URS

FINAL
REMEDIAL INVESTIGATION
FEASIBILITY STUDY
WORK PLAN
EVERETT SHIPYARD
1016 14th STREET
EVERETT, WASHINGTON

For

Everett Shipyard, Inc.
URS JOB NO.: 33760902

October 31, 2008

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List of Acronyms

AOC	Areas of Concern
ARI	Analytical Resources, Inc.
cPAHs	Carcinogenic Polycyclic Aromatic Hydrocarbon
CSL	Cleanup Screening Level
DOH	Department of Health
Ecology	Washington Department of Ecology
ESA	Environmental Site Assessment
ESRD	Everett Ship Repair & Drydock, Inc.
ESY	ESY, Inc.
GOP	General Operating Procedure
HSP	Health and Safety Plan
JSA	Job Safety Analysis
MCLG	Maximum Contaminant Level Goal
MCL	Maximum Contaminant Level
MLLW	Mean Lower Low Water
MTCA	Model Toxics Control Act Cleanup Regulation
NELAP	National Environmental Laboratory Accreditation Program
NPDES	National Pollution Discharge Elimination System
NRWQC	National Recommended Water Quality Criteria
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyls
PCOCs	Potential Chemicals of Concern
Port	Port of Everett
PSDDA	Puget Sound Dredged Disposal Analysis
RI/FS	Remedial Investigation/Feasibility Study
SAP	Sampling and Analysis Plan
SMS	Sediment Management Standards
SQS	Sediment Quality Standards
SVOC	Semi-Volatile Organic Compound
SDWA	Safe Drinking Water Act
SWQS	Surface Water Quality Standards
TBT	Tributyltin
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total Dissolved Solids
TPH	Total Petroleum Hydrocarbons
URS	URS Corporation
USGS	U.S. Geological Survey
VOC	Volatile Organic Compound
WAC	Washington Administrative Code
WISHA	Washington Industrial Safety and Health Act
WRIA	Water Resource Inventory Area

1.0 INTRODUCTION

ESY, Inc. (ESY), formerly Everett Shipyard, Inc., has operated a ship building, maintenance and repair facility at 1016 14th Street in Everett, Washington (“Site”, Figure 1) from 1959-2008. The Port of Everett (Port) has owned and/or operated vessel and marine-related services on or adjacent to the Site. The upland portion of the Site covers approximately four acres. It is located west of Marine View Drive and adjacent to the North Marina, which is located within Port Gardner Bay. A marine railway extends into the North Marina from the Site and is used to transport marine vessels onshore.

ESY leases the upland portion of the Site from the Port. On March 31, 2008, ESY sold substantially all of its assets to Everett Ship Repair & Drydock, Inc. (ESRD), a wholly owned subsidiary of Todd Shipyard Corporation. ESRD is in the process of relocating its operations. Previous investigations conducted on the area leased by ESY and in the adjacent North Marina area, near the marine railway, identified hazardous substances in soil and sediment exceeding potentially applicable cleanup levels (Landau 2003 and 2004; URS 2007b).

On April 2, 2008, the Washington Department of Ecology (Ecology), ESY (then Everett Shipyard, Inc.) and the Port entered into Agreed Order No.: DE 5271 to conduct a Remedial Investigation/Feasibility Study (RI/FS) per WAC 173-340-350, and to develop a draft Cleanup Action Plan per WAC 173-340-350 through 173-340-380 addressing both potential upland and in-water (i.e., adjacent marine sediment) contamination for the Site (Ecology 2008). Accordingly, this work plan considers the existing Site data and outlines the further investigation of soil, groundwater and sediment conditions at the Site.

2.0 PROJECT TEAM AND SAFETY MANAGEMENT

2.1 PROJECT TEAM ORGANIZATION

The URS Project Team is shown in the organization chart on Figure 2. The Project Team and contact information will also be explicitly identified within the Health and Safety Plan (HSP) (Appendix A). URS will manage the field work both in the upland and marine sediment investigations. URS contracted with Cascade Drilling of Woodinville, Washington, to complete the soil borings and construction of new monitoring wells. Laboratory analyses will be performed by Analytical Resources, Inc. (ARI) located in Tukwila, Washington. ARI is accredited under WAC 173-50 and the National Environmental Laboratory Accreditation Program (NELAP).

2.2 SAFETY MANAGEMENT

URS has developed a Health and Safety Plan, included as Appendix A, to assign responsibilities, establish personal protection standards and mandatory safety procedures, and provide for contingencies that may arise while operations are being conducted at the Site. The HSP complies with Federal Health and Safety Regulations, as set forth in 29 CFR 1910 and 1926, and applicable state regulations. The HSP will be used by URS as a supplement to these rules, regulations, and guidance.

URS implements a behavior-based safety program. URS personnel are trained to recognize unsafe conditions and practice near-miss reporting. Subcontractor and other on-site personnel directly involved with the investigation and sampling have the potential to be exposed to hazardous substances. They will be required to have health and safety training in accordance with the Occupational Safety and Health Administration (OSHA) 29 CFR 1910.120, the Washington Industrial Safety and Health Act (WISHA) Chapter 49.17 RCW and WAC 296-843, and other applicable local, state, or federal regulation as warranted. Evidence of training will be furnished to URS prior to the start of work and retained in project archives.

Before the start of work, URS will implement the following safety management approach to ensure that all appropriate front-end safety planning is in place:

- **Develop Draft Schedule and Scope of Work.** The key to effective and efficient safety planning and project execution is a well thought-out scope of work and implementation schedule.
- **Safety Management System.** Information from the draft schedule and scope of work will be used to prepare the HSP and initial Job Safety Analysis (JSA). As part of the HSP preparation, any medical surveillance requirements associated with site-specific impacts will be identified, as well as the nearby occupational health clinics and their operating hours to allow for appropriate injury management planning.
- **Safety Kick-off Meeting.** Prior to the start of work, URS will hold a safety kick-off meeting at the Site with client representatives, subcontractors and other on-site personnel to review Site specific safety concerns and provide program and site-specific training for attendees. Morning tailgate safety meetings will be held daily and documented in the field activity logs.
- **Safety Performance Metrics.** Prior to the start of work, performance targets are set for safety observations, Near Miss and Incident Reports, and site and program safety audits.

3.0 SITE BACKGROUND AND SETTING

3.1 SITE LOCATION AND TOPOGRAPHY

The “Site” is defined in Agreed Order DE-5271 Section IV.A. The Site is defined by the extent of contamination caused by the release of hazardous substances at the Site and is not limited by property or lease boundaries. The Site includes areas where hazardous substances have been deposited, stored, disposed of, placed, or otherwise come to be located. The upland portion of the Site is relatively flat and is estimated to be less than 10 feet above sea level. The Site is located in the northwest ¼ of Section 18, Township 29 North, Range 5 East (USGS 1953). The in-water portion of the Site includes the intertidal (areas exposed to air at low tide) and subtidal (areas always covered by water) parts of the Site associated with adjacent marine waters, generally located on the western portion of the Site. It also includes an area near the marine railway and one or more outfalls that currently or historically discharge surface water from the upland portion of the Site into the North Marina. The limits of the Site will be determined during the RI period.

ESY leases approximately 4 acres in the North Marina Area ("Lease Area") from the Port (Figure 3). The Lease Area is generally bounded to the east by West Marine View Drive, to the north by 14th Street, to the west by Montague Street and to the south by a paved area and the former Net Shed building that was recently demolished. The North Marina and Port Gardner are located approximately 80 feet west of the Lease Area boundary. According to Everett Shipyard personnel, the following three modifications to the lease area boundary have occurred since Everett Shipyard purchased the operation in 1959:

- The southern portion of the western boundary was moved approximately 20 feet to the east at the request of the Port to provide parking spaces for vehicles in this area.

- In the southeastern portion of the leasehold, the lease boundary was modified when the adjacent fish processing/storage building was constructed in the late 1970s. The former lease includes areas immediately west and beneath the newly constructed building.

- In the 1990s, the City of Everett widened West Marine View Drive and constructed a sidewalk and the lease area boundary was moved approximately 10 feet to the west.

The surrounding area consists of commercial and industrial development. The mouth of the Snohomish River is approximately 1 1/4 miles north of the Site (Figure 1).

3.2 SITE HISTORY

The history of the Site development and operations was prepared by reviewing historical records, including Sanborn Fire Insurance maps (1902, 1914, 1950 and 1957), aerial photographs (1947, 1965, 1969, 1974, 1978, 1984, 1991 and 1995) and topographic maps (1897, 1944, 1953, 1968, and 1973) which are included in Appendix B, and interviews with Everett Shipyard personnel. Figure 3 shows the current structures on the Site. Table 1 lists the current and historic structures and Site operations and provides a general description of the activities completed at each building and area, including chemical use, storage and disposal practices. The Site development and operational history are described below.

3.2.1 Site Development

The Site appears to have been part of Port Gardner Bay in the earliest topographic maps dated 1897 and 1944 and Sanborn Fire Insurance Maps dated 1902 and 1914. By 1947, the upland portion of the Site had been filled and the bulkhead to the west of the upland portion of the Site appears to have been constructed. A joiner shop and boat repair building was present at the location of the western portion of the present day weld and wood shops. A boat skid was located between the joiner shop to the bulkhead and appears to have been used to haul boats out of the water and transport them to the joiner shop. The limited nature of the vegetation on the Site in 1947 suggests recent completion of filling behind the bulkhead. Two ancillary paint shop and re-saw buildings were located near the current weld shop and wood shop buildings and a machine shop was located near the northeast corner of the lease area in the 1950 Sanborn Fire Insurance Map.

The 1957 Sanborn Fire Insurance Map shows a marine railway, extending west from the joiner shop to the bulkhead, in the approximate location of the current marine railway, which indicates some use of the area to the west of the leasehold. A second marine railway is located south of the joiner shop (current wood shop), but does not extend to the bulkhead. By the late 1960s, development of the property increased to include construction of the wood shop building, different location for the paint shop, additional skids on the northeast portion of the property, and the presence of small-scale boat storage and fish processing operations.

In the 1970s, development included construction of the east end of the weld shop, and a boat shed north of the northeast portion of the present day weld shop. The 1980s included development of the buildings historically occupied by Everett Engineering including the Machine Shop, and Buildings 7 and 9.

The fish processing building was no longer apparent in the 1984 aerial photograph. The skids on the northeast portion of the property were no longer apparent by 1991.

The North Marina area adjacent to the shipyard has been owned and operated as a marina since at least 1959. Prior to this time, at least one saw mill operated adjacent to the marina. Periodic maintenance dredging was required to maintain navigable water depths. The most recent dredging occurred in 1990 and 2001. The 1990 event involved dredging throughout the North Marina area adjacent to the shipyard except in the immediate vicinity of the marine railway and floating dock to the north. This dredging resulted in water depths of -10 to -13 feet mean lower low water (MLLW) in the area offshore of the shipyard. The 2001 event was more limited in scope, as it did not include any dredging south of the floating dock and marine railway, but did include some dredging in the vicinity of the Port’s haul out facility. The 2001 dredging resulted in typical water depths of -11 to -14 feet MLLW in the area north of the floating dock.

The Port operates a travel lift boat haul-out facility approximately 150 feet north of the marine railway. The Port’s haul-out facility and adjacent areas were routinely used by the Port tenants or customers for vessel washing, painting and other maintenance. The Port’s haul-out facility is evident in aerial photographs beginning in 1965 and was present when ESY began operating at the Site in 1959. In 1996, the Port constructed a nearby closed loop boat wash facility.

Historically, the Port also operated a tidal grid facility in the nearshore area south of the marine railway. According to Port of Everett personnel, the grid was used for washing ships' hulls, painting and other maintenance activities. The tidal grid (or boats positioned on the grid) is evident in aerial photographs dated 1969, 1974, 1978 and 1991 and was removed prior to construction of the new east bulkhead in 1995.

3.2.2 Operations

3.2.2.1 Facility Operations

Since the founding of Fishermen's Boat Shop in 1947, the Site has been used for cleaning, painting, and repairing marine vessels. Currently, the facility conducts repair work on marine vessels up to 110 feet long. In more recent decades, grit blasting and welding have been added as marine repair activities. The repair work involves bilge evacuations via vacuum trucks for off-site disposal, equipment disassembly, abrasive blasting, woodwork and metalwork, painting/coating, and mechanical repairs. The operations have not included engine repairs; this work was sent offsite. Fishermen's Boat Shop became a corporation in 1961. In January 2002, Fisherman's Boat Shop changed its corporate name to Everett Shipyard, Inc. In April 2008, Everett Shipyard Inc. changed its name to ESY, Inc.

Chemicals used on Site include: paint and polymer coatings, coating strippers, paint thinner, rust preventer, creosote, anti-biofouling agents, xylene, diesel, lubricants, hydraulic fluid, fuel oil, and other petroleum products. Bottom paint used at the Site in 1992 (Ecology 1992) contained copper in the form of cuprous oxide.

Abrasive blasting at the Site has been performed by contractors retained for specific projects. Grit used for abrasive blasting historically included the use of copper slag. By the mid 1980s, the grit used included "Green Diamond" and "Kleen Blast." Historically, the grit remained onsite and was removed when it accumulated to the point that it interfered with Site operations. Aerial photographs reviewed suggest that abrasive grit was historically present on the ground surface throughout most of the central and southern portions of the Site. The apparent maximum lateral extent of the grit based on aerial photographs from the late 1970s and early 1980s is depicted on Figure 3. Grit was removed from the site at more regular intervals starting in the late 1980s at the time contractors performing abrasive blasting were requested to remove the grit following each project. During the Site inspection completed by Ecology in 1992, significant quantities of abrasive grit were evident on the ground and in an open bag at the Site.

3.2.2.2 Handling of Stormwater and Surface Run-off Water

Historically, storm water from the Site was managed primarily via infiltration. Operation areas surrounding the skids (side tracks) in the southwestern and central potions of the leasehold were maintained at an elevation below the surrounding grade level to facilitate access to the boats in the shipyard. In addition, the concrete footings for the westernmost skids form a nearly continuous barrier to surface water flow along the western boundary of the leasehold. Soil at the Site consists of silty, sandy fill (Landau 2003) which appears, based on site observations (minimal evidence of ponding or overland flow in unpaved areas), to be conducive to infiltration throughout most of the unpaved portion of the leasehold. Everett Shipyard personnel also reported that the unpaved road that historically bordered the leasehold on the west and south has a “crown” in the middle that would generally prevent overland flow from crossing the road. Therefore, with the exception of the area directly surrounding the marine railway and the area directly north of the marine railway, there appears to be limited potential for surface run-off from operation areas within the leasehold to have historically discharged into the North Marina.

Catch basins were eventually installed within the leasehold and adjacent to the west of the leasehold. Catch basins that collected stormwater from within the leasehold discharged into the North Marina at Outfalls 001 and 002 located north and south of the Marine Railway, respectively. Outfalls A and C were reported by Landau (2003) to have been connected to historic storm drains and catch basins located north and south of the leasehold, respectively. Outfall B is reportedly connected to a series of catch basins located west and south of the Leasehold.

In 2002, Everett Shipyard reconfigured the catch basin discharge in the operations area to discharge to the sanitary sewer. Outfall 002 is no longer in use. The only storm water that discharges directly to Outfall 001 is limited to roof run-off from the weld shop. ESY also constructed a sump to catch wash water from boats being washed on the railway. The collection sump for the wash down facility discharges into the sanitary sewer. Following the reconfiguration of the catch basins and the installation of the collection sump, the only stormwater runoff that entered the North Marina from the Site was sheet flow from a small area, primarily north of the marine railway, that was not collected in catch basins. This discharge was confirmed by the Port of Everett during a site visit in January 2008 (Landau 2008).

In July 2008, a new catch basin was installed on the northern side of the marine railway adjacent to the bulkhead. The catch basin was equipped with a sump pump that transfers the water to the collection sump which discharges to the sanitary sewer. An asphalt berm was also constructed along the bulkhead to divert water into the catch basin and minimize the potential for surface water discharge into the North Marina. Prior to the installation of the catch basin, Everett Shipyard improved housekeeping in this area by sweeping up all loose materials in the vicinity of the marine railway and removing a small quantity of residual soil/sediment (less than one cubic foot) that had collected in the approximate location of the newly installed catch basin. Sampling and analysis of this material indicated that it contained 70 mg/kg of arsenic (Landau 2008) which exceeds the MTCA Method A soil cleanup level. Other metals were detected at concentrations below their respective MTCA cleanup levels. This soil/sediment was contained in a bucket and will be stored onsite and managed with investigation derived wastes as outlined in Appendix E following the completion of the RI.

Storm water monitoring has been performed at that Site in accordance with National Pollution Discharge Elimination System (NPDES) permit requirements since the late 1990s.

3.2.2.3 Operation of Subleased Facilities

In addition to the Everett Shipyard operations, Everett Engineering subleased three buildings at the Site. Buildings were constructed for Everett Engineering's operations between 1965 and 1984. The buildings included: the office/machine shop, Building 7 and Building 9. The operations in the office/machine shop building started in the late 1960s and activities in all three buildings ceased in 2007. The buildings are currently vacant. Operations in these buildings have included the use of cutting oils, lube oils, hydraulic fluids and solvents (see Table 1). Special foundations for heavy equipment, including a foundation slab below the floor grade, were observed in Building 9.

Based on review of historical city directories, land ownership maps, and buildings plans and permits, other tenants of the subject property have included: Northwest Propeller and Aquatic Industries.

3.3 CURRENT SITE CONDITIONS

3.3.1 Meteorology

Everett, Washington lies within the Puget Sound Convergence Zone, the area where northwest winds in the upper atmosphere become split by the Olympic Mountains and then re-converge over Puget Sound, causing updrafts. Those updrafts can lead to convection and then rain showers or more active weather. Between 1948 and 2005, Everett has averaged approximately five inches of rain monthly between October and January and two inches of rain monthly between June and September. Snow falls occasionally in the winter up to five inches monthly. Winds are typically moderate, rarely exceeding 15 miles per hour throughout the year, and blow predominantly northwesterly, westerly, and southwesterly (Western Regional Climate Center, 2008).

3.3.2 Site Layout and Operations

A summary of the existing and former site buildings and operations is provided in Table 1. URS conducted a site reconnaissance in April 2008 to evaluate the current site conditions. Current building locations are shown on Figure 3. The primary site features include the following:

- Weld shop (approximately 12,000 square feet) for construction and repair of vessels.
- A wood shop (approximately 3,000 square feet) located south of the weld shop.
- A boat shed located north of the weld shop that includes a room used for hazardous materials storage.
- A two-story office building located north of the weld shop that is heated with fuel oil stored in an AST located on the west side of the building. According to Everett Shipyard personnel, a former UST may also be present near the AST.
- A paint shed located west of the Wood Shop.
- A steam box shed, south of the wood shop that includes a small fuel oil AST. The tank fuels a boiler used to steam wooden planks to make them more flexible prior to use in ship building. A small area of stained soil was observed adjacent to the shed.
- A wood storage shed and utility shed, and two Connex shipping containers connected by a Quonset-style roof used for storage in the central part of the yard, west of Building 9.

Vessels are often stored on the wooden skids located southwest of the wood shop where abrasive blasting occurs. The southern portion of the Site is unpaved and is used for storage. Small quantities of abrasive grit were evident in the surface soil throughout most of the unpaved portion of the yard in the area of the current and former skids. The remainder of the Site is paved with asphalt. A marine railway for hauling vessels from the marina to the shipyard is located west of the Site. The winch used to operate the Marine Railway is located in the wood shop building.

Three buildings (the office/machine shop and Buildings 7 and 9) that were formerly sublet to Everett Engineering are located on the eastern portion of the Site along West Marine View Drive (Figure 3). These buildings are currently vacant and were formerly used as machine shops with a small office on the northern side of the north building. Floors within the machine shop buildings were generally stained with oils but appeared to be in good condition with a few exceptions described below:

- Floor penetrations observed in the machine shop building included an apparent drain and to two subsurface features (possibly sumps or vaults) that were welded shut.
- In Building 7, a concrete sub-slab was evident below the floor slab. Soil between the two slabs appears to be stained with cutting oils or other petroleum substances.
- An approximately 15-foot diameter steel plate was reportedly removed from the floor in Building 9 and the underlying soil is exposed. Abrasive grit or petroleum staining was not observed in the exposed soil.

Stained soil was also observed near the northwest corner of the Everett Engineering Machine shop building near the reported location of a former compressor.

3.3.3 Surface Water

The North Marina, which the Site's in-water area lies within, is located within the nearshore area of Puget Sound, which includes the marine areas of Port Gardner and eastern Possession Sound. The nearshore area has been defined to extend to a depth of 90 feet—the approximate limit of the photic zone in central Puget Sound. The surface water hydrology in this subwatershed is driven by tidal circulation. Human-made structures such as bulkheads, riprap, dock and piers, and dredging have altered the hydrology in proximity to these features (Battelle et al. 2001). A bulkhead borders the upland areas adjacent to the Site.

As outlined in WAC 173-201A-612, Possession Sound uses include excellent quality salmonid and other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning. Other uses include shellfish harvest, primary contact recreation, wildlife habitat, harvesting, commerce and navigation, boating and aesthetic values.

The nearshore area has numerous 303(d) listings, most of which are for sediment quality (Ecology, 1998). Deepwater areas (generally deeper than -30 ft MLLW) in Port Gardner and the inner Port of Everett are listed for phenol, polychlorinated biphenyls (PCBs), zinc, benzo(a)pyrene, benzo(b,k) fluoranthenes, benzo(ghi)perylene, benzyl alcohol, bis(2-ethylhexyl)phthalate, chrysene, di-n-octyl phthalate, fluoroanthene, fluorene, mercury, naphthalene, pentachlorophenol, phenanthrene, phenol, 2, 4-dimethylphenol, 2-methylnaphthalene, 2-methylpenol, 4-methylpenol, and acenaphthene (Ecology 2008).

The Site is within and adjacent to the northeastern corner of the North Marina, an approximately 1900-foot by 1400-foot docking area within the Port of Everett. The North Marina is bounded to the north, south and west by filled areas. Approximately 1,100 feet west of the North Marina is a barrier island (Jetty Island), the eastern side of which appears to have been dredged and straightened for boat traffic.

As described above in Section 3.2.2.2, most of the stormwater from the operation areas of the Site is currently collected in series of catch basins and a collection sump in the central portion of the property that discharge to the sanitary sewer system. Stormwater runoff from a small area on the north side of the marine railway that discharged into the North Marina until July 2008 is also collected in a catch basin and reportedly discharges to the sanitary sewer. Surface water from the operations area of the Site that currently discharges to the North Marina is limited to a small area in the northwest portion of the leasehold.

Historic stormwater management practices and recent corrective actions are described in Section 3.2.2.2.

3.3.4 Geology

The project site is located within the Puget Sound Lowland Physiographic Province, which covers most of Snohomish County. This north-south trending structural and topographic depression is bordered on its west side by the Olympic Mountains, and to the east by the Cascade Mountain foothills. The Puget Lowland is underlain by Tertiary volcanic and sedimentary bedrock, and has been filled to the present day land surface with Pleistocene glacial and nonglacial sediments. Repeated advances and retreats of the continental glaciers that flowed through the area from Canada more than 10,000 years ago created the low undulating plains that are characteristic of the Puget Lowland. Current land surfaces reflect the changes that are directly related to the most recent glacial advance and retreat through Snohomish County known as the Vashon Stade of the Fraser Glaciation, which took place between 13,000 and 20,000 years ago.

Near surface soils in the area have been formed primarily through glacial till and glacial meltwater deposition processes. Glacial till is unstratified glacial drift material consisting of clay, silt, sand and boulders, and is transported by moving glacial ice. Glacial meltwater soil materials are stratified, and are moved initially by glaciers and then deposited by streams flowing from the ice. These deposits occur in the site vicinity in outwash plains, which are usually smooth landforms of mainly sandy or coarsely textured material. Glacial advance outwash and glacial till were formed during the Vashon Stade period. Transitional beds were deposited during the retreat just prior to the Vashon Stade glacial advance into the area, while after that time river valleys and low lying areas subject to periodic flooding were filled in with younger alluvium and alluvial fan deposits. The area directly east of the Site is underlain by the transitional beds and the advance outwash deposits (USGS 1985).

The Site is located on an area that was filled with marine alluvium hydraulically placed about 60 years ago (Landau 2001). The old shoreline is located in the vicinity of West Marine View Drive. Soils encountered at the Site in borings completed by Landau (2003) consisted of gray or brown, very silty, fine to medium sand to a depth of 4.5 feet bgs, underlain by gray, very sandy silt to a depth of 15 feet bgs. Shell fragment and wood debris, including sawdust, was noted at 12 to 15 feet bgs in boring LB1. While not observed at the Site, fill in the area reportedly also includes concrete debris (Landau 2001).

3.3.5 Hydrogeology

The Site lies within the Snohomish County Groundwater Management Area, and groundwater use in Snohomish County is regulated by Ecology and by the Snohomish Health District. Groundwater is used as a resource primarily in agricultural areas of Snohomish County between Interstate Highway 5 and the Cascade Mountain foothills (Snohomish County Public Works, 1999). The primary aquifers used for potable or agricultural water supply are the surface alluvium and several glacially-deposited formations (till, recessional outwash, and advance outwash). The till, while it is much less permeable than the outwash units on the whole and often acts as a barrier to groundwater flow, allows enough groundwater flow in some places to serve wells. Older undifferentiated sediments can also supply some water.

A review of available water well logs did not identify any domestic or municipal water supply wells within a one-mile radius of the Site (Ecology 2008).

Groundwater was encountered in borings drilled at the Site at depths between 4 and 8 feet bgs. The static ground water levels in three monitoring wells (MW-1, MW-2 and MW-3) installed in the northern part of the site ranged from approximately 3.7 to 5.3 feet bgs in March 2003. Based on groundwater levels measurements in these monitoring wells, groundwater flow is inferred to be westerly toward the marina (Landau 2003). Due to its proximity to the bay, it is expected that shallow groundwater beneath the Site may be tidally influenced and have elevated salinity.

3.3.6 Marine Environment

The marine environment west of the shipyard is influenced both by natural tidal cycles, with a potential range of up to 19 feet, and the discharge of the Snohomish River into Port Gardner Bay. Aside from tidal movement, water currents in the North Marina area and the in-water portion of the Site are comparatively mild and are protected from the open marine environment by a breakwater (Figure 1).

The marine area west of the shipyard has been in use as a marina since at least the 1960s. The area is depositional in nature, with sediments carried by the Snohomish River tending to be brought into the marina with the incoming tide. As a result, the area must be dredged periodically to maintain navigable water depth. According to the Port, the portions of the marina north of the marine railway and the near shore areas were dredged in 1990 and 2001. However, the sediment immediately adjacent to the bulkhead was not dredged due to the potential for damage to the bulkhead and stability concerns. Consequently there is virtually no undisturbed natural habitat in close proximity to the shipyard.

Areas near the shipyard that have typically not been directly influenced by dredging operations are the marine railway and the area between the railway and the floating dock to the north, as well as the narrow nearshore zone stretching along the north-south bulkhead.

3.3.7 Terrestrial Ecological Setting

The upland portion of the Site covers approximately 4 acres, most of which is currently covered by buildings or pavement. The unpaved area, which is mostly located in the southwest potion of the Site, is estimated to be approximately 1.0 acre. The property is currently used for industrial purposes and based upon the rating system described in WAC 173-340-900, Table 749-1, the quality of the habitat would be considered low as the Site has been severely disturbed by human activity. The upland portion of the Site is considered unlikely to attract wildlife due to the absence of vegetation or standing water. In addition, the level of human activity is relatively high which would further interfere with wildlife. Upland areas to the north and south of the Site are also mostly covered by buildings and paved and are considered to provide low quality habitat. The area directly to the west of the Site is paved followed by the North Marina and Port Gardner Bay.

The nearest terrestrial habitat to the Site is located approximately 150 feet east of the Site on the east side of West Marine View Drive and includes a small vegetated area on a steeply sloping hillside that is isolated from the Site by railroad tracks, West Marine View Drive, structures and paved areas (Figure 3).

The terrestrial ecological setting of the Site is expected to change in the future when the site is redeveloped. As described below in Section 3.4, future land use may include commercial and residential development.

3.4 FUTURE LAND USE

The Port of Everett is in the process of redeveloping the upland area surrounding the North Marina. This redevelopment has included the recent demolition of the former net shed building south of the Site and demolition of other structures north and northwest of the Site. ESY's lease runs through July 2009. Once ESY or its subtenants are no longer using the Site, it is anticipated that the existing structures on the Site will be demolished as part of the redevelopment project. The City of Everett zoning map (City of Everett 2008) identifies the zoning of the Site as Waterfront Commercial which does not fit within MTCA's characteristics of Industrial Land Use. The redevelopment plan for the Site currently includes commercial development such as professional office space and retail shopping. Depending on demand, future development could include retail/hospital or residential. Following redevelopment, the site would be mostly covered with buildings or pavement with limited landscaped areas. Future use of the Site for heavy industrial purposes is <u>not</u> anticipated at this time, and would not be allowed under the current zoning code.

4.0 PREVIOUS REMEDIAL ACTION AND SITE INVESTIGATIONS

4.1 FISHERMAN'S BOAT SHOP INDEPENDENT CLEANUP ACTION - 1988/1989

Soil sampling conducted by Ecology in 1987 (Ecology 1992) detected copper, lead, and zinc contamination reportedly resulting from abrasive grit waste east of the wood shop area. In response to Ecology's findings, Fisherman's Boat Shop excavated the grit and underlying soil in the area surrounding the wood shop. The approximate limits of the excavation as reported by Everett Shipyard personnel are shown on Figure 3. According to Everett Shipyard personnel, the excavation was extended 1 to 2 feet into the underlying soil to facilitate drainage to the catch basin that was installed in this area and to allow for placement of a thick layer of asphalt needed to support heavy equipment. Confirmation soil sampling following the excavation was reportedly not performed and there is no written documentation regarding this interim cleanup action.

4.2 ECOLOGY SITE INSPECTIONS - 1992

During Ecology's April 1992 site inspection, the facility was found to be a "large-quantity generator" of hazardous waste. Abrasive grit was observed on the ground, near storm drains, and inside storm drains. The facility was subsequently cited for spills and discharges into the environment. Shipping papers maintained by the facility indicated that regulated wastes (sludge, paint thinner, paint, oil, paint solids, xylenes, methyl ethyl ketone, etc.) were disposed from the Site, but lacked manifests. Ecology found that Everett Shipyard was discharging water from a building wash sink directly to the stormwater system that was connected to an outfall that discharged into the bay (North Marina). This discharge ended in May 1992. Ecology also documented a spill of lead-acid battery liquid and a spill of creosote from a dispenser and some soil staining associated with these spills.

4.3 LANDAU PHASE I ENVIRONMENTAL SITE ASSESSMENT - 2001

In 2001, Landau completed a Phase I Environmental Site Assessment (ESA) of the North Marina property for the Port of Everett. The North Marina property covers approximately 65 acres of uplands and 35 to 45 acres of intertidal and subtidal areas, including the Everett Shipyard property and adjacent marina.

At the time of the site reconnaissance, tenants at the Site included Fisherman's Boat Shop and Everett Engineering. Creosote treated timbers, surface stains, abrasive grit and paint chips were noted during the site reconnaissance. The adjacent tenant to the north was Harbor Marine Maintenance. Quality Seafoods was located to the southeast.

The Phase I ESA summarizes the Ecology Site inspections conducted in 1992 and described above in Section 4.2. Ecology files also contained records related to the stormwater discharge permit (National Pollutant Discharge Elimination System [NPDES] permit No.:WA-003096-1). A water compliance report in Ecology's files dated August 28, 1996 described a pressure wash water collection and recycling system. Water from the wash pad at the head of the marine railway was collected in a vault, treated and then discharged to the sanitary sewer. Stormwater in excess of the storage capacity was discharged through Outfall 001. According to the report, Outfall 002 was no longer functioning. Ecology's records also contained information related to decommissioning of a 400-gallon leaded gasoline UST in 1990. The UST (Ecology Site ID 972) was formerly located south of the weld shop and east of the wood shop and was in use from 1964 to October 1989. According to the Ecology UST closure form dated August 14, 1990, a site assessment was completed to permanently close the tank and no residual contamination was found.

Landau concluded that visual observations and records indicated that the Site will likely have a significant volume of upland soil and subtidal sediment that may require special handling during redevelopment. As reported in the Phase I report (Phase I Environmental Site Assessment), hazardous substances that may have impacted soil, sediment and groundwater included metals, organotins, volatile organic compounds (VOCs) and carcinogenic polycyclic aromatic hydrocarbons (cPAHs). In addition to these data groups mentioned in the Phase I report, total petroleum hydrocarbons (TPH; gasoline, oil, and diesel range), semi-volatile organic compounds (SVOCs), and PCBs may have impacted the aforementioned media based the presence of sources (described in this work plan) containing metals (copper, lead, zinc), MEK, diesel, hydraulic fluid, fuel oil, cutting oil, lube oil, gasoline, and various solvents, other petroleum products.

4.4 LANDAU PHASE II ENVIRONMENTAL SITE ASSESSMENT - 2003

In 2003, on behalf of the Port, Landau Associates conducted a Phase II ESA to determine whether historical and current industrial site activities may have resulted in threatened or actual releases of hazardous substances to Site media (e.g., soil, ground water, adjacent marine sediment) and whether any cleanup was warranted. The soil, groundwater, accumulated solids within storm drains, and marine sediment sampling locations are shown on Figure 4. Analytical data summaries are included in Appendix C. The findings from the investigations are summarized below.

Soil

Fourteen shallow soil samples (samples SS-1 through SS-6, LB-1, LB-2 and LB-9 through LB-14) were collected at the locations shown on Figure 4 and analyzed for diesel- and oil-range petroleum hydrocarbons, metals, PCBs, organotins, and/or VOCs. Abrasive grit, fine debris, and paint chips were observed in surficial soils at the Site. Diesel- and oil-range petroleum hydrocarbons, metals, and organotins were the only analytes detected (Table 2). Landau compared the metals results to several screening criteria (Method A Unrestricted Use, Method B Direct Contact, and a level calculated to be protective of surface water). Based on this comparison, arsenic, cadmium, copper, lead, mercury and zinc exceeded screening levels in the near surface soils. Diesel- and oil-range petroleum hydrocarbons and organotin concentrations did not exceed screening levels used by Landau. In addition, the toxicity characteristic leaching procedure (TCLP) result for lead in one of two soil samples analyzed was above the state dangerous waste (WAC 173-303) characteristics criteria.

Storm Drain Sediment

Six catch basin sediment and two storm drain sediment samples were collected and analyzed for total metals and bulk tributyltin (TBT). The results are summarized in Table 3. They were compared to both the MTCA cleanup level criteria and the state Sediment Management Standards (SMS), because of the potential for release to the marine environment. Exceedances of one or both standards were found for arsenic, copper, and zinc in every sample. Select samples also had exceedances for cadmium, lead, and mercury. All samples also exceeded the preliminary TBT criterion used in the ESA for screening the marine sediment results.

Groundwater

Groundwater samples were collected from monitoring wells MW-1, MW-2 and MW-3 and borings LB4 through LB8 (Figure 4). Groundwater was encountered at depths ranging from approximately 4 to 5 feet below ground surface. The groundwater samples were analyzed for gasoline- , diesel- and oil-range petroleum hydrocarbons, metals, VOCs, SVOCs, and/or chloride. Groundwater samples analyzed for metals from temporary wells (LB4 to LB8) were filtered using a 0.45-μm in-line filter to minimize the effect of turbidity. Groundwater samples from monitoring wells (MW-1 to MW-3) were analyzed for total metals. Diesel-range petroleum hydrocarbons were detected in two (MW-3 and LB-4) of the eight samples (Table 4). Chloride concentrations ranged from 32 to 190 mg/L. The chloride results suggested some impact by saltwater. No other analytes were detected. None of the detected analytes exceeded the screening criteria used by Landau.

Marine Sediments

Shallow marine sediment (0 to 10 cm) samples were collected from six locations using a van Veen sampler. Two samples were collected close to the bulkhead in locations corresponding to the north and south boundaries of the Site. The other four samples were collected along the edges of the marine railway, two within 20 feet of the shore and the other two approximately 60 feet offshore (Figure 4). These samples were analyzed for metals, SVOCs, and organotins in porewater. Four of the samples were also analyzed for bulk organotins (this includes one field duplicate), two samples were also analyzed for PCBs, and one sample was also analyzed for volatiles.

A summary of the analytical results for the sediment samples is included in Table 5a and 5b. Copper, mercury and/or zinc exceeded SMS criteria in two of the six samples. Detected concentrations of PAHs and SVOCs exceeded SMS criteria in two of the six samples. VOCs were not detected above the SMS criteria. The preliminary screening level for TBT was exceeded in four of the six samples.

4.5 LANDAU SEDIMENT QUALITY INVESTIGATION - 2004

In 2004, Landau collected another round of marine sediment samples from the North Marina area. This sampling included both shallow 0 to 10 cm samples and sediment cores. Sampling was performed in two areas: adjacent to the western end of the peninsula north of the shipyard and in the northern portion of the nearshore area adjacent to the shipyard.

A total of five shallow grab samples and three cores were collected in the area just west of the shipyard. One grab was collected in the general vicinity of the former Port tidal grid (used for boat washing and maintenance) south of the marine railway. The other four grab samples were collected in the general area of the Port's travel lift dock and boat wash facility at the north end of the bulkhead. Two of the cores were collected approximately 25 feet offshore and closely adjacent to the sides of the marine railway. The third core was collected in the general vicinity of the boat wash facility at the north end of the bulkhead. Each of the cores was sectioned into two samples.

All of the samples were analyzed for metals and semivolatiles. All of the grab samples were also analyzed for organotins in porewater. Three of the grab samples and all of the six samples prepared from the sediment cores were also analyzed for bulk organotins.

A summary of the analytical results for the sediment samples is included in Table 6a and 6b. Arsenic, copper, mercury and/or zinc exceeded SMS criteria in three of the eleven samples. Detected concentrations of SVOCs and TBT exceeded SMS criteria in samples from two of three cores.

4.6 URS LIMITED SOIL INVESTIGATION - 2007

URS conducted a supplemental investigation of shallow soil in the southwestern portion of the Site to further assess the extent of elevated concentrations of petroleum hydrocarbons and metals concentrations detected in the shallow soil by Landau (2003). The soil investigation was conducted in general accordance with the methods and procedures outlined in the Sampling and Analysis Plan (SAP) (URS 2007a). The investigation included collecting soil samples from 29 shallow hand auger borings (boring SS-1 through SS-29) which were spaced approximately 40 feet apart as shown on Figure 4. At the request of ESY, an additional four soil borings (boring BSS-1 through BSS-4) were sampled at offsite locations north and south of the Site to obtain background soil samples (Figure 4). Analytical data summaries are included in Appendix C.

The soil sample collected from approximately 1.0 to 1.5 feet bgs from each boring was analyzed for diesel- and oil-range petroleum hydrocarbons and total metals (arsenic, arsenic, cadmium, copper, lead, mercury and zinc). If an exceedance of the MTCA Method A soil cleanup level was detected in this sample, the soil sample collected from approximately 3.0 to 3.5 feet bgs from that boring was also analyzed. In the southwestern portion of the yard where the skids have been removed and the thickness of more recent fill material appeared to be greater, the 3-foot samples were analyzed to assess soil conditions beneath the recent fill. The four samples with the highest concentrations of arsenic were also analyzed for TCLP metals. Analytical results are summarized in Tables 7 and 8.

Petroleum Hydrocarbons

Diesel- and/or oil-range petroleum hydrocarbons were detected in soil samples from three borings (SS-2, SS-5 and SS-22), located in the southwestern portion of the Site, at concentrations exceeding the MTCA Method A soil cleanup level for unrestricted use (2,000 mg/kg). The exceedances were detected in the 1 foot and/or 3-foot samples and in each case the hydrocarbon concentrations in the underlying sample was below the cleanup level (Table 7). The distribution of the petroleum hydrocarbons in soil does not suggest widespread releases have occurred and the volume of soil exceeding the cleanup levels does not appear to be extensive. The highest concentrations of oil-range petroleum hydrocarbons (26,000 mg/kg) were detected in boring SS-2 which is located adjacent to the southern boundary of the Site. This boring is located in close proximity to the location of a former aboveground storage tank that was maintained by the Port and used by marina tenants to dispose of waste oil. This tank was portable and was historically placed in several locations in close proximity to the southern boundary of the lease hold.

Petroleum hydrocarbons were detected in 25 of the 29 remaining soil samples at concentrations below the MTCA Method A soil cleanup level. Petroleum hydrocarbons were also detected in 4 of the 6 soil samples taken outside of the lease area boundary and ranged in concentration from 36 mg/kg (BSS-1) to 1,100 mg/kg (BSS-3).

Metals

One or more metal analytes were detected at concentrations above the Method A soil cleanup level for unrestricted use or Method B cleanup level in samples collected at 1 foot at 11 boring locations (Table 7). Arsenic was the metal most frequently detected above the Method A cleanup level (20 mg/kg). Arsenic was detected in all 11 samples at concentrations ranging from 21.9 to 687 mg/kg. Concentrations of cadmium, copper, lead, and mercury that exceeded potentially applicable cleanup levels were detected in the same samples that contained arsenic at concentrations above the cleanup level. Zinc did not exceed potentially applicable cleanup levels in any of the samples.

Only one of the deeper samples, SS-25 (29.8 mg/kg), contained arsenic at concentrations above the cleanup level. None of the other metal anlaytes exceeded their respective cleanups level in this sample.

The TCLP analysis did not identify any metals concentrations (Table 8) exceeding the dangerous waste threshold concentrations outline in Dangerous Waste Regulations (WAC 173-303-090).

4.7 SURFACE WATER MONITORING - 1999 TO 2008

Storm water monitoring was been performed by ESY at Outfall 001 from at least 1999 to 2003 in accordance with the requirements of the Industrial Storm Water Discharge permit (NPDES Permit No.: WA-003096-1). Available records include samples collected at approximately monthly intervals between December 1999 and September 2002. The samples were analyzed for copper, lead, zinc, oil and grease, TPH, turbidity. The background turbidity in the receiving water was also tested. As described above in Section 3.1.2, in 2002 the stormwater discharge from the Site was diverted to the sanitary sewer and therefore the monthly monitoring was no longer required. Available monitoring results are summarized in Table 9 and indicate that copper, lead, and zinc exceeded marine chronic ambient water quality criteria. Oil and grease was detected in samples collected in 1999, 2001, and 2002.

Beginning in 2001, surface water samples were also collected on an approximately quarterly basis when a ship was launched at the marine railway after undergoing repairs at the shipyard. The samples were analyzed for oil and grease and TPH. Available results are summarized in Table 10. With the exception of a single sample collected in 2007, oil and grease and petroleum hydrocarbons were below the reporting limits (5mg/L) in most of the samples.

5.0 PRELIMINARY CONCEPTUAL SITE MODEL

This section describes a preliminary conceptual model that describes the known releases on the Site, the subsurface conditions and contaminant distribution and the potential receptors and exposure pathways.

5.1 HUMAN POPULATION AND LAND USE

The site and areas to the north and south are currently or have been historically used for industrial or commercial purposes. The current use is primarily for marine-based businesses, but also includes restaurants and other retail businesses. The areas on and adjacent to the Site are used by workers, but are also accessible to the general public along various roads and right-of-ways that surround the Site. Docks within the North Marina are also accessible to the public.

Areas to the north and adjacent to the south of the Site are currently undergoing redevelopment and many of the historic buildings have been demolished. While there are no residential areas directly adjacent to the Site, single family residences are located on the top of the bluff directly east of West Marine View Drive.

5.2 POTENTIAL SOURCE AREAS AND RELEASES

A major source of contamination associated with the shipyard operation is abrasive blasting and painting. These operations were historically conducted outside buildings primarily within the central and southwestern portions of the Site. Abrasive blasting operations reportedly began in the late 1960s when the shipyard began to work on metal boats. Aerial photographs, interviews and site observations indicate that significant quantities of abrasive grit accumulated in this area during the 1970s and 1980s. Blasting operations took place in close proximity to the shoreline. Historically, copper slag was reportedly used as grit and may have resulted in release of copper and other metals into surface soils. In the 1980s, other abrasives (e.g., Kleen Blast and Green Diamond) were used for blasting and may also have released metals into the environment. Kleen Blast is reportedly still used at the Site. Metals and antifouling agents such as TBT would also have been released during the blasting process as coatings were removed from vessels. Paint and solvent use and storage at the Site may also have resulted in accidental releases.

Metals have been detected in shallow soil in the southwestern portion of the Site at concentrations exceeding MTCA cleanup levels. The highest concentrations of metals in soil were detected at a depth of approximately one foot and appear to be associated with the presence of abrasive grit which had previously accumulated on the ground surface. Elevated metal concentrations in the deeper soil samples collected from 3 feet bgs were considerably lower and with one exception did not exceed MTCA Method A or B Cleanup Levels (Table 7) suggesting limited mobility of metals in soil at the site.

While mechanical repairs were not routinely performed at the shipyard, boat owners were historically allowed to perform boat maintenance on the Site, and as a result, may have released petroleum hydrocarbons. Other potential sources of petroleum hydrocarbons related to shipyard activities include the AST associated with the steam box and existing and former USTs.

In addition to the potential onsite sources of petroleum hydrocarbons, beginning some time prior to 1998 and continuing until the present, the Port has maintained a used oil collection facility adjacent to leasehold boundary near the southwest corner of the Site. According to Port personnel, the used oil AST has been located on asphalt pavement during its entire usage period. Based on the proximity of the AST to unpaved portions of the Site, potential releases associated with the AST may have impacted the Site.

Petroleum hydrocarbons may have been released from this potential source and migrated onto the Site. Other potential sources of petroleum hydrocarbons related to shipyard activities include the ASTs associated with the steam box and heating oil and existing and former USTs. Petroleum hydrocarbons detections in soil were widespread, however concentrations exceeding the MTCA Method A soil cleanup levels were limited to three locations including one adjacent to a former aboveground waste oil tank operated by the Port.

Other hazardous substances used and stored at the Site have included paints, solvents, cutting oils, glues, hydraulic oil, creosote, rust preventers, and antifreeze. Areas where these hazardous substances were used and stored are considered to be potential source areas. Ecology observed paint spills in the boat/maintenance shed and a leaking lead-acid battery in the storage yard at the Site in 1992. Ecology also reported a creosote spill (Ecology 1992). While stained soil is still evident at the Site, there is no evidence of significant recent releases (e.g., no stains were observed) within the onsite buildings. The quantities of chemicals used in these buildings appear to have been small based on the size of containers stored at the Site (see Table 1), and the floor within most of the structures is concrete or asphalt. Prior to construction of some of these structures (i.e., Everett Engineering buildings) or portions of the structures (i.e., eastern and western additions to the weld shop), these areas appear to have been used for vessel maintenance. These areas and most of the upland portion of the Site also appear to have been unpaved until the late 1970s or early 1980s.

Everett Engineering conducted machining operations in three buildings on the eastern part of the Site and likely used significant quantities of cutting oil and lube oil with smaller quantities of solvents. The interior of these buildings were described in 2001 by Landau as well maintained. Since that time, the machinery previously installed and operated in the buildings has been removed and staining on the concrete floors in the buildings is now evident. Inside Building 7, a sub-slab was constructed below the top floor slab and the soil between the two slabs appears to have been impacted by oils Everett Engineering used in the machining operations. Other floor penetrations inside these building provide potential conduits for releases inside the buildings to reach the subsurface. In addition, the former compressor located near the northwest corner of the

Everett Engineering maintenance shop appears to have been the source of a small release of oil.

The Site is located adjacent to the North Marina. The North Marina area has included a wide variety of businesses and operations since the area was developed in the 1940s. Other potential sources of PCOCs and operations in the North Marina area may have impacted areas on or adjacent to the upland and in-water portions of the Site, including:

- Operations at the former Tidal Grid operated by the Port including boat maintenance and painting over water;
- The Port's Travel Lift and Boat Haul-out operation that historically included boat washing;
- Historic marine servicing and maintenance operations located north of the Port's Travel Lift and Boat Haul-out that may have discharged chemicals to the North Marina as overland flow or into outfalls that have been observed north and west of Outfall A.
- Operations within and adjacent to the building directly to the north of the Site, including current tenants (e.g., Harbor Marine) where metal grinding has occurred and oil staining has been observed on the pavement;
- Parked vehicles and other historic operations located along 14th Street north of the Site, between the leasehold and the bulkhead and on the north side of the former Net Shed that have existed for approximately 60 years;
- Chemically-treated wooden pilings along the bulkhead west of the leasehold;
- Releases from boats moored in and transiting the North Marina;
- Operations associated with the former Fish Processing facility (e.g., maintenance) located southeast of the Site; and
- Historic operations related to the net shed and a small motor repair station located near the west end of the Net Shed.

Additional information regarding these potential sources may be obtained during the RI/FS.

5.3 TRANSPORT MECHANISMS

Contaminants associated with marine vessel maintenance activities that were released in the upland operations areas within the leasehold and may have migrated beyond the leasehold boundary in storm water runoff. Aerial deposition of wind blown particulates may have also dispersed contaminants (primarily during abrasive blasting operations) beyond the leasehold boundary. Contaminants may also have leached from the soil and migrated laterally through the soil and downward into the underlying groundwater which flows into the adjacent North Marina. Surface water discharges (e.g., overland flow and stormwater outfalls) into the North Marina and contaminant releases directly into the marina would accumulate in sediment which may be re-suspended and dispersed by several mechanisms. Each of the transport mechanisms is described below.

When the area surrounding the leasehold was unpaved, storm water from the Site was managed primarily via infiltration and PCOCs released to surface soil may have been transported in surface water runoff onto adjacent unpaved areas affecting the shallow soil in areas adjacent to the leasehold with PCOCs. However, operation areas surrounding the skids (side tracks) in the southwestern and central portions of the leasehold were maintained at an elevation below the surrounding grade level to facilitate access to the boats in the shipyard. In addition, the concrete footings for the westernmost skids form a nearly continuous barrier to surface water flow along the southwestern boundary of the leasehold. Soil at the Site consists of silty, sandy fill which appears, based on site observations (minimal evidence of ponding or overland flow in unpaved areas), to be conducive to infiltration throughout most of the unpaved portion of the leasehold potentially allowing for lateral and vertical migration of PCOCs in the shallow soil. The unpaved road that historically bordered the leasehold on the north, west and south reportedly had a “crown” in the middle that would generally prevent overland flow from crossing the road. Therefore, with the exception of the area adjacent to the marine railway and the area directly north of the marine railway, there appears to be limited potential for surface run-off from operation areas within the leasehold to have historically transported contaminants to the adjacent unpaved areas.

Catch basins were eventually installed on and adjacent to the leasehold. Surface water runoff from the leasehold was collected in catch basins that discharged to the North Marina from Outfalls 001 and 002 located adjacent to the Marine railway. Outfalls A and C were reported by Landau (2003) to have been connected historically to catch basins located north and south of the leasehold, respectively. However, the current status of these catch basins and outfalls is uncertain. Outfall B is reportedly connected to a series of catch basins located west and south of the Leasehold. In 2002, the catch basins previously connected to Outfalls 001 and 002 were reconfigured to discharge into the sanitary sewer system. An additional catch basin was installed in 2008. Surface water from a small area adjacent to the marine railway continues to discharge to the marina as sheet flow.

Sampling of accumulated solids in the catch basins in 2003 detected elevated levels of arsenic, copper, zinc and TBT indicating that releases from the Site and/or potential offsite sources entered one or more of the catch basins. Periodic monitoring of storm water discharges from 1999 to 2002 also confirmed the presence of low levels of copper, lead and zinc in storm water discharge at Outfall 001. Other metals, TBT and petroleum hydrocarbons were also likely to have been discharged to the marina from this former outfall. These contaminants and sediment would tend to settle relatively close to the outfall given the protected nature of the marina and the relatively calm waters.

During abrasive blasting operations, wind blown contaminants had the potential to migrate beyond the leasehold boundary and onto adjacent property. Finer-grained particles containing contaminants may also have been re-suspended as fugitive dust during periods of significant wind.

Groundwater occurs beneath the Site at depths ranging from 3 and 6 feet bgs. Given the proximity of the site to the marina, the groundwater level is expected to fluctuate in response to changes in the tides and in response to local recharge following periods of precipitation. The dominant groundwater flow direction is expected to be westerly toward the marina. Tidal fluctuations could affect the flow conditions.

Groundwater samples were collected from eight locations beneath the Site in 2003 (Landau 2003). Low levels of diesel-range petroleum hydrocarbons (180 to 210 ug/l) were detected in two samples, but the concentrations did not exceed MTCA cleanup levels. Metals, VOCs and SVOCs were not detected at concentrations above the laboratory reporting limits. Several of the groundwater samples locations were situated in close proximity or downgradient of areas with elevated concentrations of metals and/or petroleum hydrocarbons in shallow soil. The low concentrations of petroleum hydrocarbons and metals in the groundwater suggest that significant concentrations of these compounds are not leaching into the groundwater. Based on the available data, it does not appear that the groundwater discharging into the marina has a significant effect on the sediments or surface water quality.

Chemicals detected in sediments in the marina at elevated concentrations that may have originated at the Site or other nearby potential former sources, such as the Port's travel lift and boat haul-out area and former tidal grid, include: metals (arsenic, cadmium, copper, lead, mercury, and zinc), organotins (bulk TBT), PAHs (fluoranthene and chrysene), and phthalates. By the mid 1990s, the Port had removed the tidal grid and constructed a closed-loop boat wash facility near the travel lift. Sediments north of the marine railway and finger pier were dredged in 1990 and 2001. The accumulation of sediment in these areas is likely to be less than in the area beneath and south of the finger pier and marine railway. Dredging and other activities at the marina (e.g., propeller wash, anchors) have the potential to re-suspend sediments, increasing the areal distribution of contaminants.

As described above in Section 5.2, there are numerous other potential sources of PCOCs adjacent to the Site. Releases of chemicals from these sources would be subject to similar transport mechanisms, including overland flow into catch basins connected to outfalls that discharge into the North Marina, and may have commingled with releases from the Site.

5.4 POTENTIAL EXPOSURE PATHWAYS AND RECEPTORS

The Site is currently used for industrial purposes and exposure pathways are primarily limited to the workers at ESY. However, construction workers, current and future commercial/industrial workers and site visitors, and future residents could also be exposed at the Site.

Potential current and future exposure pathways at the subject site are:

- **Soil**
    - Human direct contact (i.e., ingestion and dermal exposure) with soil by construction and site maintenance workers, and future residents.
    - Direct contact with soil by terrestrial ecological receptors (e.g., mammals, birds, vegetation, etc.).
    - Uptake of soil contaminants into terrestrial ecological species (i.e. terrestrial plant and animal bioaccumulation) who then would be consumed as prey by upper tropic level terrestrial ecological receptors.
    - Cross-media transfer pathway associated with hazardous substances in upland soil leaching to adjacent groundwater and followed by adjacent marine sediments.

- **Air**
    - Exposure through inhalation of soil contaminants that have migrated to air either as windblown/fugitive dust or as vapor. Receptors may include site trespassers, construction and site maintenance workers, future residents, and terrestrial ecological receptors. Contaminants deposited above ground level may mobilize in fugitive dust throughout the site. This fugitive dust could potentially be transported off-site either to other upland areas or to adjacent marine water. This pathway should also include future indoor air exposure to commercial workers/residents who may occupy future on-site buildings.
    - Exposure through inhalation of groundwater contaminants that have migrated to air as vapor. This pathway may include future indoor air exposure to commercial workers/residents who may occupy future on-site buildings. However, VOCs have not been detected in soil or groundwater at the Site and this exposure pathway appears to be unlikely based on the available data.

- **Groundwater**
    - Human dermal contact with shallow groundwater by construction and site maintenance workers.
    - Media transfer pathway associated with hazardous substances in shallow groundwater migrating to marine surface water/sediment.
    - Potable water supply is currently provided by City of Everett which obtains the water from Spada Lake Reservoir located approximately 20 miles east of Everett. Groundwater beneath the Site is not used for drinking water and groundwater should not be considered potable due to the proximity to marine waters as outlined in WAC 173-340-720(2)(d). A review of available water well log logs did not identify any domestic or municipal water supply wells within a one-mile radius of the Site (Ecology 2008). Therefore, the risk associated with the potential exposure to groundwater via human ingestion is not considered significant. It is noted that metals and petroleum hydrocarbons have not been detected in groundwater at the Site (limited groundwater sampling was performed in 2003) at

concentrations that exceed potentially applicable groundwater cleanup levels such as marine surface water criteria (WAC 173-201A-040).

- **Marine Surface Water and Sediment**
  - Human direct contact with Port Garder Bay surface water and sediment by recreational users; Direct human exposure to sediments could be limited to contact with sediments during dredging or other construction operations in the marina as there is no access to the shoreline adjacent to the Site.
  - Direct contact with Port Garder Bay surface water and sediment by aquatic ecological receptors (e.g., fish, invertebrates such as shellfish, birds, amphibians etc.). Ecological receptors that may be exposed to sediment include benthic organisms and other marine life and birds that may forage in these sediments. This includes Chinook salmon, steelhead and bull trout which are threatened species. Contaminants in the sediment have the potential to bioaccumulate within fish which could ultimately lead to a potential exposure pathway to marine mammals, birds, and humans.
  - Uptake of surface water/sediment contaminants into aquatic ecological species such as fish and shellfish (i.e., aquatic organism bioaccumulation) who then would be consumed as prey by humans and upper tropic level aquatic ecological receptors.

Terrestrial Ecological Evaluation

As described above in Section 3.2.7, the quality of the terrestrial habitat at the Site is low and the nearby habitat is limited and isolated from the Site. In addition, none of the contaminants considered in a simplified terrestrial evaluation (WAC 173-340-7492) have been detected at the Site. Therefore, potential exposure to terrestrial ecological receptors may not be considered further and the terrestrial ecological evaluation can be ended under WAC 173-340-7492 (2)(a)(ii) if the known current or future land use plan becomes final. If land-use plans at the site change, additional TEE analysis is necessary. A worksheet documenting the analysis required under WAC 173-340-7492 is included in Appendix D.

6.0 PRELIMINARY SCREENING LEVELS AND APPLICABLE REGULATIONS

This section identifies the regulations applicable to the RI activities as described in this work plan and the screening levels that will be used to identify indicator hazardous substances.

6.1 POTENTIALLY APPLICABLE REGULATIONS

In accordance with WAC 173-340-710(9)(b), remedial activities, including remedial investigations, conducted under an agreed order are exempt from the procedural requirements of certain state and local laws, including the Washington State Clean Air Act (Chapter 70.94 RCW), Washington State Solid Waste Management Act (Chapter 70.95 RCW), Washington State Hazardous Waste Management Act (Chapter 70.105 RCW), Washington State Construction Projects in Water Act (Chapter 75.20 RCW, recodified at Chapter 77.55 RCW), Washington State Water Pollution Control (Chapter 90.48 RCW) and Washington State Shoreline Management Act (Chapter 90.58 RCW), as well as any laws requiring or authorizing local government permits or approvals for the action. These remedial activities must still comply with the substantive requirements of the laws in accordance with WAC 173-340-710(9)(c). Ecology has the responsibility under an agreed order to ensure compliance with the substantive requirements, and to provide an opportunity for comment by the public, state agencies, and local governments (WAC 173-340-170[9][d]).

Since the field work described in this work plan is being conducted under a MTCA Agreed Order, activities at the site will be exempt from the procedural requirements of the above-referenced laws. Work performed in the field will comply with potentially applicable local, state and federal laws and regulations. For the proposed activities identified in this work plan, the following applicable laws will be met:

- Construction and maintenance of monitoring wells and soil borings will be conducted in accordance with select provisions of Chapter 173-160 WAC;
- Licensed contractors who install wells will meet the select provisions of Chapter 173-162 WAC and

Environmental soil, groundwater, and sediment samples and excess materials will be managed on-site and disposed of in accordance with the requirements WAC 173-350 and WAC 173-303 as specified in the SAPs included as Appendixes E and F of this work plan. Specific disposal facility requirements will also be met.

6.2 PRELIMINARY CLEANUP LEVEL EVALUATION

Based upon the preliminary conceptual site model described in Section 5 of this work plan and discussions with Ecology, preliminary cleanup levels for groundwater, soils and sediment were identified based upon the MTCA requirements (WAC 173-340-700 through 173-340-740), Sediment Management Standards (SMS) (Chapter 173-204 WAC), and applicable state and federal laws under a residential (unrestricted) land use scenario. Consistent with the requirements of the Agreed Order, this evaluation considers all applicable pathways, including direct contact (i.e., ingestion, dermal contact, and inhalation), cross-media transfer pathways (i.e., leaching to groundwater, groundwater migration to surface water/adjacent marine sediments, and vapor intrusion pathway), and exposure to terrestrial and/or aquatic ecological and human receptors.

Cleanup levels under MTCA are categorized as Methods A, B, or C (WAC 173-340-700). Method A cleanup levels, which apply to soil, groundwater, and surface water media, are intended to be used for routine site cleanups. Cleanup levels under Method A are available for only about 25 of the hundreds of potential hazardous substances and are the more commonly found contaminants. Tables of the Method A cleanup levels are available in MTCA Rule for potable groundwater, unrestricted land use (includes residential) soil, and industrial land use Method A cleanup levels for these media must be at least as stringent as concentrations established under applicable state and federal laws. Method A groundwater concentrations must be protective of surface water beneficial uses (if the pathway for surface water-groundwater is complete). Unlike for groundwater and soil, the regulation does not provide a table of Method A cleanup levels for surface water. Surface water Method A cleanup levels must be at least as stringent as concentrations established under applicable state and federal laws and other requirements (See WAC 173-340-730(2)).

Method B may be used at any site and is the most common method for setting cleanup levels when sites are contaminated with substances not listed under Method A. Cleanup levels under Method B are established using applicable state and federal laws and the risk assessment equations and other requirements specified in the MTCA Rule for each medium. In addition to accounting for human health impacts, Method B cleanup levels also account for any potential terrestrial or aquatic ecological impacts (unless it can be demonstrated that such impacts are not a concern at the site). Method B cleanup levels for human health are calculated using the equations in the MTCA rules and include cleanup levels for all exposure pathways such as soil concentrations protective of groundwater and/or surface water.

In contrast to Method B, Method C cleanup levels are intended for industrial sites where exposure to potential contaminants is limited and controllable. Method C cleanup levels are not applicable at the subject site.

Based on the discussion presented in this section, preliminary screening levels for soil, groundwater, surface water, and sediment data were developed and are included in Appendix C. These screening levels will be used for screening the existing data, unless background levels and/or PQL are higher. Final cleanup levels will be determined during the RI/FS process that follows from this work Plan.

6.2.1 Potential MTCA Groundwater Requirements

Potentially applicable groundwater cleanup levels included the following:

- **Potential MTCA Method A Values.** MTCA Method A cleanup levels include concentrations listed in WAC 173-340-900 (Table 720-1) and compliance with the corresponding footnotes.
- **Potential Federal and State Laws.** Potential MTCA Method A and B cleanup levels include concentrations specified under state and federal laws (WAC 173-340-720(3)(b)(ii); WAC 173-340-720(4)(b)(i)). These potential cleanup levels include: maximum contaminant levels (MCLs) established under the Safe Drinking Water Act (SDWA) (40 CFR 141); maximum contaminant level goals (MCLGs) established under the SDWA (40 CFR 141) and MCLs established by the Washington Department of Health (DOH) (Chapter 246-296 WAC). As required by WAC 173-340-720(7)(b), where a cleanup level developed is based

on an applicable state or federal law and the level of risk upon which the standard is based exceeds an excess cancer risk of one in one hundred thousand (1 x 10-5) or a hazard index of one (1), the cleanup level shall be adjusted downward so that the total excess cancer risk does not exceed one in one hundred thousand (1 x 10-5) and the hazard index does not exceed one (1) at the site.

