Draft Work Plan
Remedial Investigation/Feasibility Study
North Marina Ameron/Hulbert Site
Everett, WA

May 28, 2010

Prepared for

Port of Everett, Washington

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LIST OF ABBREVIATIONS AND ACRONYMS

AO	Agreed Order
ARARs	Applicable or Relevant and Appropriate Requirements
AST	Aboveground Storage Tank
BE	Biological Evaluation
BEHP	Bis(2-ethylhexyl)phthalate
BGS	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CCP	Contamination Contingency Plan
CLARC	Cleanup Levels and Risk Calculations
COCs	Constituents of Concern
Cm	Centimeter
cPAH	Carcinogenic Polycyclic Aromatic Hydrocarbons
CSL	Cleanup Screening Level
CUL	Cleanup Level
DAHP	Department of Archaeology and Historic Preservation
DCA	Disproportionate Cost Analysis
DGI	Data Gaps Investigation
DO	Dissolved Oxygen
ECI	Earth Consultants Inc.
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ESA	Environmental Site Assessment
FS	Feasibility Study
HCID	Hydrocarbon Identification
IHS	Indicator Hazardous Substances
ISGP	Industrial Stormwater General Permit
MDL	Method Detection Limit
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
MLLW	Mean Lower Low Water
MSRC	Marine Spill Response Corporation
MTCA	Model Toxics Control Act
NDPES	National Pollutant Discharge Elimination System
ORP	Oxidation Reduction Potential
OSHA	Occupational Safety and Health Act
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PCL	Preliminary Cleanup Level
PID	Photoionization Detector
PLPs	Potentially Liable Parties
Port	Port of Everett
ppm	Parts per Million
PQL	Practical Quantitation Limits
PSI	Puget Sound Initiative
PSDDA	Puget Sound Dredged Disposal Analysis
QA/QC	Quality Assurance/Quality Control
RI	Remedial Investigation
RAO	Remedial Action Objective
SAP	Sampling and Analysis Plan
SIM	Selected Ion Method
Site	North Marina Ameron/Hulbert Site

SMS	Sediment Management Standard
SQS	Sediment Quality Standard
SVOCs	Semivolatile Organic Compounds
TBT	Tributyl Tin
TDS	Total Dissolved Solids
TEF	Toxicity Equivalency Factors
TEQ	Toxicity Equivalency Quotient
TOC	Total Organic Compound
TPH	Total Petroleum Hydrocarbon
1,1,1-TCA	1,1,1-Trichloroethane
TSCA	Toxics Substance Control Act
UST	Underground Storage Tank
VCP	Voluntary Cleanup Program
VOCs	Volatile Organic Compounds
WAC	Washington Administrative Code
WISHA	Washington Industrial Safety and Health Act
Yd^3	Cubic Yards

1.0 INTRODUCTION

This document presents a work plan to conduct a Remedial Investigation and Feasibility Study (RI/FS) for the Port of Everett (Port) North Marina Ameron / Hulbert Site (Site), located within the Port North Marina Redevelopment project boundary in Everett, Snohomish County, Washington (Figure 1). This report is the second submittal required under Agreed Order DE 6677 (AO) between the Port, Ameron International and the Hulberts [the potentially liable parties (PLPs)], and the Washington Department of Ecology (Ecology). A final Interim Action Report was submitted to Ecology on April 7, 2010 (Landau Associates 2010). The Interim Action Report describes extensive site investigations and interim actions that have been completed in portions of the Site. The purpose of the RI/FS is to fill remaining data gaps, which is necessary to evaluate the nature and extent of contamination at the Site, and to develop and evaluate remedial action alternatives for final Site cleanup.

The Site is owned by the Port and is part of a larger area, referred to as the North Marina Area (Figure 2), which is being redeveloped into a mixed use development by the Port. Previous investigations of the Site and interim cleanup actions have been conducted under the Ecology's Voluntary Cleanup Program (VCP). However, Ecology requested that the remaining remedial actions for the Site be conducted under Ecology's formal program as part of the Puget Sound Initiative (PSI). As a result, the RI/FS will be performed under the AO.

This work plan was prepared for submittal to Ecology in accordance with the provisions of the AO, and was developed to meet the requirements of an RI/FS as defined by the Washington Model Toxics Control Act (MTCA) Cleanup Regulation [Washington Administrative Code (WAC) 173-340-350]. This work plan describes the RI activities to be performed, the FS activities to be performed, and the planned schedule and reporting. Appendices to this work plan consist of a list of reports documenting previous environmental investigations and interim actions conducted at the Site and brief descriptions of previous investigations and data tables and figures summarizing the results of previous investigations (Appendix A); a Historical Site Development Analysis Report (Appendix B); exploration logs from previous investigations (Appendix C); a completed terrestrial ecological exclusion form (Appendix D); a project Health and Safety Plan (Appendix E); an Upland Investigation Sampling and Analysis Plan (SAP) (Appendix F); and a Sediment Investigation SAP (Appendix G).

2.0 BACKGROUND

The Site was formerly part of the North Marina Redevelopment site, for which cleanup was being conducted under Ecology's VCP (VCP No. 1249). As a result of Ecology's request that cleanup for the North Marina Redevelopment project be conducted as part of the PSI, the North Marina Redevelopment site was removed from the VCP on November 14, 2007 and the former site was subdivided into six separate sites. This Site is one of three sites that are being addressed under formal agreements with Ecology as part of the PSI. The other three sites within the former North Marina Redevelopment site are being addressed under the VCP. The former North Marina Redevelopment site will be referred to as the North Marina Area in this document. The Site is located within the northern portion of the North Marina Area, as shown on Figure 2. The preliminary Site boundary is shown on Figure 2 and on all other Figures in this work plan. The final Site boundary will be determined based on the results of the RI for the Site. Based on the preliminary Site boundary, the Site consists of approximately 30 acres, including about 18 acres of uplands and 12 acres of adjacent in-water area, as shown on Figure 2. As a point of reference, the Manufacturing Building on the current Ameron leasehold is located at North 48.00258º and West 122.21543º.

The remainder of this section describes the Site development history, historical operations and site uses, current redevelopment plans for the Site, and the Site's environmental setting. Historical and current Site features are shown on Figures 3 and 4, respectively. Area designations used during previous Landau Associates environmental investigations (G, I, J, and M) are shown on the report figures and used in the discussion of Site features to assist the reader in locating the referenced features.

2.1 SITE DEVELOPMENT HISTORY

This section describes the Site development history including a discussion of the filling history, the paving sequence, and a description of the recent redevelopment at the Site. Information from this section was developed based on previous investigation reports, a recently conducted Historical Site Development Analysis (Historical Report; Pinnacle GeoSciences 2010), Site reconnaissance completed in February 2010, and interviews with the following individuals:

- Paul Vannini, Plant Manager, Ameron International (Vannini, P., 2010, personal communication)
- Ken Gerry, Production Supervisor, Ameron International (Gerry, K., 2010, personal communication)
- Steve Wetzel, Sales Manager, Dunlap Industrial Hardware (Wetzel, S., 2010, personal communication)
- Jim Weber, Maintenance Foreman, Port of Everett (Weber, J., 2010 personal communication)

- Rick Adams, Maintenance Lead, Port of Everett (Adams, R., 2010, personal communication)
- William Hulbert III (Hulbert, B., 2010, personal communication)
- Jim Schack, former president Oldcastle Precast, current president Norton Industries (Schack, J., 2010, personal communications)
- Don Heirman, Churchill Brother Marine Canvas (Heirman, D., 2010, personal communication)
- Brandy Stoutenburg, Central Collision Inc. (Stoutenburg, B., 2010, personal communication)
- Dean Shaughnessey, former Marina Operations Manager, Port of Everett (Shaughnessey, D., 2010, personal communication).

2.1.1 SITE FILLING HISTORY

The Site filling history is provided in the recently completed Historical Report (Appendix B), which should be reviewed for a more detailed discussion of the Site filling history. The entire Site is constructed on former tidelands. Historical information indicates that the original high water line was located just west of the railroad tracks currently located on the eastern side of West Marine View Drive. The first saw milling operations on the Site reportedly started when Fred K. Baker purchased a portion of the Site in 1913. A shingle mill operated by the Fred K. Baker Lumber Company is shown on the Site in Sanborn maps from 1914. At that time, the entire mill was constructed on piles over Port Gardner. Based on historical information, the Site was filled in a sequence of large scale events, as shown on Figure 5, and described by Pinnacle GeoSciences (2010):

- Between the mid-1930s and approximately 1941, fill from an unknown source was placed westward beginning at the rail alignment east of West Marine View Drive and extending west approximately 330 ft to approximately the east wall of the Collins Building. This filling event affected the eastern portions of Area G and Area M. Aerial photographs suggest that the upper 4 ft of fill was placed after 1947 and consisted of non-dredge fill, which is consistent with a log from a soil boring advanced in this area by ECI (ECI 1992; Appendix C).
- In 1947, a sheetpile wall was constructed to form the fill area south of the mill, including primarily the North Marina peninsula and portions of the southern Site area. It is believed the sheetpile wall enclosed a planned dredge fill that was completed by 1953. The wall enclosed an area measuring approximately 40 acres in the southern portion of Area G, the remainder of Area M, and the majority of the southern portion of Area J to the west side of the Collins Building. Photographs and the nature of dredge fills suggest that the filling elevation was likely 3 ft to 5 ft lower than the Collins Building and several feet lower than the 13th Street grade elevation.
- Non-dredge soil filling also occurred on the site between 1947 and 1953. By 1953, an area immediately west of the Collins Building, comprising small portions of Areas M and G and most of Area J, appeared to be graded differently than other parts of the 1947 to 1953 dredge fill suggesting other "structural filling" of this area. Soil boring logs from this area indicate

non-dredge fill to a depth of 2 ft to 5 ft below ground surface (BGS) and underlain by dredge fill.

- By 1961, most of Area G was filled, although the source of the fill has not been determined. It is not clear if the fill was hydraulically placed below the mill structures or if the fill was placed after the mill structures were removed. The lumber docks, lumber sheds, planing mills, and a portion of the kilns associated with the mill were destroyed in a fire in 1956 and the remaining structures were removed by 1965. Between 1956 and 1961, a bulkhead was placed along the northern boundary of Area G extending west across the eastern third of Area I, and along the western boundary of the former lumber docks. Exploration logs from the 1956 to 1961 fill area indicate non-dredge fill to a depth of approximately 11 ft BGS, underlain by dredge fill. Localized areas of wood and concrete debris were reported within the non-dredge fill unit.
- In 1973, another dredge fill occurred over most of Area I and small portions of Areas G and J in conjunction with construction of the 12th Street Channel. A shore dike was constructed from soil excavated at the north end, and "imported quarry waste" at the south end. A berm was present along the approximate eastern boundary of Area I and extending onto Area G at the north end. The berm is visible in aerial photographs until 1981, at which time only a small remnant remains in the northwest corner of Area G. The source of fill used to construct the berm is not known. The dredge fill was found beneath a layer of non-dredge fill at depths of 1.5 ft to 5 ft BGS in Area I to a depth of at least 16 ft BGS (the maximum depth explored).
- Aerial photographs from 1980 indicate active grading and filling in Areas I and J. Photographs from 1980 indicate filling in the northern portion of Area G with what appears to be concrete debris.
- Aerial photographs from 1982 indicate that Area I had been graded flat to approximately the same grade as Areas J and approximately 2 ft higher than the paved portions of Area G. Only a small portion of the eastern berm is visible at the north end of Area G.
- Filling was conducted in Area J prior to construction of the former Marine Spill Response Corporation (MSRC) building, which was completed in 1994.

2.1.2 PAVING SEQUENCE

The sequence of paving at the Site was documented in the Historical Report (Pinnacle GeoSciences 2010) and is summarized on Figures 6 and 7. The paving sequence at the Site is generally described as follows:

- The Site was unpaved prior to approximately 1956. Between 1956 and 1961, pavement was added to an area in the southern portion of the Site including the east central portion of Area J, the southern end of Area G, and the southwestern portion of Area M.
- Between 1961 and 1974, much of Area G was paved or covered by buildings, with the exception of the areas to the north, west, and directly south of the manufacturing building, and the southeastern corner of Area G. Also during this timeframe, pavement was placed to the west of the Collins Building and to the east of the currently existing buildings in the southeastern corner of Area M.

- Between 1974 and 1979, areas directly north and west of the main manufacturing building in Area G were paved; although the pavement did not extend to the northern or the western boundary of Area G.
- In approximately 1980, the area on all sides of the northern building on Area M was paved. The paving likely corresponded to the construction of the building.
- Most of the area to the south of the manufacturing building on Area G was paved between 1980 and 1982. In addition, it is believed the stormwater system running along the northern boundary of Area G was installed and paved over during this time period.
- Between 1982 and 1990, the remaining area in the southernmost portion of Area G was paved, as well as areas to the north and east of the Collins Building and a small area in the southwestern corner of Area M.
- Between 1991 and 1993, the area to the south of the Collins Building was paved.
- Between 1993 and 1995, the area surrounding the former MSRC building in Area J was paved.
- Area I and portions of Areas J and M were paved in conjunction with the recent redevelopment by the Port as described below.

2.1.3 PORT REDEVELOPMENT

The western portion of the Site is currently being redeveloped by the Port into its Craftsman District to support marine-based businesses and recreational boaters. Recently developed facilities at the Site include the Bayside Marine dry stack storage and marine retail business in the northwest corner, a new Port Marine Operations Center in the west-center area, and a new travel lift in the southwest corner of the Site. Additionally, the former MSRC building constructed in 1993 in the southwest portion of the Site is currently being redeveloped into the Waterfront Center, which will accommodate new Port offices and small business bays for marine services providers. With the exception of the Waterfront Center construction area, the upland portions of the Site lying west of the Collins Building and west of the western boundary of the Ameron leasehold have been paved with asphalt as part of the Craftsman District development. Figure 4 shows current upland Site features.

In addition to uplands redevelopment, the aquatic portion of the Site (the northern two-thirds of the 12th Street Channel) was redeveloped in 2005/2006 into the 12th Street Yacht Basin. Development of the Yacht Basin included dredging Site aquatic lands to about elevation -16 ft mean lower low water (MLLW) to create the necessary draft for its new use as a marina. A riparian area and intertidal habitat bench was created along the north shoreline of the Yacht Basin as compensation for the marina development-related impacts, as shown on Figure 4. The mitigation area consists of about a 12-ft wide (plan view) strip of upland and intertidal habitat located between the pedestrian esplanade and the subtidal zone that was planted with native vegetation and is being monitored and maintained by the Port along the

entire north shore of the 12th Street Yacht Basin. Figure 4 shows current conditions for the aquatic portion of the Site, and Figure 3 shows the area over which Site sediment was dredged for construction of the yacht basin.

Current and historical Site uses are discussed in the following sections based on existing environmental reports for the Site and the Historical Report (Pinnacle GeoSciences 2010).

2.2 HISTORICAL OPERATIONS AND SITE USES

As previously indicated, the Site was first developed as a shingle mill in approximately 1914. The majority of the Site, including the existing mill, was purchased by the Hulbert Mill Company in 1923. As shown on Figure 8, historical information indicates that the Port has owned the eastern approximately 180 ft of the Site (eastern portion of Area M and a small portion in the southeastern corner of Area G) and approximately the southern 40 ft of Area I and western 100 ft of Area J since at least 1940 (Pinnacle GeoSciences 2010). The Hulberts sold their portion of the Site to the Port in March of 1991, and the Port has remained the owner of the Site since its purchase in 1991. Current and historic Site ownership is shown on Figure 8. It should be noted that the estimated Site boundary does not precisely coincide with the parcels described above.

The Hulbert Mill operated until the early 1960s, though several of the mill features were destroyed in a fire in 1956. The Hulberts leased various portions of the Site to a number of commercial and industrial entities beginning in the early 1970s until they sold the property to the Port in 1991. A number of parcels within the Site are leased (or have previously been leased) by the Hulberts and/or the Port to various tenants, as illustrated on Figure 8. In addition, portions of the Site are or have been subleased to various tenants. The current and former tenants have utilized the leaseholds for a variety of businesses, primarily related to marine repair; concrete products manufacturing; and other marine, commercial, and light industrial activities. In anticipation of redevelopment, starting in about 2004, the Port began relocating tenants within the North Marina Area, and not renewing leases as lease terms ended. Several businesses located in the southern portion of the Site vacated the premises and the buildings were demolished in 2006. The Ameron leasehold was modified in scope and extends to 2012.

This section identifies and describes the historical uses for properties and leaseholds located within the Site by investigation area. Historical uses of the Site are also summarized in Table 1. Former operations of the Hulbert Mill are presented in a separate section because mill operations occupied a large portion of the Site. The Site usage history is based on previous Phase I Environmental Site Assessments (ESAs; Landau Associates 2001 and Kleinfelder 1992), the Historical Report (Pinnacle GeoSciences 2010), and previously referenced interviews. These documents should be reviewed for a more thorough

description of Site historical uses and environmental conditions. The Historical Report was completed as part of preparation for this Work Plan and is included in Appendix B. In addition, reconnaissance of the current structures and associated operations was conducted in February 2010.

2.2.1 WILLIAM HULBERT MILL CO.

Based on Sanborn maps, a shingle mill was constructed on pilings over tidelands west of Marine View Drive in approximately 1914. The existing mill was purchased by the William Hulbert Mill Co. in 1923. Features/operations associated with the mill included a saw mill, shingle mill, lumber sheds and planing mills, an electrical plant, boiler house, blacksmith shop, refuse burner, water towers, steam dry kilns, and shipping sheds as shown on Figures 9 and 10. Refuse burners were typically used for burning wood debris associated with milling operations (e.g., sawdust, bark, and edgings) (Pinnacle GeoSciences 2010). Based on review of aerial photographs, bottom ash from the wood refuse burner may have been placed to the south and southwest of the burner (Pinnacle GeoSciences 2010).

The saw mill fire in 1956 destroyed the lumber docks, lumber sheds, planing mills, and part of the kiln. The mill ceased operations in the early 1960s and remaining mill structures were removed in approximately 1962, with the exception of the wood refuse burner, water tower, and boiler stack, which were removed by 1976 (Pinnacle GeoSciences 2010).

2.2.2 INVESTIGATION AREA G

Investigation Area G roughly consists of the area used as a concrete pole manufacturing facility since 1973. The pole manufacturing plant was originally developed by Centrecon for the purposes of making concrete utility poles. The facility began manufacturing decorative poles in 1976. In late 1988, Ameron purchased the manufacturing facility and Ameron has continued making decorative poles.

The manufacturing facility includes four buildings and one covered work area on the current leasehold: the manufacturing building, a laboratory and storage building, a pole polishing building, and a pole finishing and dry storage building (Figure 4). Along with the four buildings, there is a covered work area located over the loading and unloading area between the manufacturing building, pole polishing building, and pole finishing and dry storage area. Based on review of available records (including aerial photographs), the manufacturing building, lab/storage building, and pole polishing building were built in approximately 1972. The pole finishing/warehouse building was added in approximately 1985, and the covered area was added in the early 2000s. The following sections discuss operations in each of the Ameron buildings based on historical information and observations made during site reconnaissance conducted in February 2010.

2.2.2.1 Main Manufacturing Building

The concrete manufacturing building houses the main production facilities. The manufacturing process includes a wet process in the east portion of the building where aggregates are mixed and placed in molds and subsequently spun to compaction; and a dry process in the west portion of the building where the poles are released from the molds, and other molds formed. The basic manufacturing process consists of placing the batch concrete into steel molds and spinning the molds to force the concrete aggregate to the exterior of the pole, leaving a fine-grained particulate slurry in the center. The process waste slurry is drained from the mold to create a hollow concrete pole. The decorative poles are created in a number of colors, including grey, white, green, brown, and red. Materials involved in the manufacturing process in this building in addition to the cement and aggregate used to batch concrete, are coloring agents, plasticizer, corrosion inhibitors, and a mold release agent.

Within the building is a basin used in the construction of the long concrete poles produced at the facility. To provide the elevation needed to hold the long pole molds, the basin extends below the water table. Floor wash water is collected in the basin and pumped to concrete-lined settling ponds on the east side of the manufacturing building. After settling the solids, the wastewater is recycled or discharged to the sanitary sewer. Prior to 2007, mixed wastewater and groundwater collected in the basin and were pumped to the concrete-lined settling ponds. In 2007, the basin was reconfigured so that the groundwater is collected in a separate enclosed drainage system and pumped directly into the storm drain. Solids are removed from the settling basins using a front-end loader and placed in dewatering bins located to the east of the settling basins. Berms have been recently constructed to the north and south of the paved area between the settling basins, and dewatering bins and storm drains in this area have been enclosed to prevent wastewater from entering the storm drain system.

