ft bgs): 20'
Groundwater ATD (ft bgs): 11'

Client: Port of Bellingham
Project: POB-Harris
Task: 4000
Address: Fairhaven Shipyard
Bellingham, Wa

Remarks: Boring located in the Former Union Oil AST Area.



PID (ppm)	SHEEN	SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
					SW	Dark brown to gray well graded medium SAND with angular gravels, trace silt, moist. Small woody fragments at 2' bgs.
0.0						
		FS13-04-031511				
					SM	Brown fine silty SAND, moist. No odor and no sheen.
					GW	Gray GRAVEL lense and crushed rock.
					SW	Gray well graded medium SAND with gravel, moist. Silt increasing with depth and gravel decreasing with depth.
					SM	Grades to brown silty SAND, wet.
0.2				▼		
0.0						
					SM	Same as above. Grading to gray with depth. Some large cobbles.
		FS13-16-031511				
0.3						

Notes:
FT BGS = feet below ground surface
ppm = parts per million

--- Dashed contact line in soil description indicates a gradational contact
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Boring ID: FS-14

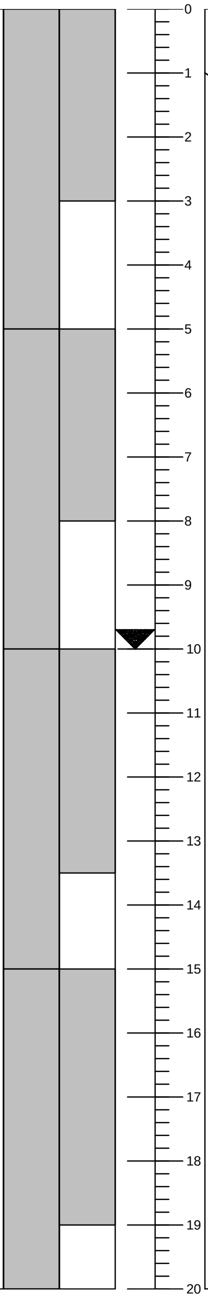
Drill Date: 3/15/2011
Logged By: Kristin Anderson
Drilled By: Eli Floyd/Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: Direct Push 2"x5' core
Boring Diameter: 2"
Boring Depth (ft bgs): 20'
Groundwater ATD (ft bgs): 10'

Coordinate system: NAD83/98
Ground Surface Elevation: 16.74; NAVD88
Latitude/Northing: 632116.41
Longitude/Easting: 1234589.11
Boring Location: See below.

Client: Port of Bellingham
Project: POB-Harris
Task: 4000
Address: Fairhaven Shipyard
Bellingham, Wa

Remarks: Boring located in the Former Union Oil AST Area.

PID (ppm)	SHEEN	SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
					SW	Dark brown well graded coarse SAND with gravels, trace silt, moist. Wood fragments 6".
					SM	Grades to brown coarse silty SAND, some large gravels. PVC fragments. Moist.
					SM	Same as above. Concrete pieces from 6 to 6.5' bgs.
58.2	Slight sheen	FS14-07-031511				Hydrocarbon odor and slight sheen at 7.5' bgs.
					SM	Same as above. No odor and no sheen.
10.4						
					SM	Same as above. Decreasing to fine sand with depth.
		FS14-17-031511				



Notes:
FT BGS = feet below ground surface
ppm = parts per million
--- Dashed contact line in soil description indicates a gradational contact
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Boring ID: FS-15

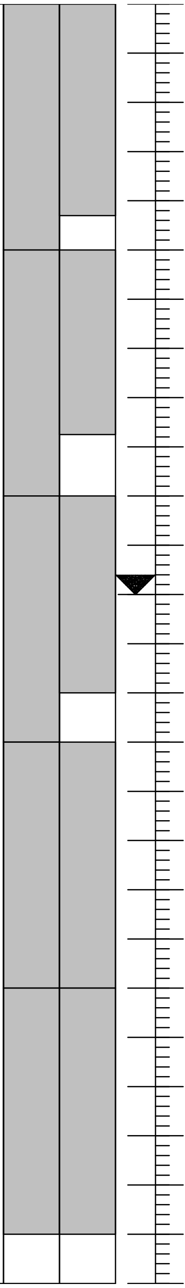
Drill Date: 3/14/2011
Logged By: Erin Murray
Drilled By: Eli Floyd/Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: Direct Push 2"x5' core
Boring Diameter: 2"
Boring Depth (ft bgs): 25'
Groundwater ATD (ft bgs): 12'

Coordinate system: NAD83/98
Ground Surface Elevation: 16.62; NAVD88
Latitude/Northing: 632141.03
Longitude/Easting: 1234569.18
Boring Location: See below.

Client: Port of Bellingham
Project: POB-Harris
Task: 4000
Address: Fairhaven Shipyard
Bellingham, Wa

Remarks: Boring located in the Former Union Oil AST Area.

PID (ppm)	SHEEN	SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
0.0				0	SW-SM	Brown to gray well graded fine and medium SAND with silt and angular gravels, moist (FILL).
6.5				1		
3.2				2		
4.0				3		
				4		
10.8				5	GW-GM	Medium brown well graded GRAVEL with silt and fine sand, moist. Charcoal-like fragments at 5.8' to 6.2' (FILL)
0.5				6		
				7		
0.3				8		
				9		
				10		
				11	SP-SM	Brownish gray poorly graded fine SAND with silt and angular gravel, moist.
34.9	Slight sheen			12	GW-GM	Medium gray well graded GRAVEL with silt and medium to coarse sand, wet. Moderate sheen and odor present.
		FS15-13 -031411		13	SP	
				14		Brownish gray poorly graded fine SAND with angular gravels, moist. No odor.
				15		
				16		Same as above. Wet
				17		
21.4				18		Grading to silty fine sand at 18' bgs and back to sand with gravels at 19' bgs.
				19		
				20	SP	Same as above.
				21		
				22		
1.5				23		
				24	GW	Gray well graded GRAVEL with sand, wet. No odor.
				25	ML/SM	Brown silty SAND and SILT, moist.
				26		



Notes:
FT BGS = feet below ground surface
ppm = parts per million
--- Dashed contact line in soil description indicates a gradational contact
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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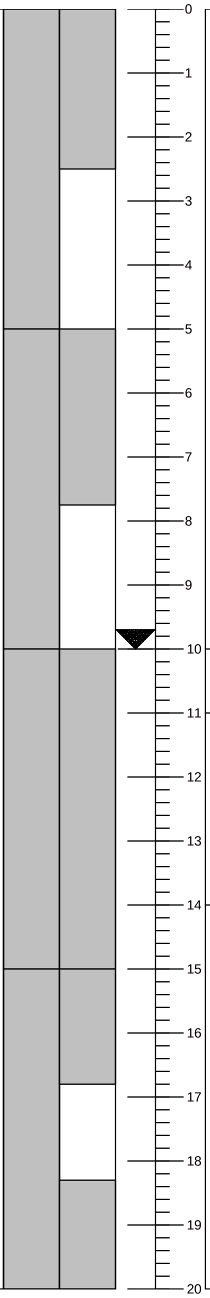
Boring ID: FS-16

Drill Date: 3/15/2011
Logged By: Kristin Anderson
Drilled By: Eli Floyd/Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: Direct Push 2"x5' core
Boring Diameter: 2"
Boring Depth (ft bgs): 20'
Groundwater ATD (ft bgs): 10'

Coordinate system: NAD83/98
Ground Surface Elevation: 15.03; NAVD88
Latitude/Northing: 632022.79
Longitude/Easting: 1234518.45
Boring Location: See below.

Client: Port of Bellingham
Project: POB-Harris
Task: 4000
Address: Fairhaven Shipyard
Bellingham, Wa

Remarks: Boring located in the Paint Shop and Sandblast Shed Area.



PID (ppm)	SHEEN	SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
		FS16-2 -031511		0	SW	Asphalt surfacing top 4". Dark brown coarse well graded SAND with trace silt and gravel, dry to moist. No odor and no sheen. At 1.5' bgs, grades to medium brown fine sandy lense with trace small gravels.
0.8				5	SW	Same as above. Very large cobble at 6' bgs. 6" of concrete and crushed shells below. At 6.5 back to well graded SAND with gravel and trace silt.
				10	SW-SM	Brown coarse well graded SAND with silt and gravel, wet. Shell fragments throughout. No sheen and no odor.
1				11	SM	Gray silty fine SAND with gravel, interbedded silty and gravelly lenses, wet.
0.8 0.0		FS16-19 -031511		14	SW	Brown well graded coarse SAND with gravel and trace silt, wet. Same as above. Same as above.

Notes:
FT BGS = feet below ground surface
ppm = parts per million
--- Dashed contact line in soil description indicates a gradational contact
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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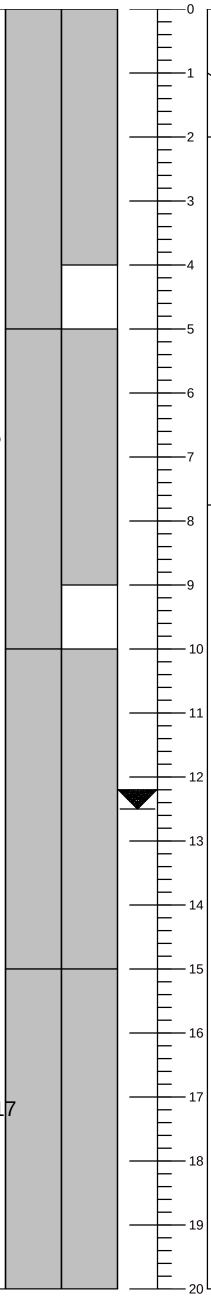
Boring ID: FS-17

Drill Date: 3/16/2011
Logged By: Kristin Anderson
Drilled By: Eli Floyd/Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: Direct Push 2"x5' core
Boring Diameter: 2"
Boring Depth (ft bgs): 20'
Groundwater ATD (ft bgs): 12.5'

Client: Port of Bellingham
Project: POB-Harris
Task: 4000
Address: Fairhaven Shipyard
Bellingham, Wa

Coordinate system: NAD83/98
Ground Surface Elevation: 15.91; NAVD88
Latitude/Northing: 631940.24
Longitude/Easting: 1234536.88
Boring Location: See below.

Remarks: Boring located in the Paint Shop and Sandblast Shed area, east of All American Marine.



PID (ppm)	SHEEN	SAMPLE ID	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
			0–1	SW	Dark brown medium SAND with gravel, trace silt, dry. No odor and no sheen.
			1–2	GW	Gray well graded angular GRAVEL with fine pulverized concrete-like material/possible limestone, dry (FILL).
0.0			2–5	SW	Dark brown well graded SAND with gravel, dry to moist. Some woody material at 3.5' bgs. No odor and no sheen.
			5–7		Same as above. Grading to black at 6' bgs. Brick fragments at 6.2' and woody debris at 6.75' bgs.
0.0		FS17-6.5 -031611	7		
			8–10	SW-SM	Brown well graded medium and coarse SAND with silt and gravel, moist.
			10.5		Same as above. Very moist.
0.0			11		
			12.5		Wet at 12.5' bgs.
			15	SW-SM	Same as above.
0.0		FS17-GW17 -031611 FS17-18 031611	17–18		

Notes:
FT BGS = feet below ground surface
ppm = parts per million
--- Dashed contact line in soil description indicates a gradational contact
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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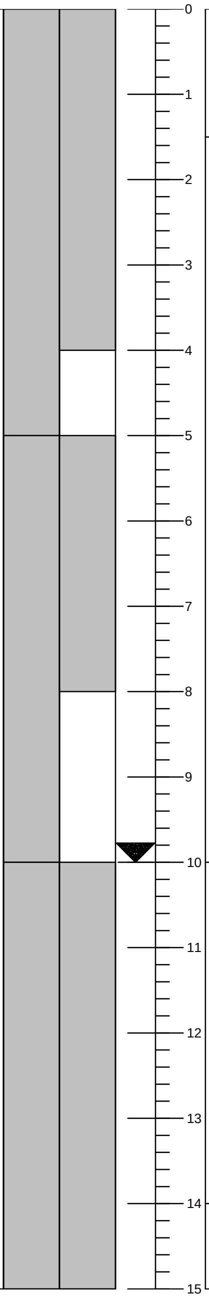
Boring ID: FS-18

Drill Date: 3/16/2011
Logged By: Erin Murray
Drilled By: Eli Floyd/Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: Direct Push 2"x5' core
Boring Diameter: 2"
Boring Depth (ft bgs): 20'
Groundwater ATD (ft bgs): 10'

Coordinate system: NAD83/98
Ground Surface Elevation: 15.35; NAVD88
Latitude/Northing: 631918.75
Longitude/Easting: 1234463.05
Boring Location: See below.

Client: Port of Bellingham
Project: POB-Harris
Task: 4000
Address: Fairhaven Shipyard
Bellingham, Wa

Remarks: Boring located in the Paint Shop and Sandblast Shed area, east of All American Marine.



PID (ppm)	SHEEN	SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
					Concrete	Gravel surfacing on top of concrete.
0.3					SP	Tan to gray poorly graded fine SAND, little silt, moist.
		FS18-3 -031611				
						Shells and small gravels at 3.5' bgs.
0.7					SP	Same as above. Gray horizontal beds of gray fine sand.
0.0						
0.0					SW-SM	Tan well graded fine to coarse SAND with gravels and silt, wet.
0.0		FS18-14 -031611			SM	Dark gray silty fine SAND with gravel, wet. Shell fragments. Native.

Notes:
FT BGS = feet below ground surface
ppm = parts per million

--- Dashed contact line in soil description indicates a gradational contact
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: MW-06

Drill Date: March 14, 2011
Logged By: Lisa Meoli
Drilled By: Scott Krueger/Cascade Drilling
Drill Type: Hollow Stem Auger
Sample Method: 18" split spoon
Boring Diameter: 2 inches
Boring Depth (ft bgs): 20 ft
Groundwater ATD (ft bgs): 11 ft

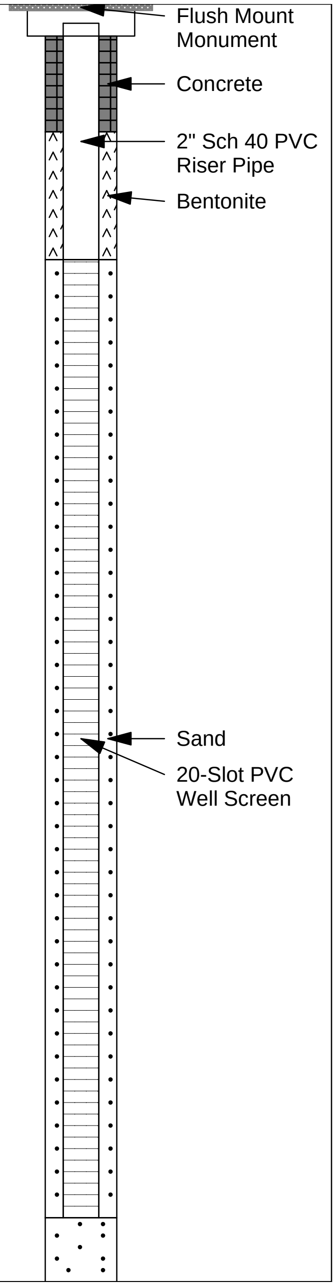
Ground Surf Elev. & Datum: 14.58
Coordinate System: NAD 83/89, NAVD 88 ver
Latitude/Northing: 632248
Longitude/Easting: 1234636
Casing Elevation: 14.22

Client: Port of Bellingham
Project: POB-Harris
Task Number: T 4010
Site Location: Harris Ave Shipyard
201 Harris Avenue

Remarks:

PID/SAMPLE INTERVAL	DRIVE / RECOVERY	BLOW COUNT	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS: (color, texture, moisture, MAJOR CONSTITUENT, odor, staining, sheen, debris, etc.)
1.0 ppm		8/9/12		SP	Light brown, SAND, minor gravel, loose, poor recovery, no odor, no sheen (FILL).
10.2 ppm		21/25/28		SP	Same as above except slightly more fines and moist. No odor, no sheen.
122 ppm		12/15/18		SM	Grey, silty SAND, minor gravel, at 9' bgs large piece of wood, at 10' bgs strong petroleum odor and sheen, wet.
MW06-10-031411					
0.0 ppm		7/8/9	▼	SP	Grey, SAND, fine grained, no gravel, no odor, no sheen, saturated.
0.0 ppm MW06-14.5-031411		5/5/8		SP	Same as above. Some minor rounded gravel and coarser grained sand, no odor, no sheen, saturated.
0.0 ppm		7/8/8		SP	Same as above. No odor, no sheen, saturated.
0.0 ppm					
0.0 ppm		12/15/15		SP	Same as above, shell fragments, minor rounded gravel, no odor, no sheen, saturated.

MONITORING WELL DETAIL



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: MW-07

Drill Date: March 15, 2011
Logged By: Lisa Meoli
Drilled By: Scott Krueger/Cascade Drilling
Drill Type: Hollow Stem Auger
Sample Method: 18" split spoon
Boring Diameter: 2 inches
Boring Depth (ft bgs): 15 ft
Groundwater ATD (ft bgs): 8 ft

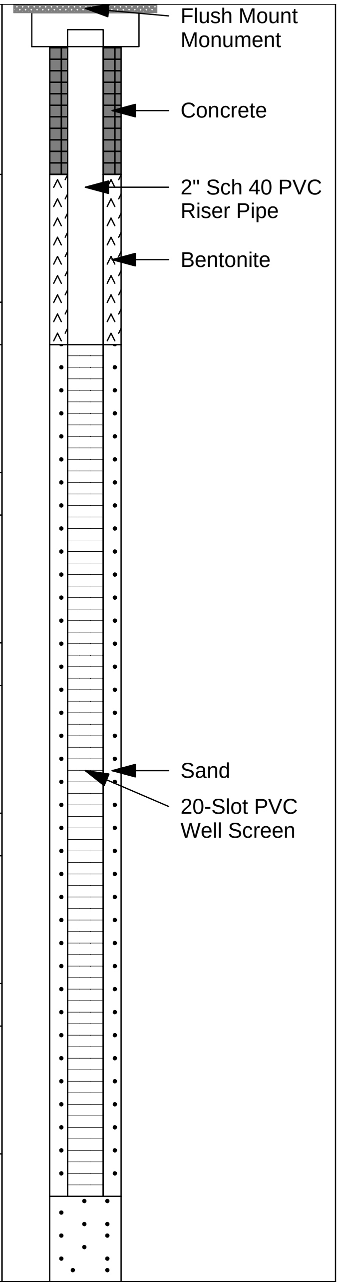
Ground Surf Elev. & Datum: 15.37
Coordinate System: NAD 83/89, NAVD 88 ver
Latitude/Northing: 632127
Longitude/Easting: 1234337
Casing Elevation: 14.95

Client: Port of Bellingham
Project: POB-Harris
Task Number: T 4010
Site Location: Harris Ave Shipyard
201 Harris Avenue

Remarks:

PID/SAMPLE INTERVAL	DRIVE / RECOVERY	BLOW COUNT	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS: (color, texture, moisture, MAJOR CONSTITUENT, odor, staining, sheen, debris, etc.)
			0		
0.0 ppm		6/7/7	2	SP	Dark brown, gravelly SAND, loose, shell fragments, no odor, no sheen, dry to moist.
0.0 ppm		9/10/11	4	SM	Same as above, no odor, no sheen. Grades to grey SAND, minor gravel, shell fragments, dry to moist, no odor no sheen.
25 ppm MW-2A-7.5-031511		9/9/10	6	SP	Same as above, saturated. At 7.5' bgs coarser grained sand and pea-sized gravels, no odor, no sheen.
6.3 ppm		11/28/30	8 ▼	SM	Reddish brown-grey, silty SAND, minor gravel, shell fragments, grading to silty sand with larger gravels, no odor, no sheen, saturated.
5.7 ppm		8/9/16	10	SP	Reddish brown, silty SAND, minor gravel, shell fragments, no odor, no sheen.
0.0 ppm MW-2A-13.5-031511		8/10/9	12	SP/ML	Dark grey, SAND, coarser grained, shell fragments, no odor, no sheen. At 13.5' bgs, grades to grey, sandy SILT, very tight and clay like, no odor or sheen.
			15		

MONITORING WELL DETAIL



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: MW-08

Drill Date: March 14, 2011
Logged By: Lisa Meoli
Drilled By: Scott Krueger/Cascade Drilling
Drill Type: Hollow Stem Auger
Sample Method: 18" split spoon
Boring Diameter: 2 inches
Boring Depth (ft bgs): 20 ft
Groundwater ATD (ft bgs): 8 ft

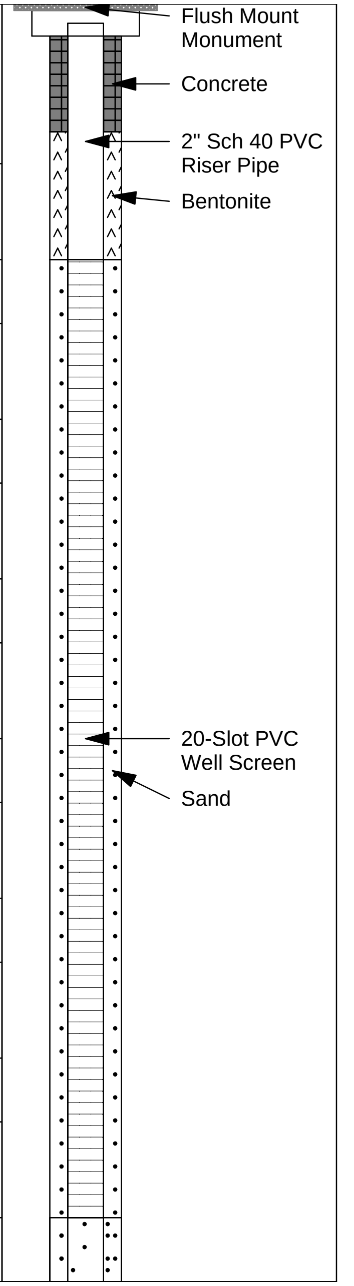
Ground Surf Elev. & Datum: 13.90
Coordinate System: NAD 83/89, NAVD 88 ver
Latitude/Northing: 631999
Longitude/Easting: 1234273
Casing Elevation: 13.42

Client: Port of Bellingham
Project: POB-Harris
Task Number: T 4010
Site Location: Harris Ave Shipyard
201 Harris Avenue

Remarks:

PID/SAMPLE INTERVAL	DRIVE / RECOVERY	BLOW COUNT	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS: (color, texture, moisture, MAJOR CONSTITUENT, odor, staining, sheen, debris, etc.)
0.0 ppm MW-8-4 -031411		18/24/ 25	3	GW	Greyish brown, sandy GRAVEL, coarse grained, loose, shell fragments, no odor, no sheen, dry (FILL).
0.0 ppm		21/28/ 33	5	GW	Same as above. Minimal recovery, no odor, no sheen, moist to wet.
0.0 ppm		14/15/ 15	▼ 8	SP	Brown, SAND, medium grained, minor gravel, loose, shell fragments, no odor, no sheen, saturated.
0.0 ppm		5/9/11	10	SM	Grey, silty SAND, very fine, no gravel, shell fragments, no gravel, no odor, no sheen, saturated.
MW-8- 13.5- 031411		3/5/5	13	SM	Same as above. No odor, no sheen.
0.0 ppm		5/7/7	15	SM	Same as above. No odor, no sheen.
0.0 ppm		4/7/6	18	SM	Same as above. No odor, no sheen.

MONITORING WELL DETAIL



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: MW-09

Drill Date: March 14, 2011
Logged By: Lisa Meoli
Drilled By: Scott Krueger/Cascade Drilling
Drill Type: Hollow Stem Auger
Sample Method: 18" split spoon
Boring Diameter: 2 inches
Boring Depth (ft bgs): 15 ft
Groundwater ATD (ft bgs): 8 ft

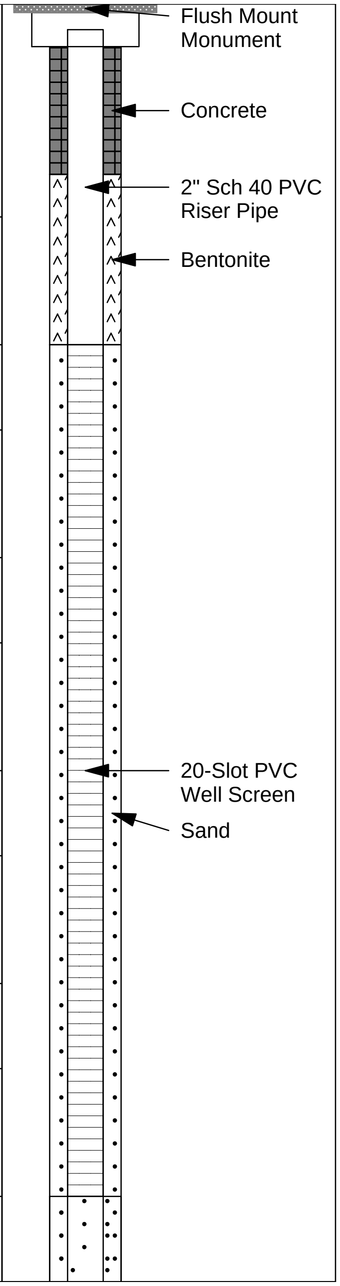
Ground Surf Elev. & Datum: 11.16
Coordinate System: NAD 83/89, NAVD 88 ver
Latitude/Northing: 632259
Longitude/Easting: 1234582
Casing Elevation: 10.58

Client: Port of Bellingham
Project: POB-Harris
Task Number: T 4010
Site Location: Harris Ave Shipyard
201 Harris Avenue

Remarks:

PID/SAMPLE INTERVAL	DRIVE / RECOVERY	BLOW COUNT	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS: (color, texture, moisture, MAJOR CONSTITUENT, odor, staining, sheen, debris, etc.)
1.2 MW-9-4-031411		10/12/12		SM	Greyish brown silty SAND, minor gravel, loose, moist (FILL).
172		15/8/7		SP	Greyish brown fine-grained SAND, poorly graded, minor gravel, loose, moist, woody debris at 6'bgs, strong petroleum odor and heavy sheen present in sampler and on paper towel test.
25.2		4/2/4	▼	SM	Grey silty SAND, minor gravel, loose, saturated, moderate petroleum odor and slight sheen present in sampler.
MW-9-10-031411 15.7		2/3/5		SM	Same as above.
		3/3/5		SM	Same as above. Shell fragments and some natural wood pieces present. Slight petroleum odor and slight sheen at 13' bgs.