- **Potential Surface Water Beneficial Use.** Potential MTCA B cleanup levels include concentrations established in accordance with the methods specified in WAC 173-340-730 (surface water cleanup levels) which may be applicable to groundwater cleanup where it is determined that the hazardous substances in the groundwater are likely to reach surface water (WAC 173-340-720(3)(b)(iv); WAC 173-340-720(4)(b)(ii)). These potential values include federal and state laws (WAC 173-340-730(2)(b)(i)), including marine water acute and chronic surface water quality standards (SWQS) specified in; National Recommended Water Quality Criteria (NRWQC; Clean Water Act 304 and National Toxics Rule 40 CFR 131) for aquatic organisms (acute and chronic criteria) and human health unless it can be demonstrated that such criteria are not relevant and appropriate for a specific surface water body or hazardous substance; State of Washington Water Quality Criteria for aquatic organisms (acute and chronic criteria) (WAC 173-201A).
- **Potential Human-Health Based Values.** Where no federal or state standards exist for a contaminant, then MTCA states that the preliminary cleanup standard will be the MTCA Method B level for carcinogenic and non-carcinogenic substances (WAC 173-340-720(3)(b)(i); WAC 173-340-720(4)(b)(iii)).

Under MTCA, groundwater must be classified as potable to protect drinking water beneficial uses unless it can be demonstrated that specific criteria are met. Per WAC 173-340-720(2), groundwater is not potable if:

- Groundwater does not serve as a current source of drinking water;
- Groundwater is not a potential future source of drinking water because:
    - Groundwater is present in insufficient quantity to yield greater than 0.5 gallons per minute on a sustainable basis to a well constructed in compliance with Chapter 173-160 WAC and in accordance with normal domestic water well construction practices for the area in which the site is located;
    - The groundwater contains natural background concentrations of organic or inorganic constituents that make use of the water as a drinking water source no practicable. Groundwater containing total dissolved solids (TDS) at concentrations greater than 10,000 mg/l shall normally be considered to have fulfilled this requirement; or
    - The groundwater is situated at a great depth or location that makes recovery of water for drinking water purposes technically impossible; and
- Ecology determines it is unlikely that hazardous substances will be transported from the contaminated groundwater to groundwater that is a current or potential

future source of drinking water at concentrations that exceed groundwater quality criteria established under Chapter 173-200 WAC.

Groundwater at the Site is not currently used as a source of drinking water and due to proximity to the North Marina is not considered suitable for future use. Therefore, groundwater at the Site is not considered potable due to the proximity to marine waters as outlined in WAC 173-340-720(2)(d) and potential human-health based values, including federal and state MCLs and MCLGs and MTCA Method A and B health-based groundwater cleanup levels may not be considered potential cleanup levels for the site. Cleanup levels for nonpotable groundwater may be established as specified in WAC 173-340-720 (3), (4) or (5) or using a site-specific risk assessment in accordance with WAC 173-340-720 (6)(c).

Due to the proximity of the groundwater to marine surface water, PCOCs in groundwater have the potential to reach surface water. Therefore, preliminary screening levels for the Site include concentrations established for the protection of surface water beneficial use. These screening levels include potential federal and state laws (WAC 173-340-730(2)(b)(i), including marine water acute and chronic SWQS specified in: NRWQC for aquatic organisms (acute and chronic criteria) and human health unless it can be demonstrated that such criteria are not relevant and appropriate for a specific surface water body or hazardous substance; and WAC 173-201A) and are summarized in Appendix C. Where appropriate, these values may be adjusted for PQL and background concentrations in accordance with WAC 173-340-720(7)(c) and WAC 173-34-730(5)(c).

6.2.2 Potential MTCA Soil Requirements

Potentially applicable soil cleanup levels included the following:

- **MTCA Method A Cleanup Levels for Unrestricted Land Use.** MTCA Method A cleanup levels include concentrations in Table 740-1 and compliance with the corresponding footnote.
- **Potential Federal and State Laws.** Potential MTCA Method A and B cleanup levels include concentrations specified under state and federal laws (WAC 173-340-740(2)(b)(ii); WAC 173-340-740(3)(b)(i)). Potential MTCA Method A and B levels are to consider concentrations specified under federal and state laws.
- **No Significant Adverse Terrestrial Ecological Risk.** MTCA requires that concentrations of hazardous substances result in no significant adverse effects on the protection and propagation of terrestrial ecological receptors unless it is determined that establishing such soil concentration is not necessary (WAC 173-340-740(2)(b)(iii); 173-340-740(3)(b)(ii)).
- **Potential Human-Health Based Values for Groundwater Protection.** For soil values based upon MTCA Method B, where no federal or state standards exist for a contaminant, then the MTCA requires that the preliminary cleanup standard will be a concentration that protects human health as determined by evaluating pathways for groundwater and dermal contact (WAC 173-340-740(3)(b)(iii) and WAC 173-340-747). Human-health based values for dermal contact are

discussed below. For groundwater, the regulation requires that PCOCs in soil will not cause contamination of groundwater at levels that exceed the human-health based groundwater cleanup levels using the methods specified in WAC 173-340-747.

- **Potential Human Health-Based Direct Contact Values.** Under WAC 173-340-740(3)(b)(iii)(B), for soil values based upon MTCA Method B, MTCA requires consideration of concentrations of PCOCs measured in site soils are estimated to result in no acute or chronic noncarcinogenic toxic effects on human health using a HQ of 1 and concentrations for which the upper bound on the estimated excess cancer risk is less than or equal to on in one million (1 x 10-6). WAC 173-340-740 specifies that the Equations 740-1 and 740-2 be used to calculate the concentration for direct contact values.
- **Potential Cleanup Levels for Petroleum Mixtures.** For soil values based upon MTCA Method B, MTCA requires consideration of potential concentrations for petroleum mixtures in soil where no federal or state standards exist for the contaminant (WAC 173-340-740(4)(b)(iii)(B)(III)). The total petroleum hydrocarbon cleanup level is calculated taking into account the additive effects of the petroleum fractions and VOCs present in the mixture using equation in Equation 740-3. For other non-carcinogens and known or suspected carcinogens within the petroleum mixture, the regulation specifies equations in Equations 740-4 and 740-5.

Based upon site-specific data, the following potential cleanup levels may not be applicable to the site:

- Since groundwater at the Site is not considered potable and preliminary groundwater cleanup levels are based upon protection of aquatic life (and not human health), potential MTCA Method A values based upon the protection of groundwater as a drinking water source (i.e., MCLs) and MTCA Method B human-health based values for groundwater protection– potability of ground water) - were determined to be not applicable (Table 740-1 and WAC 173-340-740-(3)(b)(iii)(A)).
- Soil concentrations based upon protection and propagation of terrestrial ecological receptors (WAC 173-340-740(2)(b)(iii); 173-340-740(3)(b)(ii)) were determined to be not applicable since the site is excluded from conducting any further terrestrial ecological evaluation in accordance with WAC 173-340-7491 and Table 749-1 as discussed in Section 5.3. The completed Table 749-1 is discussed in Section 3.2.7 of this Work plan and included in Appendix D.

The resulting soil screening levels for the Site include concentrations under either MTCA Method A unrestricted land use, Method B values for direct contact and soil concentrations protective of marine surface water, and are summarized in Appendix C. Soil concentrations protective of marine surface water were calculated using the fixed parameter three-phase partitioning model using default input parameters as described in WAC 173-340-747(4). However, soil concentrations were calculated using marine chronic water quality criteria outlined in WAC-173-201A-240 for metals detected at the site rather than groundwater criteria. Where appropriate, these values may be adjusted for PQL and background concentrations.

6.2.3 Potential Sediment Requirements

Potential sediment cleanup levels for sediments located within Puget Sound include the marine sediment quality standards (SQS) (WAC 173-204-320(b)) and the marine cleanup screening levels (CSL) (WAC 173-204-520 (a)). The marine SQS identified in Table I of WAC 173-204-320 correspond to a sediment quality that will result in no adverse effects, including no acute or chronic adverse effects on biological resources and no significant health risk to humans. The CSL identified in Table III of WAC 173-204-520 correspond to a sediment quality that will result in minor adverse effects. SQSs and CSLs are summarized in Appendix C

The marine area west of the shipyard is currently in use as a large marina (the North Marina), and this usage is expected to continue in the future. Much of the surrounding terrestrial area is projected by the Port to transition to mixed residential and commercial usage. Sediment data collected during the RI will be compared to both the CSL and SQS and the proposed sediment cleanup levels will be presented in the feasibility study.

No SQS or CSL values have been formally promulgated for the organotin compounds. Recent practice in the region has involved comparison with working criteria such as the values used to assess sediments as candidates for open water disposal under the Puget Sound Dredged Disposal Analysis Program (PSDDA).

7.0 EVALUATION OF EXISTING DATA

The existing analytical data collected at the Site and discussed in Section 4.0 were evaluated in terms of data usability and screened against the screening levels described in Section 6.0 and summarized in tables included in Appendix C. Both non-detect and detected data were considered in this screening. The results of the screening are presented in tables included in Appendix C. Statistical summaries of the data including the number of reported results, minimum and maximum concentrations and frequency of detection are also included in Appendix C.

Based on the available analytical results and the history of hazardous substances used at the Site, PCOCs have been identified and are summarized in Table 11. Indicator hazardous substances will be determined during the RI/FS process.

7.1 SOIL

Soil samples collected during previous investigations were analyzed for petroleum hydrocarbons (gasoline-range, diesel-range, and/or oil-range), metals, organotin compounds, PCBs, VOCs, and SVOCs. These soil data were compared to the screening levels (i.e., MTCA Method A Cleanup Levels for unrestricted land use, Method B values for direct contact and concentrations calculated to be protective of marine surface water quality) in tables included in Appendix C. Data (detects and non-detects) that exceeded one or more of the screening levels are highlighted in the tables.

The sample locations and the concentrations where hazardous substances exceeded the Method A and/or Method B cleanup levels are shown on Figure 5. The exceedances are limited to soil samples collected in the southwestern portion of the Site at depths less than or equal to approximately 3 feet bgs. Arsenic was detected in 11 samples at concentrations exceeding the MTCA Method A soil cleanup level. Concentrations of cadmium, copper, lead, and mercury that exceeded potentially applicable cleanup levels were detected in the same samples that contained arsenic at concentrations above the MTCA Method A soil cleanup level. Diesel- and/or oil-range petroleum hydrocarbons were detected in soil samples from three borings at concentrations exceeding the MTCA Method A soil cleanup level.

Detection limits for analyses completed during the previous investigations were adequate to achieve screening levels for PCOCs with the exception of arsenic and cadmium analyses. The number and location of analyses completed and/or the detection limits achieved by these analyses were not sufficient to screen out or to delineate the extent of PCOCs in soil. Soil sampling and analysis for metals, organotins, VOCs, SVOCs, and PCBs should be conducted during the RI to confirm the presence of indicator hazardous substances and delineate the extent of potential impacts.

7.2 GROUNDWATER

Groundwater samples collected during previous investigations were analyzed for petroleum hydrocarbons (gasoline-range, diesel-range, and/or oil-range), metals (total and dissolved), chloride, VOCs, and SVOCs. These groundwater data were compared to the screening levels in tables included in Appendix C. Only petroleum hydrocarbons were detected and the concentrations did not exceed the screening levels.

Detection limits for analyses completed during the previous investigations exceeded screening levels for selected metals, VOCs, and SVOCs. The number of analyses completed and/or the detection limits achieved by these analyses were not sufficient to screen out certain PCOCs. Groundwater analyses for selected metals, organotins, VOCs, SVOCs, PCBs and TDS should be conducted during the RI.

7.3 SURFACE WATER

Surface water samples collected at Outfall 001 in accordance with the requirements of the Industrial Storm Water Discharge permit (NPDES Permit No.: WA-003096-1) were analyzed for copper, lead, zinc, oil and grease, TPH, turbidity. As described in Section 4.7, concentrations of copper, lead and zinc exceeded potentially applicable surface water quality criteria (Table 10). However, catch basins that formerly collected storm water from operation areas on the Site and discharged into this outfall are now reportedly connected to the sanitary sewer. Stormwater runoff that may enter the North Marina from the Site includes sheet flow from a small area near the marine railway not collected in catch basins and roof runoff from the weld shop that is routed directly to Outfall 001. Due to the limited nature of the surface water discharge at the site, no further investigation of surface water appears to be warranted.

7.4 MARINE SEDIMENT

Sediment samples, including the samples of the accumulated solids collected from onsite catch basins, were analyzed for metals, organotin compounds, PCBs, VOCs, and SVOCs. These data were compared to the screening levels (i.e., SMS) in tables included in Appendix C. Data (detects and non-detects) that exceeded one or more of the screening levels are highlighted in the tables.

Exceedances of both the more stringent state SQS and the less stringent contaminant screening levels (CSL) were observed for a variety of chemicals in the 2003 marine sediment data samples (Figure 6). Most of the exceedances were found in samples from two locations (ESY-MS3 and ESY-MS5) adjacent to the marine railway and directly offshore of the primary historical storm drain outfall serving the shipyard area (Figure 6). The CSL value for copper was exceeded in these two locations. The SQS for zinc was also exceeded at these locations and the SQS for mercury was exceeded at one of the same railway locations.

The SQS value for three PAHs was exceeded at the same two locations near the railway. The CSL for one semivolatile phthalate was exceeded at one of the railway locations and the SQS for another phthalate was exceeded at both of the railway locations.

SQS and CSL criteria have not been formally established for the organotin compounds. Recent practice in characterizing marine sediments commonly involves comparisons to working criteria, e.g., values used in assessing sediments for possible open-water disposal under the PSDDA program. The less stringent criterion of 0.15 µg/L (treated as equivalent to a CSL value) for porewater organotins was exceeded at the two railway locations where the greatest number of exceedances were observed and also in the sample collected at the north end of the bulkhead near the Port boat wash area. The working bulk organotin criterion of 73 µg/kg was also exceeded at one of the railway locations and the northern boat wash area location.

In general, the detection limits achieved during the 2003 investigation were below the state SMS. The primary exceptions were two semivolatile chlorinated benzene compounds (1,2,4-trichlorobenzene and hexachlorobenzene); the detection limits for these compounds exceeded the SQS for most of the samples.

During the 2004 investigation, exceedances of both SQS and CSL criteria were again found for a variety of analytes. The greatest number and variety of exceedances were found in the samples prepared from the core collected just north of the marine railway (NMA-core-2). Most of the remaining observed exceedances were from samples collected along the south side of the railway (Core 1) and from a grab sample collected near the Port’s travel lift dock (NMA-grab-7).

The CSL value for copper was exceeded in both samples from Core 2 and in the lower sample from Core 1. The CSL for zinc was exceeded in the upper sample from Core 2 and the SQS for zinc was exceeded in the lower Core 2 sample. The CSL for arsenic was also exceeded in the upper Core 2 sample.

Exceedances were also observed for a variety of low and high molecular weight PAHs (LPAHs and HPAHs) in both samples from Core 2. Most of these exceedances were of the SQS, but several LPAHs were measured at concentrations exceeding the CSLs. A limited number of PAH exceedances of the SQS were also noted in the Core 1 samples.

Detection limits elevated above the regulatory criteria were more of an issue in the 2004 sediment analysis than had been the case in the 2003 investigation. Non-detects above the SQS or CSL were observed for several chlorinated benzene compounds and ionizable SVOCs (i.e., phenols, benzyl alcohol, and benzoic acid). Several instances of detection limits above either the SQS or CSL were recorded for each of the samples from Cores 1 and 2. All of the exceedances of the criteria for Grab 7 were due to elevated detection limits. The only exceedances observed for two of the grab samples and the third core involve one or two non-detects exceeding the SQS value.

As noted previously, formal criteria have not been established for the organotins. However, using the same approach noted above, exceedances of the criterion for organotins in porewater of 0.15 μg/L were observed for two grab samples collected between the marine railway and the Port travel lift dock to the north. Exceedances of the bulk organotin criterion of 73 μg/kg were found in all four samples prepared from Cores 1 and 2.

The number and location of samples collected (Figure 6), as well as the analytical findings including elevated detection limits reported for some analytes prevent a full delineation of the nature and extent of contamination in the marine sediments west of the shipyard and further investigation of sediment quality appears to be warranted.

8.0 SCOPE OF WORK

This section describes the areas of concern (AOCs) and the objectives and rationale for the upland and marine sediment investigations, and summarizes the technical approach that will be used to conduct the investigations. The details of the technical approach, including sampling methods and procedures, are described in detail in the Upland SAP (Appendix E), the Marine Sediment SAP (Appendix F) and the Quality Assurance Project Plan (Appendix G).

8.1 AREAS OF CONCERN

Based upon the preliminary site conceptual model and evaluation of existing data, areas of potential concern for the upland portion of the Site and the marine sediments located in the North Marina are described below.

8.1.1 Upland

- The exterior portions of the Site where cleaning, sandblasting, and repairing marine vessels occurred. In general this corresponds with the locations of the current and historic skids and the apparent extent of sand blast grit evident in historical aerial photographs. Releases from these operations have been confirmed in the southwestern portion of the Site where abrasive grit and stained soil is evident in the surface and subsurface soil. Similar releases may have occurred in other areas on the northern and eastern portions of the Site that have not been investigated.
- The area of the reported soil cleanup on the east side of the wood shop. While abrasive grit and underlying soil were reportedly removed from this area, no post-excavation soil samples were collected to confirm the effectiveness of the cleanup action.
- The area of staining observed adjacent to the steam box diesel AST.
- Oily residue on the ground near the northwest corner of the Everett Engineering building.
- The interior of the Everett Engineering buildings where oil staining was observed on the floors near floor penetrations that may provide pathways to the subsurface.
- The accumulated solid within the catch basins on the Site that contain elevated levels of metals and TBT.

8.1.2 Marine Sediment

- The sediments potentially impacted by the historical stormwater outfalls that discharged north and south of the marine railway. Visual evidence of contamination has been recorded in the immediate vicinity of these outfalls, and samples of surface sediment collected in 2003 and sediment cores collected in 2004 revealed a variety of chemicals exceeding the SMS criteria. The existing data are insufficient to delimit either the lateral or vertical extent of contamination in this area.
- The sediments beneath the marine railway have been accumulating since the railway was constructed, and thus have the potential to contain contaminants deposited over an extended period of time. For this reason the accumulation of sediments beneath and adjacent to the marine railway and elevated above the surrounding dredged areas represents the primary area of concern directly connected to shipyard operations. At least some portion of these sediments closest to the shoreline and historical outfalls was likely impacted by discharges from the stormwater outfalls.
- The sediments along the bulkhead have not likely been affected by periodic navigation dredging of the North Marina and only limited sediment characterization has been performed throughout most of the nearshore area. Sediments in the vicinity of outfalls draining the shipyard site may have received contaminants including abrasive grit and antifouling compounds. There is a

terrestrial buffer in the form of a roadway and parking area between the upland portion of the Site and the marine environment, and historical shipyard discharges to the marine environment appear to have been limited to the immediate vicinity of the marine railway. However, comparatively undisturbed residual sediments along the bulkhead have the potential to include accumulations of contaminants from other adjacent sources.

- Other possible sources include discharges from other nearby outfalls, discharges and historic releases associated with the Port's former tidal grid located south of the marine railway and historic releases associated with the Port's travel lift haul out area. Other possible sources of contamination include releases associated with vessels moored at and transiting the North Marina and discharges of stormwater from other terrestrial properties in the area. These potential sources are not considered areas of concern related to the Site, but release from these areas may be detected during the planned sediment investigation.

8.2 OBJECTIVES AND RATIONALE

The goal of the RI/FS process is to collect, develop, and evaluate information sufficient to select a cleanup action consistent with the requirements of WAC 173-340-360 through WAC 173-340-390. The specific rationale and objectives for the upland and marine sediment investigations are described below.

This RI/FS Work Plan is intended to be an adaptable plan. During implementation of field activities, field data will be assessed as it is collected to determine whether adjustments/modifications to the work plan are appropriate to maximize the quality and usefulness of the investigation. If field changes appear warranted, URS will contact Everett Shipyard, the Port of Everett and Ecology to discuss modifying the work.

8.2.1 Upland Investigation

Proposed sampling locations in the upland area of the Site are shown on Figure 7. The locations should be considered approximate. Actual locations will be confirmed in the field based on site conditions including locations of underground and overhead utilities.

<u>Phased RI field investigation for upland</u>

The RI field investigation will be conducted in two phases. The first phase of the investigation proposed in this work plan is designed to identify the full nature and extent of contaminants and toxic effects in upland areas. The tasks included in the initial phase of work will be sequenced as appropriate to allow for subsequent tasks to be conducted efficiently. Depending on the findings and results of initial tasks, the scope of the subsequent tasks may be modified in consultation with and agreement by Ecology.

Additional field RI investigation (if necessary based on first Phase results) will be conducted to further define the nature and extent of contamination and toxic effects based on findings during Phase 1. The scope, schedule and submittal requirements for additional field RI activities shall be developed by the PLPs, and shall be submitted to Ecology for final review and concurrence.

Soil

The objectives of the soil investigation are to better define the nature and extent of the shallow soil contamination previously detected on the southwestern portion of the Site in 2003 and 2007 and to further investigate other areas of the site to determine whether significant releases of hazardous substances occurred in these areas.

To accomplish these objectives, soil samples will be collected at locations shown on Figure 7 and described below. The sampling program is summarized in Table 12. Soil sampling methods and procedures, including the description of surface and subsurface soils, will be completed in accordance with the Upland SAP (Appendix E).

Surface Soil Samples

- Twelve surface soil samples (SS-30 through SS-41) will be collected from the unpaved southwest portion of the Site where abrasive grit is evident to characterize the near surface soil. An effort will be made to co-locate these samples with previous sampling locations if abrasive grit is present at the surface in close proximity with prior sampling locations. Based on field observations and previous analytical results (samples SS-3, SS-4, SS-5), the surface soil in the area investigated in 2007 with borings SS-1 through SS-29 and including the area immediately south of the marine railway is assumed to contain indicator hazardous substances above the cleanup levels and therefore additional investigations to define the lateral extent these substances in the surface soil within the previously investigated area is not planned. Additional surface soil samples will be collected to verify that concentrations of metals located at the edge of the undocumented cleanup are below MTCA cleanup levels (SS-39 through 41).

Direct Push/Hollow-Stem Auger Borings

- Four borings (borings SB-1, SB-2, SB-29, and 30) in the area east of the wood shop to assess the effectiveness of the reported soil cleanup in this area in the late 1980s;
- Six borings (borings SB-13, SB-14, SB-15, MW-4, MW-5, and MW-6) near the western and southern boundaries of the Site to assess the lateral extent of metals and petroleum hydrocarbons previously detected at borings SS-1, SS-2, SS-5, SS-13, and SS-25;
- Four borings (borings SB-3, SB-4, SB-5, and MW-7) west and southwest of the Everett Engineering buildings to assess the lateral extent of metals detected in previous borings SS-8 and SS-12 and areas that appear to have been used for vessel maintenance activities, including abrasive blasting;

- Four borings (borings SB-6 through SB-9) in the interior of the Everett Engineering buildings where oil staining was observed on the floors near floor penetrations that may provide pathways to the subsurface;
- One boring (boring SB-10) southwest of the steam box to assess the stained soil in this area;
- One boring (boring MW-8) located west of the Everett Engineering Machine Shop near an area of stained soil;
- Five borings (borings SB-11, SB-12, SB-16, SB-17, and MW-9) to the east, northeast and southeast of the weld shop to assess potential releases from historic operations in these areas;
- Three borings inside the weld shop (borings SB-18, SB-19, and SB-20) to assess potential releases from weld shop operations and historic operations in these areas prior to the structural additions to the weld shop;
- Two borings (borings SB-21 and SB-22) to the west and northwest of the weld shop to assess potential releases from historic operations in these areas;
- Three borings (borings SB-23, SB-24, and SB-25) at the approximate locations of previous borings SS-2, SS-5, and SS-22 where elevated levels of petroleum hydrocarbons were previously detected to assess whether other hazardous substances (i.e., SVOCs and PCBs) are contained within these affected soils; and
- One boring in the vicinity of the marine railway (boring SB-26) to assess potential releases from historic operations in this area.
- Two borings (SB-27 and SB-28) located along the north edge of the leasehold to investigate potential releases associated with historic operations in this area (e.g., historic boat shed and the office).
- Three borings (SB-31, SB-40, and SB-41) located south and southeast of Building 9 within the area formerly used by Everett Shipyard prior to construction of the Fish Processing Building to investigate potential contamination associated with historic operations in this area.
- One boring (SB-32) along the south edge of the leasehold to investigate the lateral extent of potential contamination in this area.
- Two borings (SB-33 and SB-34) along the west edge of the leasehold to investigate the lateral extent of potential contamination in this area and in the vicinity of the marine railway.
- Five borings (SB-35 to SB-39) to investigate potential contamination that may have come to be located between the west edge of the leasehold and the bulkhead as a result of site activities.
- One boring (SB-42) adjacent to the former Net Shed Building (outside of the current and historic leasehold boundaries and reported Everett Shipyard operations) to investigate potential contamination that may have come to be located be in this area.

Sample Depth Intervals

Surface soil samples (samples SS-30 through SS-41) will be collected at depths of 0.0 to 0.5 feet bgs.

Samples collected from direct-push or hollow-stem auger borings will be collected at the following approximate depth intervals in unpaved areas:

- 0.0 to 0.5 feet bgs
- 1.0 to 2.0 feet bgs
- 2.0 to 3.0 feet bgs
- 4.0 to 5.0 feet bgs (soil borings SB-1, SB-2, SB-7, SB-8, SB-9, and SB-19 only)

If asphalt or concrete pavement is present at the sampling location, then the samples depths will be modified so that the first sample is collected directly beneath the pavement and underlying base course and the samples depths for deeper samples will be adjusted downward consistent with the intervals specified above.

Soil samples will also be collected and analyzed at other depth intervals if field screening (e.g., visual observations such as staining or the presence of abrasive grit, olfactory evidence or elevated PID readings) indicates that other intervals would provide useful information. This includes drilling deeper and collecting samples at depth greater than 3.0 feet bgs if field screening indicates that hazardous substances may be present.

Where necessary to obtain sufficient sample volume for the specified interval, a second boring may be drilled adjacent to the initial boring.

Soil Sample Analyses

The soil sampling analyses are presented in Table 12.

Surface soil samples will be analyzed for petroleum hydrocarbons, 13 priority metals and carcinogenic PAHs (cPAHs) for all surface samples, and organotins, PCBs, and SVOCs for two selected samples.

The shallow sample in each boring will be analyzed for diesel- and oil-range petroleum hydrocarbons, cPAHs, and/or metals (Table 12). If petroleum hydrocarbons, cPAHs or metals are detected above the preliminary cleanup levels in the shallow sample, then within the allowable soil sample holding time the next deeper sample will be analyzed for the compounds/analytes that exceeded the preliminary cleanup level.

Samples from borings SB-1, SB-2, SB-29, and SB-30 will be analyzed to confirm the effectiveness of the reported but undocumented soil cleanup in this area. One sample from each boring will be collected from the apparent backfill material and a second sample from each boring will also be collected from the base of the cleanup excavation and analyzed for petroleum hydrocarbons, cPAHs, metals, SVOCs and organotins.

Approximately 10 additional samples collected from the borings with the highest petroleum hydrocarbon concentrations will also be analyzed for PCBs and SVOCs to assess whether these constituents are present at elevated levels in Site soils.

Approximately 10 additional samples collected from soil borings that show evidence of abrasive grit in the shallow or intermediate depth samples will also be analyzed for organotins to assess the extent of organotins.

Soil samples will be screened in the field with a PID using standard the field screening procedures (see Appendix E). If elevated PID readings are measured, soil samples will also be submitted for VOC analyses. If no elevated PID readings are measured, a minimum of eight soil samples will be analyzed for VOCs. The samples selected for analysis will be either stained soil samples or samples collected directly above the water table in areas where solvents may have been used or stored. Deeper samples may also be analyzed for petroleum hydrocarbons and/or metals based on field screening (e.g., staining or odor for petroleum hydrocarbons; abrasive grit for metals).

Specific analytes, analytical methods and detection limits are outlined in the QAPP (Appendix G).

Catch Basins

The catch basins on the Site will be visually inspected to confirm their location and the volume of accumulated solids will be estimated by removing grates and visual inspection. If a significant accumulation of sediment is evident, the thickness will be estimated by using a wooden or steel probe to identify the bottom of the catch basin. No additional sampling and analysis of the accumulated solids within the catch basins is recommended. Sampling and analysis of these materials should be completed during the cleanup action for disposal characterization. The connection of the existing catch basins to outfalls that discharge into the North Marina will be confirmed through dye testing during the RI period.

Groundwater

The objectives of the groundwater investigation are to further assess whether groundwater beneath the Site has been impacted by site operations and to confirm the direction of groundwater flow. The groundwater sampling program is summarized in Table 13. To accomplish these objectives, new groundwater monitoring wells will be installed, groundwater sampling will be conducted and water level elevations will be measured. The following scope of work is proposed:

- Samples of existing wells MW-1 and MW-2 located on the west side of the Site (i.e., downgradient of the weld shop and the wood shop);
- Attempt to locate well MW-3, determine the condition of the well and sample the well if a representative groundwater sample can be collected, otherwise the well will be decommissioned in accordance with WAC 173-160 if it can be located;

- Installation of three new wells (wells MW-4, MW-5, and MW-6) adjacent to the west (i.e., downgradient) of the areas where elevated levels of petroleum hydrocarbons and metals were detected in soil during the 2007 soil investigation;
- Installation of two new wells (wells MW-7 and MW-8) located downgradient of the Everett Engineering buildings to assess potential impacts related to operations within these buildings and historic operations prior to building construction; and
- Installation of two upgradient wells (wells MW-9 and MW-10) located along the eastern property boundary to provide additional water level data and upgradient groundwater water quality.

The monitoring well installation and sampling methods and procedures are presented in Appendix E. Samples from the monitoring wells will be analyzed for TDS, diesel- and oil-range petroleum hydrocarbons, total and dissolved metals, organotins, SVOCs (including PAHs), PCBs, and VOCs. Specific analytes, analytical methods and detection limits are outlined in the QAPP (Appendix G). The wells will be sampled twice: once following installation and then again in approximately three months. The timing of the sampling events will be selected to correspond with a low tide so that the samples will be representative of Site conditions. Water levels in all the wells will be measured before and after the sampling (i.e., at the beginning and end of the sampling event) to assess the degree of water level fluctuation in response to tidal fluctuations. The need for additional monitoring events would be evaluated based on the results of these two rounds of sampling.

To assess the potential presence of localized areas of groundwater impacts, shallow groundwater samples and deep subsurface (4-5 ft bgs) soil samples would also be collected from direct push soil borings at the following locations:

- Borings SB-1 and SB-2 located east of the wood shop to assess groundwater conditions beneath the area that was reportedly cleaned up in the late 1980s;
- Borings SB-7, SB-8, SB-9 within the Everett Engineering buildings to asses groundwater quality near floor penetrations where staining was evident on the building floor and to assess potential impacts related to historic operations prior to building construction.
- Boring SB-19 located in the eastern portion of the weld shop to assess potential releases from the weld shop and historic operations in this area prior to construction of the eastern addition to the weld shop.

Groundwater samples from the borings will be analyzed for petroleum hydrocarbons and dissolved metals. Two samples collected from inside existing buildings (SB-7 and SB-19) will also be analyzed for VOCs. If elevated PID readings are detected in headspace reading for soil samples collected from the other borings, the groundwater samples would also be analyzed for VOCs. If elevated levels of petroleum hydrocarbons or dissolved metals are detected in the boring samples, monitoring wells may be installed at these locations during a subsequent phase of investigation and analyses for additional PCOCs may be performed, if warranted.

8.2.2 Sediment Investigation

Recent marine sediment data collected in the vicinity of the shipyard's historical stormwater outfall are comparatively limited and insufficient to fully delimit the lateral and vertical extent of PCOCs in this area. In several cases, non-detections were reported for some analytes at levels exceeding regulatory criteria, leaving further uncertainty as to the actual levels of these analytes present in the sediments. A total of 27 grab samples and 6 cores will be collected from the North Marina area, at locations shown on Figure 7 and described below. The sediment samples will be analyzed for the full suite of 47 SMS chemicals and conventional sediment variables listed in Washington Administrative Code (WAC) 173-204-400. Grab samples will also be analyzed for bulk and porewater organotins, and core samples will be analyzed for bulk organotins. The sampling program is summarized in Table 14. The sediment sampling methods and procedures are presented in Appendix F.

Depending on the results of the chemical analysis, a second round of sediment sampling may be conducted to support biological testing. Samples for biological analysis will be collected at locations previously sampled for chemical analysis. It is anticipated that sampling for biological analysis will be conducted within six months of the chemical analysis and that as long as no substantive change in site conditions has occurred no chemical reanalysis will be required. Plans for sampling for biological testing will be documented in a future addendum to this plan.

Historical Shipyard Outfalls and Marine Railway

A total of 17 shallow (0 to 10 cm) grab samples and 4 cores will be collected to assess sediment quality in the general area of historical shipyard stormwater Outfall 001 and the marine railway. One grab (location SG-1) will be collected immediately north of the floating dock north of the railway and due north of the 2003 nearshore location adjacent to the north edge of the railway. A second grab sample (SG-2) will be collected immediately north of the floating dock and due north of the outermost location sampled north of the railway in 2003.

Two cores (SC-1 and SC-2) will be collected in the vicinity of the railway, approximately 40 feet west of the shoreline and 30 feet south and north of the center of the railway. These cores will be driven to native material if conditions permit. Ideally, individual samples will be made up by homogenizing material from one-foot intervals of these cores. Where sample volumes collected indicates the need to homogenize a longer than one foot core interval for certain core samples, homogenizing longer than one foot core interval (but not to exceed two feet) would be allowed after consulting with the Ecology staff. Subsurface contamination was previously observed where cores were collected on each side of the railway close to shore, so the primary goal of this sampling is to define the maximum depth of contamination. For this reason, the deepest sample from each core (or the first interval below the native horizon) will be analyzed. Samples will also be prepared from every other alternate interval to the surface. These other samples will be frozen and archived for possible future analysis depending on the results from the deepest sample. If the deepest sample is found to be free of exceedances, the next higher archived sample will be analyzed. Two 0 to 10 cm grab samples (SG-3 and SG-4) will be collected using a van Veen sampler at the core locations to characterize the surface sediments.

Two additional cores (SC-3 and SC-4) will be collected immediately north and south of the railway and approximately 120 feet from the shoreline. Ideally, these cores will also be driven to native material. These cores will also be divided into one-foot horizons for sample preparation unless sample volume requirements dictate otherwise. These locations have not been previously sampled. The primary goal of this sampling is to define the maximum depth of contamination. For this reason, the deepest sample from each core (or first interval below the native horizon) will be analyzed and samples will be prepared from every other interval to the surface. The other samples will be frozen and archived for possible future analysis depending on the results. If the deepest sample is found to be free of exceedances, the next higher archived sample will be analyzed. Two 0 to 10 cm grab samples (SG-5 and SG-6) will be collected at core stations SC-3 and SC-4 using a van Veen sampler to characterize the shallow sediments in these locations.

Two additional 0 to 10 cm grab samples (SG-7 and SG-8) will be collected immediately north and south of the railway, approximately 160 feet from the shore.

Five additional 0 to 10 cm grabs (SG-18, SG-19, SG-20, SG-21, and SG-22) will be collected from locations not previously sampled and more distant from the railway and Outfall 001. The goal of these samples is to attempt to establish the horizontal limits to contamination. Location SG-18 is approximately 40 feet west of the bulkhead and 90 feet south of the railway. Locations SG-19 and SG-20 are approximately 40 feet south of the railway and 60 feet and 130 feet west of the bulkhead, respectively. Locations SG-21 and SG-22 are approximately 70 feet north of the railway and 80 feet and 130 feet west of the bulkhead, respectively.

Another group of four 0 to 10 cm grab samples will be collected from locations not previously sampled and even more distant from Outfall 001 and the marine railway. These samples will be frozen and archived as a contingency for possible future analysis to establish the horizontal limits of contamination in case the outermost analyzed grab samples exhibit exceedances. Each of the archived samples will be linked to one or more of the grab samples being analyzed from the railway area. Should chemical exceedances be observed for any of the linked samples, the archived sample will be retrieved and analyzed for the exceeding chemicals. Location SG-24 is approximately 90 feet west of the bulkhead and 90 feet south of the railway. Archived sample SG-24 will be linked to grabs SG-18 and SG-20. Locations SG-25 and SG-26 are closely south and north of the railway and approximately 240 feet offshore. Sample SG-25 will be linked to grab SG-8 and sample SG-26 will be linked to grab SG-7. Location SG-27 is approximately 170 west of the bulkhead and 120 feet north of the railway. Sample SG-27 is linked to grab SG-22.

Nearshore Bulkhead

In addition to the sampling in the vicinity of the marine railway and historical shipyard Outfall 001, grab and core samples will also be collected in nearshore areas to the south and north of the marine railway.

Four 0 to 10 cm grab samples (SG-9 through SG-12) will be collected at roughly 80-foot intervals at the toe of the slope along the bulkhead running south from the marine railway. The intent is to sample sediment accumulation in nearshore areas not typically addressed during maintenance dredging. One sediment core (SC-5), driven to native material if conditions permit, will be collected in the vicinity of Outfall C at the south end of the bulkhead. This core will be processed in the same manner as cores SC-1 through SC-4. A 0 to 10 cm grab (SG-13) will be collected at this same location to characterize shallow sediments in the vicinity of this outfall.

One sediment core to native material (SC-6) will also be collected in close proximity to Outfall A, approximately in line with the north lease area boundary. This core will be processed in the same manner as SC-1 through SC-5. A 0 to 10 cm grab (SG-14) will be collected at this location to characterize the shallow sediments. Four 0 to 10 cm grab samples (SG-15, SG-16, SG-17, and SG-23) will also be collected from nearshore locations north and northwest of Outfall A. These samples will be collected close to the bulkhead and other shore structures, as access permits. The intent is to characterize sediments closest to shore that appear unlikely to have been affected by maintenance dredging. Locations SG-17 and SG-23 are also in the vicinity of one or more historical outfalls.

8.3 TECHNICAL APPROACH

To guide field investigations, two SAPs were prepared to specify the type, quality, and quantity of data necessary to support selection of a cleanup action. The upland SAP (Appendix E) was prepared in accordance with WAC 173-340-820, and Ecology's *Guidance on Sampling and Data Analysis Methods* (Ecology Publication 94-49). The marine sediment SAP (Appendix F) was prepared in accordance with WAC 173-340-820, Ecology's *Guidance on Sampling and Data Analysis Methods* (Ecology Publication 94-49), and with the Puget Sound SMS and Ecology Publication 03-03-043, *Sediment Sampling and Analysis Plan Appendix*. The SAPs include General Operating Procedures (GOPs) for easy reference by field personnel. The GOPs are intended to promote the following:

- Consistent field procedures;
- Accurate documentation of field observations, sampling procedures, and decontamination procedures;
- Collection of representative samples from the site;
- Properly calibrated field equipment to obtain accurate field measurements;

- Minimization of cross-contamination and the introduction of artificial contaminants;
- Management and disposal of investigation-derived wastes;
- Information that is accurate and defensible and is of adequate technical quality to meet the objectives of the project.

In addition to following the procedures outlined in the SAPs, URS field personnel and subcontractors will follow adhere to personal protection standards and mandatory safety procedures out lined in the HSP (Appendix A). As outlined in the HSP, prior to conducting any intrusive work, underground utilities will be located through both the public Utility Notification Center and private utility locating services prior to any mechanized subsurface work.

Horizontal coordinates for all sample locations will be estimated using a hand-held GPS unit. The ground surface and monitoring well top-of-casing elevations will be surveyed by State of Washington Registered Professional Land Surveyor.

8.4 REPORTING

RI/FS Reporting: Following the investigation and characterization field tasks, an RI/FS report will be prepared consistent with the requirements of both WAC 173-340-350 and WAC 173-340-840. The RI/FS report will present a summary of the field remedial investigations performed and an evaluation of the data sufficient to select a cleanup action consistent with the requirements of WAC 173-340-360 through WAC 173-340-390.

At a minimum, the report will include:

Remedial Investigation

- General facility information
- Site conditions map
- Summary of Field Activities
- Results (conceptual site model, soil impacts, groundwater impacts, sediment impacts)
- Groundwater flow characteristics
- Land use
- Ecological receptors
- Establishment of Preliminary Cleanup Levels (based on applicable land use scenarios)

Feasibility Study

- Cleanup goals and objectives
- Screening of alternatives (cleanup alternatives will be limited to practical, cost effective solutions)
- Evaluation of feasible alternatives (if possible, feasible alternatives will include at least one permanent remedy)
- Selection of Cleanup Action
- Findings and Conclusions
- Signature by a Washington State Professional Engineer or Licensed Geologist
- References

The Feasibility Study will include a comparison of a focused number of practicable cleanup alternatives consistent with MTCA requirements. Given the proposed future use of the Site, the FS is expected to focus on alternatives that remove the soil that contains concentrations of contaminants that exceeding cleanup levels from the Site. Soil would then be treated or disposed of at a permitted facility. Alternatives that may be considered for sediments include dredging the sediments. Depending on the depth of sediment contamination, capping sediments in place may also be considered. All cleanup alternatives considered will protect human health and the environment, comply with cleanup standards, comply with applicable state and federal laws, and provide for monitoring of compliance (WAC 173-340-360 (2)(a)). Preference will be given to permanent solutions to the maximum extent practicable (permanent solution is defined in WAC 173-340-200). Other criteria that will be considered include: protectiveness, permanence, cost, effectiveness in the long term, management of short-term risks, technical and administrative implementability, and consideration of public concerns.

Development of Database

All site data will be maintained in a EIM-compatible database and will include fields for well and/or sample station ID, date, time of collection, sample station coordinates and elevations (State Plane, NAD 1983), analytical method and results, units, detection limits for each sample, parameters and associated CAS numbers, well completion data, media sampled, lab qualifiers, and other relevant data needed to evaluate data quality and support data analysis necessary for closure. Data shall be supplied to Ecology in electronic format (i.e., the Environmental Information Management (EIM) System and “MyEIM” Portal v1.0.) 30 days following the completion of the Draft Final RI/FS Report.

8.5 HABITAT RESTORATION

The site is being overseen by Ecology and the cleanup work is being conducted under the Governor’s 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 Agreed Order, it is unlikely that meaningful habitat restoration opportunities exist at the site. Therefore, evaluation of on-site restoration opportunities will not constitute a significant part of the RI/FS process at this site.

9.0 SCHEDULE

A preliminary schedule for the implementation of the work plan is summarized in the table below. The date for initiation of the field work will be dependent of receipt of approval of the final work plan from Ecology. It is anticipated that approval will be received in fall 2008.

Activity or Milestone	Days Following Submittal of Final RI/FS Work Plan
Start Field Investigation	Within 30 calendar days
Complete Initial Field Investigation (including two rounds of groundwater monitoring)	180 days
Receipt of all analytical data	210 days
1st Draft RI/FS Report to Ecology	330 day
2nd Draft RI/FS Report to Ecology	420 days
Draft Final RI/FS Report to Ecology	465 days

The Draft Final RI/FS report will under go a 30-day public comment period. The Final RI/FS report will be submitted to Ecology 30 days following Ecology's completion of the responsiveness summary to public comments.

If following the completion of the investigation outlined in this work plan additional field RI activities are needed to adequately delineate the extent and magnitude of contamination at the site, a supplemental SAP and revised schedule for the field RI will be developed and submitted to Ecology.

10.0 REFERENCES

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Table 1
Site Development and Operations Summary
Everett Shipyard
Everett, Washington

BUILDING / AREA	ACTIVITY	EXAMPLES OF CHEMICALS USED / STORED	DATES / RANGE	DISPOSAL PRACTICES
Current Buildings / Areas				
Weld Shop Building Includes Fisherman's Boat Shop (FBS) / West end of building; and "Crane Shed" / East end of building	Boat repairs including welding, cutting, machining. Reportedly, ESY operations have not included engine repair work.	Cutting oil, water treatment flocculent. In containers of less than and equal to 55 gallons in volume, totaling less than 100 gallons during site reconnaissance. Self contained solvent sink removed in the 1980s. Historic operations reportedly included methyl ethyl keytone.	West portion of building: 1947 aerial photo. Tax assessor: 1940 construction. East portion of building : 1978 aerial photo. Tax assessor: 1969 construction.	Offsite disposal by Emerald Services, Inc.
Office Building (North of Weld Shop)	Office operations	Heating oil AST; possible former UST (both located on west side of building)	Heating oil likely used since late 1940s.	Not applicable
Wood Shop Building	Fabricate wood components, pattern shop,	Glues, wood filler, wood stain, in pint to 1 gallon volume containers.	Earliest documented building presence: 1965 aerial photo.	Offsite disposal by Emerald Services, Inc.
Paint Shed	Storage and cleanup of paints, coatings and solvents; cleanup of coating application equipment	Paints coatings, and solvents in containers of less than and equal to 5 gallons in volume totaling less than 100 gallons during site reconnaissance.	1957 and 1968 Sanborn maps included a "Paint Shop" located within or adjacent to the eastern portion of the weld shop. The current paint shed is evident in the 1984 aerial photograph.	
Steam Box Shed	Wood shaping by use of steam	Fuel oil AST	Earliest documented building presence: 1978 aerial photo.	
Machine Shop Building Occupied by Everett Engineering from construction until 2007.	Machine shop and offices	Historic presumed: cutting coolants, machine lubricants, hydraulic fluid. Building vacant in April 2008.	Earliest documented building presence: 1984 aerial photograph. Tax Assessor: 1980 construction.	Unknown

BUILDING / AREA	**ACTIVITY**	**EXAMPLES OF CHEMICALS USED / STORED**	**DATES / RANGE**	**DISPOSAL PRACTICES**
Building 7 / Building 9 Occupied by Everett Engineering from construction until 2007.	Machine shop	Historic presumed: cutting coolants, machine lubricants, hydraulic fluid. Building vacant in April 2008.	Building 7: 1984 aerial photograph. Building 9: 1991 aerial photograph. Tax Assessor: 1980 and 1989, respectively	Unknown
Boat Shed Building	Chemical storage area in west end	Used for storage of hazardous substances since 2002 and includes a bermed containment area. Hazardous substances stored throughout in larger containers were consolidated in this location. Paints, coatings, hydraulic fluid, anti-freeze in containers of less than and equal to 55 gallons in volume totaling approximately 150 gallons during site reconnaissance.	Earliest documented building presence: 1978 aerial photograph; current configuration in 1991 aerial photograph.	Offsite disposal by Emerald Services, Inc.
Skids (Side Tracks) ***-Northwest (still present)*** ***-Southwest (removed)*** ***-East (removed)***	Painting and sandblasting at current and historic locations of all skids. Sand blasting is performed by subcontractors.	Sand blast grit; paint. Historically copper slag may have been used as grit; more recently grits used include “Klean Blast” and “Green Diamond”. Soil and grit that accumulated between the northwest skids are excavated as needed to maintain suitable working grade. Soil and grit between the southwest skids was allowed to fill in the top of the skid foundations. Bilge water was pumped out of vessels by contractor and taken offsite for disposal. Some boat owners may have performed engine maintenance on their vessels while they were stored in these areas.	Northwest and southwest skids already present in 1947 aerial photo, however, not in use. Skids on the southwest portion of the Site were not visible in the 1984 aerial photograph. East skids on east side of wood shop first apparent in 1965 photograph; no longer present in 1991 photograph.	Blast grit historically collected by shovel after reached depth that impeded repair work. Grit is currently collected and shipped offsite by subcontractors. Bilge water is disposed offsite by Emerald Services, Inc.
Marine Railway	Moving boats from, and returning them to, water of Port Gardner, and across land to work area.	Boat maintenance activities while on the marine railway were very limited.	Earliest documented presence: “Boat Skid” in 1950 Sanborn Map - does not extend into water. Railway extends into water in 1965 aerial photograph.	None as activities were very limited.

BUILDING / AREA	ACTIVITY	EXAMPLES OF CHEMICALS USED / STORED	DATES / RANGE	DISPOSAL PRACTICES
Travel Lift Boat Haul-Out Area (Offsite)	Port of Everett provided facility for hull cleaning, general boat washing, painting for private individuals approximately 150 feet north of the marine railway.	Paints	Present in 1965 aerial photograph.	Washed into marina.
Tidal Grid (Offsite)	Port of Everett provided grid where boat owners could work on boats during low tide. Boat cleaning, painting and general maintenance were preformed in this area by private individuals directly south of Marine Railway and west of the current bulkhead.	Paints	Appears to be evident in 1984 aerial photograph and was reportedly used until the early 1990s.	Washed into marina.
Historic Buildings				
Building on property NE Corner Along West Marine View Drive	Boat Storage Outboard motor repair Propeller shop		Earliest documented building presence: 1965 aerial photograph. No longer apparent in 1991 aerial photograph.	Unknown
Paint Shop Building Southeast of original weld shop		Current employees and interviewees not familiar with specifics. Presume use of paints and solvents.	Earliest documented building presence: 1947 aerial photograph. Weld shop extended over this area in 1978 aerial photograph. A paint shop also depicted north of this in 1968 Sanborn Map.	Unknown
Re-Saw Building East of original weld shop	Current employees and interviewees not familiar with specific operations or chemical use.	Current employees and interviewees not familiar with specific operations or chemical use.	Earliest documented building presence: 1947 aerial photograph. No longer apparent in 1978 aerial photograph.	Unknown
Fish Processing Mid-South portion of property	Fish Processing	Presumed: Refrigerants, sanitizers.	Earliest documented building presence: 1969 aerial photograph. No longer apparent in 1984 aerial photograph.	Unknown

Notes: Description of activities, chemicals usage, storage and disposal practices based on site inspection and interview with Everett Shipyard personnel in April 2008.

Table 2
Soil Analytical Results - 2003
Everett Shipyard
Everett, Washington

Sample ID	Sample Depth (feet bgs)	Sample Date	Petroleum Hydrocarbons (mg/kg)		Total Metals (mg/kg)						
			Diesel-Range	Motor Oil-Range	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Zinc
SS1	0-1	3/4/2003	25U	280	3.4U	0.56U	31	750	24	0.16	1,100
SS2	0-1	3/5/2003	50U	680	12U	2.0U	51	2,000	28	0.02U	990
SS3	0-1	3/4/2003	25U	260	14U	2.3U	150	2,600	230	0.29	3,100
SS4	0-1	3/4/2003	570	870	**84**	**2.9**	51	1,400	240	0.34	1,600
SS5	0-1	3/4/2003	25U	450	**210**	**3.2**	96	2,000	**550**	0.97	2,800
SS6	0-1	3/5/2003	25U	130	3.1U	0.51U	18	84	13	0.02U	120
LB1	0-1	3/7/2003	25U	50U	3.0U	0.50U	18	19	6.0U	0.02U	28
LB1	0-1	3/7/2003 (DUP)	25U	50U	2.8U	0.47U	17	16	5.6U	0.02U	25
LB2	0-1	3/7/2003	25U	50U	3.0U	0.51U	13	9.3	6.1U	0.02U	18
LB9	0-2	5/27/2003	7.6	15	NA	NA	NA	NA	NA	NA	NA
LB10	0-2	5/27/2003	19	200	NA	NA	NA	NA	NA	NA	NA
LB11	0-2	5/27/2003	43	250	NA	NA	NA	NA	NA	NA	NA
LB12	0-2	5/27/2003	15	35	NA	NA	NA	NA	NA	NA	NA
LB13	0-2	5/27/2003	58	170	NA	NA	NA	NA	NA	NA	NA
LB14	0-2	5/27/2003	140	510	NA	NA	NA	NA	NA	NA	NA
MTCA Soil Cleanup Levels			2,000 (A)	2,000 (A)	20 (A)	2 (A)	2,000 (A)	3,000 (B)	250 (A)	2 (A)	24,000 (B)
Washington State Department of Ecology - Puget Sound Natural Background			NE	NE	7	1	42	36	17 (State-Wide) 24 (Puget Sound)	0.07	85 (State-Wide) 85 (Puget Sound)

Notes:

MTCA - Model Toxics Control Act Cleanup Regulation, WAC 173-340. MTCA Method and B values are from Ecology website CLARC tables downloaded May 2007
(https://fortress.wa.gov/ecy/clarc/reporting/CLARCReporting.aspx)
(A) - MTCA Method A soil cleanup level for unrestricted Land Uses
(B) - MTCA Method B formula values unrestricted land use - direct contact pathway
Puget Sound natural background concentrations taken from Ecology Publication Number 94-115 (October 1994)
bgs - below ground surface
mg/kg - milligrams per kilogram
DUP - Field duplicate
NE - Not established
U - Parameter was analyzed for but not detected above the reporting limit shown
Numbers in **bold** font indicate that the result reported exceeds the tabulated MTCA cleanup level
Organotins were detected in the one sample (SS3) at concentrations less than or equal to 1.2 mg/kg (see Appendix C for complete analytical results)

Source: Landau 2003

Table 3
Storm Drain Sediment Analytical Results - 2003
Everett Shipyard
Everett, Washington

Sample ID	**Organotins (ug/kg)**				**Total Metals (mg/kg)**							
	Tributyl Tin Chloride	Dibutyl Tin Dichloride	Butyl Tin Dichloride	TBT as TBT ion	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Silver	Zinc
Outfall A-CB	900	280	28 J	**800**	50	0.6 U	70	**1,100**	127	0.009	0.9 U	**1,530**
Outfall 001-CB	4,200	2,000	200 J	**3,700**	58	**10**	188	**14,100**	**740**	**4.21**	2	**9,910**
Outfall 002-CB1	1,300	390	140 J	**1,200**	41	2	82	**4,380**	480	0.329	2 U	**4,110**
Outfall B-CB	270	160	23 UJ	**240**	57	2	168	**2,470**	220	0.119	2 U	**2,290**
Outfall C-CB	350	140	23 UJ	**310**	**196**	2	154	**1,420**	348	0.358	1 U	**1,930**
MTCA Soil Cleanup Levels	NE	NE	NE	7,400	20 (A)	2 (A)	2,000(A)	3,000 (B)	250 (A)	2 (A)	400 (B)	24,000 (B)
CSL (WAC 173-204-520)	NE	NE	NE	73	93	6.7	270	390	530	0.59	6.1	960
SMS (Chapter 173-204 WAC)	NE	NE	NE	NE	57	5.1	260	390	450	0.41	6.1	410

Notes:

MTCA - Model Toxics Control Act Cleanup Regulation, WAC 173-340. MTCA Method A and B values are from Ecology website CLARC tables downloaded May 2007 (https://fortress.wa.gov/ecy/clarc/reporting/CLARCReporting.aspx)

(A) - MTCA Method A soil cleanup level for unrestricted land use

(B) - MTCA Method B formula values unrestricted land use - direct contact pathway

Soil cleanup level for TBT as TBT ion is screening level established by Ecology for ingestion pathway with Equation 740-1 (RfDo=3e-4 mg/kg-day)

CSL - Cleanup Screening Levels and Minimum Cleanup Levels, WAC 173-204-520, Table III, Puget Sound Marine Sediment Screening Levels and Minimum Cleanup Levels; CSL for TBT as TBT ion is bulk sediment screening level established by Ecology, which is conceptually equivalent to the SQS

SMS- Sediment Management Standards, WAC 173-204- 320, Table 1, Marine Sediment Quality Standards

mg/kg - milligrams per kilogram

ug/kg - micrograms per kilogram

NE - Not established

U - Parameter was analyzed for but not detected above the reporting limit shown

Numbers in **bold** font indicate that the result reported exceeds the tabulated CSL and Minimum Cleanup Levels

Source: Landau 2003

Table 4
Groundwater Analytical Results - 2003
Everett Shipyard
Everett, Washington

Sample ID	Sample Date	Petroleum Hydrocarbons (ug/l)		Metals (mg/l)							VOCs	SVOCs
		Diesel-Range	Motor Oil-Range	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Zinc		
LB4	3/5/2003	180	250 U	0.005 U	0.005 U	0.01 U	0.006 U	0.003 U	0.002 U	0.007 U	NA	NA
LB5	3/5/2003	130 U	250 U	0.005 U	0.005 U	0.01 U	0.006 U	0.003 U	0.002 U	0.007 U	ND	ND
LB6	3/7/2003	130 U	250 U	NA	NA	NA	NA	NA	NA	NA	ND	NA
LB7	3/5/2003	130 U	250 U	NA	NA	NA	NA	NA	NA	NA	ND	NA
LB8	3/5/2003	130 U	250 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW1	3/19/2003	130 U	250 U	0.005 U	0.005 U	0.01 U	0.006 U	0.003 U	0.002 U	0.007 U	ND	ND
MW2	3/19/2003	130 U	250 U	0.005 U	0.005 U	0.01 U	0.006 U	0.003 U	0.002 U	0.007 U	ND	ND
MW2	3/19/2003 (DUP)	130 U	250 U	0.005 U	0.005 U	0.01 U	0.006 U	0.003 U	0.002 U	0.007 U	ND	ND
MW3	3/19/2003	210	250 U	0.005 U	0.005 U	0.01 U	0.006 U	0.003 U	0.002 U	0.007 U	NA	NA
MTCA Method A Groundwater Cleanup Level		500	500	0.005	0.005	0.05	NE	0.015	0.002	NE	Varies	Varies

Notes:

Results for metals reported as total metals except for samples LB4 and LB5 which are dissolved metals

MTCA - Model Toxics Control Act Cleanup Regulation, WAC 173-340

bgs - below ground surface

VOCs - Volatile Organic Compounds

SVOCs - Semivolatile Organic Compounds

DUP - Field duplicate

NA - Not analyzed

ND - Not detected

NE - Not established

U - Parameter was analyzed for but not detected above the reporting limit shown

ug/l - micrograms per liter

mg/l - milligrams per liter

Source: Landau 2003

Table 5a
Sediment Analytical Results SMS OC-Normalized Criteria - 2003
Everett Shipyard
Everett, Washington

Sample ID: Depth: Lab ID: Sample Date:	**Sediment Management Standards (a)** Sediment Quality Standard (SQS)	**Sediment Management Standards (a)** Cleanup Screening Level (CSLs)	ESY-MS1 FH15A 3/5/2003	Dup of ESY-MS1 ESY-MS9 FH15G 3/5/2003	ESY-MS2 FH15B 3/5/2003	ESY-MS3 FH15C 3/5/2003	ESY-MS4 FH15D 3/5/2003	ESY-MS5 FH15E 3/5/2003	ESY-MS6 FH15F 3/5/2003
Metals (mg/kg)									
Arsenic	57	93	20	20	14	32	10	30	17
Cadmium	5.1	6.7	0.7	0.9	0.5	0.4	0.5	0.6	0.4
Chromium	260	270	64	60	51.5	84.1	48	83	52.9
Copper	390	390	161	174	117	**1800**	80.1	**531**	76.9
Lead	450	530	52	46	20	94	13	56	17
Mercury	0.41	0.59	0.29	0.27	0.2	**0.53**	0.1	0.3	0.1
Nickel	NA	NA	52	52	43	51	41	53	47
Silver	6.1	6.1	0.6 U	0.6 U	0.6 U	0.5 U	0.6 U	0.6 U	0.6 U
Zinc	410	960	178 J	325 J	148	**797**	107	**433**	148
PAHs (mg/kg OC)									
2-Methylnaphthalene	38	64	0.74 U	0.73 U	0.90 U	2.1	0.91 U	0.87 U	1.2 U
Acenaphthene	16	57	3.0 J	4.6 J	0.95	5.0	0.91 U	8.7	3.1
Acenaphthylene	66	66	1.4 J	3.1 J	2.0	9.6	1.4	7.8	2.9
Anthracene	220	1,200	4.4 J	8.1 J	5.2	26	3.5	27	6.3
Benzo(a)anthracene	110	270	13 J	25 J	15	96	10	96	16
Benzo(a)pyrene	99	210	8.9 J	18 J	13	54	7.3	33	11
Benzo(b)fluoranthene	230	450	13 J	32 J	19	92	10	57	20
Benzo(g,h,i)perylene	31	78	4.4 J	8.1 J	6.7	18	1.6	7.0	3.1
Benzo(k)fluoranthene	230	450	10 J	17 J	17	38	10	34	18
Chrysene	110	460	17 J	35 J	27	**150**	17	**135**	29
Dibenz(a,h)anthracene	12	33	1.9 J	4.2 J	2.9	11	0.91	4.3	1.3
Fluoranthene	160	1,200	35 J	100 J	18	**367**	8.6	**391**	41
Fluorene	23	79	1.4 J	2.0 J	1.7	5.8	0.91	7.8	2.5
HPAH (b)(f)	960	5,300	144	333	171	**1116**	87	**1001**	192
Indeno(1,2,3-c,d)pyrene	34	88	5.2 J	10 J	8.1	25	2.4	10	4.1
LPAH (b)(d)	370	780	22	32	21	91	10	117	40
Naphthalene	99	170	0.93	1.1	0.95	2.5	0.91 U	1.4	1.3
Phenanthrene	100	480	10	13	10	42	4.5	65	24
Pyrene	1,000	1,400	35 J	85 J	44 J	267	18	235	49
Total Benzofluoranthenes (e)	230	450	23 J	49 J	36	129	21	90	38

Table 5a
Sediment Analytical Results SMS OC-Normalized Criteria - 2003
Everett Shipyard
Everett, Washington

Sample ID:	**Sediment Management Standards (a)**		ESY-MS1	Dup of ESY-MS1 ESY-MS9	ESY-MS2	ESY-MS3	ESY-MS4	ESY-MS5	ESY-MS6
Depth:									
Lab ID:			FH15A	FH15G	FH15B	FH15C	FH15D	FH15E	FH15F
Sample Date:	Sediment Quality Standard (SQS)	Cleanup Screening Level (CSLs)	3/5/2003	3/5/2003	3/5/2003	3/5/2003	3/5/2003	3/5/2003	3/5/2003
SVOCs (mg/kg OC)									
Dimethylphthalate	53	53	4.4	4.6	2.5	5.8	0.91 U	3.5	6.3
Diethylphthalate	61	110	0.74 U	0.73 U	0.90 U	0.83 U	0.91 U	2.2	1.2 U
Di-n-Butylphthalate	220	1,700	0.74 U	0.73 U	0.90 U	2.1	0.91 U	2.5	1.2 U
Butylbenzylphthalate	4.9	64	1.4	1.7	0.90 U	**46**	0.91 U	**19**	1.9
bis(2-Ethylhexyl)phthalate	47	78	13 UJ	27 J	5.2 U	**88**	3.8 U	30	16 U
Di-n-octyl phthalate	58	4,500	0.74 U	0.73 U	0.90 U	1.2 U	0.91 U	0.87 U	1.3
Dibenzofuran	15	58	0.89	1.2	0.95	3.0	0.91 U	2.3	2.3
4-Methylphenol	670	670	20 U	19 U	19 U	140 J	20 U	40 J	20 J
Pentachlorophenol	360	690	98 U	97 U	97 U	160 J	98 U	98 U	96 U
Benzoic Acid	650	650	200 U	190 U	190 U	210	200 U	200 U	190U
Organotin (Pore Water) (µg/L)									
Tetrabutyl Tin	NE	NE	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Tributyl Tin Chloride	NE	NE	0.74	0.73	0.037	0.38	0.025 U	0.23	0.027
Dibutyl Tin Dichloride	NE	NE	0.075	0.073	0.050 U	0.061	0.050 U	0.050 U	0.050 U
Butyl Tin Trichloride	NE	NE	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
TBT as TBT ion	0.05 (g)	0.15 (h)	**0.66**	**0.65**	0.033	**0.34**	0.019 U	**0.21**	0.024
Organotin (Bulk) (µg/kg)									
Tetrabutyl Tin	NE	NE	18	NA	5.9 U	11	NA	NA	NA
Tributyl Tin Chloride	NE	NE	3400	NA	54	1000	NA	NA	NA
Dibutyl Tin Dichloride	NE	NE	150	NA	14	310	NA	NA	NA
Butyl Tin Trichloride	NE	NE	23 J	NA	5.9 UJ	28 J	NA	NA	NA
TBT as TBT ion	NE	73 (i)	**3000**	NA	49	**900**	NA	NA	NA
Conventionals									
Total Organic Carbon (percent)	NE	NE	2.7	2.6	2.1	2.4	2.2	2.3	1.6
Total Solids (percent)	NE	NE	47.7	48.0	50.3	57.2	46.0	45.3	50.8
PCBs (µg/kg dry weight)									
Aroclor 1254	NE	NE	NA	NA	NA	220	NA	47	NA
Total PCBs (f,g) (mg/kg OC)	12,000	65,000	NA	NA	NA	9.2	NA	2.0	NA

Table 5a
Sediment Analytical Results SMS OC-Normalized Criteria - 2003
Everett Shipyard
Everett, Washington

Sample ID: Depth: Lab ID: Sample Date:	Sediment Management Standards (a)		ESY-MS1	Dup of ESY-MS1 ESY-MS9	ESY-MS2	ESY-MS3	ESY-MS4	ESY-MS5	ESY-MS6
	Sediment Quality Standard (SQS)	Cleanup Screening Level (CSLs)	FH15A 3/5/2003	FH15G 3/5/2003	FH15B 3/5/2003	FH15C 3/5/2003	FH15D 3/5/2003	FH15E 3/5/2003	FH15F 3/5/2003
VOLATILES (µg/kg dry weight)									
Acetone	NE	NE	NA	NA	NA	59 J	NA	NA	NA
Carbon Disulfide	NE	NE	NA	NA	NA	2.3 J	NA	NA	NA
2-Butanone	NE	NE	NA	NA	NA	16	NA	NA	NA

Notes:

NA = Not available

NE = Not established

U = Indicates compound was analyzed for, but was not detected at the given detection limit.