A chemical storage and waste accumulation area is located in the northwest corner of the building. Petroleum products are stored within a concrete bermed area. Good housekeeping practices were observed in this area at the time of the February 2010 site reconnaissance. A compressor room is located in the northwest corner of the building, south of the chemical storage area. A small release of petroleum was observed beneath the compressor. Absorbent material had been placed over the spill; however, a gap was observed in between the exterior west wall of the compressor room and the concrete floor, which could allow for spilled petroleum to be released to the exterior of the building. Spills were also observed in this area at the time of the 1991 Kleinfelder ESA.

A sandblasting room is located south of the compressor room. This area was enclosed in approximately 2006. Prior to 2006, sandblasting was conducted on the exterior of the building in this

area. Sandblast waste accumulation was observed in this area during a 1991 site inspection (Kleinfelder 1991) and is evident in aerial photographs beginning in 1977.

A drum storage area was previously observed outside the east side of the building. Soil staining was observed in this area during an earlier Site reconnaisance (Kleinfelder 1991). At the time of the 1992 ECI Phase 2 investigation, the drums had been removed and there were no signs of soil or pavement staining remaining. Ameron indicated that the stained soil (characterized as petroleum staining in the Phase 2 investigation) had been excavated and drummed for offsite disposal. Drum storage and/or petroleum staining were not observed in this area at the time of the February 2010 site reconnaissance.

2.2.2.2 Laboratory and Storage Building Area

This building is primarily used for mixing aggregate samples for customers. The interior of the building was not observed at the time of the February 2010 reconnaissance. A 12,000-gallon diesel underground storage tank (UST) was removed in 1988 from the west side of the storage/laboratory building. Following the tank removal, a soil and groundwater investigation was conducted by Sweet-Edwards/Emcon (PSM 1989). The results of the investigation indicated petroleum hydrocarbons were not detected in soil or groundwater at concentrations greater than the preliminary cleanup levels (PCLs). Three monitoring wells (one upgradient and two downgradient) installed for the 1989 Sweet-Edwards/Emcon investigation still exist on the site. During our site visit in 2010, a fuel pump was observed on the north wall of the northwest corner of the building. It was not determined whether the pump, and potentially associated piping, remains in its original operating location, or if the pump is merely stored at its current location. However, because previous groundwater sampling in the vicinity did not indicate petroleum contamination, it is unlikely that significant releases have been associated with the fuel pump or associated piping if it does remain in place.

In the 1980s, an unlined settling pond was located north of the laboratory building near the fence line west of the manufacturing building. The pond reportedly collected water, pumped through an underground pipe, from a settling basin adjacent to the pole-polishing building. The pond was created within an earth berm that extended approximately 4 ft above ground surface. The settling pond was closed some time between 1987 and 1989 based on aerial photo interpretation, although the manner in which it was decommissioned is unknown. In 1989, as part of Ameron's due diligence in purchase of the Centrecon facility, composite samples of the pond surface water and sediment were obtained and analyzed for the priority pollutant metals. The results indicated no exceedances of the metals preliminary screening levels (PSLs), with the exception of copper (at 10 µg/L) in the surface water sample.

In 2006, an interim action was conducted in the area where the settling pond was previously located (Area G-1). That excavation concluded with bringing the site soil down to, and slightly below,

grade levels in the adjacent paved area to the east (Landau Associates 2010). The interim action was not completed due to access issues. Impacted soil (arsenic, copper, and lead) remains at the base of the south end of Area G-1.

2.2.2.3 Pole Polishing Building

The pole polishing building is located west of the south end of the main manufacturing building. Poles are moved to this building from the main manufacturing building via rails. Various methods are used to expose aggregate in the poles to meet customer specifications. A shot blast operation is located at the south end of the building and grinding is performed in the northern end of the building. Shot blast waste was observed on the exterior east side of this building during the February 2010 reconnaissance. This material is collected and reused. Air pollution equipment was observed on the exterior south wall of this building. No floor drains were observed within the building.

The polishing process was initiated in approximately 1977 or 1978 when the facility began manufacturing decorative poles rather than standard utility poles (Schack, J., 2010, personal communication). A wet process was initially used in the pole polishing building, which produced a slurry waste (Schack, J., 2010, personal communication). The waste slurry was reportedly discharged to three lined settling ponds located to the east of the building. The material was then pumped to an unlined pond located to the north to settle the solids and infiltrate the process water (PSM 1989). Based on aerial photographs, the unlined settling pond was constructed between 1980 and 1982. Interpretation of the 1980 aerial photograph suggests that a pipe may have existed that conveyed the waste slurry from the pole polishing building westward to Area I for disposal (Pinnacle GeoSciences 2010) prior to the construction of the unlined pond.

The polishing operation switched from the wet process to a dry process shortly after Ameron began operating at the facility (Gerry, K., 2010, personal communication). Two of the three concrete settling basins to the east of the pole polishing building were reportedly filled with onsite backfill including blasting sand, prior to the 1991 Kleinfelder site reconnaissance, and the third was collecting rainwater. The basins are visible in aerial photographs beginning in 1977 and are oriented in a north-south direction extending east from the eastern side of the building. One basin is visible in photographs from 1990 and none of the basins are evident in the 1992 aerial photographs.

Kleinfelder (1991) noted 55-gallon drums and evidence of sandblasting and concrete pole polishing in the area of the pole polishing building. In addition, a very limited oil-stained surface soil area, estimated to be 2.5 ft inches diameter and 1 ft in depth, adjacent to the drum storage area, was observed at the northwest corner of the pole polishing building (ECI 1992). The stained soil was removed by Ameron and a soil sample collected following removal exhibited a TPH concentration of

1,400 milligrams per kilogram (mg/kg) using U.S. Environmental Protection Agency [EPA; Method 418.1 (ECI 1992)]. Drums were not observed in the area of the pole polishing building at the time of the February 2010 site reconnaissance.

2.2.2.4 Pole Finishing and Dry Storage Buildings

The dry storage building is located directly south of the pole polishing building and is attached to the pole finishing building at the south end. Poles are finished by applying water repellant sealant using spray guns. A concrete-bermed chemical storage area was observed at the southeastern corner of the pole finishing building at the time of the February 2010 site reconnaissance. Containers of toluene, water repellant, waste paint, and acrylic, and a self contained parts washer were observed within the concrete-bermed area. The containers were observed to be in good condition. No floor drains were identified inside the building. Sandblasting debris and a storm drain were observed to the west of the pole finishing and dry storage building during an earlier Site reconnaissance (Kleinfelder 1991). At the time of the February 2010 site reconnaissance, no evidence of sandblasting debris was observed in this area. A storm drain was observed to the east of the building, but not to the west.

2.2.3 INVESTIGATION AREA I

Investigation Area I comprises the property between the 12th Street Channel Waterway (now the 12th Street Yacht Basin) and Investigation Area G to the east, the property line that separates Port property from Norton Industries property to the north, and Investigation Area J to the south. This portion of the Site has been recently redeveloped as part of the Craftsman District, and currently contains a large Bayside Marine building at the north end, the Port Marina Operations Center near the center, a concrete esplanade along the shoreline, and asphalt pavement covering on the rest of the area.

Prior to the recent redevelopment, the first development was related to the Hulbert Mill, which operated in this area from approximately 1920 to 1962 before Area I was filled. The mill fire destroyed much of the Hulbert Mill operations in 1956; however, log rafting operations continued in this portion of the property until about 1962. Subsequently, several lessees and operations were identified in this area by the Historical Report (Appendix B), and during site reconnaissance and historical Phase I ESA reviews conducted by ECI (1987, 1988, and 1992); Kleinfelder (1991); and Hart Crowser (1991). The environmental conditions observed in this Area by these investigations are discussed below. As described in the Interim Action Report, Area I was subject to extensive cleanup during the 2006 interim action. With the exception of residual contamination along the northern boundary of Area I and along the western boundary of Area G-1a (located partially within Area I), and the presence of arsenic-affected crushed rock

which was placed beneath the concrete esplanade along the western boundary, soil contamination in this area has been remediated. Previously identified environmental conditions are discussed to provide a complete history of the Site.

2.2.3.1 Bayside Marine (Current Tenant)

The northern portion of Area I is leased by the Port to Bayside Marine. Operations at Bayside Marine include retail sales, dry stack boat storage, boat washing, and boat servicing. The Bayside Marine building is a steel structure on a concrete slab and occupies approximately the northern half of Area I. An asphalt-paved parking area is located to the south of the building. Boat washing is performed on a concrete wash pad located to the west of the building. Wastewater is routed to a closed loop treatment/recycling system within the western end of the building. The service center is located in the southeastern portion of the building. Petroleum products used in the service area were observed to be stored within secondary containment. A trench stormwater drain is situated east to west along the south side of the service center. Storm drains were observed in the parking area to the south of the building.

A covered waste accumulation area is located along the east exterior wall of the building. Three steel waste oil tanks are located within secondary containment on a concrete surface. During our 2010 site reconnaissance, the concrete surface outside the containment area, which drains runoff to the east, exhibited petroleum staining and a petroleum-like sheen. Six empty 55-gallon drums were stored on a gravel surface east of the waste accumulation area. Used batteries were also observed in this area. An asphalt-paved storage area is located to the south of the east side of the building. Several dismantled motors and an engine test tank were observed on the asphalt in this uncovered storage area.

2.2.3.2 Port Marina Operations Center (Current Occupant)

The Port Marina Operations Center is located in the southern portion of Area I. The center consists of a steel building on a concrete slab that houses offices and a wastewater treatment system. Three pressure-washing stations are located to the east of the building. Wastewater from the boat washing area, as well as from the boatyard located in Area M (see discussion below), is routed to the wastewater treatment system and is either recycled or discharged to the sanitary sewer via a lift station located east of the Marina Operations Center. Recycling receptacles for used zinc were observed east of the building. A double-walled steel aboveground storage tank (AST) is located on a concrete pad east of the building, near the boundary between Area I and Area G. The AST contains 500 gallons of gasoline and 500 gallons of diesel fuel and is used for fueling Port vehicles. The AST was observed to be in good condition with no evidence of releases.

A concrete esplanade is located along the western boundary of Area I. The esplanade was constructed in 2005 in advance of the Area I cleanup to support construction of the upland portion of the 12th Street yacht basin. During cleanup in this portion of the site, crushed rock imported as subgrade support for the esplanade was determined to contain arsenic at levels of up to 55 mg/kg to 126 mg/kg (Landau Associates 2010). The Port removed the accessible portion of the imported rock and placed it in Area J-3 where long-term containment was already planned for arsenic and cPAH-affected soil and construction debris. The affected base course was left in place where already covered by the concrete walkway.

2.2.3.3 Commercial Steel Fabricators (Former Tenant)

Commercial Steel Fabricators leased 2 acres (and possibly an additional 2 acres during the lease term) of Area I from January through December of 1991 (Pinnacle GeoSciences 2010) as shown on Figure 8. The Port assumed the lease when it purchased the property from Hulbert in March of 1991. The property was being used by Commercial Steel Fabricators to manufacture prefabricated buildings. Operations reportedly included painting and sandblasting. There were no permanent structures associated with Commercial Steel Fabricators operations.

Several environmental concerns were noted by Kleinfelder (1991) in the area used by Commercial Steel Fabricators including:

- An open hazardous materials shed with drums of diesel and gasoline stored inside
- Soil staining in and to the west of the shed
- Areas of paint chips and sandblast grit deposited on soil
- Soil at the storm drain discharge to the 12th Street Channel in the northwest corner of the area noted to be darker than the surrounding soil, although there is no indication that this condition was associated with Commercial Steel Fabricator's operations.
- Two 15-foot long PVC pipes placed to prevent ponding of surface water onsite.

Features associated with Commercial Steel Fabricators were removed from this area prior to June of 1992 and the area was reportedly graded with new base rock (AGI 1992).

2.2.3.4 Jensen Reynolds Construction (Former Tenant)

Between 1982 and 1990, Jenson Reynolds Construction subleased the majority of Areas I and J and a portion of Area M from Centrecon (Figure 8). Jensen Reynolds was a waterfront construction company and used the property as an administrative base of operations (office building in southwest corner of Area M) as well as a lay-down and fabrication yard for numerous projects (ECI 1987).

Between 1987 and 1990, ECI conducted several environmental investigations of the Jenson Reynolds leasehold (see approximate leasehold boundary depicted in orange on Figure 3) for the Hulbert Mill Company (the property owner at that time). Hart Crowser conducted a preliminary environmental assessment of the former lease area in 1991 for HNTB (parent company of MSRC) prior to MSRC leasing a portion of the former lease area for a new warehouse.

The 1987 and 1988 ECI reports on the Jensen Reynolds lease identified numerous environmental conditions including drums of varying contents and condition scattered throughout the entire leasehold, leaking drums, areas of paint chips and discolored soil, black sand-blasting waste deposited on soil, and demolished building debris. Within Area I, the following were noted:

- Large areas of discolored soil on the ground in the northern half of the leasehold that appeared to be surficial overspray from the painting of large components fabricated in the yard (ECI 1987)
- An assortment of full, partially full, and empty drums scattered throughout the property, including fifteen 55-gallon drums that showed clear evidence of minor spills and leaks onto unprotected ground along the north property boundary
- Black sand blasting abrasive in small piles east of a metal truss bridge near the eastern fence line
- An accumulation of metal paint chips along the southeast side of the bridge, up to 2 ft high over a 20-ft by 20-ft area southeast quadrant of Area I
- An area about 200 square ft (ft^2) was covered with blasting sand about 4 inches thick in the north-central portion of Area I
- An area of building demolition and household debris immediately north of the blasting sand
- Piles of miscellaneous wood scraps and insulation foam scattered over the entire area
- Piles of gray/black sludge-like material spread randomly around the northern portion of the property (Hart Crowser 1991).

The 1988 ECI report noted that the surficial evidence of spray paint, blasting sand, numerous barrels, and spillage of barrel contents noted in the 1987 ECI audit were no longer apparent. The 1990 ECI report indicated that the accumulation of metal paint chips had been removed and that cleanup measures recommended in the 1987 and 1988 report had been addressed (ECI 1990). However, in November of 1991 Hart Crowser noted several piles of gray/black sludge-like materials around a series of concrete footings. A long stormwater drainage pipe was also noted extending into the bay along the western side of the property that appeared to be drainage for the footing areas.

2.2.3.5 Port Operations

The Port conducted various operations in Investigation Area I subsequent to purchase of the Site in 1991 and prior to the start of recent redevelopment in 2006. Identified operations consisted of

conducting petroleum hydrocarbon treatment (landfarming) as described below, the disposal of brush and landscape trimmings in the northeast portion of the area in contemplation of a composting operation (Webber 2010), boat impound storage, and the storage of used creosote-treated piles in the central-eastern portion of the area. In addition to the used piling storage, an alumina crane from the Port's Pier 1, fill soil removed as part of a Pier 1 improvement project, and clean soil removed during 14th Street boat wash area construction were relocated to Area I for storage purposes between 1993 and 1995(Shaughnessy 2010). In the early 1990s a submarine was hauled upland from the barge channel and dismantled, and several of its fiberglass panels were stored in the southeast corner of the Site.

Soil landfarming for remediation of petroleum hydrocarbon-contaminated soil was conducted in the northeast corner of Investigation Area I (AGI 1992). Although documentation is limited, available information indicates that the landfarming was related to a number of UST closures conducted by the Port throughout the North Marina Area in the early 1990s. Based on available information, the landfarming area was constructed between October 1991 and June 1992 and was removed prior to August 1993 (Pinnacle GeoSciences 2010). The apparent landfarming area was reportedly lined with plastic sheeting and contained within straw bales (AGI 1992). The former landfarming area is visible in a 1992 aerial photograph of the Site. Much of the area was reportedly cleared of the remnants of the Commercial Steel Fabricators operations and freshly graded with new base rock surfacing by 1992 (AGI 1992), which is also evident in the 1992 aerial photograph.

In addition to these operations, the Port leased a portion of the area along the shoreline to Shaughnessey Co., an industrial moving company, who stored moving containers using the 12th Street Channel barge wharf. They also used steel plates on the ground to support their operations, and stored articulating moving rigs at the property.

On Figure 3, the former boat impound storage is visible in the eastern portion, and former Shaughnessey Co. operations are visible in the western portion of Investigation Area I. The approximate location of the former landfarming area is also shown on Figure 3.

2.2.4 INVESTIGATION AREA J

Most of Investigation Area J was also formerly part of the Jensen Reynolds lease area until the Port bought the property in 1991 (Hart Crowser 1991). The area includes a former open-sided warehouse, two historical subgrade concrete vault structures of unknown purpose that were discovered and removed during construction activities subsequent to Port purchase of the property, and the former MSRC leasehold whose building currently remains.

In 1993, a buried concrete structure was discovered during the construction of a drainage swale associated with the partially built MSRC building. The buried concrete structure, located outside the west wall of the southern half of the MSRC building, apparently had been filled with wood debris, soil, and drums containing oil (Kleinfelder 1993). Investigation and cleanup of the historical structure and surrounding soil are discussed in Sections 3.1.1.7, 4.2, and 5.2 of the Interim Action Report (Landau Associates 2010). Historical information suggests that this structure may have been a concrete pit and associated log dump and waste burner dump related to a business to the west of Area J at that time (Pinnacle GeoSciences 2010).

Environmental conditions observed in Area J during the numerous environmental assessments conducted on the property between 1987 and 1993 are discussed below. In 1993, the MSRC building shown on Figure 3 was constructed. Much of the area around the building was paved when the building was constructed, although portions of the area to the west are unpaved near the fence line. The MSRC building remains and is being remodeled as part of the Craftsman District redevelopment plan.

2.2.4.1 Former Covered/Open-sided Warehouse

Before the MSRC building was constructed, a warehouse approximately one-third of the size of the MSRC building was located slightly to the east of, and overlapping, the area where the MSRC building now stands (Figure 3). In 1991, the southern half of the warehouse was being used by Veco Inc. to store welding and construction supplies, and the Port was using the northern half to store old electric meters and light posts removed from marinas, waste oil containers, drums, and wood piles (Hart Crowser 1991). The warehouse and surrounding area were assessed as part of the Phase 1 ESAs conducted between 1987 and 1991. The areas of environmental concern noted in and around the open-sided warehouse included:

- Numerous leaking drums of various contents, some of which include gasoline, diesel, and lubricant
- An AST
- A flooded area with an oily sheen north of the former warehouse and free-standing product on the asphalt in the warehouse
- Piles of blasting sand on the floor inside the warehouse.

ECI made housekeeping recommendations based on their observations (ECI 1988) and a subsequent site reconnaissance in 1989 indicated that the recommended housekeeping measures appeared to have been implemented.

In 1991, Hart Crowser noted waste oil tanks, waste oil in drums, open-topped buckets, and empty drums in very poor condition stored adjacent the Ameron fenceline and the north side of the open-ended

warehouse. They also observed green sand believed to be sandblasting sand west of the open-ended warehouse.

During the 1991 Phase I ESA (Kleinfelder 1991), the former warehouse was being leased by Veco, Inc, but was vacant at that time. No environmental concerns were observed; however, they noted that some of the area was covered by storage lockers and containers.

This area of the former warehouse is currently either paved or within the footprint of the former MSRC building.

2.2.4.2 Former UST

An approximately 10,000-gallon UST used for fueling Port vehicles, and later for waste oil storage, was reportedly removed in the late 1980s from the southwest corner of the Site, at the location shown on Figure 3. No documentation regarding the presence or decommissioning of this UST is available. The existence of the former tank was not known during Site environmental investigations until it was identified by Port personnel during Landau Associates' 2004 Phase II ESA (Landau Associates 2004). Soil and groundwater were characterized in the former UST vicinity during the 2004 Phase II ESA and subsequent data gaps investigation (DGI; Landau Associates 2005a). No evidence of residual contamination associated with the former USTs was identified.

2.2.4.3 Former MSRC Building

The former MSRC building and the attached open-sided work area on its north end were constructed in 1993. The MSRC facility was used for the storage of marine spill response supplies and no environmental issues were identified related to MSRC operations during previous Site investigations or during the February 2010 site reconnaissance.

The building is currently unoccupied, but is being remodeled into new Port offices and small business bays for marine services providers. The area to the east of the MSRC building has been paved and is used as a boatyard. As discussed previously, stormwater from the boatyard is collected and routed to the wastewater treatment system located at the new Marina Operations Center and is either recycled or discharged to the sanitary sewer system.