MONITORING WELL DETAIL



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: MW-2A

Drill Date: March 15, 2011
Logged By: Lisa Meoli
Drilled By: Scott Krueger/Cascade Drilling

Ground Surf Elev. & Datum: 15.37
Coordinate System: NAD 83/89, NAVD 88 ver
Latitude/Northing: 632258
Longitude/Easting: 1234456
Casing Elevation: 14.95

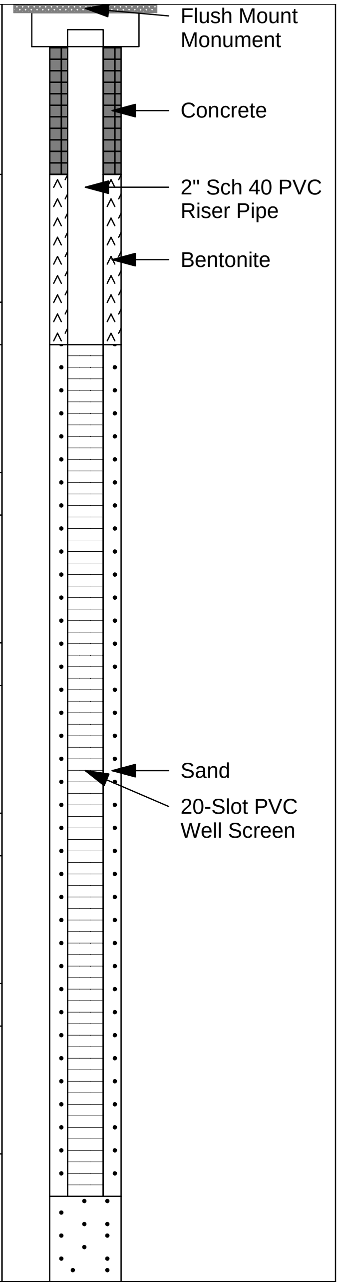
Drill Type: Hollow Stem Auger
Sample Method: 18" split spoon
Boring Diameter: 2 inches
Boring Depth (ft bgs): 15 ft
Groundwater ATD (ft bgs): 8 ft

Client: Port of Bellingham
Project: POB-Harris
Task Number: T 4010
Site Location: Harris Ave Shipyard
201 Harris Avenue

Remarks:

PID/SAMPLE INTERVAL	DRIVE / RECOVERY	BLOW COUNT	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS: (color, texture, moisture, MAJOR CONSTITUENT, odor, staining, sheen, debris, etc.)
0.0 ppm		6/7/7	2	SP	Dark brown, gravelly SAND, loose, rusted metal and nails, no odor, no sheen, dry (FILL).
0.0 ppm		9/10/11	4	SM	Reddish brown, silty SAND, minor gravel, no odor, no sheen, moist.
25 ppm MW-2A-7.5 -031511		9/9/10	6	SP	Grey, SAND, very fine grained, grading to coarser grained sand and gravel at 7.5' bgs, strong petroleum odor and sheen present, wet.
6.3 ppm		11/28/30	8	SP	Same as above, minimal recovery, strong petroleum odor and sheen present on surface of water in split spoon.
5.7 ppm		8/9/16	10	SP	Grey, SAND, coarser grained, small pea-sized gravel, slight petroleum odor and sheen present. At 11.5' bgs grades to grey, silty SAND, very fine grained, minor gravels, saturated.
0.0 ppm 0.0 ppm MW-2A-13.5 -031511		8/10/9	12	ML	Grey, sandy SILT, clay like, slight petroleum odor and sheen. No odor or sheen at the bottom of the sample interval at 13' bgs.

MONITORING WELL DETAIL



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

Harris Avenue Shipyard

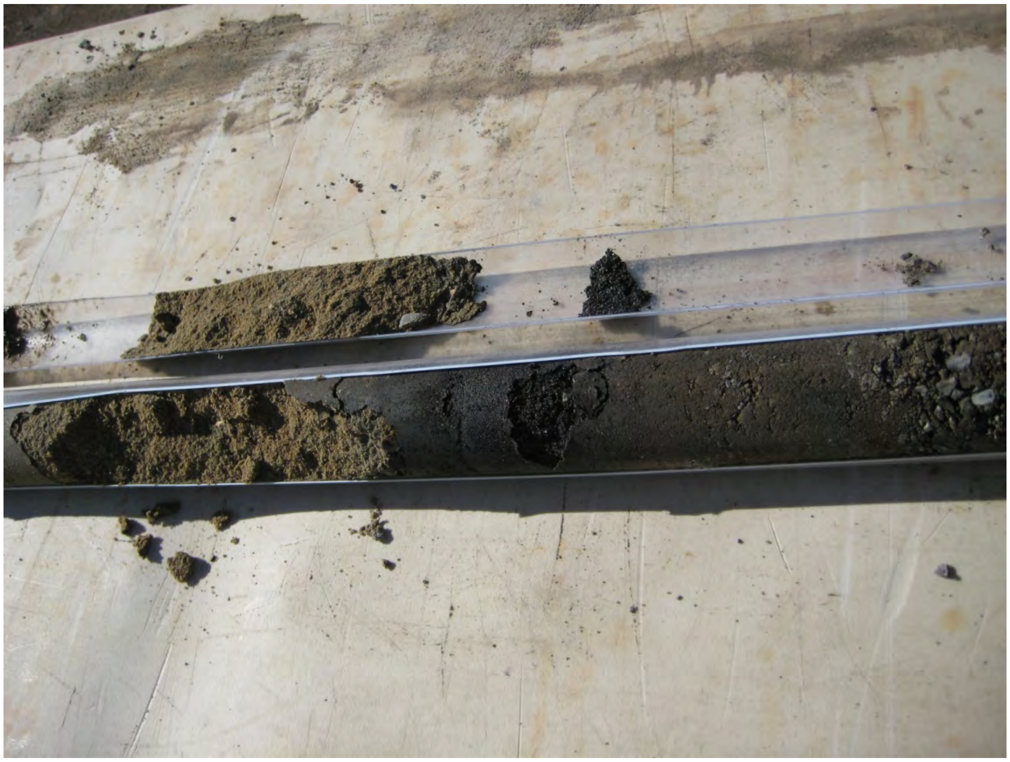
Remedial Investigation/ Feasibility Study Data Report

Appendix D
Site Photographs

Photograph 1. Soil boring location FS-01 from 0 to 20 feet below ground surface (bgs) showing fill down to native sands.

Photograph 2. Soil boring location FS-09 showing heavy sheen observed from 8.5 feet down to 17 feet bgs.

Photograph 3. Soil boring location FS-09a showing creosote-coated piling with heavy non-aqueous phase liquid (NAPL) throughout.



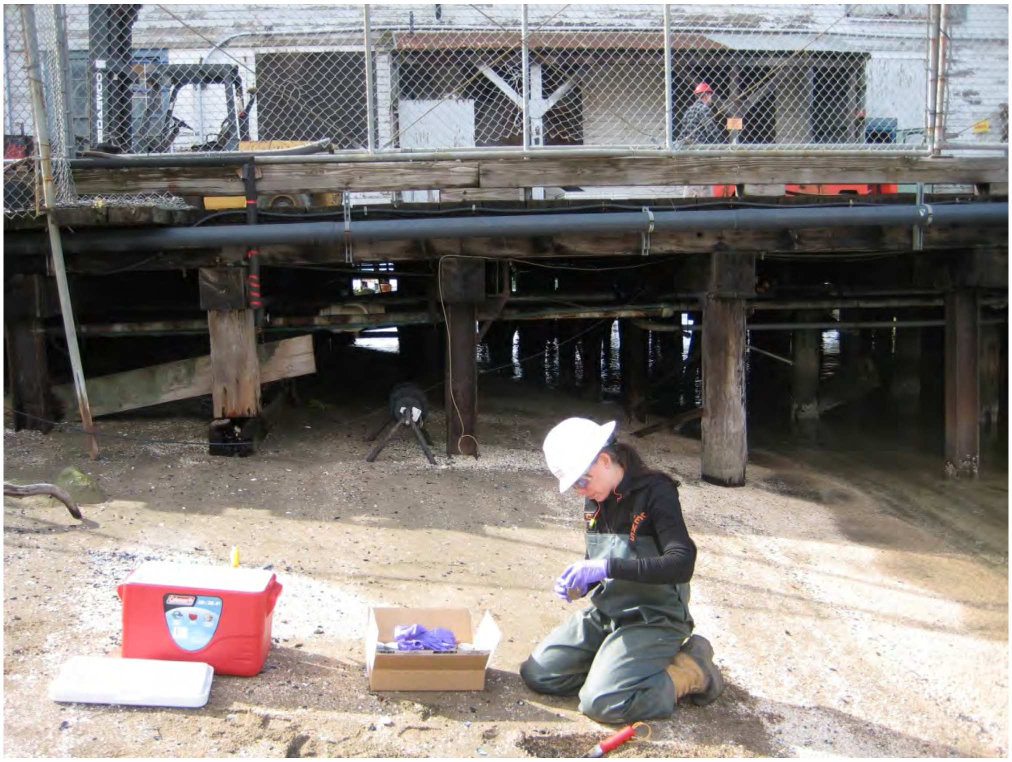
Photograph 4. Soil boring location FS-09d showing sandblast grit at 1 foot bgs.

Photograph 5. Split-spoon soil sample taken at MW-09 from 8 to 9.5 feet bgs.

Photograph 6. Soil gas sample set-up at MW-09 at 3.5 feet bgs.

Photograph 7. Well installation at Monitoring Well MW-02A in the Northern Shoreline Area.

Photograph 8. Groundwater sampling at newly installed Monitoring Well MW-09 in the Marine Railway Area along the shoreline.



Photograph 9. Intertidal/bank area sampling by hand auger at HA-02 along the shoreline in the Northern Shoreline Area.

Photograph 10. Diver assisted hand corer used to collect nearshore sediment contingency samples.

Photograph 11. Nearshore sediment sample SG-1 from 0 to 12 cm.

Harris Avenue Shipyard

Remedial Investigation/ Feasibility Study Data Report

Appendix E

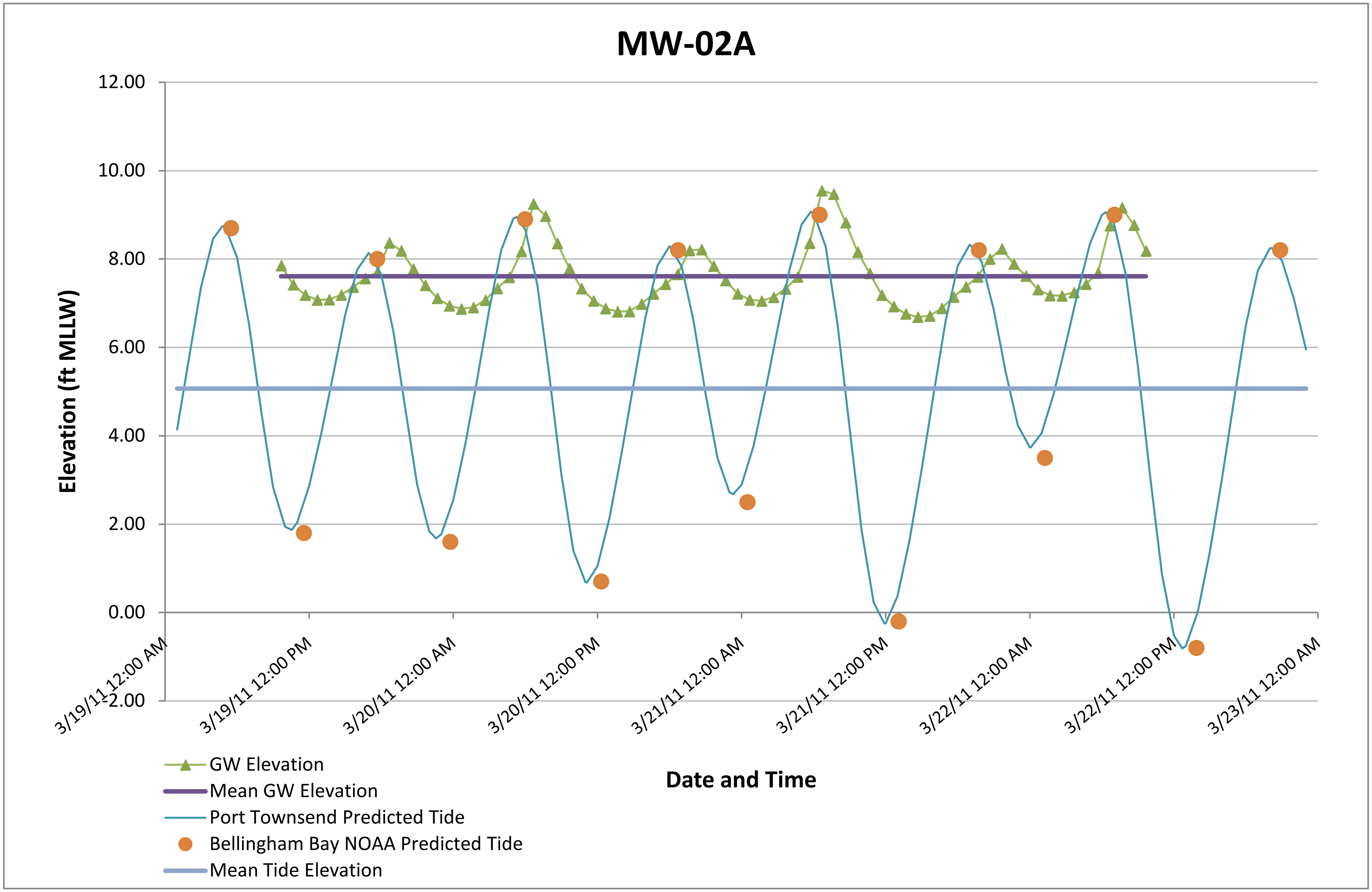
Laboratory Analytical Data Reports

(on CD-ROM)

Harris Avenue Shipyard

Remedial Investigation/ Feasibility Study Data Report

Appendix F
Tidal Study Figures



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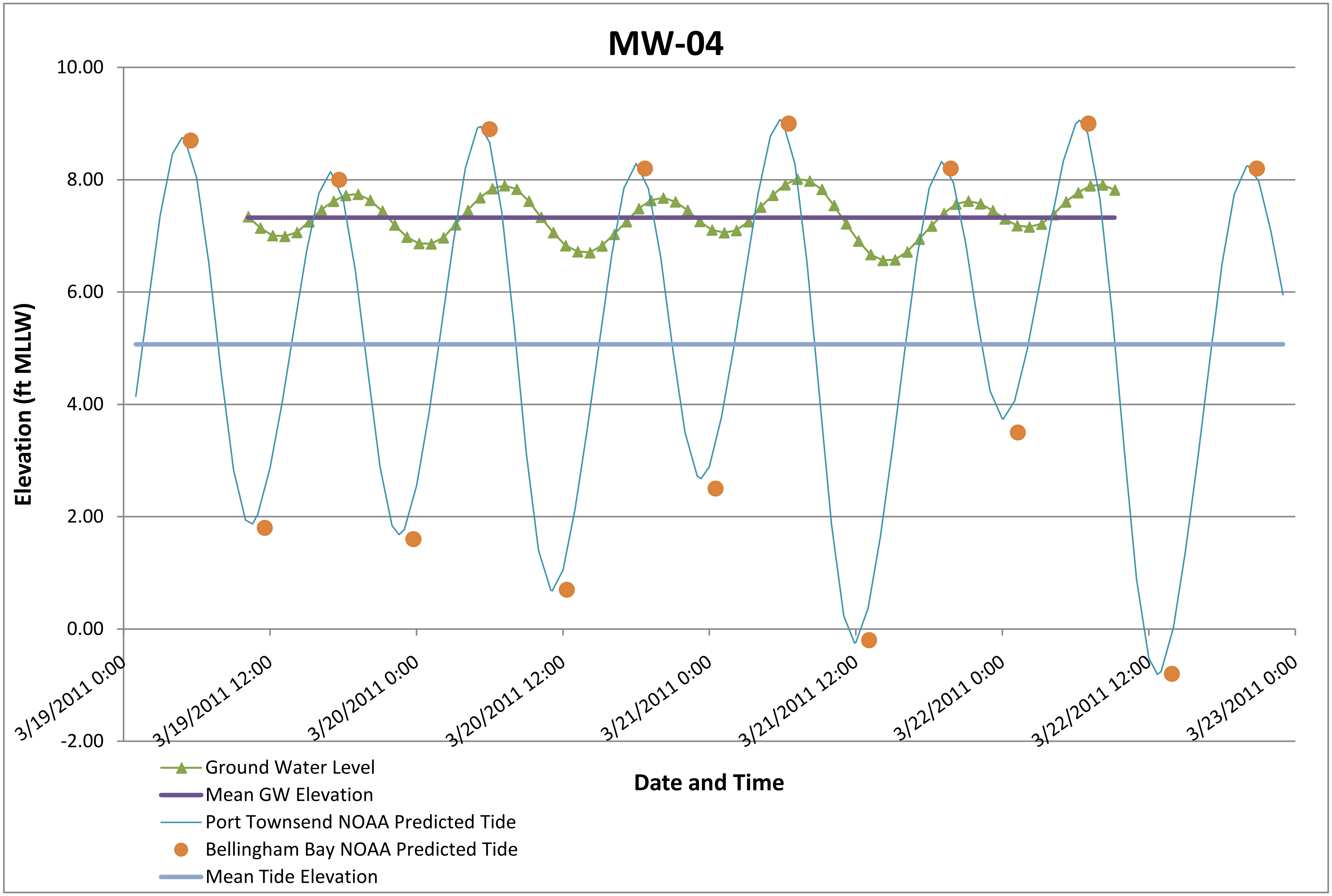
Remedial Investigation/Feasibility Study
Data Report
Harris Avenue Shipyard
Bellingham, Washington

Figure F.1
Tidal Study Results for MW-02A



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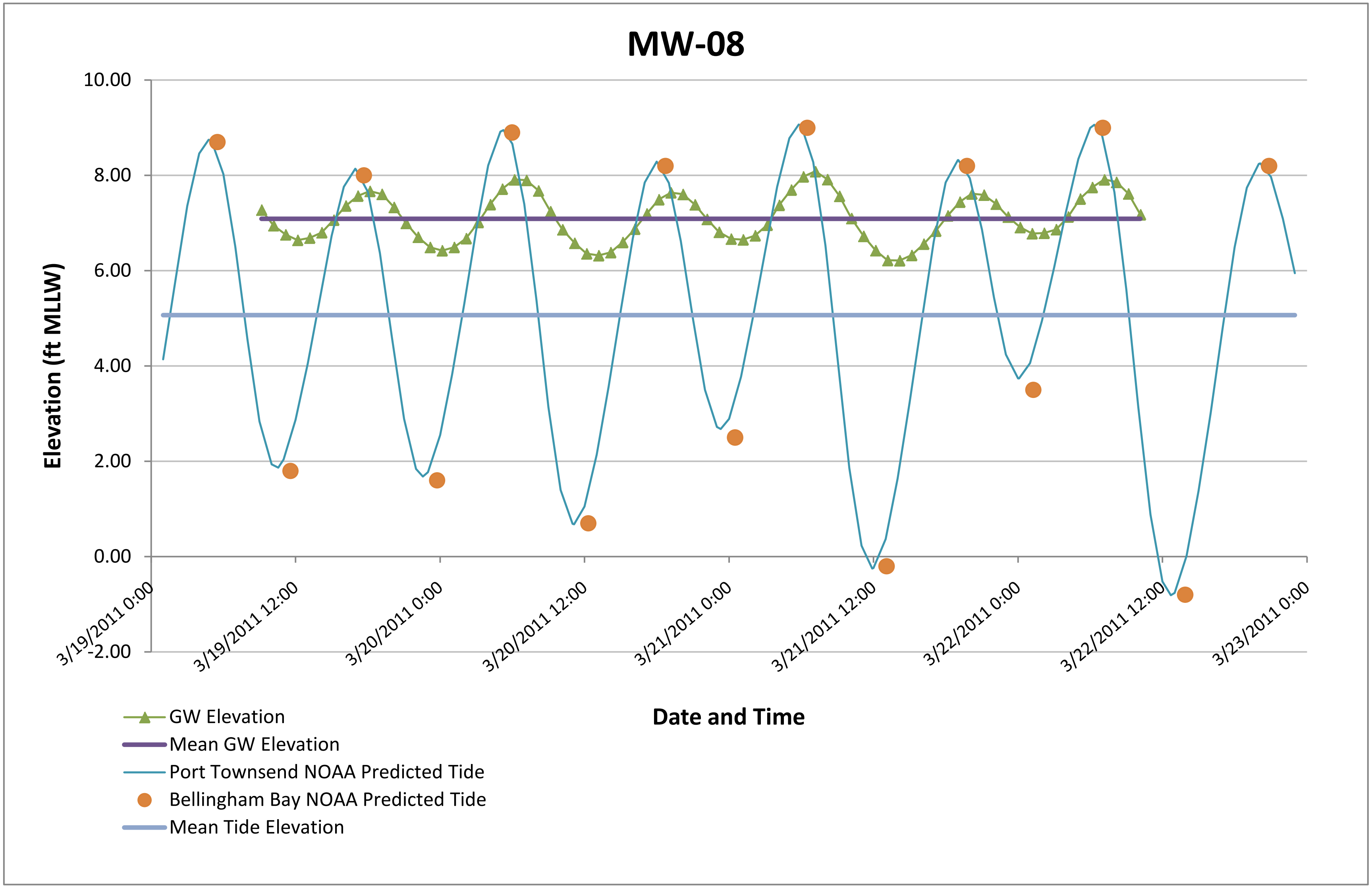
Remedial Investigation/Feasibility Study
Data Report
Harris Avenue Shipyard
Bellingham, Washington

Figure F.2
Tidal Study Results for MW-04



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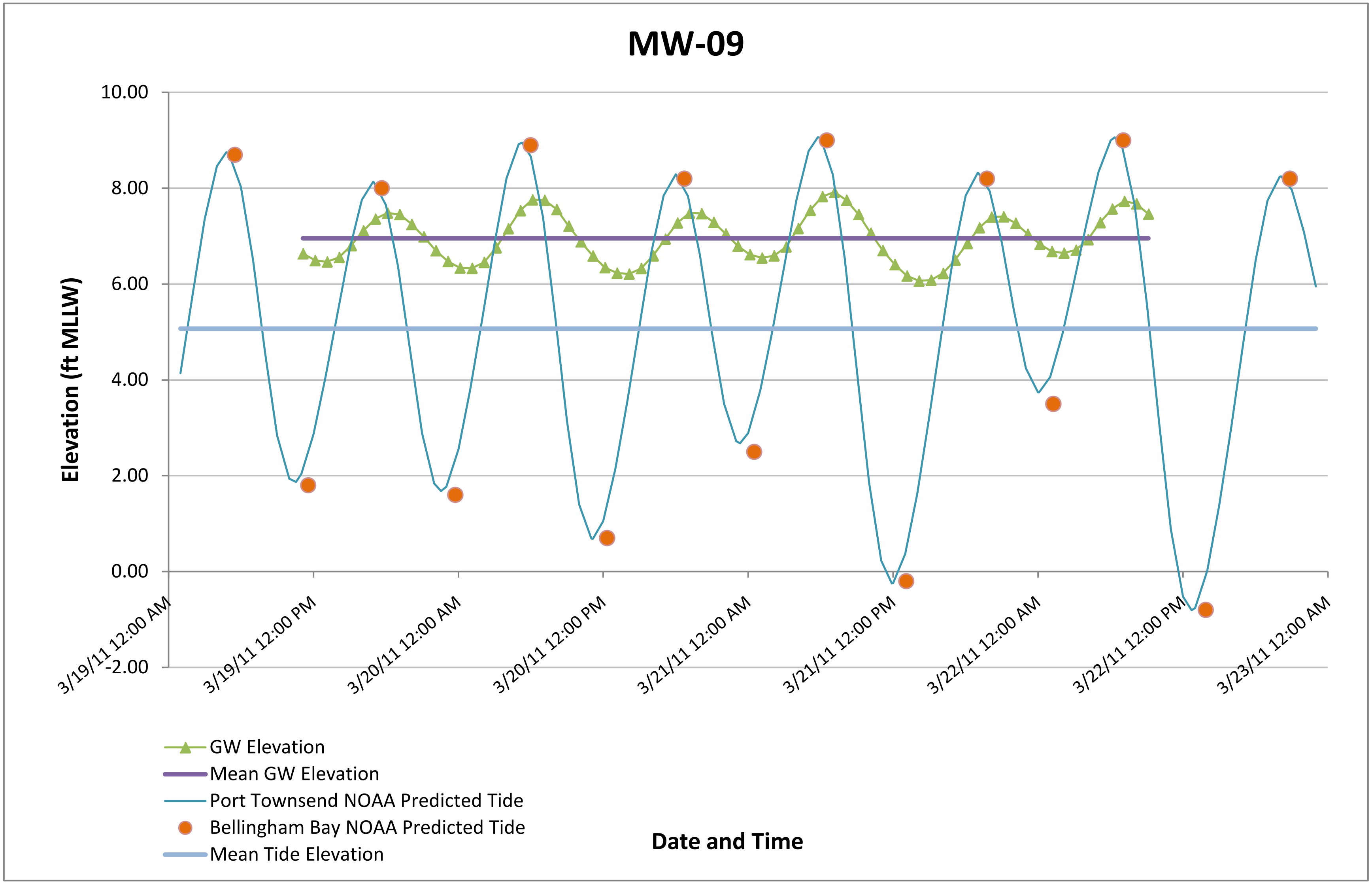
Remedial Investigation/Feasibility Study
Data Report
Harris Avenue Shipyard
Bellingham, Washington