J = Data validation flag indicating the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

M = Indicates an estimated value of analyte detected and confirmed by analyst with low spectral match parameters.

Bold results exceed the most stringent Sediment Management Standard.

(a) Sediment Sampling and Analysis Plan Appendix; Washington State Department of Ecology, Publication 03-09-043, Revised February 2008 (WAC 173-204).

(b) Where chemical criteria in this table represent the sum of individual compounds or isomers, the following methods shall be applied:

(i) Where chemical analyses identify an undetected value for every individual compound/isomer, then the single highest detection limit shall represent the sum of the respective compounds/isomers.

(ii) Where chemical analyses detect one or more individual compounds/isomers, only the detected concentrations will be added to represent the group sum.

(c) All organic data (except phenols, benzyl alcohol, and benzoic acid) are normalized to total organic carbon; this involves dividing the dry weight concentration of the constituent by the fraction of total organic carbon present.

(d) The LPAH criterion represents the sum of the following "low molecular weight polynuclear aromatic hydrocarbon" compounds: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene. The LPAH criterion is not the sum of the criteria values for the individual LPAH compounds listed.

(e) The total benzofluoranthenes criterion represents the sum of the concentrations of the "B," "J," and "K" isomers.

(f) The HPAH criterion represents the sum of the following "high molecular weight polynuclear aromatic hydrocarbon" compounds: fluoranthene, pyrene, benzo(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)perylene. The HPAH criterion is not the sum of the criteria values for the individual HPAH compounds as listed.

(g) Approximate no affects level (SQS equivalent).

(h) Puget Sound Dredged Disposal Analysis (PSDDA) open water disposal screening level criteria.

(i) Preliminary criteria based on bulk equivalent of PSDDA open water disposal screening level criteria for porewater TBT.

Table 5b
Sediment Analytical Results Dry Weight-Normalized Criteria - 2003
Everett Shipyard
Everett, Washington

Sample ID:	**Sediment Management Standards (a)**		ESY-MS1	Dup of ESY-MS1 ESY-MS9	ESY-MS2	ESY-MS3	ESY-MS4	ESY-MS5	ESY-MS6
Depth:									
Lab ID:			FH15A	FH15G	FH15B	FH15C	FH15D	FH15E	FH15F
Sample Date:	Dry Weight Sediment Quality Standard (SQS)	Dry Weight Cleanup Screening Level (CSLs)	3/5/2003	3/5/2003	3/5/2003	3/5/2003	3/5/2003	3/5/2003	3/5/2003
PAHs (ug/kg dry weight)									
2-Methylnaphthalene	670	670	20 U	19 U	19 U	50	20 U	20 U	19
Acenaphthene	500	500	39 J	81 J	41	230	30	180	46
Acenaphthylene	1,300	1,300	80 J	120 J	20	120	20 U	200	50
Anthracene	960	960	120 J	210 J	110	630	76	610	100
Benzo(a)anthracene	1,300	1,300	350 J	650 J	320	**2300**	220	**2200**	260 U
Benzo(a)pyrene	1,600	1,600	240 J	460 J	280	1300	160	750	180 U
Benzo(b)fluoranthene	NE	NE	350 J	820 J	400	2200	230	1300	320 U
Benzo(g,h,i)perylene	670	720	120 J	210 J	140	440	35	160	50 U
Benzo(k)fluoranthene	NE	NE	270 J	450 J	350	900	230	780	280
Chrysene	1,400	2,800	470 J	910 J	560	**3600**	370	**3100**	460
Dibenzo(a,h)anthracene	230	230	51 J	110 J	61	**260**	20	100	21 U
Fluoranthene	1,700	2,500	950 J	**2600** J	380	**8800**	190	**9000**	650
Fluorene	540	540	37 J	53 J	35	140	20	180	40
HPAH (b)(e)	12,000	17,000	3891	8670	3581	**26790**	1907	**23030**	3066
Indeno(1,2,3-c,d)pyrene	600	690	140 J	260 J	170	590	52	240	65 M
LPAH (b)(c)	5,200	5,200	581	832	446	2180	226	2702	647
Naphthalene	2,100	2,100	25	28	20	60	20 U	32	21
Phenanthrene	1,500	1,500	280	340	220	1000	100	1500	390
Pyrene	2,600	3,300	950 J	2200 J	920 J	**6400**	400	**5400**	780 U
Total Benzofluoranthenes (d)	3,200	3,600	620 J	1270 J	750	3100	460	2080	600
SVOCs (ug/kg dry weight)									
Dimethylphthalate	71	160	**120**	**120**	53	**140**	20 U	**81**	**100**
Diethylphthalate	200	1,200	20 U	19 U	19 U	20 U	20 U	50	19
Di-n-Butylphthalate	1,400	5,100	20 U	19 U	19 U	51	20 U	58	19
Butylbenzylphthalate	63	900	39	43	19 U	**1100**	20 U	**440**	31
bis(2-Ethylhexyl)phthalate	1300	3,100	340 UJ	710 J	110 U	**2100**	83 U	690	250
Di-n-octyl phthalate	6,200	6,200	20 U	19 U	19 U	29 U	20 U	20 U	21
Dibenzofuran	540	540	24	30	20	71	20 U	52	36

Table 5b
Sediment Analytical Results Dry Weight-Normalized Criteria - 2003
Everett Shipyard
Everett, Washington

Sample ID: Depth: Lab ID: Sample Date:	**Sediment Management Standards (a)** Dry Weight Sediment Quality Standard (SQS)	 Dry Weight Cleanup Screening Level (CSLs)	ESY-MS1 FH15A 3/5/2003	Dup of ESY-MS1 ESY-MS9 FH15G 3/5/2003	ESY-MS2 FH15B 3/5/2003	ESY-MS3 FH15C 3/5/2003	ESY-MS4 FH15D 3/5/2003	ESY-MS5 FH15E 3/5/2003	ESY-MS6 FH15F 3/5/2003
PCBs (µg/kg dry weight)									
Aroclor 1254	NE	NE	NA	NA	NA	220	NA	47	NA
Total PCBs (b) (ug/kg)	130	1,000	NA	NA	NA	**220**	NA	**47**	NA
Conventionals									
Total Organic Carbon (percent)	NE	NE	2.7	2.6	2.1	2.4	2.2	2.3	1.6
Total Solids (percent)	NE	NE	47.7	48.0	50.3	57.2	46.0	45.3	50.8

Notes:

NA = Not available

NE = Not established

U = Indicates compound was analyzed for, but was not detected at the given detection limit.

J = Data validation flag indicating the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

M = Indicates an estimated value of analyte detected and confirmed by analyst with low spectral match parameters.

Bold results exceed the most stringent Sediment Management Standard.

(a) Sediment Sampling and Analysis Plan Appendix; Washington State Department of Ecology, Publication 03-09-043, Revised February 2008 (WAC 173-204).

(b) Where chemical criteria in this table represent the sum of individual compounds or isomers, the following methods shall be applied:

(i) Where chemical analyses identify an undetected value for every individual compound/isomer, then the single highest detection limit shall represent the sum of the respective compounds/isomers.

(ii) Where chemical analyses detect one or more individual compounds/isomers, only the detected concentrations will be added to represent the group sum.

(c) The LPAH criterion represents the sum of the following "low molecular weight polynuclear aromatic hydrocarbon" compounds: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene. The LPAH criterion is not the sum of the criteria values for the individual LPAH compounds listed.

(d) The total benzofluoranthenes criterion represents the sum of the concentrations of the "B," "J," and "K" isomers.

(e) The HPAH criterion represents the sum of the following "high molecular weight polynuclear aromatic hydrocarbon" compounds: fluoranthene, pyrene, benzo(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)perylene. The HPAH criterion is not the sum of the criteria values for the individual HPAH compounds as listed.

Table 6a
Sediment Analytical Results SMS OC-Normalized Criteria - 2004
Everett Shipyard
Everett, Washington

Sample ID:	**Sediment Management Standards (a)**		NMA-core-1	NMA-core-1	NMA-core-2	NMA-core-2	NMA-grab-3	NMA-core-3	NMA-core-3	NMA-grab-7	NMA-grab-8	NMA-grab-9	NMA-grab-10
Depth:			0.5-2.0ft	2.0-3.9ft	0.5-3.2ft	3.2-6.3ft	0-10cm	0.5-1.8ft	1.8-3.1ft	0-10cm	0-10cm	0-10cm	0-10cm
Lab ID:			GU97A	GU97B	GU97C	GU97D	GU78A	GW93A	GW93B	GU78E/GW81A	GU78F/GW81B	GU78G/HD32B	GU78H
Sample Date:	Sediment Quality Standard (SQS)	Cleanup Screening Level (CSLs)	7/2/2004	7/2/2004	7/2/2004	7/2/2004	7/1/2004	7/28/2004	7/28/2004	7/1/2004	7/1/2004	7/1/2004	7/1/2004
Metals (mg/kg)													
Arsenic	57	93	45	40	**270**	22	10 U	9	13	10 U	10 U	10	10 U
Cadmium	5.1	6.7	0.3	0.6	1.4	0.9	0.6	0.6	0.4	0.6	0.6	0.6	0.6
Chromium	260	270	34.7	50.5	100	64.8	59	59.8	37.4	56	57	54	54
Copper	390	390	348	**446**	**1560**	1060	96.1	106	56.1	109	101	163	92.1
Lead	450	530	70	110	413	230	19	23	43	26	21	33	17
Mercury	0.41	0.59	0.33	**1.62**	**6.21**	**10.1**	0.11	0.22	0.34	0.13	0.11	0.35	0.12
Silver	6.1	6.1	0.4 U	0.4 U	1 U	0.4 U	0.6 U	0.5 U	0.6 U	0.6 U	0.7 U	0.6 U	0.6 U
Zinc	410	960	410	288	**1610**	**448**	117	128	99	123	121	170	117
PAHs (mg/kg OC)													
2-Methylnaphthalene	38	64	2.12 U	1.60 U	5.75	5.41	0.78 U	0.81 U	0.72	3.97 U	0.89 U	1.12 U	0.88 U
Acenaphthene	16	57	**17.46**	**23.77**	**141.76**	**73.36**	0.78 U	0.81 U	0.70	3.97 U	1.43	1.52	0.88 U
Acenaphthylene	66	66	2.38	3.98	11.88	6.95	0.78 U	0.81 U	0.45	3.97 U	0.89 U	2.25	0.88 U
Anthracene	220	1,200	10.05	18.85	95.79	61.78	0.90	1.03	2.05	5.02	1.56	6.18	1.58
Benzo(a)anthracene	110	270	39.15	73.77	**153.26**	**177.61**	2.78	2.01	3.60	22.18	4.91	21.35	4.65
Benzo(a)pyrene	99	210	26.46	49.18	**99.62**	**104.25**	1.84	1.97	2.05	10.46	2.77	14.04	3.26
Benzo(b)fluoranthene	230	450	52.91	98.36	145.59	123.55	3.49	2.35	1.88	20.50	4.91	29.21	6.98
Benzo(g,h,i)perylene	31	78	11.11	10.66	20.31	25.10	0.78 U	0.81 U	0.98	3.97	0.89 U	3.26	0.88 U
Benzo(k)fluoranthene	230	450	31.22	49.18	114.94	115.83	3.06	3.33	2.91	15.48	4.11	16.29	4.47
Chrysene	110	460	63.49	106.56	**187.74**	**216.22**	4.71	3.97	5.48	29.71	7.59	35.96	8.84
Dibenz(a,h)anthracene	12	33	3.17	3.07	6.51	8.49	0.78 U	0.81 U	0.31 U	3.97 U	0.89 U	1.12	0.88 U
Fluoranthene	160	1,200	121.69	**307.38**	**613.03**	**694.98**	5.49	4.15	5.82	58.58	14.29	61.80	12.09
Fluorene	23	79	11.11	11.48	**114.94**	**50.19**	0.78 U	0.81 U	1.10	3.97 U	0.98	1.97	0.88 U
HPAH (b)(f)	960	5,300	458.73	946.11	**1828.74**	**1998.07**	26.08	23.76	28.13	211.51	49.96	289.16	53.40
Indeno(1,2,3-c,d)pyrene	34	88	14.29	14.34	27.97	30.12	0.78 U	0.81 U	1.13	4.60	1.12	4.44	1.02
LPAH (b)(d)	370	780	67.41	94.88	**854.79**	**412.74**	2.31	3.12	11.03	15.48	7.68	30.79	4.05
Naphthalene	99	170	2.59	2.79	**118.77**	8.11	0.78 U	0.81 U	1.08	3.97 U	0.89 U	1.46	0.88 U
Phenanthrene	100	480	23.81	34.02	**371.65**	**212.36**	1.41	2.09	5.65	10.46	3.71	17.42	2.47
Pyrene	1,000	1,400	95.24	233.61	459.77	501.93	4.71	5.98	4.28	46.03	10.27	56.18	12.09
Total Benzofluoranthenes (e)	230	450	84.13	147.54	**260.54**	**239.38**	6.55	5.68	4.79	35.98	9.02	45.51	11.44
SVOCs (mg/kg OC)													
Dimethylphthalate	53	53	2.33	2.79	**141.76**	1.54 U	0.78 U	0.81 U	1.03	3.97 U	0.98	2.47	0.88 U
Di-n-Butylphthalate	220	1,700	3.65	2.09	2.80	1.54 U	1.65 U	0.81 U	1.03	23.85 U	4.46 U	3.09 U	6.05 U
Butylbenzylphthalate	4.9	64	2.12 U	1.60 U	1.49 U	1.54 U	0.78 U	0.81 U	0.31 U	3.97 U	0.89 U	1.40	0.88 U
bis(2-Ethylhexyl)phthalate	47	78	46.03	31.97	**88.12**	33.20	3.80 U	2.82	0.80	30.96	5.36 U	22.47	5.58 U
Dibenzofuran	15	58	2.33	2.95	**80.46**	**28.57**	0.78 U	0.81 U	1.51 U	3.97 U	0.89 U	1.12 U	0.88 U
N-Nitrosodiphenylamine	11	11	2.12 U	1.60 U	1.49 U	**18.92** M	0.78 U	0.81 U	0.31 U	3.97 U	0.89 U	1.12 U	0.88 U
4-Methylphenol	670	670	40 U	39 U	39 U	40 U	20 U	49	140	95 U	20 U	20 U	19 U
Pentachlorophenol	360	690	200 U	200 U	200 U	330	99 U	97 U	88 U	**470** U	98 U	**720**	97 U
Organotin (Pore Water) (µg/L)													
Tetrabutyl Tin	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tributyl Tin Chloride	NE	NE	NA	NA	NA	NA	0.025 U	NA	NA	0.056	0.083	0.12	0.025 U
Dibutyl Tin Dichloride	NE	NE	NA	NA	NA	NA	0.050 U	NA	NA	0.050 U	0.050 U	0.14	0.050 U
TBT as TBT ion	0.05 (g)	0.15 (h)	NA	NA	NA	NA	0.022 U	NA	NA	**0.049**	**0.074**	**0.11**	0.022 U
Organotin (Bulk) (µg/kg)													
Tetrabutyl Tin	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tributyl Tin Chloride	NE	NE	1700	3200	3500	410	NA	23	5.0 U	5.7 U	33	44	NA
Dibutyl Tin Dichloride	NE	NE	330	290	1100	120	NA	7.8	5.0 U	5.7 U	9.3	14	NA
Butyl Tin Trichloride	NE	NE	19	22	51	5.9 U	NA	5.7 U	5.0 U	5.7 U	5.5 U	5.5 U	NA
TBT as TBT ion	NE	73 (i)	**1500**	**2800**	**3100**	**360**	NA	21	4.5 U	5.1 U	29	**39**	NA
Conventionals													
Total Organic Carbon (percent)	NE	NE	1.89	2.44	2.61	2.59	2.55	2.34	5.84	2.39	2.24	1.78	2.15
Total Solids (percent)	NE	NE	77.80	64.20	74.70	72.50	45.10	57.00	51.60	48.60	42.70	50.60	46.60
Total Volatile Solids (percent)	NE	NE	NA	NA	NA	NA	NA	7.67	13.0	NA	NA	NA	NA

Table 6a
Sediment Analytical Results SMS OC-Normalized Criteria - 2004
Everett Shipyard
Everett, Washington

Notes:

NA = Not available
NE = Not established
U = Indicates compound was analyzed for, but was not detected at the given detection limit.
J = Data validation flag indicating the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
M = Indicates an estimated value of analyte detected and confirmed by analyst with low spectral match parameters.
Bold results exceed the most stringent Sediment Management Standard.
(a) Sediment Sampling and Analysis Plan Appendix; Washington State Department of Ecology, Publication 03-09-043, Revised February 2008 (WAC 173-204).
(b) Where chemical criteria in this table represent the sum of individual compounds or isomers, the following methods shall be applied:
  (i) Where chemical analyses identify an undetected value for every individual compound/isomer, then the single highest detection limit shall represent the sum of the respective compounds/isomers.
  (ii) Where chemical analyses detect one or more individual compounds/isomers, only the detected concentrations will be added to represent the group sum.
(c) All organic data (except phenols, benzyl alcohol, and benzoic acid) are normalized to total organic carbon; this involves dividing the dry weight concentration of the constituent by the fraction of total organic carbon present.
(d) The LPAH criterion represents the sum of the following "low molecular weight polynuclear aromatic hydrocarbon" compounds: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene. The LPAH criterion is not the sum of the criteria values for the individual LPAH compounds listed.
(e) The total benzofluoranthenes criterion represents the sum of the concentrations of the "B," "J," and "K" isomers.
(f) The HPAH criterion represents the sum of the following "high molecular weight polynuclear aromatic hydrocarbon" compounds: fluoranthene, pyrene, benzo(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)perylene. The HPAH criterion is not the sum of the criteria values for the individual HPAH compounds as listed.
(g) Approximate no affects level (SQS equivalent)
(h) Puget Sound Drilling and Dredging Act (PSDDA) open water disposal screening level criteria.
(i) Preliminary criteria based on bulk equivalent of PSDDA open water disposal screening level criteria for porewater TBT.

Table 6b
Sediment Analytical Results Dry Weight-Normalized Criteria - 2004
Everett Shipyard
Everett, Washington

Sample ID:	**Sediment Management Standards (a)**		NMA-core-1	NMA-core-1	NMA-core-2	NMA-core-2	NMA-grab-3	NMA-core-3	NMA-core-3	NMA-grab-7	NMA-grab-8	NMA-grab-9	NMA-grab-10
Depth:			0.5-2.0ft	2.0-3.9ft	0.5-3.2ft	3.2-6.3ft	0-10cm	0.5-1.8ft	1.8-3.1ft	0-10cm	0-10cm	0-10cm	0-10cm
Lab ID:			GU97A	GU97B	GU97C	GU97D	GU78A	GW93A	GW93B	GU78E/GW81A	GU78F/GW81B	GU78G/HD32B	GU78H
Sample Date:	Dry Weight Sediment Quality Standard (SQS)	Dry Weight Cleanup Screening Level (CSLs)	7/2/2004	7/2/2004	7/2/2004	7/2/2004	7/1/2004	7/28/2004	7/28/2004	7/1/2004	7/1/2004	7/1/2004	7/1/2004
PAHs (ug/kg dry weight)													
2-Methylnaphthalene	670	670	40 U	39 U	150	140	20 U	19 U	42	95 U	20 U	20 U	19 U
Acenaphthene	500	500	330	**580**	**3700**	**1900**	20 U	19 U	41	95 U	32	27	19 U
Acenaphthylene	1,300	1,300	45	97	310	180	20 U	19 U	26	95 U	20 U	40	19 U
Anthracene	960	960	190	460	**2500**	**1600**	23	24	120	120	35	110	34
Benzo(a)anthracene	1,300	1,300	740	**1800**	**4000**	**4600**	71	47	210	530	110	380	100
Benzo(a)pyrene	1,600	1,600	500	1200	**2600**	**2700**	47	46	120	250	62	250	70
Benzo(b)fluoranthene	NE	NE	1000	2400	3800	3200	89	55	110	490	110	520	150
Benzo(g,h,i)perylene	670	720	210	260	530	650	20 U	19 U	57	95	20 U	58	19 U
Benzo(k)fluoranthene	NE	NE	590	1200	3000	3000	78	78	170	370	92	290	96
Chrysene	1,400	2,800	1200	**2600**	**4900**	**5600**	120	93	320	710	170	640	190
Dibenz(a,h)anthracene	230	230	60	75	170	220	20 U	19 U	18 U	95 U	20 U	20	19 U
Fluoranthene	1,700	2,500	**2300**	**7500**	**16000**	**18000**	140	97	340	1400	320	1100	260
Fluorene	540	540	210	280	**3000**	**1300**	20 U	19 U	64	95 U	22	35	19 U
HPAH (b)(e)	12,000	17,000	8670	**23085**	**47730**	**51750**	665	556	1643	5055	1119		1148
Indeno(1,2,3-c,d)pyrene	600	690	270	350	**730**	**780**	20 U	19 U	66	110	25	79	22
LPAH (b)(c)	5,200	5,200	1274	2315	**22310**	**10690**	59	73	644	370	172	548	87
Naphthalene	2,100	2,100	49	68	**3100**	210	20 U	19 U	63	95 U	20 U	26	19 U
Phenanthrene	1,500	1,500	450	830	**9700**	**5500**	36	49	330	250	83	310	53
Pyrene	2,600	3,300	1800	**5700**	**12000**	**13000**	120	140	250	1100	230	1000	260
Total Benzofluoranthenes (d)	3,200	3,600	1590	**3600**	**6800**	**6200**	167	133	280	860	202	810	246
SVOCs (ug/kg dry weight)													
Dimethylphthalate	71	160	44	68	**3700**	40 U	20 U	19 U	60	95 U	22	44	19 U
Di-n-Butylphthalate	1,400	5,100	69	51	73	40 U	42 U	19 U	60	570 U	100 U	55 U	130 U
Butylbenzylphthalate	63	900	40 U	39 U	39 U	40 U	20 U	19 U	18 U	95 U	20 U	25	19 U
bis(2-Ethylhexyl)phthalate	1,300	3,100	870	780	**2300**	860	97 U	66	47	740	120 U	400	120 U
Dibenzofuran	540	540	44	72	**2100**	**740**	20 U	19 U	88 U	95 U	20 U	20 U	19 U
N-Nitrosodiphenylamine	28	40	40 U	39 U	39 U	**490** M	20 U	19 U	18 U	95 U	20 U	20 U	19 U
Conventionals													
Total Organic Carbon (percent)	NE	NE	1.89	2.44	2.61	2.59	2.55	2.34	5.84	2.39	2.24	1.78	2.15
Total Solids (percent)	NE	NE	77.80	64.20	74.70	72.50	45.10	57.00	51.60	48.60	42.70	50.60	46.60

Notes:
NA = Not available
NE = Not established
U = Indicates compound was analyzed for, but was not detected at the given detection limit.
J = Data validation flag indicating the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
M = Indicates an estimated value of analyte detected and confirmed by analyst with low spectral match parameters.
Bold results exceed the most stringent Sediment Management Standard.
(a) Sediment Sampling and Analysis Plan Appendix; Washington State Department of Ecology, Publication 03-09-043, Revised February 2008 (WAC 173-204).
(b) Where chemical criteria in this table represent the sum of individual compounds or isomers, the following methods shall be applied:
(i) Where chemical analyses identify an undetected value for every individual compound/isomer, then the single highest detection limit shall represent the sum of the respective compounds/isomers.
(ii) Where chemical analyses detect one or more individual compounds/isomers, only the detected concentrations will be added to represent the group sum.
(c) The LPAH criterion represents the sum of the following "low molecular weight polynuclear aromatic hydrocarbon" compounds: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene.
The LPAH criterion is not the sum of the criteria values for the individual LPAH compounds listed.
(d) The total benzofluoranthenes criterion represents the sum of the concentrations of the "B," "J," and "K" isomers.

(e) The HPAH criterion represents the sum of the following "high molecular weight polynuclear aromatic hydrocarbon" compounds: fluoranthene, pyrene, benzo(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)perylene. The HPAH criterion is not the sum of the criteria values for the individual HPAH compounds as listed.

Table 7
Soil Analytical Results - 2007
Everett Shipyard
Everett, Washington

Sample ID	**Approximate Sample Depth (feet bgs)**	**Sample Date**	**Petroleum Hydrocarbons (mg/kg)**		**Total Metals (mg/kg)**					
			Diesel-Range	Motor Oil-Range	Arsenic	Cadmium	Copper	Lead	Mercury	Zinc
BSS-1	1.0 - 1.5	4/2/2007	5.4 U	36	2.40	0.535 U	10.7 J	4.29	0.106 U	35.2 J
	3.0 - 3.5	4/2/2007	5.4 U	11 U	5.79	0.561 U	9.02 J	1.80	0.108 U	32.3 J
BSS-2	1.0 - 1.5	4/2/2007	33*	200	4.38	0.498 U	22.3 J	13.0	0.104 U	163 J
BSS-3	1.0 - 1.5	4/2/2007	6.2*	51	4.77	1.49	13.3 J	3.88	0.0962 U	198
	2.5 - 3.0	4/2/2007	180*	1,100	5.99	0.533 U	19.2 J	14.2	0.0785 U	71.8 J
BSS-4	1.0 - 1.5	4/12/2007	5.2 U	10 U	2.54	0.507 U	5.70	1.40	0.103 U	20.6
	3.0 - 3.5	4/12/2007	--	--	--	--	5.76	--	--	20.9
SS-1	1.0 - 1.5	4/2/2007	120	190	**21.9**	0.596 U	51.3 J	16.0	0.105 U	101 J
	3.0 - 3.5	4/2/2007	--	--	18.1 J	0.602 U	41.9 J	14.2 J	0.120 UJ	111 J
SS-2	1.0 - 1.5	4/2/2007	**5,500**	**26,000**	**24.8**	0.549	135 J	91.4	0.365	95.5 J
	3.0 - 3.5	4/2/2007	21*	180	10.8 J	0.540 U	32.7 J	9.17 J	0.109 UJ	73.2 J
SS-4	1.0 - 1.5	4/2/2007	810*	1,800	16.3	0.600 U	172	82.0	0.418	178
	3.0 - 3.5	4/2/2007	--	--	4.36	0.552 U	11.8	2.81	0.109 U	31.5
SS-5	1.0 - 1.5	4/2/2007	720*	**3,300***	15.2	0.722	1,280	305	0.449	501
	3.0 - 3.5	4/2/2007	**2,700***	**10,000***	16.1	0.660 U	44.6	10.3	0.141	86.4
	5.0 - 5.5	4/12/2007	890	320	--	--	--	--	--	--
SS-6	1.0 - 1.5	4/2/2007	68	30	5.58	0.564 U	16.4	3.37	0.110 U	63.5
	3.0 - 3.5	4/2/2007	--	--	9.21 J	0.556 U	40.2 J	10.3 J	0.108 UJ	73.8 J
SS-7	1.0 - 1.5	4/2/2007	26	36	3.74	0.546 U	11.5	4.57	0.111 U	35.9
	3.0 - 3.5	4/2/2007	--	--	5.68 J	0.625 U	15.4 J	6.27 J	0.119 UJ	37.1 J
SS-8	1.0 - 1.5	4/2/2007	220 J*	590	**89.0 J**	0.960	1,400	**697 J**	**8.87 J**	1,370 J
	1.0 - 1.5	4/2/2007 (DUP)	130 J	410	**27.0 J**	0.985	539	189 J	1.86 J	732 J
	3.0 - 3.5	4/2/2007	--	--	4.19 J	0.562 U	48.0	3.46 J	0.112 UJ	73.9
SS-9	1.0 - 1.5	4/2/2007	30*	110	9.54	0.437 U	45.9	11.3	0.143	245
	3.0 - 3.5	4/2/2007	--	--	5.60 J	0.579 U	17.9 J	4.04 J	0.110 UJ	45.2 J
SS-10	1.0 - 1.5	4/2/2007	140*	460	**38.2**	0.546	648	190	**3.86**	668
	3.0 - 3.5	4/2/2007	--	--	4.84 J	0.562 U	9.87 J	2.69 J	0.109 UJ	28.5 J
SS-11	1.0 - 1.5	4/2/2007	25*	120*	**79.1**	1.01	82.5	79.3	0.109 U	285
	3.0 - 3.5	4/2/2007	--	--	3.74 J	0.571 U	8.79 J	2.05 J	0.104 UJ	27.7 J
MTCA Soil Cleanup Levels			2,000 (A)	2,000 (A)	20 (A)	2 (A)	3,000(B)	250(A)	2 (A)	24,000(B)
Washington State Department of Ecology - Puget Sound Natural Background Concentration			NE	NE	7	1	36	17 (State-Wide) 24 (Puget Sound)	0.07	85 (State-Wide) 85 (Puget Sound)

Table 7
Soil Analytical Results - 2007
Everett Shipyard
Everett, Washington

Sample ID	Approximate Sample Depth (feet bgs)	Sample Date	Petroleum Hydrocarbons (mg/kg)		Total Metals (mg/kg)					
			Diesel-Range	Motor Oil-Range	Arsenic	Cadmium	Copper	Lead	Mercury	Zinc
SS-12	1.0 - 1.5	4/2/2007	220*	570	**461**	1.25	**3,080**	**810**	**3.25**	1,880
	3.0 - 3.5	4/2/2007	--	--	6.94	0.482 U	22.6	11.8	0.112 U	252
SS-13	1.0 - 1.5	4/2/2007	140	870	**64.4**	1.08	1,310	**604**	**14.3**	799
	3.0 - 3.5	4/2/2007	--	--	8.07 J	0.531 U	47.9 J	17.1 J	0.145 J	59.9 J
SS-14	1.0 - 1.5	4/12/2007	370*	720	**687**	**2.12**	**3,350**	**1,910**	**2.17**	2,100
	3.0 - 3.5	4/12/2007	--	--	14.5 J	0.479 U	58.1 J	20.8 J	0.112 U	121 J
SS-15	1.0 - 1.5	4/2/2007	7.7*	34	5.51	0.517 U	8.28	2.21	0.109 U	24.0
	3.0 - 3.5	4/2/2007	--	--	--	--	23.8	--	--	39.2
SS-16	1.0 - 1.5	4/2/2007	5.4 U	12*	5.78	0.748	21.4	5.21	0.108 U	462
	3.0 - 3.5	4/2/2007	--	--	--	--	12.6	--	--	29.7
SS-17	1.0 - 1.5	4/12/2007	5.3 U	10 U	3.82	0.561 U	18.6	1.85	0.107 U	77.7
	3.0 - 3.5	4/12/2007	--	--	--	--	202	--	--	116
SS-18	1.0 - 1.5	4/12/2007	5.2 U	10 U	2.99	0.550 U	7.52	1.66	0.109 U	26.2
	3.0 - 3.5	4/12/2007	--	--	--	--	40.5	--	--	57.7
SS-19	1.0 - 1.5	4/12/2007	5.2 U	10 U	4.31	0.532 U	8.40	2.00	0.108 U	25.8
	3.0 - 3.5	4/12/2007	--	--	--	--	51.8	--	--	87.1
SS-20	1.0 - 1.5	4/12/2007	970*	1,100	3.19	0.642 U	25.1	3.97	0.122 U	69.3
	3.0 - 3.5	4/12/2007	30	36	--	--	10.6	--	--	23.4
SS-21	1.0 - 1.5	4/12/2007	5.5 U	11 U	4.31	0.569 U	9.47	2.09	0.126 U	22.9
	3.0 - 3.5	4/12/2007	--	--	--	--	7.30	--	--	24.3
SS-22	1.0 - 1.5	4/12/2007	**4,800**	110	2.57	0.577 U	10.8	2.06	0.114 U	22.9
	3.0 - 3.5	4/12/2007	1,200	150*	--	--	69.1	--	--	57.3
	5.0 - 5.5	4/12/2007	170	14*	--	--	--	--	--	--
SS-23	1.0 - 1.5	4/12/2007	5.6*	16	4.70	0.645 U	25.8	4.06	0.122 U	40.0
	3.0 - 3.5	4/12/2007	--	--	--	--	22.4	--	--	54.6
SS-24	1.0 - 1.5	4/12/2007	9.2*	28*	6.87	0.538 U	13.3	4.00	0.113 U	221
	3.0 - 3.5	4/12/2007	--	--	--	--	22.5	--	--	39.1
SS-25	1.0 - 1.5	4/12/2007	150*	380	**196**	0.896	1,240	**444**	1.94	1,830
	3.0 - 3.5	4/12/2007	140	66	**29.8 J**	0.696 U	61.1 J	7.16 J	0.145 U	66.0 J
MTCA Soil Cleanup Levels			2,000 (A)	2,000 (A)	20 (A)	2 (A)	3,000(B)	250(A)	2 (A)	24,000(B)
Washington State Department of Ecology - Puget Sound Natural Background Concentration			NE	NE	7	1	36	17 (State-Wide) 24 (Puget Sound)	0.07	85 (State-Wide) 85 (Puget Sound)

Table 7
Soil Analytical Results - 2007
Everett Shipyard
Everett, Washington

Sample ID	Approximate Sample Depth (feet bgs)	Sample Date	Petroleum Hydrocarbons (mg/kg)		Total Metals (mg/kg)					
			Diesel-Range	Motor Oil-Range	Arsenic	Cadmium	Copper	Lead	Mercury	Zinc
SS-26	1.0 - 1.5	4/12/2007	53*	180*	4.46	0.606 U	14.2	3.90	0.107 U	49.0
	3.0 - 3.5	4/12/2007	--	--	--	--	31.9	--	--	49.2
SS-27	1.0 - 1.5	4/12/2007	40*	150	**39.6**	0.607 U	207	45.5	0.145	148
	3.0 - 3.5	4/12/2007	--	--	4.32 J	0.696 U	16.7 J	2.47 J	0.108 U	37.5 J
SS-28	1.0 - 1.5	4/12/2007	150*	490*	**132**	1.04	902	189	0.805	1,640
	3.0 - 3.5	4/12/2007	--	--	3.03 J	0.613 U	9.28 J	2.41 J	0.115 U	31.2 J
SS-29	1.0 - 1.5	4/12/2007	33*	140	4.17	0.519 U	16.5	5.20	0.350	37.5
	3.0 - 3.5	4/12/2007	5.8 U	26*	--	--	11.2	--	--	33.8
MTCA Soil Cleanup Levels			2,000 (A)	2,000 (A)	20 (A)	2 (A)	3,000 (B)	250 (A)	2 (A)	24,000 (B)
Washington State Department of Ecology - Puget Sound Natural Background Concentration			NE	NE	7	1	36	17 (State-Wide) 24 (Puget Sound)	0.07	85 (State-Wide) 85 (Puget Sound)

Notes:

Model Toxics Control Act (MTCA) Cleanup Regulation, WAC 173-340. MTCA Method A and B values are from Ecology website CLARC tables downloaded May 2007
(https://fortress.wa.gov/ecy/clarc/reporting/CLARCReporting.aspx)
(A) - MTCA Method A soil cleanup level for unrestricted land use
(B) - MTCA Method B formula values unrestricted land use - direct contact pathway
Puget Sound natural background concentrations taken from Ecology Publication Number 94-115 (October 1994)
bgs - below ground surface
DUP - Field duplicate
J - Estimated value
NE - Not established
U - Parameter was analyzed for but not detected above the reporting limit shown
UJ - Parameter was analyzed for but not detected above the reporting limit shown. The reporting limit is an estimated value.
* Chromatographic profile does not match the laboratory standard chromatogram
All values reported on a dry-weight basis.
Numbers in **bold** font indicate that the result reported exceeds the tabulated MTCA cleanup level

Source: URS 2007

Table 8
Soil TCLP Results - 2007
Everett Shipyard
Everett , Washington

Sample ID	**Sample Depth (feet bgs)**	**Sample Date**	**TCLP Metals (mg/L)**							
			Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
SS-12	1	4/2/07	1.00 U	1.00 U	0.0500 U	0.133	2.20	0.00250 U	0.750 U	0.100 U
SS-14	1	4/2/2007	0.323	1.00 U	0.0500 U	0.156	3.81	0.00308 J	0.100 U	0.0500 U
SS-25	1	4/12/2007	0.100 U	1.00 U	0.0500 U	0.100 U	0.527	0.00250 UJ	0.100 U	0.0500 U
SS-28	1	4/12/2007	0.100 U	1.00 U	0.0500 U	0.100 U	0.100 U	0.00250 UJ	0.100 U	0.0500 U
Wasington State Dangerous Waste Regulation			5.0	100.0	1.0	5.0	5.0	0.2	1.0	5.0

Notes:

Washington State Dangerous Waste Regulations defined in WAC 173-303-090 (published November 2004)

bgs - below ground surface

J - Estimated value

NE - Not established

TCLP - Toxic Characteristics Leaching Procedure

U - Parameter was analyzed for but not detected above the reporting limit shown.

UJ - Parameter was analyzed for but not detected above the reporting limit shown. The reporting limit is an estimated value.

Source: URS 2007

Table 9
Outfall #001 Analytical Results - 1999 to 2002
Everett Shipyard
Everett, Washington

Sample Date	Total Metals (mg/L)			TPH (mg/L)		Turbidity (NTU)		Conventionals	
	Copper	Lead	Zinc	Oil and Grease	Total Petroleum Hydrocarbons	Turbidity	Background Turbidity	TSS (mg/L)	pH (SU)
1/12/1999	**0.161**	0.150 U	**2.63**	2.10	NA	**198**	54.8	40	6.75
2/8/1999	**0.128**	**0.150**	**1.14**	1.08	NA	**33.7**	5.12	7.0	6.53
3/17/1999	**0.827**	**0.150**	**3.50**	**6.63**	NA	**15.7**	3.92	53	6.96
4/26/1999	**0.641**	0.150 U	**3.08**	1.00 U	NA	**33.9**	2.89	10	6.81
10/29/1999	**0.0512**	0.150 U	**0.0796**	**6.73**	NA	**593**	21.3	380	6.49
11/19/1999	**0.220**	0.150 U	**2.01**	2.90	NA	**149**	NA	6.0	6.55
2/29/2000	**0.503**	0.150 U	**1.29**	5.00 U	5.00 U	**202**	2.73	NA	NA
3/28/2001	**1.17**	**0.273**	**2.02**	5.00 U	5.00 U	**392**	9.85	120	6.93
4/30/2001	0.0300 U	0.150 U	**0.0399**	5.00 U	5.00 U	13.4	12.6	4.0	6.42
5/30/2001	**0.340**	**0.151**	**2.39**	5.00 U	5.00 U	NA	NA	NA	NA
6/4/2001	**0.322**	**0.296**	**1.88**	5.00 U	5.00 U	**122**	NA	NA	NA
6/11/2001	**0.421**	0.150 U	**0.711**	5.00 U	5.00 U	**59.5**	1.78	NA	NA
6/27/2001	**0.382**	**0.168**	**2.81**	5.00 U	5.00 U	**51.8**	1.00 U	NA	NA
9/26/2001	**0.386**	0.200 U	**1.99**	5.00 U	5.00 U	**136**	3.10	NA	NA
10/10/2001	**0.54**	**0.372**	**2.14**	**6.50**	5.00 U	**99.5**	1.40	NA	NA
11/29/2001	**0.261**	0.200 U	**1.36**	5.00 U	5.00 U	3.10	17.4	NA	NA
11/31/2001	**0.141**	0.200 U	**1.13**	5.00 U	5.00 U	**129**	1.52	NA	NA
12/11/2001	**0.159**	0.200 U	**1.37**	5.00 U	5.00 U	**82.8** [A]	2.59	NA	NA
1/8/2002	**0.905**	**0.418**	**1.92**	**13.9**	5.00 U	**115**	17.7	NA	NA
1/21/2002	**0.164**	0.150 U	**0.940**	5.00 U	5.00 U	5.90	2.90	NA	NA
3/12/2002	**0.384**	**0.221**	**2.42**	**9.10**	5.00 U	**170**	2.10	NA	NA
3/14/2002	**0.559**	**0.229**	**1.81**	**9.40**	7.50	**95.0**	5.60	NA	NA
5/20/2002	**0.142**	**0.0725**	**1.07**	5.00 U	5.00 U	**45.0**	1.90	NA	NA
6/4/2002	**0.436**	**0.138**	**2.79**	5.00 U	5.00 U	**26.0**	2.20	NA	NA
6/5/2002	**0.928**	**0.449**	**2.28**	5.00 U	5.00 U	**100**	2.10	NA	NA
7/8/2002	**0.211**	0.0500 U	**0.731**	5.00 U	5.00 U	**12.0**	2.20	NA	NA
9/3/2002	**0.936**	**0.807**	**7.50**	4.85 U	4.85 U	**120**	1.20	NA	NA
WA Marine Water Quality Standard	0.0037 [B]	0.0085 [B]	0.0856 [B]	NE	NE	5 NTU / 10% [C]	NA	NE	7.0-8.5

Table 9
Outfall #001 Analytical Results - 1999 to 2002
Everett Shipyard
Everett, Washington

Notes:

Sampling conducted in accordance with National Pollutant Discharge Elimination System (NPDES) permit number WA-003096-1.

Water Quality Standards for Surface Waters of the State of Washington, Chapter 173-201A WAC, amended November 20, 2006.

SU - Standard units

TPH - Total petroleum hydrocarbons

TSS - Total suspended solids

NA - Not applicable or not analyzed

NE - Not established

U - Parameter was analyzed for but not detected above the reporting limit shown.

[A] Turbidity sample lost by laboratory. Resampled 2/18/02 as replacement sample.

[B] Ambient criteria listed in WAC 173-201A are for the dissolved fraction. The reported chronic values have been calculated to reflect the total recoverable concentrations using marine conversion factors (CF) for copper (0.83), lead (0.951), and zinc (0.946). Criterion = (dissolved criterion) / CF

[C] Under WAC 173-201A-210 (1)(e), for extraordinary waters, turbidity must not exceed 5 NTU over background when the background is 50 NTU or less. When the background is more than 50 NTU, turbidity must not exceed 10% of the background level. When background turbidity is not available, the background turbidity is assumed to be zero.

Numbers in **bold** font indicate that the result reported exceeds the water quality standard.

Source: Everett Shipyard Discharge Monitoring Reports

Table 10
Marina Water Analytical Results - 2001 to 2008
Everett Shipyard
Everett, Washington

Sample Date	TPH (mg/L)	
	Oil and Grease	Total Petroleum Hydrocarbons
6/22/2001	5.00 U	5.00 U
9/21/2001	5.00 U	5.00 U
1/14/2002	5.00 U	5.00 U
3/28/2002	5.00 U	5.00 U
6/7/2002	5.00 U	5.00 U
7/31/2002	5.10 U	5.10 U
11/7/2002	5.00 U	5.00 U
3/11/2003	5.00 U	5.00 U
7/11/2003	5.00 U	5.00 U
8/16/2003	5.00 U	5.00 U
11/11/2003	5.62 U	5.62 U
1/22/2004	5.00 U	5.00 U
4/5/2004	5.00 U	5.00 U
10/7/2004	5.00 U	5.00 U
6/27/2005	6.25 U	6.25 U
6/30/2005	5.00 U	5.00 U
9/7/2005	5.68 U	5.68 U
1/16/06 8:00 AM	5.10 U	5.10 U
1/16/06 3:00 PM	4.81 U	4.81 U
3/27/2006	4.90 U	4.90 U
6/14/2006	4.81 U	4.81 U
10/23/2006	5.05 U	5.05 U
3/1/2007	5.32 U	5.32 U
5/7/2007	5 U	NA
11/16/2007	5 U	NA
12/5/2007	**6**	NA
1/11/2008	5 U	NA
WA Marine Water Quality Standard	NE	NE

Notes:

Tabulated from client provided data that has not been validated by URS.

Sampling conducted in accordance with National Pollutant Discharge Elimination System (NPDES) Permit Number WA-003096-1.

TPH - Total petroleum hydrocarbons

NA - Not analyzed

NE - Not established

U - Parameter was analyzed for but not detected above the reporting limit shown.

Numbers in **bold** font indicate that the result reported exceeds the permit requirement.

Source: Everett Shipyard Discharge Monitoring Reports

Table 11
Potential Chemicals of Concern
Everett Shipyard
Everett, Washington

Soil	Ground Water	Surface Water	Sediments
Metals	Metals	Copper	Arsenic
SVOCs	SVOCs	Lead	Copper
VOCs	VOCs	Zinc	Mercury
cPAHs	cPAHs		Zinc
PCBs	PCBs		Tributyl Tin
Diesel-Range Petroleum Hydrocarbons	Diesel-Range Petroleum Hydrocarbons		Naphthalene
Oil-Range Petroleum Hydrocarbons	Oil-Range Petroleum Hydrocarbons		Acenapthene
Organotins	Organotins		Fluoranthene
			Fluorene
			Chrysene
			LPAH
			Benzo(a)anthracene
			Benzo(a)pyrene
			HPAH
			1,2-Dichlorobenzene
			1,4-Dichlorobenzne
			1,2,4 Trichlorobenzene
			Hexachlorobenzene
			Hexachlorobutadiene
			Dimethylphthalate
			Dibenzofuran
			N-Nitrosdiphenylamine
			2-Methylphenol
			2,4-Dimethylphenol
			Pentachlorophenol
			Butylbenzylphthalate
			bis(2-Ethylhexyl)phthalate
			Benzyl Alcohol
			Benzoic Acid

Notes:
LPAH - Low molecular weight polynuclear aromatic hydrocarbon
HPAH - High molecular weight polynuclear aromatic hydrocarbon

Table 12
Proposed Soil Sampling Locations and Analyses
Everett Shipyard
Everett, Washington

				Laboratory Analyses					
Area of Concern/Rationale	**Boring and Monitoring Well IDs**	**Sample Type**	**Approximate Sample Depth Interval (feet bgs)**	**Diesel- and Oil-Range Petroleum Hydrocarbons**	**cPAHs**	**Metals**	**Organotins**	**SVOCs and PCBs**	**VOCs**
Surface soils in areas where cleaning, abrasive blasting, and repairing marine vessels occurred	SS-30 through SS-41	Surface grab	0 - 0.5	X	X	X	X (SS-33, SS-37)	X (SS-33, SS-37)	NA
Area east of the wood shop where undocumented soil cleanup occurred in the late 1980s	SB-1, SB-2, SB-29, SB-30	Boring	0 - 0.5	X	X	X	X	X	Soil samples will be screened in the field with a PID using standard headspace technique. If elevated PID readings are measured, soil samples will also be submitted for VOC analyses. If no (or only a few) elevated PID readings are measured, a minimum of 8 soil samples will be analyzed for VOCs.
			1.0 - 2.0	Hold	Hold	Hold	Hold	Hold	
			2.0 - 3.0	X	X	X	Hold	Hold	
			4.0 - 5.0	X (SB-1)	Hold	Hold	Hold	Hold	
Lateral extent of metals and petroleum hydrocarbons detected in previous borings in the southwestern portion of the Site	SB-3, SB-4, SB-5, SB-13, SB-14, SB-15, SB-32, SB-33, MW-4, MW-5, MW-6, MW-7	Boring	0 - 0.5	X	X	X	Approximately 10 samples collected from shallow and intermediate depths will be analyzed. Preference will be given to analyzing samples that show evidence of abrasive grit and samples collected from areas most likely to be impacted.	Approximately 10 soil samples with the highest concentrations of petroleum hydrocarbons will also be analyzed for SVOCs and PCBs to assess whether these constituents are present at elevated levels in Site soils.	
			1.0 - 2.0	Hold	Hold	Hold			
			2.0 - 3.0	Hold	Hold	Hold			
Oil staining on the floors near floor penetrations that may provide pathways to the subsurface	SB-6, SB-7, SB-8, SB-9	Boring	0 - 0.5	X	X	X			
			1.0 - 2.0	Hold	Hold	Hold			
			2.0 - 3.0	Hold	Hold	Hold			
			4.0 - 5.0	X (SB-7, SB-8, SB-9)	Hold	Hold			
Soil staining adjacent to Steam Box	SB-10	Boring	0 - 0.5	X	X	X			
			1.0 - 2.0	Hold	Hold	Hold			
			2.0 - 3.0	Hold	Hold	Hold			
			4.0 - 5.0	X	Hold	Hold			
Historic operations east, southeast and northeast of weld shop	SB-11, SB-12, SB-16, SB-17, MW-9	Boring	0 - 0.5	X	X	X			
			1.0 - 2.0	Hold	Hold	Hold			
			2.0 - 3.0	Hold	Hold	Hold			
			4.0 - 5.0	X (SB-11)	Hold	Hold			
Stained soil west of Everett Engineering Machine Shop	MW-8	Boring	0 - 0.5	X	X	X			
			1.0 - 2.0	Hold	Hold	Hold			
			2.0 - 3.0	Hold	Hold	Hold			

Table 12
Proposed Soil Sampling Locations and Analyses
Everett Shipyard
Everett, Washington

				Laboratory Analyses					
Area of Concern/Rationale	**Boring and Monitoring Well IDs**	**Sample Type**	**Approximate Sample Depth Interval (feet bgs)**	**Diesel- and Oil-Range Petroleum Hydrocarbons**	**cPAHs**	**Metals**	**Organotins**	**SVOCs and PCBs**	**VOCs**
Weld shop operations and historic operations adjacent to the original weld shop structure	SB-18, SB-19, SB-20	Boring	0 - 0.5	X	X	X			
			1.0 - 2.0	Hold	Hold	Hold			
			2.0 - 3.0	Hold	Hold	Hold			
			4.0 - 5.0	X (SB-19)	Hold	Hold			
Historic operations west and northwest of weld shop	SB-21, SB-22	Boring	0 - 0.5	X	X	X			
			1.0 - 2.0	Hold	Hold	Hold			
			2.0 - 3.0	Hold	Hold	Hold			
Marine Railway	SB-26, SB-34	Boring	0 - 0.5	X	X	X			
			1.0 - 2.0	Hold	Hold	Hold			
			2.0 - 3.0	Hold	Hold	Hold			
Historic operations (e.g., boat shed) located north of the weld shop	SB-27, SB-28	Boring	0 - 0.5	X	X	X			
			1.0 - 2.0	Hold	Hold	Hold			
			2.0 - 3.0	Hold	Hold	Hold			
Area between west edge of leasehold and bulkhead that may have been impacted by site activities	SB-35, SB-36, SB-37, SB-38, SB-39	Boring	0 - 0.5	X	X	X			
			1.0 - 2.0	Hold	Hold	Hold			
			2.0 - 3.0	Hold	Hold	Hold			
Historic operations in location of former Fish Processing Building	SB-31, SB-40, SB-41	Boring	0 - 0.5	X	X	X			
			1.0 - 2.0	Hold	Hold	Hold			
			2.0 - 3.0	Hold	Hold	Hold			
Area north of Former Net Shed outside leasehold and reporeted ESY operation areas	SB-42	Boring	0 - 0.5	X	X	X			
			1.0 - 2.0	Hold	Hold	Hold			
			2.0 - 3.0	Hold	Hold	Hold			
Areas where elevated concentrations of petroleum hydrocarbons were previously detected	SB-23, SB-24, SB-25	Boring	1.0 - 2.0	Hold	Hold	Hold	NA	X	
			2.0 - 3.0	Hold	Hold	Hold	NA	X	

Notes:
X - Analyze soil samples from designated interval from all borings at area of concern for indicated analytes
X (SB-1) - Analyze soil samples from designated interval from boring(s) identifed in parantheses for indicated analytes
bgs - below ground surface; Sample depth intervals are below ground surface or below asphalt/concrete and base course, if present
Diesel- and oil-range petroleum hydrocarbons by Ecology Method NWTPH-Dx
Metals by EPA Methods 6010/7421
Organotins by Method PSEP/Krone 1988
SVOCs - Semivolatile organic compounds by EPA Method 8270D
cPAHs - Carcinogenic polynuclear aromatic hydrocarbons by EPA Method 8270 SIM
PCBs - Polychlorinated biphenyls by EPA Method 8082A
VOCs - Volatile organic compounds by EPA Method 8260B
Hold - Samples will be placed on hold at the analytical laboratory pending receipt of results for shallow samples
Deeper samples will then be analyzed for constituents that exceed preliminary cleanup levels in the shallow soil samples
NA - Not analyzed
See Appendix G for sampling procedures and complete analyte list and detection limits for analyses

Table 13
Proposed Groundwater Sampling Locations and Analyses
Everett Shipyard
Everett, Washington

Area of Concern/Rationale	Monitoring Well and Boring IDs	Sample Type	Approximate Sample Depth Interval (feet bgs)	Laboratory Analyses							
				Total Dissolved Soilds	Diesel- and Oil-Range Petroleum Hydrocarbons	Total Metals	Dissolved Metals	Organotins	SVOCs and PAHs	PCBs	VOCs
Weld Shop	MW-1 (existing well)	Monitoring Well	5-15	X	X	X	X	X	X	X	X
Wood Shop and Paint Shed	MW-2 (existing well)	Monitoring Well	5-15	X	X	X	X	X	X	X	X
Downgradient (west) of areas of known soil impacts	MW-3 (existing well if usable) MW-4, MW-5, MW-6	Monitoring Well	5-15	X	X	X	X	X	X	X	X
Downgradient (west of Everett Engineering Buildings)	MW-7, MW-8	Monitoring Well	5-15	X	X	X	X	X	X	X	X
Upgradient Background	MW-9, MW-10	Monitoring Well	5-15	X	X	X	X	X	X	X	X
Area east of the wood shop where undocumented soil cleanup occurred in the late 1980s	SB-1	Direct-push grab sample	5 - 9	NA	X	NA	X	NA	NA	NA	NA
Oil staining on the floors near floor penetrations that may provide pathways to the subsurface	SB-7	Direct-push grab sample	5 - 9	NA	X	NA	X	NA	X	NA	X
Oil staining on the floors near floor penetrations that may provide pathways to the subsurface	SB-8, SB-9	Direct-push grab sample	5 - 9	NA	X	NA	X	NA	NA	NA	NA
Soil staining adjacent to Steam Box	SB-10	Direct-push grab sample	5 - 9	NA	X	X	X	NA	NA	NA	NA
Historic Operations east of Weld Shop	SB-11	Direct-push grab sample	5 - 9	NA	X	NA	X	NA	NA	NA	NA
Historic Operations inside eastern portion of Weld Shop	SB-19	Direct-push grab sample	5 - 9	NA	X	NA	X	NA	X	NA	X

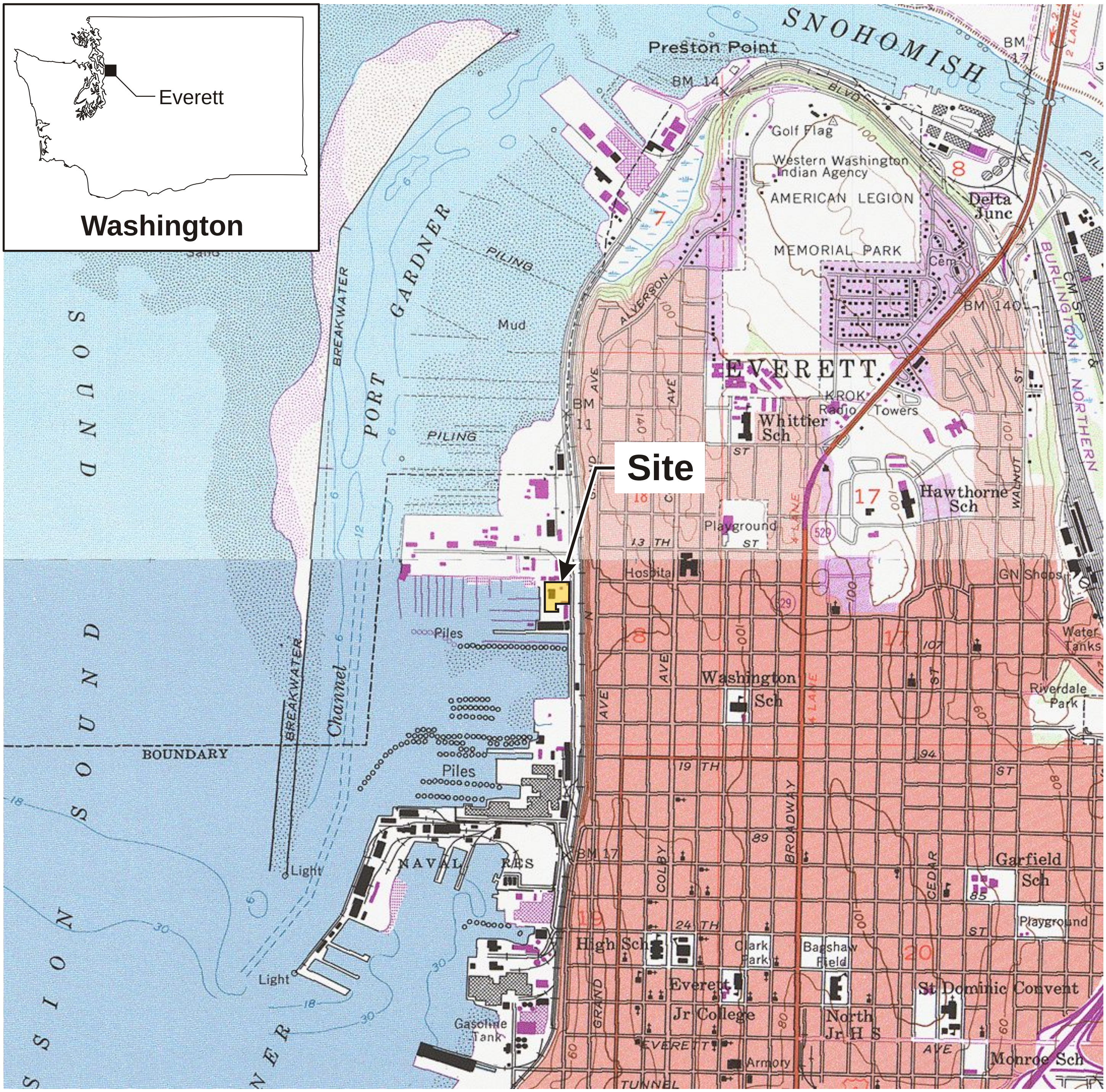
Notes:
bgs - below ground surface
Total dissolved solids by EPA Method 160.1
Diesel- and oil-range petroleum hydrocarbons by Ecology Method NWTPH-Dx
Total and dissolved metals by EPA Methods 6010B/7421/7470A; Dissolved metals will be field filtered using 0.45 micron filter
Organotins by Method PSEP/Krone 1988
SVOCs - Semivolatile organic compounds by EPA Method 8270D
PAHs - Polynuclear aromatic hydrocarbons EPA Method 8270 SIM
PCBs - Polychlorinated biphenyls by EPA Method 8082
VOCs - Volatile organic compounds by EPA Method 8260B
See Appendix G for sampling procedures and complete analyte list and detection limits for analyses
Well MW-3 could not be located.