2.2.5 INVESTIGATION AREA M

Investigation Area M borders West Marine View Drive. The northern section of Area M is narrow and consists of a long building leased by Ameron and partially subleased to various businesses. The southern section of Area M stretches farther to the West and historically consisted of several buildings, including the former Hulbert Mill company office, Sandy's Boathouse, Washington Belt and

Drive Systems, the Collins Building, the Collins warehouses and "smoke shack", a warehouse occupied by Nalley Foods, the Port Marina Maintenance Facility, a warehouse occupied by the Port and Veco, Inc., and two office buildings facing 13th street. The number and locations of some buildings have changed over the operational history of this area. Environmental conditions observed in and around each building are described below.

Area M will likely be redeveloped in the future into an extension of the Port's Craftsman District, currently located to the west, as described in the previous section.

2.2.5.1 Northern Building

The northern portion of Area M has a long building oriented north to south, which is leased by Ameron and subleased to various businesses. The building was constructed in the late 1970s and is still in use. At the time of the 1991 Kleinfelder Phase I ESA, the subleases were (from North to South) Tri-Coatings, Inc., Besco, Inc., Churchill Brothers Sail Loft, and Sunset Body Works, Inc. (Kleinfelder 1991). Several of these subleases have changed since that time. Current tenants (from north to south) are Dunlap Industrial Hardware, Churchill Brothers Marine Canvas, North Central Collision, and Ameron. Brief descriptions of the operations of these businesses are provided in the following sections with the exception of the Ameron unit at the southern end of the building, which consists of offices.

Dunlap Industrial Hardware (Current Tenant)

Dunlap Industrial Hardware (previously Dunlap Wire Rope) currently occupies the northern portion of the building. Dunlap is a marine hardware supplier and fabricator and uses the facility primarily as a warehouse and assembly area for wire rope, marine rope, and chain. Dunlap also assembles custom hydraulic hoses. Containers of petroleum products (hydraulic oil and lubricants), ranging in size from 1 quart to 5 gallons and one 55-gallon drum of toluene were observed in this unit during the February 2010 reconnaissance. Limited petroleum spillage was observed on the surface of the concrete floor beneath machinery in the unit. Based on available information, Dunlap originally occupied a unit farther south in the building, which is currently occupied by North Central Collision (Wetzel, S., 2010, personal communication).

Tri-Coatings, Inc. (Former Tenant)

Tri-Coatings, Inc. formerly occupied the northern unit of the building. Tri-Coatings (now TC-Systems) specializes in commercial coating (paint) applications (Kleinfelder 1991). Their main facility is on the adjacent property to the north, but their maintenance and mechanics shop was located in the northern portion of the northern building on Area M. Kleinfelder observed a concrete sump, reportedly

lined with a ¼-inch steel plate, in the northwest corner of the unit that was used for stripping coatings from parts. The process produced a rinsate containing water, paint, and paint stripper (methylene chloride), which was pumped into 55-gallon drums and stored in the sump area (Kleinfelder 1991). The sump has since been filled in. A monitoring well (ECI-MW-3) was installed downgradient of the sump in 1991 and a groundwater sample was tested for volatile organic compounds (VOCs). VOCs were not detected at concentrations greater than the PSLs.

BESCO, Inc. (Former Tenant)

BESCO, Inc. formerly occupied the southern half of the current Dunlap unit. BESCO is a vehicle and machinery parts supplier. Environmental concerns were not observed during previous investigations. This unit has been merged with the unit northern unit currently occupied by Dunlap Industrial Hardware.

Churchill Brothers Marine Canvas and Upholstery (Current Tenant)

Churchill Brothers Marine Canvas and Upholstery currently occupies the central unit of the northern building and is the first and only known tenant of this unit of the building. Churchill Brothers fabricates marine canvas and boat interiors. The process involves primarily cutting and sewing and a limited amount of adhesive. No environmental concerns associated with this business have been identified during previous investigations, or during the February 2010 reconnaissance.

North Central Collision (Current Tenant)

North Central Collision operates an auto body shop in the south central portion of the building. This unit was previously occupied by Sunset Body Works, also an auto body shop, and operations have been fairly consistent for approximately 30 years. Operations at this facility include frame straightening, body repair, and painting. Two paint booths are located in the northern end of the unit. A paint storage and mixing area and a waste paint and waste solvent accumulation area are located between the two paint booths. A self-contained spray gun cleaner and waste paint thinner drum were also observed in this area. Waste automotive fluids and petroleum are stored in 55-gallon drums located along the south wall of the unit. A car washing area is located in the northeastern corner of the unit. Wastewater from the car washing likely enters a storm drain located in the parking area to the east of the building. Limited paint staining was observed on the concrete floor in the paint storage and waste paint accumulation area at the time of the February 2010 site reconnaissance. In general, the Central Collision facility appeared to have good housekeeping with minor dust for a facility of this kind. All the hydraulic tooling was portable (above ground) with no apparent drips or staining. Two large compressors in a separate insulated compressor room were dusty but had no major staining present.

In 1991, Kleinfelder observed leakage beneath plastic bags containing still bottoms generated from recycling of waste paints (Kleinfelder 1991) in this unit, which was then occupied by Sunset Body Works, which conducted a similar business,

2.2.5.2 Historical Hulbert Mill Company Office

The southern part of Area M has changed more substantially over time. Just south of the Ameron subleased building was a house, built sometime while the former Hulbert Mill was operating. Historically, the house was used as the Hulbert Mill Company Office, but was vacant by the time of Kleinfelder's site reconnaissance in 1991. No noticeable environmental concerns were noted on inspection of the exterior of the building during the Kleinfelder reconnaissance. The building was demolished in the late 1990s. A paved parking lot now covers the area where the house once stood. The former location of the house is shown on Figure 3. A 1957 Sanborn map shows a structure labeled as an oil house located northwest of the office.

2.2.5.3 Port Maintenance Shop (Former Sandy's Boathouse)

South of this area along West Marine View Drive are two current buildings built in the early 1970s (Figure 3). The northern of the two buildings is currently occupied by the Port maintenance shop. Prior to the Port, this building was occupied by Sandy's Boathouse, where a parts degreaser, waste oil accumulations, and an engine test tank were noted during the 1991 Phase I ESA (Kleinfelder 1991). The degreaser oil and solvent waste were reportedly being disposed of offsite. Oil and grease associated with the test tank were reportedly being cleaned with oil-absorbent pads and associated wastewater was discharged to the sanitary sewer. An AST storing petroleum hydrocarbons with no visible staining was observed here during the Landau Associates Phase I ESA site reconnaissance in 2000 (Landau Associates 2001). Features associated with the former tenant had been removed by the time of the February 2010 reconnaissance.

This building is currently used by the Port for maintenance activities and storage of equipment and parts. The Port has occupied this building since late 2009. A parts washer and a self-contained sandblast unit were observed this building. Paint and petroleum products are also used and stored in this building. No evidence of releases from any of the containers was observed at the time of the February 2010 site reconnaissance. A floor drain was observed in the paint storage area in the southwestern corner of the building.

The area to the west of the building has a gravel surface and is currently used by the Port for storage. Several steel storage containers were observed in this area at the time of the February 2010 site reconnaissance.

2.2.5.4 Port Net Shed (Formerly Washington Belt and Drive Systems)

The building just south of the Port's maintenance shop is currently used by the Port as a net shed with the exception of the southern end of the building, which is occupied by Marine Power Services. This entire building was previously occupied by Washington Belt and Drive Systems, a machinery parts retailer. The building has a sanitary sewer drain in the storage area. Limited quantities of hazardous materials are stored in a flammable materials cabinet along the east wall of the building. In 1991, Kleinfelder observed unopened containers of 1,1,1-trichloroethane (1,1,1-TCA) and flammables stored for retail sale and a sanitary sewer drain that was reported to occasionally back up during high tides (Kleinfelder 1991).During the February 2010 site reconnaissance, a limited release of hydraulic oil was observed on the concrete floor beneath a hydraulic pump and reel used for winding nets. The area to the west of the building is partially paved and is currently used for net storage. The floor drain reported in the Kleinfelder report was not located, but may have been covered by nets or other materials.

The southern portion of the building currently houses Marine Power Services, which is a marine engine repair shop. The interior of this unit was not accessible at the time of the February 2010 site reconnaissance. Inspection through the limited visibility of the windows showed diesel and gasoline engines in various stages of repair. Miscellaneous small quantity aerosols could be seen such as WD-40, penetrating oil, etc. Although not visible, a part-cleaning tank and miscellaneous fluids such as motor oil, hydraulic fluid, and antifreeze are often associated with small engine repair operation.

2.2.5.5 Collins Building

West of these buildings (southern building A and B) is the Collins Building (formerly North Coast Casket Company), built in 1926 and still present. An abandoned fuel oil boiler system exists at the Collins Building, and small surface stains were observed during the Landau Associates Phase I ESA site reconnaissance in 2000 (Landau Associates 2001). The boiler system and surface stains were not observed during the February 2010 site reconnaissance. The building is currently unoccupied and is heated using natural gas. A hydraulic system for the elevator was observed on the first floor of the building and remnants of former spray booths were observed on the 2nd and 3rd floors of the building.

This building was previously occupied by Collins Casket Manufacturing. Collins Casket primarily manufactured wood caskets, but also finished other types of caskets such as metal and fiberglass (Hulbert, B., 2010, personal communication). They occupied multiple buildings, including the former Hulbert Mill office, the Collins manufacturing building, a "smoke shack" and covered storage building to the west, and a painting and metal parts fabrication building to the east of the main building. Collins Casket sublet portions of the Collins Building to:

- Michael's Woodcraft (occupied 2nd floor of Collins Building: Manufactured wood products)
- RL Enterprises (occupied 2nd and 3rd floors of Collins Building: Manufactured wood cabinetry)

The paved area to the north of the Collins Building is currently used by the Port as a waste accumulation area for boatyard tenants. Drums containing waste oil and smaller containers of various automotive fluids were observed in this area as well as used batteries. No evidence of a release was observed in this area during the 2010 Site reconnaissance.

2.2.5.6 Former Collins "Smoke Shack" and Covered Storage Shed

The former Collins "smoke shack" and covered storage shed, built in the 1960s, were located to the west of the Collins Building and were associated with Collins Casket Company operations. The building, located off the northwest corner of the Collins Building, was used as a break room for employees (dubbed the "smoke shack"), and also reportedly stored building materials. During the 1991 Phase I ESA Site reconnaissance (Kleinfelder 1991), waste paint containers and stained soil were observed outside in an area northwest of this building. The covered storage shed, located south of the smoke shack and west of the Collins Building, was made up of two connected open warehouses and was reportedly used as open storage for metal parts, wood scraps, and old machinery; no environmental concerns were noted related to this building. The smoke shack and the northern half of the warehouse were demolished in the early 1990's and the southern half of the open warehouse was demolished in 2001 or 2002, and the location is currently paved with asphalt.

2.2.5.7 Collins Casket Warehouse

From approximately 1961 until 2005, a warehouse was located adjacent to the east side of the Collins Building. The building was originally used by Cascade Casket Company for painting and finishing caskets, which included spray painting and metal fabrication (Hulbert, B., 2010, personal communication and Pinnacle 2010). This building was later used for food storage by Nalley Foods. No environmental concerns were identified for this building during previous Phase 1 investigations; however, the occurrence of vinyl chloride in this area (M-3, Figure 11) indicates the potential for historic releases of chlorinated solvents in this area. In addition, former tenants (Cascade Casket Company, Collins Casket Company, Michael's Woodcraft, and RL Enterprises) all used glues and wood finishing chemicals during the manufacture of wood products and metal finishing were conducted in this building.

2.2.5.8 Port of Everett Marina Maintenance Facility

The former Port Marina Maintenance Facility was built over the northern portion of the smoke shack/and covered storage shed area in the early 1990's. During Landau Associates' 2000 Phase I ESA Site reconnaissance, an AST containing petroleum hydrocarbons with no visible surface stains was observed in the paved yard to the south of the maintenance building (Landau Associates 2001). No environmental concerns were identified, although the interior of the building was not observed. The Port Marina Maintenance Facility was demolished in 2007 in conjunction with development of the Craftsman District and construction of the new Marina Operations Center; this area is currently paved.

2.2.5.9 Former Warehouse (Veco, Inc. and Port of Everett)

The southwestern part of Area M was the location of an additional warehouse. The warehouse was built in 1983, and in 1991 was being leased by Veco, Inc. from Jensen-Reynolds Construction for storage and occasional use on large jobs. In 1991, the northern portion of the warehouse was being used by the Port of Everett as a maintenance garage prior to construction of its new maintenance facility (Kleinfelder 1991 and Hart Crowser 1991). Several environmental issues, noted below, were identified at this location by Kleinfelder (1991) and Hart Crowser (1991):

- Dark staining on the surface grating of a storm drain in the building floor, and chemical drums stored onsite and nearby (Kleinfelder 1991)
- Storage of waste oil in cans and drums that showed leakage and spillage outside of the maintenance garage, and small piles of oil absorbent material was observed adjacent to lube, motor, and hydraulic oil drums inside the building (Hart Crowser 1991)
- Green sand was observed at multiple locations, including behind the maintenance garage, and was assumed to be related to sandblasting activities (Hart Crowser 1991).
- Waste oil staining was also observed on asphalt around a 75-gallon waste oil tank located outside at the northwest corner of the garage and petroleum odor and sludge were identified in stormwater drains and sumps inside the building (Hart Crowser 1991).

The warehouse was demolished in 2007 in conjunction with development of the Craftsman District; this area is currently paved and used as a boatyard.

2.2.5.10 Office Buildings

Two buildings bordering 13th street in Area M served as office buildings. The western-most building was present to the south of the Veco/Port warehouse. The eastern half of the office building was constructed in 1982 and a western expansion was added in the early 1990s. The buildings were demolished in 2006 during construction of the Craftsman District.

Two gasoline USTs and one diesel UST were located within the expanded building footprint, which was reportedly the reason for their removal prior to construction of the building addition. These USTs, erroneously listed in Ecology records as having been removed from Bayside Marine (1100 13th Street), were determined to be incorrectly located; the correct location was identified with the assistance of Port personnel and historic aerial photographs. The correct location for these former USTs are shown on Figure 3. As discussed in the Interim Action Report, an interim action was conducted in this area based on visual evidence of petroleum hydrocarbon contamination observed during decommissioning of three USTs. Based on the soil compliance monitoring results, and the post-interim action groundwater monitoring results, the 1991 interim action conducted in association with the UST removal was effective and further action at this location is not needed.

The other building, a modular home unit used as an office building, briefly existed in Area M between 2002 and 2006, just south of the Collins building, facing 13th Street. No environmental concerns were identified associated with this structure.

2.2.6 IN-WATER AREA

The 12th Street Yacht Basin is located in the 12th Street Channel, and constitutes the aquatic portion of the Site. The currently estimated Site boundary extends from the western shoreline of Area I to the point where the channel intersects the Snohomish River, and from the north shoreline of the channel to the estimated north boundary of the North Marina West End site (about 200 ft north of the Channel's south shoreline). Based on review of historic aerial photos, the Yacht Basin was heavily used for log rafting and other saw milling activities until the Hulbert Mill ceased operations in the 1960s. Based on aerial photos and other information, a navigation channel was dredged along the south side of the channel in the early 1970s to provide adequate vessel draft for both Port and Hulbert operations. The entire Site aquatic area was dredged to about elevation -16 ft MLLW in 2005 as part of the Yacht Basin development, and the Yacht Basin floats and upland infrastructure were built between 2005 and 2007.

Sediment investigation studies prior to the construction of the Yacht Basin are discussed in Section 3.1.3. However, the 2005 dredging of the Yacht Basin likely removed any impacts from historic activities reflected in pre-2005 sediment quality data.

A stormwater outfall present in the northeast corner of the Yacht Basin receives stormwater from a stormwater trunk line that runs easterly from the outfall (Figure 12). The age of the trunk line is uncertain, but it is interpreted to have gone in along the northern boundary of Area I in the mid-1970s in association with the construction of the Centrecon facility and filling of Area I. The trunk line along the north property line of Area G is interpreted to have been installed between 1980 and 1982 during the

filling and construction of the property to the north (Pinnacle GeoSciences 2010). Numerous laterals drain into the main trunk line, including laterals from the northern half of the Ameron leasehold and the Norton Industries property to the north of the Site (including the TC Systems, Dunlap Industrial Hardware, and O&W Glass businesses). Stormwater conveyance from the northern portion of the Bayside Marine leasehold and the access roadway to the west of the Bayside building were recently added to the trunk line during the development of the Craftsman District. Due to its age and the limited documentation of its construction, there could be additional, undocumented, laterals connected to the trunk line.

The stormwater trunk line appears to be in poor condition. Replacement of failed sections of the main trunk line was conducted by Ameron in 2005 and the Port in 2008. In addition, recent camera surveys in 2008 and 2009 could not be completed because of sediment accumulation in the trunk line. It is also noted that marine surface water backs up into the main trunk line during high tide due to the lack of a properly functioning tidal gate.

Stormwater was collected and tested from the outfall, and marine sediment was collected and tested from the immediate outfall vicinity during previous Site investigations, as discussed in Section 3.1.3.

2.3 PORT REDEVELOPMENT PLANS

The western portion of the Site is currently being redeveloped by the Port into its Craftsman District to support marine-based businesses and recreational boaters. Recently developed facilities in Area I include the Bayside Marine dry stack storage and a marine retail business in the northwest corner, a new Port Marine Operations Center in the west-center area, and a new travel lift in the southwest corner of the Site. Additionally, the former MSRC building constructed in 1993 in the southwest portion of the Site is currently being redeveloped into new Port offices and small business bays for marine services providers. Approximately the southwestern half of the upland portion of the Site has been paved with asphalt as part of the Craftsman District development.

The southwestern portion of Area M has been paved and redeveloped as a boatyard for marina tenants. Area G and the northern part of Area M will likely be eventually redeveloped as an expansion of the Craftsman District.

In addition to uplands redevelopment, the aquatic portion of the Site (the northern two-thirds of the 12th Street Channel) was redeveloped in 2005/2006 into the 12th Street Yacht Basin. Development of the yacht basin included dredging Site aquatic lands to about elevation -16 ft MLLW to create the necessary draft for its new use as a marina. A riparian area and intertidal habitat bench was created along the north shoreline of the Yacht Basin as compensation for the marina development-related impacts.

Figure 4 shows current conditions for the aquatic portion of the Site, and Figure 3 shows the area over which Site sediment was dredged for construction of the yacht basin.

A Contamination Contingency Plan (CCP) was developed for the North Marina Area (Landau Associates 2008). Any unanticipated soil or groundwater contamination encountered at the Site during future redevelopment activities will be managed using the approach and procedures outlined in the CCP.

2.4 ENVIRONMENTAL SETTING

This section describes the geology and hydrogeology of the Uplands Area of the Site based on information collected during previous investigations, and presents the setting of the in-water area of the Site, including habitat, biota, and vegetation.

2.4.1 UPLANDS AREA

Site geologic conditions encountered within the depth range of environmental explorations consisted primarily of a pavement section and a granular fill layer overlying non-dredge fill of various thicknesses, followed by hydraulic fill. The non-dredge fill is predominantly fine to coarse sand and gravel, fine to medium sand, or silty sand. The non-dredge fill occasionally contains wood debris, brick, concrete-like waste, and sandblasting material. The non-dredge fill is variable in thickness in different areas of the site. Specific cross sections have not yet been developed to fully delineate the thickness of the non-dredge fill, but a brief review of the geologic logs from previous site drilling (Appendix C) in consort with the history report (Appendix B) suggests the following non-dredge fill thicknesses:

- In the pre-1947 fill area, which consists of a strip of land along the eastern Site boundary (Figure 5), between 1ft and 4 ft of non-dredge fill is present above the hydraulic fill.
- In the 1947 to 1955 fill area, which includes the southwestern corner of Area G, the western portion of Area M, and the majority of Area J, approximately 2 ft to 5 ft of non-dredge fill is present above the hydraulic fill.
- In the 1955 to 1965 fill area, which includes most of Area G, exploration logs indicate variable non-dredge fill thicknesses ranging from 3 to 4 ft around the northwestern corner of Area G (location of former berm) to between 7 and 9 ft in other borings in the northwestern G area. Only 2 ft of non-dredge fill was logged in the original general characterization borings (G-1, B-2, G-3) completed by Landau Associates (Landau Associates 2005a). In the 1973 fill area, which includes most of Area I, 1.5 ft to 5 ft of non-dredge fill was present above the hydraulic fill prior to interim action. This non-dredge fill was typically included 0.5 to 1.5 ft of a roadbase layer of fine to coarse sand, sand and gravel, or crushed gravel. Underlying the "roadbase" was typically a fine to medium sand, locally containing a layer of a colored concrete-like material (e.g., former cleanup area I-2), or layers of black sand or wood debris.