Figure F.3
Tidal Study Results for MW-08

12/09/2011



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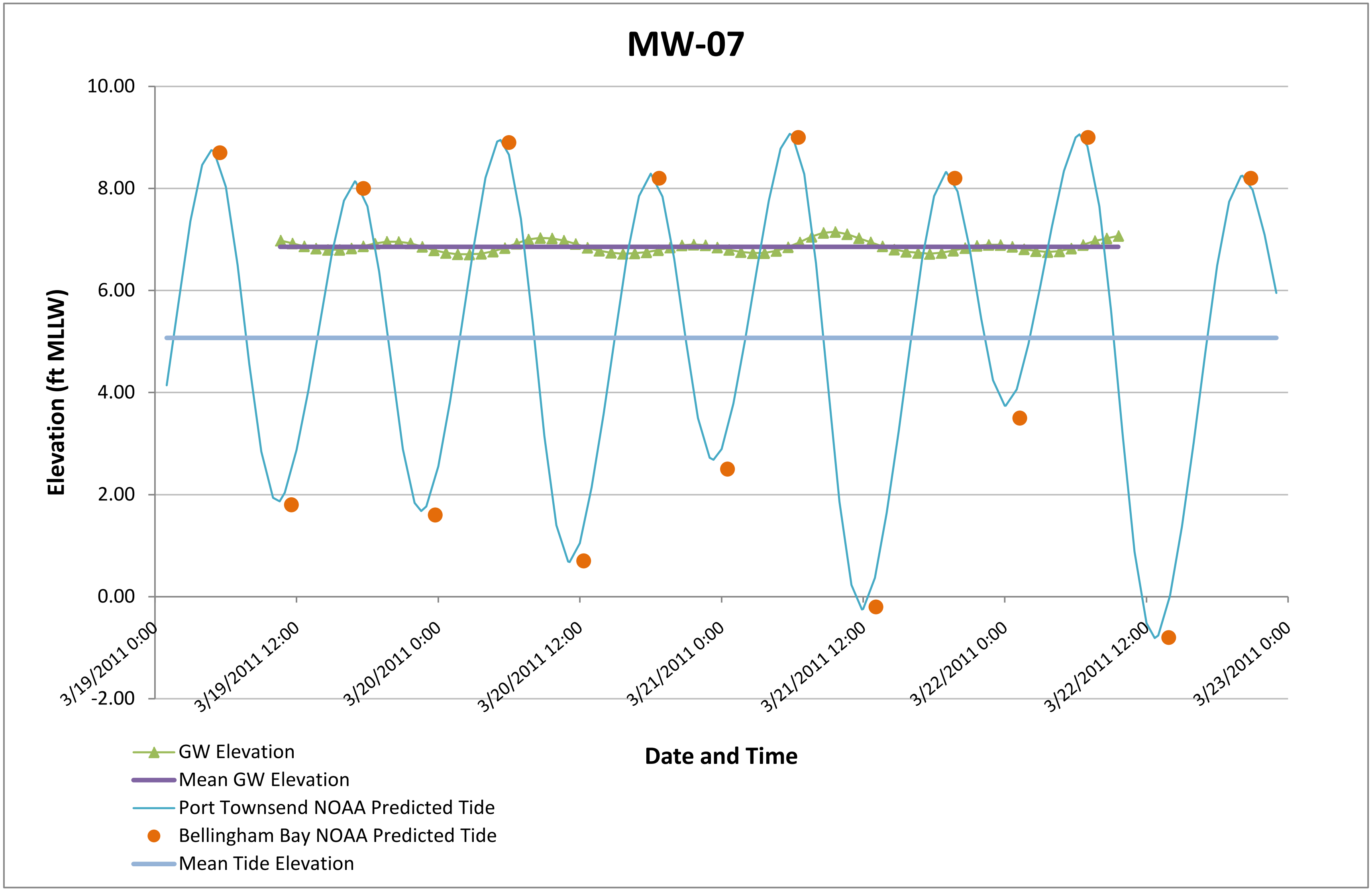
Remedial Investigation/Feasibility Study
Data Report
Harris Avenue Shipyard
Bellingham, Washington

Figure F.4
Tidal Study Results for MW-09



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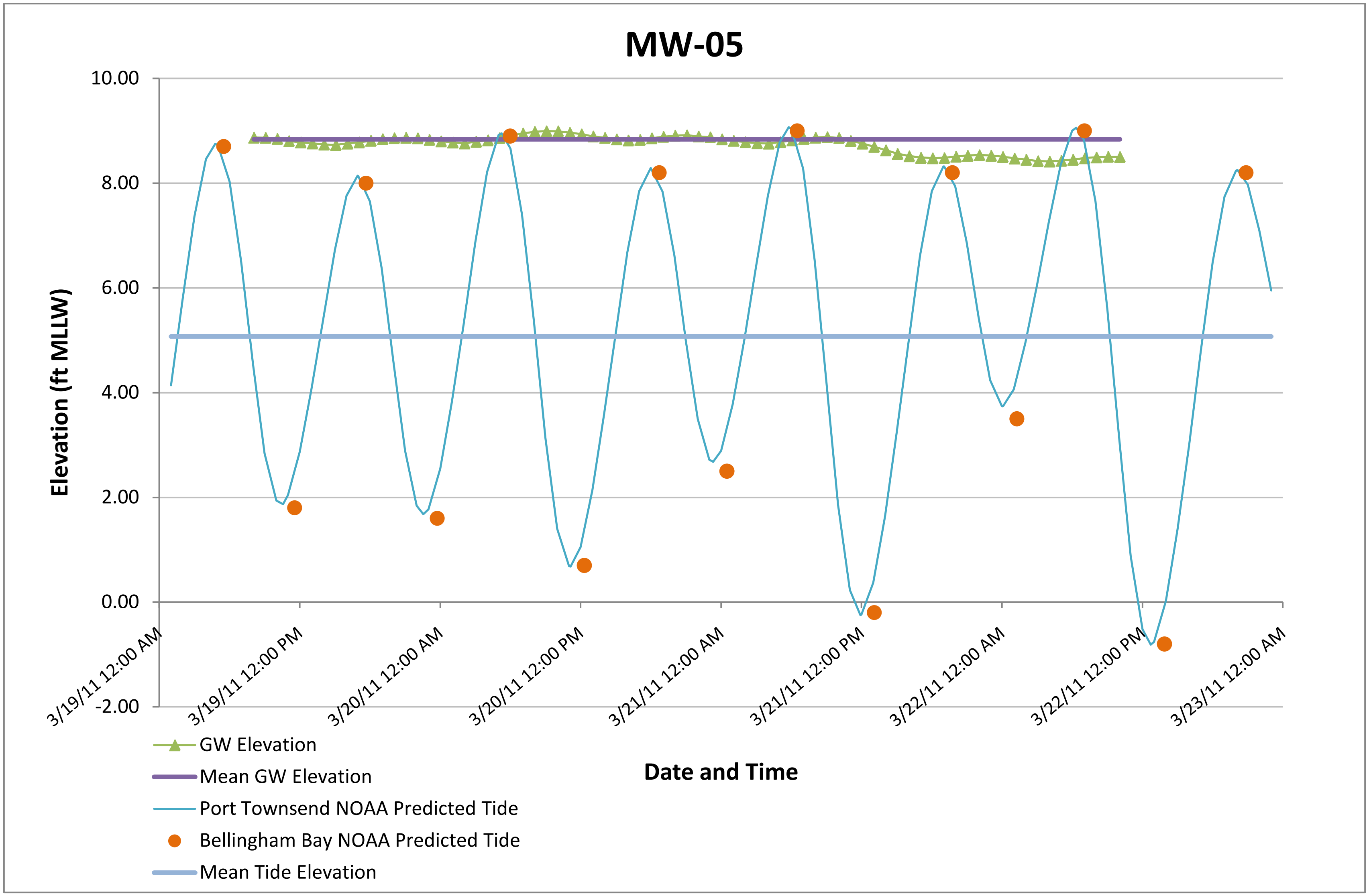
Data Report
Harris Avenue Shipyard
Bellingham, Washington

Figure F.5
Tidal Study Results for MW-07



FLOYD | SNIDER strategy ▪ science ▪ engineering	**Remedial Investigation/Feasibility Study** **Data Report** **Harris Avenue Shipyard** **Bellingham, Washington**	Figure F.6 Tidal Study Results for MW-05

Harris Avenue Shipyard

Remedial Investigation/ Feasibility Study Data Report

Appendix G
Data Validation Reports

Port of Bellingham
Harris Avenue Shipyards

Data Validation Report
RI/FS Sampling Event

Prepared for

Port of Bellingham
1801 Roeder Avenue
Bellingham, WA 98225

Prepared by

Floyd|Snider
601 Union Street, Suite 600
Seattle, WA 98101

July 2011

Table of Contents

List of Tables

List of Appendices

List of Abbreviations and Acronyms

Abbreviation/ Acronym	Definition
ALS	ALS Environmental Laboratory
DNR	Do not report
LCS	Laboratory control sample
LCSD	Laboratory control sample duplicate
MS	Matrix spike
MSD	Matrix spike duplicate
PCB	Polychlorinated biphenyl
RPD	Relative percent difference
QA	Quality assurance
QC	Quality control
SDG	Sample delivery group
SVOC	Semivolatile organic compound
TBT	Tributyltin
TFT	Trifluorotoluene
TPH	Total petroleum hydrocarbons
USEPA	U. S. Environmental Protection Agency
VOC	Volatile organic compound

1.0 Project Narrative

1.1 OVERVIEW OF DATA VALIDATION

This report summarizes the results of the Compliance Screening (Level I) performed on the soil, sediment, groundwater, and field quality control (QC) sample data for the Harris Avenue Shipyard RI/FS Sampling Event. A complete list of samples is provided in Table 1.

The chemical analyses were performed by ALS Environmental Laboratory (ALS), Everett, WA. A total of 37 soil, 8 sediment, 14 groundwater, and 6 field QC samples were collected between March 14th and 23rd, 2011 and submitted to ALS for chemical analyses. The analytical methods include the following:

- Diesel- and Oil-Range TPH—NWTPH-Dx
- Gasoline-Range TPH—NWTPH-Gx
- VOCs—USEPA Method 8260
- SVOCs—USEPA Method 8270
- PCBs—USEPA Method 8082
- Metals—USEPA Method 6020B
- Mercury—USEPA Method 7470/7471
- TBT—KRONE 1988
- Total Solids—USEPA Method 160.3
- Total Organic Carbon—PLUMB 1981

The data were reviewed using guidance and quality control criteria documented in the analytical methods, Port of Bellingham Harris Avenue Shipyard Sampling and Analysis Plan/Quality Assurance Project Plan, *National Functional Guidelines for Inorganic Data Review* (USEPA 1994 and 2004), and *National Functional Guidelines for Organic Data Review* (USEPA 1999 and 2008).

Floyd|Snider's goal in assigning data assessment qualifiers is to assist in proper data interpretation. If values are estimated (J or UJ), data may be used for site evaluation and risk assessment purposes, but reasons for data qualification should be taken into consideration when interpreting sample concentrations. If values are assigned an R, the data are to be rejected and should not be used for any site evaluation purposes. When compounds are analyzed at multiple dilutions, select results will be assigned a Do Not Report (DNR) qualification as a more appropriate result is reported from another dilution. If values have no data qualifier assigned, then the data meet the data quality objectives as stated in the documents and methods referenced above.

Data qualifier definitions, reasons, and validation criteria are included as Appendix A. The Qualified Data Summary Table is included in Appendix B. Data validation worksheets (excel worksheets) will be kept on file at Floyd|Snider.

2.0 Data Validation Report
Diesel- and Oil-Range TPH by NWTPH-Dx

This report documents the review of analytical data from the analyses of soil, sediment, groundwater, and field QC samples, and the associated laboratory QC samples. Samples were analyzed by ALS. Compliance Screening (Level I) was performed on all analytical results by Chell Black as the primary data reviewer, and secondary review was performed by Erin Breckel.

2.1 DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and any anomalies were discussed in the case narrative.

2.2 TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

QC Requirements

Cooler temperature and preservation	Surrogate recoveries
[2] Extraction and analysis holding times	Reporting limits and reported results
Blank contamination	[1,2] Compound identification
Laboratory control sample (LCS) and LCS duplicate (LCSD)	Matrix spike (MS) and MS Duplicate (MSD)

Notes

1 Quality control results are discussed below, but no data were qualified.

2 Quality control outliers that impact the reported data were noted. Data qualifiers were issued, as discussed below

Appendix A presents data validation criteria tables for diesel range hydrocarbon analysis. QC requirements that were met without exception are not discussed below. QC requirements that required further evaluation and had exceptions to the validation criteria are discussed below.

2.2.1 Extraction and Analysis Holding Times

SDG 1103102-Soil

Sample delivery group (SDG) 1103102 was originally submitted to ALS on March 17, 2011 to be archived. On April 8, 2011 it was requested that six of the archived samples from this SDG be analyzed. This request was outside of the 14 day holding time requirement for NWTPH-Dx analysis, therefore the analytical results for these six samples have been qualified as estimated, “J” for detects, “UJ” for non-detects, to reflect the analysis outside of the holding time. See Appendix B for full details.

SDG 1105025-Sediment

Three samples originally submitted in SDG 1103098 were discovered to have been missing the request for NWTPH-Dx analysis on the Chain of Custody. The samples were analyzed for NWTPH-Dx under the new SDG 1105025 outside of the 14 holding time requirement. Therefore, all results for these three samples have been qualified as estimated, "J" for detects, "UJ" for non-detects, to reflect the analysis outside of the holding time. See Appendix B for full details.

2.2.2 Compound Identification

SDG 1103081-Soil

Samples FS13-4-031511 and FS09-8-031511 had notations by the laboratory that the oil-range product results were biased high due to diesel-range product overlap. It is with professional judgment that the TPH-Oil Range results for these two samples be qualified "J" as estimated due to this overlap. See Appendix B for full details.

Sample FS01-24-031411 had a notation by the laboratory that the chromatogram indicated unidentified diesel and oil range products in the sample. It is with professional judgment that no results be qualified based on the laboratory's interpretation of the chromatogram.

SDG 1103128-Water

Sample MW6-032211 had a notation by the laboratory that the chromatogram indicated unidentified diesel and oil range products in the sample. It is with professional judgment that no results be qualified based on the laboratory's interpretation of the chromatogram.

2.3 OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by surrogate, LCS, LCSD, MS, and MSD percent recovery values. Precision was acceptable, as demonstrated by the LCS/LSCD and MS/MSD relative percent differences (RPDs).

All data are acceptable for use as qualified; see Appendix B for details.

3.0 Data Validation Report
Gasoline-Range TPH by NWTPH-Gx

This report documents the review of analytical data from the analyses of soil, sediment, groundwater, and field QC samples, and the associated laboratory QC samples. Samples were analyzed by ALS. Compliance Screening (Level I) was performed on all analytical results by Chell Black as the primary data reviewer, and secondary review was performed by Erin Breckel.

3.1 DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and any anomalies were discussed in the case narrative.

3.2 TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

QC Requirements

	Cooler temperature and preservation		LCS and LCSD
2	Extraction and analysis holding times		Field duplicates
	Blank contamination		Reporting limits and reported results
1,2	Surrogate recoveries	2	Compound identification

Notes

1 Quality control results are discussed below, but no data were qualified.

2 Quality control outliers that impact the reported data were noted. Data qualifiers were issued, as discussed below

Appendix A presents data validation criteria tables for diesel range hydrocarbon analysis. QC requirements that were met without exception are not discussed below. QC requirements that required further evaluation and had exceptions to the validation criteria are discussed below.

3.2.1 Extraction and Analysis Holding Times

SDG 1103102-Soil

SDG 1103102 was originally submitted to ALS on March 17, 2011 to be archived. On April 8, 2011 it was requested that six of the archived samples from this SDG be analyzed. This request was outside of the 14 day holding time requirement for NWTPH-Gx analysis, therefore the non-detected results for these six samples have been qualified as estimated, “UJ” for non-detects, to reflect the analysis outside of holding time. See Appendix B for full details.

3.2.2 Surrogate Recoveries

SDG 1103081-Soil

For sample FS11-2-031411, the surrogate recovery of trifluorotoluene (TFT) was 154% and outside the laboratory control limits (50-150%), high by 4%. Per the laboratory, this recovery should be considered an uncontrolled surrogate recovery due to the x10 dilution factor of this sample. In addition, the sample result was a non-detect and for recoveries that are greater than the upper control limits only detected results are qualified. Therefore, the gasoline-range (or volatile-range) TPH result for this sample was not qualified based on this surrogate recovery exceedance.

SDG 1103102-Soil

For sample FS09C-8.5-031711, the surrogate recovery for TFT was flagged prior to analysis as considered out of control by the laboratory due to the x10 dilution of the sample. The recorded recovery of 116% was within the laboratory control limits of 60-140%. For sample FS09A-6-031711, the surrogate recovery of TFT (50.4%) was outside control limits (60-140%) low. No additional qualification is needed as the results are already flagged as estimated, “UJ”, due to the analysis of these samples outside of holding time.

3.2.3 Compound Identification

SDG 1103081-Soil

Samples FS01-14-031411 and FS01-2.5-031411 had notations from the laboratory that the gasoline-range product results were biased high due to semi-volatile range product overlap. It is with professional judgment that the gasoline-range (or volatile-range) TPH results for these two samples be qualified “J” as estimated due to this overlap. See Appendix B for full details.

SDG 1103082-Soil

Samples MW6-10-031411, MW9-6-031411, and MW2A-7.5-031511 had notations from the laboratory that the gasoline-range product results were biased high due to semi-volatile range product overlap. It is with professional judgment that the gasoline-range (or volatile-range) TPH results for these three samples be qualified “J” as estimated due to this overlap. See Appendix B for full details.

SDG 1103128-Water

Sample MW9-GW-032211 had a notation from the laboratory that the gasoline-range product result was biased high due to semi-volatile range product overlap. It is with professional judgment that the gasoline-range (or volatile-range) TPH result for this sample be qualified “J” as estimated due to this overlap. See Appendix B for full details.

SDG 1103141-Water

Sample MW1-GW-032311 had a notation from the laboratory that the gasoline-range product result was biased high due to semi-volatile range product overlap. It is with professional judgment that the gasoline-range (or volatile-range) TPH result for this sample be qualified “J” as estimated due to this overlap. See Appendix B for full details.

3.3 OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was generally acceptable, as demonstrated by surrogate, LCS, and LCSD percent recovery values. Precision was acceptable, as demonstrated by the LCS/LSCD RPDs.

All data are acceptable for use as qualified; see Appendix B for details.

4.0 Data Validation Report
VOCs by USEPA Method 8260

This report documents the review of analytical data from the analyses of soil, groundwater, and field QC samples, and the associated laboratory QC samples. Samples were analyzed by ALS. Compliance Screening (Level I) was performed on all analytical results by Chell Black as the primary data reviewer, and secondary review was performed by Erin Breckel.

4.1 DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

4.2 TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

QC Requirements

	Cooler temperature and preservation	1	MS and MSD
2	Extraction and analysis holding times		Field duplicates
	Blank contamination		Reporting limits and reported results
1,2	Surrogate recoveries		Target analyte list
	LCS and LCSD		

Notes
1 Quality control results are discussed below, but no data were qualified.
2 Quality control outliers that impact the reported data were noted. Data qualifiers were issued, as discussed below

Appendix A presents data validation criteria tables for organic compound analysis. QC requirements that were met without exception are not discussed below. QC requirements that required further evaluation and had exceptions to the validation criteria are discussed below.

4.2.1 Extraction and Analysis Holding Times

SDG 1103102-Soil

SDG 1103102 was originally submitted to ALS on March 17, 2011 to be archived. On April 8, 2011 it was requested that six of the archived samples from this SDG be analyzed. This request was outside of the 14 day holding time requirement for the USEPA Method 8260 analysis, therefore the results for these six samples have been qualified as estimated, “J” for detects, “UJ” for non detects, to reflect the analysis outside of holding time. See Appendix B for full details.

4.2.2 Surrogate Recoveries

SDG 1103081-Soil

The 4-Bromofluorobenzene surrogate was out of specification (73-123%) low for three samples: FS01-2.5-031411 (72.9%), FS-01-24.8-031411 (16.3%), and FS09-8-031511 (68%) and were qualified using USEPA guidelines as follows. For sample FS01-2.5-031411, all results for this sample were non-detects and have been qualified "UJ" as estimated. For sample FS01-24.8-031411, all results, except Naphthalene, were non-detects and qualified "UJ" as estimated. The detected Naphthalene results was qualified "J" as estimated. For sample FS09-8-031511, the low surrogate recovery applied only to the non-diluted analysis of the sample. All detected compounds have been qualified "J" as estimated and all non-detected compounds have been qualified "UJ" as estimated for this non-diluted analysis. Naphthalene was re-analyzed at x100 dilution for this sample and the surrogate recoveries for the x100 dilution were within specifications, and therefore the Naphthalene result for this diluted sample result was not qualified. Only the Naphthalene result from the diluted analysis was reported by the laboratory. See Appendix B for full details.

SDG 1103082-Soil

Sample MW2A-7.5-031511 had two surrogate recoveries from the 3/17/2011 analysis that were out of specification. Toluene-d8 (61%) was out of specification (69.4-126%) low and 4-Bromofluorobnezene (203%) was out of specification (73-123%) high. Per USEPA guidelines, the results for this sample from 3/17/2011 have been qualified "J" for detected results and "UJ" for non-detected results to indicate estimated results. There were also three compounds that had results reported from a separate analysis on this sample completed on 3/18/2011. The surrogates for this 3/18/2011 analysis were all within specification and therefore the results for these three compounds (S-Butyl Benzene, N-Butylbenzene, and Naphthalene) from the 3/18/2011 have not been qualified. Only the 3/18/2011 results for these three compounds were reported by the laboratory. See Appendix B for complete details on compounds qualified for this sample.

SDG 1103098-Soil

The 4-Bromoflurobenzene surrogate recovery (137%) for sample FS17-6.5-031611 was outside specification (79-133%) high. Per UESPA guidelines, only detected analytes are qualified "J" as estimated. All results for this sample were non-detect, therefore no results have been qualified.

4.2.3 Matrix Spike and Matrix Spike Duplicate

SDG 1103098 - Water

The recoveries for 1,1-Dichloroethene in the MS (137%) and MSD (135%) performed on sample FS17-GW-031611 were out of specification (79-133%) high. The MS/MSD RPD for 1,1-Dichloroethene was within control limits. Additionally, the recoveries for Chlorobenzene in the MS (124%) and MSD (122%) were out of specification (80-120%) high. The MS/MSD RPD for Chlorobenzene was within limits. The results for both of these compounds were non-detect in all four water samples in this batch. Per USEPA guidelines, data is not to be qualified based on MS/MSD data alone. Therefore, it is with professional judgment that no data be qualified based on this MS/MSD recovery data as the recoveries are biased high and all results were non-detects.

SDG 1103128-Water

The MS recoveries for 1,1,-Dichloroethene (137%) and Chlorobenzene (122%) were outside their respective specifications (79-133% and 80-120%) high. Per USEPA guidelines, detected results in the parent sample are to be qualified "J" as estimated and data is not to be qualified based on MS/MSD data alone. The MS was run on the "Batch QC" sample and not a specific field sample and there were no other quality control issues with the corresponding water samples; therefore, no results for the field samples are qualified based on the MS recovery exceedances.

4.3 OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was generally acceptable, as demonstrated by surrogate, LCS, LCSD, MS, and MSD percent recovery values. ~~.~~Precision was acceptable, as demonstrated by the MS/MSD RPDs and LCS/LSCD RPDs.

All data are acceptable for use as qualified; see Appendix B for details.

5.0 Data Validation Report
SVOCs by USEPA Method 8270

This report documents the review of analytical data from the analyses of soil, sediment, and groundwater samples, and the associated laboratory QC samples. Samples were analyzed by ALS. Compliance Screening (Level I) was performed on all analytical results by Chell Black as the primary data reviewer, and secondary review was performed by Erin Breckel.

5.1 DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

5.2 TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

QC Requirements

	Cooler temperature and preservation	MS and MSD
2	Extraction and analysis holding times	Field duplicates
	Blank contamination	Reporting limits and reported results
1,2	Surrogate recoveries	Target analyte list
1	LCS and LCSD	

Notes
1 Quality control results are discussed below, but no data were qualified.
2 Quality control outliers that impact the reported data were noted. Data qualifiers were issued, as discussed below

Appendix A presents data validation criteria tables for organic compound analysis. QC requirements that were met without exception are not discussed below. QC requirements that required further evaluation and had exceptions to the validation criteria are discussed below.