Table 14
Proposed Sediment Sampling Locations and Analyses
Everett Shipyard
Everett, Washington

Area of Concern/Rationale	Location IDs	Sample Type	Laboratory Analyses							
				Organotins						
			Metals	Bulk	Porewater	SVOCs	PCBs	VOCs	Pesticides	Conventionals
Stormdrain Outfalls 001 and 002 and Marine Railway	SG-1 through SG-8, SG-18 through SG-22, SG-24 through SG-27	0 to 10 cm grab	X	X	X	X	X	X	X	X
	SC-1 through SC-4	core to native material	X	X	NA	X	X	X	X	X
Bulkhead and Tidal Grid South of Railway	SG-9 through SG-13	0 to 10 cm grab	X	X	X	X	X	X	X	X
	SC-5	core to native material	X	X	NA	X	X	X	X	X
Bulkhead and Travel Lift Haul-Out Area North of Marine Railway	SG-14 through SG-17, SG-23	0 to 10 cm grab	X	X	X	X	X	X	X	X
	SC-6	core to native material	X	X	NA	X	X	X	X	X

Notes:
cm - centimeter
Metals by EPA Methods 6010B/7421/7470A
Organotins by Method PSEP/Krone 1988
SVOCs - Semivolatile organic compounds by EPA Method 8270 SIM
PCBs - Polychlorinated biphenyls by EPA Method 8082
VOCs - Volatile Organic Compounds by EPA Method 8260B
Pesticides by EPA Method 8081A
Conventionals include ammonia, total sulfides, total solids and total organic carbon by various methods
NA - Not analyzed
See Appendix G for complete analyte list and detection limits for analyses

33759794_04.cdr



SOURCE: 7.5-minute USGS topographic quadrangles, Marysville and Everett, Washington

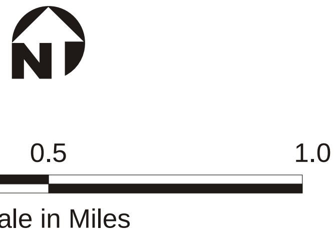


Figure 1

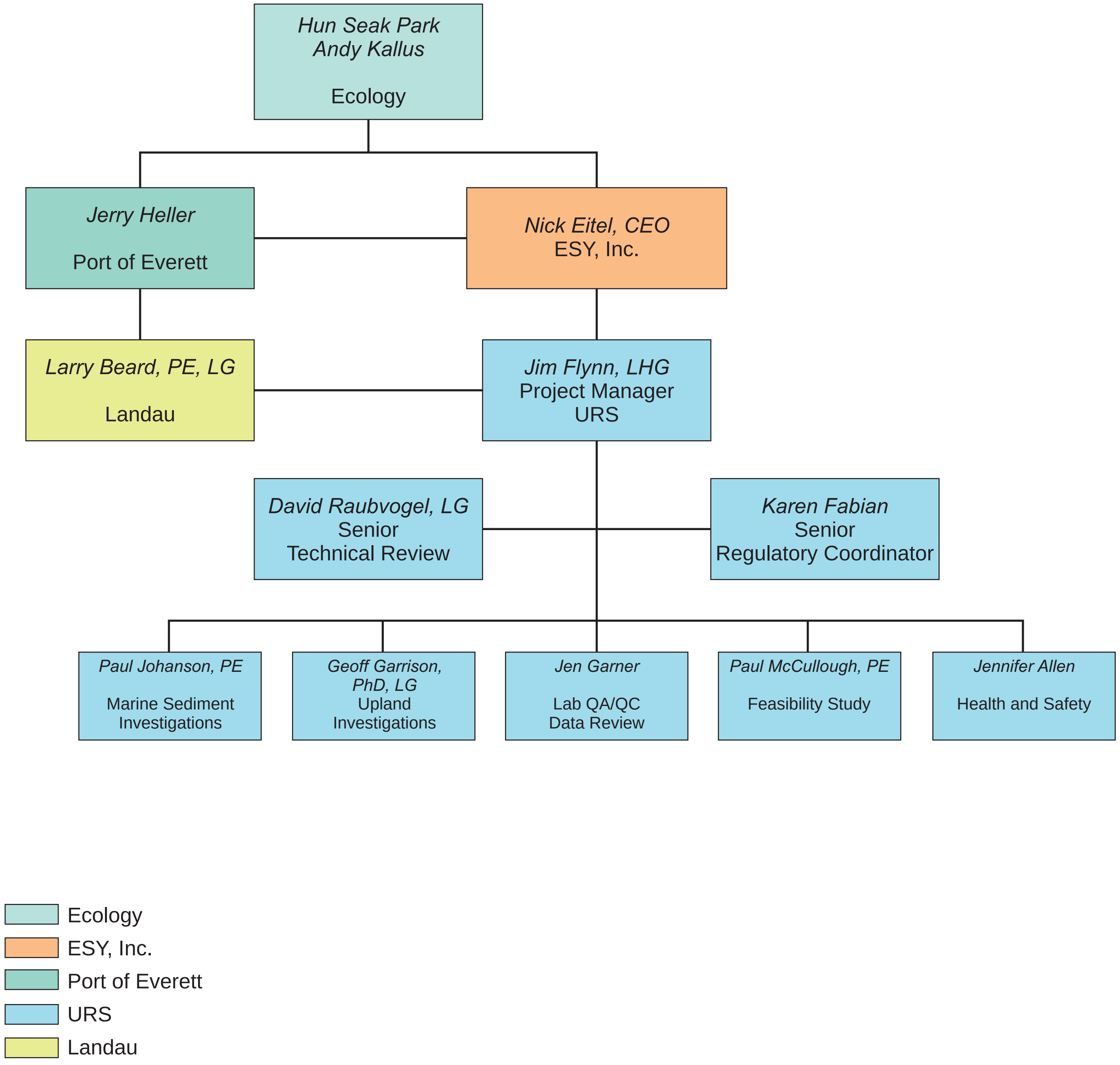
Site Location Map

Job No. 33759794

URS

Everett Shipyard
Port of Everett, Washington

33760902_01.cdr



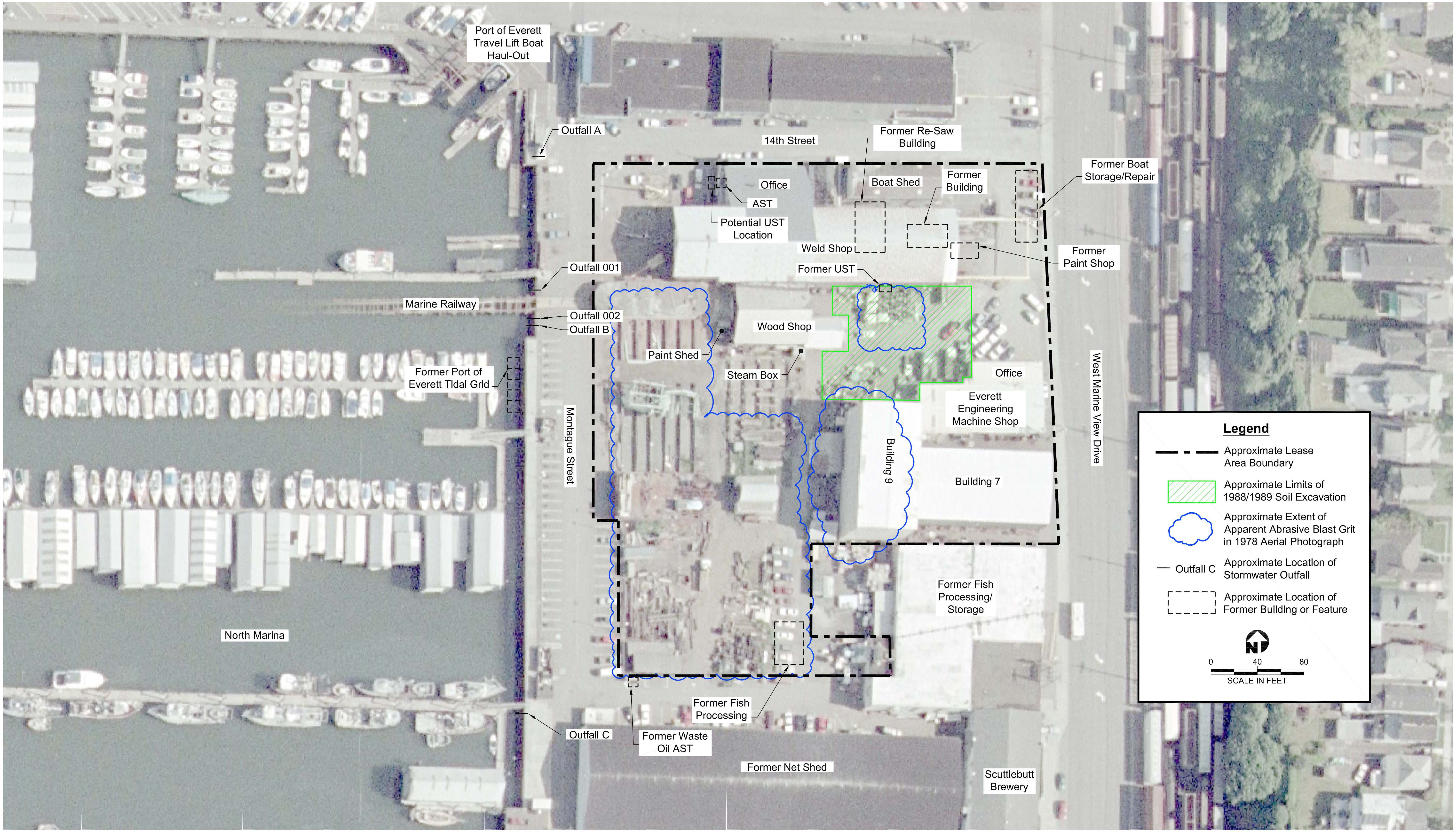
Job No. 33760902

Figure 2

Organization Chart

URS

Everett Shipyard
Everett, Washington
RI/FS Work Plan



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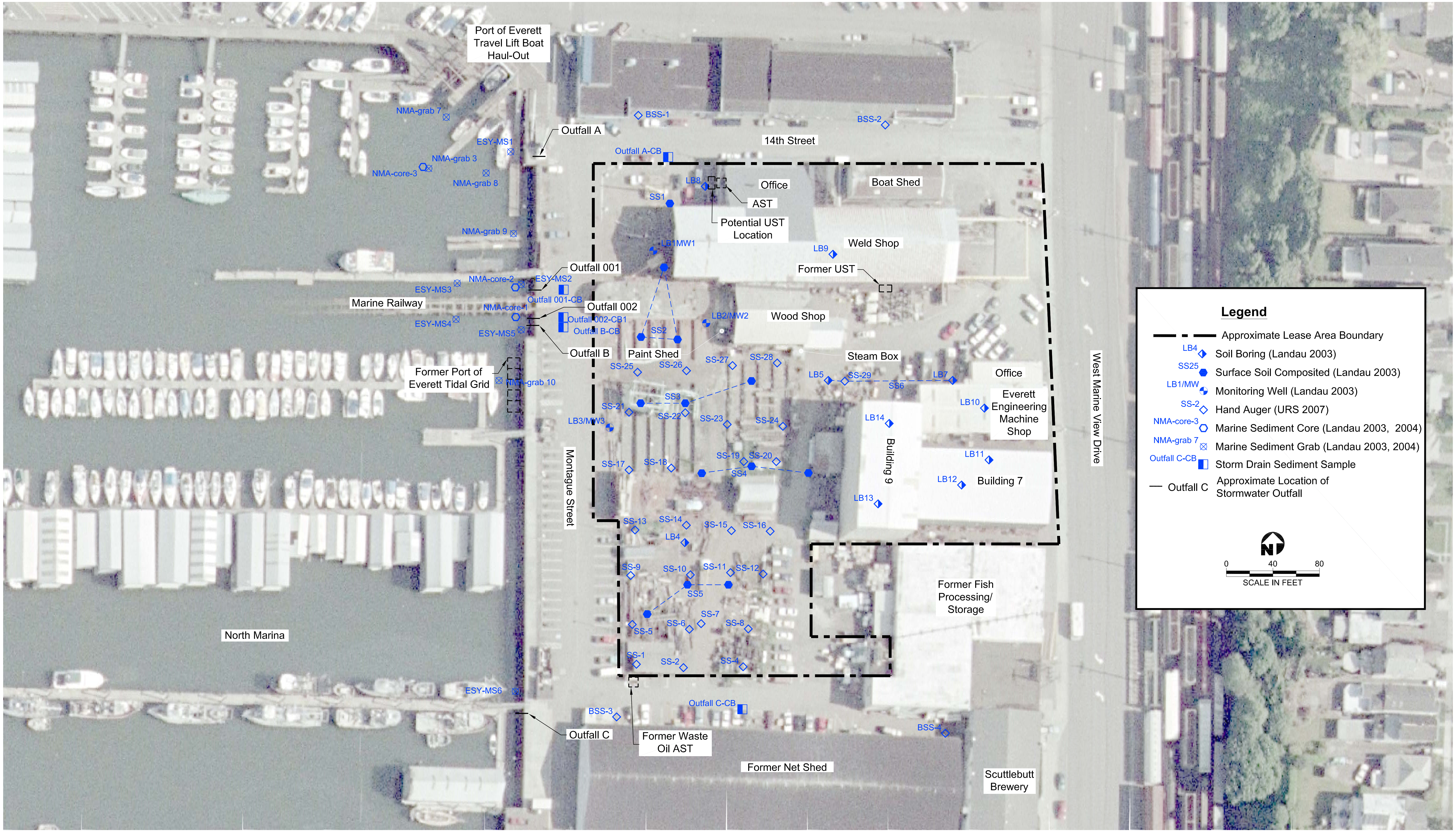
URS

Figure 3

Site Plan

Everett Shipyard
Everett, Washington
RI/FS WORK PLAN



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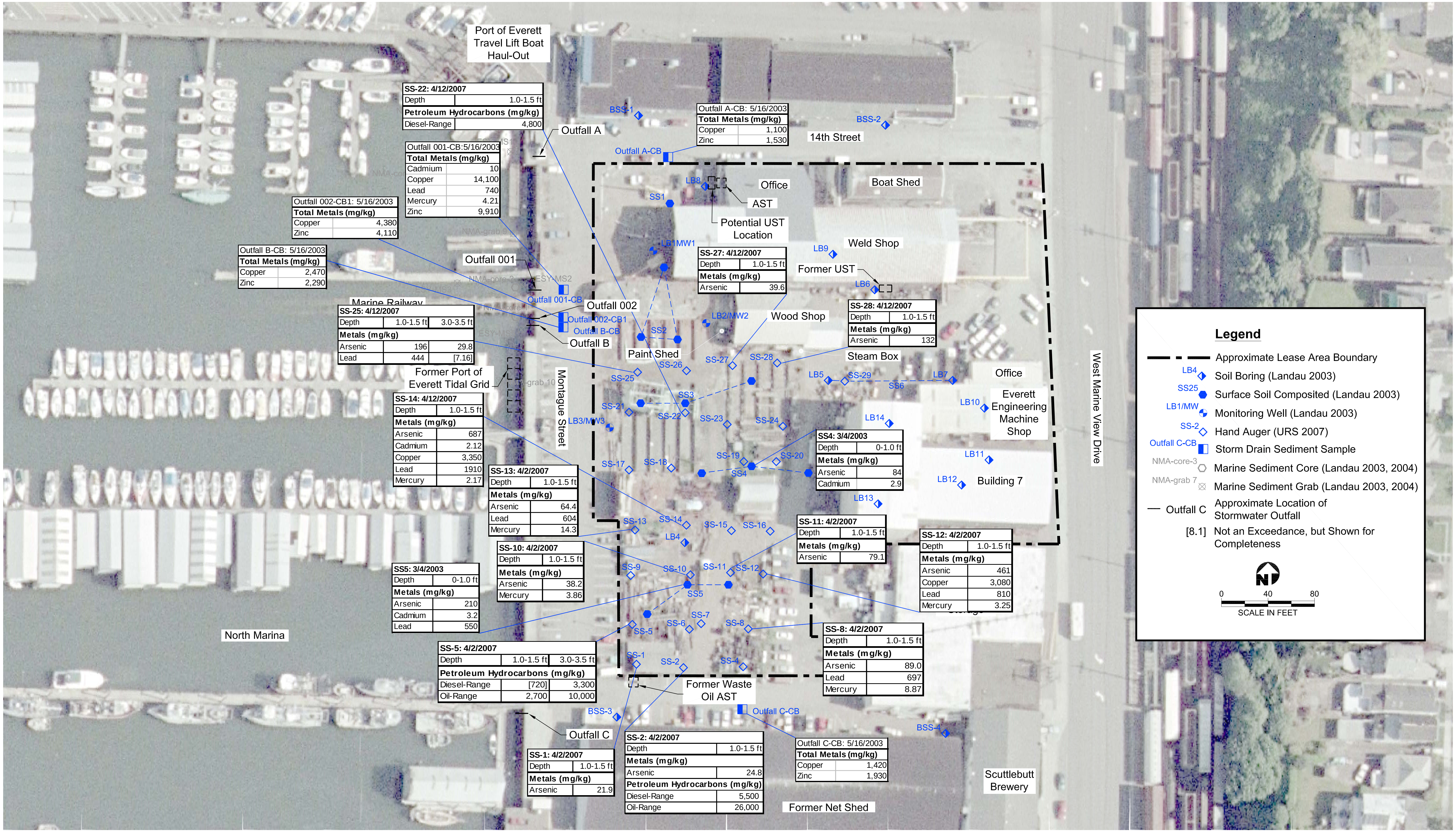
URS

Figure 4
Historical Sample Locations

Everett Shipyard
Everett, Washington
RI/FS WORK PLAN



SS-22: 4/12/2007	
Depth	1.0-1.5 ft
Petroleum Hydrocarbons (mg/kg)	
Diesel-Range	4,800

Outfall 001-CB:5/16/2003	
Total Metals (mg/kg)	
Cadmium	10
Copper	14,100
Lead	740
Mercury	4.21
Zinc	9,910

Outfall A-CB: 5/16/2003	
Total Metals (mg/kg)	
Copper	1,100
Zinc	1,530

Outfall 002-CB1: 5/16/2003	
Total Metals (mg/kg)	
Copper	4,380
Zinc	4,110

Outfall B-CB: 5/16/2003	
Total Metals (mg/kg)	
Copper	2,470
Zinc	2,290

SS-27: 4/12/2007	
Depth	1.0-1.5 ft
Metals (mg/kg)	
Arsenic	39.6

SS-28: 4/12/2007	
Depth	1.0-1.5 ft
Metals (mg/kg)	
Arsenic	132

SS-25: 4/12/2007		
Depth	1.0-1.5 ft	3.0-3.5 ft
Metals (mg/kg)		
Arsenic	196	29.8
Lead	444	[7.16]

SS-14: 4/12/2007	
Depth	1.0-1.5 ft
Metals (mg/kg)	
Arsenic	687
Cadmium	2.12
Copper	3,350
Lead	1910
Mercury	2.17

SS4: 3/4/2003	
Depth	0-1.0 ft
Metals (mg/kg)	
Arsenic	84
Cadmium	2.9

SS-13: 4/2/2007	
Depth	1.0-1.5 ft
Metals (mg/kg)	
Arsenic	64.4
Lead	604
Mercury	14.3

SS-11: 4/2/2007	
Depth	1.0-1.5 ft
Metals (mg/kg)	
Arsenic	79.1

SS-12: 4/2/2007	
Depth	1.0-1.5 ft
Metals (mg/kg)	
Arsenic	461
Copper	3,080
Lead	810
Mercury	3.25

SS-10: 4/2/2007	
Depth	1.0-1.5 ft
Metals (mg/kg)	
Arsenic	38.2
Mercury	3.86

SS5: 3/4/2003	
Depth	0-1.0 ft
Metals (mg/kg)	
Arsenic	210
Cadmium	3.2
Lead	550

SS-8: 4/2/2007	
Depth	1.0-1.5 ft
Metals (mg/kg)	
Arsenic	89.0
Lead	697
Mercury	8.87

SS-5: 4/2/2007		
Depth	1.0-1.5 ft	3.0-3.5 ft
Petroleum Hydrocarbons (mg/kg)		
Diesel-Range	[720]	3,300
Oil-Range	2,700	10,000

SS-1: 4/2/2007	
Depth	1.0-1.5 ft
Metals (mg/kg)	
Arsenic	21.9

SS-2: 4/2/2007	
Depth	1.0-1.5 ft
Metals (mg/kg)	
Arsenic	24.8
Petroleum Hydrocarbons (mg/kg)	
Diesel-Range	5,500
Oil-Range	26,000

Outfall C-CB: 5/16/2003	
Total Metals (mg/kg)	
Copper	1,420
Zinc	1,930

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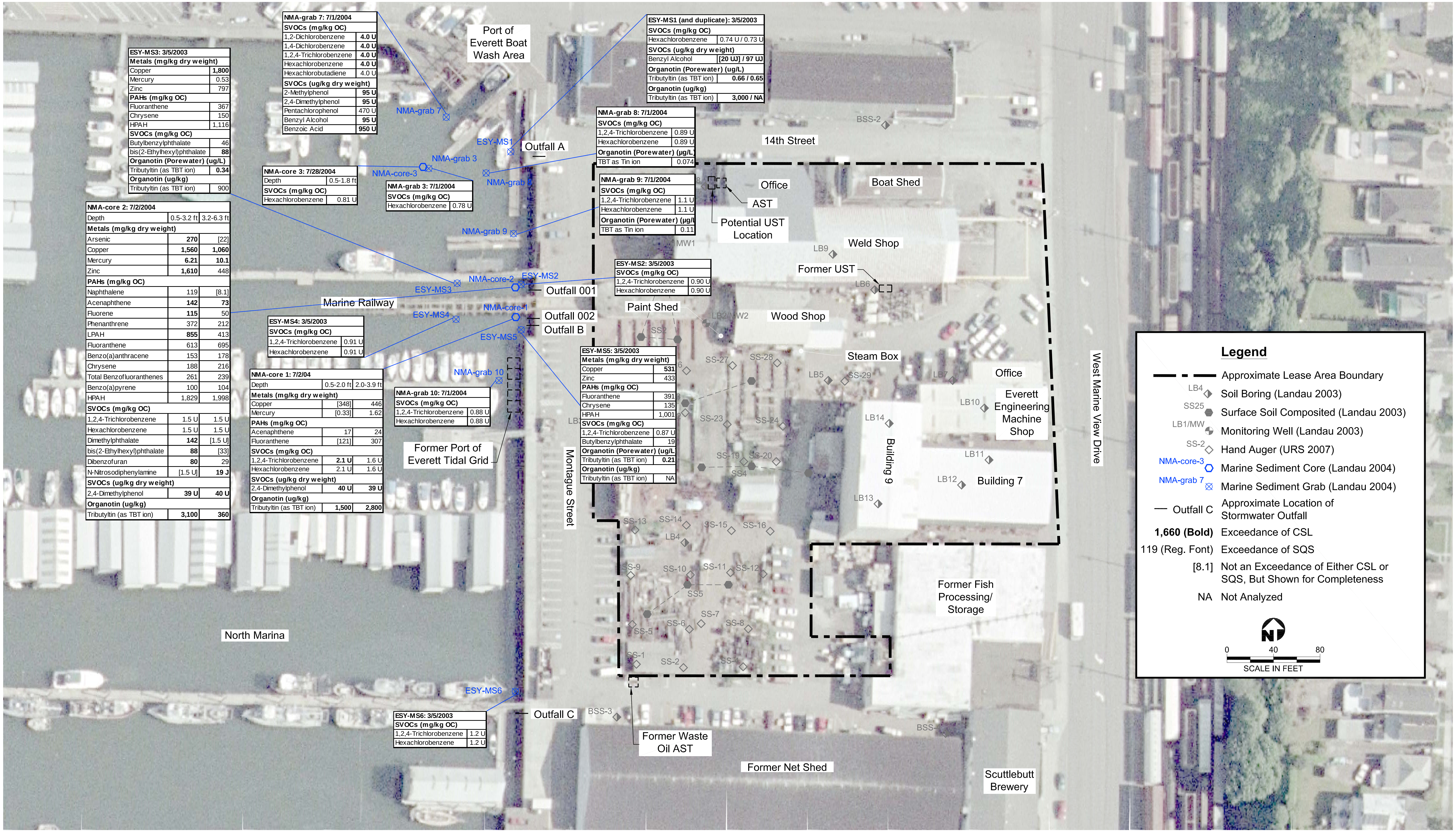
Figure 5
Soil Sample and Storm Drain Sediment Exceedances

Everett Shipyard
Everett, Washington
RI/FS WORK PLAN



ESY-MS3: 3/5/2003	
Metals (mg/kg dry weight)	
Copper	**1,800**
Mercury	0.53
Zinc	797
PAHs (mg/kg OC)	
Fluoranthene	367
Chrysene	150
HPAH	1,116
SVOCs (mg/kg OC)	
Butylbenzylphthalate	46
bis(2-Ethylhexyl)phthalate	**88**
Organotin (Porewater) (ug/L)	
Tributyltin (as TBT ion)	**0.34**
Organotin (ug/kg)	
Tributyltin (as TBT ion)	900

NMA-grab 7: 7/1/2004	
SVOCs (mg/kg OC)	
1,2-Dichlorobenzene	**4.0 U**
1,4-Dichlorobenzene	**4.0 U**
1,2,4-Trichlorobenzene	**4.0 U**
Hexachlorobenzene	**4.0 U**
Hexachlorobutadiene	4.0 U
SVOCs (ug/kg dry weight)	
2-Methylphenol	**95 U**
2,4-Dimethylphenol	**95 U**
Pentachlorophenol	470 U
Benzyl Alcohol	**95 U**
Benzoic Acid	**950 U**

NMA-core 3: 7/28/2004	
Depth	0.5-1.8 ft
SVOCs (mg/kg OC)	
Hexachlorobenzene	0.81 U

NMA-grab 3: 7/1/2004	
SVOCs (mg/kg OC)	
Hexachlorobenzene	0.78 U

ESY-MS1 (and duplicate): 3/5/2003	
SVOCs (mg/kg OC)	
Hexachlorobenzene	0.74 U / 0.73 U
SVOCs (ug/kg dry weight)	
Benzyl Alcohol	**[20 UJ] / 97 UJ**
Organotin (Porewater) (ug/L)	
Tributyltin (as TBT ion)	**0.66 / 0.65**
Organotin (ug/kg)	
Tributyltin (as TBT ion)	**3,000 / NA**

NMA-grab 8: 7/1/2004	
SVOCs (mg/kg OC)	
1,2,4-Trichlorobenzene	0.89 U
Hexachlorobenzene	0.89 U
Organotin (Porewater) (µg/L)	
TBT as Tin ion	0.074

NMA-grab 9: 7/1/2004	
SVOCs (mg/kg OC)	
1,2,4-Trichlorobenzene	1.1 U
Hexachlorobenzene	1.1 U
Organotin (Porewater) (µg/L	
TBT as Tin ion	0.11

NMA-core 2: 7/2/2004		
Depth	0.5-3.2 ft	3.2-6.3 ft
Metals (mg/kg dry weight)		
Arsenic	**270**	[22]
Copper	**1,560**	**1,060**
Mercury	**6.21**	**10.1**
Zinc	**1,610**	448
PAHs (mg/kg OC)		
Naphthalene	119	[8.1]
Acenaphthene	**142**	**73**
Fluorene	**115**	50
Phenanthrene	372	212
LPAH	**855**	413
Fluoranthene	613	695
Benzo(a)anthracene	153	178
Chrysene	188	216
Total Benzofluoranthenes	261	239
Benzo(a)pyrene	100	104
HPAH	1,829	1,998
SVOCs (mg/kg OC)		
1,2,4-Trichlorobenzene	1.5 U	1.5 U
Hexachlorobenzene	1.5 U	1.5 U
Dimethylphthalate	**142**	[1.5 U]
bis(2-Ethylhexyl)phthalate	**88**	[33]
Dibenzofuran	**80**	29
N-Nitrosodiphenylamine	[1.5 U]	**19 J**
SVOCs (ug/kg dry weight)		
2,4-Dimethylphenol	**39 U**	**40 U**
Organotin (ug/kg)		
Tributyltin (as TBT ion)	**3,100**	**360**

ESY-MS2: 3/5/2003	
SVOCs (mg/kg OC)	
1,2,4-Trichlorobenzene	0.90 U
Hexachlorobenzene	0.90 U

ESY-MS4: 3/5/2003	
SVOCs (mg/kg OC)	
1,2,4-Trichlorobenzene	0.91 U
Hexachlorobenzene	0.91 U

ESY-MS5: 3/5/2003	
Metals (mg/kg dry weight)	
Copper	**531**
Zinc	433
PAHs (mg/kg OC)	
Fluoranthene	391
Chrysene	135
HPAH	1,001
SVOCs (mg/kg OC)	
1,2,4-Trichlorobenzene	0.87 U
Butylbenzylphthalate	19
Organotin (Porewater) (ug/L)	
Tributyltin (as TBT ion)	**0.21**
Organotin (ug/kg)	
Tributyltin (as TBT ion)	NA

NMA-core 1: 7/2/04		
Depth	0.5-2.0 ft	2.0-3.9 ft
Metals (mg/kg dry weight)		
Copper	[348]	446
Mercury	[0.33]	1.62
PAHs (mg/kg OC)		
Acenaphthene	17	24
Fluoranthene	[121]	307
SVOCs (mg/kg OC)		
1,2,4-Trichlorobenzene	**2.1 U**	1.6 U
Hexachlorobenzene	2.1 U	1.6 U
SVOCs (ug/kg dry weight)		
2,4-Dimethylphenol	**40 U**	**39 U**
Organotin (ug/kg)		
Tributyltin (as TBT ion)	**1,500**	**2,800**

NMA-grab 10: 7/1/2004	
SVOCs (mg/kg OC)	
1,2,4-Trichlorobenzene	0.88 U
Hexachlorobenzene	0.88 U

ESY-MS6: 3/5/2003	
SVOCs (mg/kg OC)	
1,2,4-Trichlorobenzene	1.2 U
Hexachlorobenzene	1.2 U

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Figure 6
Marine Sediment Sample Exceedances

Everett Shipyard
Everett, Washington
RI/FS WORK PLAN

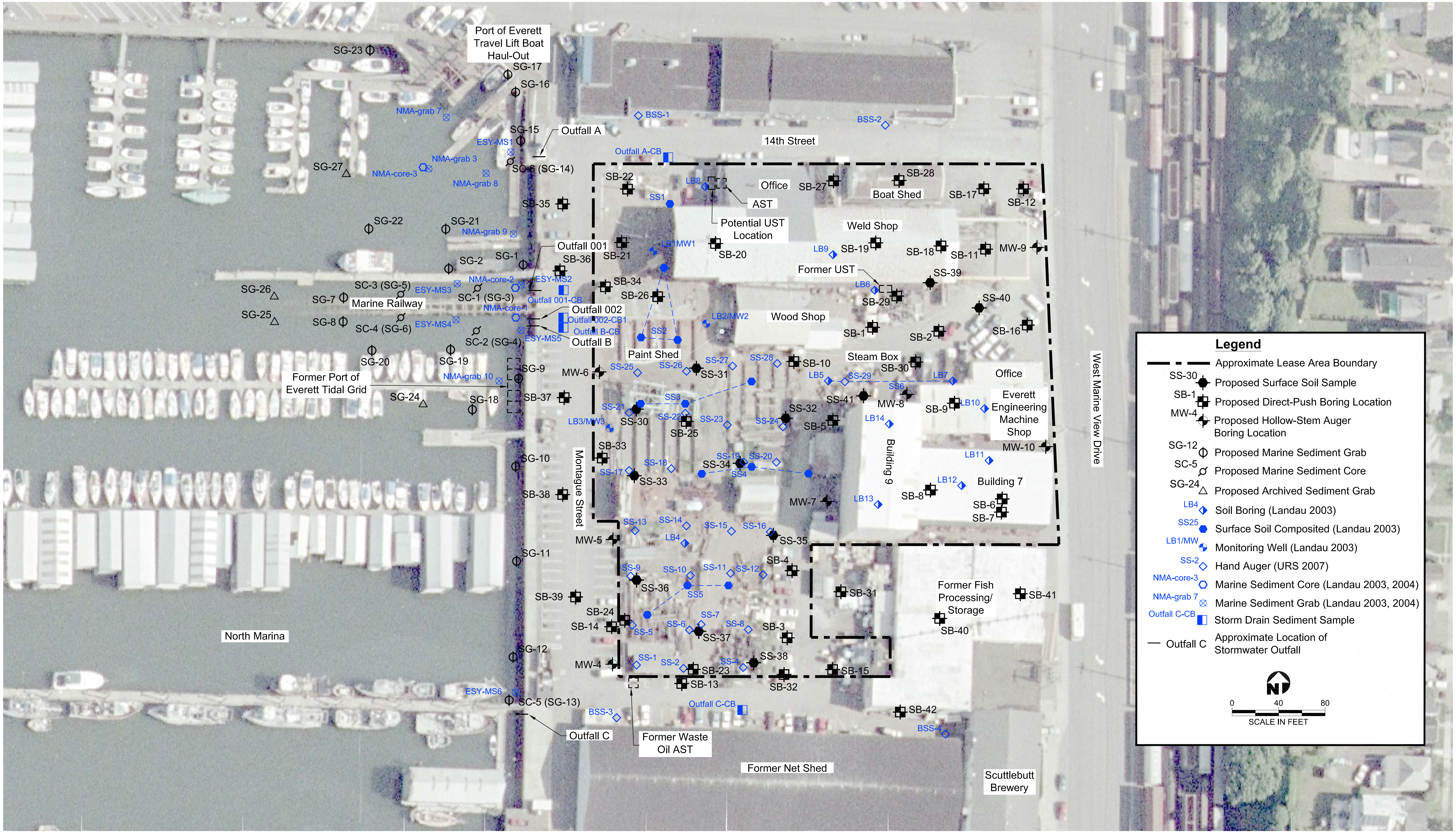

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Figure 7
Proposed Sample Locations

Everett Shipyard
Everett, Washington
RI/FS WORK PLAN

APPENDIX A

SITE-SPECIFIC HEALTH AND SAFETY PLAN

APPENDIX A

SITE-SPECIFIC HEALTH AND SAFETY PLAN

Prepared by:

URS CORPORATION
Jennifer Allen CIH

For

Everett Shipyard RI/FS

October 24, 2008

Disclaimer:

This Site-Specific Health and Safety Plan, and each of its provisions, is applicable only to, and for use only by, URS Corporation, its affiliates, and its subcontractors. Any use of this Plan by other parties, including, without limitation, third party contractors on projects where URS is providing engineering, construction management, or similar services, without the express written permission of URS, will be at that party's sole risk, and URS Corporation shall have no responsibility therefore. The existence and use of this Plan by URS shall not be deemed an admission or evidence of any acceptance of any safety responsibility by URS for other parties unless such responsibility is expressly assumed in writing by URS in a specific project contract.

SITE-SPECIFIC HEALTH AND SAFETY PLAN
Everett Shipyard RI/FS

(Phone Numbers)

		PHONE
Project Manager:	James Flynn	206.438.2113
Task Manager:	Geoff Garrison	206.438.2128
Site Safety Officers:	Geoff Garrison Jessica Wellmeyer	206.438.2128 206.438.2319
Plan Preparer:	Jennifer Allen, CIH	206.438.2120
Preparation Date:	April 28, 2008	
Expiration Date:	April 28, 2009	

APPROVALS

Plan Preparer:

10/20/08
(DATE)

Task Manager:

10/21/08
(DATE)

This Site-Specific Health and Safety Plan (HSP) is valid only for this specific project as described in Section 3.0. It is not to be used for other projects or subsequent phases of this project without the written approval of the Regional Health, Safety, and Environment Manager. A copy of this plan is to be maintained on the site at all times.

SITE-SPECIFIC HEALTH AND SAFETY PLAN

Everett Shipyard RI/FS

TABLE OF CONTENTS

Attachments

Attachment A	Hospital Route Map and Occupational Health Clinic Map
Attachment B	Safety Plan Compliance Agreement and Medical Emergency Contact Sheet
Attachment C	Material Safety Data Sheets (MSDSs)
Attachment D	Daily Project Review Form and Safe Plan of Action Checklist

GLOSSARY OF TERMS, ACRONYMS, AND ABBREVIATIONS

ºC	degrees Centigrade
ºF	degrees Fahrenheit
ACGIH	American Conference of Governmental Industrial Hygienists
atm	atmosphere
C	ceiling
Carcinogen	a substance that can cause cancer
CNS	central nervous system
CSP	Certified Safety Professional
CRZ	contaminant reduction zone
DERA	Designated Emergency Response Authority
DOT	Department of Transportation
EZ	Exclusion Zone
kg	kilogram
Lpm	liters per minute
m	meter
mg	milligram
mg/M^3	milligrams per cubic meter
ml	milliliter
mm	millimeter
MSDS	Material Safety Data Sheet
MSL	mean sea level
ND	not detected
NIOSH	National Institute for Occupational Safety and Health
O_2	oxygen
OBZ	operator’s breathing zone
OEL	occupational exposure limit
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyls
PEL	permissible exposure limit
PFD	personal floatation device
PM	project manager
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million

GLOSSARY OF TERMS, ACRONYMS, AND ABBREVIATIONS (Continued)

REL	recommended exposure limit
RHSEM	Regional Health, Safety and Environment Manager
SMS	Safety Management Standard (URS)
SSHSP	Site-specific Health and Safety Plan
SSO	Site Safety Officer
SSR	Subcontractor's Safety Representative
STEL	short term exposure limit
TLV	threshold limit value
TWA	time-weighted average
URS	URS Corporation and subsidiaries
WAC	Washington Administrative Code
WISHA	Washington Industrial Safety and Health Administration (Department of Labor & Industry)

SITE-SPECIFIC HEALTH AND SAFETY PLAN
Everett Shipyard RI/FS

1.0 PLAN-AT-A-GLANCE

HEALTH AND SAFETY PLAN SUMMARY SHEET

THIS SUMMARY SECTION IS PROVIDED AS A QUICK-REFERENCE/OVERVIEW ONLY. THE REMAINDER OF THIS SITE-SPECIFIC HEALTH AND SAFETY PLAN (SSHSP) IS INTEGRAL TO THE SAFE CONDUCT OF SITE OPERATIONS AND MUST BE APPLIED IN ITS ENTIRETY.

EMERGENCY INFORMATION

Site Address:
Everett Shipyard
1016 14th Street
Everett, WA
98201-1686

Cross Street: West Marine View Drive

Ambulance:	911
Fire:	911
Police:	911
Hospital:	425.258.7660 (Providence Everett Medical Center)

Project Manager:	James Flynn	206.438.2113
Task Manager:	Geoff Garrison	206.438.2128
Health, Safety, and Environment Representative:	Bryan Berna	206.438.2274
Regional Health, Safety, and Environment Manager:	Mark Litzinger, CIH	206.438.2199
Alternate:	Jennifer Allen, CIH	206.438.2120
National Response Center:		800.424.8802

A cellular phone will be available on site at all times.

For an emergency at Everett Shipyard:

1. Call Emergency at 911.
2. Be prepared to provide the following information:
   a. Name
   b. Phone number that you are calling from
   c. Organization
   d. Nature of incident, type of injury/emergency
   e. Location (e.g. building number)
3. Post someone at the nearest safe aisle or road to direct emergency vehicles
4. Control site entry

5. Report to the ESY, Inc. Project Manager, and the URS PM, URS Occupational Health Nurse and URS Regional Health, Safety and Environment Manager.

HOSPITAL DIRECTIONS:

For emergencies at the Everett Shipyard, the nearest hospital is:

Providence Everett Medical Center
1321 Colby Avenue, Everett, WA
425.261.2000

See Attachment A for a map of the route to the hospital.

Additional information concerning emergency procedures is located in Section 12.0.

CONSTITUENTS OF CONCERN (COC'S)

- **Petroleum Products (TPHs)**
- **Semivolatile Organic Compounds (SVOCs)**
- **Arsenic (As)**
- **Cadmium (Cd)**
- **Copper (Cu)**
- **Lead (Pb)**
- **Mercury (Hg)**
- **Tributyl Tin (TBT)**
- **Zinc (Zn)**

HAZARDOUS MATERIALS BROUGHT ON SITE

List any hazardous materials – acids, caustics, solvents, detergents, fuel, etc. – that will be brought on site by URS or contractors.

- Alconox
- Hydrochloric Acid
- Methanol
- Sodium Bisulfite

Additional information regarding site history, constituents of concern, and scope of work activities is located in sections 2.0 and 5.0.

PROJECT HAZARD ANALYSIS

Task	Chemical Hazards	Heat/ Cold Stress	Noise	Slip/ Trip/ Fall	Lifting Hazards	Mechanical Hazards	Electrocution	Explosion	Excavation
1. Mobilization	Low	Med	Low	Med	Med	Low	Low	Low	Low
2. Surveying and utility locating	Low	Low	Low	Med	Low	Low	Low	Low	Low
3. Hand Augering	Low	Med	Low	Med	Med	High	Med	Low	Low
4. Direct-push or conventional drilling	Low	Med	High	High	Med	High	Med	Low	Low
5. Concrete coring	Low	Med	High	Med	Med	High	Med	Low	Low
6. Soil/water/ sediment sampling	Med	Med	Med	High	Med	Med	Med	Low	Low
7. Catch basin inspections	Low	Med	Med	High	Med	Low	Low	Low	Low
8. Sample and waste handling	Med	Med	Low	Low	Med	Low	Low	Low	Low

High - Exposure likely more than 50% of the time Med - Exposure likely 10 to 50% of the time
Low - Exposure likely less than 10% of the timen/a – Exposure not anticipated

Additional information concerning project hazards and their control can be found in Section 5.0.

PROTECTIVE CLOTHING

A minimum of Level D protection will be required for all site activities. This level includes:

- Hard hat
- Safety glasses
- Steel-toed boots
- Traffic safety vest
- Hearing protection within 25 feet of noisy heavy equipment operations.

For work around contaminated soils, chemical protective clothing or respiratory protection may be utilized if necessary.

For work over water or on a skiff/boat, workers are required to wear a personal floatation device (PFD), and to have a float plan prepared by the boat operator.

The SSHSP Preparer has conducted a Hazard Assessment for this project based on information provided by the Project Manager, in accordance with 29 CFR 1910.132(d).

For more information on Personal Protective Equipment (PPE), see Section 7.0.

ENGINEERING CONTROLS TO BE USED (AS APPLICABLE)

Adherence to all Everett Shipyard site specific health and safety requirements at each location

For more information, see Section 5.0

INSTRUMENTATION TO BE USED

A photoionization detector (PID) will be used to screen soil samples for volatile organic compounds (VOCs), in order to identify samples for VOC analysis. The PID readings may also be used to screen for personnel exposures.

A carbon monoxide (CO) monitor is required when running gas or diesel powered equipment indoors without exhaust ventilation hoses.

For more information, see Section 6.0

PERSONAL EXPOSURE SAMPLING

__ Will be conducted
__ Will be conducted if the use of respiratory protection is required in an amendment to this plan
_√_ **Is not anticipated**

For more information on monitoring, see Section 6.0.

HEALTH AND SAFETY EQUIPMENT LIST

Required	As needed	
X		URS SMSs (relevant to project - see next page)
	X	Occupational Safety and Health Administration (OSHA) “Safety on the Job” Posters
X		Hardhats
X		Safety glasses
X		Ear plugs or muffs
	X	Cotton coveralls
X		Traffic safety vest
	X	Tyvek® coveralls
		Polycoated Tyvek® Q-23 coveralls
X		Steel-toed boots
	X	Chemical-resistant steel-toed boots or chemical-resistant boot covers
	X	Work gloves
X		Nitrile outer gloves
X		Surgical nitrile inner gloves
X		Plastic sheeting (polyethylene)
	X	55-gallon 17-H drums (for contaminated solids or PPE)
	X	55-gallon 17-E drums (for liquids)
	X	Drum liners
	X	Barricade tape and barricades
X		Wash tubs and scrub brushes
X		Decontamination solution (i.e., TSP, Alconox)
	X	Folding chairs
	X	5- or 10-gallon portable eyewash
X		Respirator sanitizing equipment
X		First aid kit
X		Infection control kit
X		Drinking water
		Gatorade or similar drink
X		Type ABC fire extinguishers
X		Half-face respirators approved by National Institute for Occupational Safety and Health (NIOSH)
		Full-face respirators (NIOSH-approved)
X		Respirator cartridges [HEPA/Organic Vapor]
X		PID w/10.6 lamp and calibration kit
X		Carbon monoxide monitor
	X	Compressed gas horn
X		Duct tape
X		Paper towels and hand soap
		Spill sorbent
	X	Plastic garbage bags
		Broom and/or shovel

SAFETY MANAGEMENT STANDARDS REFERENCED BY THIS SSHSP

SMS	TOPIC	SSHSP SECTION
72	Behavior Based Safety	4
2	Worker Right to Know	5
26	Noise and Hearing Conservation	5
69	Manual Material Handling	5
19	Heavy Equipment Operations	5
34	Utility Clearances	5
56	Drilling Safety Guidelines	5
32	Traffic Control	5
13	Excavation Safety	5
53	Marine Safety and Boat Operation	5
27	Work Over Water	5
43	Industrial Hygiene Monitoring	6
29	Personal Protective Equipment	7
30	Sanitation	10
14	Fire Prevention	12
49	Incident Reporting	12

These SMSs are available on the URS Health, Safety, and Environment Web site. Access the Web site from the SoURSe or through the Internet (www.urshse.com).

Copies of the SMSs referenced by this SSHSP are to be maintained by the Project Manager (PM).

2.0 FACILITY BACKGROUND/WORK PLAN

2.1 SITE HISTORY

ESY, Inc. (ESY), formerly Everett Shipyard, Inc. has operated a ship building, maintenance and repair facility at 1016 14th Street in Everett, Washington since approximately 1959. ESY leases the upland portion of the site from the Port of Everett (Port). Previous investigations conducted on the area leased by ESY and in the adjacent North Marina area near the marine railway, identified hazardous substances in soil and sediment exceeding potentially applicable cleanup levels. URS will conduct a Remedial Investigation (RI) / Feasibility Study (FS) to further investigate environmental impacts to soil, groundwater and sediment related to potential hazardous substance releases. As described in the RI/FS Work Plan, the RI/FS is being conducted in accordance with Agreed Order No. DE 5271.

2.2 PURPOSE AND SCOPE OF WORK

The purpose of this SSHSP is to address health and safety at the leased ESY property during URS's Remedial Investigation (RI) / Feasibility Study (FS).

It is anticipated that the work will include:

- Collection of soil samples using a hand auger, direct-push drill rig and a hollow-stem auger drill rig, and concrete coring, in accordance with the Sampling and Analysis Plan (SAP) prepared for the investigation.
- Collection of groundwater samples using direct-push drill rig in accordance with the SAP.
- Installation of groundwater monitoring wells using a hollow-stem drill rig in accordance with the SAP.
- Collection of groundwater samples from monitoring wells.
- Inspection of catch basins for presence of accumulated solids.
- Collection of sediment samples from the near shore area of the marina, from a marine vessel.
- Submittal of samples for laboratory analysis followed by interpretation of results.
- Mapping and documentation of sampling areas on the site.
- Preparation of a RI report and Feasibility Study for cleanup.

Removal or disposal of contaminated sediments is not part of this work.

URS will retain Cascade Drilling of Woodinville WA for drilling. Another contractor (not yet identified) will be retained for the Marine sediment samples, including operation of the boat. A private property utility locates contractor (not yet identified) will be retained by URS prior to any subsurface work.

3.0 APPLICABILITY

The purpose of this SSHSP, which was developed specifically for Everett Shipyard RI/FS, is to assign responsibilities, establish personal protection standards and mandatory safety procedures, and provide for contingencies that may arise while operations are being conducted at the site. This SSHSP complies with, but does not replace, Federal Health and Safety Regulations, as set forth in 29 CFR 1910 and 1926, and applicable state regulations (Washington Administrative Code (WAC) 296-62, WAC 296-843 and WAC 296-155). This SSHSP is to be used by URS personnel as a supplement to these rules, regulations, and guidance. This SSHSP is to be augmented by the URS Health, Safety, and Environment Program and Management System; relevant standards from that program and system are required to be available on site during all activities.

The provisions of the SSHSP are mandatory for all on site URS employees engaged in hazardous material management activities associated with this project, which may involve health and safety hazards.

Changing and/or unanticipated site conditions may require modification of this SSHSP to maintain a safe and healthful work environment. Any proposed changes to this plan will be reviewed with a URS health, safety, and environment professional prior to their implementation. If this is not feasible, the Site/Project Manager may modify the plan and record all changes in the field log book; under no circumstances will modifications to this plan conflict with federal, state, or other governmental health and safety regulations.

Subcontractors to URS will be required to follow the requirements of this plan or more stringent standards. In addition, subcontractors are contractually required to provide documentation to URS that describes their plan for addressing applicable health and safety requirements for activities that are unique to their scope of services (for example: drill rig operation, excavation safety, electrical safety, etc).

4.0 RESPONSIBILITIES

URS will have site safety and health oversight and coordination responsibilities for URS personnel. Each subcontractor will be held accountable for the safe and healthful performance of work by each of its employees, subcontractors, or support personnel who may enter the site.

URS is committed to a Behavior Based Safety program, in accordance with SMS 072. Safe behaviors include following health and safety plans, using work practices that minimize risk, coaching others on safe behavior, and having safety as a priority over speed and convenience. All employees are encouraged to provide immediate one-on-one feedback when observing at-risk behavior, and positive feedback for safe behavior.

URS will adhere strictly to the provisions of this SSHSP, along with applicable regulations issued by governmental entities.

4.1 PROJECT MANAGER (URS) – JAMES FLYNN

The PM will direct URS onsite operations. The PM may delegate all or part of these duties to a properly qualified URS employee who is designated as the Task Manager. At the site, the PM, assisted by the Site Safety Officer (SSO), has primary responsibility for the following.

- Seeing that appropriate PPE and monitoring equipment are available and properly used by all onsite URS employees.
- Establishing that URS personnel are aware of the provisions of this SSHSP, are instructed in the work practices necessary to ensure safety, and are familiar with procedures for dealing with emergencies.
- Establishing that all URS onsite personnel have completed a minimum of 40 hours of health and safety training, have appropriate medical clearance, as required by 29 CFR 1910.120 (WAC 296-843), and have been fit tested for the appropriate respirators.
- Seeing that URS personnel are aware of the potential hazards associated with site operations.
- Monitoring the safety performance of all URS personnel to see that required work practices are employed, using checklist SMS 72-1.
- Correcting any URS work practices or conditions that may result in injury or exposure to hazardous substances.
- Preparing any accident/incident reports for URS activities (see Section 12.6).
- Seeing to the completion of Safety Plan Compliance Agreements by URS personnel (Attachment B).
- Halting URS site operations, if necessary, in the event of an emergency or to correct unsafe work practices.
- Seeing that utility clearances are obtained prior to the commencement of work (see Section 5.2.7).
- Seeing that the appropriate SMS's are appended to this SSHSP and are available on site (see "Plan-at-a-Glance").
- Reviewing and approving this project SSHSP.

4.2 SITE SAFETY OFFICERS (URS) – GEOFF GARRISON AND JESSICA WELLMEYER

The SSO's duties may be carried out by the PM or another qualified URS Site Manager. The SSO is responsible for the following.

- Implementing the project SSHSP and reporting any deviations from the anticipated conditions described in that plan to the PM and, if necessary, the RHSEM.
- Checking with a URS Health, Safety, and Environment Representative to assure URS personnel have current medical clearance and training.
- Assuming any other duties as directed by the PM or RHSEM.
- Coordinating with a URS health, safety, and environment professional to identify URS personnel on site for whom special PPE, exposure monitoring, or work restrictions may be required.
- Conducting safety meetings for all site personnel in accordance with Section 13 of this SSHSP.
- Conducting daily site inspections prior to the start of each shift. All inspections must be documented (preferably in a bound field logbook).
- Providing ongoing review of protection level needs as project work is performed and informing the PM of the need to upgrade/downgrade protection levels, as appropriate.
- Seeing that decontamination procedures described in Section 10.0 are followed by URS personnel.
- If necessary, establishing monitoring of URS personnel and recording the results of exposure evaluations.
- Determining that monitoring equipment (if necessary) is used properly by URS personnel and calibrated in accordance with manufacturer's instructions or other standards, and that monitoring results are properly recorded and retained.
- Halting URS site operations, as necessary, in the event of an emergency or to correct unsafe work practices.
- Maintaining the visitor log.

4.3 REGIONAL HEALTH, SAFETY AND ENVIRONMENT MANAGER (URS) – MARK LITZINGER

The RHSEM is responsible for:

- Determining the need for periodic audits of the operation to evaluate compliance with this plan.
- Providing health and safety support as requested by the SSO and PM.

4.4 PROJECT PERSONNEL (URS)

Project personnel involved in onsite investigations and operations are responsible for:

- Taking all reasonable precautions to prevent injury to themselves and to their fellow employees.
- Performing only those tasks that they believe they can do safely and immediately reporting any accidents and/or unsafe conditions to the SSO or PM.
- Implementing the procedures set forth in the SSHSP and reporting any deviations from the procedures described in that SSHSP to the SSO or PM for action.
- Notifying the PM and SSO of any special medical problems (i.e., allergies) and seeing that all onsite URS personnel are aware of such problems.
- Reviewing the project SSHSP and signing the Safety Plan Compliance Agreement.

4.5 SUBCONTRACTOR'S SAFETY REPRESENTATIVE

Subcontractors are required to follow the requirements of this plan or more stringent standards. Every contractor will provide:

- Trained employees (with training documentation).
- Properly maintained equipment (with appropriate documentation).
- Copies of their Standard Operating Procedures (SOP's) for all tasks and activities.
- A designated on-site employee (preferably a manager) who will serve as the Site Safety Representative (SSR) for their company.

The SSR is responsible for:

- Providing health and safety oversight of their personnel participating on the project team.
- Performing routine work area inspections.
- Conducting safety meetings.
- Providing safety orientations for new employees.
- Investigating incidents involving their employees.
- Attending periodic safety meetings with the URS SSO.

For certain activities, URS personnel may be subject to the subcontractor's safety requirements (e.g. when on the water, URS follows the operator's safety requirements). In situations where URS and subcontractor safety requirements conflict, the most stringent requirement will normally be followed. However, if the field crew is uncertain as to which safety requirements apply to a particular activity, the activity should be suspended temporarily and the crew should consult with the URS project manager for direction.

URS contractors and subcontractors, respective SSR's, and contact information are as follows. This table will be completed prior to start of job, and updated as needed.

Include all URS contractors, such as utility locators, surveyors, drilling companies, concrete coring, marine operators, etc.

Contractor Type/ Activity	Company Name	SSR Name	SSR Contact Phone Number	Does Contractor report to URS? If not – who?
Drilling	Cascade Drilling of Woodinville WA			

5.0 JOB HAZARD ANALYSIS

5.1 CHEMICAL HAZARDS

Two categories of chemical hazards are associated with site activities:

- Site constituents
- Chemicals used to conduct the site work.

Site constituents are those that exist at the site and are the cause for conducting site activities. The chemicals that are brought on site to conduct the work may be hazardous and subject to regulation under OSHA's Hazard Communication Standard (29 CFR 1910.1200).

5.1.1 Site Constituents

The maximum concentrations of contaminants found in soil and sediment on the site in 2003, 2004 and 2007 as described in the RI/FS work plan , with corresponding MTCA cleanup levels and Permissible Exposure Limits, are as follows.

Contaminant Of Concern	**Maximum Soil/Sediment Concentration (mg/kg)**	**MTCA Soil Cleanup Level**	**Permissible Exposure Limit (8 hr TWA)**
TPH – Diesel Range	5,500	2,000	None
TPH – Motor Oil Range	26,000	2,000	5 mg/m^3 as oil mist
Low Molecular Weight PAHs (LPAH)	855	0.1 (A)*	None
High Molecular Weight PAHs (HPAH)	1,829	0.1 (A)*	None
Arsenic	687	20(A), 88(C)	0.01 mg/m^3
Cadmium	2.12	2(A), 3500(C)	0.005 mg/m^3
Copper	3,350	3,000 (B)	1 mg/m^3
Lead	1,910	250(A), 1000(C)	0.05 mg/m^3
Mercury	14.3	2(A), 1100(C)	C 0.1 mg/m^3
Zinc	2,100	24,000(B)	5 mg/m^3
Tributyl Tin	3.1	NE	0.1 mg/m^3

Notes:
PAHs - polynuclear aromatic hydrocarbons
A - Method A soil cleanup level
B - Method C soil cleanup level
C - Method C soil cleanup level
* Method A cleanup level for carcinogenic PAHs
NE - Not established

From an occupational health standpoint, given that any potential exposure to site personnel will be for a short period of time (intermittent for several days), the levels of contaminants encountered during site activities should not represent a significant concern if the provisions of this SSHSP are appropriately implemented. However, given that the site is still under investigation, the potential for exposure to elevated levels of these contaminants may exist. Exposure to elevated levels of these contaminants may pose hazards. Overviews of these hazards are presented below.

Skin contact with potentially contaminated materials will be minimized by the use of personal protective clothing (as described in Sections 1.0 and 7.0). Ingestion of contaminated materials will be minimized by the use of appropriate personal and equipment hygiene procedures during decontamination (i.e. thoroughly washing face and hands with soap and water after leaving the work area and prior to eating or drinking). Inhalation of vapors or particulates during site activities is expected to be minimal. If deemed necessary by the RHSEM, air monitoring and/or additional engineering controls will be initiated. If airborne exposures become a concern, respiratory protection will be specified and this plan will be revised accordingly.

Petroleum Products (TPHs)
Potential contact with fugitive emissions or dermal exposure to petroleum hydrocarbons in the soil may be encountered by field personnel during this project. A minor release of vapors associated with fuel could occur while refueling the boat, or impacting contaminated soil. Some of the constituents of concern in common fuels are benzene, toluene, ethylbenzene, and xylene. Skin and eye contact and inhalation of organic vapors are significant routes of exposure during intrusive sampling. Accidental ingestion may also occur through inadequate decontamination procedures or poor personal hygiene practices. Acute symptoms of exposure include headaches, dizziness, and nausea. Contact with skin or eyes may cause irritation or dermatitis. Appropriate controls and PPE are required to protect against such fugitive emissions and to protect the skin from contamination.

Semivolatile Organic Compounds (including LPAH and HPAH)
Direct contact with contaminated soil and sediment is the primary route for SVOCs. However, inhalation may be of concern if dust levels are allowed to increase. Overexposure may cause irritation to eyes, nose, and throat. Systemic effects may include liver damage, promotion of tumors, and melanoma of skin.

Arsenic
Arsenic compounds can be corrosive to the skin. Brief contact has no effect, but prolonged contact results in localized skin problems. Some compounds are capable of producing skin sensitization and contact dermatitis. Poisoning from chronic (low-level) exposure can occur; initial symptoms include weakness, loss of appetite, nausea, vomiting, and diarrhea. The National Toxicology Program considers arsenic to be a known carcinogen.

Cadmium
Cadmium fume is irritating to the respiratory tract, and may cause lung edema or metal fume fever. The effects may be delayed. This substance is a known lung and prostate carcinogen and may have effects on the kidneys, bones and respiratory system.

Copper
Inhalation of copper fume from welding processes has produced upper respiratory tract irritation and metal fume fever in exposed workers. Copper is an essential element in human nutrition; normal intake is approximately 2 mg/day. Adverse effects have been demonstrated only at high exposure levels, and low levels of exposure are unlikely to be of concern.

Lead
Lead is toxic at acute and chronic exposure levels. Ongoing low-level exposure can result in irreversible central nervous system effects, kidney damage, and reproductive effects. Meticulous personal hygiene and decontamination procedures are required to prevent ingestion and transport of trace amounts on clothing and equipment.

Mercury
Mercury can affect the central nervous system and kidneys, resulting in irritability, emotional instability, tremor, mental and memory disturbances, and speech disorders. Mercury is especially toxic to children and the developing fetus.

Zinc
Zinc intake occurs largely from food, and ranges from 12 to 15 mg/day. Zinc has very low toxicity, and exposure on this site is unlikely to be of toxicological concern.

Tributyl Tin
Tributyl Tin oxide and other organotin compounds were widely used as antifouling marine paints, and are anticipated on the site. These compounds are skin and mucous membrane irritants, and toxic via ingestion or inhalation. Personal hygiene and decontamination procedures are required to prevent skin or eye contact and accidental ingestion.

5.1.2 Chemicals Used to Conduct Site Work

Indoor Use of Powered Equipment: Diesel Exhaust and Carbon Monoxide
Diesel exhaust contains hundreds of organic and inorganic compounds in the gas and particle phases including potentially carcinogenic aldehydes, benzene, 1,3-butadiene, and polycyclic aromatic hydrocarbons (PAHs). Carbon monoxide is a colorless, odorless gas that is produced as a result of incomplete burning of carbon-containing fuels. Exposure to CO reduces the blood's ability to carry oxygen, resulting in headaches, dizziness, weakness, sleepiness, nausea, vomiting, confusion, and disorientation. At very high levels, it causes loss of consciousness and death.

The project work plan includes indoor concrete coring and direct-push drilling in the Everett Engineering buildings. They are empty, warehouse type structures. Sampling may also occur in the open weld shop.

- Generators or engines for indoor equipment should be placed outside whenever possible, while ensuring exhaust does not enter the building through open doors, windows, or HVAC.
- If running equipment power sources inside a building, the exhaust must be vented outside using ventilation hoses approved for that purpose.
- In large, unoccupied, warehouse-type buildings, if exhaust cannot be vented outside, equipment may be used inside provided (1) warehouse doors are opened, providing cross ventilation, and (2) continuous carbon monoxide monitoring is performed to ensure safe levels are not exceeded.

Corrosives (Acids and Caustics Used in Sample Collection/Analysis)
Corrosives are low pH (acid) or high pH (caustic or alkaline) substances that can injure body tissue or damage metal by direct chemical action. Corrosive injury may be minor (irritation) or severe (causing burns or blindness). Caustic burns can be particularly dangerous because strong alkalis gelatinize tissue. Initial contact may not be painful, but prolonged contact and/or high concentrations can cause deep penetrating burns. The effects of solid corrosives (such as dusts) are largely dependent on their solubility in skin, moisture content, and duration of contact. Eye, face, and skin protection should be worn whenever there may be contact with corrosives or materials suspected of being contaminated with corrosives.

Materials that are considered hazardous materials under the OSHA Hazard Communication Standard (29 CFR 1910.1200) may be used during this project. In accordance with the URS Hazard Communication Program, any hazardous materials used or brought on site must be listed in Section 1.0.

The Material Safety Data Sheets (MSDSs; Attachment C) for these materials will be on site and available to any subcontractors (i.e, excavators) on this project. URS' written Hazard Communication Program is located in SMS 002, a copy of which is to be maintained on site

5.2 PHYSICAL HAZARDS

Physical hazards at this work site include:

- Cold stress
- Moving vehicles and equipment
- Noise from the operation of site equipment
- Slip-trip-fall types of accidents (during work on site and sampling)
- Back injuries resulting from improper lifting
- Being caught in or struck by moving equipment
- Excavation hazards
- Underground and above ground utilities
- Drill rig hazards
- Hand tool usage
- Marine hazards (hypothermia and drowning)

5.2.1 Cold Stress Recognition and Control

Protection against cold stress will be initiated when temperatures drop below 7°C (45°F). Cold stress guidance is provided below.

Exposure to cold working conditions can result in cold stress (hypothermia) and/or injury (frostbite) to hands, feet, and head. Hypothermia can result when the core body temperature drops below 36°C (96.8°F). Lower body temperature will be likely to result in dizziness, drowsiness, disorientation, slurred speech, or loss of consciousness, with possible fatal consequences. Pain in the extremities may be the first warning of danger from cold stress. Shivering develops when the body temperature falls to 35°C (95°F).

Hypothermia can be brought on by exposure to cold air, immersion in cold water, or a combination of both. The wind chill factor, which is the cooling power of moving air, is a critical factor in cold stress. Workers must wear adequate insulating clothing if work is performed in temperatures below 4°C (40°F). At temperatures of 2°C (35.6°F or less), workers whose clothing becomes wet will be provided immediately with a change of clothing and, if necessary, treated for hypothermia. Treatment includes warming the victim (with skin-to-skin contact or by providing warm blankets or other coverings) and providing warm liquids for the victim to drink. Skin exposure will not be permitted at temperatures of -32°C (-25°F) or below.

If fieldwork is to be performed with bare hands for more than 10 to 20 minutes at temperatures below 16°C (60°F), provisions will be made for keeping the workers' hands warm. If equivalent wind-chill temperatures fall below 4°C (40°F), and fine manual dexterity is not required, gloves will be worn. Metal handles of tools will be covered with insulating material at air temperatures below -1°C (30°F).

If work is to be performed continuously in the cold when the wind chill factor is at or below -7°C (19°F), heated warming shelters (tents, trailers, vehicle cabs) will be made available nearby.

5.2.2 Work Area Protection

Project operations may be undertaken in a roadway or parking lot, causing motor vehicles to pose a hazard. Guidance on properly coning and flagging the work area is provided in SMS 032. Consideration should be given to parking work vehicles within the coned area between the work area and oncoming traffic.