Post-interim action conditions in Area I consist of a pavement/crushed rock base course layer directly overlying hydraulic fill. Post-interim action conditions in Area G-1 consist of a layer of structural fill overlying much of the excavation surface resulting from the construction of the Bayside Marine building; the structural fill thins from west to east and is not present in the easternmost portion of the area.

An area of construction debris that extended to depths greater than the hydraulic fill upper surface was encountered in the northeast portion of Area J. Hydraulic fill is typically a loose to medium dense, poorly graded fine to medium sand with silt or silty fine to medium sand. Based on available geologic information from geotechnical borings, native marine sediment consisting of about a 10-ft thick layer of soft to loose silt to silty sand directly underlies the hydraulic fill and is first encountered at about 10 ft to 30 ft BGS, with the depth of the contact increasing from east to west. Dense glacial soil underlie the marine sediment and slope downward from east to west. An east-west geologic cross section through the Site is provided on Figure 13 and exploration logs are provided in Appendix C.

The uppermost hydrostratigraphic unit at the Site consists of the fill unit that overlies the finer-grained marine sediment unit. The marine sediment unit appears to form the uppermost aquitard throughout the Site, although the interpretation of geologic conditions below the hydraulic fill unit is based on limited data. The depth to groundwater ranges from about 4 to 6 ft BGS in Site monitoring wells. Although sufficient groundwater data are not available to plot groundwater isopleths and quantitatively determine the direction of groundwater flow, data collected elsewhere in the North Marina Area indicates that shallow groundwater flows toward surface water. Therefore, groundwater is expected to flow generally westward, with a northerly component to groundwater flow in the southern portion of the Site. Groundwater flow in the northern portion of the Site may also be influenced by surface water located to the northwest of the Site.

2.4.2 IN-WATER AREA

The Site is located on the eastern shoreline of Port Gardner Bay, which is an inlet of Possession Sound (Figure 1). The Snohomish River flows past the west end of the Site into the bay, as shown on Figure 1. The 12th Street Yacht Basin is located in the 12th Street Channel, connected to Port Gardner, and constitutes the in-water portion of the Site. The currently estimated Site boundary extends from the western shoreline of Area I to the point where the channel intersects the Snohomish River, and from the north shoreline of the channel to the estimated north boundary of the North Marina West End site (about 200 ft north of the Channel's south shoreline).

The 12th Street Marina has been altered by dredging and filling over several decades to convert portions of the shoreline to industrial and commercial uses and to provide navigation. The entire Site in-water area was dredged to about elevation -16 ft MLLW in 2005 as part of the yacht basin development, and the yacht basin floats and upland infrastructure were built between 2005 and 2007. Most, if not all, of the sediment previously characterized in this area was removed.

A biological evaluation (BE) conducted by Pentec Environmental (Pentec 2004) describes the habitat, biota, and vegetation within the 12th Street Waterway and North Marina. According to the Pentec BE, the lower Snohomish River basin, including the 12th Street Waterway, is habitat for juvenile salmonid rearing and migration, saltwater-freshwater transition, and possibly adult migration. Salmonid species believed to be present in the Site vicinity include chinook salmon and bull trout, which are listed as threatened species under the federal Endangered Species Act. Coho salmon are also believed to be present in the Site vicinity, and are a candidate specie that may be listed in the future.

Scattered rockweed has been observed on riprap and pilings in the 12th Street Waterway. Eelgrass is not present in the waterway. Forage fish documented in the Port Gardner area include Pacific herring, Pacific sand lance, and surf smelt and may be present in the waterway.

3.0 PREVIOUS INVESTIGATIONS AND INTERIM ACTIONS

As described in the Interim Action Report (Landau Associates 2010), a large number of investigations and interim actions have been conducted at the Site and are briefly described in this section. These investigations and the interim actions are documented in several reports including the Ameron/Hulbert Site Interim Action Report (Landau Associates 2010), which provides a comprehensive overview of the previous investigations and interim actions at the Site. A list of the relevant documents is provided in Appendix A. Several of the investigations and the interim action were conducted by Landau Associates when the Site was part of the North Marina Redevelopment site and was under Ecology's VCP. At that time, the former North Marina Area was subdivided into investigation areas A through L. The Upland portion of the Site addressed by this report includes only Investigation Areas G, I, and M, and most of Area J. The northern portion of the 12th Street Yacht Basin is located within the in-water portion of the Site. The investigation areas are shown on Figure 4 and will be referenced in this report when discussing Site features and environmental conditions.

Sampling location identifications (for samples collected by Landau Associates from 2000 onward) were assigned prefixes that match the investigation area in which they are located. For example, sample location G-FA-5 was collected from Investigation Area G. Similarly, identifications of interim action areas have a prefix that matches the investigation area in which they are located. For example, Interim Action Area I-9 is located in Investigation Area I. Interim action Area G-1a is located in both Area G and Area I and the prefix for samples from this area is G-1a. For organizational purposes and easy reference, these letter designations have been carried forward in this work plan. Note that samples collected by other consultants prior to 2000 do not follow these criteria.

3.1 ENVIRONMENTAL INVESTIGATIONS

Prior to the Site's entry into the MTCA formal process, a large number of environmental investigations were conducted to determine the nature and extent of contamination within the North Marina Area, including the Site. Up until 2000, investigations were performed by a number of different parties. From 2000 onward, Landau Associates performed all upland environmental investigations at the Site, starting with a Phase I ESA (Landau Associates 2001) and several subsequent investigations including a Phase II ESA conducted in late 2003 and early 2004 (Landau Associates 2004) and a Data Gaps Investigation conducted in late 2004 and early 2005 (Landau Associates 2005a). Brief descriptions of each environmental investigation are provided in Appendix A.

Several sediment quality investigations have been conducted for the in-water portions of the Site. The in-water portion of the Site has been dredged and much of the sediment characterization has been

associated with disposal/relocation requirements of the dredged sediment, with the exception of the surface sample collected by SAIC for Ecology in a study covering sediment quality for the entirety of Port Gardner Bay (SAIC 2009). With the exception of the SAIC data, the 2005 dredging for the 12th Street Yacht Basin removed most of the sediment associated with these previous characterization activities.

The number of soil, groundwater, and sediment samples collected for characterization purposes and the types of chemical analyses performed for each are described below.

3.1.1 SOIL

About 290 soil samples have been collected throughout the Site and submitted for laboratory analysis during previous investigations. Laboratory analysis of the soil samples included VOCs, semivolatile organic compounds (SVOCs) including carcinogenic polycyclic aromatic hydrocarbons (cPAHs), organotins [e.g., tributyl tin ion (TBT)], metals, PCBs, and petroleum hydrocarbons, as summarized in Table 2. Previous environmental soil sampling locations are shown on Figures 14 and 15 and investigation results are presented on Figures 16 and 17. In addition, figures showing analytical results by parameter and data tables summarizing characterization sample results are included in Appendix A.

3.1.2 GROUNDWATER

Investigation of groundwater quality at the Site has consisted of laboratory analysis of groundwater samples collected from 14 monitoring wells and 15 soil boring locations (temporary well points). These locations are shown on Figures 14 and 15. In addition, three water samples were collected from a concrete basin settling sump on the eastern side of the Ameron facility and two water samples were collected from a former settling pond in the northwestern portion of Area G. Groundwater samples were selectively analyzed for VOCs, SVOCs including cPAHs, metals, and petroleum hydrocarbons, as summarized in Table 3 and presented on Figure 11. In addition, figures showing analytical results by parameter and data tables summarizing characterization sample results are included in Appendix A.

3.1.3 SEDIMENT

Three sediment quality investigations were conducted in the 12th Street Channel in advance of it being redeveloped into the 12th Street Yacht Basin to evaluate the sediment quality for open water disposal under the Puget Sound Dredge Disposal Analysis (PSDDA) program. These investigations are described in the Interim Action Report (Landau Associates 2010).

The sediment quality investigations consisted of laboratory analysis of 18 composite samples collected from 39 sediment cores and one surface sediment sample. The sample locations are shown on Figure 18. Laboratory analysis for sediment samples included VOCs, SVOCs including cPAHs, metals, petroleum hydrocarbons, pesticides, PCBs, organotins, conventional paramaters, and grain size. Selected samples were also submitted for bioassay analysis. Analytical parameters for sediment samples are summarized in Table 4. Carbon normalized and dry weight analytical results are presented in Tables 5 and 6, respectively.

Seven sediment samples were collected by Landau Associates in 2009 from the southern portion of the 12th Street Yacht Basin during the remedial investigation for the adjacent North Marina West End Site (Landau Associates 2009) and one sediment sample was collected from the in-water portion of the Site by SAIC in 2008 to evaluate sediment quality as part of the evaluation of Port Gardner Bay under the PSI (SAIC 2009). These post-dredging sediment samples are shown on Figure 19. None of the samples exceeded the PSLs (Tables 5 and 6).

Following submittal of the Interim Action Report, an unsigned Landau Associates report describing a limited stormwater/sediment investigation conducted within the northeastern portion of the 12th Street Channel was discovered in Landau Associates files. In 1997, an individual had an adverse skin reaction (similar to a sever burn) to either the sediment or surface water while salvaging creosote-treated timbers in the tidelands in the northeast corner of the 12th Street barge channel. Landau Associates was retained by the Port to evaluate whether sediment or surface water quality in the vicinity of the incident was the likely cause of the adverse reaction.

Three surface sediment samples were collected from the tidelands (near the outfall) and one stormwater sample was collected directly from the outfall. Note that a figure was not prepared as part of the assessment and the exact sample locations are not known. The samples were analyzed for pH, VOCs, SVOCs, and herbicides as these constituents were determined to be the most likely to cause an adverse reaction. A limited number of volatile and semivolatile compounds were detected in the samples, but not at concentrations likely to cause an adverse reaction. The report concluded that the constituents detected are commonly found in marine sediments in urban or industrialized areas, and that all constituents were detected at concentrations significantly below which a severe dermal reaction would be expected (Landau Associates 1997).

3.2 INTERIM ACTION

Three interim actions were conducted at the Site by the Port. In 1991, the Port conducted an interim action to address petroleum hydrocarbon contamination encountered during decommissioning of

three USTs at the south end of Site. In 1993, an interim action was conducted in conjunction with construction of the MSRC facility in the southwest portion of the Site. The most extensive of the three interim actions was conducted by the Port between 2005 and 2007 in conjunction with the North Marina Redevelopment project to address contaminated soil and groundwater at interim action areas identified based on previous Site characterization activities. The 2005 to 2007 interim action included excavation and offsite disposal of impacted soil and the collection and analysis of compliance monitoring samples to verify that interim action cleanup levels (CULs) were achieved. Planned and final interim action areas are shown on Figure 20. A summary of interim actions implemented within each area is provided in Table 7; a more detailed description of the interim action is provided in the *Interim Action Report, North Marina Ameron/Hulbert Site* (Landau Associates 2010). Soil and groundwater compliance monitoring analytical results are discussed in Section 6.0.

4.0 PRELIMINARY CONCEPTUAL SITE MODEL

This section presents a preliminary conceptual Site model that identifies the main contaminants encountered at the Site, the potential sources for the contaminants previously found, the media where these contaminants were found, the potential contaminant migration pathways, and potential contaminant receptors and exposure pathways. The schematic of the conceptual Site model presented below is provided on Figure 21.

4.1 SITE CONTAMINANTS

An evaluation of the prior investigation results was previously conducted to identify indicator hazardous substances (IHS) for the interim action cleanup. The results of this evaluation were also used to identify IHS for the RI. The data used for the evaluation is summarized in Tables 8 and 9, which includes the analytical testing, the number of detections, and the number of samples that exceeded the interim action CULs for the previous investigations. The tables also summarize the constituent frequency of detection, minimum and maximum detected concentrations and reporting limits, and analytes identified as IHS for the interim action. Constituents identified in the tables as selected IHS have been included as contaminants to be evaluated in the RI. IHS identified for the Site based on previous soil and groundwater investigation results include cPAHs, antimony, arsenic, copper, lead, diesel-range petroleum hydrocarbons, lube oil-range petroleum hydrocarbons, fluorene, benzo(a)pyrene, PCBs (Aroclor 1248, 1254, and 1260), bis(2-ethylhexyl phthalate) (BEHP), and vinyl chloride.

4.2 POTENTIAL CONTAMINANT SOURCES

Four primary potential contaminant sources have been identified for the Site: 1) former industrial activities, and associated waste materials, 2) ASTs and/or USTs, 3) contaminated fill material, and 4) releases from adjacent industrial operations. Areas where these potential contaminant sources existed and the contaminants associated with each source are described below. It should be noted, however, that many of these potential contaminant sources no longer exist at the Site, either because the activities that may have resulted in a release or spill have ceased or the release (e.g., contaminated soil) has been removed by interim actions conducted at the Site (described in Section 3.2).

- **Commercial/Industrial Activities and Waste Products.** The Site operated as a sawmill from 1914 into the 1960s. Area G has been used for concrete pole manufacturing since 1972. Additionally, the property owners and their tenants and subtenants conducted a variety of commercial and/or industrial activities at the Site. These activities, and the residual waste products resulting from these activities, may have released heavy metals, petroleum hydrocarbons, PCBs, VOCs, and/or PAHs to Site media of concern.

- **ASTs and USTs.** ASTs and USTs containing diesel, gasoline, heating oil, and/or waste oil were located on the former Jensen Reynolds leasehold and Ameron leasehold, and associated with the Port marine fueling system. The former locations of these tanks are shown on Figure 3. Releases of petroleum hydrocarbons to the Site soil may have occurred due to spills to the ground surface during dispensing of petroleum products to or from the tanks and/or from potentially leaky tanks and/or pipelines associated with the tanks. All known USTs have been removed from the Site and compliance monitoring results from the former UST areas indicate that residual contamination is not present in soil or groundwater in these areas.

- **Fill Material.** Soil containing wood debris and other building materials (i.e., brick) are described in logs as fill material in Area J. In addition, crushed base course material imported as subgrade support for the esplanade at the head of the 12th Street channel was determined to contain arsenic concentrations in exceedance of the interim action CUL. The base course was removed from accessible areas and placed in Area J-3 for containment. The affected base course material is present beneath the concrete esplanade located along the western boundary of Area I. Other areas of the site are also likely to contain fill that may contain construction debris, such as around the storm drain backfill at the northern boundary of Area G, and likely other areas of the site based on filling history (Pinnacle 2010).

- **Adjacent Industrial Operations**. Industrial operations to the north of the Site, such as TC Systems, may have released hazardous substances to soil, groundwater, or the stormwater system. These hazardous substances, if present, may have migrated onto the Site via groundwater or may have entered the shared stormwater trunk line and contaminated stormwater sediment and/or marine sediment in the vicinity of the outfall, or been released to soil and groundwater in the vicinity of the trunk line.

4.3 CONTAMINANT MIGRATION PATHWAYS/MEDIA OF POTENTIAL CONCERN

Previous investigations at the Site have determined that the soil at the Site generally consists of a surface trafficking layer overlying varying thickness of non-dredge fill, followed by a thick layer of hydraulic fill, which in turn overlies native marine sediment. The saturated portion of the fill represents a shallow, relatively low-permeability hydrostratigraphic unit. Depth to water ranges from 4 to 6 ft BGS, depending on the season and proximity to the shoreline. The shallow hydrostratigraphic unit discharges to the adjacent marine surface water. Other discharges to marine surface water include surface water runoff from the Site that is collected in catch basins and discharged via outfalls along the eastern shoreline of the 12th Street Yacht Basin.

Based on the occurrence of groundwater discharge to marine surface water, discharge of upland surface water to marine surface water, the shallow nature of groundwater below the Site, and the presence of an unsaturated soil zone, the potential pathways for contaminant migration at the Site include:

1. Leaching of contaminants from soil to groundwater
2. Transport of contaminants in groundwater to adjacent marine surface water and sediment

3. Transport of contaminants to soil and adjacent marine surface water and sediment via surface water runoff
4. Re-suspension and mixing of marine sediments via bioturbation (i.e., mixing of sediment by benthic animals), marine vessels coming in and out of the area, and/or tidal currents
5. Volatilization of contaminants from soil and groundwater to indoor air
6. Transport of contaminants in soil to outdoor air via wind or fugitive dust.

Based on potential migration pathways, the Site media of potential concern consist of soil, groundwater, surface water, sediment, and indoor/outdoor air.

4.4 CURRENT AND FUTURE LAND AND WATER USES

The Site is currently zoned as waterfront commercial, which allows for commercial, residential, and limited industrial use. Industrial use is limited to research/testing labs (zoning does not allow for mass production or manufacturing of goods). Long-term Site use is anticipated to be commercial and retail, with the majority of the Site either currently or planned for use as the Craftsman District and Port offices. It is unlikely that residential housing will be constructed within the Site boundary, although hospitality services (hotel or restaurant use) could occur within the southern portion of the Site. Drinking water for the Site is currently supplied by the City of Everett Water District.

Groundwater at or potentially affected by the Site is not currently used for drinking water. It is not considered to be a reasonable future source of drinking water due to its to proximity to marine surface water, its limited productivity, and the likelihood that it would have a high salinity content following extended periods of groundwater extraction that would make it unsuitable as a domestic water supply.

4.5 POTENTIAL RECEPTORS AND EXPOSURE PATHWAYS

The potential receptors that may be exposed to the contaminants present at the Site and the potential exposure pathways depend primarily on the current and likely future land uses for the Site. This section identifies potential receptors and the potential exposure pathways for the receptors based on the future land uses described in Section 4.4.

4.5.1 POTENTIAL RECEPTORS

Potential receptors of Site contaminants could be humans and terrestrial ecological receptors (i.e., wildlife, soil biota, and plants) and aquatic organisms. Each of these was evaluated based on the future land use of the Site, as follows:

- **Humans.** Because the Site is zoned waterfront commercial, which allows for commercial, residential, and limited commercial and light industrial use, humans are considered to be

potential receptors. However, it is unlikely that residential housing will be constructed within the Site boundary.

- **Terrestrial Ecological Receptors:** The Site is currently almost entirely covered with buildings and pavement, and will remain similarly covered under anticipated future Site uses. Most Site landscaping will be contained in planters or otherwise isolated from the underlying existing soil surface; therefore, terrestrial ecological receptors (wildlife, soil biota, and plants) are not considered to be potential receptors. Also, in accordance with WAC 173-340-7491(1)(c)(i), sites that contain less than 1.5 acres of contiguous undeveloped area are excluded from having to conduct a terrestrial ecological evaluation. Because the Site will be mostly covered with buildings and pavement following redevelopment, the Site meets the exclusion for a terrestrial ecological evaluation. Ecology's Terrestrial Ecological Exclusion form is included as Appendix D.

- **Benthic and Aquatic Organisms.** Due to the Site's proximity to marine surface water, benthic organisms in sediment and aquatic organisms in Port Gardner Bay are considered to be potential receptors.

4.5.2 POTENTIAL EXPOSURE PATHWAYS

Potential exposure pathways were identified for the receptors identified in Section 4.5.1 and are presented by medium below.

4.5.2.1 Soil

The potential human health exposure pathways for Site soil are:

- Incidental ingestion and dermal contact with constituents in Site soil.
- Exposure through inhalation of soil contaminants (as particulates) that have migrated to air as windblown or fugitive dust
- Exposure through inhalation of soil contaminants (as soil vapor) that have migrated to air via soil vapor intrusion into occupied buildings.

4.5.2.2 Groundwater

As discussed in Section 4.4, groundwater at or potentially affected by the Site is not currently used for drinking water and is not a reasonable future source of drinking water due to its proximity to marine surface water and the availability of a municipal water supply. However, the shallow hydrostratigraphic unit discharges to the adjacent marine surface water. Exposure pathways associated with marine sediment and surface water are discussed in Sections 4.5.2.3 and 4.5.2.4, respectively. Because vinyl chloride was detected in groundwater at one location during a previous investigation (13 µg/L at M-3, Figure 11), inhalation of vapors in indoor air that volatize from groundwater is a potential exposure pathway. The potential for this exposure pathway will be assessed further during the RI based on the results for the RI groundwater monitoring.