5.2.1 Extraction and Analysis Holding Times

SDG 1103102-Soil

SDG 1103102 was originally submitted to ALS on March 17, 2011 to be archived. On April 8, 2011 it was requested that six of the archived samples be analyzed. This request was outside of the 14 day holding time requirement for the USEPA Method 8270 analysis, therefore all results have been qualified as estimated, “J” for detects, “UJ” for non detects, to reflect the analysis outside of holding time. See Appendix B for full details.

5.2.2 Surrogate Recoveries

SDG 1103081-Soil

Surrogate recoveries were out of laboratory specifications for multiple samples as follows:

Sample FS11-2-031411 - Two base surrogates were outside control limits high (2-Fluorobipheyl at 110% (55-105%) and Nitrobenzene at 135% (53-117%)), and therefore per USEPA guidelines, detected target analytes are qualified "J" as estimated and non-detects are not qualified. Two acid surrogates were also outside control limits, one high and one low (2-Fluorophenol at 115% (43-105%) and 2,4,6-Tribromophenol at 43.9% (45-108%)), and therefore per USEPA guidelines, both detected and non-detected target analytes are qualified as estimated, "J" for detects and "UJ" for non-detects. See Appendix B for complete details on the compounds qualified as estimated for this sample.

Sample FS11-12.5-031411 - One acid surrogate (2,4,6-Tribromophenol at 112% (45-108%)) was outside of specifications high. Per USEPA guidelines, no action is taken unless two or more surrogates from the same fraction are out of specifications; therefore no results for this sample were qualified.

Sample FS01-24-031411 - For the x2 dilution of this sample, one acid surrogate (2,4,6-Tribromophenol at 166% (45-108%)) was out of specifications. No action is taken unless two or more surrogates from the same fraction are out of specifications. For the x40 dilution of this sample, the surrogates were considered out of control due to the dilution and not comparable to specifications. Therefore, it is with professional judgment that no results from this sample at either dilution factor be qualified based on the surrogate recoveries.

Sample FS15-13-031411 - One base surrogate (2-Fluorobiphenyl at 105% (55-105%)) was flagged as out of specifications by the laboratory. No action is taken unless two or more surrogates from the same fraction are out of specifications; therefore no results for this sample were qualified.

Sample FS14-7-031511 - One acid surrogate (2-Fluorophenol at 111% (43-105%)) and two base surrogates (2-Fluorobiphenyl at 105% (55-105%) and Nitrobenzene at 127% (53-117%)) were out of specifications high. Per USEPA guidelines, as two or more base surrogates are out of specifications high, then the detected base target analytes in this sample are qualified "J". See Appendix B for complete details on compounds qualified for this sample.

Sample FS09-8-031511 - This sample was diluted at x100 and the surrogates were considered out of control due to the dilution and not comparable to specifications. It is with professional judgment that no results from this sample be qualified from lack of surrogate information.

SDG 1103082-Soil

Surrogate recoveries were out of laboratory specifications for multiple samples as follows:

Sample MW6-10-031411 - Two base surrogates were outside control limits high (2-Fluorobiphenyl at 106% (44-105%) and Nitrobenzene at 134% (53-117%)), and therefore per USEPA guidelines detected target analytes are qualified "J" as estimated. See Appendix B for complete details on compounds qualified for this sample.

Sample MW6-14.5-031411-D - One base surrogate (2-Fluorobiphenyl at 109% (55-105%)) was outside specifications high. Per USEPA guidelines, no action is taken unless two or more surrogates from the same fraction are out of specifications; therefore no results for this sample were qualified.

Sample MW9-4-031411 - One base surrogate (2-Fluorobiphenyl at 108% (55-105%)) was outside specifications high and one acid surrogate (2,4,6-Tribromophenol at 133% (45-108%)) was outside specifications high. Per USEPA guidelines, no action is taken unless two or more surrogates from the same fraction are out of specifications; therefore no results for this sample were qualified.

Sample MW9-6-031411 - One base surrogate (2-Fluorobipheynl at 109% (55-105%)) was outside specifications high for the non-diluted analysis of this sample. No action is taken unless two or more surrogates from the same fraction are out of specifications. The x2 dilution analysis of this sample had one acid surrogate (2,4,6-Tribromophenol at 122% (45-108%)) outside specifications high and one base surrogate (Nitrobenzene at 122% (53-117%)) outside specifications high. Again, no action is taken unless two or more surrogates from the same fraction are outside specifications. Therefore, no results from either dilution analysis for this sample were qualified.

Sample MW8-4-031411 - Two base surrogates (2-Fluorobiphenyl at 113% (55-105%) and Nitrobenzene at 122% (53-117%)) were outside specifications high. Per USEPA guidelines, detected target analytes are qualified "J" as estimated and non-detects are not qualified. As all results for this sample were non-detect, no qualifiers were added to the sample results.

Sample MW8-13.5-031411 - One base surrogate (2-Fluorobiphenyl at 108% (55-105%)) was outside specifications high. Per USEPA guidelines, no action is taken unless two or more surrogates from the same fraction are out of specifications; therefore no results for this sample were qualified. Sample MW2A-7.5-031511 - Two base surrogates (2-Fluorobiphenyl at 117% (55-105%) and Nitrobenzene at 118% (53-117%)) were outside of specifications high. One acid surrogate (2,4,6-Tribromophenol 132% (45-108%)) was also outside of specifications high. Per USEPA guidelines, as two or more base surrogates are out of specifications high, then the detected base target analytes in this sample are qualified "J". See Appendix B for complete details on compounds qualified for this sample.

Sample MW2A-13.5-031511 - One base surrogate (2-Fluorobiphenyl at 107% (55-105%)) and one acid surrogate (2,4,6-Tribromophenol at 120% (45-108%)) were outside specifications high. Per USEPA guidelines, no action is taken unless two surrogates from the same fraction are outside specifications; therefore no results for this sample were qualified.

Sample MW7-5.5-031511 - Two base surrogates (2-Fluorobiphenyl at 110% (55-105%) and Nitrobenzene at 120% (53-117%)) were outside specifications high. Per USEPA guidelines, detected target analytes are qualified "J" as estimated and non-detects are not qualified. All results for this sample were non-detect; therefore no results were qualified.

Sample MW7-14-031511 - Two base surrogates (2-Fluorobiphenyl at 108% (55-105%) and Nitrobenzene at 118% (53-117%)) were outside specifications high. One acid surrogate (2,4,6-Tribromophenol 113% (45-108%)) was outside specifications high. Per USEPA guidelines, as two or more base surrogates are out of specifications high, then the detected base target analytes in this sample are qualified "J". See Appendix B for complete details on compounds qualified for this sample.

SDG 1103098-Soil

Surrogate recoveries were outside laboratory specifications for one LCSD and two samples as follows:

LCSD - One acid surrogate (2-Fluorophenol at 107% (43-105%)) was outside specifications high. No action is taken unless two surrogates from the same fraction are outside specifications.

Sample FS10-14-031511 - One base surrogate (2-Fluorobiphenyl at 106% (55-105%)) was outside specifications high. No action is taken unless two surrogates from the same fraction are outside specifications.

Sample FS06-19-031611 - One base surrogate (2-Fluorobiphenyl at 106% (55-105%)) was outside specifications high. No action is taken unless two surrogates from the same fraction are outside specifications.

SDG 1103102-Soil

Surrogate recoveries were outside laboratory specifications for two method blanks, and LCS, and multiple samples as follows:

MB-041211S - One acid surrogate (2,4,6-Tribromophenol at 112% (45-108%)) was outside specifications high and one base surrogate (2-Flurobiphenyl at 107% (55-105%)) was outside specifications high. No action is taken unless two surrogates from the same fraction are outside specifications.

MB-041311S - One acid surrogate (2,4,6-Tribromophenol at 110% (45-108%)) was outside specifications high. No action is taken unless two surrogates from the same fraction are outside specifications.

LCS-041211S - One acid surrogate (2,4,6-Tribromophenol at 112% (45-108%)) was outside specifications high. No action is taken unless two surrogates from the same fraction are outside specifications.

Sample FS09B-15-031711 - One acid surrogate (2,4,6-Tribromophenol at 112% (45-108%)) was outside specifications high. No action is taken unless two surrogates from the same fraction are outside specifications.

Sample FS09D-5-031711 - One acid surrogate (2-Fluorophenol at 107% (43-105%)) was outside specifications high. No action is taken unless two surrogates from the same fraction are outside specifications.

Sample FS09A(2)-14-031711 - One acid surrogate (2,4,6-Tribromophenol at 119% (45-108%)) was outside specifications high. No action is taken unless two surrogates from the same fraction are outside specifications.

Sample FS09A(2)-5-031711 - One acid surrogate (2,4,6-Tribromophenol at 118% (45-108%)) was outside specifications high. No action is taken unless two surrogates from the same fraction are outside specifications.

Sample FS09A-6-031711 - One acid surrogate (2,4,6-Tribromophenol at 132% (45-108%)) was outside specifications high and one base (2-Fluorobiphenyl at 120% (55-105%)) outside specifications high. No action is taken unless two surrogates from the same fraction are outside specifications.

Sample FS09C-8.5-031711 - The surrogate recoveries were considered out of control due to the dilutions (both x10 and x100) and not comparable to specifications. It is with professional judgment that no results from this sample be qualified from lack of surrogate information. Additionally, the results for this sample were already qualified as estimated due to this analysis being outside of holding time (refer to Section 5.2.1).

SDG 1103103-Sediment

Sample HA4-031711 - The recovery for one acid surrogate (2-Fluorobiphenyl at 107% (55-105%)) was outside specifications. No action is taken unless two surrogates from the same fraction are outside specifications.

SDG 1103141-Water

Sample MW2A-GW-032311 – One base surrogate recovery (2-Fluorobiphenyl at 104% (46-100%)) was outside specifications high. No action is taken unless two surrogates from the same fraction are outside specifications.

5.2.3 Laboratory Control Sample and Laboratory Control Sample Duplicate

SDG 1103098-Soil

The LCSD percent recovery for 4-Chloro-3-Methylphenol (112%) was outside of specifications (53-108%) high. Per USEPA guidelines, if the LCS recovery is greater than the upper acceptance limit, then the detected sample results for the analytes that exceeded the control limits are qualified. The sample results for this analyte were all non-detects; therefore no data was qualified based on this LCSD percent recovery information.

SDG 1103103-Soil

The LCSD percent recovery for 4-Chloro-3-Methylphenol (112%) was outside of specifications (53-108%) high. Per USEPA guidelines, if the LCS recovery is greater than the upper acceptance limit, then the detected sample results for the analytes that exceeded the control limits are qualified. The sample results for this analyte were all non-detects; therefore no data was qualified based on this LCSD percent recovery information.

5.3 OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was generally acceptable, as demonstrated by LCS, LCSD, MS, and MSD recoveries. Precision was acceptable, as demonstrated by the MS/MSD RPDs and LCS/LSCD RPDs.

All data are acceptable for use as qualified; see Appendix B for details.

6.0 Data Validation Report
PCBs by USEPA Method 8082

This report documents the review of analytical data from the analyses of soil, sediment, and groundwater samples, and the associated laboratory QC samples. Samples were analyzed by ALS. Compliance Screening (Level I) was performed on all analytical results by Chell Black as the primary data reviewer, and secondary review was performed by Erin Breckel.

6.1 DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

6.2 TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

QC Requirements

Cooler temperature and preservation	[1] MS and MSD
Extraction and analysis holding times	Field duplicates
Blank contamination	Reporting limits and reported results
Surrogate recoveries	Target analyte list
LCS (and LCSD for SDG 1103141)	

Notes
1 Quality control results are discussed below, but no data were qualified.

Appendix A presents data validation criteria tables for organic compound analysis. QC requirements that were met without exception are not discussed below. QC requirements that required further evaluation and had exceptions to the validation criteria are discussed below.

6.2.1 Matrix Spike and Matrix Spike Duplicate

SDG 1103128-Sediment and Water

For SDG 1103128, no MS/MSD was performed for the USEPA Method 8082 analysis and additionally, no LCS/LCSD was performed to help access precision. MS/MSDs were analyzed for this analysis on the other project SDGs, or if an MS/MDS was not analyzed than an LCS/LCSD was analyzed. As all other QA/QC requirements were met for this analysis on SDG 1103128, and the MS/MSDs were acceptable for the other SDGs for this project with the USEPA Method 8082 analysis of water and sediment samples, it is with professional judgment that no results be qualified based on the lack of precision data for this analysis in this SDG.

6.3 OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the surrogate, MS, MSD, and LCS percent recovery values. Precision was acceptable, as demonstrated by the MS/MSD RPDs, when performed.

All data, as reported by the laboratory, are acceptable for use.

7.0 Data Validation Report
Metals by USEPA Method 6020B

This report documents the review of analytical data from the analyses of soil, sediment, and groundwater samples, and the associated laboratory QC samples. Samples were analyzed by ALS. Compliance Screening (Level I) was performed on all analytical results by Chell Black as the primary data reviewer, and secondary review was performed by Erin Breckel.

7.1 DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

7.2 TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

QC Requirements

Cooler temperature and preservation	Target analyte list
Extraction and analysis holding times	Field duplicates
Blank contamination	Reporting limits and reported results
LCS and LCSD	MS and MSD

All QC requirements were met without exception, and did not require further evaluation.

7.3 OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by LCS, LCSD, MS, and MSD percent recovery values. Precision was acceptable, as demonstrated by the LCS/LCSD RPDs and the MS/MSD RPDs.

All data, as reported by the lab, are acceptable for use.

8.0 Data Validation Report
Mercury by USEPA Methods 7470/7471

This report documents the review of analytical data from the analyses of soil, sediment, and groundwater samples, and the associated laboratory QC samples. Samples were analyzed by ALS. Compliance Screening (Level I) was performed on all analytical results by Chell Black as the primary data reviewer, and secondary review was performed by Erin Breckel.

8.1 DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

8.2 TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

QC Requirements

Cooler temperature and preservation	Target analyte list
Extraction and analysis holding times	Field duplicates
Blank contamination	Reporting limits and reported results
LCS and LCSD	MS and MSD

All QC requirements were met without exception, and did not require further evaluation.

8.3 OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by LCS, LCSD, MS, and MSD percent recovery values. Precision was acceptable, as demonstrated by the LCS/LCSD RPDs and MS/MSD RPDs.

All data, as reported by the lab, are acceptable for use.

9.0 Data Validation Report
TBT by KRONE 1988

This report documents the review of analytical data from the analyses of soil and sediment samples, and the associated laboratory QC samples. Samples were analyzed by ALS. A summary review was performed on all analytical results by Chell Black as the primary data reviewer, and secondary review was performed by Erin Breckel.

9.1 DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

9.2 TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

QC Requirements

Cooler temperature and preservation	Surrogate recoveries
Extraction and analysis holding times	LCS
Blank contamination	Reporting limits and reported results

All QC requirements were met without exception, and did not require further evaluation.

9.3 OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by LCS percent recovery values. No information was provided by the laboratory to evaluate precision.

It is with professional judgment that all data, as reported by the lab, be considered acceptable for use even though precision could not be evaluated.

10.0 Data Validation Report
Total Solids by USEPA 160.3

This report documents the review of analytical data from the analyses of soil and sediment samples, and the associated laboratory QC samples. Samples were analyzed by ALS. A summary review was performed on all analytical results by Chell Black as the primary data reviewer, and secondary review was performed by Erin Breckel.

10.1 DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

10.2 TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

QC Requirements

Cooler temperature and preservation	Reporting limits and reported results
Extraction and analysis holding times	

All QC requirements were met without exception, and did not require further evaluation.

10.3 OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method.. No information was provided by the laboratory to evaluate precision or accuracy. It is with professional judgment that all data, as reported by the lab, be considered acceptable for use even though accuracy and precision could not be evaluated.

11.0 Data Validation Report
Total Organic Carbon by PLUMB 1981

This report documents the review of analytical data from the analyses of soil and sediment samples, and the associated laboratory QC samples. Samples were analyzed by ALS. A summary review was performed on all analytical results by Chell Black as the primary data reviewer, and secondary review was performed by Erin Breckel.

11.1 DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

11.2 TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

QC Requirements

Cooler temperature and preservation	Reporting limits and reported results
Extraction and analysis holding times	

All QC requirements were met without exception, and did not require further evaluation.

11.3 OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. . No information was provided by the laboratory to evaluate precision or accuracy. It is with professional judgment that all data, as reported by the lab, be considered acceptable for use even though accuracy and precision could not be evaluated.

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Tables

Table 1
Project Sample Index

SDG	Sample ID	Lab Sample ID	Matrix	TPH by NWTPH-Dx	TPH by NWTPH-Gx	VOCs by 8260	SVOCs by 8270	PCBs by 8082	Total Metals by 6020B/7471	Dissolved Metals by 6020B/7470	TBT by KRONE 1988	Total Solids by 160.3	TOC by PLUMB 1981
1103081	FS11-2-031411	1103081-01	Soil	X	X	X	X	X	X		X		
1103081	FS11-12.5-031411	1103081-02	Soil	X	X	X	X	X	X		X		
1103081	FS01-14-031411	1103081-03	Soil	X	X	X	X		X				
1103081	FS01-2.5-031411	1103081-04	Soil	X	X	X	X		X				
1103081	FS01-24-031411	1103081-05	Soil	X	X	X	X		X				
1103081	FS01-24.8-031411	1103081-06	Soil	X	X	X	X		X				
1103081	FS12-2-031411	1103081-07	Soil	X	X	X	X		X				
1103081	FS12-17-031411	1103081-08	Soil	X	X	X	X		X				
1103081	FS12A-17-031411	1103081-09	Soil	X	X	X	X		X				
1103081	FS15-13-031411	1103081-10	Soil	X	X	X	X		X				
1103081	FS15-23-031411	1103081-11	Soil	X	X	X	X		X				
1103081	FS15-GW19-031411	1103081-12	Water	X	X	X				X			
1103081	FS13-4-031511	1103081-13	Soil	X	X	X	X		X				
1103081	FS13-16-031511	1103081-14	Soil	X	X	X	X		X				
1103081	FS14-7-031511	1103081-15	Soil	X	X	X	X		X				
1103081	FS14-17-031511	1103081-16	Soil	X	X	X	X		X				
1103081	FS16-2-031511	1103081-17	Soil	X	X	X	X		X				
1103081	FS-16-19-031511	1103081-18	Soil	X	X	X	X		X				
1103081	FS09-GW17-131511	1103081-19	Water	X	X	X				X			
1103081	FS09A-GW17-131511	1103081-20	Water	X	X	X				X			
1103081	FS09-8-031511	1103081-21	Soil	X	X	X	X		X				
1103081	FS09-18.5-031511	1103081-22	Soil	X	X	X	X		X				
1103081	FS08-2-031511	1103081-23	Soil	X	X	X	X		X				
1103081	Trip Blank	1103081-24	QC Water			X							
1103082	MW6-10-031411	1103082-01	Soil	X	X	X	X	X	X				
1103082	MW6-14.5-031411	1103082-02	Soil	X	X	X	X	X	X				
1103082	MW6-14.4-031411-D	1103082-03	Soil	X	X	X	X	X	X				
1103082	MW9-4-031411	1103082-04	Soil	X	X	X	X	X	X				
1103082	MW9-6-031411	1103082-05	Soil	X	X	X	X	X	X				
1103082	MW9-10-031411	1103082-06	Soil	X	X	X	X	X	X				

SDG	Sample ID	Lab Sample ID	Matrix	TPH by NWTPH-Dx	TPH by NWTPH-Gx	VOCs by 8260	SVOCs by 8270	PCBs by 8082	Total Metals by 6020B/7471	Dissolved Metals by 6020B/7470	TBT by KRONE 1988	Total Solids by 160.3	TOC by PLUMB 1981
1103082	MW8-4-031411	1103082-07	Soil	X	X	X	X	X	X				
1103082	MW8-13.5-031411	1103082-08	Soil	X	X	X	X	X	X				
1103082	MW2A-7.5-031511	1103082-09	Soil	X	X	X	X	X	X				
1103082	MW2A-13.5-031511	1103082-10	Soil	X	X	X	X	X	X				
1103082	MW7-5.5-031511	1103082-11	Soil	X	X	X	X	X	X				
1103082	MW7-14-031511	1103082-12	Soil	X	X	X	X	X	X				
1103082	Trip Blank	1103082-13	QC Water			X							
1103098	FS08-21-031511	1103098-01	Soil	X	X	X	X		X				
1103098	FS10-2-031511	1103098-02	Soil					X	X		X		
1103098	FS10-14-031511	1103098-03	Soil	X	X	X	X	X	X		X		
1103098	FS17-6.5-031511	1103098-04	Soil	X	X	X	X		X				
1103098	FS17-18-031611	1103098-05	Soil	X	X	X	X		X				
1103098	FS17A-18-031611	1103098-06	Soil	X	X	X	X		X				
1103098	FS17-GW17-031611	1103098-07	Water	X	X	X				X			
1103098	FS18-3-031611	1103098-08	Soil	X	X	X	X		X				
1103098	FS18-14-031611	1103098-09	Soil	X	X	X	X		X				
1103098	FS05-2.5-031611	1103098-10	Soil	X	X	X	X		X				
1103098	FS05-13-031611	1103098-11	Soil	X	X	X	X		X				
1103098	FS06-2.3-031611	1103098-12	Soil	X	X	X	X		X				
1103098	FS06-19-031611	1103098-13	Soil	X	X	X	X		X				
1103098	FS07-2-031611	1103098-14	Soil	X	X	X	X		X				
1103098	FS07-12.5-031611	1103098-15	Soil	X	X	X	X		X				
1103098	FS07-GW16-031611	1103098-16	Water	X	X	X				X			
1103098	FS04-5-031611	1103098-17	Soil	X	X	X	X		X				
1103098	FS04-11.5-031611	1103098-18	Soil	X	X	X	X		X				
1103098	FS02-2.5-031611	1103098-19	Soil	X	X	X	X		X				
1103098	FS02-18-031611	1103098-20	Soil	X	X	X	X		X				
1103098	FS03-1.5-031611	1103098-21	Soil	X	X	X	X		X				
1103098	FS03-11-031611	1103098-22	Soil	X	X	X	X		X				
1103098	HA1-031611	1103098-23	Sediment	1105025	X		X	X	X		X	X	X
1103098	HA2-031611	1103098-24	Sediment	1105025	X		X	X	X		X	X	X
1103098	HA3-031611	1103098-25	Sediment	1105025	X		X	X	X		X	X	X

SDG	Sample ID	Lab Sample ID	Matrix	TPH by NWTPH-Dx	TPH by NWTPH-Gx	VOCs by 8260	SVOCs by 8270	PCBs by 8082	Total Metals by 6020B/7471	Dissolved Metals by 6020B/7470	TBT by KRONE 1988	Total Solids by 160.3	TOC by PLUMB 1981
1103098	RB-031611	1103098-26	QC Water	X	X	X							
1103098	TB-031611	1103098-27	QC Water			X							
1103102	FS09A-6-031711	1103102-01	Soil	X	X	X	X						
1103102	FS09A(2)-5-031711	1103102-02	Soil	X	X	X	X						
1103102	FS09A(2)-14-031711	1103102-03	Soil	X	X	X	X						
1103102	FS09D-5-031711	1103102-04	Soil	X	X	X	X						
1103102	FS09D-15-031711	1103102-05	Soil	X	X	X	X						
1103102	FS09B-15-031711	1103102-06	Soil	X	X	X	X						
1103102	FS09C-8.5-031711	1103102-07	Soil	X	X	X	X						
1103102	Trip Blank	1103102-08	QC Water										
1103102	FS09C-19-031711	1103102-09	Soil										
1103103	HA4-031711	1103103-01	Sediment				X	X	X		X	X	X
1103128	HA8-032211	1103128-01	Sediment	X			X	X	X		X	X	X
1103128	HA7-032211	1103128-02	Sediment	X			X	X	X		X	X	X
1103128	MW8-GW-032211	1103128-03	Water	X	X	X	X	X		X			
1103128	MW4-GW-032211	1103128-04	Water	X	X	X	X	X		X			
1103128	MW9-GW-032211	1103128-05	Water	X	X	X	X	X		X			
1103128	HA6-032211	1103128-06	Sediment	X			X	X	X		X	X	X
1103128	HA5-032211	1103128-07	Sediment	X			X	X	X		X	X	X
1103128	MW6-032211	1103128-08	Water	X	X	X	X	X		X			
1103141	MW5-GW-032311	1103141-01	Water	X	X	X	X	X		X			
1103141	MW7-GW-032311	1103141-02	Water	X	X	X	X	X		X			
1103141	MW2A-GW-032311	1103141-03	Water	X	X	X	X	X		X			
1103141	MW1-GW-032311	1103141-04	Water	X	X	X	X	X		X			
1103141	MW2A-GW-032311-D	1103141-05	Water	X	X	X	X	X		X			
1103141	Trip Blank	1103141-06	QC Water			X							

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Appendix A
Data Qualifier Definitions and Criteria Tables

DATA VALIDATION QUALIFIER CODES
National Functional Guidelines

The following definitions provide brief explanations of the qualifiers assigned to results in the data review process.

U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a “tentative identification”.
NJ	The analysis indicates the presence of an analyte that has been “tentatively identified” and the associated numerical value represents the approximate concentration.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

The following is a Floyd|Snider qualifier that may also be assigned during the data review process:

DNR	Do not report; a more appropriate result is reported from another analysis or dilution.