5.2.3 Noise Hazards

Previous surveys indicate that heavy equipment can may produce continuous and impact noise at or above the action level of 85 dBA. Equipment operators and all URS personnel within 25 feet of operating equipment or near an operation that creates noise levels high enough to impair conversation will wear hearing protective devices (either muffs or plugs). URS personnel who are in the Medical Surveillance Program are automatically enrolled in the URS Hearing Conservation Program and have had baseline and, where appropriate, annual audiograms. Personnel will wash their hands with soap and water prior to inserting earplugs to avoid initiating ear infections. Additional information regarding the URS Hearing Conservation Program is located in SMS 026, a copy of which is to be maintained on site. Subcontractor personnel exposed to noise at or above the action level should be participating in a Hearing Conservation Program administered by their employer.

5.2.4 Slip/Trip/Fall Hazards

Workers should exercise caution when walking around the site to avoid fall and trip hazards. There are holes, rip rap, trees, slopes and uneven terrain in the work area that could cause site personnel to fall or trip. Workers should exercise caution around open excavations, and avoid getting closer than 2 feet to the edge of an unsloped excavation. If conditions become slippery, workers should take small steps with their feet pointed slightly outward to decrease the probability of slipping. Workers should watch where they are walking and walk only in areas of good stability.

5.2.5 Lifting Hazards

The following guidelines will be followed whenever lifting equipment such as portable generators, coolers filled with samples, and any other objects that are of odd size or shape or that weigh over 40 pounds. Safe lifting procedures are described in SMS 069 (Manual Material Handling), a copy of which is to be available on site. Lifting procedures include the following.

- Get help when lifting heavy loads. Lift portable generators using a two-person lift.
- When moving heavy objects, such as drums or containers, use a dolly or other means of assistance.

- Plan the lift. If lifting a heavy object, plan the route and where to place the object. In addition, plan communication signals to be used (i.e., "1,2,3, lift," etc.)
- Wear sturdy shoes that are in good condition and supply traction when performing lifts.
- Keep your back straight and head aligned during the lift, and use your legs to lift the load – do not twist or bend from the waist. Keep the load in front of you – do not lift or carry objects from the side.
- Keep the heavy part of the load close to your body to help maintain your balance.

5.2.6 Heavy Equipment and Excavation Safety

Operation of heavy equipment during site activities presents potential physical hazards to personnel. Issues associated with heavy equipment operations are addressed in SMS 019, a copy of which is to be maintained on site.

The following precautions must be observed whenever heavy equipment is in use:

- Wear PPE, such as steel-toed shoes, safety glasses or goggles, and hard hats, whenever such equipment is present.
- At all times, be aware of the location and operation of heavy equipment, and take precautions to avoid getting in the way of its operation. Never assume that the equipment operator sees you. Make eye contact and use hand signals to inform the operator of your intent, particularly if you intend to work near or approach the equipment.
- Traffic safety vests **ARE REQUIRED** for URS personnel working near mobile heavy equipment, such as backhoes and other excavators.
- Never walk directly behind or to the side of heavy equipment without the operator's acknowledgment.
- Keep all non-essential personnel out of the work area.

Excavations and Trenches

URS personnel will not enter trenches, sumps, tanks or other confined spaces for sampling; all sampling must be conducted from outside the space.

URS personnel are prohibited from entering any excavation that is not appropriately sloped or protected, or for which the excavation contractor has not provided a trained competent person. Regulations prohibit entering excavations deeper than 4 feet without adequate shoring or sloping. See URS SMS 013 for additional information.

5.2.7 Underground and Aboveground Utilities

The Site Manager or SSO is responsible for locating underground utilities before the commencement of any subsurface (> 0.3 meter [1 ft.]) activities. Resources include site plans, utility companies, and regional utility locating services. The proper utility company personnel will certify in writing to the Site Manager or SSO that underground utilities have been deactivated, and the certification will be retained in the project files.

Procedures for activities conducted proximate to utility locations are located in SMS 034, a copy of which is to be maintained on site.

- Utility markings are to be protected and preserved. If destroyed, contact the utility locating service for a new locate.

- Do not conduct mechanical-assisted subsurface work (e.g. powered drill rig) within five feet (1.5 meters) of a confirmed or suspected utility or other subsurface structure. Greater distances may be required by the utility owner.

- Subsurface work within five feet of a suspected or confirmed utility or subsurface structure must be done by manual (careful hand digging) or vacuum clearing to the point where the obstruction is visually located and exposed. Once the obstruction is confirmed in this manner, mechanical-assisted work may commence.

Excavation, drilling, crane work, or similar operations adjacent to overhead lines will not be initiated until operations are coordinated with utility officials. Operations within 50 feet (15 meters) of overhead lines are prohibited without first contacting the utility company to determine the voltage of the system.

Following the voltage determination, operations are further prohibited unless one of the following conditions is satisfied:

1. Power has been shut off, positive means taken to prevent lines from being energized, and shut down has a signed certification by utility.
2. Minimum clearance of all parts of equipment is maintained from energized lines, per the table in SMS 034.
3. Power lines are isolated by insulating blankets, and minimum clearance distances determined by the utility representative, in writing, and are maintained throughout the operation.

5.2.8 Hand Augering

Muscle strains can occur with hand augering. To minimize the occurrence of injury, the following will be observed.

- Keep augers sharp – a dull auger requires more work to advance through the soil.
- Before beginning work, stretch or warm up the body as you would prior to exercising.
- Try to avoid excessive twisting or wrenching motions when using the auger

5.2.9 Drilling

The drill rig operator is responsible for safety and maintenance at all times, however, if URS personnel observing the drill rig believe there is an unsafe condition, the operation will be stopped until corrections are made and deemed acceptable by the PM or SSO. Drilling operations shall conform with SMS 056, Drilling Safety Guidelines.

URS technicians, geologists, engineers, or other field staff assigned to observe drilling operations or collect soil samples should observe the following guidelines:

- Require a meeting at project start-up regarding the drill rig operator responsibility for rig safety and any site and equipment specific safety requirements
- Set up any sample tables and general work areas for the URS field staff to the side of the drill rig (preferably 10 meters away) and not directly behind the rig.
- URS engineers, technician, and geologists shall not assist the drillers with the drilling equipment or supplies and shall not at any time operate the drill rig controls.

5.2.10 Water Hazards

When collecting samples near water (intertidal, docks, or from a boat) all staff and contractors shall be wearing a properly secured personal flotation device PFD. When sampling, two people must be present at all times.

For all boat or shore intertidal work, URS staff will adhere to URS SMS 027 and SMS 053. Workers will be knowledgeable in the interpretation of tidal charts. All work in the intertidal zone will be performed during low tide. Good housekeeping practices will be adhered to, to prevent any slip/trip/fall accidents while working on the boat.

All vessels must meet Coast Guard safety standards and have a current Coast Guard certification or Washington State inspection sticker. Requirements include fire extinguishing capability, running and anchor lights, an audible warning device capable of being heard, and a marine band radio capable of communication. A rescue line shall be available in a throw bag or other approved device.

A float plan must be prepared by the boat operator. URS and subcontractors will follow all boat operator instructions.

6.0 EXPOSURE MONITORING PLAN

Cold stress, noise, and chemical exposures may be encountered at this site. Cold stress monitoring and prevention is addressed in Section 5.2.1.

Noise levels will not be monitored. Equipment operators and all URS personnel within 25 feet of operating equipment or near an operation that creates noise levels high enough to impair conversation will wear hearing protective devices (either muffs or plugs). URS personnel who are in the Medical Surveillance Program are automatically enrolled in the URS Hearing Conservation Program and have had baseline and, where appropriate, annual audiograms.

6.1 CHEMICAL EXPOSURE MONITORING

Total Petroleum Hydrocarbons (TPH) were detected during prior sampling at concentrations up to 26,000 ppm. On this project, disturbed soils will be screened for volatile components using a direct reading Photo Ionization Detector (PID).

- Respiratory protection should be available and may be used optionally at levels below 25 ppm.
- If levels exceed 25 ppm in the breathing zone, personnel must retreat until levels drop.
- If work will proceed at levels above 25 ppm, an industrial hygienist must be consulted.

It is not anticipated that personal exposure monitoring will be performed; however, if it is required a URS industrial hygienist will perform quantitative personal monitoring of personnel at the greatest risk of exposure. The industrial hygienist will determine who to sample based on site conditions at the time of the sampling.

Personnel will be monitored in accordance with NIOSH Methods. A laboratory accredited by the American Industrial Hygiene Association will perform analyses; results will be reported and records will be maintained in accordance with OSHA criteria.

Procedures for personal monitoring are located in SMS 043.

6.2 DUST CONTROL

Generation of airborne dust at hazardous levels is unlikely due to previously documented soil contamination results. High winds and site operations can cause airborne dust hazards. If site operations generate sustained visible dust, a water mist will be applied to reduce dust generation. If water mist is not sufficient to eliminate visible dust, it will be necessary to stop work until exposure monitoring is conducted.

7.0 PERSONAL PROTECTIVE EQUIPMENT

Procedures for the use and selection of PPE are provided in SMS 029, a copy of which is to be maintained on site.

Level D is the minimum Personal Protective Equipment (PPE) ensemble for site personnel:

- Hardhat
- Safety glasses with side shields (or impact-resistant goggles)
- Steel-toed boots or chemical-resistant steel-toed boots depending on work activity
- Ear protection within 25 feet of noisy heavy equipment
- Work gloves and/or chemical-resistant gloves
- Chemical resistant gloves when handling contaminated samples, hazardous materials, or waste
- Chemical resistant disposable work clothing (Tyvek) if activities cause work clothing to become soiled
- Traffic safety vest.

<u>Upgrades in PPE</u>
For work around contaminated soils, chemical protective clothing may be utilized as necessary to allow for full decontamination and the prevention of contaminant transfer to personal clothing or vehicles.

7.1 LIMITATIONS OF PROTECTIVE CLOTHING

The protective equipment ensembles selected for this project are anticipated to provide protection against the types and concentrations of hazardous materials that may be encountered during field operations. However, no protective garment, glove, or boot is resistant to all chemicals at any concentration; in fact, chemicals may continue to permeate or degrade a garment even after the source of the contamination is removed. To obtain optimal usage from PPE, the following procedures are to be followed by all URS personnel.

- When using disposable coveralls, use a new garment after each rest break or at the beginning of each shift.
- Inspect all clothing, gloves and boots both prior to and during use for:
    - Imperfect seams;
    - Non-uniform coatings;
    - Tears;
    - Poorly functioning closures.
- Inspect reusable garments, boots, and gloves prior to use and discard if they display:
    - Visible signs of chemical permeation, such as swelling, discoloration, stiffness, or brittleness;
    - Cracks or any signs of puncture or abrasion.

7.2 DURATION OF WORK TASKS

The SSO will establish the duration of work tasks in which personnel use PPE ensembles that include chemical protective clothing (including uncoated Tyvek®). Variables to be considered include ambient temperature and other weather conditions, the capacity of individual personnel to work in the required level of PPE in heat and cold, and the limitations of specific PPE ensembles. Recommended rest breaks are as follows:

- Fifteen minutes midway between shift startup and lunch;
- Lunch break (30 to 60 minutes); and
- Fifteen minutes midway between lunch and shift end.

Rest breaks are to be taken in the support zone or other clean area after personnel have completed the decontamination process, including washing the hands and face with soap and water.

[Additional rest breaks will be scheduled according to heat stress monitoring protocols as described in SMS 018.]

8.0 RESPIRATORY PROTECTION

8.1 RESPIRATOR SELECTION

It is not anticipated that respiratory protection will be required for this project. Following the initiation of work activities, if the SSO, PM or industrial hygienist for the project determines that respiratory protection may be necessary, an addendum will be made to this plan.

Disturbed soils will be screened for volatile components using a direct reading Photo Ionization Detector (PID). Respiratory protection should be available and may be used optionally at levels below 25 ppm. If levels exceed 25 ppm in the breathing zone, personnel will retreat until levels drop and/or further evaluation takes place.

Engineering controls and safe work practices (e.g. elimination of the source of contamination, ventilation equipment, working upwind, limiting exposure time, etc) are always the primary control for airborne exposure to contaminants.

Safe work practices including minimal disturbance of contaminated soils and sediments is a requirement of this project. Water mist will be used for dust suppression whenever needed. Any task resulting in sustained visible airborne dust will be evaluated for potential exposure.

Respirators will be used if engineering or work practice controls are not feasible for controlling airborne exposures below acceptable concentrations and as an interim control measure while engineering or work practice controls are implemented.

Once the need for respirators has been established, the respirators will be selected on the basis of the hazards to which the worker is exposed. Only NIOSH-approved respirators will be issued. Selection criteria established in 29 CFR 1910.134 have been used by the preparer of this SSHSP in determining respirator requirements for this project.

For respirators used optionally on this project:

- Each URS employee must complete and submit Form 42-2, Voluntary Use of Respirators.
- Prohibit facial hair where the respirator-sealing surface meets the wearer's face.
- Require employees to perform a positive and negative fit check every time the respirator is put on.
- Use cartridges with End of Service Life Indicators or determine the respirator cartridge change out schedule. See SMS 42-4 for Guidance.
- Require respirators to be cleaned and stored properly.
    - Clean and disinfect respirators after each use.
    - Store respirators in a plastic bag or case and in a clean location.
    - Inspect respirators before use and after each cleaning.

Additional information on the URS Respiratory Protection Program is located in SMS 042.

9.0 SITE CONTROL

9.1 GENERAL

Barricade tape and/or barricades will be used to delineate a work zone for safety purposes around the work area as needed. The barriers will be set in a 25-foot radius (as practical) around the work area to provide sufficient maneuvering space for personnel and equipment. A short piece of barricade tape can be affixed to a secure upright (e.g., a drill rig mast or a vehicle antenna) to serve as a wind direction telltale. A 5-foot opening in the barricades at the support zone (upwind of the work area) will serve as the personnel and equipment entry and exit point. The personnel decontamination station will be established at this point if formal decontamination procedures are required (see Section 10.0). All entry and exit from the work area will be made at this opening to control potential sources of contamination and leave contaminated soil and debris in the work area.

At the end of the shift, all excavations must be covered or otherwise secured. All soils and decontamination fluids are to be handled in accordance with relevant regulations and instructions from the PM.

The PM or SSO will determine the designated evacuation area prior to each shift, and all personnel will be notified of its location in the initial site safety briefing and weekly thereafter. URS employees will be familiar with the Everett Shipyard evacuation alarm system.

The SSO will verify that all site visitors are accounted for. In addition, all URS personnel and site visitors entering the work area must present evidence of their participation in a medical surveillance program and completion of health and safety training programs that fulfill the requirements of this SSHSP.

The SSO will provide site hazard and emergency action information to all site visitors before they enter the site. This can be done by reviewing the Everett Shipyard emergency action protocols and providing a copy of this SSHSP to the visitor.

10.0 DECONTAMINATION PROCEDURES

The following steps will be followed whenever personnel leave the work area.

- If walking in (or through) shallow sumps, catch basins, areas of known contamination, or visible contamination: scrub boots with a stiff bristle brush and water prior to leaving the work area.
- Remove chemical resistant gloves, bag for later use if non-disposable, or discard.
- Remove respirator (if used optionally) and decontaminate per SMS 042.
- Thoroughly wash hands and face.

All spent decontamination fluids (rinse waters, etc.) will be handled as directed by the PM and in accordance with relevant regulations.

10.1 SANITATION

Toilet and washing facilities are available on site.

URS procedures for site sanitation are located in SMS 030, a copy of which is to be maintained on site.

10.2 DECONTAMINATION – MEDICAL EMERGENCIES

In the event of physical injury or other serious medical concerns, immediate first aid is to be administered in lieu of further decontamination efforts.

10.3 DECONTAMINATION OF TOOLS

When all work activities have been completed, contaminated tools used by URS personnel will be appropriately decontaminated or properly disposed of as hazardous waste. Tools will be placed on a decontamination pad or into a bucket and thoroughly washed using a detergent solution and brush; washing will be followed by a fresh water rinse. All visible particles are to be removed before the tool is considered clean.

All spent decontamination fluids (rinse waters, etc.) will be handled as directed by the PM and in accordance with relevant regulations.

11.0 SAFE WORK PRACTICES

11.1 GENERAL SITE RULES

- Eating, drinking, chewing gum or tobacco, and smoking are prohibited in the contaminated or potentially contaminated area or where the possibility for the transfer of contamination exists.
- Alcohol consumption is prohibited during work hours. Excessive drinking is strongly discouraged at all times while the team is in the field. Use of prescription medications that impair judgment or affect motor skill and all illegal drugs are also prohibited. For additional information, please review the URS Substance Abuse Policy. Behavior that could endanger the health or safety of any individual of the field team will not be tolerated. Any individual violating these requirements will be subject to disciplinary action that may include termination.
- Personnel will wash their hands and faces thoroughly with soap and water prior to eating, drinking, or smoking.
- Personnel will avoid contact with potentially contaminated substances. Do not walk through puddles, pools, mud, etc. Avoid, whenever possible, kneeling, leaning, or sitting on contaminated surfaces. Do not place monitoring equipment on potentially contaminated surfaces (i.e., the ground, etc.)
- All field crew members should remain alert to potentially dangerous situations in which they should not become involved (i.e., note the presence of strong, irritating, or nauseating odors, etc.).
- Only those vehicles and the equipment required to complete work tasks should be permitted within the work zone (drill rigs, excavators, and similar items). All non-essential vehicles should remain within the support zone.
- Containers, such as drums, will be moved only with the proper equipment and will be secured to prevent dropping or the loss of control during transport.
- Field survey instruments will be covered with plastic or similar coverings to minimize the potential for contamination.
- No matches or lighters are permitted in the work area.
- Contaminated protective equipment, such as respirators, hoses, boots, and disposable protective clothing, will not be removed from the work area or decontamination area until it has been cleaned or properly packaged and labeled.
- Spills should be prevented, to the extent possible. Should a spill occur, any liquid should be contained, if possible.
- Splashing of contaminated materials should be prevented.
- Field crew members should be familiar with the physical characteristics of the site, including:
  - Wind direction in relation to the contaminated area
  - Accessibility to equipment and vehicles
  - Areas of known or suspected contamination
  - Site access
  - Nearest water sources

- The number of personnel and equipment in the work area should be minimized, but only to the extent consistent with workforce requirements for safe site operations.
- All wastes generated by URS activities at the site will be disposed of as directed by the Client.
- All PPE will be used as specified and required.
- The buddy system will be used at all times when sampling for hazardous material, when the first action level criteria have been exceeded, or when working in remote areas.
- Personnel are to immediately notify the SSO or Site Manager if any indications of potential explosions or unusual conditions are observed.

11.2 SAMPLING PRACTICES

For all sampling activities, the following standard safety procedures will be employed:

- All sampling equipment will be cleaned before proceeding to the site.
- At the sampling site, sampling equipment will be cleaned after each use.
- Work in "cleaner" areas will be conducted first, where practical.
- All unauthorized personnel will remain outside the work area at all times.

11.3 SAMPLE SHIPMENT/HAZARDOUS MATERIALS SHIPMENT

If samples to be collected during the course of this project fall under criteria that define them as hazardous materials under Department of Transportation (DOT) regulations 49 CFR Parts 171-177 (see URS guidelines for determination), then they must be shipped in accordance with those regulations by an individual who is certified as having been "function-specific" trained, as required under the DOT regulations.

12.0 EMERGENCY RESPONSE PLAN

It is URS policy to evacuate personnel from areas of hazardous material emergencies and to summon outside assistance from agencies with personnel trained to respond to the specific emergency. This section outlines the procedures to be followed by URS personnel in the event of a site emergency. These procedures are to be reviewed during the onsite safety briefings conducted by the SSO.

In the event of a fire or medical emergency, the emergency numbers identified in Section 1.0 can be called for assistance.

12.1 PLACES OF REFUGE

In the event of a site emergency requiring evacuation, all personnel will evacuate to the pre-designated area a safe distance from any health or safety hazard. The assembly area may have to be re-designated by the SSO in the event that the area of influence of an emergency affects the primary assembly area. Once personnel are assembled, the SSO will do a head count. The SSO will evaluate the assembly area to determine whether it is outside of the influence of the situation; if it is not, the SSO will redirect the group to a new assembly area where a new head count will be taken. URS will be familiar with the Everett Shipyard facility emergency response plan and will locate to the Everett Shipyard primary and/or secondary evacuation meeting areas.

During any site evacuation, all employees will be instructed to observe wind direction indicators. During evacuation, employees will be instructed to travel upwind or crosswind of the area of influence. The SSO will provide site personnel with specific evacuation instructions via the site emergency radio, if necessary, specifying the actual site conditions.

12.2 FIRE

Fire prevention procedures are described in SMS 014. An ABC fire extinguisher will be available on site and on the boat to contain and extinguish small fires. The local or facility fire department will be summoned in the event of any fire on site.

12.3 COMMUNICATION

Cell phones will be used to alert site personnel of emergencies and to summon outside emergency assistance. Where cell phones or voice do not work, an alarm system (i.e., sirens, horns, etc.) will be set up to alert employees of emergencies. Radio communication also may be used to communicate with personnel in the work area. Site personnel will be trained on the use of the Everett Shipyard site emergency communication network. Emergency phone numbers will be posted at the phone or radio used for outside communication. The SSO is responsible for establishing the communication network prior to the start of work and for explaining it to all site personnel during the site safety briefing.

12.4 EMERGENCY RESPONSE PROCEDURES

The emergency response team will consist of employees who assume the following roles:

- Emergency care provider(s), to provide first aid/CPR as needed
- Communicator

  The role of the communicator is to maintain contact with appropriate emergency services and to provide as much information as possible, such as the number injured, the type and extent of injuries, and the exact location of the accident scene. The communicator will be located as close to the scene as possible to transmit to the emergency care providers any additional instructions that may be given by emergency services personnel in route.

- Site Supervisor

  The site supervisor (usually the SSO) will survey and assess existing and potential hazards, evacuate personnel as needed, and contain the hazard. Follow up responsibilities include replacing or repairing damaged equipment, documenting the incident, and notifying appropriate personnel/agencies described under Incident Reporting. Responsibilities also include reviewing and revising site safety and contingency plans as necessary.

12.5 MEDICAL EMERGENCY RESPONSE PLAN

At least one URS employee on site will hold a current certificate in American Red Cross Standard First Aid. This training provides six and one-half hours of instruction in adult CPR and basic first aid. If a medical emergency exists, personnel should:

- Consult the emergency phone number list and request an ambulance immediately.
- Perform First Aid/CPR as necessary.
- Stabilize the injured, decontaminate if necessary, and extricate *only* if the injured/ill person is in a dangerous or unsafe environment AND ONLY if the rescuers are appropriately protected from potential hazards that might be encountered during the rescue.
- When emergency services personnel arrive, communicate all first aid activities that have occurred.
- Transfer responsibility for the care of the injured/ill to the emergency services personnel.

The following items and emergency response equipment will be located within easy access at all times:

- First aid kit and infection control kit.
- Emergency telephone numbers list.

Drugs, inhalants, or medications will not be included in the first aid kit. Supplies should be reordered as they are used.

12.5.1 Non-Emergency Injuries and Medical Incidents

For sprains, strains, minor fractures (fingers and toes), cuts needing additional first aid, insect bites and other non-emergency medical treatment, do not go to the emergency room. Go to The Everett Clinic, which has walk-in (no appointment needed) occupational health services.

Life threatening medical emergencies require immediate medical attention. Call 911 or go to the hospital emergency room for the following:

- Severe chest pain and shortness of breath
- Major burns
- Severe head injuries
- Emergency childbirth
- Seizures
- Bleeding that does not stop
- Drug or other poisoning
- Life-threatening injuries

If you are in doubt about whether or not you should go to the emergency room, you can call The Everett Clinic at **(425) 339-5422**.

12.6 INCIDENT REPORT

ALL site injuries and illnesses must be reported to the SSO and PM immediately following first-aid treatment. Additionally, Jeannette Schrimsher ***(512-419-6440)*** must be contacted prior to the employee leaving the site for treatment. The SSO will notify the RHSEM (***206-438-2199***). Work is to be stopped until the PM or SSO have determined the cause of the incident and have taken the appropriate action to prevent a recurrence. Any injury or illness, regardless of severity, is to be reported using URS Form 49-1 as soon as possible, but at least within 24 hours when the employee sees a medical care provider (see SMS 049).

12.7 SPILL OR HAZARDOUS MATERIALS RELEASE

Small spills are immediately reported to the SSO and are dealt with according to the chemical manufacturer’s recommended procedures, which are found on the MSDS. Steps will be taken to contain and/or collect small spills for approved storage and disposal. In the unlikely event of a larger release of hazardous materials as a result of site activities, site personnel will evacuate to the predesignated assembly area. The local Designated Emergency Response Authority (DERA) will be notified by the SSO immediately, and appropriate actions will be taken to protect public health and mitigate the contaminant release. The DERA can be reached through the local police or fire department. The Site Manager will make the following emergency contacts:

Regional Health, Safety, and Manager – ***Mark Litzinger 206.438.2199***
Health, Safety, and Environment Representative – ***Bryan Berna 206.438.2274***
Project Manager – ***James Flynn 206.438.2113***
EPA Response Center (if reportable quantity is exceeded) – ***800.424.8802***

EMERGENCY RESPONSE CHECKLIST

In an Emergency	Yes	No
Confirm the reported incident		
Evacuate and secure the area		
Render first aid/emergency medical care		
Notify promptly:		
Project Manager		
Fire Department		
Police Department		
Nearest Hospital or Medical Care Facility		
Start Documentation		
If spill or leak occurs:		
Don the proper PPE		
Stop the source		
Contain the spill		
Clean up the spill		
Upon evacuating, take attendance at the assembly area		
Authority given:		
Leave the site		
Restart the operations		
Debrief and document the incident		
Submit a copy of the document to the Health and Safety Manager		

13.0 TRAINING, MEDICAL SURVEILLANCE, SITE INSPECTIONS

13.1 TRAINING AND MEDICAL SURVEILLANCE

All URS site personnel will have met the requirements of 29 CFR 1910.120(e), including:

- Forty hours of initial off-site training or its recognized equivalent
- Eight hours of annual refresher training for all personnel (as required);
- Eight hours of supervisor training for personnel serving as SSOs; and
- Three days of work activity under the supervision of a trained and experienced supervisor.

All URS site personnel are participating in medical surveillance programs that meet the requirements of OSHA/WA-DOSH hazardous waste operations regulations. Current copies of training certificates and statements of medical program participation for all URS personnel are maintained by the local office.

In addition, all URS site personnel will review this SSHSP and sign a copy of the Safety Plan Compliance Agreement provided in Attachment B. The PM will maintain these agreements at the site and place them in the project file at the conclusion of the operation.

13.2 INITIAL SITE SAFETY BRIEFING

Prior to the start of operations at the site, the SSO will conduct a site safety briefing, which will include all personnel, including subcontractor personnel, involved in site operations. All personnel must attend the briefing and sign the briefing form. Briefings will also be conducted whenever new personnel report to the site. At this meeting, the SSO will discuss general and site-specific issues, including:

- Contents of this SSHSP
- Project Hazard Analyses for all tasks and activities
- Constituents of Concern at the site and means for minimizing exposure
- Requirements for bringing hazardous materials on site
- Required PPE for all tasks and activities
- Decontamination protocol
- Site control measures, including safe operating practices and communication
- Reporting and investigation of incidents
- Location and use of emergency equipment
- Evacuation locations, signals and procedures

13.3 DAILY SITE INSPECTION AND TASK HAZARD ANALYSIS

The URS Site Manager or Site Safety Officer will:

- Conduct a daily safety task hazard analysis (i.e., a daily project review) prior to the start of each shift and document on the form found in Attachment D.

- Conduct daily site safety briefings following the task hazard analysis, or whenever there is a change in task or significant change in task location.

The purpose of the daily safety task hazard analysis is to identify the steps in the tasks that will be performed, the respective hazards, and methods to eliminate or control the hazards. The analysis will be updated during the shift if new or different tasks or unanticipated hazards are encountered, or if the control measures are inadequate. The completed forms are to be maintained on site until the completion of the project, at which time they are to be placed in the project files.

14.0 RECORDKEEPING

The PM and SSO are responsible for site recordkeeping. Prior to the start of work, they will review this SSHSP; if no changes are needed, they will sign the approval form (PM) or acceptance form (SSO) and forward a copy to the RHSEM.

All URS personnel will review the SSHSP and sign the Safety Plan Compliance Agreement; copies of these forms will be maintained in the project file.

The SSO will conduct a Site Safety Briefing in accordance with Section 13.0.

Copies of daily task hazard analysis forms will be maintained in the project file.

Any incident or exposure incident will be investigated and the Incident Report form (SMS 049) will be completed and forwarded to the Office Human Resources Representative and the RHSEM.

All instrument readings and calibrations, PPE use and changes, health and safety-related issues, and deviations from or problems with this SSHSP will be recorded in the field log.

ATTACHMENT A

SITE PLAN

ROUTE TO HOSPITAL

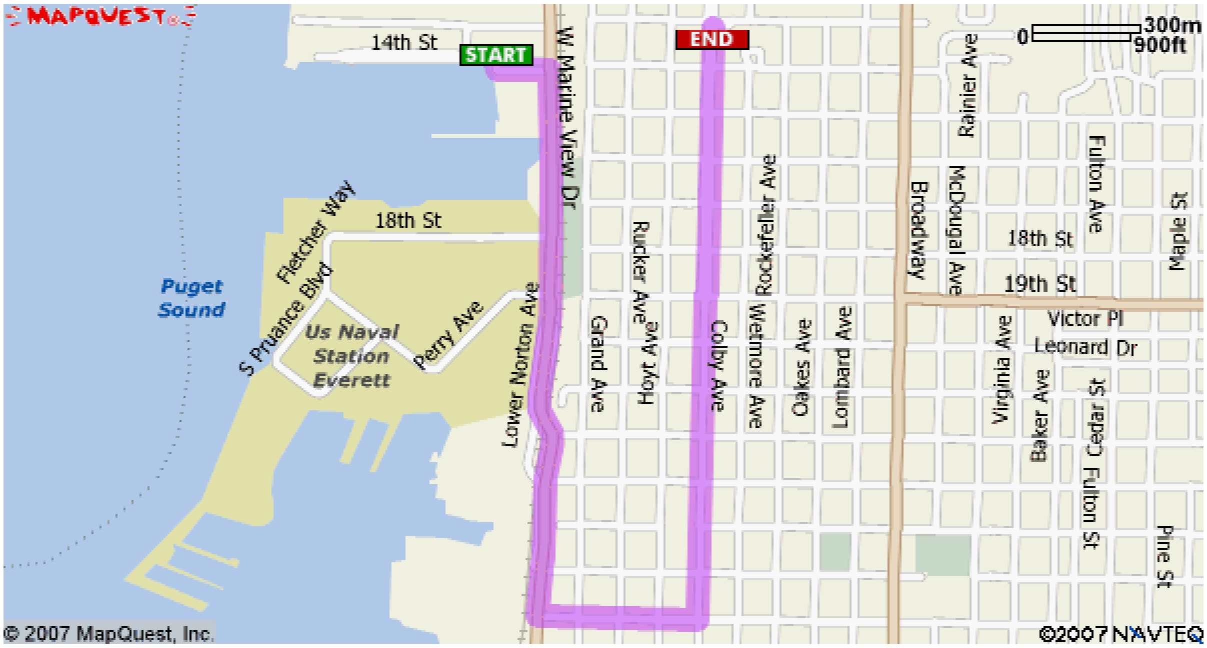
AND

ROUTE TO NON-EMERGENCY WALK-IN CLINIC

ROUTE TO PROVIDENCE HOSPITAL EMERGENCY ROOM

Start out going EAST on 14TH ST toward W MARINE VIEW DR / WA-529.	**<0.1 miles**
Turn RIGHT onto W MARINE VIEW DR / WA-529.	**1.0 miles**
Turn LEFT onto 26TH ST.	**0.2 miles**
Turn LEFT onto COLBY AVE.	**1.1 miles**
End at Providence General Medical Ctr: **1321 Colby Ave, Everett, WA 98201, US** **(425) 261-3000**	

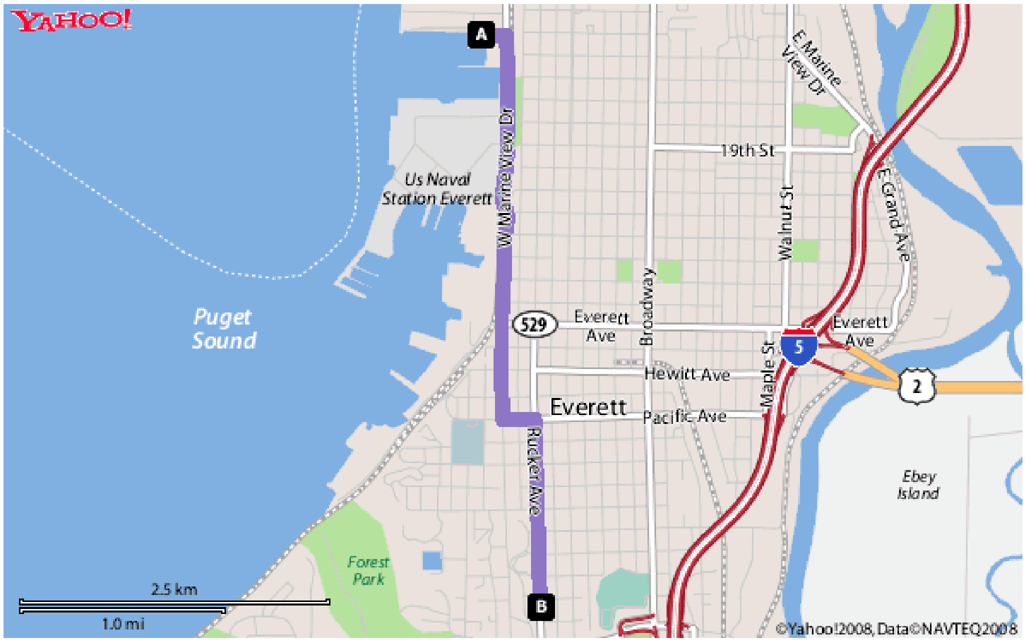
Total Est. Time: **8 minutes** Total Est. Distance: **2.62 miles**



ROUTE TO EVERETT CLINIC FOR NON-EMERGENCY MEDICAL CASES

Walk-in Clinic is located in the Gunderson Building at 3927 Rucker Avenue, Everett, WA 98201.

- Start at 1016 **14TH ST**, EVERETT going toward **W MARINE VIEW DR**
- Turn Right on W MARINE VIEW DR(WA-529) - go **1.6** mi
- Turn Left on **PACIFIC AVE** - go **0.1** mi
- Turn Right on **RUCKER AVE** - go **0.8** mi
- Arrive at 3927 **RUCKER AVE**, EVERETT, on the Left



ATTACHMENT B
SAFETY PLAN COMPLIANCE AGREEMENT AND MEDICAL EMERGENCY CONTACT SHEET

Safety Plan Compliance Agreement and Medical Emergency Sheet

I, ____________________________________, have received a copy of the Site-Specific Health and Safety Plan for this Project. I have reviewed the plan, understand it, and agree to comply with all of its provisions. I understand that I could be prohibited from working on the project for violating any of the health and safety requirements specified in the plan.

SIGNED:______________________________________ ____________________

Signature Date

Firm: ____ URS Corporation

This brief Medical Emergency Contact Sheet will be kept in the Support Zone during site operations. It is in no way a substitute for the Medical Surveillance Program requirements of the URS Health, Safety, and Environment Program. This data sheet will accompany injured personnel when medical assistance or transport to hospital facilities is necessary.

Emergency Contact: __________________________ Phone #:________________

Relationship: ____

Do you wear contact lenses? _____________

SAFETY COMPLIANCE AGREEMENT

I have read the Health and Safety Plan for the project and I understand it, and agree to comply with all of its provisions. I understand that I could be prohibited from working on the project for violating any of the health and safety requirements specified in the Plan.

PRINTED NAME	COMPANY	SIGNATURE	DATE

ATTACHMENT C
MATERIAL SAFETY DATA SHEETS
(MSDSs)

ALCONOX MSDS

Section 1 : MANUFACTURER INFORMATION

Product name: Alconox

Supplier: Same as manufacturer.

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Manufacturer emergency phone number: 800-255-3924.
813-248-0585 (outside of the United States).

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Supplier MSDS date: 2005/03/09

D.O.T. Classification: Not regulated.

Section 2 : HAZARDOUS INGREDIENTS

C.A.S.	CONCENTRATION %	Ingredient Name	T.L.V.	LD/50	LC/50
25155-30-0	10-30	SODIUM DODECYLBENZENESULFONATE	NOT AVAILABLE	438 MG/KG RAT ORAL 1330 MG/KG MOUSE ORAL	NOT AVAILABLE
497-19-8	7-13	SODIUM CARBONATE	NOT AVAILABLE	4090 MG/KG RAT ORAL 6600 MG/KG MOUSE ORAL	2300 MG/M3/2H RAT INHALATION 1200 MG/M3/2H MOUSE INHALATION
7722-88-5	10-30	TETRASODIUM PYROPHOSPHATE	5 MG/M3	4000 MG/KG RAT ORAL 2980 MG/KG MOUSE ORAL	NOT AVAILABLE
7758-29-4	10-30	SODIUM PHOSPHATE	NOT AVAILABLE	3120 MG/KG RAT ORAL 3100 MG/KG MOUSE ORAL >4640 MG/KG RABBIT DERMAL	NOT AVAILABLE

Section 2A : ADDITIONAL INGREDIENT INFORMATION

Note: (supplier).
CAS# 497-19-8: LD50 4020 mg/kg - rat oral.
CAS# 7758-29-4: LD50 3100 mg/kg - rat oral.

Section 3 : PHYSICAL / CHEMICAL CHARACTERISTICS

Physical state: Solid

Appearance & odor: Almost odourless.
White granular powder.

Odor threshold (ppm): Not available.

Vapour pressure (mmHg): Not applicable.

Vapour density (air=1): Not applicable.

By weight: Not available.

Evaporation rate (butyl acetate = 1): Not applicable.

Boiling point (°C): Not applicable.

Freezing point (°C): Not applicable.

pH: (1% aqueous solution).
9.5

Specific gravity @ 20 °C: (water = 1).
0.85 - 1.10

Solubility in water (%): 100 - > 10% w/w

Coefficient of water\oil dist.: Not available.

VOC: None

Section 4 : FIRE AND EXPLOSION HAZARD DATA

Flammability: Not flammable.

Conditions of flammability: Surrounding fire.

Extinguishing media: Carbon dioxide, dry chemical, foam.
Water
Water fog.

Special procedures: Self-contained breathing apparatus required.
Firefighters should wear the usual protective gear.

Auto-ignition temperature: Not available.

Flash point (°C), method: None

Lower flammability limit (% vol): Not applicable.

Upper flammability limit (% vol): Not applicable.

Not available.

Sensitivity to mechanical impact: Not applicable.

Hazardous combustion products: Oxides of carbon (COx).
Hydrocarbons.

Rate of burning: Not available.

Explosive power: None

Section 5 : REACTIVITY DATA

Chemical stability:	Stable under normal conditions.
Conditions of instability:	None known.
Hazardous polymerization:	Will not occur.
Incompatible substances:	Strong acids. Strong oxidizers.
Hazardous decomposition products:	See hazardous combustion products.

Section 6 : HEALTH HAZARD DATA

Route of entry:	Skin contact, eye contact, inhalation and ingestion.
Effects of Acute Exposure	
Eye contact:	May cause irritation.
Skin contact:	Prolonged contact may cause irritation.
Inhalation:	Airborne particles may cause irritation.
Ingestion:	May cause vomiting and diarrhea. May cause abdominal pain. May cause gastric distress.
Effects of chronic exposure:	Contains an ingredient which may be corrosive.
LD50 of product, species & route:	> 5000 mg/kg rat oral.
LC50 of product, species & route:	Not available for mixture, see the ingredients section.
Exposure limit of material:	Not available for mixture, see the ingredients section.
Sensitization to product:	Not available.
Carcinogenic effects:	Not listed as a carcinogen.
Reproductive effects:	Not available.
Teratogenicity:	Not available.
Mutagenicity:	Not available.
Synergistic materials:	Not available.
Medical conditions aggravated by exposure:	Not available.
First Aid	
Skin contact:	Remove contaminated clothing. Wash thoroughly with soap and water. Seek medical attention if irritation persists.
Eye contact:	Check for and remove contact lenses. Flush eyes with clear, running water for 15 minutes while holding eyelids open: if irritation persists, consult a physician.
Inhalation:	Remove victim to fresh air. Seek medical attention if symptoms persist.
Ingestion:	Dilute with two glasses of water. Never give anything by mouth to an unconscious person. Do not induce vomiting, seek immediate medical attention.

Section 7 : PRECAUTIONS FOR SAFE HANDLING AND USE

Leak/Spill: Contain the spill.
Recover uncontaminated material for re-use.
Wear appropriate protective equipment.
Contaminated material should be swept or shoveled into appropriate waste container for disposal.

Waste disposal: In accordance with municipal, provincial and federal regulations.

Handling procedures and equipment: Protect against physical damage.
Avoid breathing dust.
Wash thoroughly after handling.
Keep out of reach of children.
Avoid contact with skin, eyes and clothing.
Launder contaminated clothing prior to reuse.

Storage requirements: Keep containers closed when not in use.
Store away from strong acids or oxidizers.
Store in a cool, dry and well ventilated area.

Section 8 : CONTROL MEASURES

Precautionary Measures

Gloves/Type: Neoprene or rubber gloves.

Respiratory/Type: If exposure limit is exceeded, wear a NIOSH approved respirator.

Eye/Type: Safety glasses with side-shields.

Footwear/Type: Safety shoes per local regulations.

Clothing/Type: As required to prevent skin contact.

Other/Type: Eye wash facility should be in close proximity.
Emergency shower should be in close proximity.

Ventilation requirements: Local exhaust at points of emission.

To return to the page you just left,
select the "back" button on your browser.

HYDROCHLORIC ACID, 33 - 40%

MSDS Number: H3880 — *Effective Date: 11/17/99*

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1. Product Identification

Synonyms: Muriatic acid; hydrogen chloride, aqueous
CAS No.: 7647-01-0
Molecular Weight: 36.46
Chemical Formula: HCl
Product Codes:
J.T. Baker: 5367, 5537, 5575, 5800, 5814, 5839, 6900, 7831, 9529, 9530, 9534, 9535, 9536, 9537, 9538, 9539, 9540, 9544, 9548
Mallinckrodt: 2062, 2612, 2624, 2626, 5587, H611, H613, H987, H992, H999, V078, V628

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2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Hydrogen Chloride	7647-01-0	33 - 40%	Yes
Water	7732-18-5	60 - 67%	No

---

3. Hazards Identification

Emergency Overview

POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG DAMAGE.

J.T. Baker SAF-T-DATA$^{(tm)}$ Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 3 - Severe (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Inhalation:
Corrosive! Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death.
Ingestion:
Corrosive! Swallowing hydrochloric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract. May cause nausea, vomiting, and diarrhea. Swallowing may be fatal.
Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and discolor skin.
Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth. Long term exposures seldom occur due to the corrosive properties of the acid.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye disease may be more susceptible to the effects of this substance.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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5. Fire Fighting Measures

Fire:
Extreme heat or contact with metals can release flammable hydrogen gas.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
If involved in a fire, use water spray. Neutralize with soda ash or slaked lime.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Structural firefighter's protective clothing is ineffective for fires involving hydrochloric acid. Stay away from ends of tanks. Cool tanks with water spray until well after fire is out.

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6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB(R) or TEAM(R) 'Low Na+' acid neutralizers are recommended for spills of this product.

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7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. When opening metal containers, use non-sparking tools because of the possibility of hydrogen gas being present. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

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8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
5 ppm Ceiling
-ACGIH Threshold Limit Value (TLV):
5 ppm Ceiling

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a full facepiece respirator with an acid gas cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
Colorless, fuming liquid.
Odor:
Pungent odor of hydrogen chloride.
Solubility:
Infinite in water with slight evolution of heat.
Density:
1.18
pH:
For HCL solutions: 0.1 (1.0 N), 1.1 (0.1 N), 2.02 (0.01 N)
% Volatiles by volume @ 21C (70F):
100

Boiling Point:
53C (127F) Azeotrope (20.2%) boils at 109C (228F)
Melting Point:
-74C (-101F)
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
190 @ 25C (77F)
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:
When heated to decomposition, emits toxic hydrogen chloride fumes and will react with water or steam to produce heat and toxic and corrosive fumes. Thermal oxidative decomposition produces toxic chlorine fumes and explosive hydrogen gas.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
A strong mineral acid, concentrated hydrochloric acid is incompatible with many substances and highly reactive with strong bases, metals, metal oxides, hydroxides, amines, carbonates and other alkaline materials. Incompatible with materials such as cyanides, sulfides, sulfites, and formaldehyde.
Conditions to Avoid:
Heat, direct sunlight.

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11. Toxicological Information

Inhalation rat LC50: 3124 ppm/1H; oral rabbit LD50: 900 mg/kg (Hydrochloric acid concentrated); investigated as a tumorigen, mutagen, reproductive effector.

```
--------\Cancer Lists\------------------------------------------------------
                                         ---NTP Carcinogen---
Ingredient                               Known    Anticipated    IARC Category
------------------------------------     -----    -----------    -------------
Hydrogen Chloride (7647-01-0)             No          No               3
Water (7732-18-5)                         No          No             None
```

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12. Ecological Information

Environmental Fate:
When released into the soil, this material is not expected to biodegrade. When released into the soil, this material may leach into groundwater.
Environmental Toxicity:
This material is expected to be toxic to aquatic life.

---

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

---

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: HYDROCHLORIC ACID
Hazard Class: 8
UN/NA: UN1789
Packing Group: II
Information reported for product/size: 475LB

International (Water, I.M.O.)

Proper Shipping Name: HYDROCHLORIC ACID
Hazard Class: 8
UN/NA: UN1789
Packing Group: II
Information reported for product/size: 475LB

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15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Hydrogen Chloride (7647-01-0)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

		--Canada--		
Ingredient	Korea	DSL	NDSL	Phil.
Hydrogen Chloride (7647-01-0)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

	-SARA 302-		------SARA 313------	
Ingredient	RQ	TPQ	List	Chemical Catg.
Hydrogen Chloride (7647-01-0)	5000	500*	Yes	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Hydrogen Chloride (7647-01-0)	5000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: 2R
Poison Schedule: No information found.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: 3 Flammability: 0 Reactivity: 0
Label Hazard Warning:
POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG DAMAGE.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Store in a tightly closed container.
Remove and wash contaminated clothing promptly.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
No changes.
Disclaimer:
****

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Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

Material Safety Data Sheet
Methyl Alcohol, Reagent ACS, 99.8% (GC)

ACC# 95294

Section 1 - Chemical Product and Company Identification

MSDS Name: Methyl Alcohol, Reagent ACS, 99.8% (GC)
Catalog Numbers: AC423950000, AC423950010, AC423950020, AC423955000, AC9541632, AC423952
Synonyms: Carbinol; Methanol; Methyl hydroxide; Monohydroxymethane; Pyroxylic spirit; Wood alcohol; Wood naptha; Wood spirit; Monohydroxymethane; Methyl hydrate.
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
67-56-1	Methyl alcohol	99+	200-659-6

Hazard Symbols: T F
Risk Phrases: 11 23/24/25 39/23/24/25

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless. Flash Point: 11 deg C. Poison! Cannot be made non-poisonous. Causes eye and skin irritation. May be absorbed through intact skin. This substance has caused adverse reproductive and fetal effects in animals. **Danger! Flammable liquid and vapor.** Harmful if inhaled. May be fatal or cause blindness if swallowed. May cause central nervous system depression. May cause digestive tract irritation with nausea, vomiting, and diarrhea. Causes respiratory tract irritation. May cause liver, kidney and heart damage.
Target Organs: Kidneys, heart, central nervous system, liver, eyes.

Potential Health Effects
Eye: Produces irritation, characterized by a burning sensation, redness, tearing, inflammation, and possible corneal injury. May cause painful sensitization to light.
Skin: Causes moderate skin irritation. May be absorbed through the skin in harmful amounts. Prolonged and/or repeated contact may cause defatting of the skin and dermatitis.
Ingestion: May be fatal or cause blindness if swallowed. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause systemic toxicity with acidosis. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. May cause cardiopulmonary system effects.
Inhalation: Harmful if inhaled. May cause adverse central nervous system effects including

headache, convulsions, and possible death. May cause visual impairment and possible permanent blindness. Causes irritation of the mucous membrane.
Chronic: Prolonged or repeated skin contact may cause dermatitis. Chronic inhalation and ingestion may cause effects similar to those of acute inhalation and ingestion. Chronic exposure may cause reproductive disorders and teratogenic effects. Laboratory experiments have resulted in mutagenic effects. Prolonged exposure may cause liver, kidney, and heart damage.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.
Skin: Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists. Wash clothing before reuse.
Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately. Induce vomiting by giving one teaspoon of Syrup of Ipecac.
Inhalation: Get medical aid immediately. Remove from exposure to fresh air immediately. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
Notes to Physician: Effects may be delayed. Ethanol may inhibit methanol metabolism.

Section 5 - Fire Fighting Measures

General Information: Containers can build up pressure if exposed to heat and/or fire. As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Water runoff can cause environmental damage. Dike and collect water used to fight fire. Vapors can travel to a source of ignition and flash back. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Flammable Liquid. Can release vapors that form explosive mixtures at temperatures above the flashpoint. Use water spray to keep fire-exposed containers cool. Water may be ineffective. Material is lighter than water and a fire may be spread by the use of water. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. May be ignited by heat, sparks, and flame.
Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. Use water spray to cool fire-exposed containers. Water may be ineffective. For large fires, use water spray, fog or alcohol-resistant foam. Do NOT use straight streams of water.

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Scoop up with a nonsparking tool, then place into a suitable container for disposal. Use water spray to disperse the gas/vapor. Remove all sources of ignition. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. Do not use combustible materials such as saw dust. Provide ventilation. A vapor suppressing foam may be used to reduce vapors. Water spray may reduce vapor but may not prevent ignition in closed spaces.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Do not breathe dust, vapor, mist, or gas. Do not get in eyes, on skin, or on clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Avoid contact with heat, sparks and flame. Do not ingest or inhale. Use only in a chemical fume hood. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.
Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area. Keep containers tightly closed. Do not store in aluminum or lead containers.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits. Use only under a chemical fume hood.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Methyl alcohol	200 ppm TWA; 250 ppm STEL; skin - potential for cutaneous absorption	200 ppm TWA; 260 mg/m3 TWA 6000 ppm IDLH	200 ppm TWA; 260 mg/m3 TWA

OSHA Vacated PELs: Methyl alcohol: 200 ppm TWA; 260 mg/m3 TWA; 250 ppm STEL; 325 mg/m3 STEL
Personal Protective Equipment
Eyes: Wear chemical goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR ?1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless
Odor: alcohol-like - weak odor
pH: Not available.
Vapor Pressure: 128 mm Hg @ 20 deg C
Vapor Density: 1.11 (Air=1)
Evaporation Rate:5.2 (Ether=1)
Viscosity: 0.55 cP 20 deg C
Boiling Point: 64.7 deg C @ 760.00mm Hg
Freezing/Melting Point:-98 deg C
Autoignition Temperature: 464 deg C (867.20 deg F)
Flash Point: 11 deg C (51.80 deg F)

Decomposition Temperature: Not available.
NFPA Rating: (estimated) Health: 1; Flammability: 3; Reactivity: 0
Explosion Limits, Lower:6.0 vol %
Upper: 36.00 vol %
Solubility: miscible
Specific Gravity/Density:.7910g/cm3
Molecular Formula:CH_4O
Molecular Weight:32.04

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: High temperatures, incompatible materials, ignition sources, oxidizers.
Incompatibilities with Other Materials: Acids (mineral, non-oxidizing, e.g. hydrochloric acid, hydrofluoric acid, muriatic acid, phosphoric acid), acids (mineral, oxidizing, e.g. chromic acid, hypochlorous acid, nitric acid, sulfuric acid), acids (organic, e.g. acetic acid, benzoic acid, formic acid, methanoic acid, oxalic acid), azo, diazo, and hydrazines (e.g. dimethyl hydrazine, hydrazine, methyl hydrazine), isocyanates (e.g. methyl isocyanate), nitrides (e.g. potassium nitride, sodium nitride), peroxides and hydroperoxides (organic, e.g. acetyl peroxide, benzoyl peroxide, butyl peroxide, methyl ethyl ketone peroxide), epoxides (e.g. butyl glycidyl ether), Oxidants (such as barium perchlorate, bromine, chlorine, hydrogen peroxide, lead perchlorate, perchloric acid, sodium hypochlorite)., Active metals (such as potassium and magnesium)., acetyl bromide, alkyl aluminum salts, beryllium dihydride, carbontetrachloride, carbon tetrachloride + metals, chloroform + heat, chloroform + sodium hydroxide, cyanuric chloride, diethyl zinc, nitric acid, potassium-tert-butoxide, chloroform + hydroxide, water reactive substances (e.g. acetic anyhdride, alkyl aluminum chloride, calcium carbide, ethyl dichlorosilane).
Hazardous Decomposition Products: Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide, formaldehyde.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 67-56-1: PC1400000
LD50/LC50:
CAS# 67-56-1:
Draize test, rabbit, eye: 40 mg Moderate;
Draize test, rabbit, eye: 100 mg/24H Moderate;
Draize test, rabbit, skin: 20 mg/24H Moderate;
Inhalation, rat: LC50 = 64000 ppm/4H;
Oral, mouse: LD50 = 7300 mg/kg;
Oral, rabbit: LD50 = 14200 mg/kg;
Oral, rat: LD50 = 5628 mg/kg;
Skin, rabbit: LD50 = 15800 mg/kg;
Carcinogenicity:
CAS# 67-56-1: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.
Epidemiology: Methanol has been shown to produce fetotoxicity in the embr yo or fetus of laboratory animals. Specific developmenta l abnormalities include cardiovascular, musculoskeletal, and urogenital systems.
Teratogenicity: Effects on Newborn: Behaviorial, Oral, rat: TDLo=7500 mg/kg (female 17-19 days after conception). Effects on Embryo or Fetus: Fetotoxicity, Inhalation, rat: TCLo=10000

ppm/7H (female 7-15 days after conception). Specific Developmental Abnormalities: Cardiovascular, Musculoskeletal, Urogenital, Inhalation, rat: TCLo=20000 ppm/7H (7-14 days after conception).
Reproductive Effects: Paternal Effects: Spermatogenesis: Intraperitoneal, mouse TDLo=5 g/kg (male 5 days pre-mating). Fertility: Oral, rat: TDLo = 35295 mg/kg (female 1-15 days after conception). Paternal Effects: Testes, Epididymis, Sperm duct: Oral, rat: TDLo = 200 ppm/20H (male 78 weeks pre-mating).
Neurotoxicity: No information available.
Mutagenicity: DNA inhibition: Human Lymphocyte = 300 mmol/L. DNA damage: Oral, rat = 10 umol/kg. Mutation in microorganisms: Mouse Lymphocyte = 7900 mg/L. Cytogenetic analysis: Oral, mouse = 1 gm/kg.
Other Studies: Standard Draize Test(Skin, rabbit) = 20 mg/24H (Moderate) S tandard Draize Test: Administration into the eye (rabbit) = 40 mg (Moderate). Standard Draize test: Administration int o the eye (rabbit) = 100 mg/24H (Moderate).

Section 12 - Ecological Information

Ecotoxicity: Fish: Fathead Minnow: 29.4 g/L; 96 Hr; LC50 (unspecified) Goldfish: 250 ppm; 11 Hr; resulted in death Rainbow trout: 8000 mg/L; 48 Hr; LC50 (unspecified) Rainbow trout: LC50 = 13-68 mg/L; 96 Hr.; 12 degrees C Fathead Minnow: LC50 = 29400 mg/L; 96 Hr.; 25 degrees C, pH 7.63 Rainbow trout: LC50 = 8000 mg/L; 48 Hr.; Unspecified ria:. Phytobacterium phosphoreum: EC50 = 51,000-320,000 mg/L; 30 minutes; Microtox test No data available.
Environmental: Dangerous to aquatic life in high concentrations. Aquatic toxicity rating: TLm 96>1000 ppm. May be dangerous if it enters water intakes. Methyl alcohol is expected to biodegrade in soil and water very rapidly. This product will show high soil mobility and will be degraded from the ambient atmosphere by the reaction with photochemically produced hyroxyl radicals with an estimated half-life of 17.8 days. Bioconcentration factor for fish (golden ide) < 10. Based on a log Kow of -0.77, the BCF value for methanol can be estimated to be 0.2.
Physical: No information available.
Other: None.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: CAS# 67-56-1: waste number U154; (Ignitable waste).

Section 14 - Transport Information

	US DOT	**IATA**	**RID/ADR**	**IMO**	**Canada TDG**
Shipping Name:	METHANOL				METHANOL
Hazard Class:	3				3(6.1)
UN Number:	UN1230				UN1230
Packing Group:	II				II
Additional Info:					FLASHPOINT

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 67-56-1 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA

Section 302 (RQ)
CAS# 67-56-1: final RQ = 5000 pounds (2270 kg)
Section 302 (TPQ)
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 67-56-1: acute, flammable.
Section 313
This material contains Methyl alcohol (CAS# 67-56-1, 99%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
CAS# 67-56-1 is listed as a hazardous air pollutant (HAP). This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA. None of the chemicals in this product are listed as Priority Pollutants under the CWA. None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 67-56-1 can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.
California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
T F
Risk Phrases:
R 11 Highly flammable.
R 23/24/25 Toxic by inhalation, in contact with skin and if swallowed.
R 39/23/24/25 Toxic : danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.

Safety Phrases:
S 16 Keep away from sources of ignition - No

smoking.
S 36/37 Wear suitable protective clothing and gloves.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 7 Keep container tightly closed.

WGK (Water Danger/Protection)
CAS# 67-56-1: 1
Canada
CAS# 67-56-1 is listed on Canada's DSL List. CAS# 67-56-1 is listed on Canada's DSL List.
This product has a WHMIS classification of B2, D1A, D2B.
CAS# 67-56-1 is listed on Canada's Ingredient Disclosure List.
Exposure Limits
CAS# 67-56-1: OEL-ARAB Republic of Egypt:TWA 200 ppm (260 mg/m3);Skin OEL-AUSTRALIA:TWA 200 ppm (260 mg/m3);STEL 250 ppm;Skin OEL-BELGIUM:TWA 200 ppm (262 mg/m3);STEL 250 ppm;Skin OEL-CZECHOSLOVAKIA:TWA 100 mg/m3;STEL 500 mg/m3 OEL-DENMARK:TWA 200 ppm (260 mg/m3);Skin OEL-FINLAND:TWA 200 ppm (260 mg/m3);STEL 250 ppm;Skin OEL-FRANCE:TWA 200 ppm (260 mg/m3);STEL 1000 ppm (1300 mg/m3) OEL-GERMANY:TWA 200 ppm (260 mg/m3);Skin OEL-HUNGARY:TWA 50 mg/m3;STEL 100 mg/m3;Skin JAN9 OEL-JAPAN:TWA 200 ppm (260 mg/m3);Skin OEL-THE NETHERLANDS:TWA 200 ppm (260 mg/m3);Skin OEL-THE PHILIPPINES:TWA 200 ppm (260 mg/m3) OEL-POLAND:TWA 100 mg/m3 OEL-RUSSIA:TWA 200 ppm;STEL 5 mg/m3;Skin OEL-SWEDEN:TWA 200 ppm (250 mg/m3);STEL 250 ppm (350 mg/m3);Skin OEL-SWITZERLAND:TWA 200 ppm (260 mg/m3);STEL 400 ppm;Skin OEL-THAILAND:TWA 200 ppm (260 mg/m3) OEL-TURKEY:TWA 200 ppm (260 mg/m3) OEL-UNITED KINGDOM:TWA 200 ppm (260 mg/m3);STEL 250 ppm;Skin OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

Section 16 - Additional Information

MSDS Creation Date: 7/21/1999
Revision #4 Date: 3/14/2001

MSDS Number: S3074 * * * * * *Effective Date: 10/16/06* * * * * * *Supercedes: 08/10/04*

MSDS *Material Safety Data Sheet*

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. And Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker®

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

SODIUM BISULFITE

1. Product Identification

Synonyms: Sodium acid sulfite; Sulfurous acid, monosodium salt; Sodium hydrogen sulfite, solid
CAS No.: 7631-90-5
Molecular Weight: 104.06
Chemical Formula: A mixture of $NaHSO_3$ (sodium bisulfite) and $Na_2S_2O_5$ (sodium metabisulfite)
Product Codes: 3556, 3557

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sodium Bisulfite	7631-90-5	58 - 99%	Yes
Sodium Metabisulfite	7681-57-4	1 - 42%	Yes

3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE ALLERGIC RESPIRATORY REACTION. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. REACTS WITH ACIDS AND WATER RELEASING TOXIC SULFUR DIOXIDE GAS.

SAF-T-DATA$^{(tm)}$ Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate (Life)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 3 - Severe
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: Green (General Storage)

Potential Health Effects

Inhalation:
Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath. May cause allergic reaction in sensitive individuals.
Ingestion:
May cause gastric irritation by the liberation of sulfurous acid. An asthmatic reaction may occur after ingestion. Large doses may result in nausea, vomiting, diarrhea, abdominal pains, circulatory disturbance, and central nervous system depression. Estimated fatal dose is 10 gm.
Skin Contact:
Causes irritation to skin. Symptoms include redness, itching, and pain.
Eye Contact:
Causes irritation, redness, and pain. Contact may cause irreversible eye damage. Symptoms may include stinging, tearing, redness, swelling, corneal damage and blindness.
Chronic Exposure:
No information found.
Aggravation of Pre-existing Conditions:
Some individuals are said to be dangerously sensitive to minute amounts of sulfites in foods. Symptoms may include broncho constriction, shock, gastrointestinal disturbances, angio edema, flushing, and tingling sensations. Once allergy develops, future exposures can cause asthma attacks with shortness of breath, wheezing, and cough.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by

mouth to an unconscious person. Get medical attention.

Skin Contact:

Wipe off excess material from skin then immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:

Not considered to be a fire hazard.

Explosion:

Not considered to be an explosion hazard.

Fire Extinguishing Media:

Use any means suitable for extinguishing surrounding fire. Do not allow water runoff to enter sewers or waterways.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. Cautiously spray residue with plenty of water, providing ventilation to clear sulfur dioxide fumes generated from water contact. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Keep in a tightly closed container. Protect from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture and incompatibilities. Releases toxic sulfur dioxide gas when in contact with water, ice. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-ACGIH Threshold Limit Value (TLV):
5mg/m3 (TWA) for sodium bisulfite & for sodium metabisulfite, A4 Not classifiable as a human carcinogen.
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half-face respirator with an acid gas cartridge may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece respirator with an acid gas cartridge may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
Coarse white granules.
Odor:
Slight odor of sulfur dioxide.
Solubility:
Very soluble in water, insoluble in alcohol.
Specific Gravity:
1.48
pH:
No information found.
% Volatiles by volume @ 21C (70F):
No information found.
Boiling Point:
Not applicable.
Melting Point:
150C (302F)
Vapor Density (Air=1):

No information found.
Vapor Pressure (mm Hg):
No information found.
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Strength diminishes somewhat with age. Gradually decomposes in air to sulfate, generating sulfurous acid gas. Contact with moisture (water, wet ice, etc.), will release toxic sulfur dioxide gas.
Hazardous Decomposition Products:
Burning may produce sulfur oxides.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Water, acids, alkalis, sodium nitrite, oxidizers, aluminum powder.
Conditions to Avoid:
Moisture, heat, flames, ignition sources and incompatibles.