4.5.2.3 Sediment

The potential exposure pathways for sediment include:

- Exposure of benthic organisms, which may result in acute or chronic effects, to hazardous substances released from the Site (e.g., groundwater to surface water discharge, storm runoff, etc.) in the biologically active zone of sediment [the upper 10 centimeters (cm) below the mudline]. This may result in the uptake and bioaccumulation of contaminants in these organisms.
- Ingestion of contaminated benthic organisms as prey by higher trophic level organisms in the food chain (e.g., foraging fish, aquatic birds, marine mammals, etc.).
- Human ingestion of marine organisms contaminated by Site hazardous substances that have migrated to sediment.

4.5.2.4 Surface Water

The potential exposure pathways for surface water include:

- Exposure of aquatic organisms, which may result in acute or chronic effects, to hazardous substances released from the Site to surface water. This may result in the uptake and bioaccumulation of contaminants in these organisms.
- Ingestion of contaminated aquatic organisms as prey by higher trophic level organisms in the food chain (e.g., foraging fish, aquatic birds, marine mammals, etc.).
- Human ingestion of contaminated marine organisms contaminated by Site hazardous substances that have migrated to surface water.

5.0 PRELIMINARY SCREENING LEVELS

PSLs have been developed for media of potential concern identified in Section 4.1 (i.e., soil, groundwater, and sediment). PSLs for soil and groundwater that are adequately protective of human health and the environment were developed in accordance with MTCA requirements. MTCA provides three approaches for establishing cleanup levels: Method A, Method B, and Method C. The Method A approach is appropriate for sites that have few hazardous constituents. The Method B approach is applicable to all sites. The Method C approach is applicable for specific site uses and conditions. The Method B and Method C approaches use applicable state and federal laws and risk equations to establish cleanup levels. However, the Method B approach establishes cleanup levels using exposure assumptions and risk levels for unrestricted land uses, whereas the Method C approach uses exposure assumptions and risk levels for restricted land uses. MTCA also requires that cleanup levels developed using MTCA Method B and Method C approaches not be set at levels below the practical quantitation limit (PQL) or natural background.

In general, the Method B approach was used for the development of the proposed soil and groundwater PSLs presented herein based on the future land uses described in Section 4.4. However, Method A cleanup levels were applied to certain constituents for which Method B cleanup levels have not been promulgated (e.g., lead and petroleum hydrocarbons), and for constituents with unique considerations addressed by Ecology in development of the Method A values (e.g., arsenic).

PSLs for sediment were developed in accordance with the Sediment Management Standards (SMS); WAC 173-204) requirements.

5.1 GROUNDWATER

Groundwater PSLs were developed for those constituents previously detected in groundwater (see Table 9). Because human ingestion of constituents in groundwater is not a potential exposure pathway, as described in Section 4.5.2.2, potable groundwater cleanup levels were not developed for Site groundwater. However, cleanup levels protective of marine surface water were developed because Site groundwater discharges directly to Port Gardner Bay. Except for arsenic and total petroleum hydrocarbons (TPH), MTCA Method B marine surface water PSLs were developed in accordance with WAC 173-340-730(3) for detected constituents in groundwater. However, in the absence of an applicable marine surface water cleanup level, MTCA Method B potable groundwater cleanup levels were used for screening purposes in accordance with WAC 173-340-720(4). The MTCA Method A cleanup levels were used for arsenic and TPH (WAC 173-340-900 – Table 720-1). PSLs were adjusted to be no less than the

PQL in accordance with WAC 173-340-730(5)(c). Reporting limits for the groundwater analytical methods were used as PQLs.

Groundwater PSLs protective of indoor air were not developed. This exposure pathway will be assessed further based on the results of the RI groundwater monitoring. If VOCs or gasoline-range petroleum hydrocarbons are detected in groundwater at more than one location during the RI, groundwater PSLs protective of indoor air will be developed. Groundwater PSLs protective of marine surface water are shown in Table 10.

5.2 SOIL

Soil PSLs were developed for those constituents analyzed for in soil samples representing soil remaining at the Site following the interim action. The PSLs were developed to be protective of the potential receptors identified in Section 4.5.2.1. The receptors include humans and groundwater (as marine surface water). The proposed soil PSLs protective of human health and groundwater for the constituents detected in soil remaining at the Site are presented in Table 11. Soil PSLs protective of human health were developed using applicable human health risk assessment procedures specified in WAC 173-340-708. These procedures include development of PSLs based on the reasonable maximum exposure to occur at the Site. Ecology has determined that residential land use is generally the site use requiring the most protective PSLs and that exposure to hazardous substances under residential land use conditions represents the reasonable maximum exposure scenario. As discussed in Section 4.4, residential development of the Site is unlikely; however, hospitality services (hotel/restaurant) could occur within the southern portion of the Site. Therefore, soil PSLs protective of human health were developed based on the requirements under WAC 173-340-740 for unrestricted (residential) land use. Under WAC 173-340-740, Method B soil cleanup levels must be as stringent as:

- Concentrations established under applicable state and federal laws
- Concentrations protective of direct human contact with soil
- Concentrations protective of groundwater.

These criteria were considered during development of the soil PSLs.

Except for the toxics substance control act (TSCA), which establishes cleanup levels for PCBs, there are no soil PSLs established under applicable state or federal laws. Except for arsenic and TPH, standard MTCA Method B soil PSLs protective of direct human contact were determined in accordance with WAC 173-340-740(3) using Ecology's Cleanup Levels and Risk Calculations (CLARC) database. The MTCA Method A soil cleanup levels for unrestricted site use were used to address arsenic and TPH in soil. These cleanup levels are shown in Table 11. The cleanup level for benzo(a)pyrene will be used

for the sum of cPAHs using toxicity equivalency factors (TEFs) to calculate a toxicity equivalency quotient (TEQ) for total cPAHs in accordance with WAC 173-340-708(8)(e).

Soil PSLs protective of groundwater were determined using the fixed parameter three-phase partitioning model in accordance with WAC 173-340-747(4). Because groundwater is not a current or likely future source of drinking water and because it discharges to marine surface water, groundwater PSLs were developed based on marine surface water cleanup levels protective of human health and aquatic organisms in accordance with WAC 173-340-730. However, in the absence of an applicable marine surface water cleanup level, MTCA Method B potable groundwater PSLs were used for screening purposes. The three-phase model provides a conservative estimate of the concentration of a contaminant in soil that is protective of groundwater. Soil PSLs protective of groundwater as marine surface water are shown in Table 11.

To develop a single preliminary soil cleanup level for each constituent, the lowest protective criterion was selected as the PSL, as indicated by shaded values in Table 11, with the following exceptions:

- Soil cleanup screening levels may be adjusted to be no less than the PQL in accordance with WAC 173-340-730(5)(c) and/or no less than natural background levels in accordance with WAC 173-340-740(5)(c). The PQL for each constituent, based on ten times the current method detect limits (MDL), and background concentrations for metals, based on Puget Sound 90th percentile values (Ecology 1994), are shown in Table 11 and were compared to the soil PSLs protective of human direct contact and groundwater. No adjustments upward to the PQL or the natural background were necessary, except for thallium.
- For some constituents present in soil but not detected in groundwater at concentrations above their respective groundwater PSLs (i.e., cPAHs, PCE, carbazole, cadmium, mercury, and zinc), the soil criteria protective of human health (i.e., Method B direct human contact) was selected as the soil PSL regardless if it was higher than PSL based on groundwater protection. In accordance with WAC 173-340-747(9), if an empirical demonstration can be made that concentrations present in soil are not causing exceedances of the groundwater cleanup levels, then development of a soil criterion protective of groundwater is not necessary. WAC 173-340-747(9)(b) lists specific requirements for empirically demonstrating that measured soil concentrations will not cause an exceedance of applicable groundwater cleanup levels. Further discussion regarding compliance with these requirements will be included in the RI/FS.

5.3 SEDIMENT

Sediment PSLs were developed according to MTCA and SMS requirements. Two SMS criteria are promulgated by Ecology as follows:

- The marine sediment quality standard (SQS; WAC 173-204-320), the concentration below which effects to biological resources and human health are unlikely
- The sediment cleanup screening level criteria (CSL; WAC 173-204-520), the concentration above which more than minor adverse biological effects may be expected.

The SQS and CSL values have been developed for a suite of analytes that includes metals, PAHs and other SVOCs, PCBs, and ionizable organic compounds. The SQS are the most stringent SMS numeric criteria and represent the goal for sediment cleanups. The suite of SMS analytes and the associated SQS and CSL are listed in Table 12, as are dry weight equivalents to these criteria. The sediment data, including conventionals, will be presented comparing carbon-normalized results to the SMS criteria. In a separate table, the dry weight-normalized results will be compared to the Puget Sound Apparent Effect Threshold (AET) values, which are the dry weight equivalents to the carbon normalized SMS criteria.

6.0 CURRENT ENVIRONMENTAL SITE CONDITIONS

Current environmental conditions for the Site are evaluated in this section using analytical results for soil samples representing soil remaining at the Site following implementation of the interim actions discussed in Section 3.2, analytical results for groundwater samples collected during previous investigations and the interim actions, and analytical results for sediment samples collected during previous investigations.

6.1 UPLAND AREA

As defined by the AO, the upland area is the portion of the Site that falls outside the in-water portion of the Site. Because this area does not include the intertidal and subtidal areas, the discussion in this section is limited to current known environmental conditions of the Site soil, groundwater, and surface water. The Upland area was originally tidelands that have since been filled to create this upland area. The environmental conditions for soil, groundwater, and surface water are discussed by investigation areas (i.e., Area G, Area I, Area J, and Area M).

6.1.1 INVESTIGATION AREA G

Area G roughly represents the lease area where Ameron currently operates a concrete pole manufacturing facility. Much of the area around the existing concrete plant was paved at the time of its construction in 1973 (Pinnacle GeoSciences 2010). Prior to the concrete pole plant operations, Area G was the location of the former Hulbert Mill lumber yard and the site of the 1956 mill fire. Area G was completely paved by 1982, with the exception of the northwestern corner to the north of the lab and storage building (including Area G-1) and the area to the west of the pole polishing and pole finishing buildings.

During pre-interim action investigations, 58 soil samples were collected at varying depths from approximately 43 locations within Area G and 16 groundwater samples were collected from monitoring wells, soil borings, sumps, and a former settling pond. In 2006, an interim action excavation was implemented in the northwest corner of Area G (Interim Action Area G-1) in conjunction with the cleanup action being completed as part of the redevelopment of Area I. Sampling conducted adjacent to the excavated area indicated elevated levels of arsenic and lead still remain (Figure 22).

In 2007, an interim action was implemented southwest of Area G-1, spanning both Area G and I (Interim Action Area G-1a), to remove multi-colored concrete-like waste material and apparent sandblast grit encountered during construction of underground utilities south of the new Bayside Marine building. Sixteen (16) compliance monitoring samples were collected from the base and sidewalls of the final

excavations completed in Areas G-1 and G-1a. Analytical results for the compliance monitoring soil samples indicate occurrences of concrete and sandblast waste materials with arsenic, copper, and lead still remain in this area. Locations for samples representing soil remaining are shown on Figure 22. Analytical results for the groundwater samples collected prior to implementation of the interim action in Area G are summarized in data tables provided in Appendix A. Post-interim action groundwater conditions in Area G have not been evaluated.

6.1.1.1 Soil Quality

The principal soil quality issue in Area G is the nature of the fill materials. Concrete waste material and sandblast grit containing metals have been found in the fill in the areas investigated to date. The analytical results for soil remaining after implementation of the interim actions were compared to the PSLs discussed in Section 5.2 (see Tables 13 and 14). The principal issues include:

- **Arsenic.** Arsenic is present in soil samples containing sandblast grit and, in some cases, concrete-waste materials at concentrations ranging from 40 to 350 mg/kg. The known areas containing arsenic in fill occur along the eastern boundary of Interim Action Areas G-1 and G1a, to the west of the pole finishing building, and in one of the former concrete-lined settling ponds to the east of the pole polishing building (Figure 23). Arsenic was also detected at concentrations exceeding the PSL in a sample within the stormwater line backfill (80 mg/kg). The approximate area of fill potentially containing residual arsenic contamination is shown on Figure 23.

- **Copper**. Copper is present in soil remaining at concentrations exceeding the PSL (based on protection of groundwater) at two locations along the eastern boundary of Interim Action Area G-1 (215 mg/kg and 487 mg/kg) and at three locations in Interim Action Area G-1a (47 to 470 mg/kg), as shown on Figure 22. In addition, copper was detected at concentrations greater than the PSL at six other locations within Area G, but outside the Interim Action Area. The detected concentrations of copper in these samples range from 37 mg/kg to 514 mg/kg. Note that the detected concentrations are all below the interim action CUL of 2,960, which was based on direct contact.

- **Lead**. Lead is present in soil remaining at concentrations exceeding the PSL at one location within the G-1 Interim Action Area (312 mg/kg)] and one location within the G-1a Interim Action Area (473 mg/kg)] as shown on Figure 22. In addition, lead was detected at a concentration greater than the PSL in one sample location within Area G, but outside of the Interim Action Areas [ECI-K-1 (304 mg/kg)]. The lead exceedances have always been associated with sandblasting material in the sample.

- **Antimony**. Antimony was detected at a concentration (106 mg/kg) exceeding the PSL (32 mg/kg) at one location west of the pole polishing building in 1991. Sample ECI- K-1, was identified as sandblasting material and was collected at a depth of 4 ft, as shown on Figure 22.

6.1.1.2 Groundwater Quality

Groundwater sampling has been conducted in Area G during previous investigations conducted between 1989 and 2005 (Table 3). Groundwater samples were collected from soil borings, monitoring wells, sumps, and former settling ponds (see Tables A-1 through A-18, Appendix A). As shown on Figure 11, groundwater quality impacts have been limited to the following:

- **Arsenic.** Arsenic was detected above the PSL in two groundwater grab samples collected from borings along the stormwater line (soil borings G-FA-4 and G-FA-7). In addition, arsenic was detected in a second sampling of MW-2 in 1992 at 7.5 µg/L. The original sampling of this well in 1992 indicated arsenic below PSLs. The detected concentrations of dissolved arsenic above the PSL ranged from 7.5 µg/L to 10 µg/L. A settling pond sample obtained in 1989, prior to the closure of the pond by 1990 and the 2006 interim action in Area G-1 that removed the soil in and around the pond location, indicated an arsenic concentration in the water of less than 10 µg/L.

- **Copper**. Copper was detected in the former settling pond sample at 10 µg/L. However, the pond and the soil surrounding the pond have been removed. Otherwise, the groundwater and sump (interior plant wastewater basin) samples have not exceeded groundwater PSL.

- **SVOCs**: BEHP (a common laboratory contaminant) was detected in one groundwater sample collected from Area G at a concentration greater than the PSL [G-FA-7 (26 µg/L)], as shown on Figure 11.

6.1.1.3 Stormwater Quality

Stormwater from Area G primarily drains to the 12th Street Waterway through a subsurface drainage system consisting of catch basins and pipes, and some segments of trench drain, as shown on Figure 12. A trunk line (from SD-4 to the outfall) parallels the northern Site boundary and receives stormwater from smaller diameter lateral lines serving adjacent areas. The stormwater system serves portions of Area I, Area G, Area M, and the industries located on the adjacent property to the north. The trunk line and portions of the lateral lines are tidally influenced, and the trunk line typically contains seawater at high tide.

Stormwater samples were collected from two catch basins [SD-5 (sample identified as CB-2) and SD-8 (sample identified as CB-3)] in Area G in March of 2008 (Table A-6, Appendix A). The catch basin locations are shown on Figure 12. The samples were analyzed for total and dissolved metals. Total zinc and dissolved zinc were detected in the sample collected from SD-8/CB-3 at concentrations of 3,230 µg/L and 1,640 µg/L, respectively, which are greater than the Ecology Industrial Stormwater General Permit (ISGP) benchmark of 117 µg/L. The sample collected from SD-5/CB-2 had a total zinc concentration of 250 µg/L, which also exceeds the benchmark. Concentrations of other total and dissolved metals in both samples met permit benchmarks.

Ameron obtained coverage under the ISGP in May 2009 and has since collected quarterly stormwater samples as required by the permit. Analytical results for the quarterly samples are shown in Table 15. A new ISGP was issued by Ecology and became effective on January 1, 2010. The new permit has different monitoring requirements, benchmarks for evaluating the potential for water quality impacts, and required responses for exceeding benchmarks.

Two samples were collected at SD-9 (located west of the manufacturing building; Figure 12) under the old ISGP. Those samples met permit benchmarks for turbidity, pH, and oil and grease. Both samples exceeded the total zinc benchmark of 117 µg/L, but neither sample exceeded the action level of 372 µg/L (Table 15). Ameron reportedly conducted Level 1 responses for the zinc benchmark exceedances as required by the permit.

6.1.1.4 Catch Basin Sediment Quality

During the March 2008 stormwater sampling event, a sediment sample was collected from SD-8 (sample identified as CB-3). The catch basin sediment analytical results were compared to SMS SQS and CSL cleanup standards as the most applicable criteria for these data because stormwater discharges to Puget Sound. Exceedances of SQS and CSL criteria for heavy metals (arsenic, cadmium, copper, chromium, lead, and zinc) were found in the sediment at SD-8/CB-3 (Table A-15, Appendix A). It is also noted that diesel-range petroleum hydrocarbons were detected at 1,800 mg/kg and lube oil petroleum hydrocarbons were detected at 3,000 mg/kg in this sample.

6.1.2 INVESTIGATION AREA I

Area I was subjected to interim cleanup action that was completed in 2006/2007 as part of the Craftsman District/Bayside Marine redevelopment (Landau Associates 2010). Prior to the cleanup, 136 soil samples were collected at varying depths at approximately 112 locations within Area I and 6 groundwater samples were collected from monitoring wells and soil borings. In 2005, the area was subdivided into 11 interim action areas and an interim action implemented in each area to remove soil containing contaminants above the interim action CULs (Landau Associates 2008). One hundred forty-six (146) compliance monitoring soil samples were collected from the base and sidewalls of the final excavations completed in Area I. Confirmation soil samples were analyzed for those constituents that previously exceeded the interim action CULs within a specific interim action area. Analytical results for the confirmation soil samples and analytical results for 8 samples collected in areas not excavated during the interim action are summarized in Tables 13 and 14. These analytical results are representative of soil remaining in Area I. Locations for samples representing soil remaining are shown on Figure 22.

Analytical results for the groundwater samples collected prior to implementation of the interim action in Area I are summarized in data tables provided in Appendix A and shown on Figure 11.

6.1.2.1 Soil Quality

The analytical results for soil remaining after implementation of the interim actions were compared to the PSLs discussed in Section 5.2 (see Tables 13 and 14). Based on this comparison, current environmental conditions for soil within Area I can be described as follows:

- **Arsenic.** Arsenic is present in soil remaining at concentrations exceeding the PSL at three locations (I5-S3D, I5-AC-NWALLA, and I5-AC-NWALLB) along the northern boundary of Interim Action Area I-5, as shown on Figure 22. The excavation was limited to the north by the property boundary. Arsenic was detected at these locations at concentrations ranging from 130 mg/kg to 1,730 mg/kg. In addition, crushed rock base course material imported as subgrade support for the esplanade at the head of the 12th Street channel (western edge of Area I) was determined to contain arsenic exceeding the PSL at concentrations ranging from 29 mg/kg to 126 mg/kg. Accessible portions of the base course material were removed; however, about the western 20 ft of the affected base course material was already covered by the concrete esplanade constructed for public access along the shoreline and, as a result, the affected base course beneath the esplanade was left in place and is contained by this structure (Figure 22). Arsenic exceedances in Area G-1a (which is located partially within Area I) were discussed in Section 6.1.1.1.

- **Copper**. Copper is present in soil remaining at concentrations exceeding the PSL along the northern boundary of the I-5 Interim Action Area and at a few scattered locations throughout Area I. As previously discussed, the interim action screening level for copper (2,960 mg/kg) was based on direct contact. Based on investigation reports received following the interim actions, copper has been detected in groundwater at concentrations greater than the screening level; therefore, the PSL for copper (36 mg/kg) is based on protection of groundwater (as discharge to surface water). With the exception of one location along the northern boundary of Area I-5 (3,070 mg/kg at I5-AC-NWALLA), the detected concentrations of copper that exceed the PSL for soil remaining in this area are less than the interim action screening level and range from 36.6 mg/kg to 283 mg/kg. Copper exceedances in Area G-1a (which is located partially within Area I) are discussed in Section 6.1.1.1.

- **Lead**. Lead is present in soil remaining at concentrations exceeding the PSL at one location along the northern boundary of Interim Action Area I-5a [I5-AC-NWALLA (2,270 mg/kg)]. Lead exceedances in Area G-1a (which is located partially within Area I) are discussed in Section 6.1.1.1.