Floyd|Snider Validation Guidelines for Total Petroleum Hydrocarbons-Diesel & Residual Range and Gasoline Range
(Based on USEPA National Functional Guidelines as applied to criteria in NWTPH-Dx and NWTPH-Gx, June 1997, Ecology & Oregon DEQ)

Validation QC Element	Acceptance Criteria	Action
Cooler Temperature & Preservation	4°C± 2°C Water: HCl to pH < 2	J/UJ if greater than 6 deg. C
Holding Time	Ext. Waters: 14 days preserved 7 days unpreserved Ext. Solids: 14 Days Analysis: 40 days from extraction	J/UJ if hold times exceeded J/R if exceeded > 3X (Floyd|Snider PJ)
Initial Calibration	5 calibration points (All within 15% of true value) Linear Regression: R2 >0.990 If used, RSD of response factors <20%	Narrate if fewer than 5 calibration levels or if %R >15% J/UJ if R2 <0.990 J/UJ if %RSD > 20%
Mid-range Calibration Check Std.	Analyzed before and after each analysis shift & every 20 samples. Recovery range 85% to 115%	Narrate if frequency not met. J/UJ if %R < 85% J if %R >115%
Method Blank	At least one per batch (<10 samples) Method Blank No results >RL	U (at the RL) if sample result is < RL & < 5X blank result.
		U (at reported sample value) if sample result is > RL and < 5X blank result
Field Blanks (if required by project)	No results > RL	Action is same as method blank for positive results remaining in the field blank after method blank qualifiers are assigned.
MS samples (accuracy) (if required by project)	%R within lab control limits	Qualify parent only, unless other QC indicates systematic problems. J if both %R > upper control limit (UCL) J/UJ(-) if both %R < lower control limit (LCL) No action if parent conc. >5X the amount spiked. Use PJ if only one %R outlier
Precision: MS/MSD or LCS/LCSD or sample/dup	At least one set per batch (<10 samples) RPD < lab control limit	J if RPD > lab control limits

Validation QC Element	Acceptance Criteria	Action
LCS (not required by method)	%R within lab control limits	J/UJ if %R < LCL J if %R > UCL J/R if any %R <10% (Floyd|Snider PJ)
Surrogates	2-fluorobiphenyl, p-terphenyl, o-terphenyl, and/or pentacosane added to all samples (inc. QC samples). %R = 50-150%	J/UJ if %R < LCL J if %R > UCL J/R if any %R <10% No action if 2 or more surrogates are used, and only one is outside control limits. (Floyd|Snider PJ)
Pattern Identification	Compare sample chromatogram to standard chromatogram to ensure range and pattern are reasonable match. Laboratory may flag results which have poor match.	J
Field Duplicates	Use project control limits, if stated in QAPP Floyd|Snider default: water: RPD < 35% solids: RPD < 50%	Narrate (Floyd|Snider PJ to qualify)
Two analyses for one sample (dilution)	Report only one result per analyte	"DNR" (or client requested qualifier) all results that should not be reported

Abbreviation:
PJ Professional judgment

Floyd|Snider Validation Guidelines for Volatile Analysis by GC/MS
(Based on Organic NFG 1999)

Validation QC Element	Acceptance Criteria	Action
Cooler Temperature	4°C±2°C Water: HCl to pH < 2	J/UJ if greater than 6 deg. C (Floyd|Snider PJ)
Hold Time	Waters: 14 days preserved 7 Days: unpreserved (for aromatics) Solids: 14 Days	J/UJ if hold times exceeded If exceeded by > 3X HT: J/R (Floyd|Snider PJ)
Tuning	BFB Beginning of each 12 hour period Method acceptance criteria	R all analytes in all samples associated with the tune
Initial Calibration (Minimum 5 stds.)	RRF > 0.05	(Floyd|Snider PJ) If MDL= reporting limit: J/R if RRF < 0.05 If reporting limit > MDL: note in worksheet if RRF <0.05
	%RSD < 30%	(Floyd|Snider PJ) J if %RSD > 30%
Continuing Calibration (Prior to each 12 hr. shift)	RRF > 0.05	(Floyd|Snider PJ) If MDL= reporting limit: J/R if RRF < 0.05 If reporting limit > MDL: note in worksheet if RRF <0.05
	%D <25%	(Floyd|Snider PJ) If > +/-90%: J/RIf -90% to -26%: J (high bias) If 26% to 90%: J/UJ (low bias)
Method Blank	One per matrix per batch No results > CRQL	U if sample result is less than CRQL and less than appropriate 5X or 10X rule (raise sample value to CRQL)
		U if sample result is greater than or equal to CRQL and less than appropriate 5X and 10X rule (at reported sample value)
	No TICs present	R TICs using 10X rule
Storage Blank	One per SDG <CRQL	U the specific analyte(s) results in all assoc. samples using the 5x or 10x rule

Validation QC Element	**Acceptance Criteria**	**Action**
Trip Blank	Frequency as per project QAPP	Same as method blank for positive results remaining in trip blank after method blank qualifiers are assigned
Field Blanks (if required in QAPP)	No results > CRQL	Apply 5X/10X rule; U < action level
MS/MSD (recovery)	One per matrix per batch Use method acceptance criteria	Qualify parent only unless other QC indicates systematic problems: J if both %R > UCL J/UJ if both %R < LCL J/R if both %R < 10% PJ if only one %R outlier
MS/MSD (RPD)	One per matrix per batch Use method acceptance criteria	J in parent sample if RPD > CL
LCS *low conc. H2O VOA*	One per lab batch Within method control limits	J assoc. cmpd if > UCL J/R assoc. cmpd if < LCL J/R all cmpds if half are < LCL
LCS *regular VOA (H2O & solid)*	One per lab batch Lab or method control limits	J if %R > UCL J/UJ if %R <LCL J/R if %R < 10% (Floyd|Snider PJ)
LCS/LCSD *(if required)*	One set per matrix and batch of 20 samples RPD < 35%	J/UJ assoc. cmpd. in all samples
Surrogates	Added to all samples Within method control limits	J if %R >UCL J/UJ if %R <LCL but >10% J/R if <10%
Internal Standard (IS)	Added to all samples Acceptable Range: IS area 50% to 200% of CCAL area RT within 30 seconds of CC RT	J if > 200% J/UJ if < 50% J/R if < 25% RT>30 seconds, narrate and Notify PM
Field Duplicates	Use QAPP limits. If no QAPP: Solids: RPD <50% OR absolute diff. < 2X RL (for results < 5X RL) Aqueous: RPD <35% OR absolute diff. < 1X RL (for results < 5X RL)	Narrate and qualify if required by project (Floyd|Snider PJ)
TICs	Major ions (>10%) in reference must be present in sample; intensities agree within 20%; check identification	NJ the TIC unless: R common laboratory contaminants See Technical Director for ID issues

Validation QC Element	**Acceptance Criteria**	**Action**
Quantitation/ Identification	RRT within 0.06 of standard RRT Ion relative intensity within 20% of standard All ions in std. at > 10% intensity must be present in sample	See Technical Director if outliers

Notes:

PJ[1] No action if there are 4+ surrogates and only 1 outlier

Floyd|Snider Validation Guidelines for Semivolatile Analysis by GC/MS (Based on Organic NFG 1999)

Validation QC Element	Acceptance Criteria	Action
Cooler Temperature	4°C ± 2°	J/UJ if greater than 6 deg. C (Floyd|Snider PJ)
Holding Time	Water: 7 days from collection Soil: 14 days from collection Analysis: 40 days from extraction	Water: J/UJ if ext. > 7 and < 21 days J/R if ext > 21 days (Floyd|Snider PJ) Solids/Wastes: J/UJ if ext. > 14 and < 42 days J/R if ext. > 42 days (Floyd|Snider PJ) J/UJ if analysis >40 days
Tuning	DFTPP Beginning of each 12 hour period Method acceptance criteria	R all analytes in all samples associated with the tune
Initial Calibration (Minimum 5 stds.)	RRF > 0.05	(Floyd|Snider PJ) If MDL= reporting limit: J/R if RRF < 0.05 If reporting limit > MDL: note in worksheet if RRF <0.05
	%RSD < 30%	(Floyd|Snider PJ) J if %RSD > 30%
Continuing Calibration (Prior to each 12 hr. shift)	RRF > 0.05	(Floyd|Snider PJ) If MDL= reporting limit: J/R if RRF < 0.05 If reporting limit > MDL: note in worksheet if RRF < 0.05
	%D <25%	(Floyd|Snider PJ) If > +/-90%: J/RIf -90% to -26%: J (high bias) If 26% to 90%: J/UJ (low bias)
Method Blank	One per matrix per batch No results > CRQL	U if sample result is less than CRQL and less than appropriate 5X or 10X rule (raise sample value to CRQL)
		U if sample result is greater than or equal to CRQL and less than appropriate 5X and 10X rule (at reported sample value)

Validation QC Element	**Acceptance Criteria**	**Action**
Method Blank (continued)	No TICs present	RTICs using 10X rule
Field Blanks (Not Required)	No results > CRQL	Apply 5X/10X rule; U < action level
MS/MSD (recovery)	One per matrix per batch Use method acceptance criteria	Qualify parent only unless other QC indicates systematic problems: J if both %R > UCL J/UJ if both %R < LCL J/R if both %R < 10% Floyd|Snider PJ if only one %R outlier
MS/MSD (RPD)	One per matrix per batch Use method acceptance criteria	J in parent sample if RPD > CL
LCS CLP **low conc. H2O only**	One per lab batch Within method control limits	J assoc. cmpd if > UCL J/R assoc. cmpd if < LCL J/R all cmpds if half are < LCL
LCS **regular SVOA (H2O & solid)**	One per lab batch Lab or method control limits	J if %R > UCL J/UJ if %R <LCL J /R if %R < 10% (Floyd|Snider PJ)
LCS/LCSD *(if required)*	One set per matrix and batch of 20 samples RPD < 35%	J/UJ associated compounds in all samples
Surrogates	Minimum of 3 acid and 3 base/neutral compounds Use method acceptance criteria	Do not qualify if only 1 acid and/or 1 B/N surrogate is out unless <10% J if %R > UCL J/UJ if %R < LCL J/R if %R < 10%
Internal Standards	Added to all samples Acceptable Range: IS area 50% to 200% of CCAL area RT within 30 seconds of CC RT	J if > 200% J/UJ if < 50% J/R if < 25% RT>30 seconds, narrate and Notify PM
Field Duplicates	Use QAPP limits. If no QAPP: Solids: RPD <50% OR absolute diff. < 2X RL (for results < 5X RL) Aqueous: RPD <35% OR absolute diff. < 1X RL (for results < 5X RL)	Narrate and qualify if required by project (Floyd|Snider PJ)

Validation QC Element	Acceptance Criteria	Action
TICs	Major ions (>10%) in reference must be present in sample; intensities agree within 20%; check identification	NJ the TIC unless: R common laboratory contaminants See Technical Director for ID issues
Quantitation/ Identification	RRT within 0.06 of standard RRT Ion relative intensity within 20% of standard All ions in std. at > 10% intensity must be present in sample	See Technical Director if outliers

Abbreviation:

PJ	Professional judgment

Floyd|Snider Validation Guidelines for Metals Analysis by ICP-MS (Based on Inorganic NFG 1994 & 2004)

Validation QC Element	Acceptance Criteria	Action
Cooler Temperature and Preservation	Cooler temperature: 4°C ±2° Waters: Nitric Acid to pH < 2 For Dissolved Metals: 0.45um filter & preserve after filtration	Floyd|Snider Professional Judgment—no qualification based on cooler temperature outliers J/UJ if pH preservation requirements are not met
Holding Time	180 days from date sampled Frozen tissues—HT extended to 2 years	J/UJ if holding time exceeded
Tune	Prior to ICAL monitoring compounds analyzed 5 times wih Std Dev. < 5% mass calibration <0.1 amu from True Value Resolution < 0.9 AMU @ 10% peak height or <0.75 amu @ 5% peak height	Use Professional Judgment to evaluate tune J/UJ if tune criteria not met
Initial Calibration	Blank + minimum 1 standard If more than 1 standard, r>0.995	J/UJ if r<0.995 (for multi point cal)
Initial Calibration Verification (ICV)	Independent source analyzed immediately after calibration %R within ±10% of true value	J/UJ if %R 75–89% J if %R = 111-125% R if %R > 125% R if %R < 75%
Continuing Calibration Verification (CCV)	Every ten samples, immediately following ICV/ICB and at end of run ±10% of true value	J/UJ if %R = 75–89% J if %R 111-125% R if %R > 125% R if %R < 75%

Initial and Continuing Calibration Blanks (ICB/CCB)	After each ICV and CCV
	every ten samples and end of run
	| blank | < IDL (MDL)
		Action level is 5x absolute value of blank conc.
		For (+)blanks, U results < action level
		For (-) blanks, J/UJ results < action level

Validation QC Element	Acceptance Criteria	Action
Reporting Limit Standard (CRI)	2x RL analyzed beginning of run Not required for Al, Ba, Ca, Fe, Mg, Na, K %R = 70%-130% (50%-150% Co,Mn, Zn)	R, < 2x RL if %R < 50% (< 30% Co,Mn, Zn) J < 2x RL, UJ if %R 50-69% (30%-49% Co,Mn, Zn) J < 2x RL if %R 130%-180% (150%-200% Co,Mn, Zn) R < 2x RL if %R > 180% (200% Co, Mn, Zn)
Interference Check Samples (ICSA/ICSAB)	Required by SW 6020, but not 200.8 ICSAB %R 80% - 120% for all spiked elements | ICSA | < IDL (MDL) for all unspiked elements	For samples with Al, Ca, Fe, or Mg > ICS levels R if %R < 50% J if %R >120% J/UJ if %R = 50% to 79% Use Professional Judgment for ICSA to determine if bias is present
Method Blank	One per matrix per batch (batch not to exceed 20 samples) blank < MDL	Action level is 5x blank concentration U results < action level
Laboratory Control Sample (LCS)	One per matrix per batch Blank Spike: %R within 80%-120%	R if %R < 50% J/UJ if %R = 50-79% J if %R >120%
	CRM: Result within manufacturer's certified acceptance range or project guidelines	J/UJ if < LCL, J if > UCL
Matrix Spike/ Matrix Spike Duplicate (MS/MSD)	One per matrix per batch 75-125% for samples where results do not exceed 4x spike level	J if %R>125% J/UJ if %R <75% J/R if %R<30% or J/UJ if Post Spike %R 75%-125% Qualify all samples in batch
Post-digestion Spike	If Matrix Spike is outside 75-125%, Spike parent sample at 2x the sample conc.	No qualifiers assigned based on this element
Laboratory Duplicate (or MS/MSD)	One per matrix per batch RPD < 20% for samples > 5x RL Diff < RL for samples > RL and < 5 x RL (Diff < 2x RL for solids)	J/UJ if RPD > 20% or diff > RL All samples in batch
Serial Dilution	5x dilution one per matrix %D < 10% for original sample values > 50x MDL	J/UJ if %D >10% All samples in batch

Validation QC Element	**Acceptance Criteria**	**Action**
Internal Standards	Every sample SW6020: 60%-125% of cal blank IS 200.8: 30%-120% of cal blank IS	J /UJ all analytes associated with IS outlier
Field Blank	Blank < MDL	Action level is 5x blank conc. U sample values < AL in associated field samples only
Field Duplicate	For results > 5x RL: Water: RPD < 35% Solid: RPD < 50% For results < 5 x RL: Water: Diff < RL Solid: Diff < 2x RL	J/UJ in parent samples only
Linear Range	Sample concentrations must fall within range	J values over range

Port of Bellingham
Harris Avenue Shipyards

Data Validation Report
RI/FS Sampling Event

Appendix B
Qualified Data Summary Table

Qualified Data Summary Table
Harris Avenue Shipyard RI/FS Sampling Event

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103081	FS11-2-031411	1103081-01	8270	Phenol	200	µg/kg	U	UJ
1103081	FS11-2-031411	1103081-01	8270	2-Chlorophenol	200	µg/kg	U	UJ
1103081	FS11-2-031411	1103081-01	8270	Benzyl Alcohol	200	µg/kg	U	UJ
1103081	FS11-2-031411	1103081-01	8270	2-Methylphenol	200	µg/kg	U	UJ
1103081	FS11-2-031411	1103081-01	8270	3&4-Methylphenol	200	µg/kg	U	UJ
1103081	FS11-2-031411	1103081-01	8270	2-Nitrophenol	500	µg/kg	U	UJ
1103081	FS11-2-031411	1103081-01	8270	2,4-Dimethylphenol	200	µg/kg	U	UJ
1103081	FS11-2-031411	1103081-01	8270	Benzoic Acid	2000	µg/kg	U	UJ
1103081	FS11-2-031411	1103081-01	8270	2,4-Dichlorophenol	200	µg/kg	U	UJ
1103081	FS11-2-031411	1103081-01	8270	2,6-Dichlorophenol	200	µg/kg	U	UJ
1103081	FS11-2-031411	1103081-01	8270	4-Chloro-3-Methylphenol	200	µg/kg	U	UJ
1103081	FS11-2-031411	1103081-01	8270	1-Methylnaphthalene	3800	µg/kg		J
1103081	FS11-2-031411	1103081-01	8270	2,4,6-Trichlorophenol	200	µg/kg	U	UJ
1103081	FS11-2-031411	1103081-01	8270	2,4,5-Trichlorophenol	200	µg/kg	U	UJ
1103081	FS11-2-031411	1103081-01	8270	Acenaphthene	980	µg/kg		J
1103081	FS11-2-031411	1103081-01	8270	2,4-Dinitrophenol	1000	µg/kg	U	UJ
1103081	FS11-2-031411	1103081-01	8270	4-Nitrophenol	1000	µg/kg	U	UJ
1103081	FS11-2-031411	1103081-01	8270	Dibenzofuran	570	µg/kg		J
1103081	FS11-2-031411	1103081-01	8270	2,3,4,6-Tetrachlorophenol	500	µg/kg	U	UJ
1103081	FS11-2-031411	1103081-01	8270	Fluorene	1500	µg/kg		J
1103081	FS11-2-031411	1103081-01	8270	4,6-Dinitro-2-Methylphenol	200	µg/kg	U	UJ
1103081	FS11-2-031411	1103081-01	8270	Pentachlorophenol	1000	µg/kg	U	UJ
1103081	FS11-2-031411	1103081-01	8270	Phenanthrene	3500	µg/kg		J
1103081	FS11-2-031411	1103081-01	8270	Anthracene	360	µg/kg		J
1103081	FS11-2-031411	1103081-01	8270	Fluoranthene	720	µg/kg		J

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103081	FS11-2-031411	1103081-01	8270	Pyrene	990	µg/kg		J
1103081	FS11-2-031411	1103081-01	8270	Benzo(a)anthracene	290	µg/kg		J
1103081	FS11-2-031411	1103081-01	8270	Chrysene	370	µg/kg		J
1103081	FS11-2-031411	1103081-01	8270	Benzo(b)fluoranthene	360	µg/kg		J
1103081	FS11-2-031411	1103081-01	8270	Benzo(k)fluoranthene	290	µg/kg		J
1103081	FS11-2-031411	1103081-01	8270	Benzo(a)pyrene	390	µg/kg		J
1103081	FS11-2-031411	1103081-01	8270	Indeno(1,2,3-cd)pyrene	240	µg/kg		J
1103081	FS11-2-031411	1103081-01	8270	Benzo(g,h,i)perylene	240	µg/kg		J
1103081	FS01-14-031411	1103081-03	NWTPH-Gx	TPH-Volatile Range	250	mg/kg		J
1103081	FS01-2.5-031411	1103081-04	NWTPH-Gx	TPH-Volatile Range	4.5	mg/kg		J
1103081	FS01-2.5-031411	1103081-04	8260	Dichlorodifluoromethane	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	Chloromethane	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	Vinyl Chloride	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	Bromomethane	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	Chloroethane	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	Trichlorofluoromethane	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	Acetone	50	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	Carbon Disulfide	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	1,1-Dichloroethene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	Methylene Chloride	20	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	Acrylonitrile	50	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	Methyl T-Butyl Ether	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	trans-1,2,-Dichloroethene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	1,1-Dichloroethane	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	2-Butanone	50	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	cis-1,2-Dichloroethene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	2,2-Dichloropropane	10	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103081	FS01-2.5-031411	1103081-04	8260	Bromochloromethane	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	Chloroform	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	1,1,1-Trichloroetheane	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	1,1-Dichloropropene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	Carbon Tetrachloride	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	1,2-Dichloroethane	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	Benzene	5	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	Trichloroethene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	1,2-Dichloropropane	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	Dibromomethane	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	Bromodichloromethane	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	trans-1,3-Dichloropropene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	4-Methyl-2-Pentanone	50	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	Toluene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	cis-1,3-Dichloropropene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	1,1,2-Trichloroethane	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	2-Hexanone	50	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	1,3-Dichloropropane	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	Tetrachloroethylene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	Dibromochloromethane	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	1,2-Dibromoethane	5	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	chlorobenzene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	1,1,1,2-Tetrachloroethane	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	Ethylbenzene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	m,p-Xylene	20	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	Styrene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	o-Xylene	10	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103081	FS01-2.5-031411	1103081-04	8260	Bromoform	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	Isopropylbenzene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	1,1,2,2-Tetrachloroethane	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	1,2,3-Trichloropropane	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	Bromobenzene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	N-Propyl Benzene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	2-Chlorotoluene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	1,3,5-Trimethylbenzene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	4-Chlorotoluene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	T-Butyl Benzene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	1,2,4-Trimethylbenzene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	S-Butyl Benzene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	P-Isopropyltoluene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	1,3-Dichlorobenzene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	1,4-Dichlorobenzene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	N-Butylbenzene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	1,2-Dichlorobenzene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	1,2-Dibromo 3-Chloropropane	50	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	1,2,4-Trichlorobenzene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	Hexachlorobutadiene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	Naphthalene	10	µg/kg	U	UJ
1103081	FS01-2.5-031411	1103081-04	8260	1,2,3-Trichlorobenzene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	Dichlorodifluoromethane	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	Chloromethane	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	Vinyl Chloride	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	Bromomethane	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	Chloroethane	10	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103081	FS01-24.8-031411	1103081-06	8260	Trichlorofluoromethane	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	Acetone	50	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	Carbon Disulfide	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	1,1-Dichloroethene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	Methylene Chloride	20	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	Acrylonitrile	50	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	Methyl T-Butyl Ether	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	trans-1,2,-Dichloroethene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	1,1-Dichloroethane	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	2-Butanone	50	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	cis-1,2-Dichloroethene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	2,2-Dichloropropane	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	Bromochloromethane	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	Chloroform	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	1,1,1-Trichloroetheane	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	1,1-Dichloropropene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	Carbon Tetrachloride	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	1,2-Dichloroethane	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	Benzene	5	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	Trichloroethene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	1,2-Dichloropropane	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	Dibromomethane	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	Bromodichloromethane	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	trans-1,3-Dichloropropene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	4-Methyl-2-Pentanone	50	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	Toluene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	cis-1,3-Dichloropropene	10	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103081	FS01-24.8-031411	1103081-06	8260	1,1,2-Trichloroethane	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	2-Hexanone	50	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	1,3-Dichloropropane	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	Tetrachloroethylene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	Dibromochloromethane	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	1,2-Dibromoethane	5	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	chlorobenzene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	1,1,1,2-Tetrachloroethane	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	Ethylbenzene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	m,p-Xylene	20	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	Styrene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	o-Xylene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	Bromoform	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	Isopropylbenzene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	1,1,2,2-Tetrachloroethane	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	1,2,3-Trichloropropane	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	Bromobenzene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	N-Propyl Benzene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	2-Chlorotoluene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	1,3,5-Trimethylbenzene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	4-Chlorotoluene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	T-Butyl Benzene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	1,2,4-Trimethylbenzene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	S-Butyl Benzene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	P-Isopropyltoluene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	1,3-Dichlorobenzene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	1,4-Dichlorobenzene	10	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103081	FS01-24.8-031411	1103081-06	8260	N-Butylbenzene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	1,2-Dichlorobenzene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	1,2-Dibromo 3-Chloropropane	50	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	1,2,4-Trichlorobenzene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	Hexachlorobutadiene	10	µg/kg	U	UJ
1103081	FS01-24.8-031411	1103081-06	8260	Naphthalene	81	µg/kg		J
1103081	FS01-24.8-031411	1103081-06	8260	1,2,3-Trichlorobenzene	10	µg/kg	U	UJ
1103081	FS13-4-031511	1103081-13	NWTPH-Dx	TPH-Oil Range	160	mg/kg		J
1103081	FS14-7-031511	1103081-15	8270	Dibenzofuran	120	µg/kg		J
1103081	FS14-7-031511	1103081-15	8270	Fluorene	460	µg/kg		J
1103081	FS14-7-031511	1103081-15	8270	Phenanthrene	1200	µg/kg		J
1103081	FS14-7-031511	1103081-15	8270	Anthracene	110	µg/kg		J
1103081	FS09-8-031511	1103081-21	NWTPH-Dx	TPH-Oil Range	520	mg/kg		J
1103081	FS09-8-031511	1103081-21	8260	Dichlorodifluoromethane	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	Chloromethane	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	Vinyl Chloride	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	Bromomethane	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	Chloroethane	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	Trichlorofluoromethane	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	Acetone	50	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	Carbon Disulfide	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	1,1-Dichloroethene	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	Methylene Chloride	20	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	Acrylonitrile	50	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	Methyl T-Butyl Ether	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	trans-1,2,-Dichloroethene	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	1,1-Dichloroethane	10	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103081	FS09-8-031511	1103081-21	8260	2-Butanone	50	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	cis-1,2-Dichloroethene	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	2,2-Dichloropropane	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	Bromochloromethane	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	Chloroform	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	1,1,1-Trichloroetheane	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	1,1-Dichloropropene	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	Carbon Tetrachloride	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	1,2-Dichloroethane	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	Benzene	5	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	Trichloroethene	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	1,2-Dichloropropane	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	Dibromomethane	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	Bromodichloromethane	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	trans-1,3-Dichloropropene	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	4-Methyl-2-Pentanone	50	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	Toluene	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	cis-1,3-Dichloropropene	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	1,1,2-Trichloroethane	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	2-Hexanone	50	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	1,3-Dichloropropane	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	Tetrachloroethylene	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	Dibromochloromethane	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	1,2-Dibromoethane	5	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	chlorobenzene	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	1,1,1,2-Tetrachloroethane	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	Ethylbenzene	10	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103081	FS09-8-031511	1103081-21	8260	m,p-Xylene	20	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	Styrene	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	o-Xylene	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	Bromoform	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	Isopropylbenzene	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	1,1,2,2-Tetrachloroethane	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	1,2,3-Trichloropropane	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	Bromobenzene	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	N-Propyl Benzene	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	2-Chlorotoluene	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	1,3,5-Trimethylbenzene	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	4-Chlorotoluene	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	T-Butyl Benzene	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	1,2,4-Trimethylbenzene	35	µg/kg		J
1103081	FS09-8-031511	1103081-21	8260	S-Butyl Benzene	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	P-Isopropyltoluene	15	µg/kg		J
1103081	FS09-8-031511	1103081-21	8260	1,3-Dichlorobenzene	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	1,4-Dichlorobenzene	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	N-Butylbenzene	39	µg/kg		J
1103081	FS09-8-031511	1103081-21	8260	1,2-Dichlorobenzene	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	1,2-Dibromo 3-Chloropropane	50	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	1,2,4-Trichlorobenzene	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	Hexachlorobutadiene	10	µg/kg	U	UJ
1103081	FS09-8-031511	1103081-21	8260	1,2,3-Trichlorobenzene	10	µg/kg	U	UJ
1103082	MW6-10-031411	1103082-01	NWTPH-Gx	TPH-Volatile Range	85	mg/kg		J
1103082	MW6-10-031411	1103082-01	8270	Acenaphthene	220	µg/kg		J
1103082	MW6-10-031411	1103082-01	8270	Fluorene	580	µg/kg		J