11. Toxicological Information

Sodium Metabisulfite [7681-57-4]: No LD50/LC50 information found relating to normal routes of occupational exposure. Investigated as a tumorigen, mutagen and reproductive effector. Sodium Bisulfite [7631-90-5]: Oral rat LD50: 2000 mg/kg. Investigated as a tumorigen and mutagen.

--------\Cancer Lists\--

	---NTP Carcinogen---		
Ingredient	Known	Anticipated	IARC Category
Sodium Bisulfite (7631-90-5)	No	No	3
Sodium Metabisulfite (7681-57-4)	No	No	3

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------------------------------

Ingredient	TSCA	EC	Japan	Australia
Sodium Bisulfite (7631-90-5)	Yes	Yes	Yes	Yes
Sodium Metabisulfite (7681-57-4)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------------------------------

		--Canada--		
Ingredient	Korea	DSL	NDSL	Phil.
Sodium Bisulfite (7631-90-5)	Yes	Yes	No	Yes
Sodium Metabisulfite (7681-57-4)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

	-SARA 302-		------SARA 313------	
Ingredient	RQ	TPQ	List	Chemical Catg.
Sodium Bisulfite (7631-90-5)	No	No	No	No
Sodium Metabisulfite (7681-57-4)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Sodium Bisulfite (7631-90-5)	5000	No	Yes
Sodium Metabisulfite (7681-57-4)	No	No	Yes

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: No Fire: No Pressure: No
Reactivity: No (Mixture / Solid)

Australian Hazchem Code: None allocated.
Poison Schedule: None allocated.

WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: 1 Flammability: 0 Reactivity: 1
Label Hazard Warning:
WARNING! HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE ALLERGIC RESPIRATORY REACTION. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. REACTS WITH ACIDS AND WATER RELEASING TOXIC SULFUR DIOXIDE GAS.
Label Precautions:
Avoid breathing dust.
Avoid contact with eyes, skin and clothing.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
For Reagent and Technical Grades: Not For Food Use.For TAC Grades: Do not use in meats or in foods recognized as a source of Vitamin B-1, nor in fruits or vegetables to be served or sold raw to consumers or to be presented to consumers as fresh.
Label First Aid:
If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, wipe off excess material from skin then immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 3.
Disclaimer:
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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

ATTACHMENT D
DAILY PROJECT REVIEW FORM AND SAFE PLAN OF ACTION CHECKLIST

Daily Project Review

Project Name/Number ______________________ **Date:** ____________

Work Area ______________________ **Permits(s) required and attached** ☐ **YES** ☐ **NO**

Major Steps of Task:	**Recognized/Unanticipated Hazards:**	**Safe Plan:**	**Tools *Required* to do the job safely:**

Adjacent Work/Processes and/or co-occupancy ☐ **Yes** ☐ **No** ☐ **Notified them of our presence** ☐ **Coordinated with adjacent work supervisor/customer operator**

TEAM MEMBERS SIGNATURES

______________ ______________ ______________ ______________

______________ ______________ ______________ ______________

______________ ______________ ______________ ______________

The signature of the Supervisor certifies the completion of the Project Review by the crew.

Supervisor's Signature: ______________________ Date ______________

Instructions: 1. Write the name of the job or task in the space provided. 2. Conduct a walk-through survey of work area. 3. Write the steps of the task in a safe sequence. 4. List all possible hazards involved in each step as well as reaction to failure. 5. In the Safe Plan column, provide the corrective actions that will be taken to keep the hazard from becoming an accident or injury. 6. In Tools column list tools needed to do the job, additional safety equipment, etc. 7. Have each team member that helped develop and will use this form sign in the spaces provided at the bottom. 8. Review the form at the end of the task for improvements. **(NOTE:** THE WORK SHALL STOP IF CONDITIONS CHANGE, JOB CHANGES, OR DEFICIENCY IN PLAN IS NOTED.)

Review checklist on next page

Daily Project Review

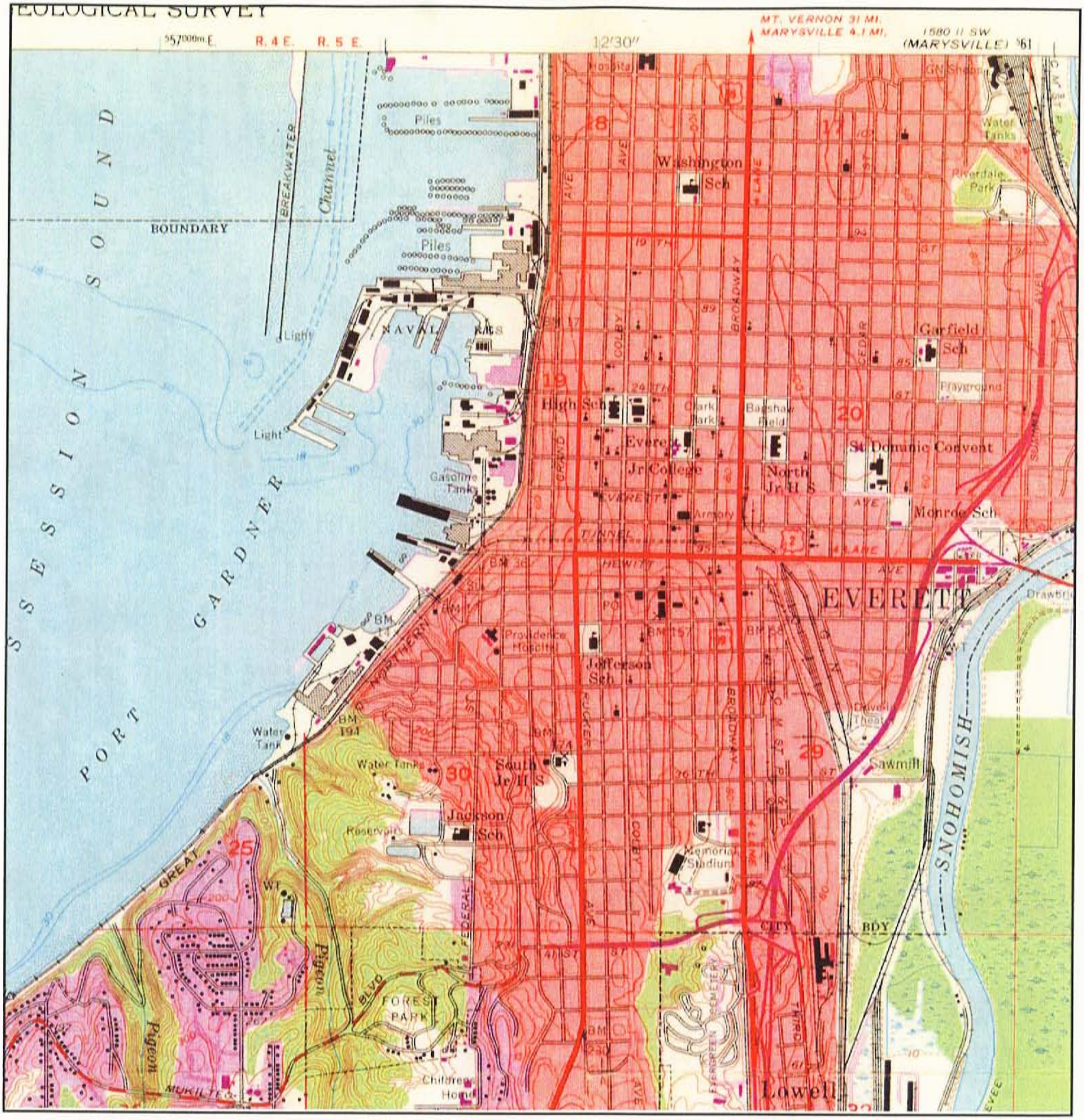
Safe Plan of Action Checklist (Check the items that apply)

	Permits/Clearances
☐	Utility Clearance Obtained
☐	Confined Space
☐	Critical Lift
☐	Hoisting & Rigging Safety Review
☐	Boom Assembly and Breakdown
☐	Boom Proximity
☐	Concrete Structure Penetration
☐	Soil Excavation
☐	Pneumatic Test
☐	Hot Work
☐	Scaffolding Erection Plan
☐	Steel Erection/Decking/Flooring/ Grating Checklist
☐	Request for Shutdown
☐	Electrically Hazardous Work
☐	Radiation Work Permit for Visitors
	Required PPE
☐	Hard Hat
☐	Ear Plugs/Ear Muffs
	Eye Protection
☐	Safety Glasses
☐	Face Shield
☐	Chemical Goggles
☐	Welding Hood
	Hand Protection
☐	Cut Resistant Gloves
☐	Welders Gloves
☐	Nitrile Gloves
☐	Surgical Gloves
☐	Rubber Gloves
☐	Electrical Insulated Gloves
☐	Arm Sleeves
	Foot Protection
☐	Safety Toe Boots
☐	Rubber Boots
☐	Rubber Boot Covers
☐	Dielectric Footware
	Respiratory Protection
☐	Dust Mask (NIOSH)
☐	Air Purifying Respirator
☐	Supplied Air Respirator
☐	SCBA
☐	Emergency Escape Respirator
	Special Clothing
☐	Tyvek®
☐	Poly Coated Tyvek®
☐	NOMEX®
☐	Rain Suit
	Fall Protection
☐	Harness
☐	Double Lanyard Required
☐	Anchorage Point Available

	Hazards	**Safe Plan**	
☐	Overhead Utilities	☐ Power de-energization required ☐ Required clearance distance = _______ ft.	☐ Insulation blankets required ☐ Wire watcher required ☐ Safe work zone marked
☐	Crane or other Lifting Equipment	☐ Signalman assigned ☐ Tag lines in use ☐ Lifting equipment inspected	☐ Area around crane barricaded ☐ Personnel protected from overhead load
☐	Underground Utilities	☐ Reviewed as-builts ☐ Required clearance distance = _____ ft.	☐ Subsurface surveys ☐ Received dig permit ☐ Safe work zone marked
☐	Electrical	☐ Lock Out/Tag Out/Try Out? ☐ Reviewed electrical safety procedures	☐ Permit required ☐ Confirm that equipment is de-energized ☐ Additional info below
☐	Excavations	☐ Permits ☐ Inspected prior to entering ☐ Barricades provided ☐ Access/egress provided	☐ Proper sloping/shoring ☐ Protection from accumulated water
☐	Fire Hazard	☐ Permit ☐ Fire Extinguishers ☐ Unnecessary flammable material removed	☐ Fire watch ☐ Adjacent area protected ☐ Additional info below
☐	Vehicular Traffic or Heavy Equipment	☐ Traffic Barricades ☐ Cones ☐ Signs ☐ Communication with equipment operator	☐ Flagmen ☐ Lane closure ☐ Additional information below
☐	Noise > 85 dB	Hearing protection is required: ☐ Ear plugs ☐ Ear muffs	☐ Both ☐ Additional info below
☐	Hand & Power Tools:	☐ Inspect general condition ☐ GFCI in use ☐ Reviewed safety requirements in operators manual(s)	☐ Identified PEP required for each tool ☐ Guarding OK ☐ Additional info below
☐	Hand Hazards	☐ List sharp tools, material, equipment ☐ PPE gloves, etc. ☐ Protected sharp edges as necessary	☐ Additional info below
☐	Manual Lifting	☐ Reviewed proper lifting tech. ☐ Hand protection required ☐ Back support belts	☐ Identified material requiring lifting equipment ☐ Additional information below
☐	Ladders	☐ Inspect general condition before use ☐ Ladder tied off ☐ Proper angle and placement	☐ Ladder inspected within last quarter ☐ Reviewed ladder safety
☐	Scaffolds	☐ Inspect general condition before use ☐ Toe boards used ☐ Footings adequate	☐ Tags in place ☐ Properly secured ☐ Materials properly stored on scaffold
☐	Slips, Trips, Falls	☐ Inspect for trip hazards ☐ Hazards marked ☐ Extension cords properly secured ☐ Work zone free of debris	☐ Tools & material properly stored ☐ Additional information below
☐	Pinch Points	List potential pinch points: ☐ Working near operating equipment ☐ Hand/Body positioning	☐ Additional information below
☐	Working w/Chemicals	☐ The task creates potential for direct contact with hazardous chemicals. ☐ Reviewed MSDS hazards and precautions ☐ Have identified proper PPE (respirators, clothing, gloves, etc.	☐ Have proper containers and labels
☐	Heat Stress Potential	☐ Heat stress monitoring (>85º F; 29.4º C) ☐ Liquids available ☐ Sun Screen ☐ Reviewed Heat Stress symptoms	☐ Cool down periods ☐ Additional info below
☐	Cold Stress Potential	☐ Proper clothing (i.e., gloves, coat, coveralls) ☐ Reviewed Cold Stress symptoms ☐ Warm up periods	☐ Wind chill (<32º F; 0º C) ☐ Additional information below
☐	Environmental	☐ Air emissions ☐ Water discharge ☐ Pollution prevention	☐ Hazardous wastes ☐ Other wastes ☐ Waste minimization
☐	Natural or Site Hazards	☐ Weather ☐ Terrain ☐ Animals/reptiles/insects hazards	☐ Adjacent operations or processes ☐ Biological hazards
☐	Overhead Work	☐ Caution barricade tape required ☐ Rigid railing required ☐ Covers over opening	☐ Danger barricade tape required ☐ Warming signs required

Additional Information

Historical Topographic Map



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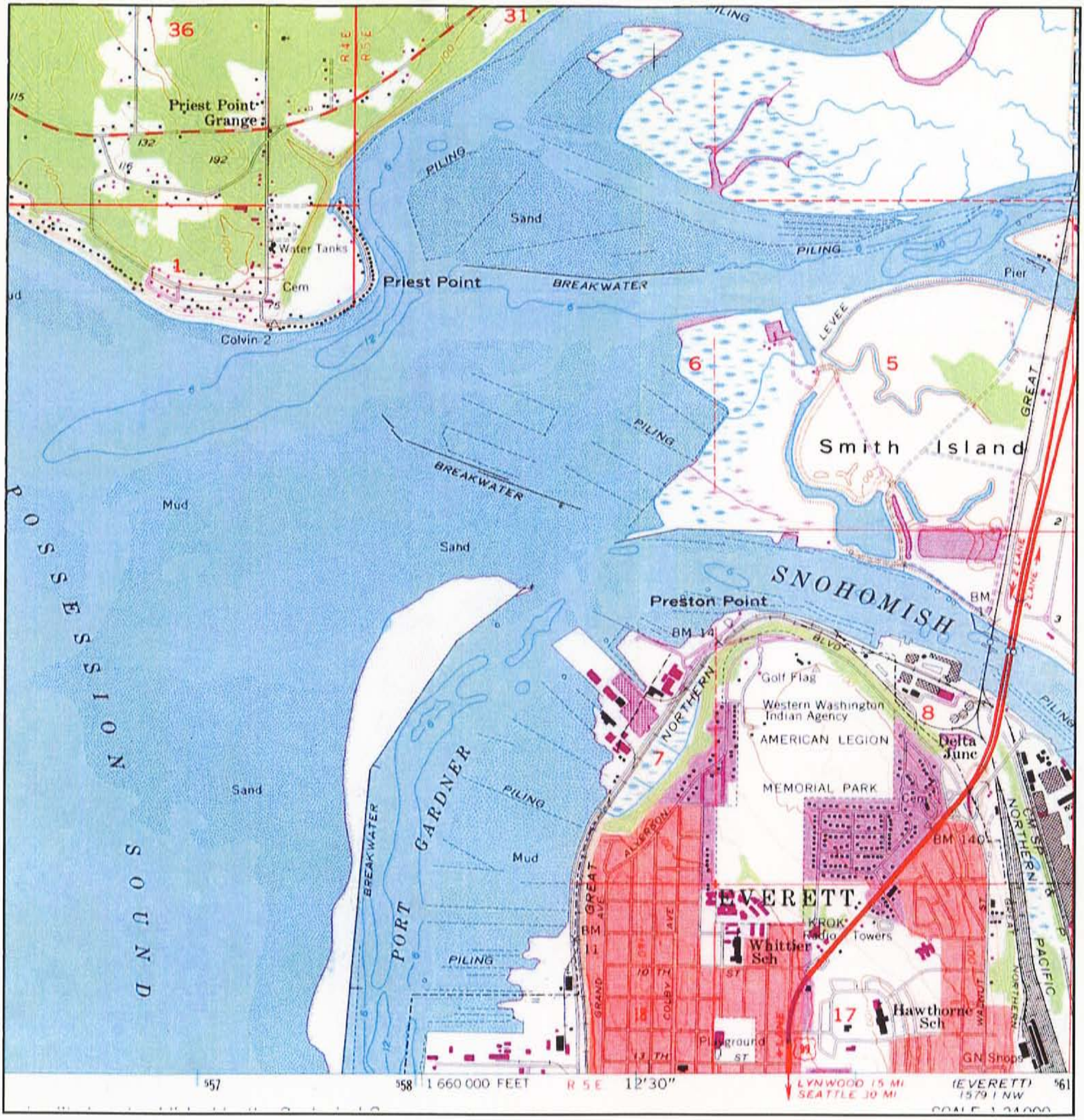
Historical Topographic Map



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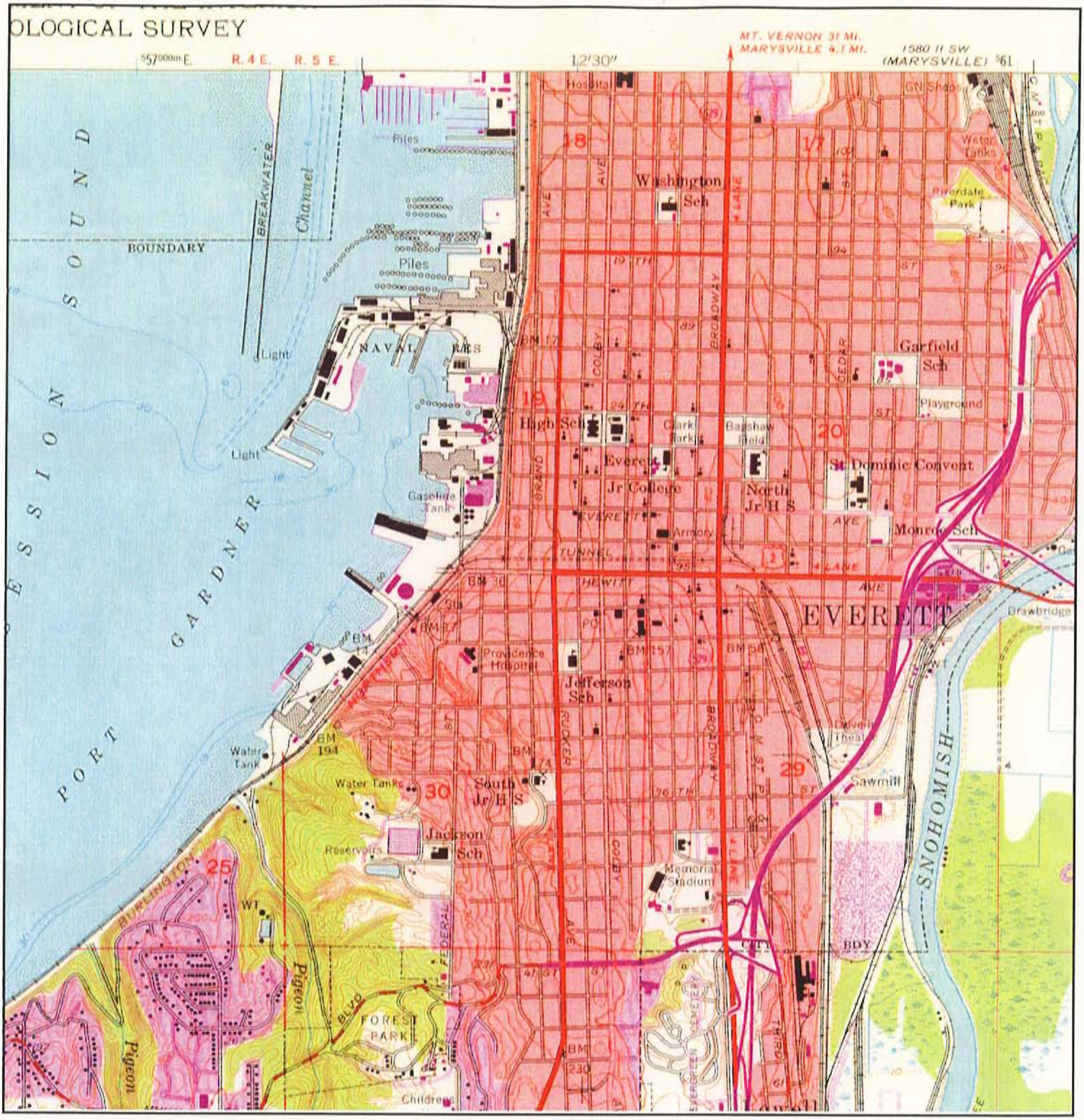
ADJOINING QUAD
NAME: Marysville, WA
MAP YEAR: 1968
PHOTOREVISED FROM:1953
SERIES: 7.5
SCALE: 1:24,000

SITE NAME: Everett Shipyard
ADDRESS: 1016 14th Street
Everett, WA 98201
LAT/LONG: 47.9987 / 122.215

CLIENT: URS Corporation
CONTACT: Al Thatcher
INQUIRY#: 2185666.4
RESEARCH DATE: 04/03/2008

Historical Topographic Map



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Historical Topographic Map

N ↑	ADJOINING QUAD NAME: Marysville, WA MAP YEAR: 1973 PHOTOREVISED FROM:1953 SERIES: 7.5 SCALE: 1:24,000	SITE NAME: Everett Shipyard ADDRESS: 1016 14th Street Everett, WA 98201 LAT/LONG: 47.9987 / 122.215	CLIENT: URS Corporation CONTACT: Al Thatcher INQUIRY#: 2185666.4 RESEARCH DATE: 04/03/2008

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Sanborn® Library search results
Certification # 2F7A-453D-91A0

Everett Shipyard
1016 14th Street
Everett, WA 98201

Inquiry Number 2185666.3S

April 03, 2008

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4/03/08

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Everett Shipyard
1016 14th Street
Everett, WA 98201

EDR Inquiry # 2185666.3S

Client Name:
URS Corporation
1501 Fourth Avenue
Seattle, WA 98101

Contact: Al Thatcher

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Cross Street:
P.O. # NA
Project: ESY
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Maps Identified - Number of maps indicated within "( )"

1968 (3)
1957 (3)
1950 (3)
1914 (3)
1902 (1)

Total Maps: 13

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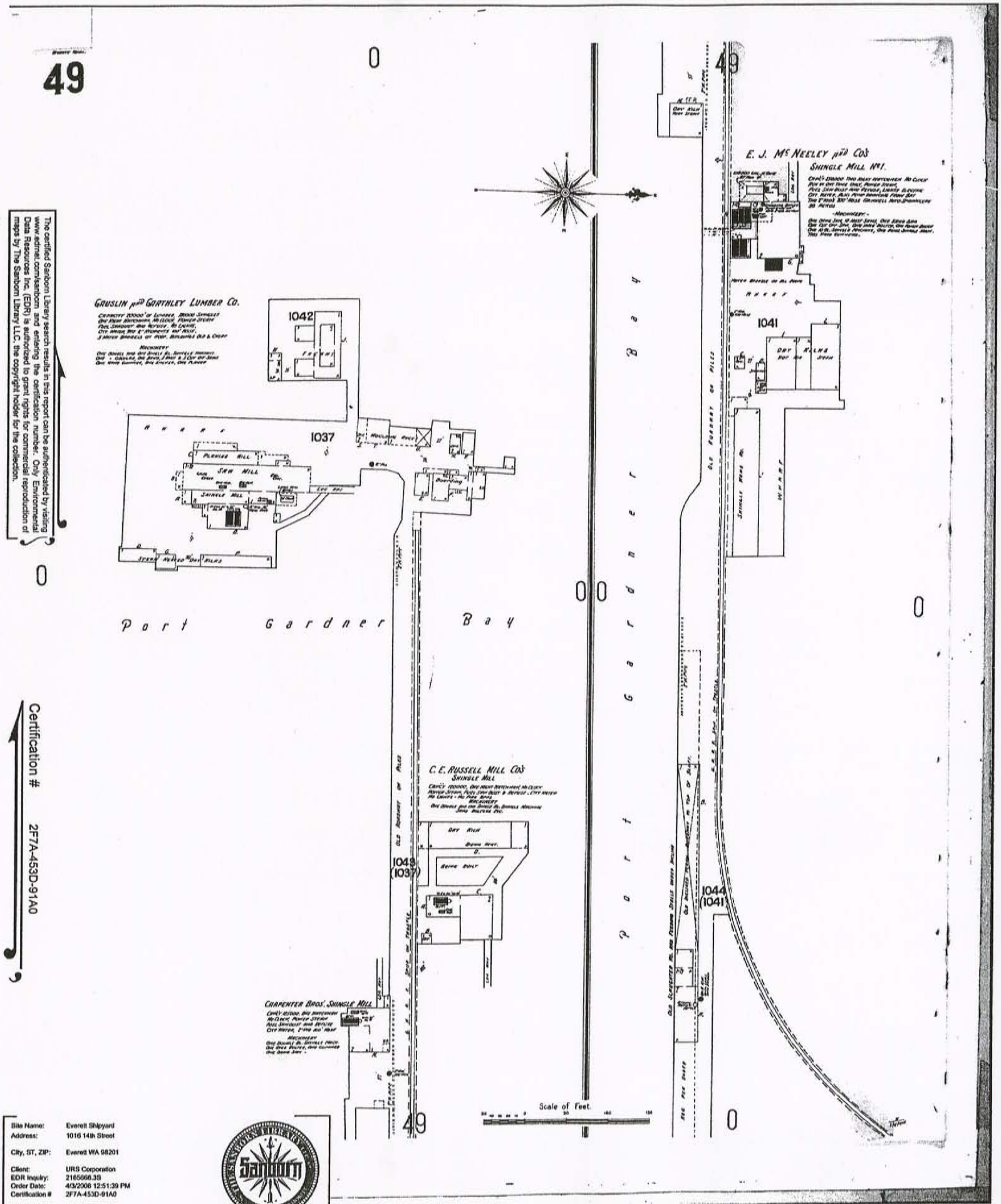

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Address:	1010 14th Street
City, ST, ZIP:	Everett WA 98201
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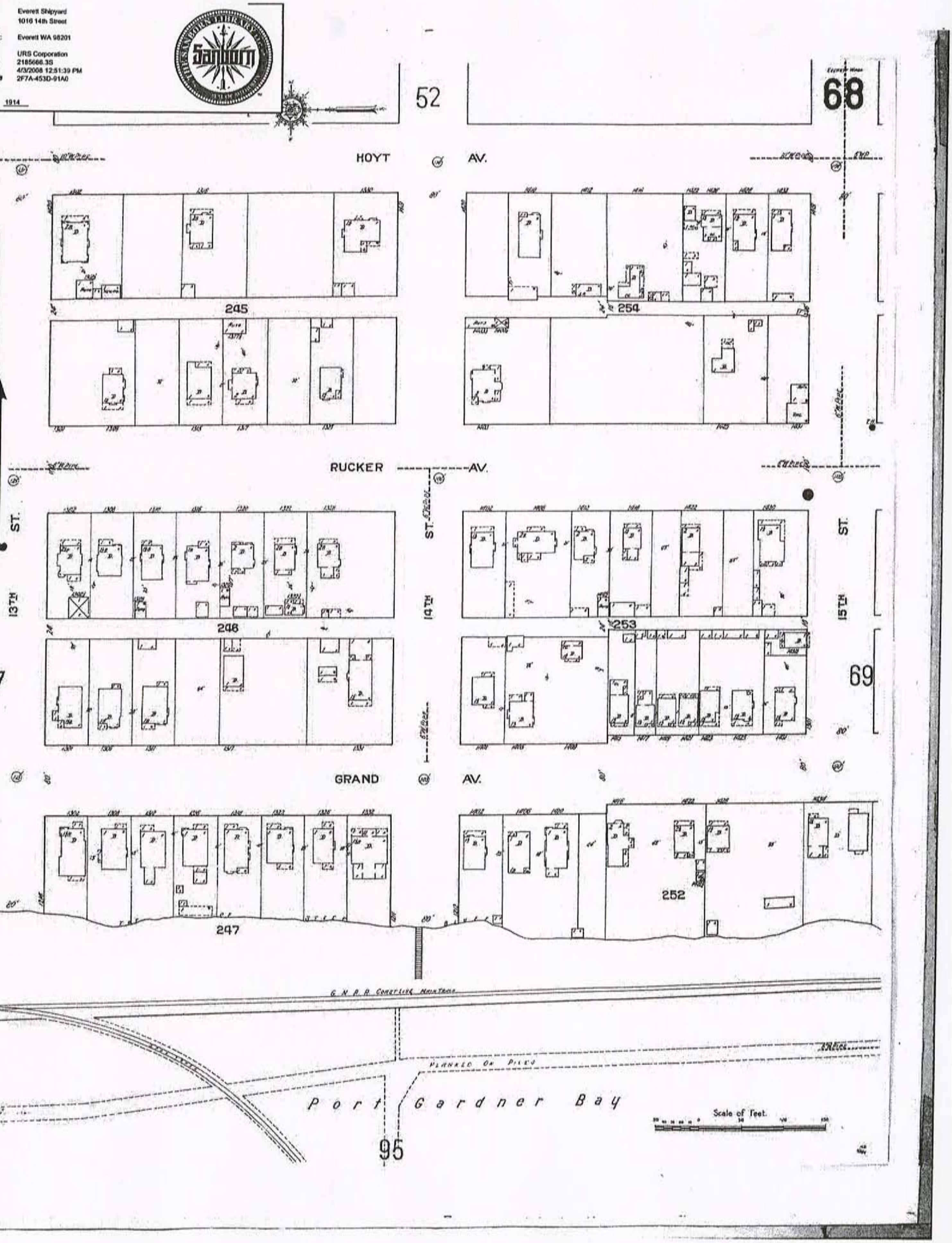

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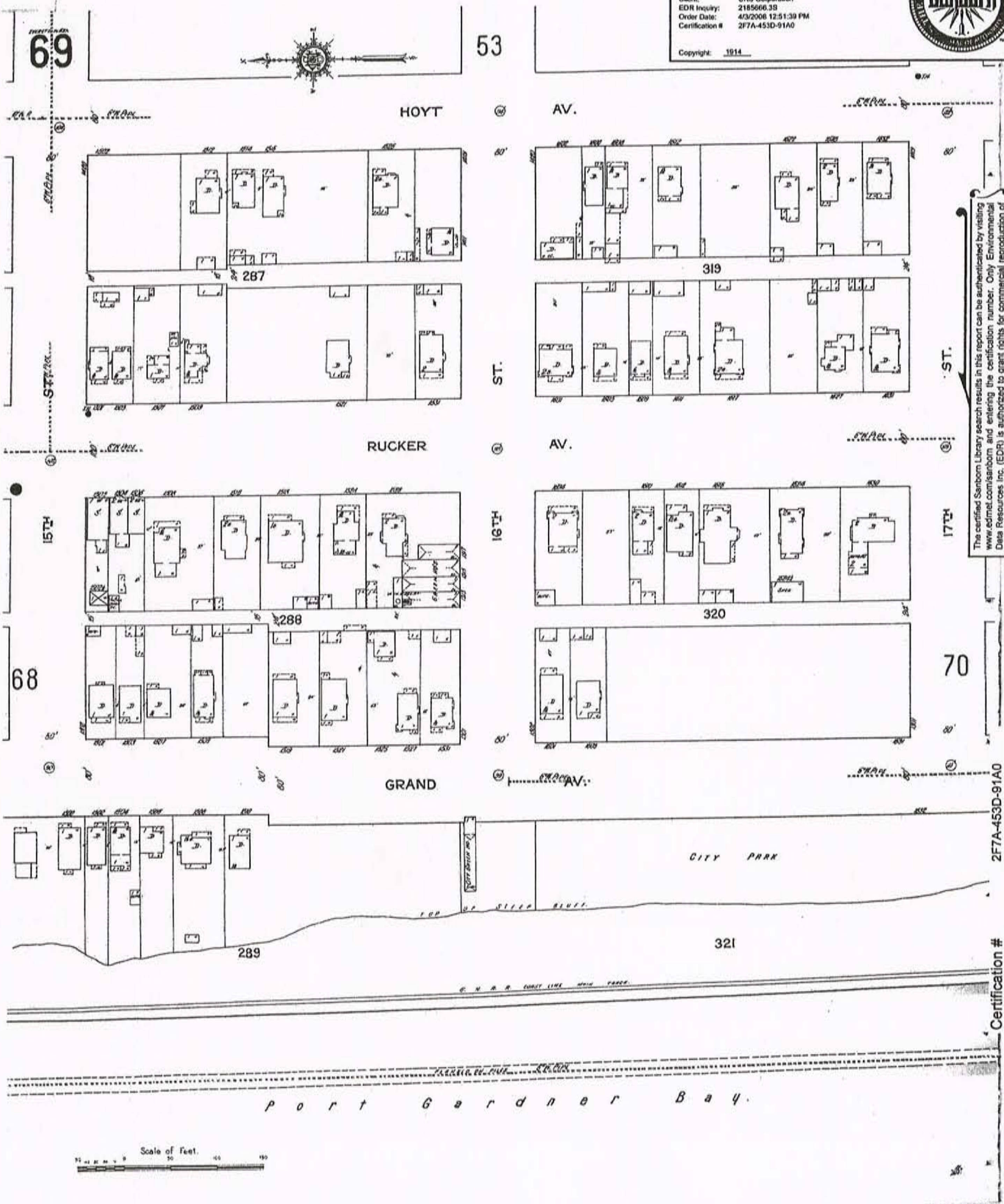

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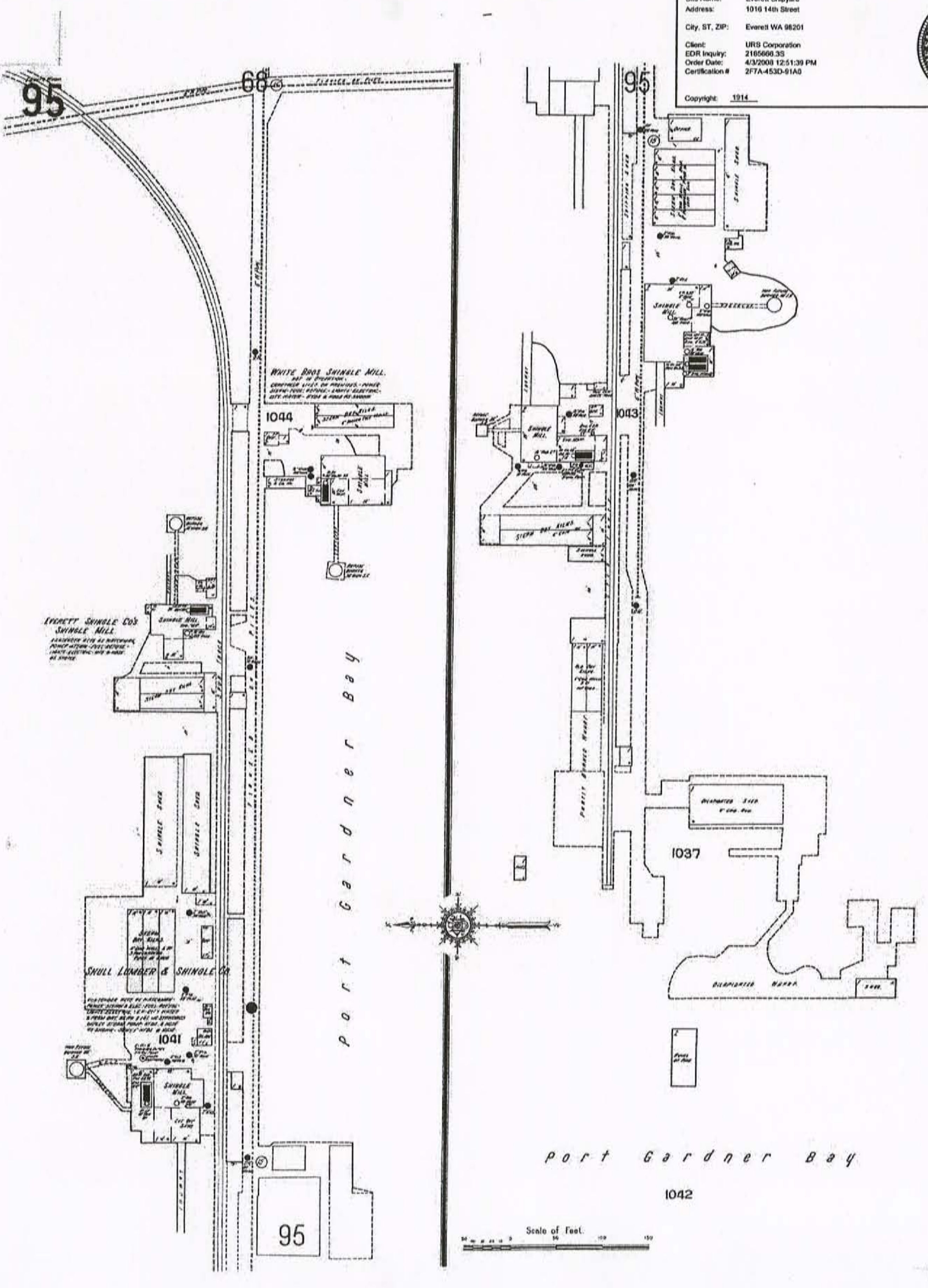

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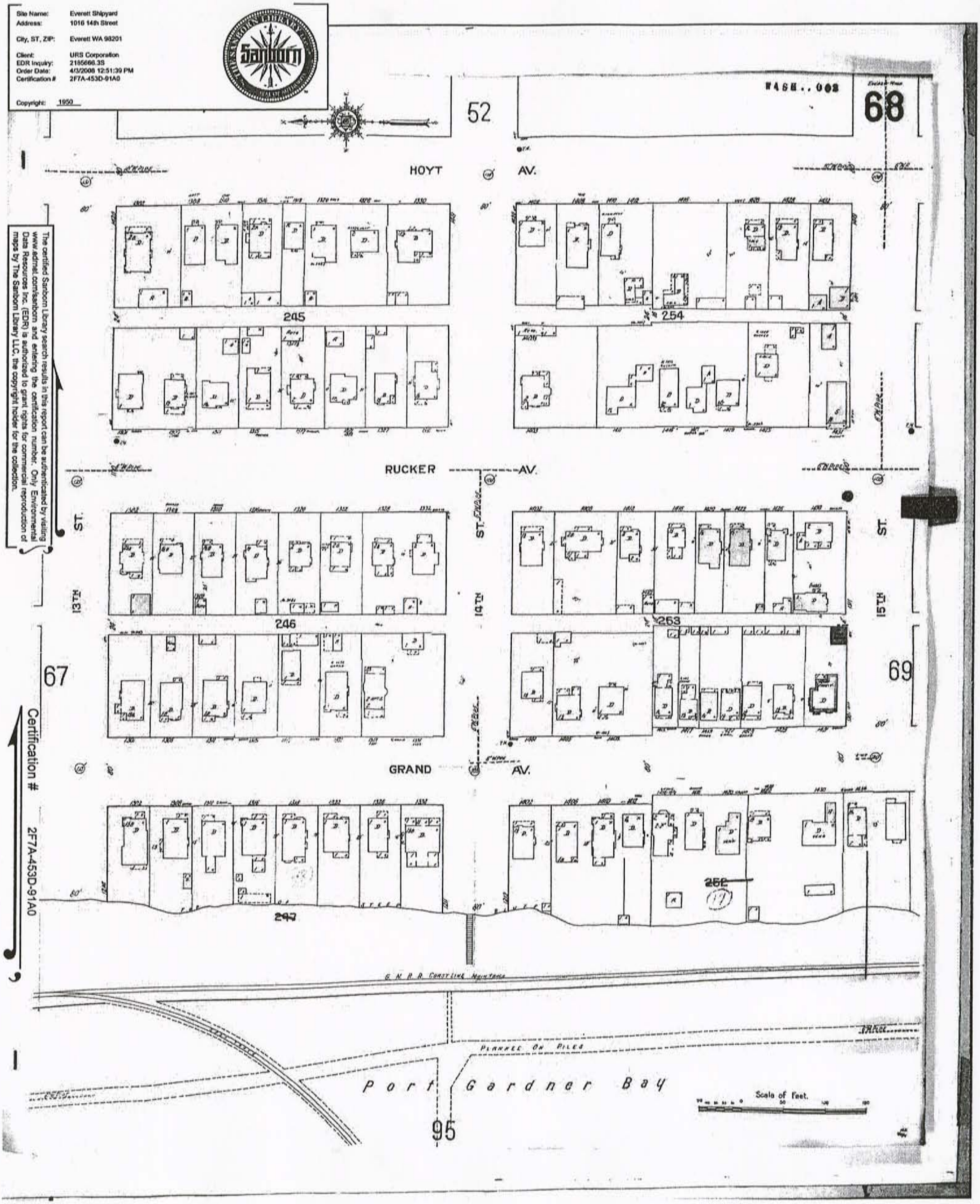

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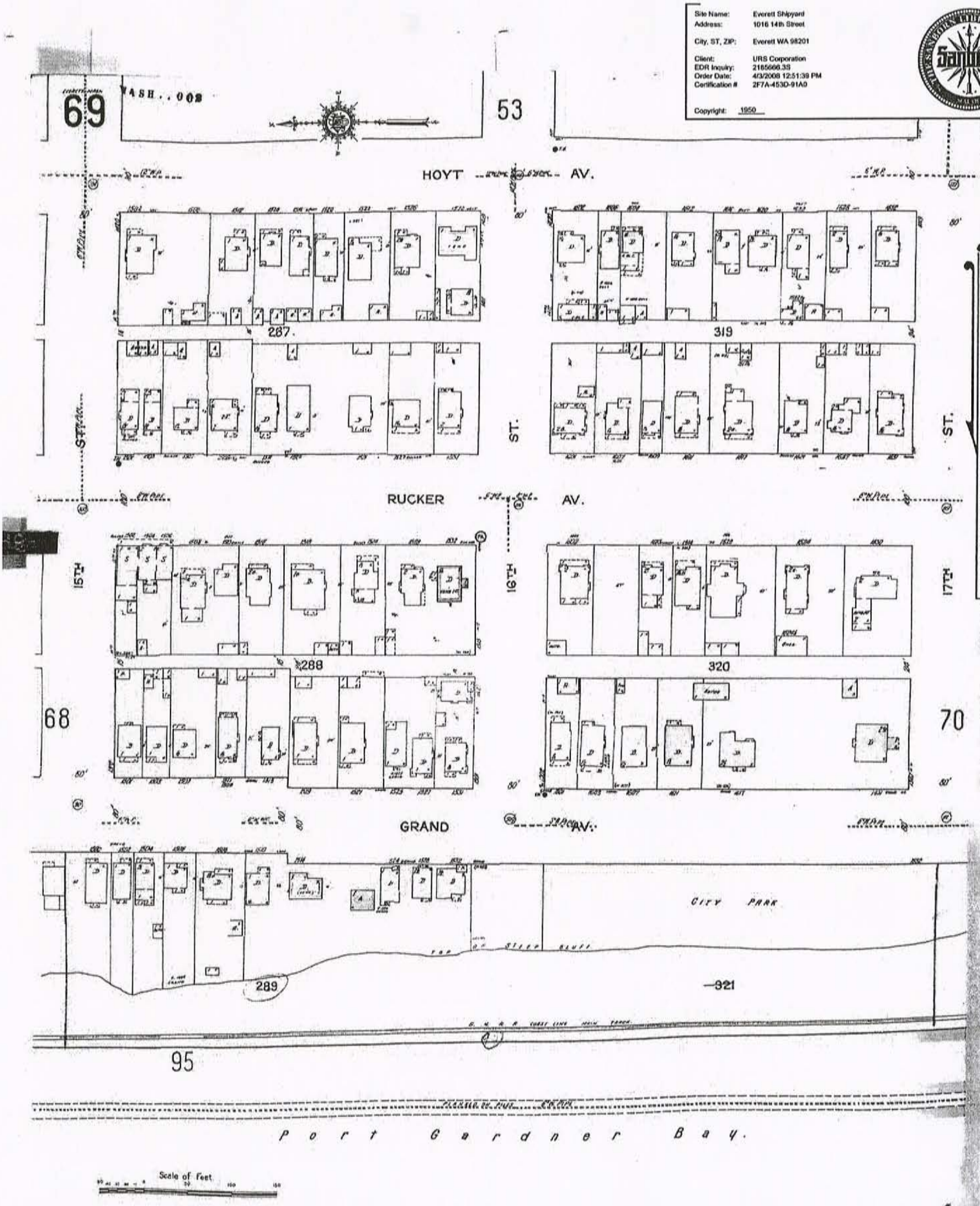

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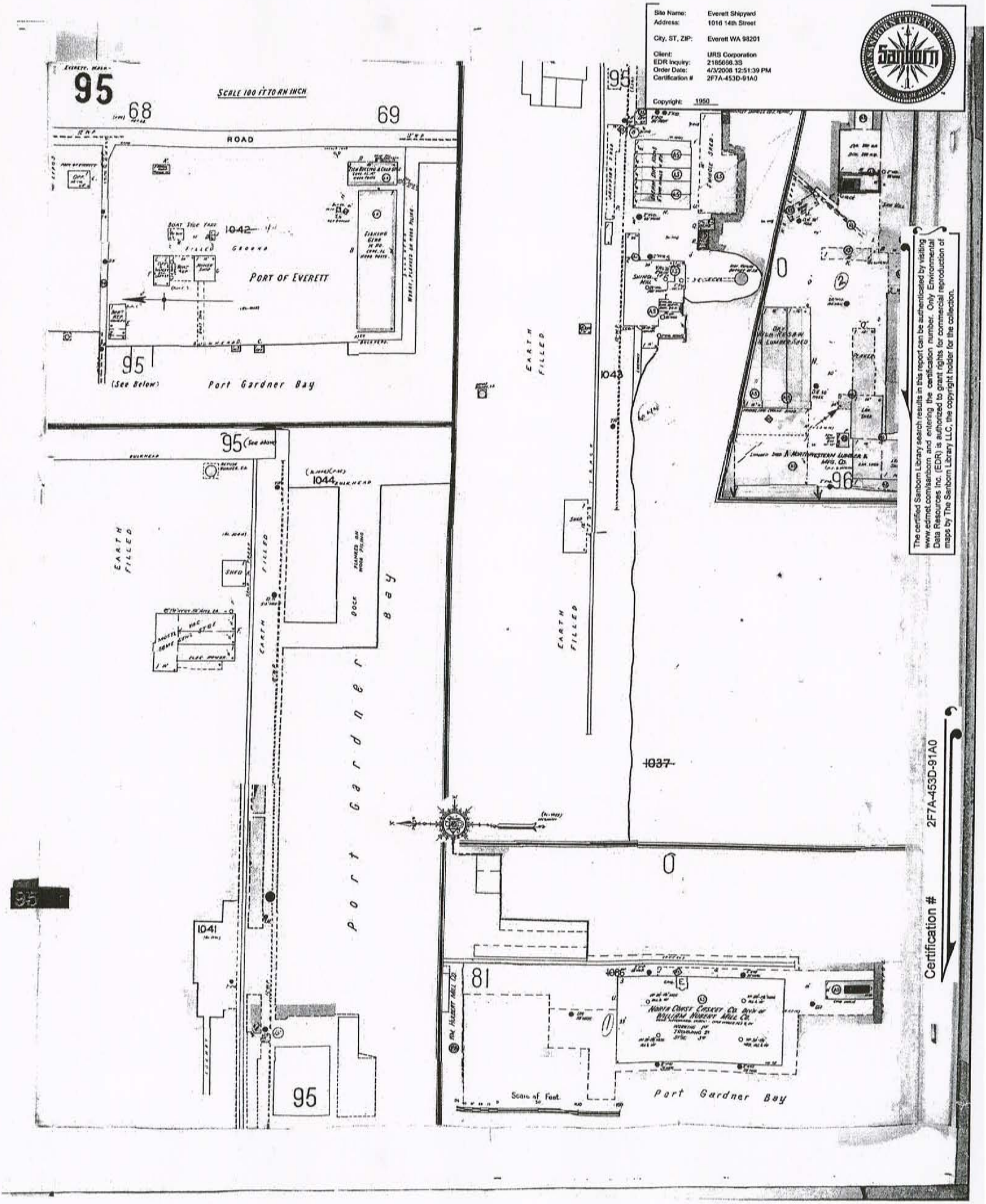

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Site Name: Everett Shipyard
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City, ST, ZIP: Everett WA 98201

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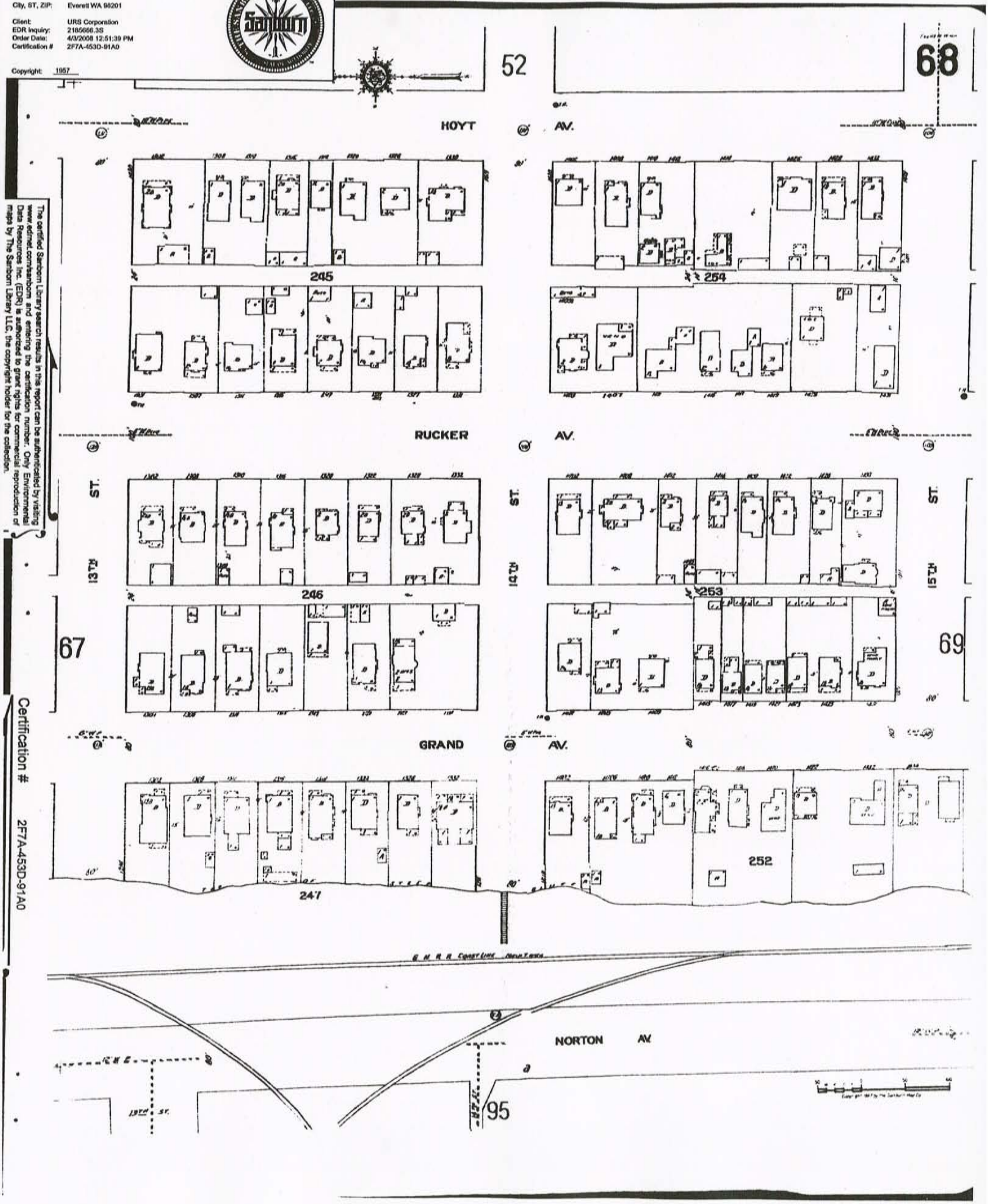

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Address: 1016 14th Street

City, ST, ZIP: Everett WA 98201

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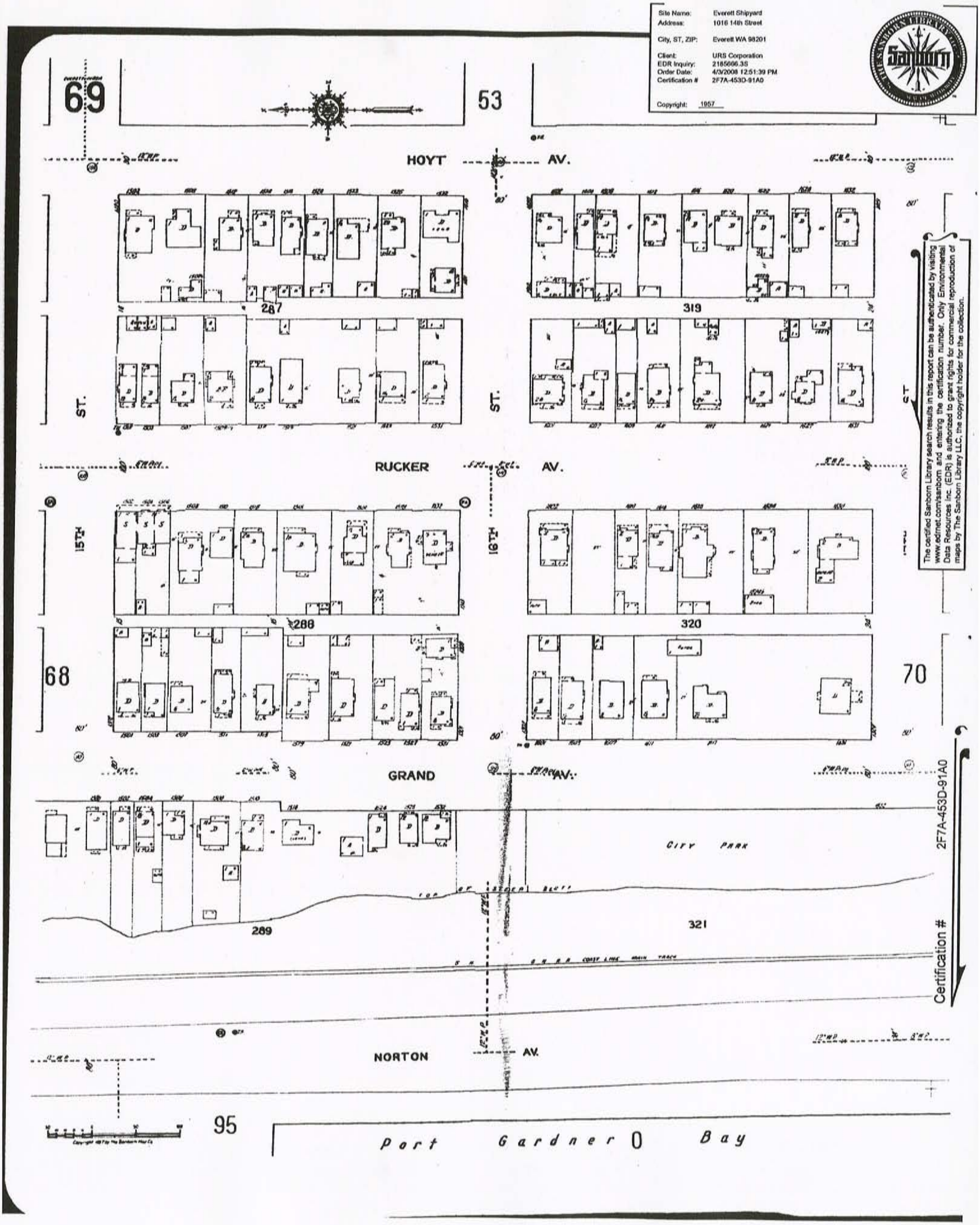

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Site Name: Everett Shipyard
Address: 1016 14th Street
City, ST, ZIP: Everett WA 98201
Client: URS Corporation
EDR Inquiry: 2185666.3S
Order Date: 4/3/2008 12:51:39 PM
Certification # 2F7A-453D-91A0
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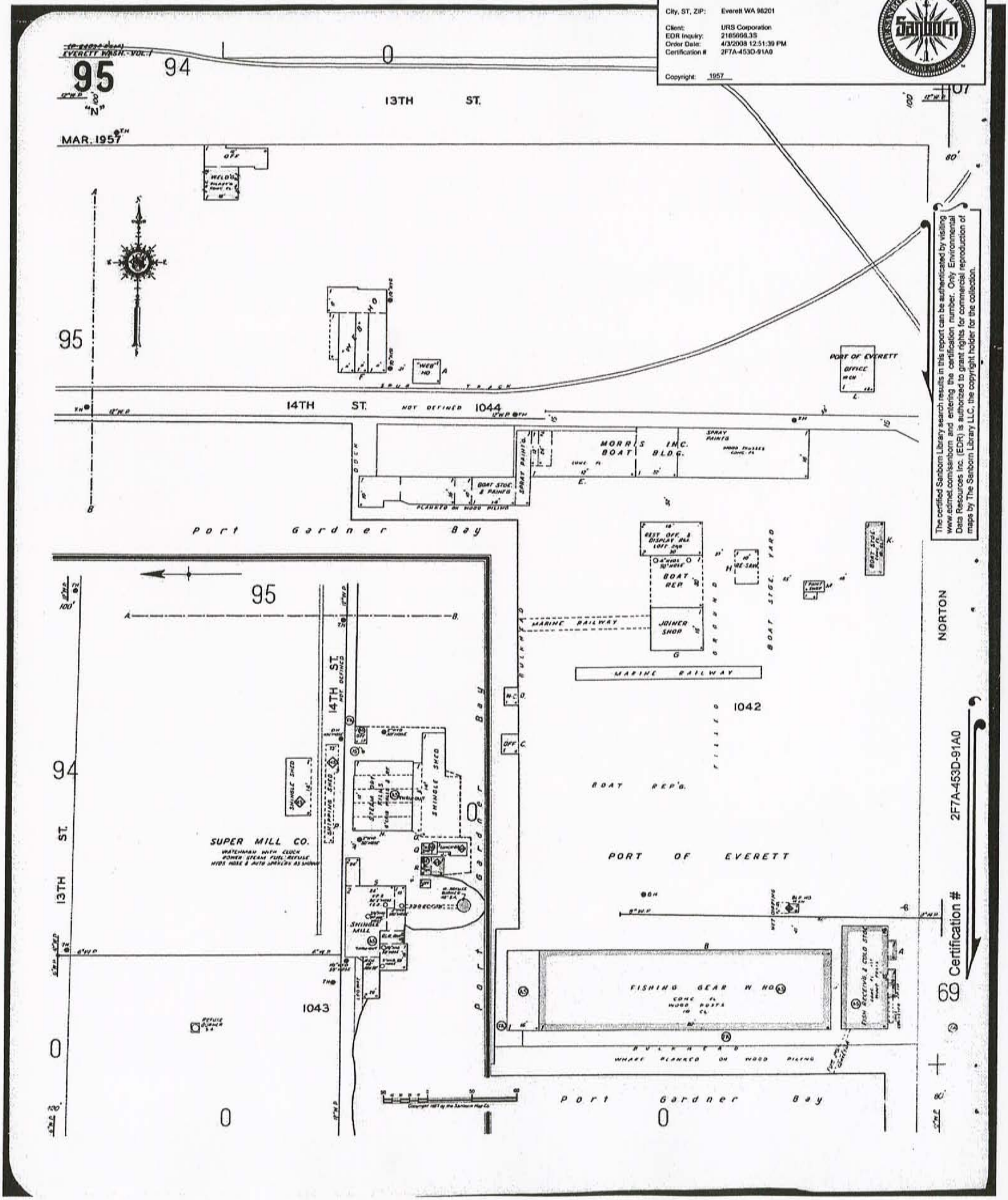

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Certification #

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Address: 1016 14th Street

City, ST, ZIP: Everett WA 98201

Client: URS Corporation
EDR Inquiry: 2185666.3S
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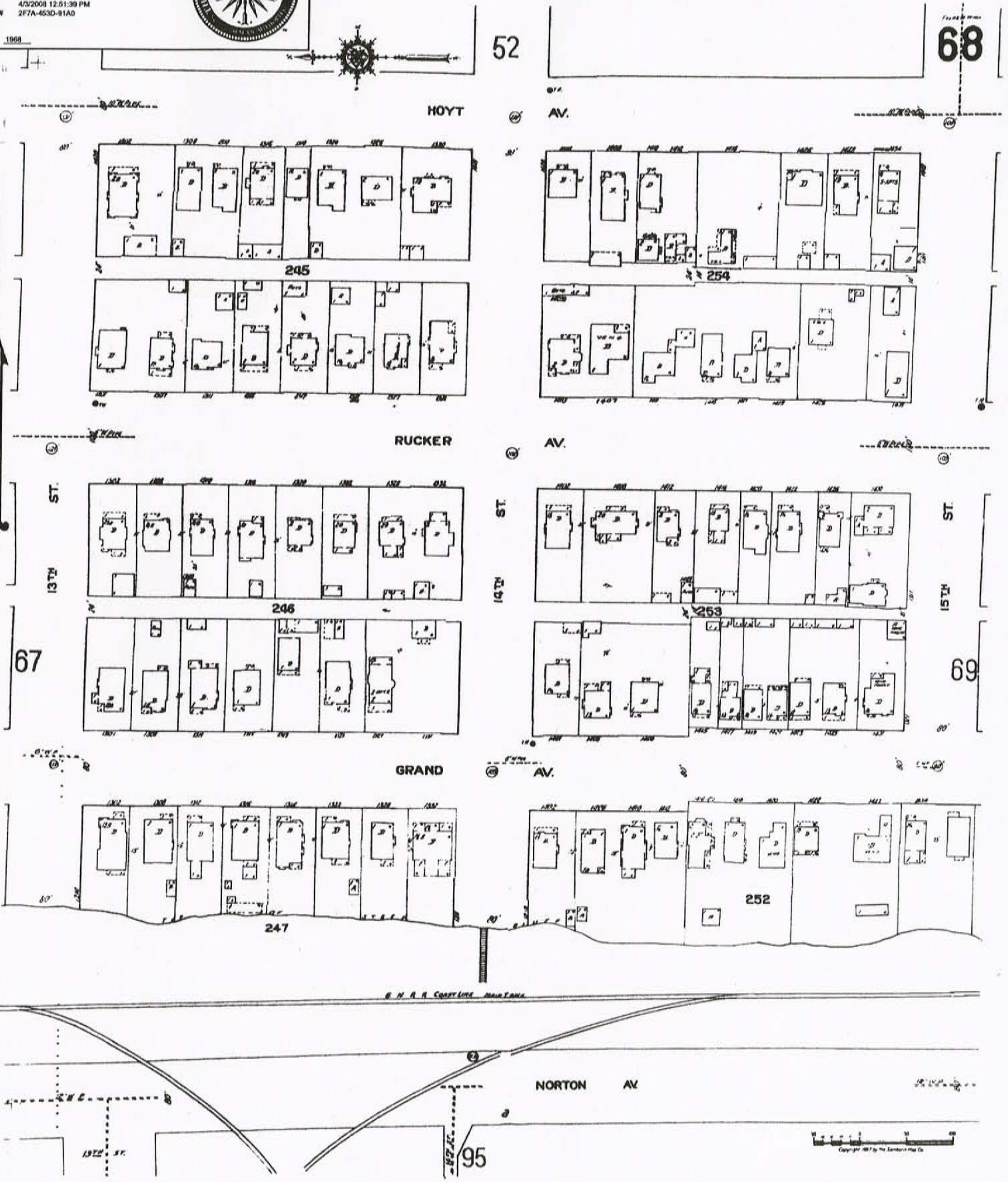