6.1.2.2 Groundwater Quality

Evaluation of groundwater conditions in Area I relies on groundwater samples collected during groundwater investigations conducted in 1992 (HC-MW02 and HC-MW03) and in 2004 (P11 and P12). Groundwater samples have not been collected from Area I since the interim actions were completed; however, it would be expected to be better following soil cleanup. Based on the comparison of analytical

results for the groundwater samples collected prior to the interim action to PSLs discussed in Section 5.1 (data tables in Appendix A), environmental concerns for groundwater within Area I are limited to copper. Dissolved copper was detected in groundwater at a concentration above the PSL at two locations [HC-MW02 (12 µg/L) and HC-MW03 (38 µg/L)] prior to implementation of the interim action in Area I.

6.1.2.3 Stormwater Quality

No stormwater quality data are available for Area I. However, the outfall for the trunk line that conveys stormwater from portions of Area G, Area M, Area I, and the property immediately north of the Site discharges in the northwest corner of Area I. Since 2007, the trunk line has conveyed stormwater from the parking area to the south of the new Bayside Marine building and the roadway to the west of the Bayside building, but has only serviced these areas since 2007.

A stormwater discharge sample (ECI-Area-R) was collected in 1991 by ECI from the outfall in the northeast corner of the 12th Street Channel. Trace levels of chloroform and acetone were detected in the stormwater sample; in a later stormwater sample collected in 1992 by AGI (Sample R), chloroform was still detected, but not acetone. Although cleanup levels were not developed for either compound, AGI concluded that concentrations were low enough not to be considered an environmental threat, based on drinking water standards (AGI 1992).

In 1997, Landau Associates collected a stormwater sample from the outfall in the northeastern corner of the 12th Street Channel. The sample was analyzed for VOCs, SVOCs, and pH (Table A-6). Concentrations of organic compounds below National Pollutant Discharge Eliminary System (NPDES) benchmark values under the industrial general permit were detected in the sample.

6.1.3 INVESTIGATION AREA J

Soil samples were collected at varying depths at approximately 65 locations and 8 groundwater samples were collected from soil borings and monitoring wells during previous environmental investigations within Area J. Interim action was conducted at three locations based on these data, consisting of the 1993 interim action conducted during construction of the MSRC building and two areas (J-1 and J-3) addressed during the North Marina Redevelopment interim action conducted in 2006; Area J-2 was cleaned up and reported as part of the North Marina Phase I VCP site (Landau Associates 2008).

Forty-two (42) confirmation soil samples were collected from the base and sidewalls of the interim action excavations completed in Area J, including the 1993 interim action. Confirmation soil samples were analyzed for those constituents that previously exceeded the interim action screening levels within a specific interim action area. Analytical results for the confirmation soil samples and analytical

results for three soil samples collected in areas not excavated during the interim actions are summarized in Tables 13 and 14. Analytical results for these samples represent soil remaining in Area J. Locations for samples representing soil remaining in Area J are shown on Figure 22. Analytical results for groundwater samples collected during the previous investigations are summarized in data tables provided in Appendix A and shown on Figure 11.

6.1.3.1 Soil Quality

The analytical results for soil remaining after implementation of the interim action were compared to the PSLs discussed in Section 5.2 (see Tables 13 and 14). Based on this comparison, current environmental conditions for soil within Area J (Figure 22) can be described as follows:

- **Arsenic.** Arsenic is present in soil at one location (J3-S1) along the eastern boundary of Interim Action Area J-3. The excavation was not continued to the east because it would have encroached on the Ameron leasehold. Compliance monitoring samples were not collected from the base of Area J-3 because the affected soil and debris extended to a significantly greater depth than the excavation, so arsenic concentrations may exceed the PSL in deeper soil within the Area J-3 footprint. Additionally, arsenic-affected crushed rock from the esplanade vicinity was placed within the eastern portion of Area J-3 for containment beneath the pavement.
- **cPAHs.** Although not detected above the PSL in compliance monitoring samples collected from the Area J-3 excavation, cPAHs were present above the PSL in a characterization sample collected within the cleanup area (J-GC-6; Figure 17). It is possiblethat cPAH concentrations exceed the PSL in the affected soil remaining below the depth of excavation for the interim action conducted in Area J-3.
- **Copper.** Copper was detected at a concentration greater than the PSL in one compliance monitoring location in Interim Action Area J-1 (J1-B4) and one compliance monitoring location in Interim Action Area J-3 (J3-S1). In addition, copper was detected in three characterization samples collected from areas that were not subsequently excavated (J-GC-3, J-GC-7, and J-GC-9). The detected concentrations of copper in soil remaining in Area J range from 36.3 mg/kg to 287 mg/kg. As discussed previously, the interim action screening level for copper (2,960 mg/kg) was based on direct contact and was not exceeded in any of the compliance monitoring samples. The soil cleanup screening level for copper (36 mg/kg) is based on protection of groundwater (as discharge to surface water).

6.1.3.2 Groundwater Quality

Evaluation of groundwater quality in Investigation Area J relies on groundwater samples collected during investigations conducted prior to implementation of the interim actions in this area. Based on a comparison of analytical results for these groundwater samples to the PSLs discussed in Section 5.1 (data tables in Appendix A), environmental conditions for groundwater within Area J are described below.

- **Arsenic.** Arsenic was detected in groundwater at a concentration slightly above the PSL at one location in Area J (J-2 at 6 µg/L), shown on Figure 11.
- **Copper.** Copper was detected at concentrations greater than the PSL at two locations in Area J (J-1 at 4 µg/L and HC-MW01 12 at µg/L). Note that monitoring well HC-MW01 is located within Area J, but outside of the Site boundary.
- **Petroleum hydrocarbons.** Diesel-range and lube oil-range petroleum hydrocarbons were detected in a product sample collected from the water surface in an excavation trench for the sanitary sewer line being installed as part of the Craftsman District construction (J-MSRC). The detected concentrations of diesel (390,000 mg/kg) and lube-oil (410,000 mg/kg) were reported in solids units as is customary for product samples. Based on the product analytical results, the excavation was continued and all visual evidence of product was removed from the excavation water surface with absorbent pads. Soil samples collected from the excavation sidewalls and bottom did not contain concentrations of petroleum hydrocarbons exceeding the PSLs. Additional groundwater sampling has not been conducted in this area.

6.1.3.3 Stormwater Quality

No stormwater quality data have been collected in Area J. Stormwater from Area J primarily drains to the southeast corner of the12th Street Waterway through a subsurface drainage system consisting of catch basins and conveyance pipes, as shown on Figure 12. A sediment sample was collected in the vicinity of this outfall for the North Marine West End RI (RI-SED-1), and no exceedances of sediment PSLs were detected (see Tables 5 and 6).

6.1.4 INVESTIGATION AREA M

Previous investigations in Area M include soil sampling from varying depths at approximately 18 locations and 8 groundwater samples collected from monitoring wells and soil borings. In 2006, an interim action was implemented in Area M to remove soil containing cPAHs above the interim action CULs (Landau Associates 2008) within a planned utility corridor between West Marine View Drive and the Craftsman District. Eleven (11) compliance monitoring soil samples were collected from the base and sidewalls of the Area M-1 excavation. Compliance monitoring soil samples were analyzed for cPAHs. Analytical results for the compliance monitoring soil samples and analytical results for 18 soil samples collected in areas not excavated during the interim action are summarized in Tables 13 and 14 and represent soil remaining in Area M. Locations for samples representing soil remaining are shown on Figure 22. Analytical results for the groundwater confirmation samples and for groundwater samples collected prior to implementation of the interim action are summarized in data table provided in Appendix A.

6.1.4.1 Soil Quality

The analytical results for soil remaining after implementation of the interim action were compared to the PSLs discussed in Section 5.2 (see Tables 13 and 14). Based on this comparison, current environmental conditions for soil within Area M can be described as follows:

- **cPAHs.** cPAHs are present in soil remaining at concentrations exceeding the PSL at one location (M1-S1) along the northern sidewall of Interim Action Area M-1. The detected concentration of cPAHs at this location is 1 mg/kg. cPAHs were not detected at any of the 18 soil sample locations outside of Interim Action Area M-1 at concentrations greater than the laboratory reporting limits.
- **Copper.** Copper was detected at a concentration greater than the PSL in one location (M-3). The detected concentration of copper at this location is 85.3 mg/kg.
- **Petroleum hydrocarbons.** In 1992, a diesel-range petroleum hydrocarbon was detected at a concentration of 7,160 mg/kg in a surface soil sample collected in the northwestern portion of Area M. This sample was collected from a former drum storage area (ECI-B-1). Earth Consultants describes the affected soil as being "limited to a strip two inches wide and about three feet long" (ECI 1992). Petroleum hydrocarbons were not detected at concentrations greater than the PSLs at any other location tested within Area M. This area has since been developed by Ameron into paved holding bins for concrete slurry waste.

6.1.4.2 Groundwater Quality

Groundwater quality in Investigation Area M relies on groundwater samples collected during groundwater investigations that were conducted prior to implementation of the interim action. Based on a comparison of analytical results for these groundwater samples to the PSLs discussed in Section 5.1 (data tables in Appendix A), environmental conditions for groundwater within Area M are described below.

- **Arsenic.** Arsenic was detected in groundwater at a concentration above the PSL at one location in investigation Area M (M-2 at 14 µg/L), shown on Figure 11. Approximately 400 tons [270 cubic yards (yds^3) of soil were removed from this area during the interim action and groundwater conditions have not been reassessed since completion of the interim action.
- **Vinyl Chloride.** During a 2005 sampling event, vinyl chloride was detected in groundwater at a concentration of 13 µg/L at one location, soil boring M-3, as shown on Figure 11. The detected concentration exceeds the PSL. The source of the vinyl chloride contamination is unknown.

6.1.4.3 Stormwater Quality

A stormwater sample was collected from catch basin SD-4 (sample identified as CB-1) in Area M in March of 2008 (Table A-6, Appendix A). Dissolved zinc was detected at a concentration of 380 µg/L, which is slightly greater than the Ecology Industrial Stormwater general permit criteria (372 µg/L). One

stormwater sample has been collected at SD-15 (located northwest of the Ameron sublease building; Figure 12) under Ameron's ISGP (Table 15). The sample met permit benchmarks for all parameters.

6.2 IN-WATER AREA

As described in Section 3.1.3, three sediment investigations have been conducted in the 12th Street Channel in advance of it being redeveloped into the 12th Street Yacht Basin that included collection of sediment samples within the in-water portion of the Site. These investigations consisted of sampling and analysis of 18 composite samples collected from 39 sediment cores and one surface sediment sample. The sediment sampling locations are shown on Figure 18. In addition and as described in Section 3.1.3, three surface sediment samples were collected near the outfall during a 1997 investigation resulting from an individual having an adverse skin reaction to either the surface sediment or surface water near the outfall. The exact locations of these samples are not known and the analytical parameters were selected to identify a potential cause for the skin reaction and not to evaluate sediment quality. Samples from this investigation are, therefore, not discussed in this section.

Results of investigations completed prior to dredging indicate that sediment was generally of good quality with limited exceedances of the PSLs. A comparison of the analytical results for the sediment samples to the sediment PSLs discussed in Section 5.3 (Table 5) indicates that surface sediment at the one sampling location (RZA-C-2) and subsurface sediment at one location (RZA-C-6) in the 12th Street Yacht Basin exceeded the sediment PSL (i.e., the SQS and CSL) for mercury. Surface sample ECI-Area-R exceeded the SQS for zinc. The SQS for benzyl butyl phthalate was exceeded at RZA-C-2. Sediment at one subsurface location (RZA-C-7) exceeded the sediment the SQS for di-n-butyl phthalate. None of the AET-based dry weight PSLs were exceeded in the sediment quality data, although the reporting limits for a few analytes exceeded their PSLs.

The in-water portion of the Site has been dredged (the approximate limits for a portion of the dredging that occurred within the 12th Street Marina in 2005 are shown on Figure 3) and much of the sediment characterization has been associated with disposal/relocations requirements of the dredged sediment, with the exception of the surface sample collected by SAIC for Ecology in a study covering sediment quality for the entirety of Port Gardner Bay (SAIC 2009). Surface sediment at the location of the SAIC sample meets the PSLs, and is the only Site sediment sample that represents current sediment quality conditions.

7.0 DATA GAPS

The Site has undergone a significant amount of characterization and cleanup. The existing data were evaluated to identify data gaps in the nature and extent of contamination. Information from the historical research identified several potential areas of contamination resulting from historical Site operations. The data gaps will require further investigation to confirm that adequate data is obtained to fully delineate the nature and extent of contamination, to develop and evaluate cleanup action alternatives, and to select a preferred cleanup action alternative. General data gaps are listed below. This section describes data gaps identified for site-wide groundwater quality, and data gaps identified for each of the investigation areas.

General gaps for groundwater are as follows:

- **Site-wide groundwater quality:** Existing data for groundwater quality represents pre-interim action Site conditions and may not reflect current Site conditions, particularly in areas that have undergone cleanup.

- **Site-wide groundwater flow:** Site-wide groundwater flow conditions have not been evaluated.

- **Focus area groundwater quality:** Historical activities and documented releases to Site soil may have impacted groundwater quality. Additionally, vinyl chloride groundwater contamination needs to be further characterized in the southeast portion of the Site.

- **Groundwater quality at the downgradient Site boundary:** Groundwater quality conditions at the western boundary of the upland portion of the Site need to be evaluated to identify potential impacts of contaminants in groundwater discharging to the 12th Street Yacht Basin.

General data gaps for soil are as follows:

- **Delineation in areas of known soil contamination:** Several areas have documented soil contamination (G-1, G-1a, I-5, J-3) that were not fully addressed during previous Site interim actions.

- **Site-wide fill soil quality:** The existing data indicate that soil quality (outside of the interim action areas and other focused areas) is generally of good quality. However, soil quality has not been evaluated in some areas of the Site.

- **Soil Quality in areas of historical site use:** Past specific site uses in certain areas may have resulted in soil quality impacts.

General data gaps for sediment are as follows:

- **Sediment quality at stormwater outfalls:** Three stormwater outfalls drain the Site and two stormwater outfalls drain the property adjacent to the north of the 12th Street Yacht Basin. With the exception of one sample collected in 2008 by SAIC, sediment quality in the 12th

Street Yacht Basin has not been evaluated following extensive dredging completed prior to development of the yacht basin.

7.1 SITE WIDE GROUNDWATER QUALITY

Groundwater quality samples collected to date have indicated limited exceedances of the PSLs for metals (copper and arsenic), vinyl chloride (in one sample in the southeastern corner of the Site), and BEHP (in one sample along the northern boundary of the Site). Groundwater quality conditions at the Site were not evaluated following the completion of extensive interim actions.

The soil PSL for copper (36 mg/kg) is based on protection of groundwater because three exceedances of the copper groundwater PSL occurred in groundwater quality samples collected from the Site prior to implementation of the interim actions. These groundwater exceedances occurred at different locations and a second round of sampling was not conducted at any of these locations. Because the data for these groundwater samples were received after implementation of the interim action, the interim action CUL (2,960 mg/kg) was based on direct contact. As discussed below, the need for additional soil characterization for copper is dependent on whether groundwater quality monitoring indicates that copper groundwater contamination remains at the Site following the interim action. Arsenic was detected at concentrations greater than the PSL in groundwater samples collected from Areas G, J, and M prior to implementation of interim actions.

Groundwater quality samples were not collected for arsenic and copper at the Site following implementation of the interim actions. As a result, it is not known whether the interim action achieved groundwater PSLs for arsenic and copper. Because the interim actions largely removed arsenic soil contamination throughout most of the Site, the interim action likely reduced the arsenic concentration in groundwater and may have achieved compliance with the arsenic groundwater PSLs. Arsenic-impacted soil remains along the northern boundary or Interim Action Area I-5, in Interim Action Areas G-1 and G-1a, and in other locations in Areas G, I, and J. Additional investigation is needed in these areas as discussed below.

The impact of the interim action on the groundwater copper concentration is less certain. The interim action may have removed a sufficient amount of the copper contamination source to achieve the copper groundwater PSLs, though a specific source has not been identified. Additionally, the copper groundwater exceedances are based on single water quality samples collected from each location, so the exceedances are not confirmed through multiple rounds of groundwater monitoring. As a result, the current status of copper groundwater concentrations at the Site is a data gap that needs to be addressed prior to determining whether copper concentrations in soil need to be further evaluated. Soil samples collected during the RI will be analyzed for copper.

7.2 AREA G

Soil contamination was identified within fill around the stormwater trunk line at the northern boundary of Area G during a storm line repair project (Landau Associates 2005b). In addition, residual metals contamination was identified during Interim Actions in Area G-1 and G-1a and at other locations within Area G. Based on the investigations and cleanup conducted to date the following data gaps have been identified for Area G.

- Apparent sandblast grit and concrete-like waste material remain in fill along the eastern boundary of the Area G-1 and Area G-1a interim action area excavations. The vertical and lateral extents of these materials have not been fully defined in these areas and previous characterization results indicate that these materials may contain concentrations of metals that are greater than the PSLs. It is anticipated that the western extent of the remaining waste materials in Area G-1a may generally lie to the east of the crest of the historic soil berm constructed to contain the 1973 hydraulic fill placed in Area I, as shown on Figure 23. The eastern extent of contamination in this area is likely bounded by the edge of pavement west of the manufacturing building and the western edge of the lab/storage, pole polishing, and pole finishing buildings.

- Contamination (cPAHs) was identified within the stormwater trunk line backfill along the northern boundary of Area G. The investigation results indicated that the soil contamination was either very localized around the stormwater line break or originated on the property to the north and only extended a short distance onto the Ameron leasehold. The northern extent of contamination has not been delineated. It was also noted that discolored material encountered at a number of locations and characterized as an apparent concrete waste material was not bounded during the investigation. The apparent concrete waste material was also encountered during recent grading and paving to the north of the manufacturing building to the east and west of the oil-affected area.

- Arsenic and copper were detected at concentrations greater than the PSLs in a soil sample collected from within one of three former lined settling basins on the east side of the pole polishing building. It is expected the contamination is contained to backfill of the former basin.

7.3 AREA I

As previously discussed, soil contamination in Area I was largely remediated during the North Marina Redevelopment interim action. As a result, only limited data gaps remain in this area, consisting of the following:

- Arsenic, copper, and or lead were detected at concentrations greater than the PSLs in compliance monitoring samples collected along the northern boundary of Interim Action Area I-5 (northern property boundary)

- Arsenic, copper, and/or lead were detected at concentrations greater than the PSLs in compliance monitoring samples collected in Interim Action Area G-1a (which is located partially in Area I). Apparent sandblast grit and concrete-like material were observed in the

sidewalls of the Area G-1a excavation; the extent of these materials has not been delineated to the west. In addition, petroleum hydrocarbons were encountered in the southeastern corner of the G-1a excavation.

- Arsenic-containing crushed rock base course material is present beneath the esplanade at the head of the 12th Street Yacht Basin and the potential impact of this material on groundwater quality has not been evaluated.

Four Area I monitoring wells were sampled prior to implementation of the interim action. Copper was the only parameter detected at concentrations greater than the PSLs in samples collected from these locations. As previously described, groundwater characterization is needed to evaluate general post-interim action groundwater conditions and to evaluate the potential impacts of the arsenic-containing crushed rock base course material.

7.4 AREA J

The following data gaps have been identified in Area J:

- Construction debris and associated arsenic and cPAH-contaminated soil, and recently placed arsenic-containing crushed rock base course material, are located beneath the pavement in Area J-3. The construction debris extends up to 17 ft BGS in Area J-3 and the potential impact of these materials on groundwater quality has not been evaluated downgradient of this area.
- A wood refuse burner associated with the former mill operations was located in the northern portion of Area J. Interpretation of historical aerial photographs suggests that bottom ash from the wood refuse burner and granular material may have been placed at the base of the smoke stack for the boiler house and the wood refuse burner, which were constructed over the intertidal area. Because the tide flat surface is anticipated to be approximately 28 ft BGS, and bottom ash could be present at this surface, the boiler ash may not be present in thick enough deposits to extend above the soil point of compliance for direct contact (15 ft BGS) and, as a result, any wood refuse burner ash may only be a potential groundwater quality concern. Neither soil (deeper than 4 ft BGS) nor groundwater has been evaluated in the vicinity of this feature.
- Petroleum hydrocarbons were observed in an excavation conducted at the north end of the former MSRC building during construction for the Craftsman District utilities. The petroleum hydrocarbon contamination was encountered in shallow soil and groundwater in the vicinity of the former boiler house for the saw mill. Impacted soil and product were excavated from this area, but groundwater conditions have not been evaluated.
- The Historical Report (Pinnacle GeoSciences 2010) indicates that the 1993 Kleinfelder interim action excavation was located approximately 150 ft north and slightly east of the location presented on Site figures prepared by Kleinfelder and presented in the Interim Action Report prepared by Landau Associates. As a result, groundwater samples collected in the area where the 1993 interim action was reported to have been completed are not representative of groundwater conditions downgradient of the 1993 interim action.