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103082	MW6-10-031411	1103082-01	8270	N-Nitrosodiphenylamine	580	µg/kg		J
1103082	MW6-10-031411	1103082-01	8270	Phenanthrene	2000	µg/kg		J
1103082	MW6-10-031411	1103082-01	8270	Anthracene	100	µg/kg		J
1103082	MW6-10-031411	1103082-01	8270	Pyrene	100	µg/kg		J
1103082	MW9-6-031411	1103082-05	NWTPH-Gx	TPH-Volatile Range	230	mg/kg		J
1103082	MW2A-7.5-031511	1103082-09	NWTPH-Gx	TPH-Volatile Range	280	mg/kg		J
1103082	MW2A-7.5-031511	1103082-09	8270	Acenaphthene	1200	µg/kg		J
1103082	MW2A-7.5-031511	1103082-09	8270	Dibenzofuran	970	µg/kg		J
1103082	MW2A-7.5-031511	1103082-09	8270	Fluoranthene	1400	µg/kg		J
1103082	MW2A-7.5-031511	1103082-09	8270	Pyrene	1500	µg/kg		J
1103082	MW2A-7.5-031511	1103082-09	8270	Chrysene	640	µg/kg		J
1103082	MW2A-7.5-031511	1103082-09	8260	Dichlorodifluoromethane	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	Chloromethane	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	Vinyl Chloride	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	Bromomethane	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	Chloroethane	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	Trichlorofluoromethane	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	Acetone	50	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	Carbon Disulfide	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	1,1-Dichloroethene	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	Methylene Chloride	20	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	Acrylonitrile	50	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	Methyl T-Butyl Ether	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	trans-1,2,-Dichloroethene	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	1,1-Dichloroethane	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	2-Butanone	50	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	cis-1,2-Dichloroethene	10	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103082	MW2A-7.5-031511	1103082-09	8260	2,2-Dichloropropane	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	Bromochloromethane	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	Chloroform	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	1,1,1-Trichloroetheane	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	1,1-Dichloropropene	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	Carbon Tetrachloride	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	1,2-Dichloroethane	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	Benzene	5	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	Trichloroethene	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	1,2-Dichloropropane	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	Dibromomethane	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	Bromodichloromethane	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	trans-1,3-Dichloropropene	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	4-Methyl-2-Pentanone	50	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	Toluene	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	cis-1,3-Dichloropropene	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	1,1,2-Trichloroethane	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	2-Hexanone	50	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	1,3-Dichloropropane	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	Tetrachloroethylene	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	Dibromochloromethane	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	1,2-Dibromoethane	5	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	chlorobenzene	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	1,1,1,2-Tetrachloroethane	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	Ethylbenzene	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	m,p-Xylene	20	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	Styrene	10	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103082	MW2A-7.5-031511	1103082-09	8260	o-Xylene	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	Bromoform	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	Isopropylbenzene	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	1,1,2,2-Tetrachloroethane	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	1,2,3-Trichloropropane	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	Bromobenzene	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	N-Propyl Benzene	16	µg/kg		J
1103082	MW2A-7.5-031511	1103082-09	8260	2-Chlorotoluene	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	1,3,5-Trimethylbenzene	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	4-Chlorotoluene	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	T-Butyl Benzene	12	µg/kg		J
1103082	MW2A-7.5-031511	1103082-09	8260	1,2,4-Trimethylbenzene	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	P-Isopropyltoluene	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	1,3-Dichlorobenzene	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	1,4-Dichlorobenzene	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	1,2-Dichlorobenzene	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	1,2-Dibromo 3-Chloropropane	50	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	1,2,4-Trichlorobenzene	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	Hexachlorobutadiene	10	µg/kg	U	UJ
1103082	MW2A-7.5-031511	1103082-09	8260	1,2,3-Trichlorobenzene	10	µg/kg	U	UJ
1103082	MW7-14-031511	1103082-12	8270	Di-N-Butylphthalate	140	µg/kg		J
1103102	FS09A-6-031711	1103102-01	NWTPH-Gx	TPH-Volatile Range	3	mg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	NWTPH-Dx	TPH-Diesel Range	25	mg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	NWPTH-Dx	TPH-Oil Range	50	mg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	Dichlorodifluoromethane	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	Chloromethane	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	Vinyl Chloride	10	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09A-6-031711	1103102-01	8260	Bromomethane	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	Chloroethane	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	Trichlorofluoromethane	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	Acetone	50	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	Carbon Disulfide	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	1,1-Dichloroethene	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	Methylene Chloride	20	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	Acrylonitrile	50	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	Methyl T-Butyl Ether	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	trans-1,2,-Dichloroethene	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	1,1-Dichloroethane	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	2-Butanone	50	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	cis-1,2-Dichloroethene	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	2,2-Dichloropropane	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	Bromochloromethane	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	Chloroform	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	1,1,1-Trichloroetheane	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	1,1-Dichloropropene	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	Carbon Tetrachloride	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	1,2-Dichloroethane	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	Benzene	5	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	Trichloroethene	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	1,2-Dichloropropane	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	Dibromomethane	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	Bromodichloromethane	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	trans-1,3-Dichloropropene	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	4-Methyl-2-Pentanone	50	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09A-6-031711	1103102-01	8260	Toluene	33	µg/kg		J
1103102	FS09A-6-031711	1103102-01	8260	cis-1,3-Dichloropropene	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	1,1,2-Trichloroethane	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	2-Hexanone	50	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	1,3-Dichloropropane	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	Tetrachloroethylene	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	Dibromochloromethane	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	1,2-Dibromoethane	5	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	Chlorobenzene	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	1,1,1,2-Tetrachloroethane	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	Ethylbenzene	14	µg/kg		J
1103102	FS09A-6-031711	1103102-01	8260	m,p-Xylene	42	µg/kg		J
1103102	FS09A-6-031711	1103102-01	8260	Styrene	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	o-Xylene	19	µg/kg		J
1103102	FS09A-6-031711	1103102-01	8260	Bromoform	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	Isopropylbenzene	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	1,1,2,2-Tetrachloroethane	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	1,2,3-Trichloropropane	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	Bromobenzene	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	N-Propyl Benzene	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	2-Chlorotoluene	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	1,3,5-Trimethylbenzene	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	4-Chlorotoluene	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	T-Butyl Benzene	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	1,2,4-Trimethylbenzene	27	µg/kg		J
1103102	FS09A-6-031711	1103102-01	8260	S-Butyl Benzene	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	P-Isopropyltoluene	61	µg/kg		J

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09A-6-031711	1103102-01	8260	1,3-Dichlorobenzene	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	1,4-Dichlorobenzene	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	N-Butylbenzene	56	µg/kg		J
1103102	FS09A-6-031711	1103102-01	8260	1,2-Dichlorobenzene	11	µg/kg		J
1103102	FS09A-6-031711	1103102-01	8260	1,2-Dibromo 3-Chloropropane	50	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	1,2,4-Trichlorobenzene	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	Hexachlorobutadiene	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8260	Naphthalene	6900	µg/kg		J
1103102	FS09A-6-031711	1103102-01	8260	1,2,3-Trichlorobenzene	10	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Pyridine	200	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	N-Nitrosodiphenylamine	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Phenol	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Aniline	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Bis(2-Chloroetheyl)Ether	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	2-Chlorophenol	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	1,3-Dichlorobenzene	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	1,4-Dichlorobenzene	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Benzyl Alcohol	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	1,2-Dichlorobenzene	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	2-Methylphenol	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Bis(2-Chlorosopropyl)Ether	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	3&4-Methylphenol	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	N-Nitro-Di-N-Proplyamine	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Hexachloroethane	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Nitrobenzene	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Isophorone	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	2-Nitrophenol	250	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09A-6-031711	1103102-01	8270	2,4-Dimethylphenol	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Benzoic Acid	1000	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Bis(2-Chloroethoxy)Methane	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	2,4-Dichlorophenol	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	1,2,4-Trichlorobenzene	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Naphthalene	190	µg/kg		J
1103102	FS09A-6-031711	1103102-01	8270	4-Chloroaniline	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	2,6-Dichlorophenol	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Hexachlorobutadiene	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	4-Chloro-3-Methylphenol	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	2-Methylnaphthalene	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	1-Methylnaphthalene	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Hexachlorcyclopentadiene	500	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	2,4,6-Trichlorophenol	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	2,4,5-Trichlorophenol	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	2-Chloronaphtalene	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	2-Nitroaniline	250	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Acenaphthylene	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Dimethylphthalate	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	2,6-Dinitrotoluene	250	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Acenaphthene	140	µg/kg		J
1103102	FS09A-6-031711	1103102-01	8270	3-Nitroaniline	250	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	2,4-Dinitrophenol	500	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	4-Nitrophenol	500	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Dibenzofuran	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	2,4-Dinitrotoluene	250	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	2,3,4,6-Tetrachlorophenol	250	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09A-6-031711	1103102-01	8270	Diethylphthalate	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Fluorene	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	4-Chlorophenyl-Phenylether	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	4-Nitroaniline	250	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	4,6-Dinitro-2-Methylphenol	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	N-Nitrosodiphenylamine	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Azobenzene	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	4-Bromophenyl-Phenylether	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Hexachlorobenzene	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Pentachlorophenol	500	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Phenanthrene	130	µg/kg		J
1103102	FS09A-6-031711	1103102-01	8270	Anthracene	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Carbazole	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Di-N-Butylphthalate	130	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Fluoranthene	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Pyrene	170	µg/kg		J
1103102	FS09A-6-031711	1103102-01	8270	Butylbenzylphthalate	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	3,3'-dichlorobenzidine	500	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Benzo(a)anthracene	230	µg/kg		J
1103102	FS09A-6-031711	1103102-01	8270	Chrysene	640	µg/kg		J
1103102	FS09A-6-031711	1103102-01	8270	Bis(2-Ethylhexyl)Phthalate	130	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Di-N-Octylphthalate	100	µg/kg	U	UJ
1103102	FS09A-6-031711	1103102-01	8270	Benzo(b)fluoranthene	570	µg/kg		J
1103102	FS09A-6-031711	1103102-01	8270	Benzo(k)fluoranthene	280	µg/kg		J
1103102	FS09A-6-031711	1103102-01	8270	Benzo(a)pyrene	470	µg/kg		J
1103102	FS09A-6-031711	1103102-01	8270	Indeno(1,2,3-cd)pyrene	260	µg/kg		J
1103102	FS09A-6-031711	1103102-01	8270	Dibenz(a,h)anthracene	120	µg/kg		J

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09A-6-031711	1103102-01	8270	Benzo(g,h,i)perylene	290	µg/kg		J
1103102	FS09A(2)-5-031711	1103102-02	NWTPH-Gx	TPH-Volatile Range	3	mg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	NWTPH-Dx	TPH-Diesel Range	25	mg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	NWPTH-Dx	TPH-Oil Range	50	mg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Dichlorodifluoromethane	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Chloromethane	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Vinyl Chloride	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Bromomethane	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Chloroethane	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Trichlorofluoromethane	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Acetone	50	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Carbon Disulfide	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	1,1-Dichloroethene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Methylene Chloride	20	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Acrylonitrile	50	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Methyl T-Butyl Ether	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	trans-1,2,-Dichloroethene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	1,1-Dichloroethane	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	2-Butanone	50	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	cis-1,2-Dichloroethene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	2,2-Dichloropropane	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Bromochloromethane	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Chloroform	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	1,1,1-Trichloroetheane	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	1,1-Dichloropropene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Carbon Tetrachloride	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	1,2-Dichloroethane	10	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09A(2)-5-031711	1103102-02	8260	Benzene	5	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Trichloroethene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	1,2-Dichloropropane	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Dibromomethane	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Bromodichloromethane	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	trans-1,3-Dichloropropene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	4-Methyl-2-Pentanone	50	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Toluene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	cis-1,3-Dichloropropene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	1,1,2-Trichloroethane	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	2-Hexanone	50	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	1,3-Dichloropropane	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Tetrachloroethylene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Dibromochloromethane	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	1,2-Dibromoethane	5	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Chlorobenzene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	1,1,1,2-Tetrachloroethane	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Ethylbenzene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	m,p-Xylene	20	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Styrene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	o-Xylene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Bromoform	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Isopropylbenzene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	1,1,2,2-Tetrachloroethane	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	1,2,3-Trichloropropane	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Bromobenzene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	N-Propyl Benzene	10	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09A(2)-5-031711	1103102-02	8260	2-Chlorotoluene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	1,3,5-Trimethylbenzene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	4-Chlorotoluene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	T-Butyl Benzene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	1,2,4-Trimethylbenzene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	S-Butyl Benzene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	P-Isopropyltoluene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	1,3-Dichlorobenzene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	1,4-Dichlorobenzene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	N-Butylbenzene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	1,2-Dichlorobenzene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	1,2-Dibromo 3-Chloropropane	50	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	1,2,4-Trichlorobenzene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Hexachlorobutadiene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	Naphthalene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8260	1,2,3-Trichlorobenzene	10	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Pyridine	200	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	N-Nitrosodiphenylamine	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Phenol	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Aniline	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Bis(2-Chloroetheyl)Ether	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	2-Chlorophenol	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	1,3-Dichlorobenzene	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	1,4-Dichlorobenzene	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Benzyl Alcohol	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	1,2-Dichlorobenzene	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	2-Methylphenol	100	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09A(2)-5-031711	1103102-02	8270	Bis(2-Chlorosopropyl)Ether	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	3&4-Methylphenol	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	N-Nitro-Di-N-Proplyamine	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Hexachloroethane	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Nitrobenzene	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Isophorone	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	2-Nitrophenol	250	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	2,4-Dimethylphenol	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Benzoic Acid	1000	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Bis(2-Chloroethoxy)Methane	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	2,4-Dichlorophenol	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	1,2,4-Trichlorobenzene	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Naphthalene	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	4-Chloroaniline	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	2,6-Dichlorophenol	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Hexachlorobutadiene	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	4-Chloro-3-Methylphenol	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	2-Methylnaphthalene	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	1-Methylnaphthalene	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Hexachlorcyclopentadiene	200	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	2,4,6-Trichlorophenol	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	2,4,5-Trichlorophenol	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	2-Chloronaphtalene	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	2-Nitroaniline	250	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Acenaphthylene	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Dimethylphthalate	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	2,6-Dinitrotoluene	250	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09A(2)-5-031711	1103102-02	8270	Acenaphthene	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	3-Nitroaniline	250	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	2,4-Dinitrophenol	500	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	4-Nitrophenol	500	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Dibenzofuran	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	2,4-Dinitrotoluene	250	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	2,3,4,6-Tetrachlorophenol	250	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Diethylphthalate	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Fluorene	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	4-Chlorophenyl-Phenylether	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	4-Nitroaniline	250	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	4,6-Dinitro-2-Methylphenol	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	N-Nitrosodiphenylamine	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Azobenzene	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	4-Bromophenyl-Phenylether	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Hexachlorobenzene	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Pentachlorophenol	500	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Phenanthrene	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Anthracene	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Carbazole	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Di-N-Butylphthalate	130	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Fluoranthene	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Pyrene	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Butylbenzylphthalate	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	3,3'-dichlorobenzidine	500	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Benzo(a)anthracene	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Chrysene	100	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09A(2)-5-031711	1103102-02	8270	Bis(2-Ethylhexyl)Phthalate	130	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Di-N-Octylphthalate	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Benzo(b)fluoranthene	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Benzo(k)fluoranthene	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Benzo(a)pyrene	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Indeno(1,2,3-cd)pyrene	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Dibenz(a,h)anthracene	100	µg/kg	U	UJ
1103102	FS09A(2)-5-031711	1103102-02	8270	Benzo(g,h,i)perylene	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	NWTPH-Gx	TPH-Volatile Range	3	mg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	NWTPH-Dx	TPH-Diesel Range	25	mg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	NWPTH-Dx	TPH-Oil Range	50	mg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Dichlorodifluoromethane	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Chloromethane	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Vinyl Chloride	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Bromomethane	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Chloroethane	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Trichlorofluoromethane	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Acetone	50	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Carbon Disulfide	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	1,1-Dichloroethene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Methylene Chloride	20	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Acrylonitrile	50	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Methyl T-Butyl Ether	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	trans-1,2,-Dichloroethene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	1,1-Dichloroethane	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	2-Butanone	50	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	cis-1,2-Dichloroethene	10	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09A(2)-14-031711	1103102-03	8260	2,2-Dichloropropane	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Bromochloromethane	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Chloroform	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	1,1,1-Trichloroetheane	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	1,1-Dichloropropene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Carbon Tetrachloride	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	1,2-Dichloroethane	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Benzene	5	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Trichloroethene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	1,2-Dichloropropane	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Dibromomethane	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Bromodichloromethane	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	trans-1,3-Dichloropropene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	4-Methyl-2-Pentanone	50	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Toluene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	cis-1,3-Dichloropropene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	1,1,2-Trichloroethane	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	2-Hexanone	50	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	1,3-Dichloropropane	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Tetrachloroethylene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Dibromochloromethane	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	1,2-Dibromoethane	5	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Chlorobenzene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	1,1,1,2-Tetrachloroethane	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Ethylbenzene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	m,p-Xylene	20	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Styrene	10	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09A(2)-14-031711	1103102-03	8260	o-Xylene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Bromoform	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Isopropylbenzene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	1,1,2,2-Tetrachloroethane	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	1,2,3-Trichloropropane	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Bromobenzene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	N-Propyl Benzene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	2-Chlorotoluene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	1,3,5-Trimethylbenzene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	4-Chlorotoluene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	T-Butyl Benzene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	1,2,4-Trimethylbenzene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	S-Butyl Benzene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	P-Isopropyltoluene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	1,3-Dichlorobenzene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	1,4-Dichlorobenzene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	N-Butylbenzene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	1,2-Dichlorobenzene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	1,2-Dibromo 3-Chloropropane	50	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	1,2,4-Trichlorobenzene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Hexachlorobutadiene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	Naphthalene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8260	1,2,3-Trichlorobenzene	10	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Pyridine	200	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	N-Nitrosodiphenylamine	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Phenol	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Aniline	100	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09A(2)-14-031711	1103102-03	8270	Bis(2-Chloroetheyl)Ether	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	2-Chlorophenol	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	1,3-Dichlorobenzene	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	1,4-Dichlorobenzene	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Benzyl Alcohol	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	1,2-Dichlorobenzene	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	2-Methylphenol	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Bis(2-Chlorosopropyl)Ether	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	3&4-Methylphenol	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	N-Nitro-Di-N-Proplyamine	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Hexachloroethane	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Nitrobenzene	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Isophorone	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	2-Nitrophenol	250	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	2,4-Dimethylphenol	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Benzoic Acid	1000	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Bis(2-Chloroethoxy)Methane	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	2,4-Dichlorophenol	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	1,2,4-Trichlorobenzene	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Naphthalene	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	4-Chloroaniline	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	2,6-Dichlorophenol	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Hexachlorobutadiene	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	4-Chloro-3-Methylphenol	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	2-Methylnaphthalene	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	1-Methylnaphthalene	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Hexachlorcyclopentadiene	200	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09A(2)-14-031711	1103102-03	8270	2,4,6-Trichlorophenol	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	2,4,5-Trichlorophenol	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	2-Chloronaphtalene	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	2-Nitroaniline	250	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Acenaphthylene	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Dimethylphthalate	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	2,6-Dinitrotoluene	250	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Acenaphthene	300	µg/kg		J
1103102	FS09A(2)-14-031711	1103102-03	8270	3-Nitroaniline	250	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	2,4-Dinitrophenol	500	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	4-Nitrophenol	500	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Dibenzofuran	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	2,4-Dinitrotoluene	250	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	2,3,4,6-Tetrachlorophenol	250	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Diethylphthalate	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Fluorene	170	µg/kg		J
1103102	FS09A(2)-14-031711	1103102-03	8270	4-Chlorophenyl-Phenylether	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	4-Nitroaniline	250	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	4,6-Dinitro-2-Methylphenol	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	N-Nitrosodiphenylamine	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Azobenzene	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	4-Bromophenyl-Phenylether	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Hexachlorobenzene	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Pentachlorophenol	500	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Phenanthrene	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Anthracene	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Carbazole	100	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09A(2)-14-031711	1103102-03	8270	Di-N-Butylphthalate	130	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Fluoranthene	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Pyrene	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Butylbenzylphthalate	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	3,3'-dichlorobenzidine	500	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Benzo(a)anthracene	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Chrysene	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Bis(2-Ethylhexyl)Phthalate	130	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Di-N-Octylphthalate	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Benzo(b)fluoranthene	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Benzo(k)fluoranthene	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Benzo(a)pyrene	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Indeno(1,2,3-cd)pyrene	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Dibenz(a,h)anthracene	100	µg/kg	U	UJ
1103102	FS09A(2)-14-031711	1103102-03	8270	Benzo(g,h,i)perylene	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	NWTPH-Gx	TPH-Volatile Range	37	mg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	NWTPH-Dx	TPH-Diesel Range	1700	mg/kg		J
1103102	FS09D-5-031711	1103102-04	NWPTH-Dx	TPH-Oil Range	50	mg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	Dichlorodifluoromethane	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	Chloromethane	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	Vinyl Chloride	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	Bromomethane	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	Chloroethane	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	Trichlorofluoromethane	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	Acetone	50	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	Carbon Disulfide	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	1,1-Dichloroethene	10	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09D-5-031711	1103102-04	8260	Methylene Chloride	20	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	Acrylonitrile	50	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	Methyl T-Butyl Ether	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	trans-1,2,-Dichloroethene	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	1,1-Dichloroethane	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	2-Butanone	50	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	cis-1,2-Dichloroethene	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	2,2-Dichloropropane	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	Bromochloromethane	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	Chloroform	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	1,1,1-Trichloroetheane	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	1,1-Dichloropropene	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	Carbon Tetrachloride	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	1,2-Dichloroethane	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	Benzene	5	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	Trichloroethene	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	1,2-Dichloropropane	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	Dibromomethane	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	Bromodichloromethane	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	trans-1,3-Dichloropropene	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	4-Methyl-2-Pentanone	50	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	Toluene	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	cis-1,3-Dichloropropene	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	1,1,2-Trichloroethane	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	2-Hexanone	50	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	1,3-Dichloropropane	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	Tetrachloroethylene	10	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09D-5-031711	1103102-04	8260	Dibromochloromethane	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	1,2-Dibromoethane	5	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	Chlorobenzene	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	1,1,1,2-Tetrachloroethane	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	Ethylbenzene	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	m,p-Xylene	20	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	Styrene	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	o-Xylene	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	Bromoform	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	Isopropylbenzene	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	1,1,2,2-Tetrachloroethane	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	1,2,3-Trichloropropane	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	Bromobenzene	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	N-Propyl Benzene	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	2-Chlorotoluene	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	1,3,5-Trimethylbenzene	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	4-Chlorotoluene	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	T-Butyl Benzene	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	1,2,4-Trimethylbenzene	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	S-Butyl Benzene	16	µg/kg		J
1103102	FS09D-5-031711	1103102-04	8260	P-Isopropyltoluene	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	1,3-Dichlorobenzene	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	1,4-Dichlorobenzene	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	N-Butylbenzene	10	µg/kg		J
1103102	FS09D-5-031711	1103102-04	8260	1,2-Dichlorobenzene	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	1,2-Dibromo 3-Chloropropane	50	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	1,2,4-Trichlorobenzene	10	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09D-5-031711	1103102-04	8260	Hexachlorobutadiene	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8260	Naphthalene	11	µg/kg		J
1103102	FS09D-5-031711	1103102-04	8260	1,2,3-Trichlorobenzene	10	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Pyridine	200	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	N-Nitrosodiphenylamine	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Phenol	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Aniline	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Bis(2-Chloroetheyl)Ether	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	2-Chlorophenol	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	1,3-Dichlorobenzene	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	1,4-Dichlorobenzene	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Benzyl Alcohol	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	1,2-Dichlorobenzene	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	2-Methylphenol	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Bis(2-Chlorosopropyl)Ether	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	3&4-Methylphenol	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	N-Nitro-Di-N-Proplyamine	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Hexachloroethane	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Nitrobenzene	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Isophorone	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	2-Nitrophenol	250	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	2,4-Dimethylphenol	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Benzoic Acid	1000	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Bis(2-Chloroethoxy)Methane	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	2,4-Dichlorophenol	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	1,2,4-Trichlorobenzene	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Naphthalene	100	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09D-5-031711	1103102-04	8270	4-Chloroaniline	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	2,6-Dichlorophenol	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Hexachlorobutadiene	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	4-Chloro-3-Methylphenol	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	2-Methylnaphthalene	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	1-Methylnaphthalene	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Hexachlorcyclopentadiene	200	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	2,4,6-Trichlorophenol	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	2,4,5-Trichlorophenol	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	2-Chloronaphtalene	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	2-Nitroaniline	250	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Acenaphthylene	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Dimethylphthalate	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	2,6-Dinitrotoluene	250	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Acenaphthene	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	3-Nitroaniline	250	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	2,4-Dinitrophenol	500	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	4-Nitrophenol	500	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Dibenzofuran	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	2,4-Dinitrotoluene	250	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	2,3,4,6-Tetrachlorophenol	250	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Diethylphthalate	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Fluorene	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	4-Chlorophenyl-Phenylether	860	µg/kg		J
1103102	FS09D-5-031711	1103102-04	8270	4-Nitroaniline	250	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	4,6-Dinitro-2-Methylphenol	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	N-Nitrosodiphenylamine	460	µg/kg		J