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Address: 1016 14th Street

City, ST, ZIP: Everett WA 98201

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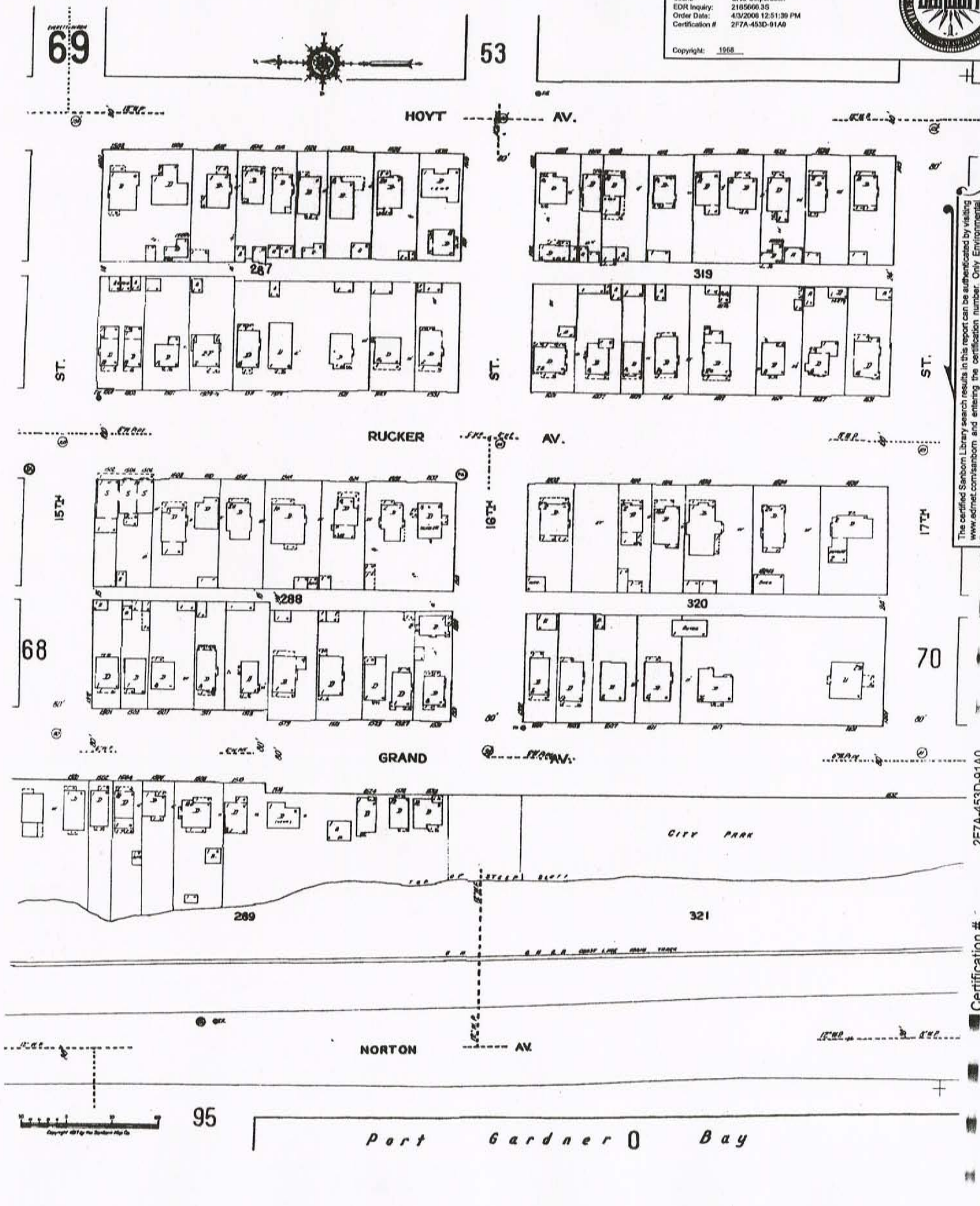

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Address: 1016 14th Street

City, ST, ZIP: Everett WA 98201

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EDR Inquiry: 2185666.3S
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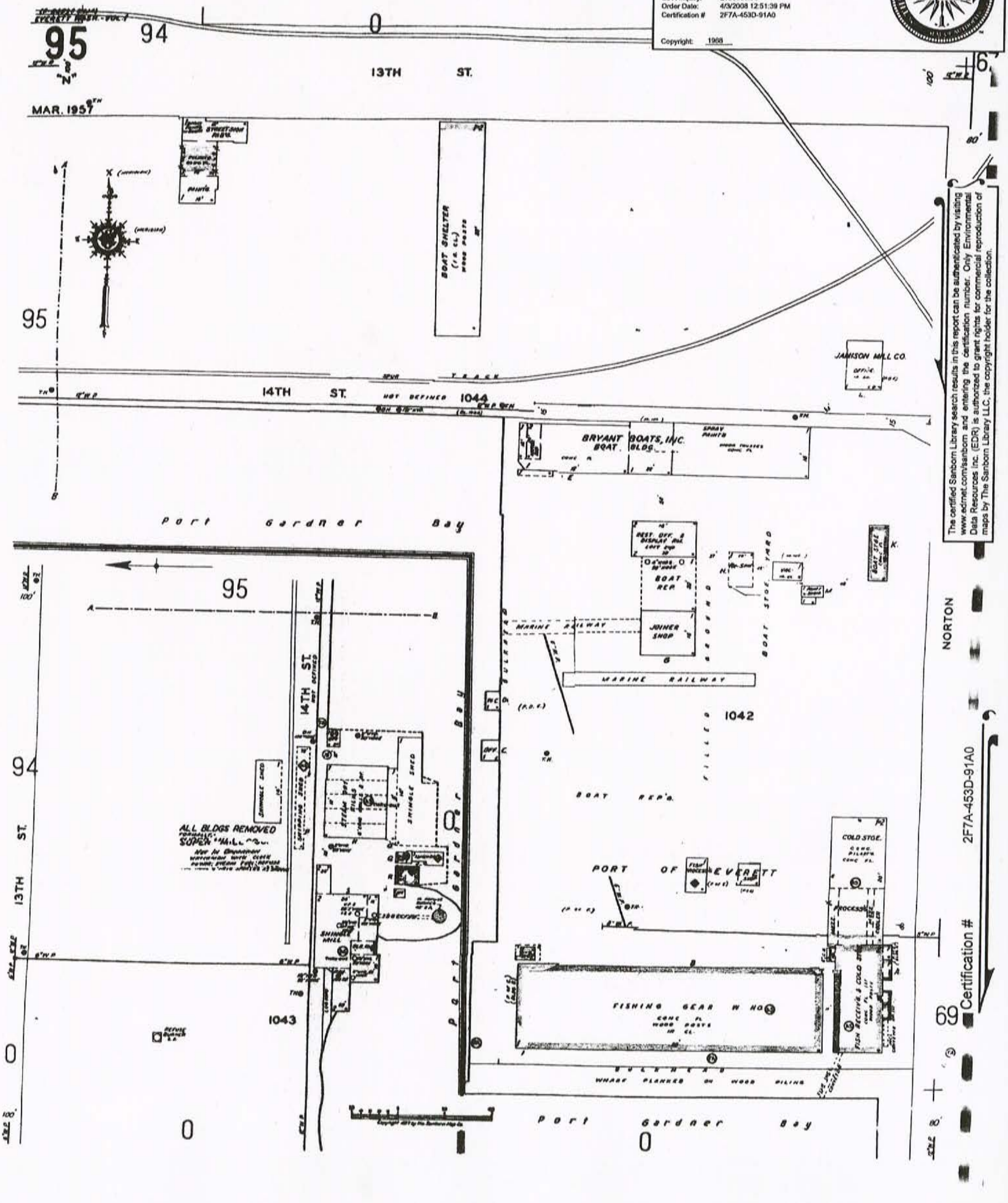

2F7A-453D-91A0

Certification #

EDR Historical Topographic Map Report

Everett Shipyard
1016 14th Street
Everett, WA 98201

Inquiry Number: 2185666.4

April 03, 2008

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Milford, Connecticut 06461

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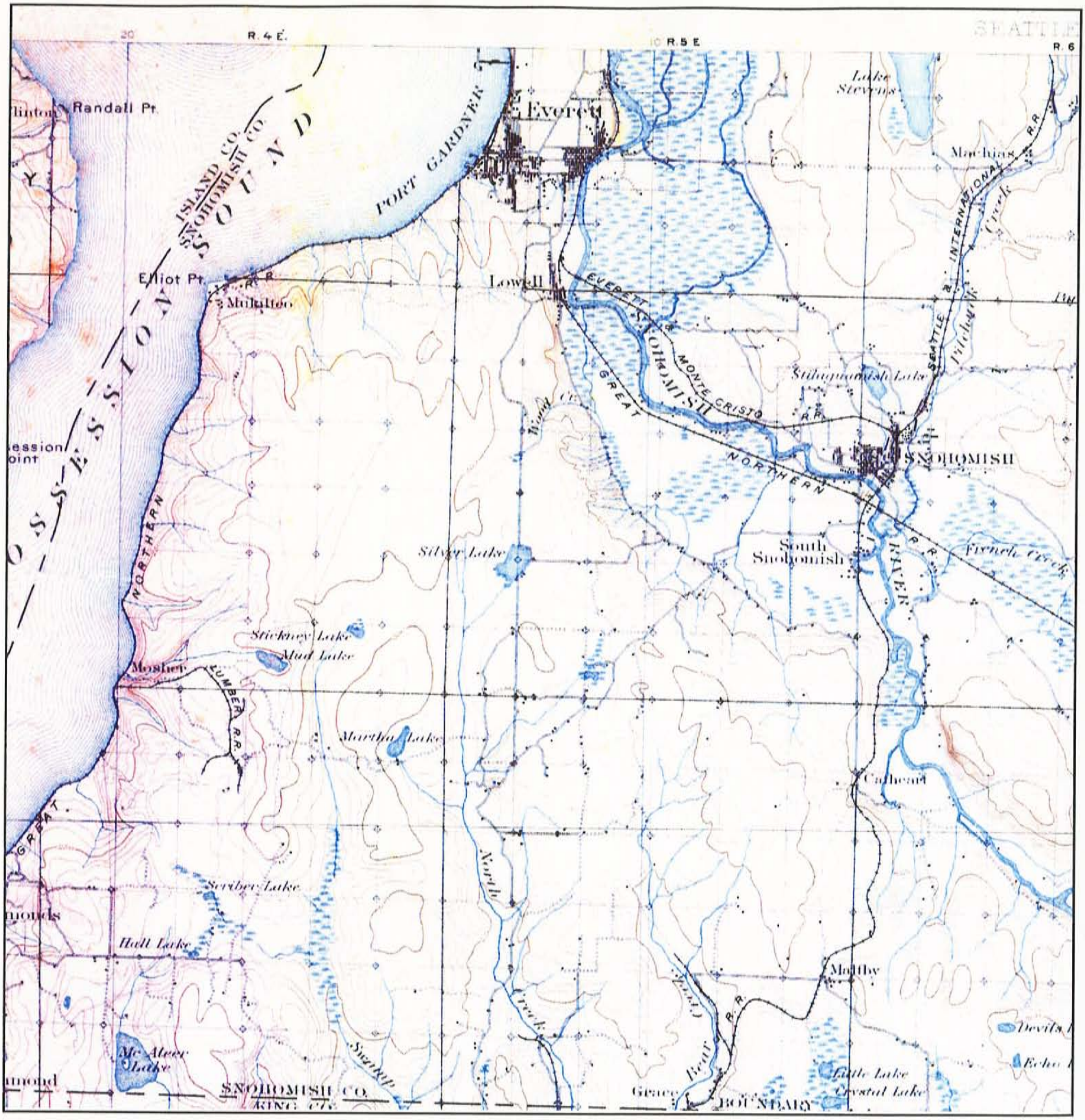
Historical Topographic Map



N

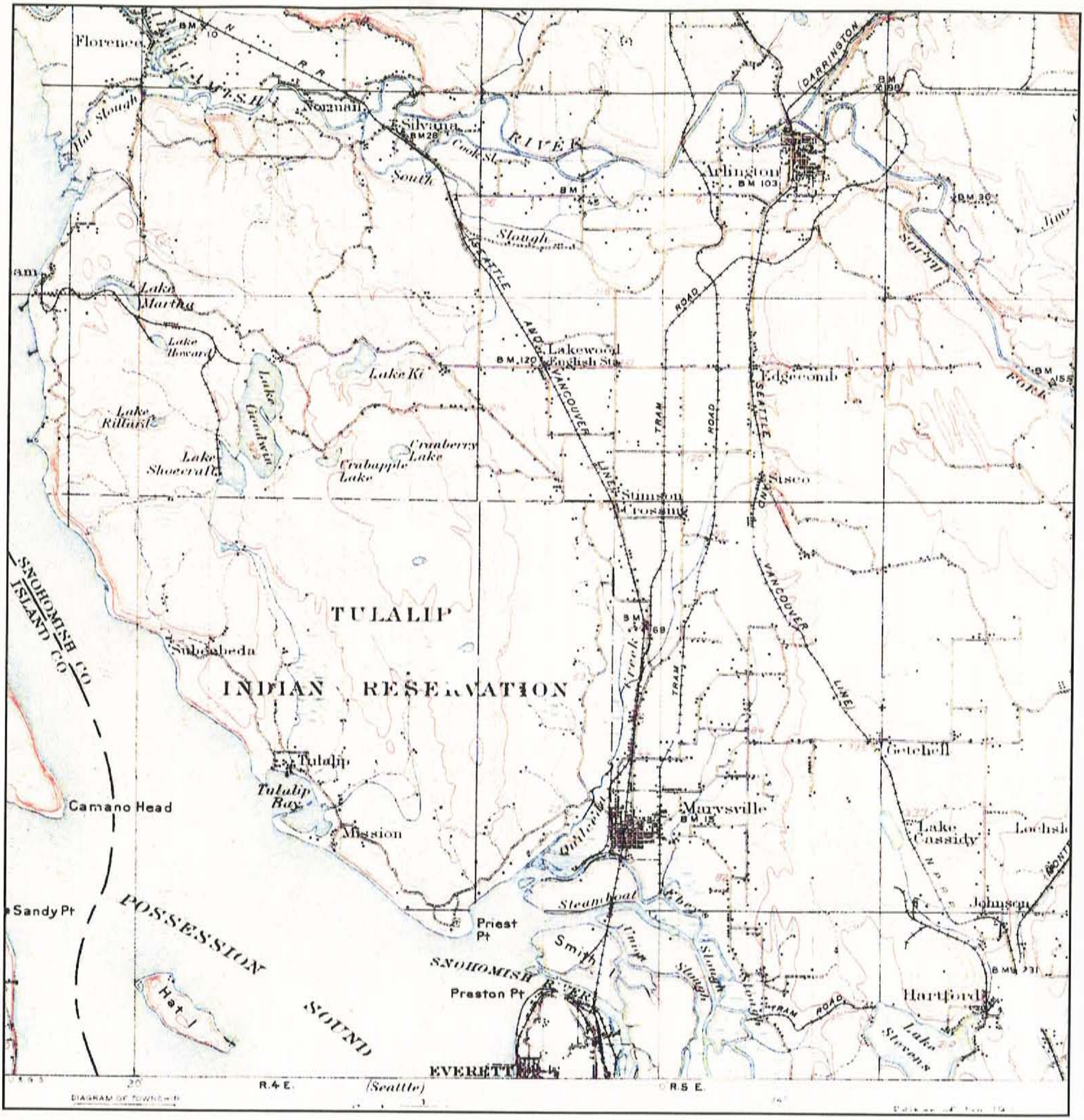
TARGET QUAD
NAME: Seattle, WA
MAP YEAR: 1897

SERIES: 30
SCALE: 1:125,000

SITE NAME: Everett Shipyard
ADDRESS: 1016 14th Street
Everett, WA 98201
LAT/LONG: 47.9987 / 122.215

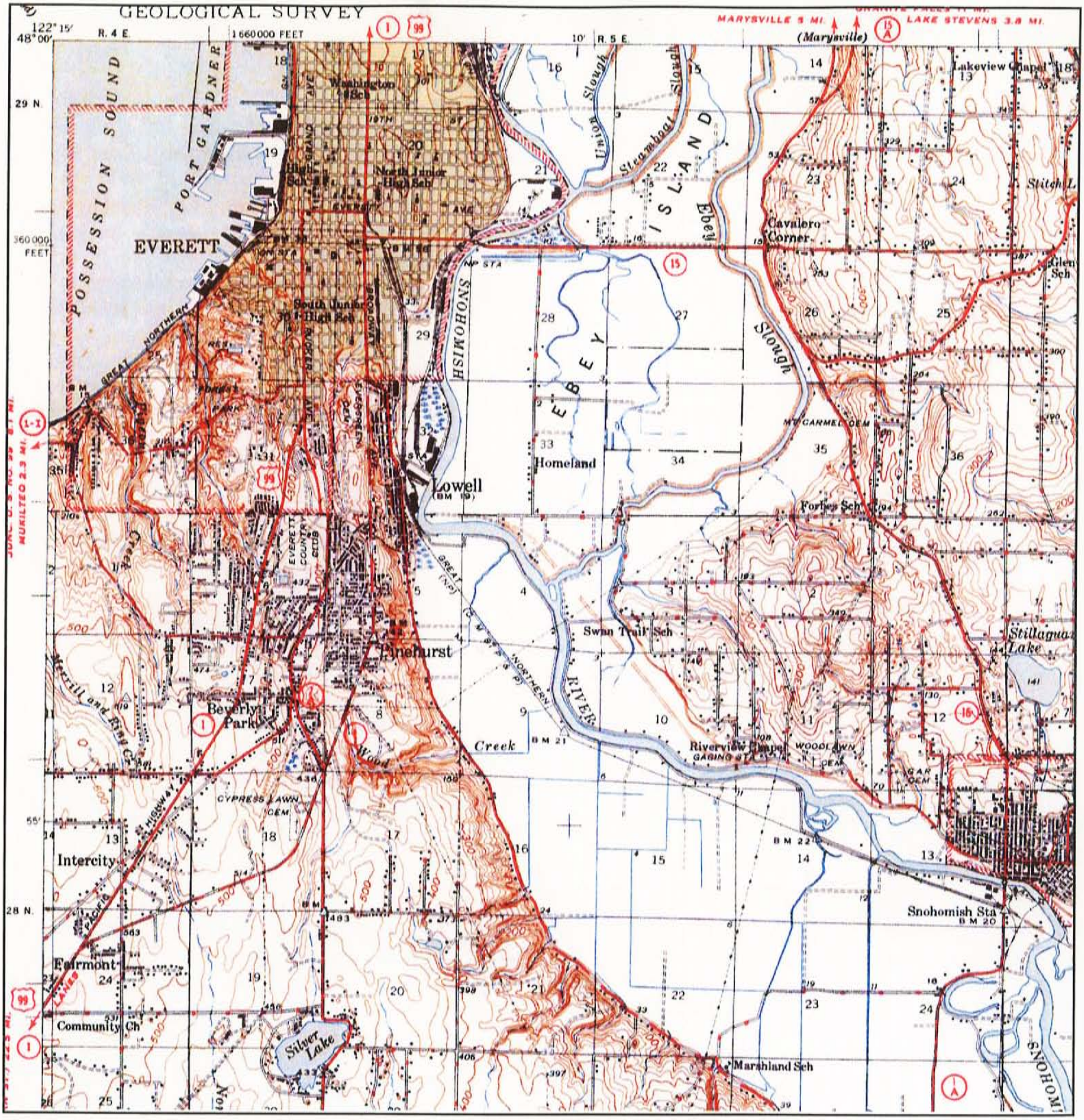
CLIENT: URS Corporation
CONTACT: Al Thatcher
INQUIRY#: 2185666.4
RESEARCH DATE: 04/03/2008

Historical Topographic Map



N ADJOINING QUAD NAME: Mount Vernon, WA MAP YEAR: 1911 SERIES: 30 SCALE: 1:125,000	SITE NAME: Everett Shipyard ADDRESS: 1016 14th Street Everett, WA 98201 LAT/LONG: 47.9987 / 122.215	CLIENT: URS Corporation CONTACT: Al Thatcher INQUIRY#: 2185666.4 RESEARCH DATE: 04/03/2008

Historical Topographic Map



N

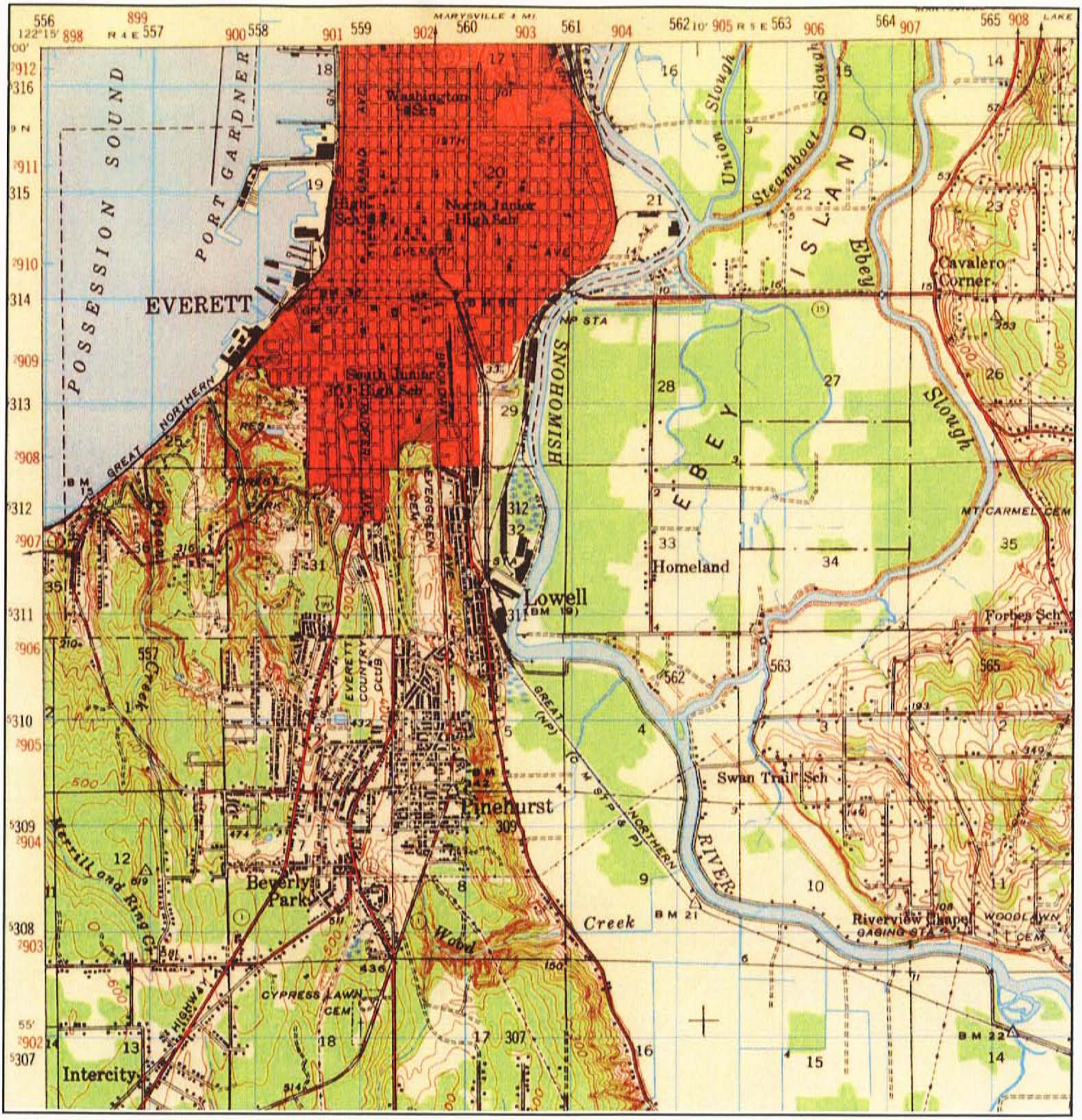
TARGET QUAD
NAME: Everett, WA
MAP YEAR: 1944

SERIES: 15
SCALE: 1:62,500

SITE NAME: Everett Shipyard
ADDRESS: 1016 14th Street
Everett, WA 98201
LAT/LONG: 47.9987 / 122.215

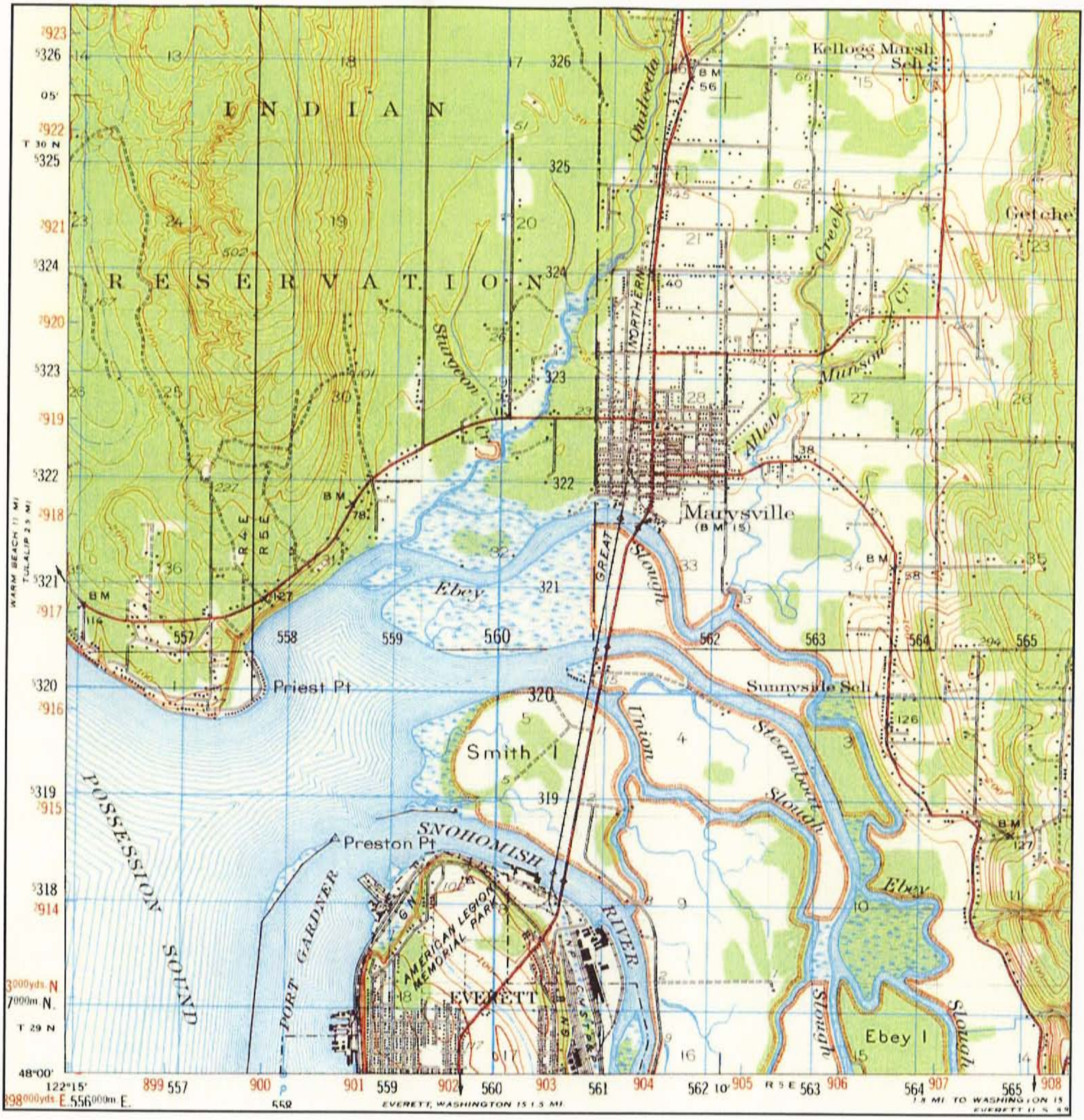
CLIENT: URS Corporation
CONTACT: Al Thatcher
INQUIRY#: 2185666.4
RESEARCH DATE: 04/03/2008

Historical Topographic Map



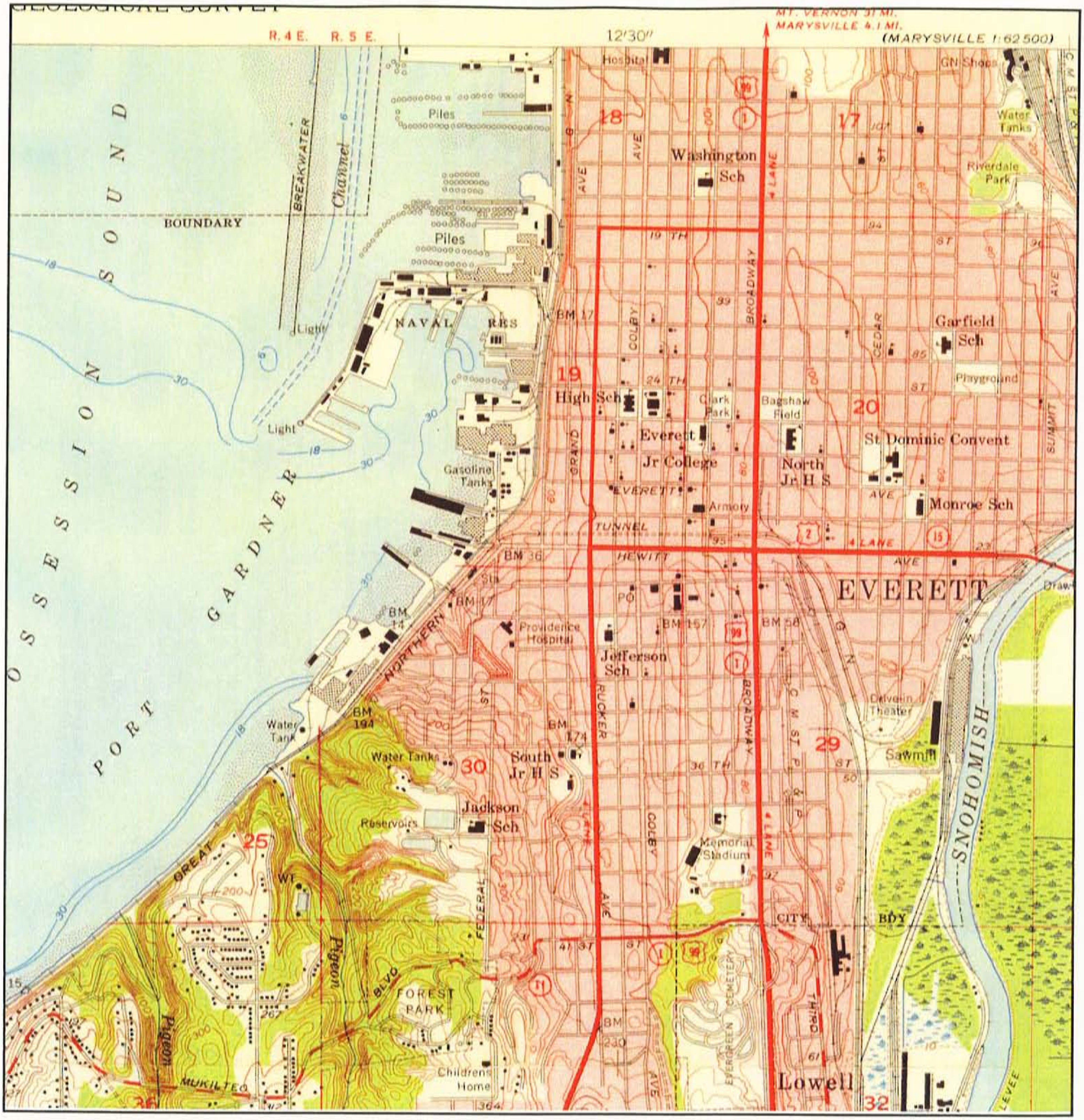
TARGET QUAD NAME: Everett, WA MAP YEAR: 1947 SERIES: 15 SCALE: 1:50,000	SITE NAME: Everett Shipyard ADDRESS: 1016 14th Street Everett, WA 98201 LAT/LONG: 47.9987 / 122.215	CLIENT: URS Corporation CONTACT: Al Thatcher INQUIRY#: 2185666.4 RESEARCH DATE: 04/03/2008

Historical Topographic Map



N	ADJOINING QUAD NAME: Marysville, WA MAP YEAR: 1947 SERIES: 15 SCALE: 1:50,000	SITE NAME: Everett Shipyard ADDRESS: 1016 14th Street Everett, WA 98201 LAT/LONG: 47.9987 / 122.215	CLIENT: URS Corporation CONTACT: Al Thatcher INQUIRY#: 2185666.4 RESEARCH DATE: 04/03/2008

Historical Topographic Map



TARGET QUAD NAME: Everett, WA MAP YEAR: 1953 SERIES: 7.5 SCALE: 1:24,000	SITE NAME: Everett Shipyard ADDRESS: 1016 14th Street Everett, WA 98201 LAT/LONG: 47.9987 / 122.215	CLIENT: URS Corporation CONTACT: Al Thatcher INQUIRY#: 2185666.4 RESEARCH DATE: 04/03/2008

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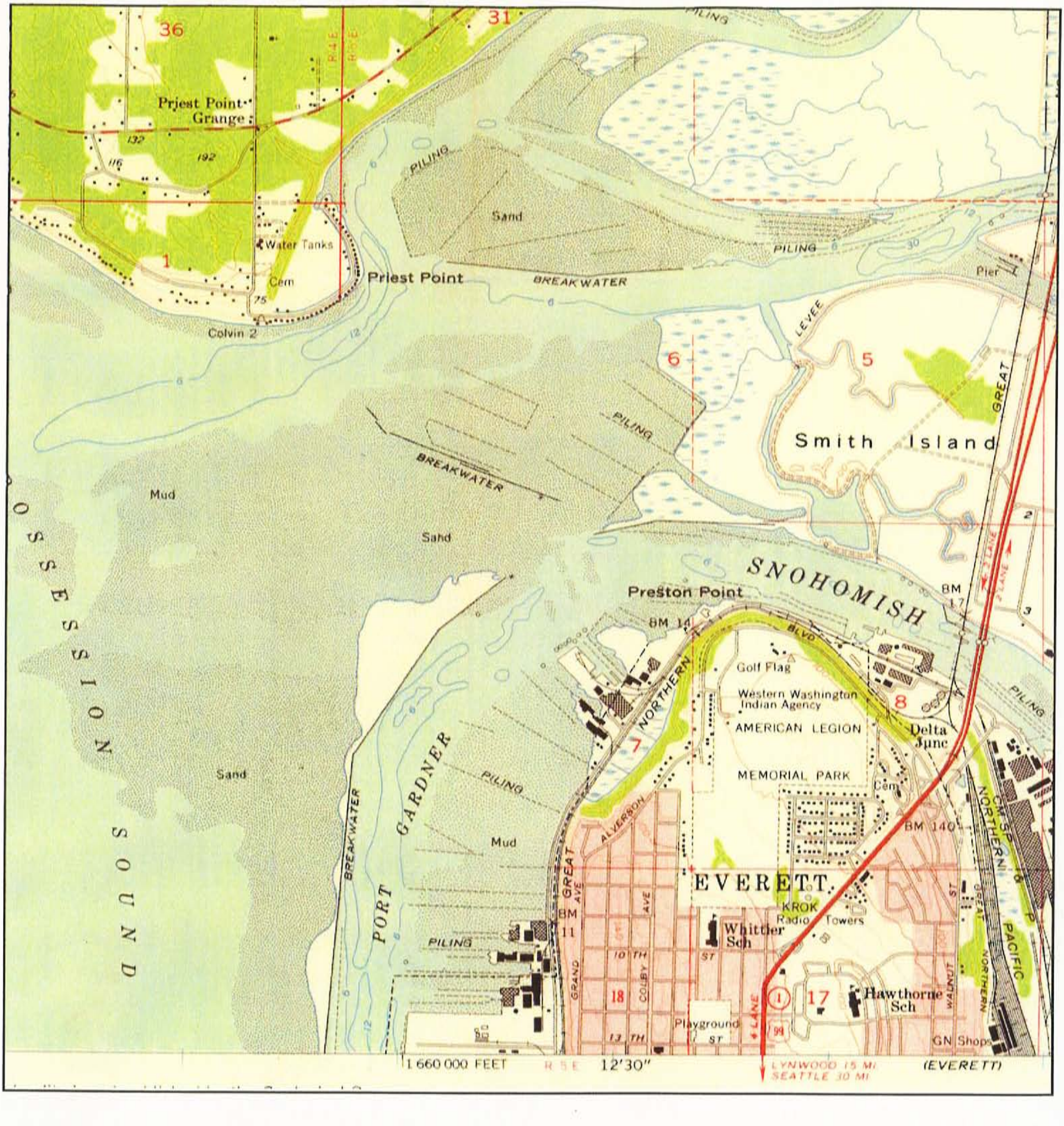
Historical Topographic Map



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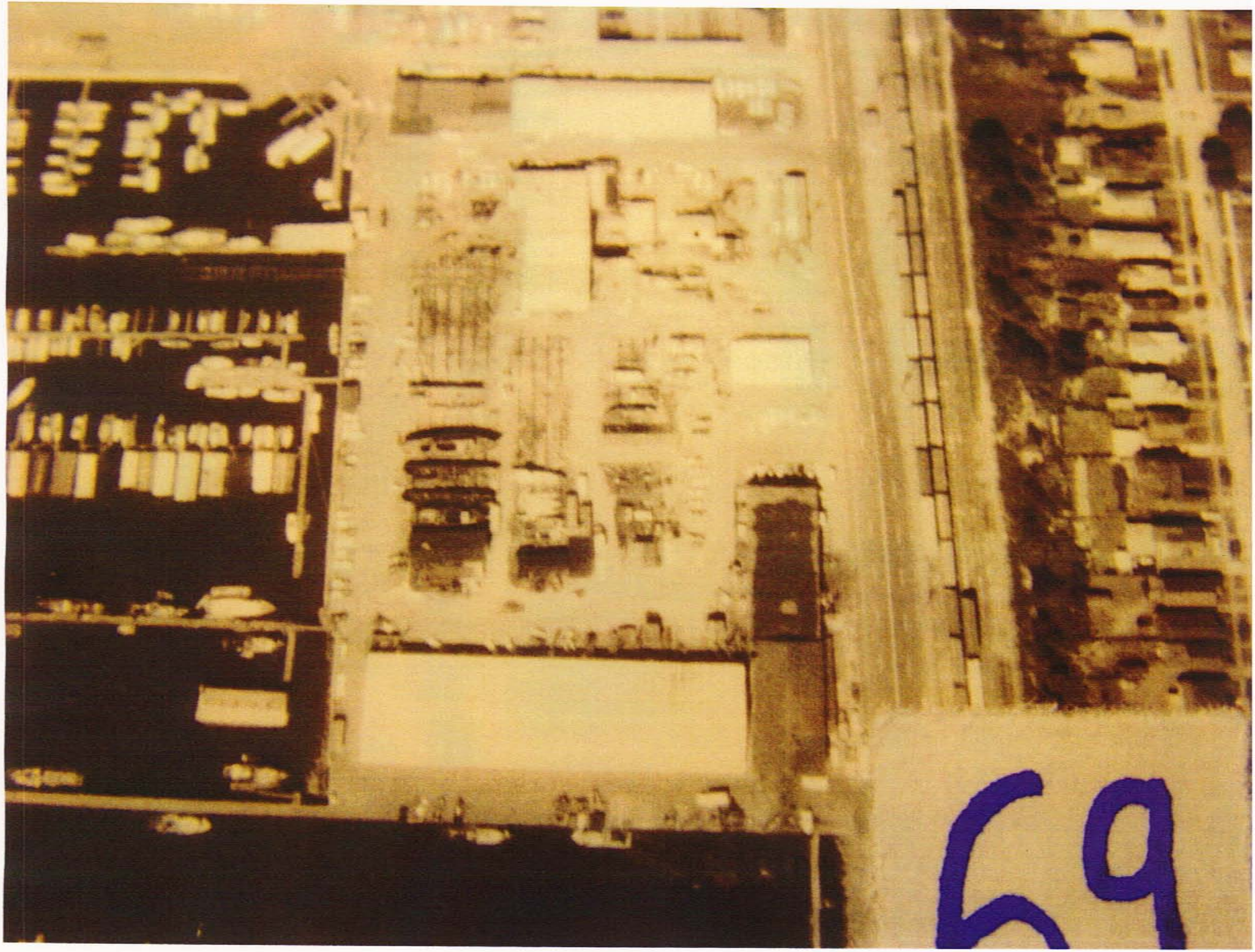
ADJOINING QUAD NAME:	Marysville, WA	SITE NAME:	Everett Shipyard	CLIENT:	URS Corporation
MAP YEAR:	1953	ADDRESS:	1016 14th Street Everett, WA 98201	CONTACT:	Al Thatcher
SERIES:	7.5	LAT/LONG:	47.9987 / 122.215	INQUIRY#:	2185666.4
SCALE:	1:24,000			RESEARCH DATE:	04/03/2008

APPENDIX B

HISTORIC AERIAL PHOTOGRAPHS AND MAPS

1947


65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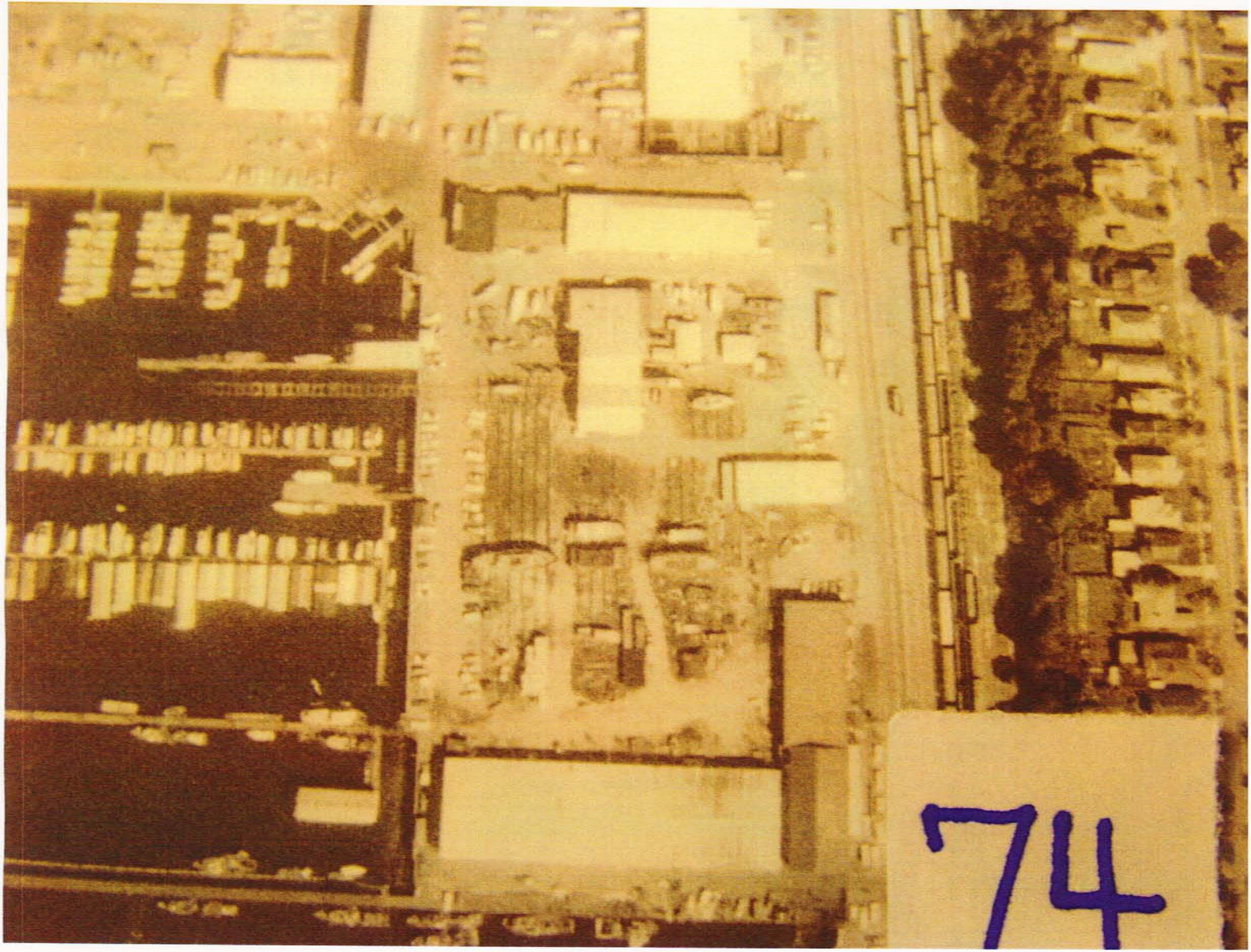
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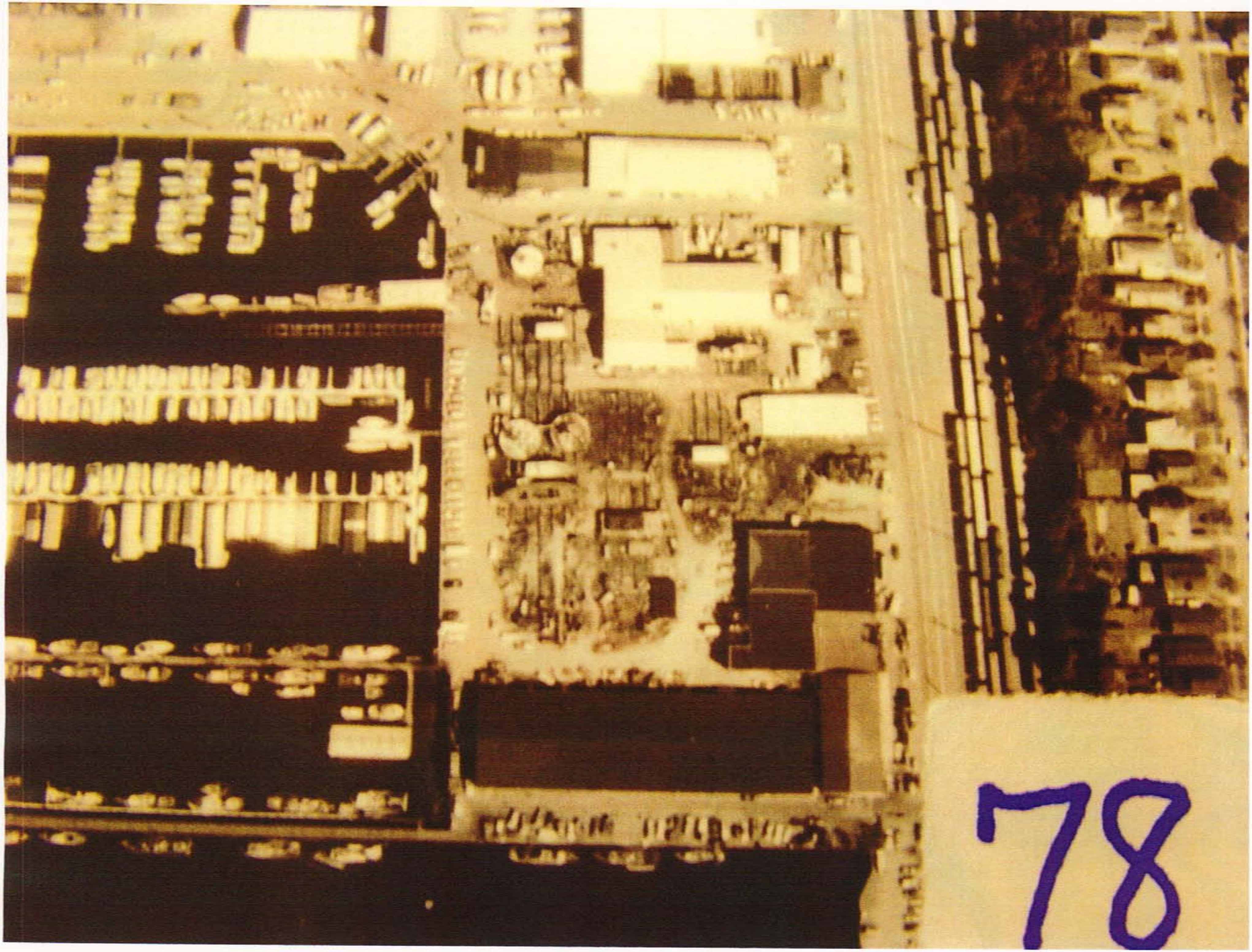
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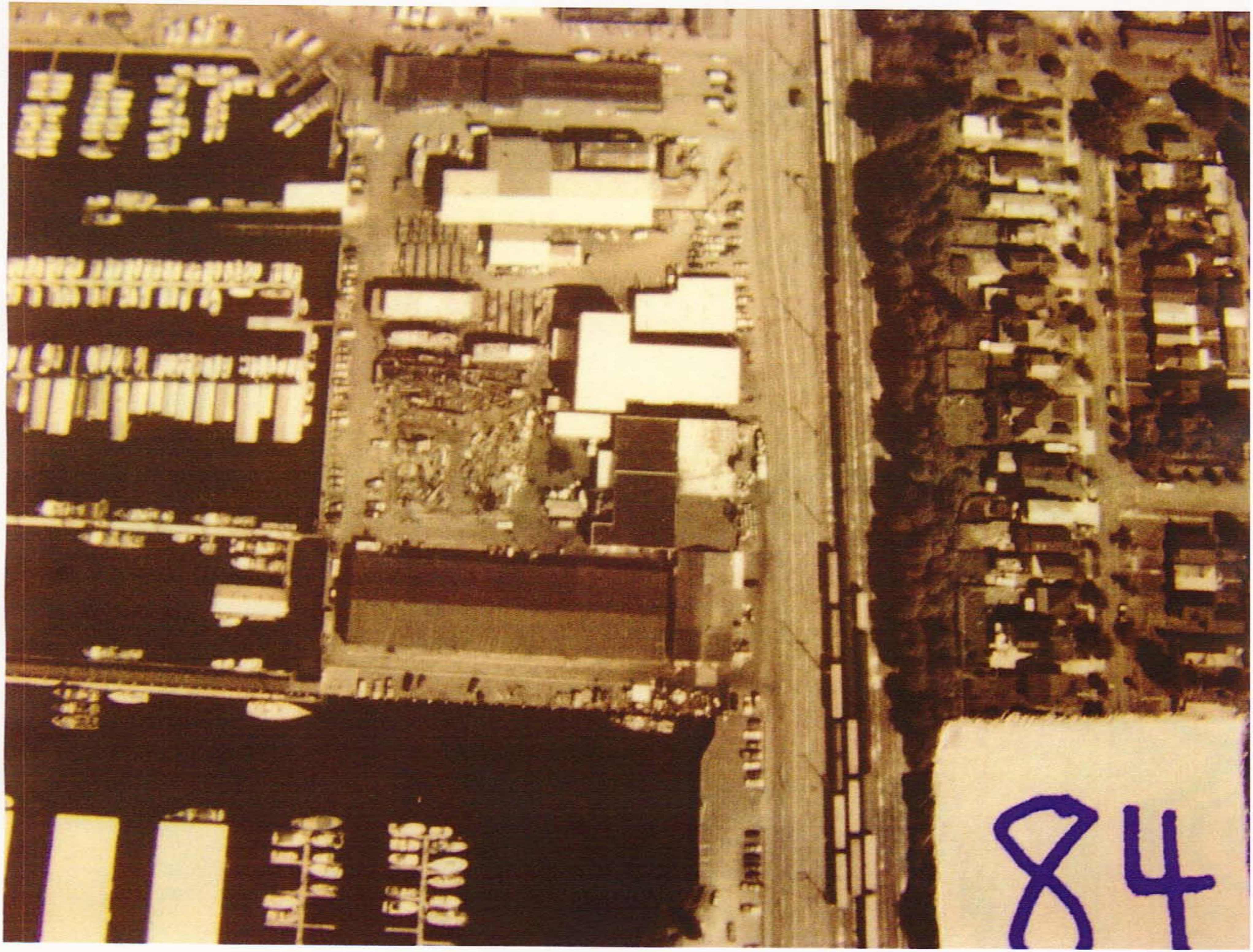

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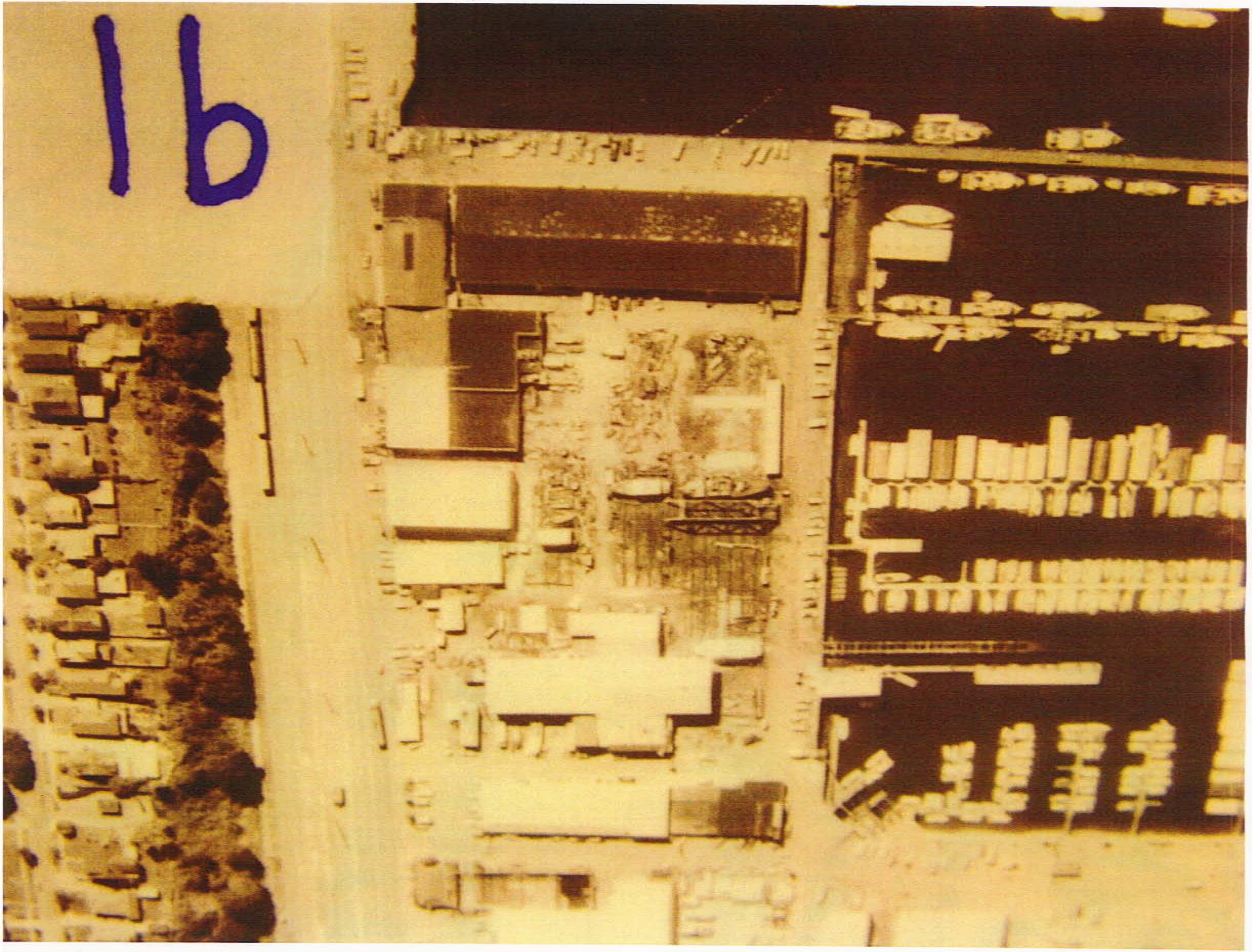
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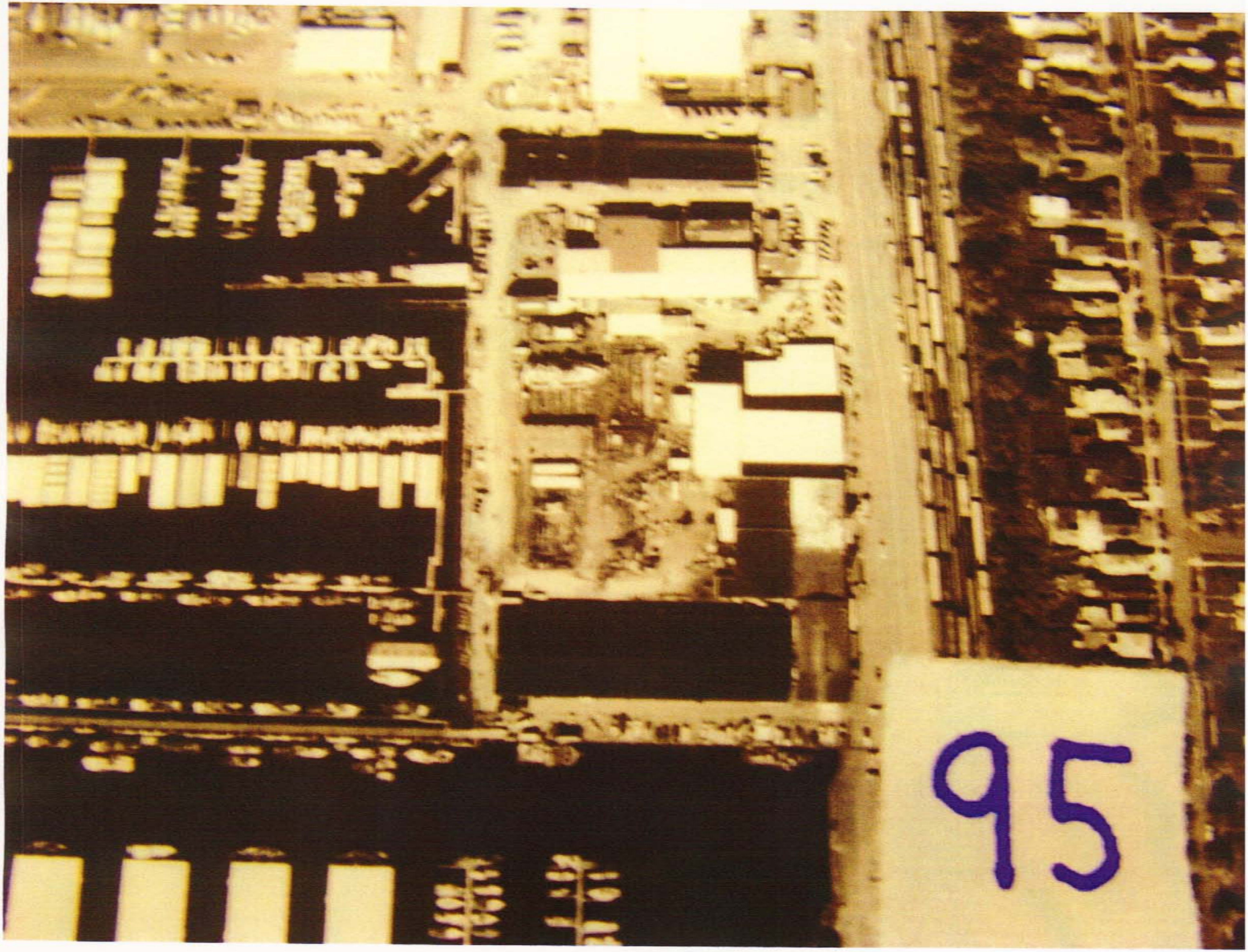

95

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4/03/08

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Everett Shipyard
1016 14th Street
Everett, WA 98201

EDR Inquiry # 2185666.3S

Client Name:
URS Corporation
1501 Fourth Avenue
Seattle, WA 98101

Contact: Al Thatcher

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Site Name: Everett Shipyard
Address: 1016 14th Street
City, State, Zip: Everett, WA 98201
Cross Street:
P.O. # NA
Project: ESY
Certification # 2F7A-453D-91A0

Sanborn® Library search results
Certification # 2F7A-453D-91A0

Maps Identified - Number of maps indicated within "( )"

1968 (3)
1957 (3)
1950 (3)
1914 (3)
1902 (1)

Total Maps: 13

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- ✓ Library of Congress
- ✓ University Publications of America
- ✓ EDR Private Collection

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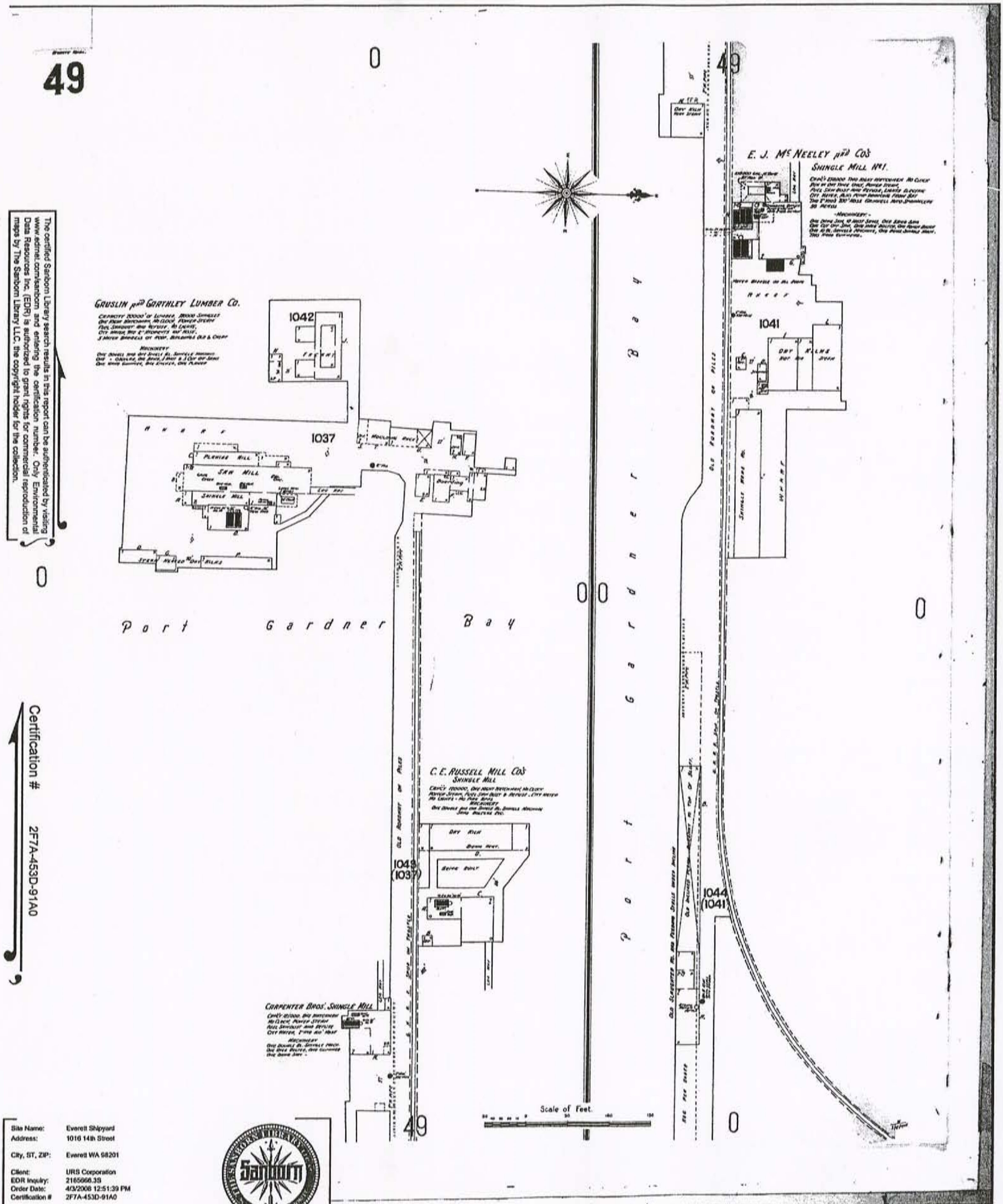