7.5 AREA M

The following data gaps have been identified in Area M:

- An oil house and boiler house associated with the former mill operations were identified to the northwest of the former mill office and to the south of the Collins Building, as shown on Figure 23. Groundwater conditions have not been evaluated downdgradient of these areas.
- Subsurface conditions downgradient of the south end of the Ameron subleased building (located at the north end of Area M) have not been evaluated. This portion of the building has continuously operated as a body shop for over 30 years.
- Subsurface conditions downgradient of the Port-occupied and Port-leased buildings and the former warehouse (located west of the northern of the two southern Area M buildings and formerly used for metal casket finishing, including spray painting) at the south end of Area M have not been evaluated. The northern of the two buildings was operated as a marine repair services over a long period of time. Vinyl chloride was detected in groundwater during a previous Site investigation downgradient of the southern of the two buildings in this area.

7.6 IN-WATER AREA

The in-water portion of the Site was dredged in 2005 (shown on Figure 3). As a result, most, if not all, of the sediment associated with previously identified exceedances of the sediment PSLs have likely been removed. However, two stormwater outfalls discharge from the east shore of the in-water area and two outfalls discharge from the north shore, as shown on Figure 12. Sediment quality data have not been collected from the vicinity of these outfalls, or of the post-dredging sediment surface with the exception of one sample collected by SAIC in 2008 that did not exceed the PSLs.

8.0 REMEDIAL INVESTIGATION

As described in Section 7.0, further investigation of Site soil, groundwater, stormwater sediment, and marine sediment is needed to fill the data gaps. Results from previous soil investigations and compliance monitoring associated with the interim actions conducted are considered sufficient for characterizing soil quality for much of Area I and Area J, except as described below in Section 8.1. The RI soil characterization will largely focus on those areas with remaining contamination that requires additional delineation and those areas not previously investigated. Post-interim action groundwater and post-dredging sediment conditions have not been evaluated at the Site. As a result, a Site-wide groundwater evaluation will be conducted and sediment quality will be evaluated throughout the in-water portion of the site during the RI.

Investigation locations were selected for two purposes to fill the remaining data gaps: 1) general characterization, and 2) focused investigation of specific areas where contamination was previously detected or is expected. General characterization will be conducted to evaluate whether undocumented Site activities have caused releases of hazardous substances to shallow soil, to evaluate the quality of fill used to create Site uplands, and to characterize Site geology. Focused investigations will be implemented in areas where contamination was encountered during previous investigations, and at locations where current or historic Site features and activities suggest that releases of hazardous substances may have occurred.

General characterization borings will contain "GC" in the boring and sample designations. Focus area borings will contain "FA" in the boring and sample designations. Monitoring wells will be numbered sequentially starting with "RI-MW-1." The rationale for selecting sample locations is discussed below; location-specific information is presented in Table 16 and is discussed in the following sections.

Additional delineation, consisting of visual observation and possibly analytical testing, may be conducted if potential contamination is observed at proposed investigation locations. For the purposes of this investigation, "potential contamination" is defined as the presence of:

- Free-phase petroleum product, material with moderate to heavy sheen, staining, or odor
- Soil or groundwater with moderate to heavy visible free product film
- Soil containing waste materials such as blasting sand and concrete-like waste
- Soil with visible staining
- Soil with elevated photoionization detector (PID) readings of VOCs.

In the event that any of these conditions are encountered during field activities, Landau Associates' field personnel will contact Landau Associates' project manager (Larry Beard) for further

direction. The Landau Associates' project manager will confer with the other PLP consultants and Ecology in determining how to address the encountered condition, subject to the availability of the other parties.

If any archaeological resources are discovered during RI field activities including any excavations (although none are anticipated), work will be stopped immediately and Ecology, the Department of Archaeology and Historic Preservation (DAHP), the City of Everett Planning and Community Development Department, and the Tulalip Tribes Cultural Resources Department will be notified by the close of the current business day. An archeologist retained by Landau Associates will arrange an onsite inspection and invite the parties to attend. The archaeologist will document the discovery and provide a professionally documented site form and report to the above-listed parties. In the event of any discovery of human remains, work will be immediately halted in the discovery area, the remains will be covered and secured against further disturbance, and the Everett Police Department and Snohomish County Medical Examiner will be immediately contacted, along with the DAHP Physical Anthropologist and authorized Tribal representatives. A treatment plan by the archaeologist will be developed in consultation with the above-listed parties consistent with RCW 27.44 and RCW 27.53 and implemented according to WAC 25-48.

8.1 SOIL INVESTIGATION

The RI soil investigation will largely focus on shallow soil, although limited characterization of deeper soil will be conducted in investigation Area J as part of a focus area investigation and in Areas G, I, and M as part of general characterization to evaluate the quality of fill placed at the site during various events. As shown on Figure 24, 48 proposed soil boring and test pit locations are distributed throughout the Site.

The proposed scope for the RI soil investigation is discussed below by investigation area. It should be noted that proposed soil sampling locations are approximate and may be revised, as necessary, due to conditions encountered in the field. General characterization and focus areas will be investigated as described below in Section 8.1.2 and 8.1.3, respectively. Analytical testing is summarized in Section 8.1.4. Detailed procedures for soil sample collection and analyses, and quality assurance, are provided in the Upland SAP provided in Appendix F of this work plan.

8.1.1 GENERAL CHARACTERIZATION

As shown on Figure 24, general characterization borings are proposed in areas where previous characterization has not been conducted. In some cases, these are combined with delineating the extent of contamination in areas where contamination has previously been identified. General characterization sampling will also be conducted in areas that were unpaved following the onset of post-saw mill industrial activities at the Site. A 150-ft grid has been added to the figure for reference. It should be noted that the proposed boring locations are approximate and may be adjusted based on observed site conditions, available access, and the location of utilities. At each soil boring location being used for general characterization purposes, except as otherwise noted in Table 16, the boring will be extended to 12 ft BGS and samples for laboratory analysis will be collected from the ground surface to 3 ft BGS. However, if soil samples are collected in paved areas or in areas where recent surface filling and grading has been conducted, sample collection will begin immediately below the base course layer. The first sample below the base course layer will be identified as the 0 to 1 ft sample.

Three intervals will be sampled at each boring location: 0 to 1 ft, 1 to2 ft, and 2 to 3 ft BGS. The top interval (0 to 1 ft) will be immediately analyzed by the laboratory for selected metals (antimony, arsenic, cadmium, chromium, copper, lead, mercury, and zinc) and cPAHs. Samples from selected areas will also be analyzed for gasoline- and/or diesel-range TPH based on field screening. The two remaining intervals (1 to 2 ft and 2 to 3 ft) will be initially archived at the laboratory pending a review of the results of the top interval. The second interval (1 to 2 ft) will be analyzed for those constituents that are above PSLs in the top interval. Similarly, the third interval (2 to 3 ft) will be analyzed for constituents that are above PSLs in the second interval. Deeper soil (greater than 3 ft) will be sampled at selected locations as described in Table 16.

Because cPAHs and TPH have holding times of 14 days, the analytical laboratory will be required to provide cPAHs and TPH results of the top sample interval with sufficient time to analyze subsequent intervals within holding time. To meet this goal, the laboratory may have to expedite their cPAH and TPH analysis and reporting. If analysis indicates the presence of petroleum hydrocarbons or cPAHs at concentrations greater than the PSLs in the first interval, then both the second and third interval samples will be extracted to extend the holding times for these intervals.

If access limitations are encountered at a proposed sampling location, the sample may be collected from a nearby location. Each general characterization boring will generally be advanced to approximately 12 ft BGS (depending on asphalt/base course thickness), or to the depth indicated in Table 16, though samples will generally only be collected from the upper 3 ft. However, if visual evidence of contamination is present at the planned boring depth, the exploration will be extended deeper

to adequately delineate the depth of contamination. Borings in some general characterization sample locations will be advanced to the depth of the former tideflat surface to evaluate quality of fill placed during separate filling events, as described in Table 16, and to delineate Site geologic conditions.

A Site reconnaissance will be conducted prior to intrusive activities to identify obstructions to planned boring locations (i.e., utilities, equipment, materials), and to evaluated the condition of certain features that may affect the approach to or need for investigation at that location (e.g, stormwater sumps). If practical, boring locations will be relocated to accommodate obstructions. However, if locations are obstructed by equipment or materials, and a viable alternative location is not available nearby, the Port will coordinate with applicable tenants to move the obstruction to allow sampling.

8.1.2 FOCUS AREA CHARACTERIZATION

We will characterize conditions at identified focus areas of the Site for the following purposes:

- To better delineate contamination identified during previous investigations
- To investigate environmental conditions associated with historical features and operations not sufficiently characterized in previous investigations

Focus area sampling locations, the rationale for sampling, the planned sampling intervals, and planned analytical testing are described in Table 16 and the focus area soil sample locations are shown on Figure 24. Both soil and groundwater focus areas have been identified. Groundwater focus areas are described in Section 8.2.

8.1.2.1 Area G

In Area G, the soil investigation will focus primarily on characterization of shallow soil as follows:

- Test pits will be excavated in Area G-1, Area G-1a, and west of the pole polishing building to investigate the depth of any remaining soil contamination and the nature of the subsurface fill materials. Sandblast grist and concrete-like waste were observed in this area during previous investigations.
- Borings will be drilled between the manufacturing building and the unpaved Area G-1 to bound any residual contamination in G-1 to the east, and to investigate the fill below the paved area in the area of the mill operations and fire.
- One boring will be drilled in the northern portion of Area G-1 where confirmation samples were not collected following the interim action excavation.
- Borings will be drilled in each of the former settling basins on the eastern side of the lab/storage building
- Soil borings will be drilled along the stormwater alignment at the northern boundary of Area G, where fill containing waste material has been identified (concrete-like waste material and oil-affected area)

A total of 6 test pits will be completed in Area G. In addition, 16 soil borings, including focused areas and general characterization locations, will be advanced in Area G using direct-push drilling techniques. Two soil boring will be advanced on the property adjacent to the north Site boundary to bound the northern extent of the oil-affected area. Proposed soil sampling locations are shown on Figure 24. Soil sample collection procedures are discussed in the Upland SAP provided in Appendix F.

8.1.2.2 Area I

Area I was subject to extensive characterization and compliance monitoring sampling prior to and following implementation of the interim action. As a result, soil sampling in Area I will be limited to two focus areas at the following locations:

- The northern boundary of Interim Action Area I-5 (northeastern corner of Area I) where arsenic, copper, and/or lead were detected at concentrations greater than the PSL in compliance monitoring samples (I5-S3I, I5-S3D) and one characterization sample (I5-AC-NWALL) collected from the northern sidewall of the excavation. Sampling will be conducted on the adjacent property to the north to delineate the extent of metals contamination in this area.
- Along the eastern boundary of the southern half of Area I, west and south of Interim Action Area G-1a. The compliance data for Interim Action Area G-1a and field observations indicate the sandblast waste continues to the east, west, and southwest, and multi-colored concrete-like waste continues to the west, of the previous excavation boundaries.

General characterization soil sampling will not be conducted in Area I. A total of four soil borings will be advanced in Area I using direct-push drilling techniques. A total of two soil borings will be advanced on the property adjacent to the north of Area I. Proposed soil sampling locations are shown on Figure 24. Soil sample collection procedures are discussed in Upland SAP provided in Appendix F. Note that additional soil borings may be advanced in the focus areas to delineate the lateral extent of contamination if visual evidence of sandblast grit or concrete-like material is observed in the planned soil borings.

8.1.2.3 Area J

In Area J, the soil investigation will focus primarily on characterization of soil in the following locations:

- Beneath the eastern side of the canopy located at the north end of the former MSRC building. This is the former location of the wood refuse burner associated with the mill and the area where construction debris and associated contaminated soil were observed during the J-3 interim action. Additionally, the arsenic-affected crushed rock material excavated from the 12th Street Channel esplanade area was placed within the eastern portion of Area J-3. Soil borings in this area will be extended to the former tideflat surface.

- To the north of the MSRC building canopy, where free product was observed during excavation of a utility trench for the Craftsman District. This is also the location of the boiler house for the Hulbert Mill.

General characterization soil samples will also be collected from two locations to the east of the MSRC building not previously investigated. A total of six soil borings will be advanced in Area J using direct-push drilling techniques, although soil sampling for chemical analyses is only planned for three of these locations. Proposed soil sampling locations are shown on Figure 24, and locations where soil sampling is not planned are highlighted in yellow. Note that soil borings will not be conducted inside the former MSRC building during the RI. If sampling inside the building is necessary based on the results of the RI soil sampling, a supplemental work plan will be prepared. Soil sample collection procedures are discussed in Upland SAP provided in Appendix F.

8.1.2.4 Area M

In Area M, the soil investigation will focus primarily on characterization of shallow soil in the following locations:

- Along the northern boundary of Area M where concrete-like material was observed during repair of the storm line and during recent grading and paving in the northern portion of Area G. The eastern extent of the material was not defined and may encroach onto Area M.
- Along the western side of the Ameron sublease building, adjacent to the unit currently operated by North Central Collision to determine whether impacts from long-term use of hazardous materials have occurred.
- To the south of the Collins building in the area of a former boiler house.
- Along the western side of the current Port of Everett maintenance building (former Sandy's Boathouse) to identify whether impacts have resulted from long-term use of the hazardous materials.
- Along the western side of the former Washington Belt & Drive Systems building to determine whether releases occurred that caused the presence of vinyl chloride in the groundwater sample collected from location M-3.

General characterization sampling was previously completed in the southern portion of Area M to support the Craftsman District development prior to implementation of the interim actions; therefore, general characterization sampling in this area will be limited. General characterization samples in the eastern and southern portions of Area M will be used to evaluate quality of fill material in this area. A total of 12 soil borings will be advanced in Area M. Soil sample collection procedures are discussed in the Upland SAP provided in Appendix F.

8.1.3 SOIL LABORATORY ANALYSES

Soil samples will be submitted to the laboratory for the analyses described in Table 16. Analytical testing for general characterization samples will consist of cPAHs using EPA Methods 3545/8270, and metals (antimony, arsenic, copper, cadmium, chromium, lead, mercury, and zinc) using EPA Method 3050A/6010B.

Focused area soil samples will be tested for metals and for additional constituents at some locations, including cPAHs using Method 2545/8270, VOCs by EPA Method 8260, SVOCs by Method 8270C, petroleum hydrocarbon testing using NWTPH-G and/or NWTPH-D analyses based on field screening, and PCBs by Method SW8082, as indicated in Table 16. Additional discussion of laboratory analysis and quality assurance/quality control (QA/QC) is presented in the Upland SAP (Appendix F).

8.2 GROUNDWATER INVESTIGATION

The groundwater portion of the RI will address limited groundwater impacts identified by the previous investigations and additional information collected subsequent to those investigations, and to provide general characterization of groundwater quality and the data needed to characterize groundwater flow. Groundwater quality data gaps were identified in Section 7.0 for Areas G, I, J, and M. Groundwater samples collected during pre-interim action investigations identified the following constituents at concentrations above the PSLs.

- Area G: Arsenic (three locations) and copper (one sample from former settling pond)
- Area I: Copper (two locations)
- Area J: TPH (one location), arsenic (one location), and copper (one location)
- Area M: Arsenic (one location) and vinyl chloride (one location).

The groundwater investigation will evaluate groundwater quality exceedances identified during the previous investigations and will focus on evaluating whether affected groundwater exceeds the cleanup level at its point of discharge to surface water (the proposed conditional point of compliance). At previously uncharacterized locations, the intent of the investigation is to determine whether groundwater is affected by an identified potential release, and to provide data on general Site groundwater quality. Additional groundwater investigation associated with these locations may be required if groundwater is significantly affected.

The proposed scope for the RI groundwater investigation is discussed below. It should be noted that proposed groundwater monitoring locations are approximate and may be revised, as necessary, due to conditions encountered in the field. As shown on Figure 25, four monitoring wells will be installed during the RI investigation. Additionally, groundwater samples will be collected directly from soil

borings at 15 locations and from 3 existing monitoring wells. Based on the analytical results for groundwater samples collected from direct-push borings, monitoring wells may be installed to confirm results. A supplemental work plan will be submitted to Ecology for approval prior to installation of additional monitoring wells.

Groundwater will be monitored for two sampling events as part of the RI; one will be completed during wet season (November through March) and one during the dry season (June through October). During groundwater sampling at each well, standard field parameters will be obtained [i.e., pH, specific conductance, temperature, dissolved oxygen (DO), and oxidation/reduction potential (ORP). Because of the proximity of the wells to the shoreline, the wells in Areas I and J will be sampled at a time that corresponds to low tide conditions. Depending on the outcome of the monitoring results, additional groundwater quality monitoring may be conducted.

The rationale for groundwater monitoring and proposed analyses is described in Table 16. Monitoring well installation procedures are described in Section 8.2.1. Planned investigation activities for investigation Areas G, I, J, and M are presented in Sections 8.2.2 through 8.2.5, respectively, and groundwater sample collection methods and planned analyses are presented in Section 8.2.6. More detailed procedures for groundwater sample collection and analyses and QA are provided in the Upland SAP provided in Appendix F of this work plan.

8.2.1 MONITORING WELL INSTALLATION PROCEDURES

Monitoring wells will be installed using Geoprobe® drilling technologies in accordance with WAC 173-160 (Ecology 2006). The monitoring wells will be approximately 13 ft to 15 ft in depth. In areas where observed conditions during drilling indicate that there is the potential for free product to be present (i.e., observed sheen or heavy soil staining), a 10-ft pre-packed screen will be installed; the screen will be located to span a portion of the unsaturated zone above the groundwater table and the saturated zone below the groundwater table. The screen interval will be extended a minimum of 2 ft above the groundwater table if sufficient unsaturated zone thickness exists. At locations where there is little potential for free product to be present, 5-ft screen sections will be installed starting at the base of the boring.

Soil samples will be collected from the saturated zone from at least three borings advanced for the construction of monitoring wells. The soil samples will be submitted for mechanical grain size analysis and the results used to estimate hydraulic conductivity for the uppermost hydrostratigraphic unit.

Monitoring wells will be constructed using 3/4-inch diameter schedule 80 PVC casing installed through the 2-inch Geoprobe® borehole. The annular space above the well screen will be filled with

bentonite chips to within about 2 ft of the ground surface. A flush-mounted monument cover will be cemented in place for each monitoring well.

All new monitoring wells will be developed prior to sampling to remove particulates entrained during the well construction process. Development will be accomplished by purging groundwater from the monitoring wells until the water appears clear and free of particulates, which typically requires the purging of 5 to 10 well casing volumes. The following field parameters will be measured during development:

- pH
- Conductivity
- Temperature
- Turbidity
- DO
- ORP.

8.2.2 AREA G

The objectives of the RI groundwater investigation in Area G are to:

- Evaluate groundwater conditions downgradient of Areas G-1 and G-1a and on the eastern side of the pole polishing building
- Evaluate groundwater conditions downgradient of a former oil house associated with the former mill.

Groundwater grab samples will be collected from three direct-push borings in Area G and from one location on the property adjacent to the north of Area G. In addition, groundwater samples will be collected from two existing monitoring wells (P10 and SEE-EC-3) for general characterization purposes. Groundwater sampling locations are shown on Figure 25 and rationale for the sampling locations and planned analyses are described in Table 16.

8.2.3 AREA I

In Area I, the groundwater investigation will focus primarily on characterization of groundwater near its point of discharge to surface water. Limited sampling will be conducted within the interior of Area I in order to evaluate post-interim action groundwater conditions and groundwater conditions in the area of observed sandblast grit and concrete-like waste along the eastern boundary of Area I and downgradient of current and historical industrial operations in Area G. To a large extent, the potential sources of groundwater contamination in Area I have been removed through excavation of contaminated soil during the interim action.

Because groundwater flow in Area I is inferred to be primarily to the west, two monitoring wells will be installed along the western shoreline in Area I and one monitoring well will be installed west of the G-1a interim action area. In addition, two groundwater grab samples will be collected from the eastern portion of Area I, as described in Table 16 and shown on Figure 25.