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09D-5-031711	1103102-04	8270	Azobenzene	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	4-Bromophenyl-Phenylether	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Hexachlorobenzene	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Pentachlorophenol	500	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Phenanthrene	220	µg/kg		J
1103102	FS09D-5-031711	1103102-04	8270	Anthracene	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Carbazole	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Di-N-Butylphthalate	130	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Fluoranthene	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Pyrene	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Butylbenzylphthalate	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	3,3'-dichlorobenzidine	500	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Benzo(a)anthracene	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Chrysene	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Bis(2-Ethylhexyl)Phthalate	130	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Di-N-Octylphthalate	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Benzo(b)fluoranthene	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Benzo(k)fluoranthene	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Benzo(a)pyrene	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Indeno(1,2,3-cd)pyrene	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Dibenz(a,h)anthracene	100	µg/kg	U	UJ
1103102	FS09D-5-031711	1103102-04	8270	Benzo(g,h,i)perylene	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	NWTPH-Gx	TPH-Volatile Range	3	mg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	NWTPH-Dx	TPH-Diesel Range	25	mg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	NWPTH-Dx	TPH-Oil Range	50	mg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Dichlorodifluoromethane	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Chloromethane	10	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09B-15-031711	1103102-06	8260	Vinyl Chloride	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Bromomethane	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Chloroethane	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Trichlorofluoromethane	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Acetone	50	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Carbon Disulfide	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	1,1-Dichloroethene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Methylene Chloride	20	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Acrylonitrile	50	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Methyl T-Butyl Ether	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	trans-1,2,-Dichloroethene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	1,1-Dichloroethane	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	2-Butanone	50	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	cis-1,2-Dichloroethene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	2,2-Dichloropropane	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Bromochloromethane	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Chloroform	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	1,1,1-Trichloroetheane	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	1,1-Dichloropropene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Carbon Tetrachloride	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	1,2-Dichloroethane	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Benzene	5	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Trichloroethene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	1,2-Dichloropropane	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Dibromomethane	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Bromodichloromethane	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	trans-1,3-Dichloropropene	10	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09B-15-031711	1103102-06	8260	4-Methyl-2-Pentanone	50	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Toluene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	cis-1,3-Dichloropropene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	1,1,2-Trichloroethane	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	2-Hexanone	50	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	1,3-Dichloropropane	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Tetrachloroethylene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Dibromochloromethane	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	1,2-Dibromoethane	5	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Chlorobenzene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	1,1,1,2-Tetrachloroethane	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Ethylbenzene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	m,p-Xylene	20	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Styrene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	o-Xylene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Bromoform	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Isopropylbenzene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	1,1,2,2-Tetrachloroethane	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	1,2,3-Trichloropropane	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Bromobenzene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	N-Propyl Benzene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	2-Chlorotoluene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	1,3,5-Trimethylbenzene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	4-Chlorotoluene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	T-Butyl Benzene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	1,2,4-Trimethylbenzene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	S-Butyl Benzene	10	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09B-15-031711	1103102-06	8260	P-Isopropyltoluene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	1,3-Dichlorobenzene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	1,4-Dichlorobenzene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	N-Butylbenzene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	1,2-Dichlorobenzene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	1,2-Dibromo 3-Chloropropane	50	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	1,2,4-Trichlorobenzene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Hexachlorobutadiene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	Naphthalene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8260	1,2,3-Trichlorobenzene	10	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Pyridine	200	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	N-Nitrosodiphenylamine	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Phenol	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Aniline	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Bis(2-Chloroetheyl)Ether	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	2-Chlorophenol	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	1,3-Dichlorobenzene	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	1,4-Dichlorobenzene	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Benzyl Alcohol	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	1,2-Dichlorobenzene	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	2-Methylphenol	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Bis(2-Chlorosopropyl)Ether	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	3&4-Methylphenol	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	N-Nitro-Di-N-Proplyamine	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Hexachloroethane	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Nitrobenzene	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Isophorone	100	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09B-15-031711	1103102-06	8270	2-Nitrophenol	250	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	2,4-Dimethylphenol	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Benzoic Acid	1000	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Bis(2-Chloroethoxy)Methane	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	2,4-Dichlorophenol	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	1,2,4-Trichlorobenzene	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Naphthalene	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	4-Chloroaniline	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	2,6-Dichlorophenol	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Hexachlorobutadiene	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	4-Chloro-3-Methylphenol	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	2-Methylnaphthalene	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	1-Methylnaphthalene	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Hexachlorcyclopentadiene	200	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	2,4,6-Trichlorophenol	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	2,4,5-Trichlorophenol	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	2-Chloronaphtalene	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	2-Nitroaniline	250	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Acenaphthylene	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Dimethylphthalate	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	2,6-Dinitrotoluene	250	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Acenaphthene	130	µg/kg		J
1103102	FS09B-15-031711	1103102-06	8270	3-Nitroaniline	250	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	2,4-Dinitrophenol	500	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	4-Nitrophenol	500	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Dibenzofuran	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	2,4-Dinitrotoluene	250	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09B-15-031711	1103102-06	8270	2,3,4,6-Tetrachlorophenol	250	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Diethylphthalate	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Fluorene	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	4-Chlorophenyl-Phenylether	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	4-Nitroaniline	250	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	4,6-Dinitro-2-Methylphenol	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	N-Nitrosodiphenylamine	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Azobenzene	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	4-Bromophenyl-Phenylether	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Hexachlorobenzene	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Pentachlorophenol	500	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Phenanthrene	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Anthracene	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Carbazole	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Di-N-Butylphthalate	130	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Fluoranthene	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Pyrene	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Butylbenzylphthalate	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	3,3'-dichlorobenzidine	500	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Benzo(a)anthracene	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Chrysene	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Bis(2-Ethylhexyl)Phthalate	130	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Di-N-Octylphthalate	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Benzo(b)fluoranthene	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Benzo(k)fluoranthene	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Benzo(a)pyrene	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Indeno(1,2,3-cd)pyrene	100	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09B-15-031711	1103102-06	8270	Dibenz(a,h)anthracene	100	µg/kg	U	UJ
1103102	FS09B-15-031711	1103102-06	8270	Benzo(g,h,i)perylene	100	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	NWTPH-Gx	TPH-Volatile Range	3	mg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	NWTPH-Dx	TPH-Diesel Range	25	mg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	NWPTH-Dx	TPH-Oil Range	50	mg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	Dichlorodifluoromethane	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	Chloromethane	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	Vinyl Chloride	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	Bromomethane	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	Chloroethane	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	Trichlorofluoromethane	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	Acetone	50	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	Carbon Disulfide	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	1,1-Dichloroethene	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	Methylene Chloride	20	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	Acrylonitrile	50	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	Methyl T-Butyl Ether	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	trans-1,2,-Dichloroethene	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	1,1-Dichloroethane	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	2-Butanone	50	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	cis-1,2-Dichloroethene	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	2,2-Dichloropropane	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	Bromochloromethane	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	Chloroform	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	1,1,1-Trichloroetheane	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	1,1-Dichloropropene	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	Carbon Tetrachloride	10	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09C-8.5-031711	1103102-07	8260	1,2-Dichloroethane	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	Benzene	5	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	Trichloroethene	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	1,2-Dichloropropane	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	Dibromomethane	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	Bromodichloromethane	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	trans-1,3-Dichloropropene	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	4-Methyl-2-Pentanone	50	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	Toluene	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	cis-1,3-Dichloropropene	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	1,1,2-Trichloroethane	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	2-Hexanone	50	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	1,3-Dichloropropane	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	Tetrachloroethylene	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	Dibromochloromethane	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	1,2-Dibromoethane	5	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	Chlorobenzene	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	1,1,1,2-Tetrachloroethane	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	Ethylbenzene	37	µg/kg		J
1103102	FS09C-8.5-031711	1103102-07	8260	m,p-Xylene	50	µg/kg		J
1103102	FS09C-8.5-031711	1103102-07	8260	Styrene	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	o-Xylene	58	µg/kg		J
1103102	FS09C-8.5-031711	1103102-07	8260	Bromoform	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	Isopropylbenzene	53	µg/kg		J
1103102	FS09C-8.5-031711	1103102-07	8260	1,1,2,2-Tetrachloroethane	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	1,2,3-Trichloropropane	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	Bromobenzene	10	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09C-8.5-031711	1103102-07	8260	N-Propyl Benzene	50	µg/kg		J
1103102	FS09C-8.5-031711	1103102-07	8260	2-Chlorotoluene	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	1,3,5-Trimethylbenzene	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	4-Chlorotoluene	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	T-Butyl Benzene	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	1,2,4-Trimethylbenzene	510	µg/kg		J
1103102	FS09C-8.5-031711	1103102-07	8260	S-Butyl Benzene	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	P-Isopropyltoluene	270	µg/kg		J
1103102	FS09C-8.5-031711	1103102-07	8260	1,3-Dichlorobenzene	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	1,4-Dichlorobenzene	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	N-Butylbenzene	310	µg/kg		J
1103102	FS09C-8.5-031711	1103102-07	8260	1,2-Dichlorobenzene	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	1,2-Dibromo 3-Chloropropane	50	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	1,2,4-Trichlorobenzene	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	Hexachlorobutadiene	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8260	Naphthalene	40000	µg/kg		J
1103102	FS09C-8.5-031711	1103102-07	8260	1,2,3-Trichlorobenzene	10	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Pyridine	2000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	N-Nitrosodiphenylamine	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Phenol	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Aniline	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Bis(2-Chloroetheyl)Ether	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	2-Chlorophenol	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	1,3-Dichlorobenzene	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	1,4-Dichlorobenzene	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Benzyl Alcohol	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	1,2-Dichlorobenzene	1000	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09C-8.5-031711	1103102-07	8270	2-Methylphenol	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Bis(2-Chlorosopropyl)Ether	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	3&4-Methylphenol	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	N-Nitro-Di-N-Proplyamine	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Hexachloroethane	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Nitrobenzene	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Isophorone	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	2-Nitrophenol	2500	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	2,4-Dimethylphenol	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Benzoic Acid	10000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Bis(2-Chloroethoxy)Methane	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	2,4-Dichlorophenol	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	1,2,4-Trichlorobenzene	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Naphthalene	110000	µg/kg		J
1103102	FS09C-8.5-031711	1103102-07	8270	4-Chloroaniline	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	2,6-Dichlorophenol	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Hexachlorobutadiene	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	4-Chloro-3-Methylphenol	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	2-Methylnaphthalene	38000	µg/kg		J
1103102	FS09C-8.5-031711	1103102-07	8270	1-Methylnaphthalene	25000	µg/kg		J
1103102	FS09C-8.5-031711	1103102-07	8270	Hexachlorcyclopentadiene	5000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	2,4,6-Trichlorophenol	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	2,4,5-Trichlorophenol	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	2-Chloronaphtalene	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	2-Nitroaniline	2500	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Acenaphthylene	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Dimethylphthalate	1000	µg/kg	U	UJ

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09C-8.5-031711	1103102-07	8270	2,6-Dinitrotoluene	2500	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Acenaphthene	29000	µg/kg		J
1103102	FS09C-8.5-031711	1103102-07	8270	3-Nitroaniline	2500	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	2,4-Dinitrophenol	5000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	4-Nitrophenol	5000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Dibenzofuran	20000	µg/kg		J
1103102	FS09C-8.5-031711	1103102-07	8270	2,4-Dinitrotoluene	2500	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	2,3,4,6-Tetrachlorophenol	2500	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Diethylphthalate	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Fluorene	28000	µg/kg		J
1103102	FS09C-8.5-031711	1103102-07	8270	4-Chlorophenyl-Phenylether	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	4-Nitroaniline	2500	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	4,6-Dinitro-2-Methylphenol	1700	µg/kg		J
1103102	FS09C-8.5-031711	1103102-07	8270	N-Nitrosodiphenylamine	1900	µg/kg		J
1103102	FS09C-8.5-031711	1103102-07	8270	Azobenzene	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	4-Bromophenyl-Phenylether	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Hexachlorobenzene	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Pentachlorophenol	5000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Phenanthrene	71000	µg/kg		J
1103102	FS09C-8.5-031711	1103102-07	8270	Anthracene	6100	µg/kg		J
1103102	FS09C-8.5-031711	1103102-07	8270	Carbazole	3900	µg/kg		J
1103102	FS09C-8.5-031711	1103102-07	8270	Di-N-Butylphthalate	1300	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Fluoranthene	31000	µg/kg		J
1103102	FS09C-8.5-031711	1103102-07	8270	Pyrene	23000	µg/kg		J
1103102	FS09C-8.5-031711	1103102-07	8270	Butylbenzylphthalate	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	3,3'-dichlorobenzidine	5000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Benzo(a)anthracene	6000	µg/kg		J

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1103102	FS09C-8.5-031711	1103102-07	8270	Chrysene	4100	µg/kg		J
1103102	FS09C-8.5-031711	1103102-07	8270	Bis(2-Ethylhexyl)Phthalate	1300	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Di-N-Octylphthalate	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Benzo(b)fluoranthene	2600	µg/kg		J
1103102	FS09C-8.5-031711	1103102-07	8270	Benzo(k)fluoranthene	2800	µg/kg		J
1103102	FS09C-8.5-031711	1103102-07	8270	Benzo(a)pyrene	2600	µg/kg		J
1103102	FS09C-8.5-031711	1103102-07	8270	Indeno(1,2,3-cd)pyrene	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Dibenz(a,h)anthracene	1000	µg/kg	U	UJ
1103102	FS09C-8.5-031711	1103102-07	8270	Benzo(g,h,i)perylene	1000	µg/kg	U	UJ
1103128	MW9-GW-032211	1103128-05	NWTPH-Gx	TPH-Volatile Range	520	µg/L		J
1103141	MW1-GW-032311	1103141-04	NWTPH-Gx	TPH-Volatile Range	730	µg/L		J
1105025	HA2-031611	1105025-01	NWTPH-Dx	TPH-Diesel Range	25	mg/kg	U	UJ
1105025	HA2-031611	1105025-01	NWTPH-Dx	TPH-Oil Range	50	mg/kg	U	UJ
1105025	HA3-031611	1105025-02	NWTPH-Dx	TPH-Diesel Range	25	mg/kg	U	UJ
1105025	HA3-031611	1105025-02	NWTPH-Dx	TPH-Oil Range	50	mg/kg	U	UJ
1105025	HA4-031711	1105025-03	NWTPH-Dx	TPH-Diesel Range	25	mg/kg	U	UJ
1105025	HA4-031711	1105025-03	NWTPH-Dx	TPH-Oil Range	63	mg/kg		J

Qualifiers:

J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
U	The analyte was not detected at the given reporting limit.
UJ	The analyte was not detected; the given reporting limit is an estimate.

Port of Bellingham
Harris Avenue Shipyards

Data Validation Report
RI/FS Round 2 Sampling Event

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List of Abbreviations and Acronyms

Abbreviation/ Acronym	Definition
ALS	ALS Environmental Laboratory
DNR	Do not report
LCS	Laboratory control sample
LCSD	Laboratory control sample duplicate
MS	Matrix spike
MSD	Matrix spike duplicate
PCB	Polychlorinated biphenyl
RPD	Relative percent difference
QC	Quality control
SDG	Sample delivery group
SVOC	Semivolatile organic compound
TBT	Tributyltin
TPH	Total petroleum hydrocarbons
USEPA	U. S. Environmental Protection Agency
VOC	Volatile organic compound

1.0 Project Narrative

1.1 OVERVIEW OF DATA VALIDATION

This report summarizes the results of the Compliance Screening (Level I) performed on the soil, groundwater, and field quality control (QC) sample data for the Harris Avenue Shipyard RI/FS Round 2 Sampling Event. A complete list of samples is provided in Table 1.

The chemical analyses were performed by ALS Environmental Laboratory (ALS), Everett, WA. A total of 4 soil, 9 groundwater, and 2 field QC samples were collected between July 28th and 29th, 2011 and submitted to ALS for chemical analyses. The analytical methods include the following:

- Diesel- and Oil-Range TPH—NWTPH-Dx
- Gasoline-Range TPH—NWTPH-Gx
- VOCs—USEPA Method 8260
- SVOCs—USEPA Method 8270
- PCBs—USEPA Method 8082
- Metals—USEPA Method 6020B
- Mercury—USEPA Method 7470/7471
- TBT—KRONE 1988
- Total Solids—USEPA Method 160.3
- Total Organic Carbon—PLUMB 1981

The data were reviewed using guidance and quality control criteria documented in the analytical methods, Port of Bellingham Harris Avenue Shipyard Sampling and Analysis Plan/Quality Assurance Project Plan, *National Functional Guidelines for Inorganic Data Review* (USEPA 1994 and 2004), and *National Functional Guidelines for Organic Data Review* (USEPA 1999 and 2008).

Floyd|Snider's goal in assigning data assessment qualifiers is to assist in proper data interpretation. If values are estimated (J or UJ), data may be used for site evaluation and risk assessment purposes, but reasons for data qualification should be taken into consideration when interpreting sample concentrations. If values are assigned an R, the data are to be rejected and should not be used for any site evaluation purposes. When compounds are analyzed at multiple dilutions, select results will be assigned a Do Not Report (DNR) qualification as a more appropriate result is reported from another dilution. If values have no data qualifier assigned, then the data meet the data quality objectives as stated in the documents and methods referenced above.

Data qualifier definitions, reasons, and validation criteria are included as Appendix A. The Qualified Data Summary Table is included in Appendix B. Data validation worksheets (excel worksheets) will be kept on file at Floyd|Snider.

2.0 Data Validation Report
Diesel- and Oil-Range TPH by NWTPH-Dx

This report documents the review of analytical data from the analyses of soil and groundwater, and the associated laboratory QC samples. Samples were analyzed by ALS. Compliance Screening (Level I) was performed on all analytical results by Chell Black as the primary data reviewer, and secondary review was performed by Erin Breckel.

2.1 DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and any anomalies were discussed in the case narrative.

2.2 TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

QC Requirements

	Cooler temperature and preservation		Surrogate recoveries
	Extraction and analysis holding times		Reporting limits and reported results
	Blank contamination	[1]	Compound identification
	Laboratory control sample (LCS) and LCS duplicate (LCSD)		Field duplicates

Notes
1 Quality control results are discussed below, but no data were qualified.

Appendix A presents data validation criteria tables for diesel range hydrocarbon analysis. QC requirements that were met without exception are not discussed below. QC requirements that required further evaluation and had exceptions to the validation criteria are discussed below.

2.2.1 Compound Identification

SDG 1108001-Water

Samples MW1-GW-072911, MW6-GW-072911, MW7-GW-072911, MW9-GW-072911, and MW16B-GW-072911 from sample delivery group (SDG) 1108001 had notations by the laboratory that these samples likely contained weathered diesel. It is with professional judgment that no results be qualified based on the laboratory’s interpretation of the chromatograms.

Sample MW6-GW-072911 had a notation by the laboratory that it likely contained an unidentified oil range product. It is with professional judgment that no results be qualified based on the laboratory’s interpretation of the chromatogram.

2.3 OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by surrogate, LCS and LCSD percent recovery values. Precision was acceptable, as demonstrated by the LCS/LSCD relative percent differences (RPDs).

All data, as reported by the lab, are acceptable for use.

3.0 Data Validation Report
Gasoline-Range TPH by NWTPH-Gx

This report documents the review of analytical data from the analyses of groundwater samples and the associated laboratory QC samples. Samples were analyzed by ALS. Compliance Screening (Level I) was performed on all analytical results by Chell Black as the primary data reviewer, and secondary review was performed by Erin Breckel.

3.1 DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and any anomalies were discussed in the case narrative.

3.2 TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

QC Requirements

	Cooler temperature and preservation		LCS and LCSD
	Extraction and analysis holding times		Field duplicates
	Blank contamination		Reporting limits and reported results
	Surrogate recoveries	[1,2]	Compound identification

Notes

1 Quality control results are discussed below, but no data were qualified.

2 Quality control outliers that impact the reported data were noted. Data qualifiers were issued, as discussed below

Appendix A presents data validation criteria tables for diesel range hydrocarbon analysis. QC requirements that were met without exception are not discussed below. QC requirements that required further evaluation and had exceptions to the validation criteria are discussed below.

3.2.1 Compound Identification

SDG 1108001-Water

Sample MW7-GW-072911 had a notation from the laboratory that the gasoline-range result was primarily due to an individual peak eluting in the gas range. It is with professional judgment that no results be qualified based on the laboratory’s interpretation of the chromatogram.

Samples MW1-GW-072911 and MW9-GW-072911 had notations from the laboratory that the samples likely contained highly weathered gasoline and that gasoline-range product results were biased high due to semi-volatile range product overlap. It is with professional judgment that the gasoline-range (or volatile-range) TPH results for these samples be qualified “J” as estimated due to this overlap. See Appendix B for full details.

3.3 OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by surrogate, LCS, and LCSD percent recovery values. Precision was acceptable, as demonstrated by the LCS/LSCD RPDs.

All data are acceptable for use as qualified; see Appendix B for details.

4.0 Data Validation Report
VOCs by USEPA Method 8260

This report documents the review of analytical data from the analyses of groundwater and field QC samples, and the associated laboratory QC samples. Samples were analyzed by ALS. Compliance Screening (Level I) was performed on all analytical results by Chell Black as the primary data reviewer, and secondary review was performed by Erin Breckel.

4.1 DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

4.2 TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

QC Requirements

Cooler temperature and preservation	LCS and LCSD
Extraction and analysis holding times	Field duplicates
Blank contamination	Reporting limits and reported results
Surrogate recoveries	Target analyte list

All QC requirements were met without exception, and did not require further evaluation.

4.3 OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by surrogate, LCS, and LCSD percent recovery values. Precision was acceptable, as demonstrated by the LCS/LSCD RPDs.

All data, as reported by the lab, are acceptable for use.

5.0 Data Validation Report
SVOCs by USEPA Method 8270

This report documents the review of analytical data from the analyses of soil, groundwater, and field QC samples, and the associated laboratory QC samples. Samples were analyzed by ALS. Compliance Screening (Level I) was performed on all analytical results by Chell Black as the primary data reviewer, and secondary review was performed by Erin Breckel.

5.1 DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

5.2 TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

QC Requirements

	Cooler temperature and preservation	1	MS and MSD
	Extraction and analysis holding times		Field duplicates
	Blank contamination		Reporting limits and reported results
1	Surrogate recoveries		Target analyte list
1	LCS and LCSD		

Notes
1 Quality control results are discussed below, but no data were qualified.

Appendix A presents data validation criteria tables for organic compound analysis. QC requirements that were met without exception are not discussed below. QC requirements that required further evaluation and had exceptions to the validation criteria are discussed below.

5.2.1 Surrogate Recoveries

SDG 1108001-Soil

One base surrogate recovery (2-Fluorbiphenyl at 123%) was outside specification high (55-105%) for sample SG1-072811. Per USEPA guidelines, no action is taken unless two surrogates from the same fraction are outside specifications; therefore no results are qualified based on this surrogate recovery information.

SDG 1108001-Water

The surrogate recoveries of base surrogate 2-Fluorbiphenyl was outside specifications (46-100%) high for four samples as follows: MW1-GW-072911 at 111%; MW4-GW-072911 at 119%; MW8-GW-072911 at 110%; and MW16B-GW-072911at 106%. No action is taken unless two surrogates from the same fraction are outside specifications; therefore no results are qualified based on this surrogate recovery information.