The results of the groundwater monitoring in Area I will be used in conjunction with the results of the RI sediment investigation (see Section 8.3) to determine if groundwater may have adversely impacted surface sediments in Port Gardner Bay/Snohomish River.

8.2.4 AREA J

The objectives of the RI groundwater investigation in Area J are to:

- Evaluate groundwater quality downgradient of the 1993 MSRC interim action.
- Evaluate groundwater quality downgradient of former saw mill wood refuse burner, and interim action area J-3 where construction debris and associated contaminated soil have been identified and where arsenic-containing crushed rock base course material has been placed for containment.
- Evaluate groundwater in the area north of the former MSRC building canopy, where petroleum hydrocarbons were observed during construction associated with the Craftsman District and where the former saw mill boiler house was located. General characterization groundwater sampling along the eastern boundary of Area J.

The groundwater samples will be collected from one monitoring well and three direct-push borings and analyzed as described in Table 15. The proposed monitoring wells and direct-push groundwater sampling locations are shown on Figure 25.

8.2.5 AREA M

The objectives of the RI groundwater investigation in Area M are to:

- Characterize the groundwater quality downgradient of the former Sandy's Boathouse (former operations involving hazardous substances and/or petroleum products)
- Characterize groundwater quality in the area of the former metal casket finishing operations
- Characterize groundwater conditions downgradient of the former boiler house associated with the Collins Building
- Characterize the extent of vinyl chloride in groundwater at concentrations above the PSL, and determine whether a source area is present upgradient to the previously detected PSL exceedance.

General characterization groundwater sampling will also be conducted north and west of the Collins Building. One monitoring well will be installed and monitored, and groundwater quality samples will be collected and tested from one existing monitoring well (ECI-MW-3) and five direct-push boring

locations. The monitoring wells and direct-push locations for groundwater characterization are shown on Figure 25. The rationale for the locations and the proposed analysis for each located are listed in Table 16.

8.2.6 GROUNDWATER LABORATORY ANALYSES

Groundwater samples will be submitted to the laboratory for various analyses, depending on the previously detected constituents and/or potential COCs based on past practices. Proposed laboratory analyses are described in Table 16, and include dissolved metals (antimony, arsenic, cadmium, chromium, copper, lead, mercury, and Zn) using EPA Methods 3010A/6020 and VOCs using EPA Method 8260. Selected groundwater samples will be screened for TPH using Method NWHCID, with follow-up analysis for gasoline-range TPH using the NWTPH-G method, and/or diesel- and motor oil-range petroleum hydrocarbons using the NWTPH-Dx method (with acid/silica gel cleanup procedures) based on the HCID results. In addition to the laboratory analysis described above, pH, specific conductance, temperature, and turbidity will be measured in the field during sample collection:

All metals samples will be field-filtered prior to analysis. Any groundwater samples submitted for analysis of parameters that tend to partition heavily to soil, such as oil-range petroleum hydrocarbons and cPAHs, will be centrifuged by the laboratory to settle particulates prior to analysis. Groundwater samples will be collected and preserved consistent with the method-specific requirements presented in the SAP. Analyses will be conducted within the specified holding times, also presented in the SAP. All samples will be archived by the laboratory under the Chain of Custody protocol until Landau Associates directs the laboratory that they may be discarded.

8.3 SEDIMENT INVESTIGATION

As previously identified in Section 4.3, the primary pathway for contaminants to migrate from the uplands portion of the Site to sediment is via stormwater runoff. Stormwater runoff from portions of the Site is collected in catch basins and discharged to marine surface water via stormwater outfalls. Additionally, stormwater from the upland area to the northwest of the Site discharges to the in-water portion of the Site. The known outfall locations are shown on Figure 19. The sediment investigation will be focused on characterizing sediment in the vicinity of stormwater outfalls that discharge to the in-water portion of the Site, and characterizing the quality of the sediment surface following dredging for the 12th Street Yacht Basin. The sediment investigation will focus on the biologically active zone (i.e., the upper 10 cm of sediment). Sediment core samples will only be collected and analyzed if the results of surface sediment sampling indicate the presence of sediment contamination that requires vertical delineation, and

only after consultation with Ecology. This section describes the sampling locations and rationale for the proposed locations and the planned laboratory analyses. Detailed procedures for collecting sediment samples, as well as QA procedures, are provided in the Sediment SAP provided in Appendix G to this work plan.

8.3.1 SAMPLING LOCATIONS

Because the north and south sides of the in-water portions of the Site are relatively protected, any sediment transported via surface water runoff likely settles near the outfall. As described in Section 6.2, and shown on Figure 3, much of the aquatic area that lies within the preliminary Site boundary has been dredged within the last 2 to 7 years for maintenance and redevelopment purposes, so any affected sediment is anticipated to be limited to areas in close proximity to the shoreline. Previous sediment sampling conducted following dredging in the 12th Street Yacht Basin by SAIC and Landau Associates has not identified sediment quality issues; however, the sediment quality of the post-dredging surface in the northern two thirds of the 12th Street Yacht Basin has not been evaluated. Based on these considerations, sediment characterization will include focus areas near the stormwater outfalls and general characterization throughout the remainder of the in-water area. It should be noted that riprap located along much of the shoreline may influence the final sampling locations. The proposed sediment sample stations are located in areas anticipated to be beyond the limits of the shoreline riprap; however, sediment sample locations will be modified in the field if riprap is encountered.

Six sampling stations are planned for the in-water portion of the Site, within the 12th Street Yacht Basin. The planned sediment sampling locations are shown on Figure 19 and described as follows:

- Three stations (RI-SED-1, RI-SED-2, and RI-SED-3) are directly offshore from the stormwater outfall located in the northeast corner of the in-water area. Only the sample collected nearest the outfall will be analyzed initially, and the other two samples will be archived for potential analysis depending on the analytical results for the initial sample.
- Two stations (RI-SED-4 and RI-SED-5) are located in the vicinity of other outfalls located on the east and north shorelines of the in-water area. Additional samples for archiving will not be collected in the vicinity of these outfalls because the outfalls were recently installed and do not convey stormwater from areas of industrial activity.
- One station (RI-SED-6) is located in the west-central portion of the in-water portion of the Site for general characterization.

8.3.2 LABORATORY ANALYSIS

Each surface sediment sample will undergo analysis for SMS chemicals including metals (arsenic, cadmium, chromium, copper, lead, mercury, silver, and zinc); SVOCs and PCBs; and

conventional parameters (grain size, TOC and total volatile solids, total solids, ammonia, total sulfides). Analysis of core samples, if collected, will be determined after consultation with Ecology.

8.4 STORMWATER SYSTEM INVESTIGATION

As previously identified in Section 4.3, a significant potential pathway for contaminants to migrate from the upland portion of the Site to sediment is via surface water runoff. Of primary concern is the release of contaminated stormwater sediment because it has the greatest potential to affect sediment quality. The stormwater system investigation will be focused on the evaluation of stormwater sediment collected from catch basins in areas of the Site with industrial activities. Based on these criteria, stormwater sediment will be collected from catch basins connected to the stormwater trunk line that discharges to the northeast corner of the in-water area. Catch basin sediment samples will be analyzed for total metals, SVOCs, and PCBs.

Proposed catch basin sediment sampling locations are shown on Figure 19. Stormwater sediment samples will be collected and analyzed from the following five locations:

- One sample from a catch basin located near the northeast corner of the Site, near the northeast corner of the Ameron sublease building
- Two samples from catch basins located along the trunk line near the northeast and northwest corners of the Ameron leasehold; one before the stormwater discharges from the property to the north (SD-4), and one after several stormwater discharges from the property to the north (SD-7).
- One sample at the last catch basin (CB-111) prior to discharge to the 12th Street Yacht Basin
- One sample collected from the catch basin located downstream of the Bayside Marine stormwater treatment system (CB-101).

Additional stormwater sediment sampling may be conducted based on the results of the stormwater sediment evaluation, or based on marine sediment quality data collected in the vicinity of other outfall locations. The scope for any additional stormwater sediment characterization would be submitted to Ecology for review and approval prior to implementation. Detailed procedures for collecting catch basin sediment samples, as well as QA procedures, are provided in the Upland SAP.

9.0 FEASIBILITY STUDY

The purpose of the FS is to develop and evaluate cleanup action alternatives for the Site. The FS will:

- Identify applicable or relevant and appropriate requirements (ARARs) for Site cleanup
- Identify media and locations where remedial action is needed
- Develop remedial action objectives (RAOs)
- Develop, screen, and evaluate cleanup alternatives
- Identify a preferred alternative.

The following sections provide additional discussion of details for each of the above bullets.

9.1 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

In accordance with MTCA, all cleanup actions must comply with applicable state and federal laws (WAC 173-340-710(1)). MTCA defines applicable state and federal laws to include legally applicable requirements and those requirements that are relevant and appropriate. Collectively, these requirements are referred to as ARARs. The starting point for ARARs is the MTCA cleanup levels and regulations that address implementation of a cleanup under MTCA (Chapter 173.105D RCW; Chapter 173-340 WAC). Other potential ARARs may include the following:

- Washington State SMS (Chapter 173-204 WAC)
- State Water Pollution Control Act (Chapter 90.48 RCW)
- EPA National Recommended Water Quality Criteria – Section 304 Clean Water Act
- EPA Water Quality Standards (National Toxics Rule) – 40 CFR 131
- Minimum Standards for Construction and Maintenance of Wells (Chapter 173-160 RCW)
- Washington Pollution Control Act and the implementing regulations, Water Quality Standards for Surface Waters of the State of Washington (Chapter 173-201A WAC)
- Washington Hazardous Waste Management Act and the implementing regulations, Dangerous Waste Regulations (Chapter 173-303 WAC), to the extent that any dangerous wastes are discovered or generated during the cleanup action
- The Federal Clean Water Act, with respect to in-water work associated with dredging or sediment capping
- Washington's Shoreline Management Act, with respect to construction activities conducted near the shoreline during the cleanup action
- Endangered Species Act, due to listing of Puget Sound chinook and the potential listing of Coastal/Puget Sound bull trout
- Washington Clean Air Act (Chapter 70.94 WAC)

- Occupational Safety and Health Act (OSHA), 29 CFR Subpart 1910.120
- Washington Industrial Safety and Health Act (WISHA).

The FS will identify ARARs if a cleanup action is needed. In addition, the FS will identify likely permits required for implementation of the cleanup action.

9.2 DELINEATION OF MEDIA REQUIRING REMEDIAL ACTION

The RI process will determine if soil, groundwater, and/or sediment results exceed PSLs and, if so, identify the locations of the exceedances. Based on any exceedances and the established points of compliance, the FS will identify the areas that require remedial action.

9.3 DEVELOPMENT OF REMEDIAL ACTION OBJECTIVES

The RAOs identify the goals that must be achieved by a cleanup alternative in order to achieve cleanup standards and provide adequate protection of human health and environment. The RAOs must address all affected media and a cleanup alternative must achieve all RAOs to be considered a viable cleanup action. RAOs will be developed for portions of the Site requiring remedial action.

The RAOs will be action-specific and/or media-specific. Action-specific RAOs are based on actions required for environmental protection that are not intended to achieve a specific chemical criterion. Media-specific RAOs are based on the cleanup levels. The RAOs will specify the COCs, the potential exposure pathways and receptors, and acceptable contaminant levels or range of levels for each exposure pathway, as appropriate.

The extent to which each alternative meets the RAOs will be determined by applying the specific evaluation criteria identified in the MTCA and SMS regulations.

The site is being overseen by Ecology and the cleanup work is being conducted under the Governor's Puget Sound Initiative (PSI). Under the PSI, Ecology is striving to combine remediation and habitat restoration to maximize the synergy of the process. As a result, the FS will evaluate elements of the remedial alternatives for opportunities to coincidentally improve the value of habitat and/or provide for shoreline restoration in conjunction with remedial actions. As stated in the AO, it is unlikely that meaningful habitat restoration opportunities exist at the site. Therefore, evaluation of onsite restoration opportunities will not constitute a significant part of the RI/FS process at this site.

9.4 SCREENING OF CLEANUP ALTERNATIVES

Cleanup alternatives will be developed for portions of the Site that require remedial action. Initially, general remediation technologies will be identified for the purpose of meeting RAOs. General

remediation technologies consist of specific remedial action technologies and process options. General remediation technologies will be considered and evaluated based on the properties of identified contaminant(s) and may include institutional controls, containment or other engineering controls, removal, *in situ* treatment, and natural attenuation.

Specific remedial action technologies are the engineering components of a general remediation technology and process options are those specific processes within each specific technology. Specific remedial action technologies and representative process options will be selected for evaluation based on documented development or documented successful use for sediment. Cleanup alternatives will be developed from the general and specific remedial technologies and process options consistent with Ecology's expectations identified in WAC 173-340-370 using best professional judgment and guidance documents as appropriate [e.g., *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA 1988)].

During the development of cleanup alternatives, both the current and planned future land use will be considered.

9.5 EVALUATION OF CLEANUP ALTERNATIVES

MTCA requires that cleanup alternatives be compared to a number of criteria as set forth in WAC 173-340-360 to evaluate the adequacy of each alternative in achieving the intent of the regulations, and as a basis for comparing the relative merits of the developed cleanup alternatives. Consistent with MTCA, the alternatives will be evaluated with respect to compliance with threshold requirements, permanence, and restoration timeframe; the results of the evaluation will be documented in the RI/FS reports.

9.5.1 THRESHOLD REQUIREMENTS

As specified in WAC 173-340-360(2)(a), all cleanup actions are required to meet the following threshold requirements:

- Protection of human health and the environment
- Compliance with cleanup standards specified under MTCA
- Compliance with applicable state and federal laws
- Provisions for compliance monitoring.

9.5.2 REQUIREMENT FOR PERMANENT SOLUTION TO THE MAXIMUM EXTENT PRACTICABLE

WAC 173-340-200 defines a permanent solution as one in which cleanup standards can be met without further action being required at the original site or any other site involved with the cleanup action, other than the approved disposal site for any residue from the treatment of hazardous substances. Ecology recognizes that permanent solutions may not be practicable for all sites. To determine whether a cleanup action is permanent to the "maximum extent practicable", MTCA requires that disproportionate cost analysis [DCA; (WAC 173-340-360(3)(b)] be used. In accordance with WAC 173-340-360(3)(f), the following criteria are used to evaluate and compare each cleanup action alternative when conducting a disproportionate cost analysis:

- ***Overall protectiveness*** of human health and the environment, including the degree to which Site risks are reduced, the risks during implementation, and the improvement of overall environmental quality
- ***Long-term effectiveness***, including the degree of certainty that the alternative will be successful, the long-term reliability, the magnitude of residual risk, and the effectiveness of controls required to manage treatment residues and remaining waste
- ***Management of short-term risks***, including the protection of human health and the environment during construction and implementation
- ***Permanent reduction in toxicity, mobility, and volume of hazardous substances***, including the reduction or elimination of hazardous substance releases and sources of releases
- ***Implementability***, including consideration of whether the alternative is technically possible; the availability of necessary offsite facilities, services, and materials; administrative and regulatory requirements; scheduling, size, and complexity of construction; monitoring requirements; access for construction, operations, and monitoring; and integration with existing facility operations
- ***Cleanup costs,*** including capital costs and operation and maintenance costs
- ***Consideration of public concerns,*** which will be addressed through public comment on the cleanup action plan.

Procedures that will be used for conducting a DCA are described in Section 9.6.

9.5.3 REQUIREMENT FOR A REASONABLE RESTORATION TIMEFRAME

WAC 173-340-360(4)(b) specifies that the following factors be considered in establishing a "reasonable" timeframe:

- Potential risks to human health and the environment
- Practicability of achieving a shorter restoration timeframe
- Current use of the Site, surrounding areas, and associated resources that are, or may be, affected by releases from the Site

- Potential future use of the Site, surrounding areas, and associated resources that are, or may be, affected by releases from the Site
- Availability of alternate water supplies
- Likely effectiveness and reliability of institutional controls
- Ability to control and monitor migration of hazardous substances from the Site
- Toxicity of the hazardous substances at the Site
- Natural processes that reduce concentrations of hazardous substances and have been documented to occur at the Site or under similar Site conditions.

9.5.4 REQUIREMENT FOR CONSIDERATION OF PUBLIC CONCERNS

The draft final RI/FS report will be issued for public comment, which will provide the public an opportunity to express any concerns. Those concerns will be addressed in a responsiveness summary prepared by Ecology and, if appropriate, the RI/FS report will be modified in response to the public concerns.

9.6 DISPROPORTIONATE COST ANALYSIS PROCEDURES

As described in Section 9.5.2 (Requirement for Permanent Solution to the Maximum Extent Practicable), MTCA requires that cleanup actions be permanent to the maximum extent practicable and requires that a DCA be used when the cleanup alternatives being considered are not permanent as defined under WAC 173-340-200. Evaluation of the practicability of a given alternative is a comparative evaluation of whether the incremental increase in cost associated with increasingly protective cleanup actions is substantial and disproportionate to the incremental increase in environmental benefit. In the DCA, cleanup alternatives are arranged from most to least permanent based on the criteria specified in WAC 173-340-360(f) and described in Section 9.5.2. Costs are disproportionate to benefits if the incremental costs of the more permanent alternative exceed the incremental benefits achieved by the lower cost alternative [WAC 173-340-360(3)(e)(i)]. Alternatives that exhibit disproportionate costs are considered "impracticable." Where the benefits of two alternatives are equivalent, MTCA specifies that Ecology select the least costly alternative [WAC 173-340-360(e)(ii)(C)].

9.7 RECOMMENDATION OF REMEDIAL ACTION ALTERNATIVES

This section of the FS will recommend a remedial action alternative based on the results of the comparative evaluation. The recommended alternative will meet the minimum requirements for cleanup actions: protect human health and the environment, comply with cleanup standards, comply with applicable state and federal laws, provide for compliance monitoring, use permanent solutions to the extent practicable, provide for a reasonable timeframe, and consider public concerns.

10.0 PUBLIC INVOLVEMENT

As required by WAC 173-340-600, Ecology and the Port will promote public involvement throughout the RI/FS and cleanup stages at the Site. Public involvement will include, but is not limited to, preparation of periodic fact sheets made available to the public, public comment periods to provide the public opportunity to comment on major documents, updates to the MTCA Site Registrar, and mailings to addresses within one-quarter mile of the Site. A Public Participation Plan was prepared by Ecology and is attached as Exhibit D to the AO.

11.0 PROJECT MANAGEMENT

The Site project team is shown in the organization chart on Figure 26. An analytical laboratory and a drilling contractor will also be part of the project team, although the firms that will be used in this capacity have not been selected yet.

12.0 SCHEDULE AND REPORTING

The AO establishes the RI/FS schedule and reporting requirements, which are summarized below.

- RI field activities will commence within 30 days of submittal of the final work plan to Ecology.
- The results of the RI field activities will be summarized in a data report and submitted to Ecology within 30 days after all of the associated analytical data has been validated.
- The 1st draft of the RI/FS report will be submitted to Ecology within 180 calendar days following receipt of all analytical data associated with the RI/FS. Ecology will have a 30-day review period of the draft report.
- The draft final RI/FS report will be submitted to Ecology within 90 calendar days following receipt of Ecology's comments on the draft RI/FS report.
- The public will have 30 days to comment on the draft final RI/FS report.
- The final RI/FS report will be submitted to Ecology within 45 days following Ecology's completion of the responsiveness summary to public comment on the draft final RI/FS report.

All sampling data (including historic data) will be submitted to Ecology in both printed and electronic formats in accordance with Ecology's Toxics Cleanup Program Policy 840. Data will be supplied to Ecology in electronic format within 45 days after the data from the RI field activities is validated.

If additional field RI activities are needed to adequately delineate the extent and magnitude of contamination at the Site, the scope, schedule, and submittal requirements for this additional work will be developed by the Port and submitted to Ecology for review and concurrence. Any additional data will be submitted to Ecology within 45 days after the additional data has been validated.

13.0 LIMITATIONS

This work plan has been prepared for the exclusive use of the Port of Everett for specific application to the North Marina Ameron/Hulbert RI/FS Project. No other party is entitled to rely on the information, conclusions, and recommendations included in this document without the express written consent of the Port and Landau Associates. Further, the reuse of information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by the Port and Landau Associates, shall be at the user's sole risk. Landau Associates warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as this project. We make no other warranty, either express or implied.

LANDAU ASSOCIATES, INC.

Lawrence D. Beard, P.E., L.G.
Principal

Kathryn F. Hartley
Project Scientist

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