5.2.2 Laboratory Control Sample and Laboratory Control Sample Duplicate

SDG 1108001-Soil

The LCSD percent recovery for 4-Chloro-3-Methylphenol (117%) was outside of specifications (53-108%) high. Per USEPA guidelines, if the LCS recovery is greater than the upper acceptance limit, then the detected sample results for the analytes that exceeded the control limits are qualified. The sample results for this analyte were all non-detects; therefore no data was qualified based on this LCSD percent recovery information.

5.2.3 Matrix Spike and Matrix Spike Duplicate

SDG 1108001-Soil

The MS and MSD percent recoveries for 4-Chloro-3-Methylphenol (114% for both) were outside specifications (53-108%) high. As all sample results for this analyte were non-detects, it is with professional judgment that no results be qualified based on this MS/MSD data.

5.3 OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was generally acceptable, as demonstrated by surrogate, LCS, LCSD, MS, and MSD recoveries. Precision was acceptable, as demonstrated by the MS/MSD RPDs and LCS/LSCD RPDs.

All data, as reported by the lab, are acceptable for use.

6.0 Data Validation Report
PCBs by USEPA Method 8082

This report documents the review of analytical data from the analyses of soil, groundwater, and field QC samples, and the associated laboratory QC samples. Samples were analyzed by ALS. Compliance Screening (Level I) was performed on all analytical results by Chell Black as the primary data reviewer, and secondary review was performed by Erin Breckel.

6.1 DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

6.2 TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

QC Requirements

Cooler temperature and preservation	[1] LCS (and LCSD for water samples)
Extraction and analysis holding times	Field duplicates
Blank contamination	Reporting limits and reported results
Surrogate recoveries	Target analyte list

Notes
1 Quality control results are discussed below, but no data were qualified.

Appendix A presents data validation criteria tables for organic compound analysis. QC requirements that were met without exception are not discussed below. QC requirements that required further evaluation and had exceptions to the validation criteria are discussed below.

6.2.1 Laboratory Control Sample and Laboratory Control Sample Duplicate

SDG 1108001-Soil

For SDG 1108001, no LCSD was performed for the USEPA Method 8082 analysis to help assess the precision on the soil samples analyzed. Additionally, no MS/MSD was performed by the laboratory to help access the precision for this method. It is with professional judgment that no results be qualified based on the lack of precision data for this analysis of this media.

6.3 OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the surrogate, LCS, and LCSD (for water) percent recovery values. Precision was acceptable, as demonstrated by the LCS/LCSD RPDs, when performed.

All data, as reported by the laboratory, are acceptable for use.

7.0 Data Validation Report
Metals by USEPA Method 6020B

This report documents the review of analytical data from the analyses of soil and groundwater samples, and the associated laboratory QC samples. Samples were analyzed by ALS. Compliance Screening (Level I) was performed on all analytical results by Chell Black as the primary data reviewer, and secondary review was performed by Erin Breckel.

7.1 DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

7.2 TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

QC Requirements

	Cooler temperature and preservation		Target analyte list
	Extraction and analysis holding times		Field duplicates
	Blank contamination		Reporting limits and reported results
	LCS and LCSD	1	MS and MSD (for water samples)

Notes

1 Quality control results are discussed below, but no data were qualified.

Appendix A presents data validation criteria tables for organic compound analysis. QC requirements that were met without exception are not discussed below. QC requirements that required further evaluation and had exceptions to the validation criteria are discussed below.

7.2.1 Matrix Spike and Matrix Spike Duplicate

SDG 1108001-Water

The MS/MSD recoveries for four analytes (Chromium, Copper, Lead, and Zinc) were outside specifications. Per USEPA Guidelines, spike recovery limits do not apply when the sample concentration exceeds the spike concentration by a factor of four or greater. For all four analytes the original sample concentration was greater than four times the spike concentration: Chromium 25 mg/kg, spike 3.9 mg/kg; Copper 44 mg/kg, spike 7.9 mg/kg; Lead 47 mg/kg, spike 3 mg/kg; and Zinc 64 mg/kg, spike 3.9 mg/kg). In this situation the data shall be reported unflagged even if the percent recovery does not meet the acceptance criteria. Therefore no data is qualified based on the MS/MSD recoveries for these four analytes.

7.3 OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by LCS, LCSD, MS, and MSD percent recovery values. Precision was acceptable, as demonstrated by the LCS/LCSD RPDs and the MS/MSD RPDs.

All data, as reported by the lab, are acceptable for use.

8.0 Data Validation Report
Mercury by USEPA Methods 7470/7471

This report documents the review of analytical data from the analyses of soil and groundwater samples, and the associated laboratory QC samples. Samples were analyzed by ALS. Compliance Screening (Level I) was performed on all analytical results by Chell Black as the primary data reviewer, and secondary review was performed by Erin Breckel.

8.1 DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

8.2 TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

QC Requirements

Cooler temperature and preservation	Target analyte list
Extraction and analysis holding times	Field duplicates
Blank contamination	Reporting limits and reported results
LCS and LCSD	

All QC requirements were met without exception, and did not require further evaluation.

8.3 OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by LCS and LCSD percent recovery values. Precision was acceptable, as demonstrated by the LCS/LCSD RPDs.

All data, as reported by the lab, are acceptable for use.

9.0 Data Validation Report
TBT by KRONE 1988

This report documents the review of analytical data from the analyses of soil samples and the associated laboratory QC samples. Samples were analyzed by ALS. A summary review was performed on all analytical results by Chell Black as the primary data reviewer, and secondary review was performed by Erin Breckel.

9.1 DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

9.2 TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

QC Requirements

Cooler temperature and preservation	Surrogate recoveries
Extraction and analysis holding times	LCS
Blank contamination	Reporting limits and reported results

All QC requirements were met without exception, and did not require further evaluation.

9.3 OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by LCS percent recovery values. No information was provided by the laboratory to evaluate precision. It is with professional judgment that all data, as reported by the lab, be considered acceptable for use even though precision could not be evaluated.

10.0 Data Validation Report
Total Solids by USEPA 160.3

This report documents the review of analytical data from the analyses of soil samples and the associated laboratory QC samples. Samples were analyzed by ALS. A summary review was performed on all analytical results by Chell Black as the primary data reviewer, and secondary review was performed by Erin Breckel.

10.1 DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

10.2 TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

QC Requirements

Cooler temperature and preservation	Reporting limits and reported results
Extraction and analysis holding times	

All QC requirements were met without exception, and did not require further evaluation.

10.3 OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy and precision could not be evaluated due to lack of LCS or RPD information. It is with professional judgment that all data, as reported by the lab, be considered acceptable for use even though accuracy and precision could not be evaluated.

11.0 Data Validation Report
Total Organic Carbon by PLUMB 1981

This report documents the review of analytical data from the analyses of soil samples and the associated laboratory QC samples. Samples were analyzed by ALS. A summary review was performed on all analytical results by Chell Black as the primary data reviewer, and secondary review was performed by Erin Breckel.

11.1 DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

11.2 TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

QC Requirements

Cooler temperature and preservation	Reporting limits and reported results
Extraction and analysis holding times	

All QC requirements were met without exception, and did not require further evaluation.

11.3 OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy and precision could not be evaluated due to lack of LCS or RPD information. It is with professional judgment that all data, as reported by the lab, be considered acceptable for use even though accuracy and precision could not be evaluated.

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RI/FS Round 2 Sampling Event

Tables

Table 1
Project Sample Index

SDG	Sample ID	Lab Sample ID	Matrix	TPH by NWTPH-Dx	TPH by NWTPH-Gx	VOCs by 8260	SVOCs by 8270	PCBs by 8082	Total Metals by 6020B/7471	Dissolved Metals by 6020B/7470	TBT by KRONE 1988	Total Solids by 160.3	TOC by PLUMB 1981
1108001	SG4-072811	1108001-01	Soil	X			X	X	X		X	X	X
1108001	SG3-072811	1108001-02	Soil						X				
1108001	SG2A-072811	1108001-03	Soil						X				
1108001	SG1-072811	1108001-04	Soil	X			X	X	X		X	X	X
1108001	Rinsate-1	1108001-05	QC Water				X	X					
1108001	MW6-GW-072911	1108001-06	Water	X	X	X	X	X		X			
1108001	MW7-GW-072911	1108001-07	Water	X	X	X	X	X		X			
1108001	MW4-GW-072911	1108001-08	Water	X	X	X	X	X		X			
1108001	MW8-GW-072911	1108001-09	Water	X	X	X	X	X		X			
1108001	MW5-GW-072911	1108001-10	Water	X	X	X	X	X		X			
1108001	MW16B-GW-072911	1108001-11	Water	X	X	X	X	X		X			
1108001	MW2A-GW-072911	1108001-12	Water	X	X	X	X	X		X			
1108001	MW1-GW-072911	1108001-13	Water	X	X	X	X	X		X			
1108001	MW9-GW-072911	1108001-14	Water	X	X	X	X	X		X			
1108001	TB-072911	1108001-15	QC Water			X							

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Appendix A
Data Qualifier Definitions and Criteria Tables

DATA VALIDATION QUALIFIER CODES
National Functional Guidelines

The following definitions provide brief explanations of the qualifiers assigned to results in the data review process.

U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a “tentative identification”.
NJ	The analysis indicates the presence of an analyte that has been “tentatively identified” and the associated numerical value represents the approximate concentration.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

The following is a Floyd|Snider qualifier that may also be assigned during the data review process:

DNR	Do not report; a more appropriate result is reported from another analysis or dilution.

Floyd|Snider Validation Guidelines for Total Petroleum Hydrocarbons-Diesel & Residual Range and Gasoline Range
(Based on USEPA National Functional Guidelines as applied to criteria in NWTPH-Dx and NWTPH-Gx, June 1997, Ecology & Oregon DEQ)

Validation QC Element	Acceptance Criteria	Action
Cooler Temperature & Preservation	4°C± 2°C Water: HCl to pH < 2	J/UJ if greater than 6 deg. C
Holding Time	Ext. Waters: 14 days preserved 7 days unpreserved Ext. Solids: 14 Days Analysis: 40 days from extraction	J/UJ if hold times exceeded J/R if exceeded > 3X (Floyd|Snider PJ)
Initial Calibration	5 calibration points (All within 15% of true value) Linear Regression: R2 >0.990 If used, RSD of response factors <20%	Narrate if fewer than 5 calibration levels or if %R >15% J/UJ if R2 <0.990 J/UJ if %RSD > 20%
Mid-range Calibration Check Std.	Analyzed before and after each analysis shift & every 20 samples. Recovery range 85% to 115%	Narrate if frequency not met. J/UJ if %R < 85% J if %R >115%
Method Blank	At least one per batch (<10 samples) Method Blank No results >RL	U (at the RL) if sample result is < RL & < 5X blank result.
		U (at reported sample value) if sample result is > RL and < 5X blank result
Field Blanks (if required by project)	No results > RL	Action is same as method blank for positive results remaining in the field blank after method blank qualifiers are assigned.
MS samples (accuracy) (if required by project)	%R within lab control limits	Qualify parent only, unless other QC indicates systematic problems. J if both %R > upper control limit (UCL) J/UJ(-) if both %R < lower control limit (LCL) No action if parent conc. >5X the amount spiked. Use PJ if only one %R outlier
Precision: MS/MSD or LCS/LCSD or sample/dup	At least one set per batch (<10 samples) RPD < lab control limit	J if RPD > lab control limits

Validation QC Element	**Acceptance Criteria**	**Action**
LCS (not required by method)	%R within lab control limits	J/UJ if %R < LCL J if %R > UCL J/R if any %R <10% (Floyd|Snider PJ)
Surrogates	2-fluorobiphenyl, p-terphenyl, o-terphenyl, and/or pentacosane added to all samples (inc. QC samples). %R = 50-150%	J/UJ if %R < LCL J if %R > UCL J/R if any %R <10% No action if 2 or more surrogates are used, and only one is outside control limits. (Floyd|Snider PJ)
Pattern Identification	Compare sample chromatogram to standard chromatogram to ensure range and pattern are reasonable match. Laboratory may flag results which have poor match.	J
Field Duplicates	Use project control limits, if stated in QAPP Floyd|Snider default: water: RPD < 35% solids: RPD < 50%	Narrate (Floyd|Snider PJ to qualify)
Two analyses for one sample (dilution)	Report only one result per analyte	"DNR" (or client requested qualifier) all results that should not be reported

Abbreviation:

PJ Professional judgment

Floyd|Snider Validation Guidelines for Volatile Analysis by GC/MS
(Based on Organic NFG 1999)

Validation QC Element	Acceptance Criteria	Action
Cooler Temperature	4°C±2°C Water: HCl to pH < 2	J/UJ if greater than 6 deg. C (Floyd|Snider PJ)
Hold Time	Waters: 14 days preserved 7 Days: unpreserved (for aromatics) Solids: 14 Days	J/UJ if hold times exceeded If exceeded by > 3X HT: J/R (Floyd|Snider PJ)
Tuning	BFB Beginning of each 12 hour period Method acceptance criteria	R all analytes in all samples associated with the tune
Initial Calibration (Minimum 5 stds.)	RRF > 0.05	(Floyd|Snider PJ) If MDL= reporting limit: J/R if RRF < 0.05 If reporting limit > MDL: note in worksheet if RRF <0.05
	%RSD < 30%	(Floyd|Snider PJ) J if %RSD > 30%
Continuing Calibration (Prior to each 12 hr. shift)	RRF > 0.05	(Floyd|Snider PJ) If MDL= reporting limit: J/R if RRF < 0.05 If reporting limit > MDL: note in worksheet if RRF <0.05
	%D <25%	(Floyd|Snider PJ) If > +/-90%: J/RIf -90% to -26%: J (high bias) If 26% to 90%: J/UJ (low bias)
Method Blank	One per matrix per batch No results > CRQL	U if sample result is less than CRQL and less than appropriate 5X or 10X rule (raise sample value to CRQL)
		U if sample result is greater than or equal to CRQL and less than appropriate 5X and 10X rule (at reported sample value)
	No TICs present	R TICs using 10X rule
Storage Blank	One per SDG <CRQL	U the specific analyte(s) results in all assoc. samples using the 5x or 10x rule

Validation QC Element	**Acceptance Criteria**	**Action**
Trip Blank	Frequency as per project QAPP	Same as method blank for positive results remaining in trip blank after method blank qualifiers are assigned
Field Blanks (if required in QAPP)	No results > CRQL	Apply 5X/10X rule; U < action level
MS/MSD (recovery)	One per matrix per batch Use method acceptance criteria	Qualify parent only unless other QC indicates systematic problems: J if both %R > UCL J/UJ if both %R < LCL J/R if both %R < 10% PJ if only one %R outlier
MS/MSD (RPD)	One per matrix per batch Use method acceptance criteria	J in parent sample if RPD > CL
LCS *low conc. H2O VOA*	One per lab batch Within method control limits	J assoc. cmpd if > UCL J/R assoc. cmpd if < LCL J/R all cmpds if half are < LCL
LCS *regular VOA (H2O & solid)*	One per lab batch Lab or method control limits	J if %R > UCL J/UJ if %R <LCL J/R if %R < 10% (Floyd|Snider PJ)
LCS/LCSD *(if required)*	One set per matrix and batch of 20 samples RPD < 35%	J/UJ assoc. cmpd. in all samples
Surrogates	Added to all samples Within method control limits	J if %R >UCL J/UJ if %R <LCL but >10% J/R if <10%
Internal Standard (IS)	Added to all samples Acceptable Range: IS area 50% to 200% of CCAL area RT within 30 seconds of CC RT	J if > 200% J/UJ if < 50% J/R if < 25% RT>30 seconds, narrate and Notify PM
Field Duplicates	Use QAPP limits. If no QAPP: Solids: RPD <50% OR absolute diff. < 2X RL (for results < 5X RL) Aqueous: RPD <35% OR absolute diff. < 1X RL (for results < 5X RL)	Narrate and qualify if required by project (Floyd|Snider PJ)
TICs	Major ions (>10%) in reference must be present in sample; intensities agree within 20%; check identification	NJ the TIC unless: R common laboratory contaminants See Technical Director for ID issues

Validation QC Element	Acceptance Criteria	Action
Quantitation/ Identification	RRT within 0.06 of standard RRT Ion relative intensity within 20% of standard All ions in std. at > 10% intensity must be present in sample	See Technical Director if outliers

Notes:

PJ[1] No action if there are 4+ surrogates and only 1 outlier

Floyd|Snider Validation Guidelines for Semivolatile Analysis by GC/MS (Based on Organic NFG 1999)

Validation QC Element	Acceptance Criteria	Action
Cooler Temperature	4°C ± 2°	J/UJ if greater than 6 deg. C (Floyd|Snider PJ)
Holding Time	Water: 7 days from collection Soil: 14 days from collection Analysis: 40 days from extraction	Water: J/UJ if ext. > 7 and < 21 days J/R if ext > 21 days (Floyd|Snider PJ) Solids/Wastes: J/UJ if ext. > 14 and < 42 days J/R if ext. > 42 days (Floyd|Snider PJ) J/UJ if analysis >40 days
Tuning	DFTPP Beginning of each 12 hour period Method acceptance criteria	R all analytes in all samples associated with the tune
Initial Calibration (Minimum 5 stds.)	RRF > 0.05	(Floyd|Snider PJ) If MDL= reporting limit: J/R if RRF < 0.05 If reporting limit > MDL: note in worksheet if RRF <0.05
	%RSD < 30%	(Floyd|Snider PJ) J if %RSD > 30%
Continuing Calibration (Prior to each 12 hr. shift)	RRF > 0.05	(Floyd|Snider PJ) If MDL= reporting limit: J/R if RRF < 0.05 If reporting limit > MDL: note in worksheet if RRF < 0.05
	%D <25%	(Floyd|Snider PJ) If > +/-90%: J/RIf -90% to -26%: J (high bias) If 26% to 90%: J/UJ (low bias)
Method Blank	One per matrix per batch No results > CRQL	U if sample result is less than CRQL and less than appropriate 5X or 10X rule (raise sample value to CRQL)
		U if sample result is greater than or equal to CRQL and less than appropriate 5X and 10X rule (at reported sample value)

Validation QC Element	**Acceptance Criteria**	**Action**
Method Blank (continued)	No TICs present	RTICs using 10X rule
Field Blanks (Not Required)	No results > CRQL	Apply 5X/10X rule; U < action level
MS/MSD (recovery)	One per matrix per batch Use method acceptance criteria	Qualify parent only unless other QC indicates systematic problems: J if both %R > UCL J/UJ if both %R < LCL J/R if both %R < 10% Floyd|Snider PJ if only one %R outlier
MS/MSD (RPD)	One per matrix per batch Use method acceptance criteria	J in parent sample if RPD > CL
LCS CLP **low conc. H2O only**	One per lab batch Within method control limits	J assoc. cmpd if > UCL J/R assoc. cmpd if < LCL J/R all cmpds if half are < LCL
LCS **regular SVOA (H2O & solid)**	One per lab batch Lab or method control limits	J if %R > UCL J/UJ if %R <LCL J /R if %R < 10% (Floyd|Snider PJ)
LCS/LCSD *(if required)*	One set per matrix and batch of 20 samples RPD < 35%	J/UJ associated compounds in all samples
Surrogates	Minimum of 3 acid and 3 base/neutral compounds Use method acceptance criteria	Do not qualify if only 1 acid and/or 1 B/N surrogate is out unless <10% J if %R > UCL J/UJ if %R < LCL J/R if %R < 10%
Internal Standards	Added to all samples Acceptable Range: IS area 50% to 200% of CCAL area RT within 30 seconds of CC RT	J if > 200% J/UJ if < 50% J/R if < 25% RT>30 seconds, narrate and Notify PM
Field Duplicates	Use QAPP limits. If no QAPP: Solids: RPD <50% OR absolute diff. < 2X RL (for results < 5X RL) Aqueous: RPD <35% OR absolute diff. < 1X RL (for results < 5X RL)	Narrate and qualify if required by project (Floyd|Snider PJ)

Validation QC Element	**Acceptance Criteria**	**Action**
TICs	Major ions (>10%) in reference must be present in sample; intensities agree within 20%; check identification	NJ the TIC unless: R common laboratory contaminants See Technical Director for ID issues
Quantitation/ Identification	RRT within 0.06 of standard RRT Ion relative intensity within 20% of standard All ions in std. at > 10% intensity must be present in sample	See Technical Director if outliers

Abbreviation:

PJ	Professional judgment

Floyd|Snider Validation Guidelines for Metals Analysis by ICP-MS (Based on Inorganic NFG 1994 & 2004)

Validation QC Element	Acceptance Criteria	Action
Cooler Temperature and Preservation	Cooler temperature: 4°C ±2° Waters: Nitric Acid to pH < 2 For Dissolved Metals: 0.45um filter & preserve after filtration	Floyd|Snider Professional Judgment—no qualification based on cooler temperature outliers J/UJ if pH preservation requirements are not met
Holding Time	180 days from date sampled Frozen tissues—HT extended to 2 years	J/UJ if holding time exceeded
Tune	Prior to ICAL monitoring compounds analyzed 5 times wih Std Dev. < 5% mass calibration <0.1 amu from True Value Resolution < 0.9 AMU @ 10% peak height or <0.75 amu @ 5% peak height	Use Professional Judgment to evaluate tune J/UJ if tune criteria not met
Initial Calibration	Blank + minimum 1 standard If more than 1 standard, r>0.995	J/UJ if r<0.995 (for multi point cal)
Initial Calibration Verification (ICV)	Independent source analyzed immediately after calibration %R within ±10% of true value	J/UJ if %R 75–89% J if %R = 111-125% R if %R > 125% R if %R < 75%
Continuing Calibration Verification (CCV)	Every ten samples, immediately following ICV/ICB and at end of run ±10% of true value	J/UJ if %R = 75–89% J if %R 111-125% R if %R > 125% R if %R < 75%

Initial and Continuing Calibration Blanks (ICB/CCB)	After each ICV and CCV
	every ten samples and end of run
	| blank | < IDL (MDL)
		Action level is 5x absolute value of blank conc.
		For (+)blanks, U results < action level
		For (-) blanks, J/UJ results < action level

Validation QC Element	**Acceptance Criteria**	**Action**
Reporting Limit Standard (CRI)	2x RL analyzed beginning of run Not required for Al, Ba, Ca, Fe, Mg, Na, K %R = 70%-130% (50%-150% Co,Mn, Zn)	R, < 2x RL if %R < 50% (< 30% Co,Mn, Zn) J < 2x RL, UJ if %R 50-69% (30%-49% Co,Mn, Zn) J < 2x RL if %R 130%-180% (150%-200% Co,Mn, Zn) R < 2x RL if %R > 180% (200% Co, Mn, Zn)
Interference Check Samples (ICSA/ICSAB)	Required by SW 6020, but not 200.8 ICSAB %R 80% - 120% for all spiked elements | ICSA | < IDL (MDL) for all unspiked elements	For samples with Al, Ca, Fe, or Mg > ICS levels R if %R < 50% J if %R >120% J/UJ if %R = 50% to 79% Use Professional Judgment for ICSA to determine if bias is present
Method Blank	One per matrix per batch (batch not to exceed 20 samples) blank < MDL	Action level is 5x blank concentration U results < action level
Laboratory Control Sample (LCS)	One per matrix per batch Blank Spike: %R within 80%-120%	R if %R < 50% J/UJ if %R = 50-79% J if %R >120%
	CRM: Result within manufacturer's certified acceptance range or project guidelines	J/UJ if < LCL, J if > UCL
Matrix Spike/ Matrix Spike Duplicate (MS/MSD)	One per matrix per batch 75-125% for samples where results do not exceed 4x spike level	J if %R>125% J/UJ if %R <75% J/R if %R<30% or J/UJ if Post Spike %R 75%-125% Qualify all samples in batch
Post-digestion Spike	If Matrix Spike is outside 75-125%, Spike parent sample at 2x the sample conc.	No qualifiers assigned based on this element
Laboratory Duplicate (or MS/MSD)	One per matrix per batch RPD < 20% for samples > 5x RL Diff < RL for samples > RL and < 5 x RL (Diff < 2x RL for solids)	J/UJ if RPD > 20% or diff > RL All samples in batch
Serial Dilution	5x dilution one per matrix %D < 10% for original sample values > 50x MDL	J/UJ if %D >10% All samples in batch

Validation QC Element	**Acceptance Criteria**	**Action**
Internal Standards	Every sample SW6020: 60%-125% of cal blank IS 200.8: 30%-120% of cal blank IS	J /UJ all analytes associated with IS outlier
Field Blank	Blank < MDL	Action level is 5x blank conc. U sample values < AL in associated field samples only
Field Duplicate	For results > 5x RL: Water: RPD < 35% Solid: RPD < 50% For results < 5 x RL: Water: Diff < RL Solid: Diff < 2x RL	J/UJ in parent samples only
Linear Range	Sample concentrations must fall within range	J values over range

Port of Bellingham
Harris Avenue Shipyards

Data Validation Report
RI/FS Round 2 Sampling Event

Appendix B
Qualified Data Summary Table

Qualified Data Summary Table
Harris Avenue Shipyard RI/FS Round 2 Sampling Event

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier
1108001	MW1-GW-072911	1108001-13	NWTPH-Gx	TPH – Gasoline Range	770	µg/L		J
1108001	MW9-GW-072911	1108001-14	NWTPH-Gx	TPH – Gasoline Range	450	µg/L		J

Qualifiers:

J The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.