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City, ST, ZIP: Everett WA 98201

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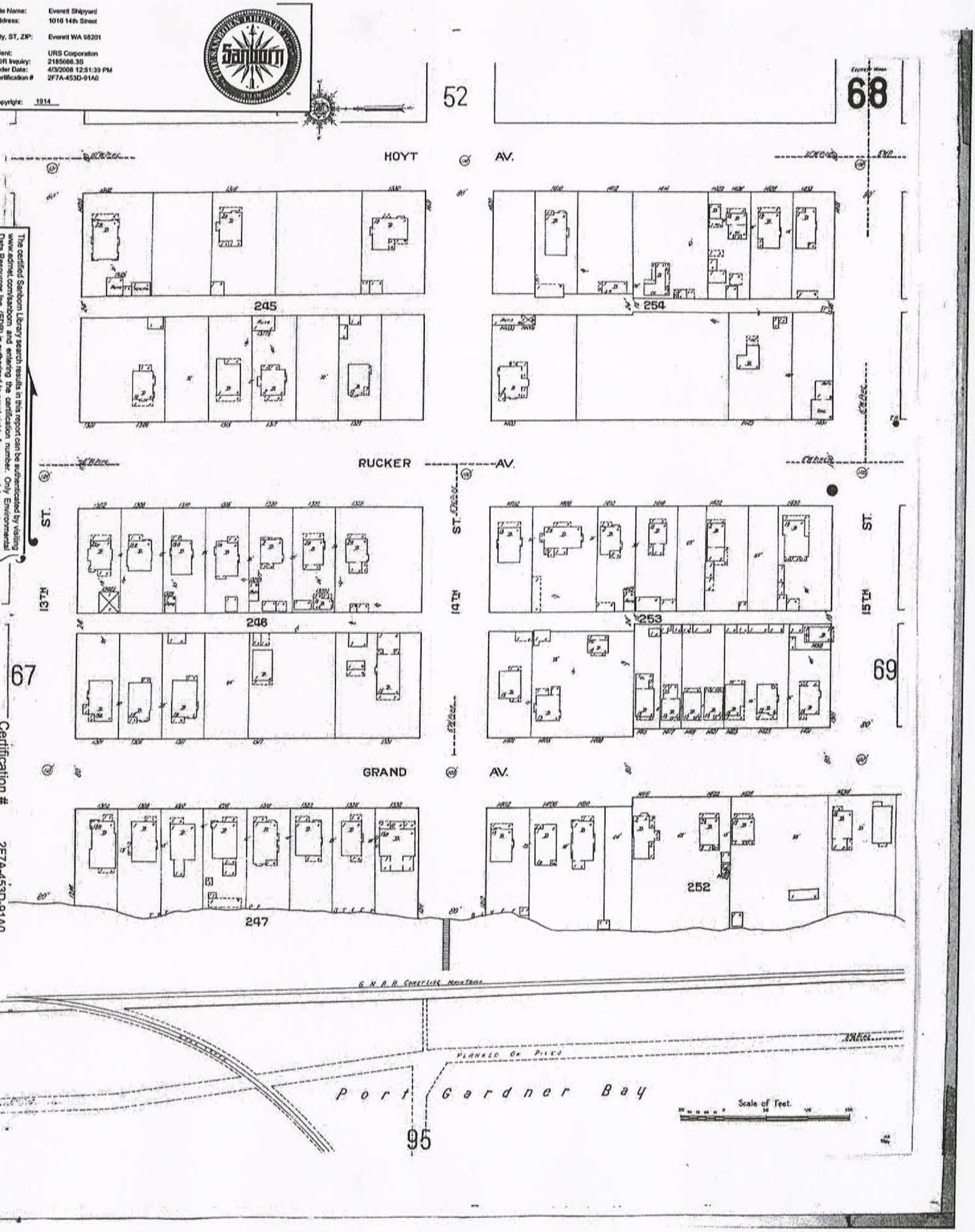
Copyright: 1914



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City, ST, ZIP: Everett WA 98201

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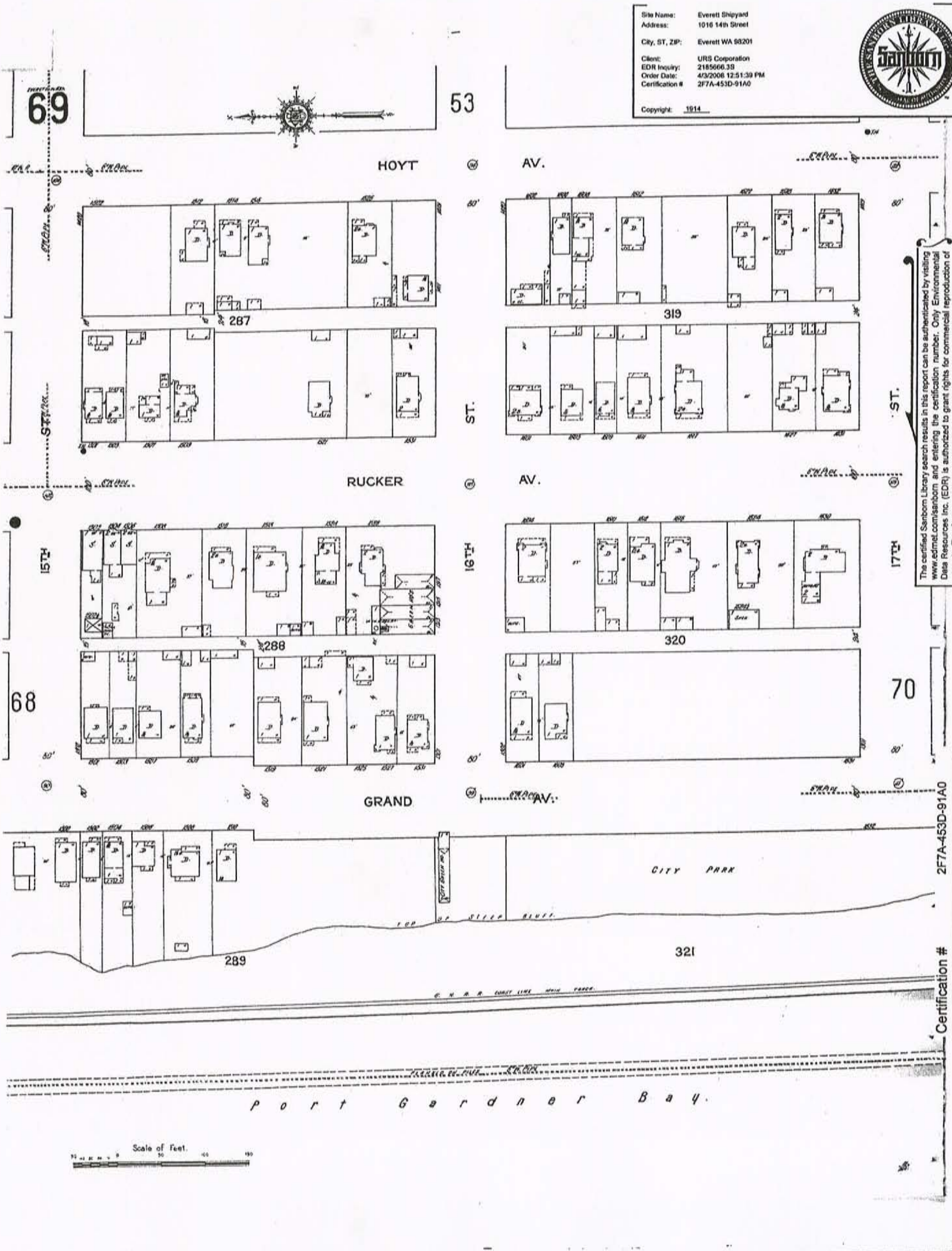
Copyright: 1914



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City, ST, ZIP:	Everett WA 98201
Client:	URS Corporation
EDR Inquiry:	2165666.3S
Order Date:	4/3/2008 12:51:39 PM
Certification #	2F7A-453D-91A0
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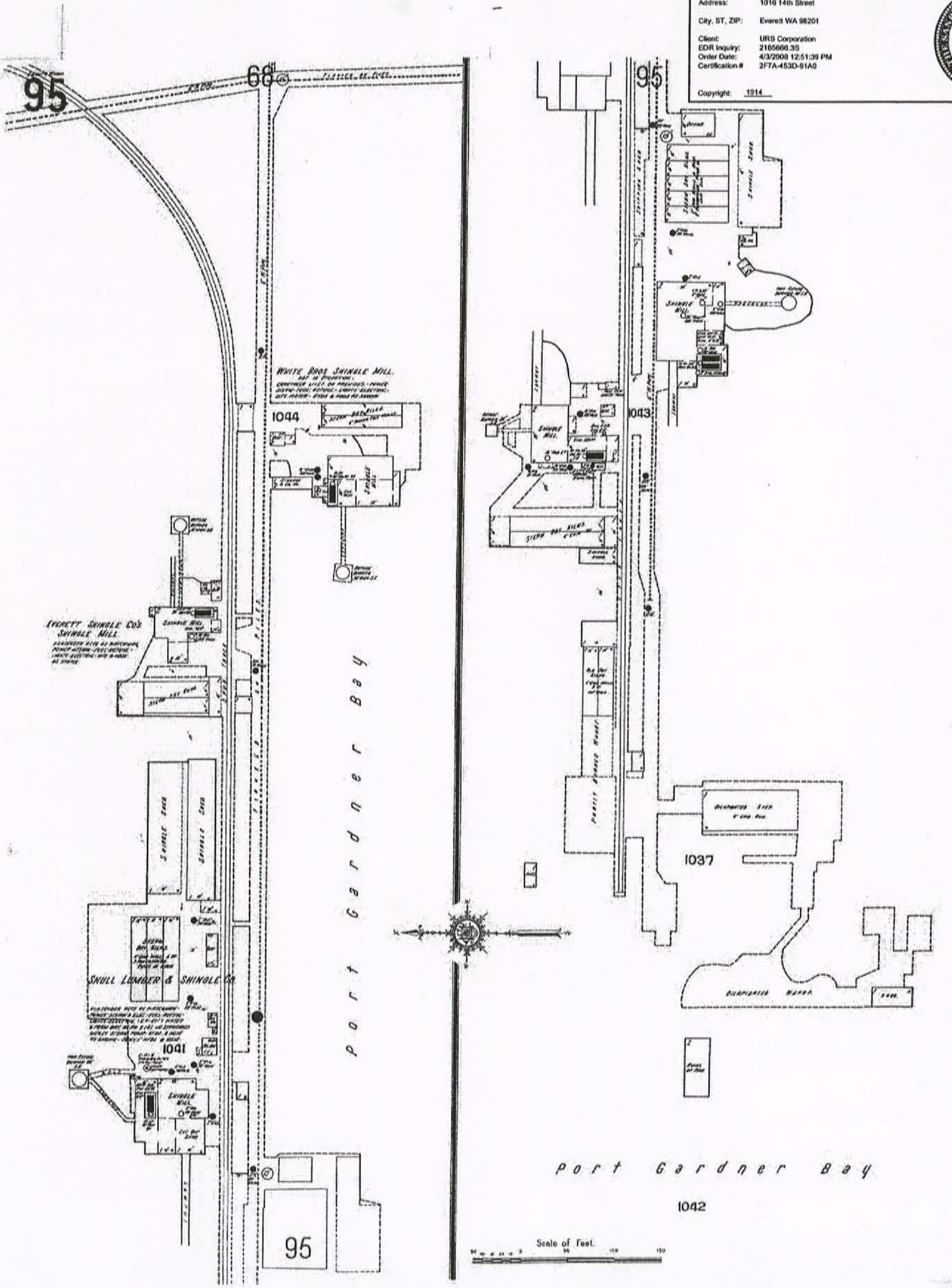

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Address: 1016 14th Street

City, ST, ZIP: Everett WA 98201

Client: URS Corporation
EDR Inquiry: 2185666.3S
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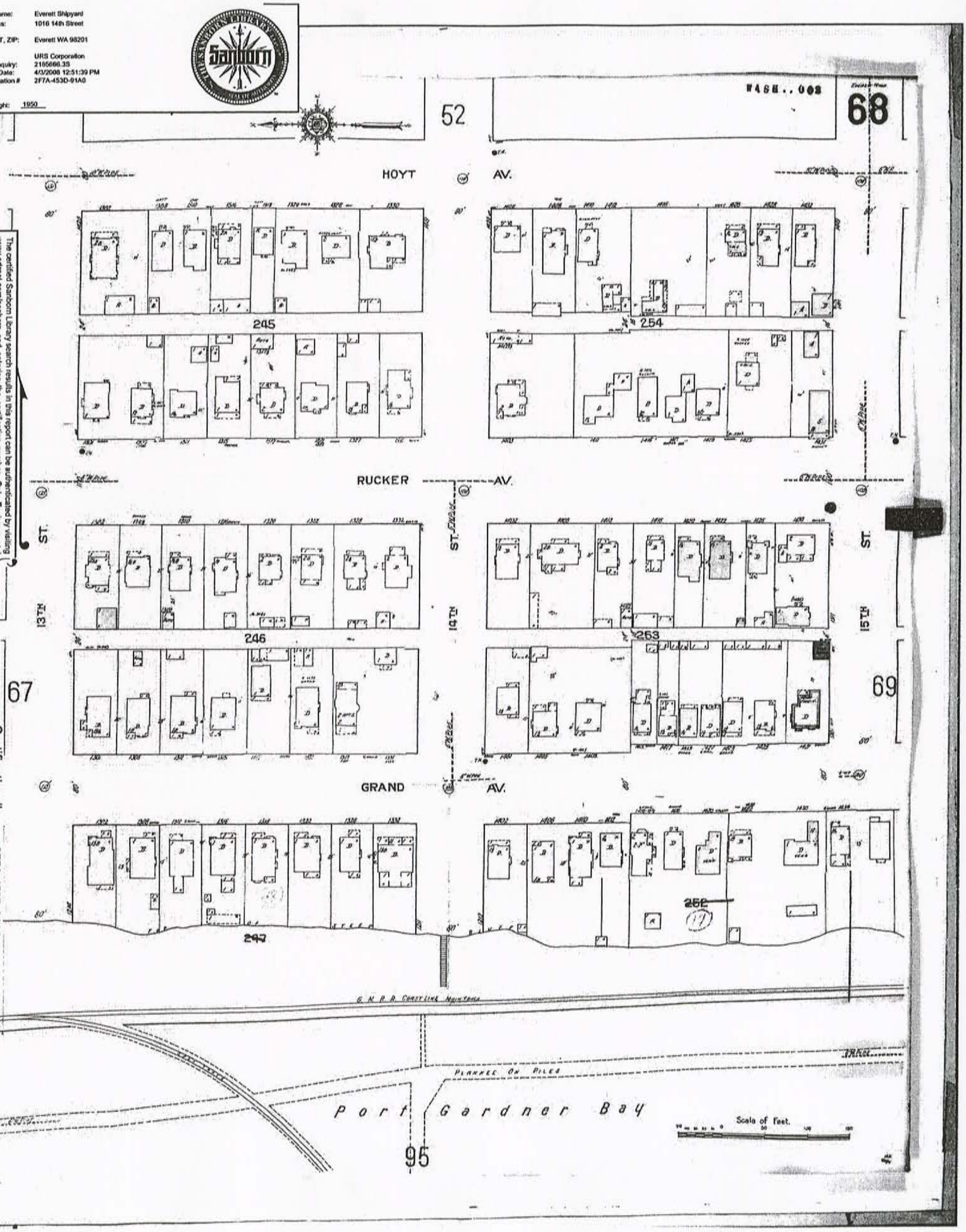
Certification # 2F7A-453D-91A0

Copyright: 1950

Certification # 2F7A-453D-91A0



Site Name: Everett Shipyard
Address: 1016 14th Street

City, ST, ZIP: Everett WA 98201

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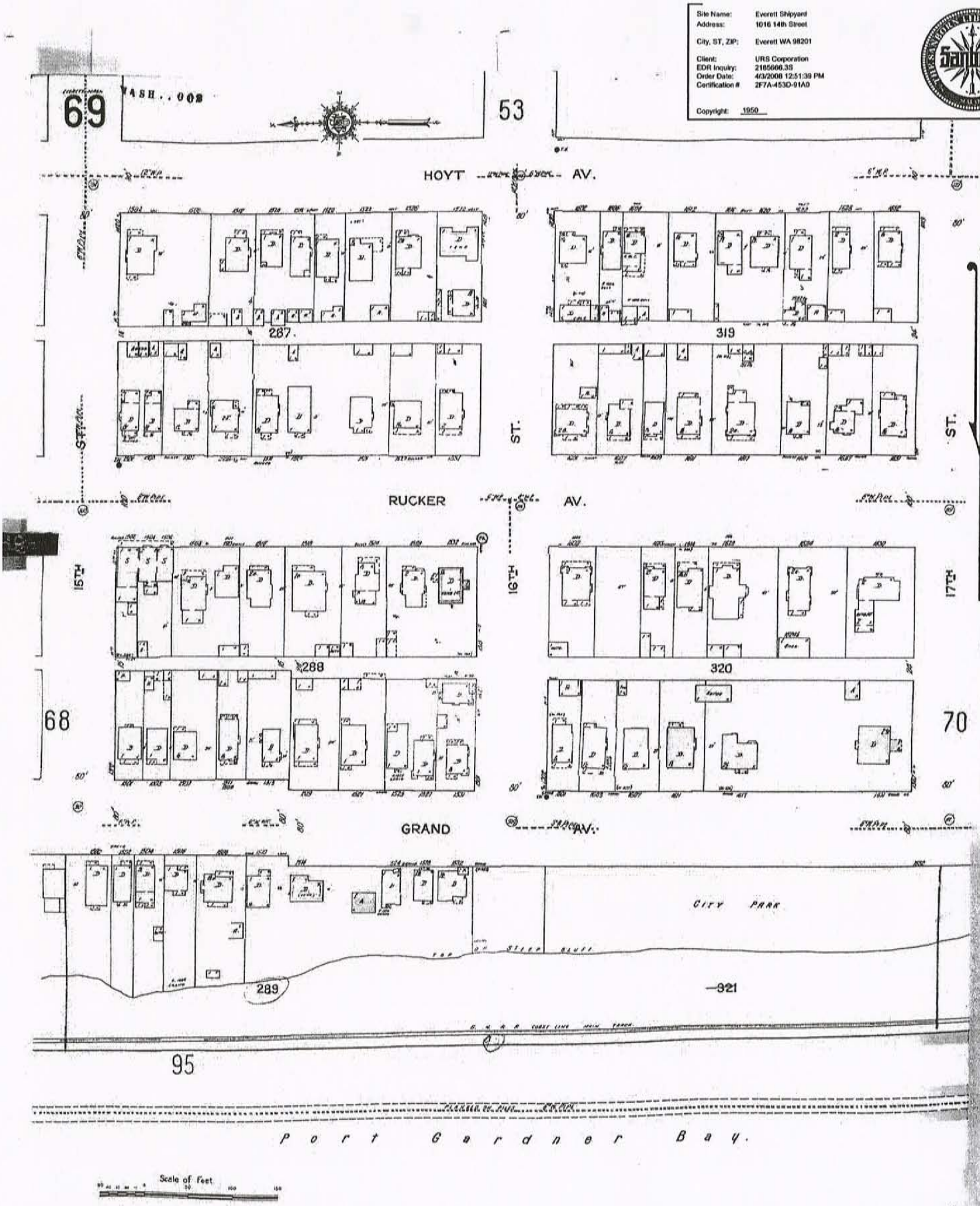

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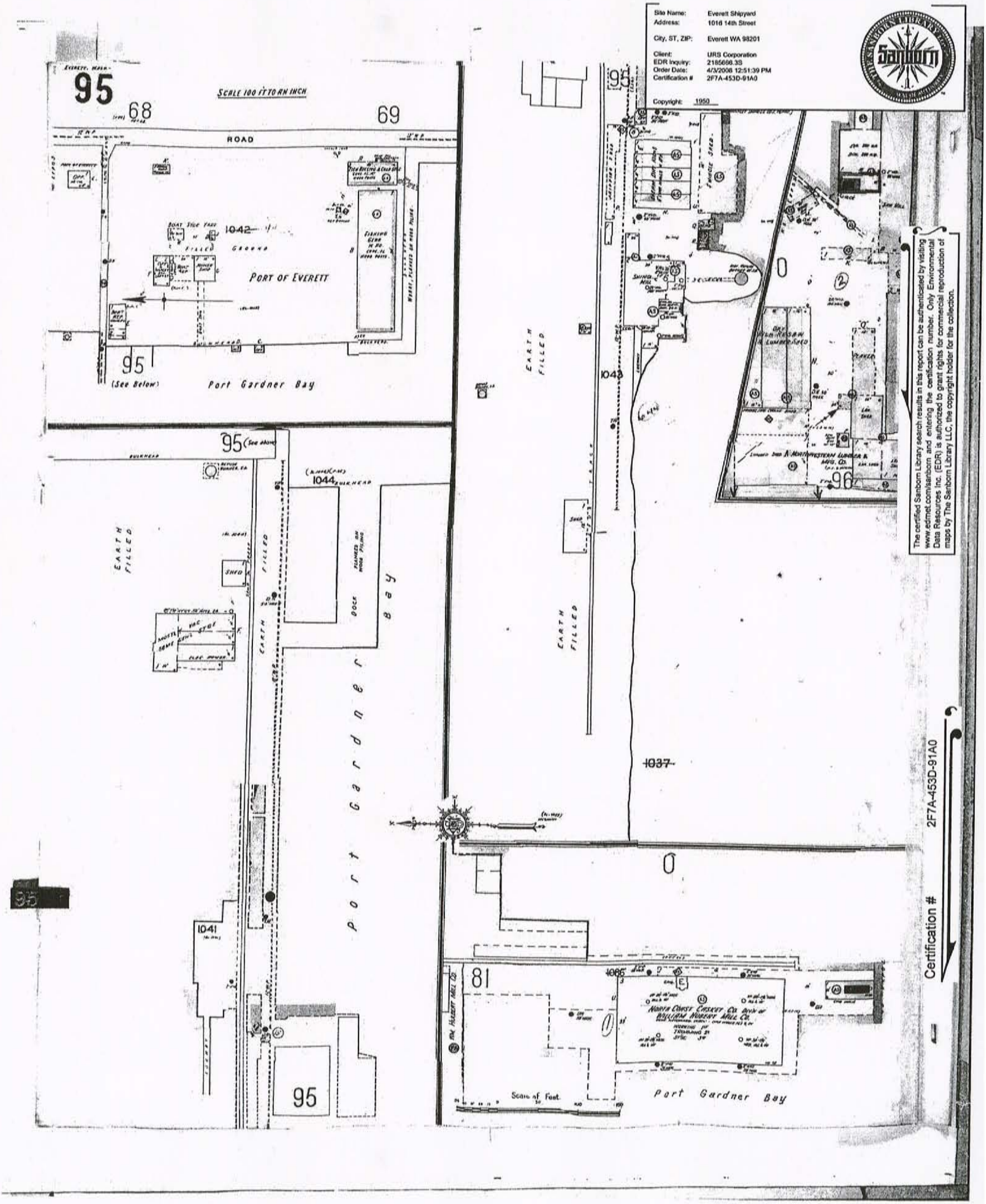

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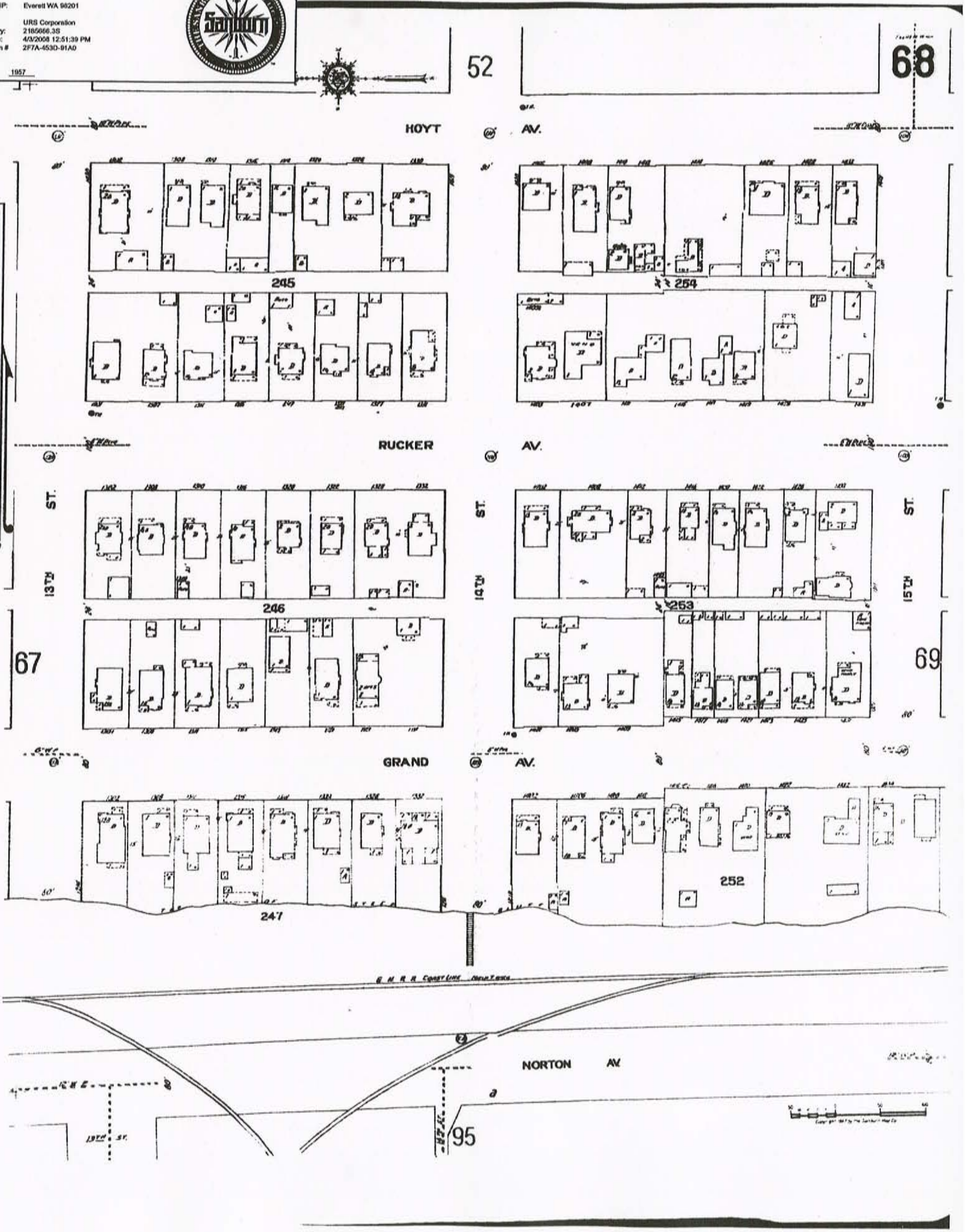

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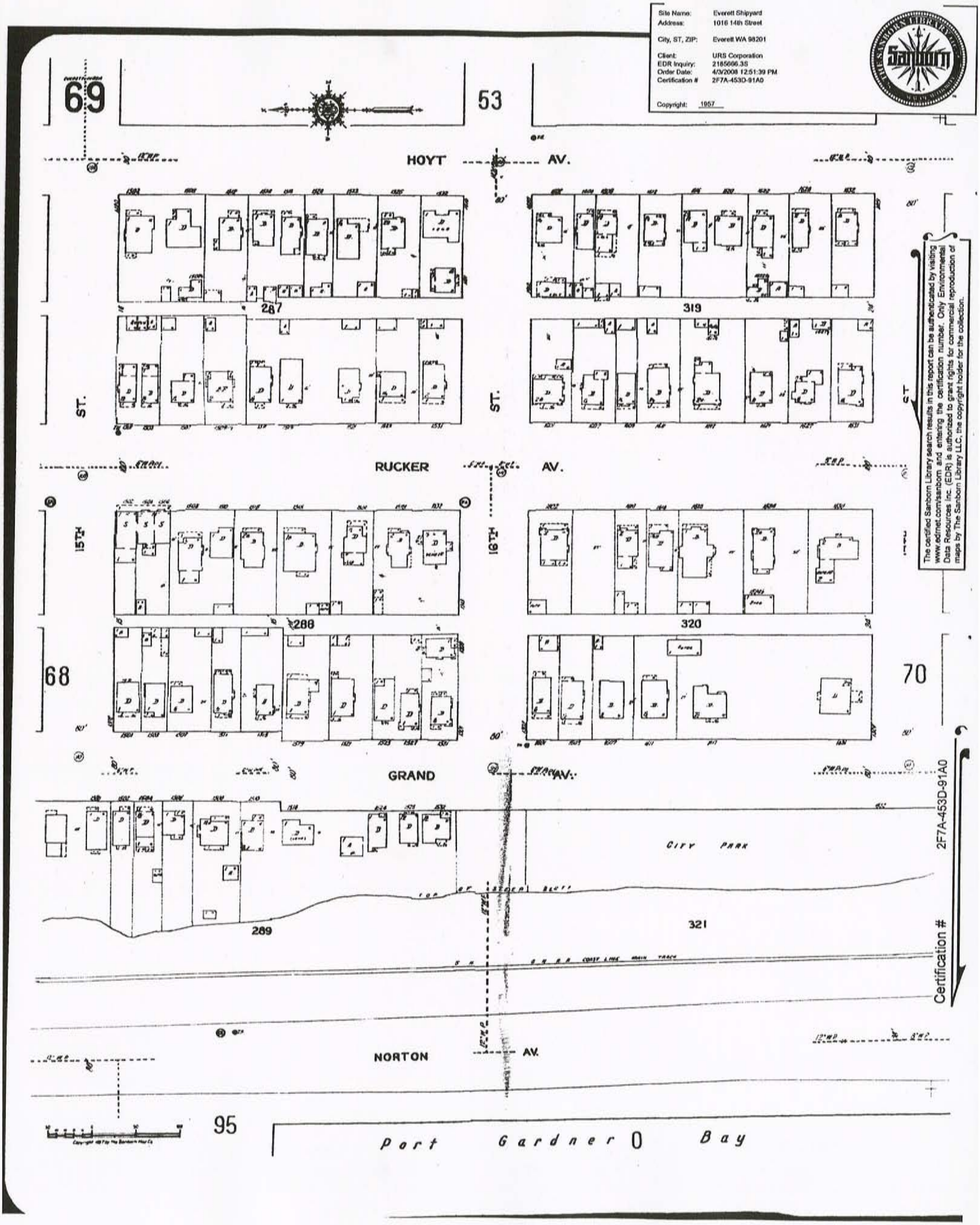

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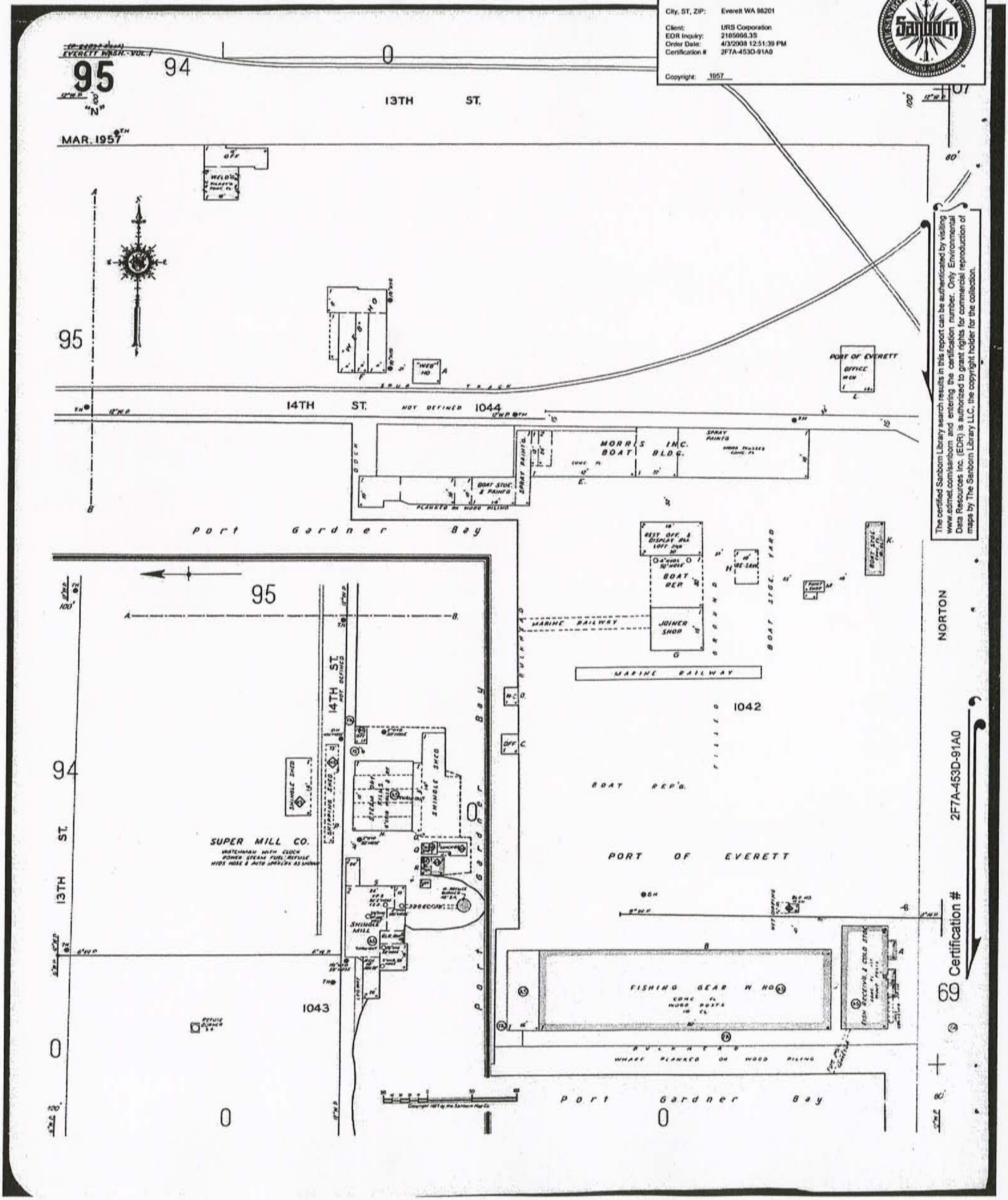

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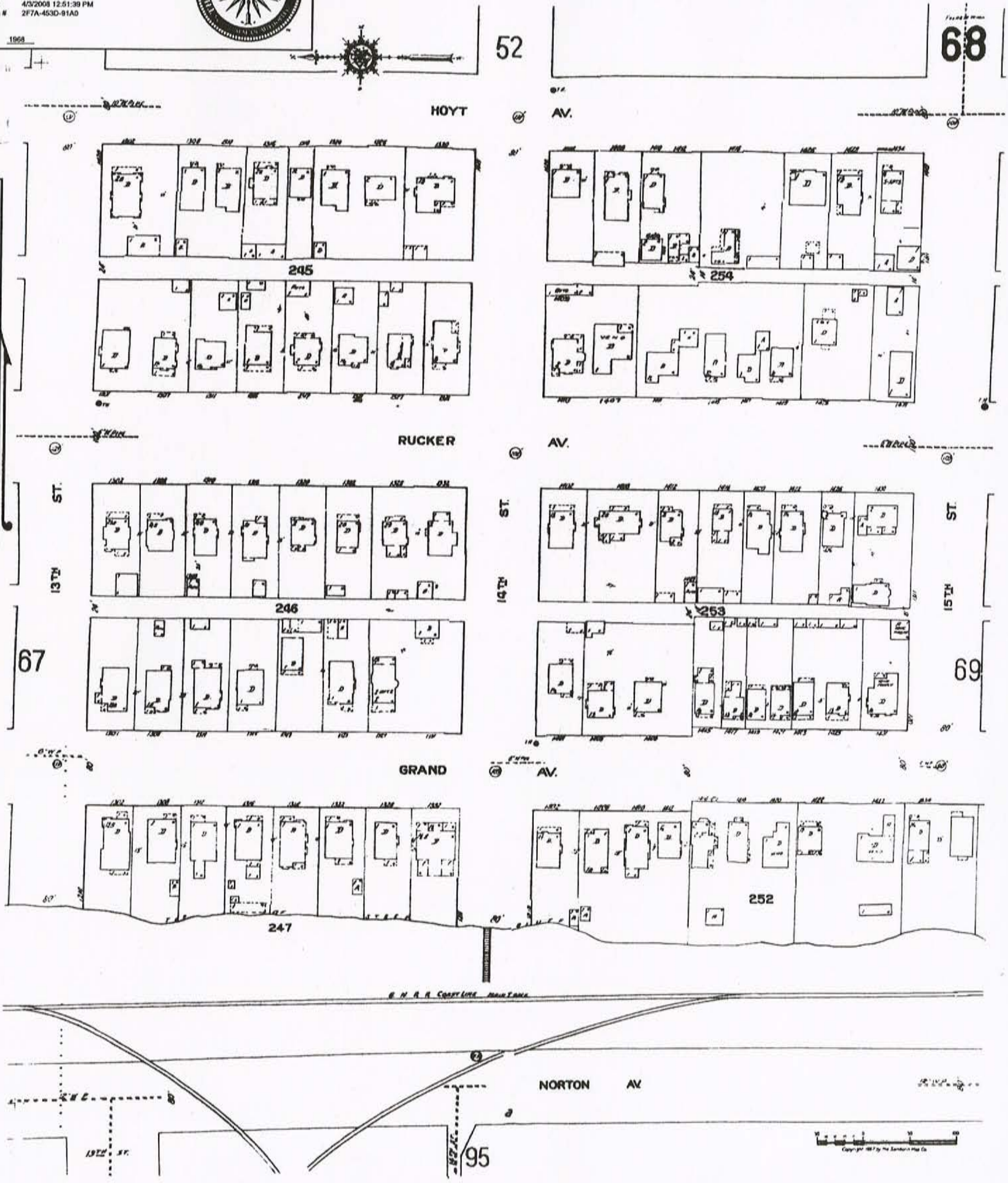

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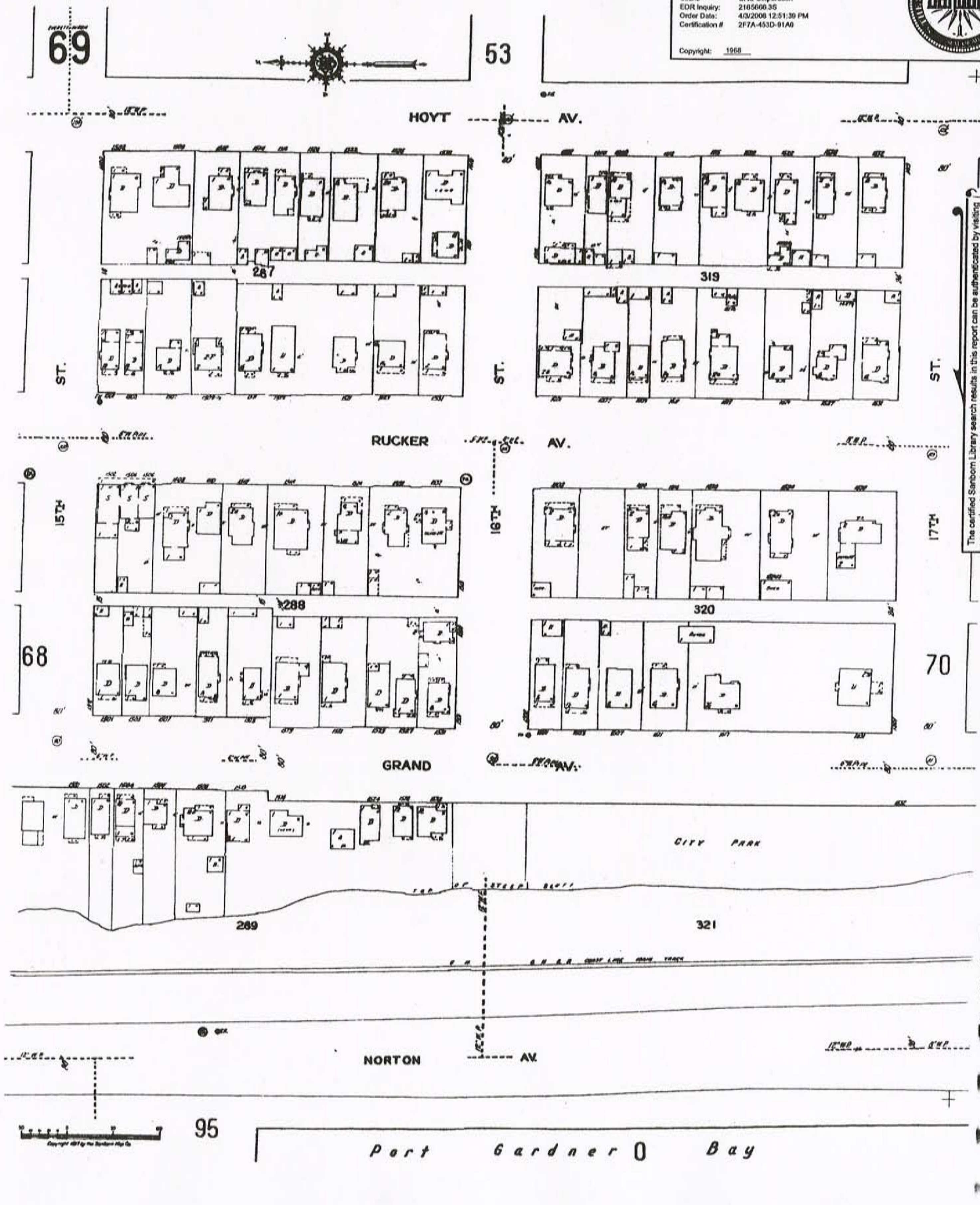

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City, ST, ZIP: Everett WA 98201

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EDR Inquiry: 2185666.3S
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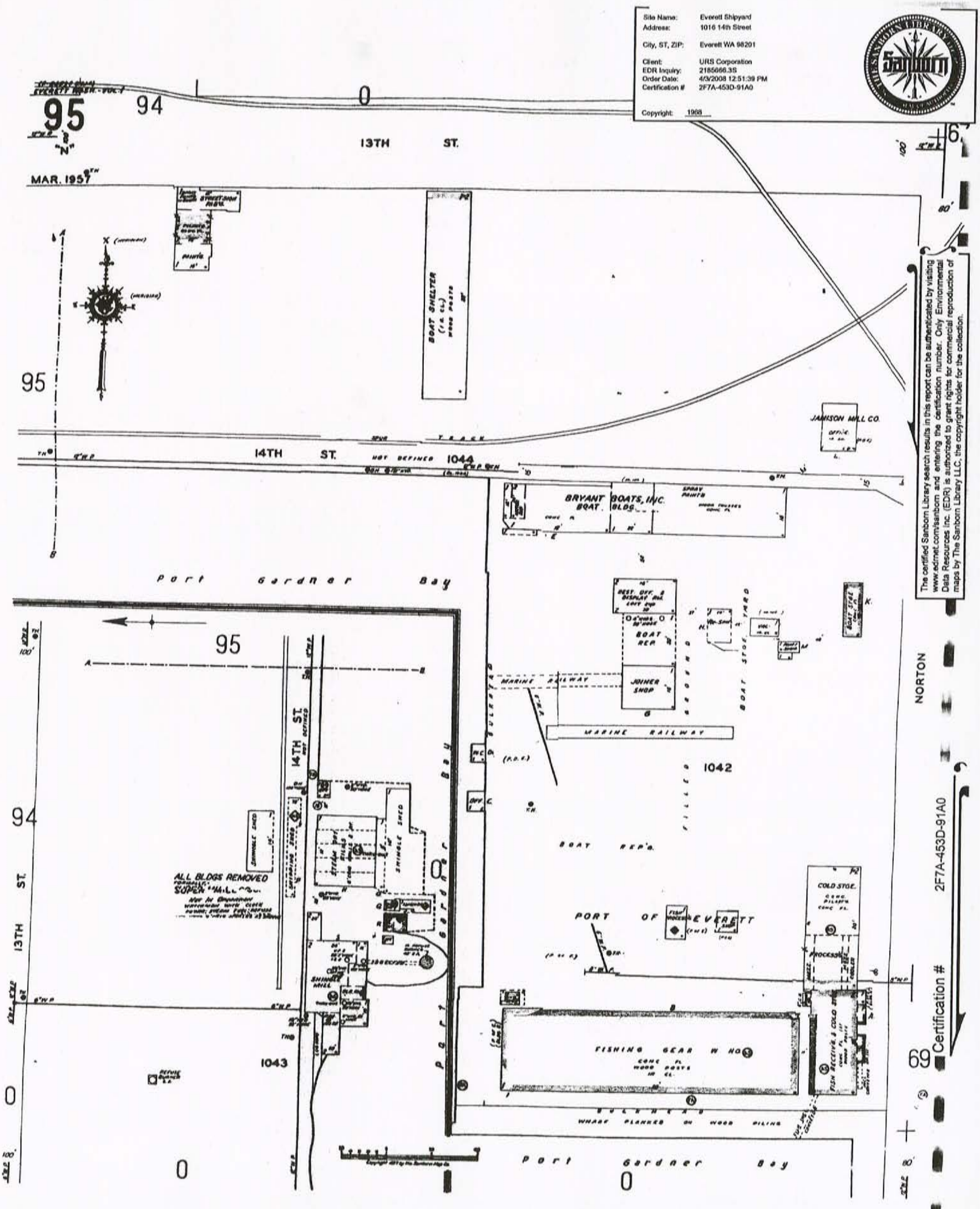

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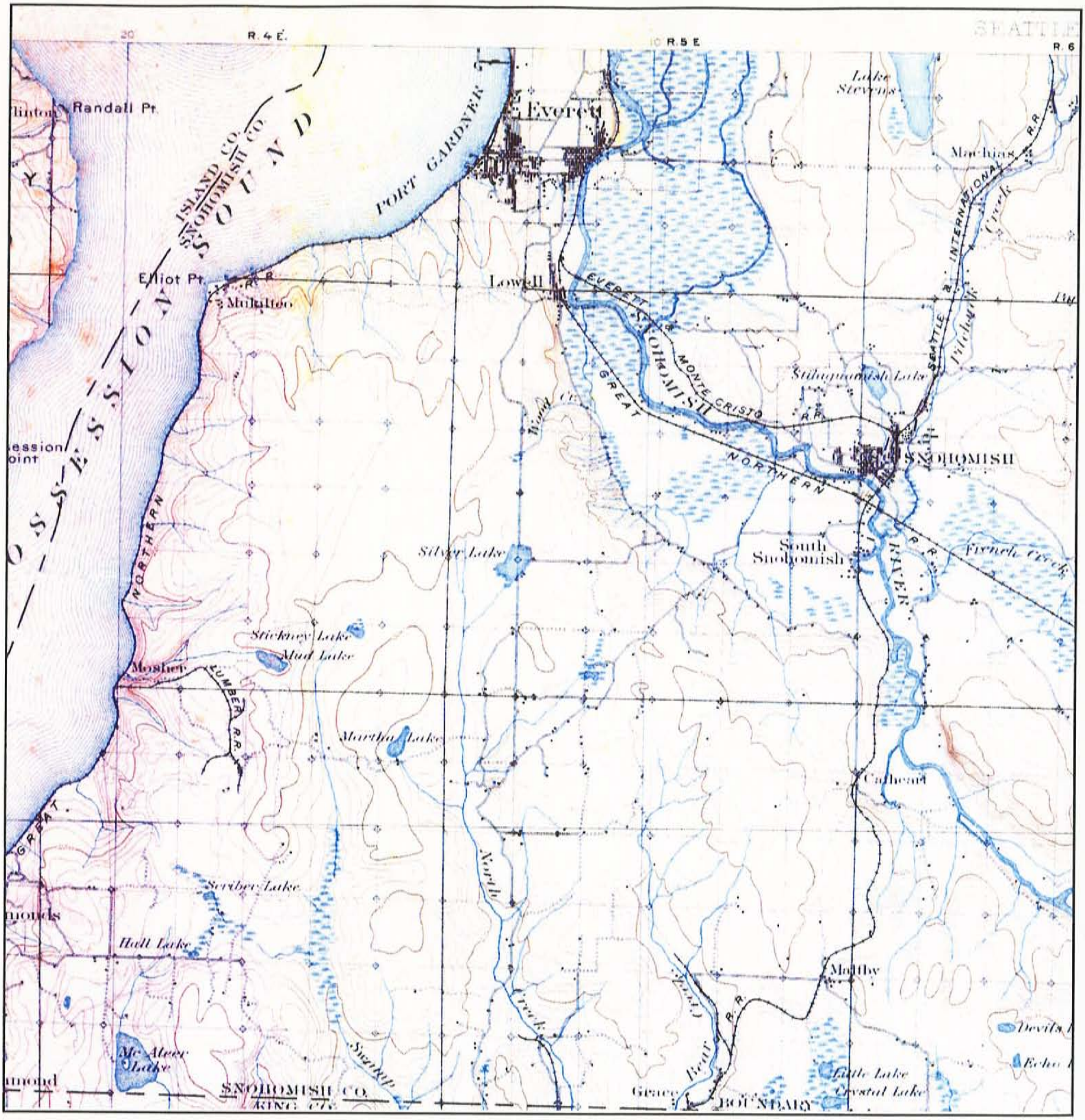
Historical Topographic Map



N

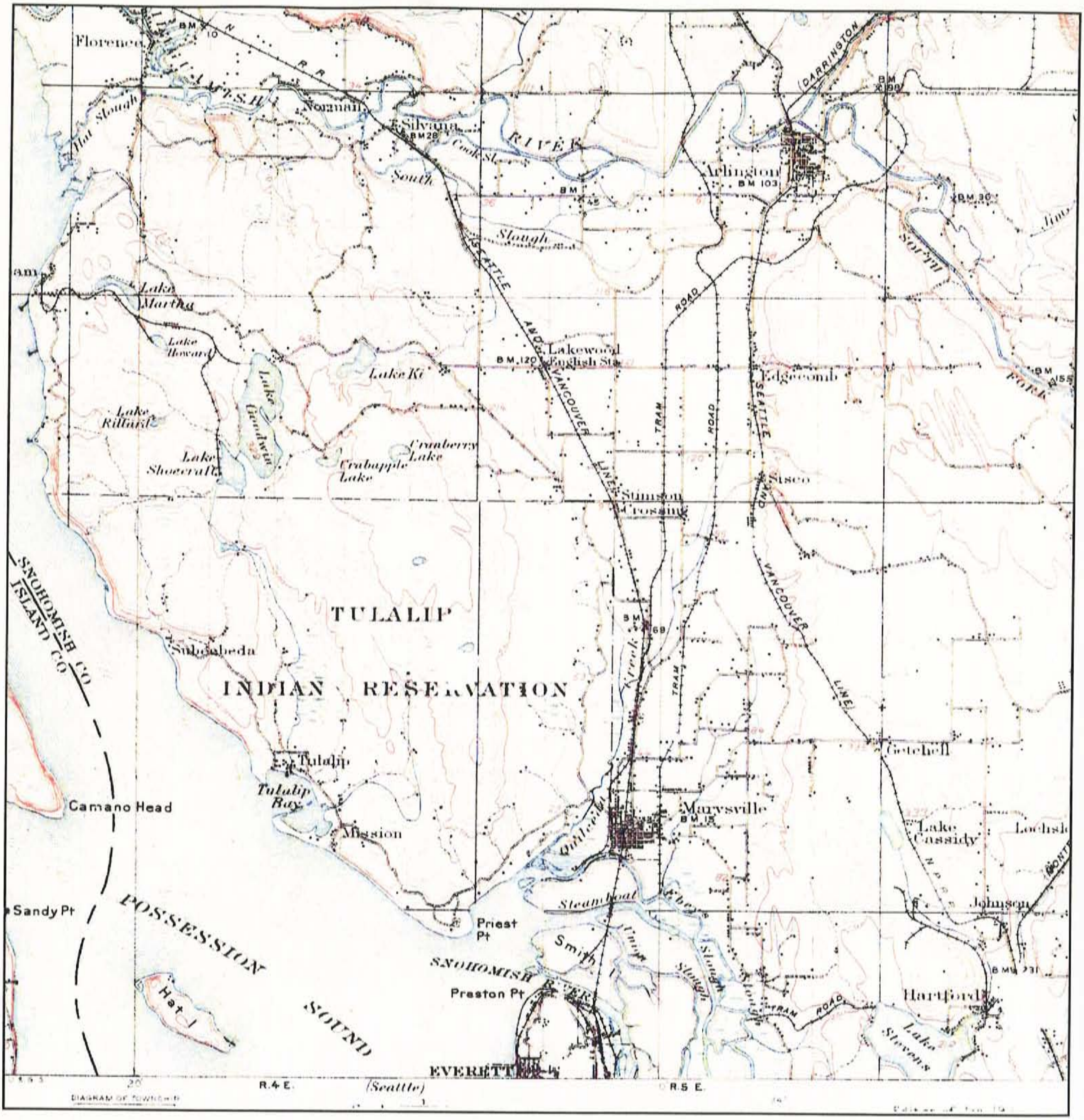
TARGET QUAD
NAME: Seattle, WA
MAP YEAR: 1897

SERIES: 30
SCALE: 1:125,000

SITE NAME: Everett Shipyard
ADDRESS: 1016 14th Street
Everett, WA 98201
LAT/LONG: 47.9987 / 122.215

CLIENT: URS Corporation
CONTACT: Al Thatcher
INQUIRY#: 2185666.4
RESEARCH DATE: 04/03/2008

Historical Topographic Map



N

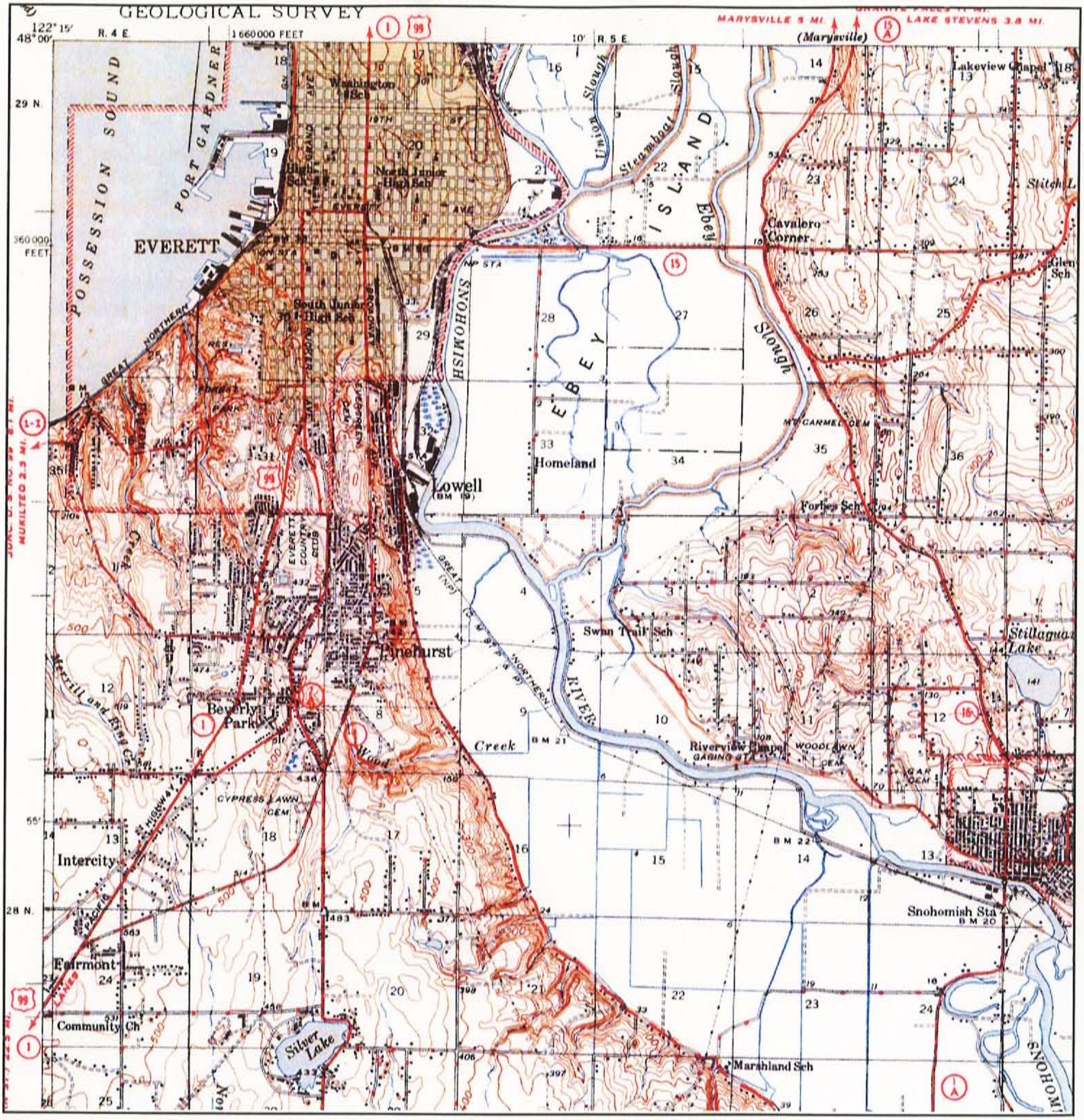
ADJOINING QUAD
NAME: Mount Vernon, WA
MAP YEAR: 1911

SERIES: 30
SCALE: 1:125,000

SITE NAME: Everett Shipyard
ADDRESS: 1016 14th Street
Everett, WA 98201
LAT/LONG: 47.9987 / 122.215

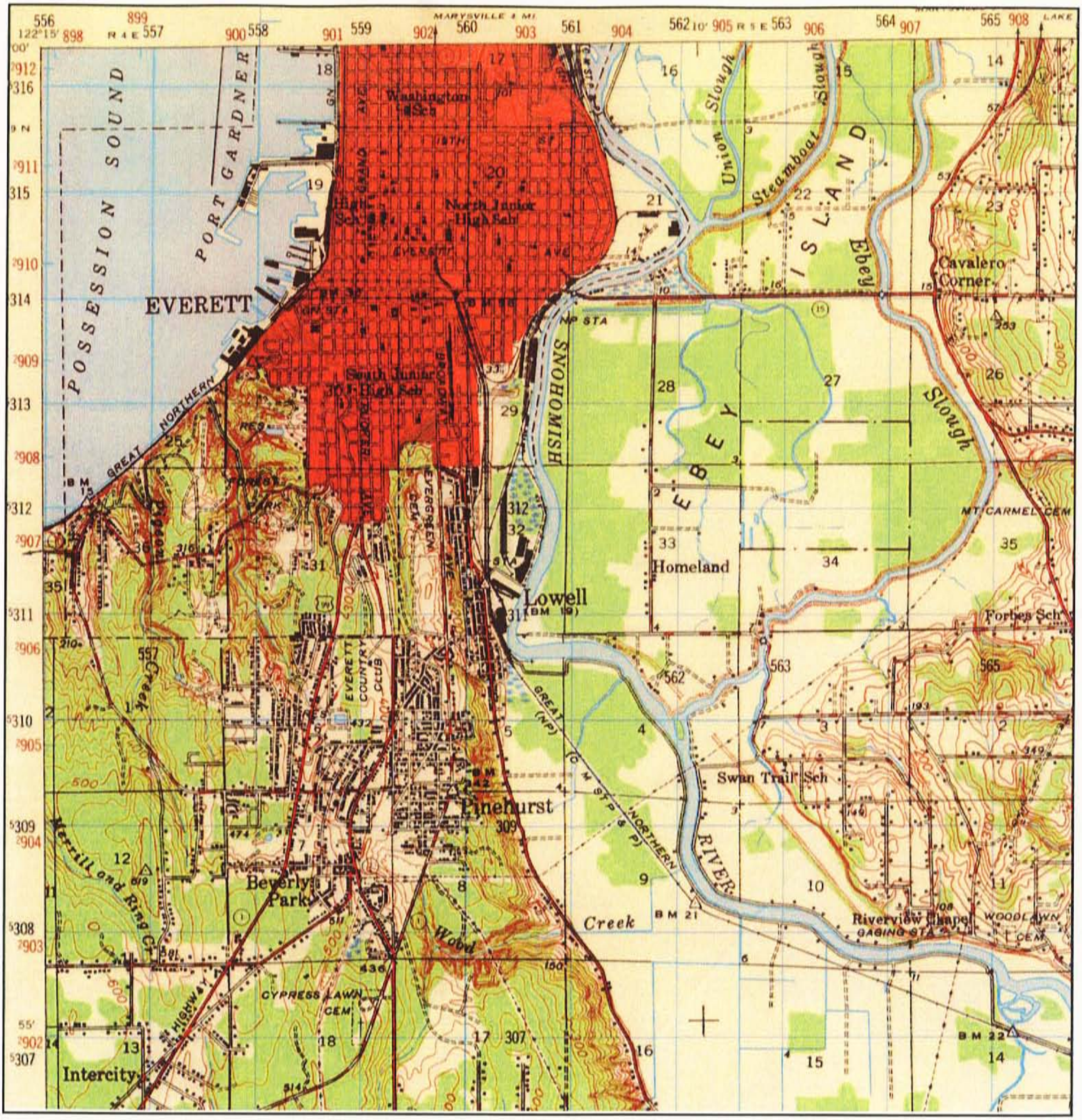
CLIENT: URS Corporation
CONTACT: Al Thatcher
INQUIRY#: 2185666.4
RESEARCH DATE: 04/03/2008

Historical Topographic Map



TARGET QUAD NAME: Everett, WA MAP YEAR: 1944 SERIES: 15 SCALE: 1:62,500	SITE NAME: Everett Shipyard ADDRESS: 1016 14th Street Everett, WA 98201 LAT/LONG: 47.9987 / 122.215	CLIENT: URS Corporation CONTACT: Al Thatcher INQUIRY#: 2185666.4 RESEARCH DATE: 04/03/2008

Historical Topographic Map



N

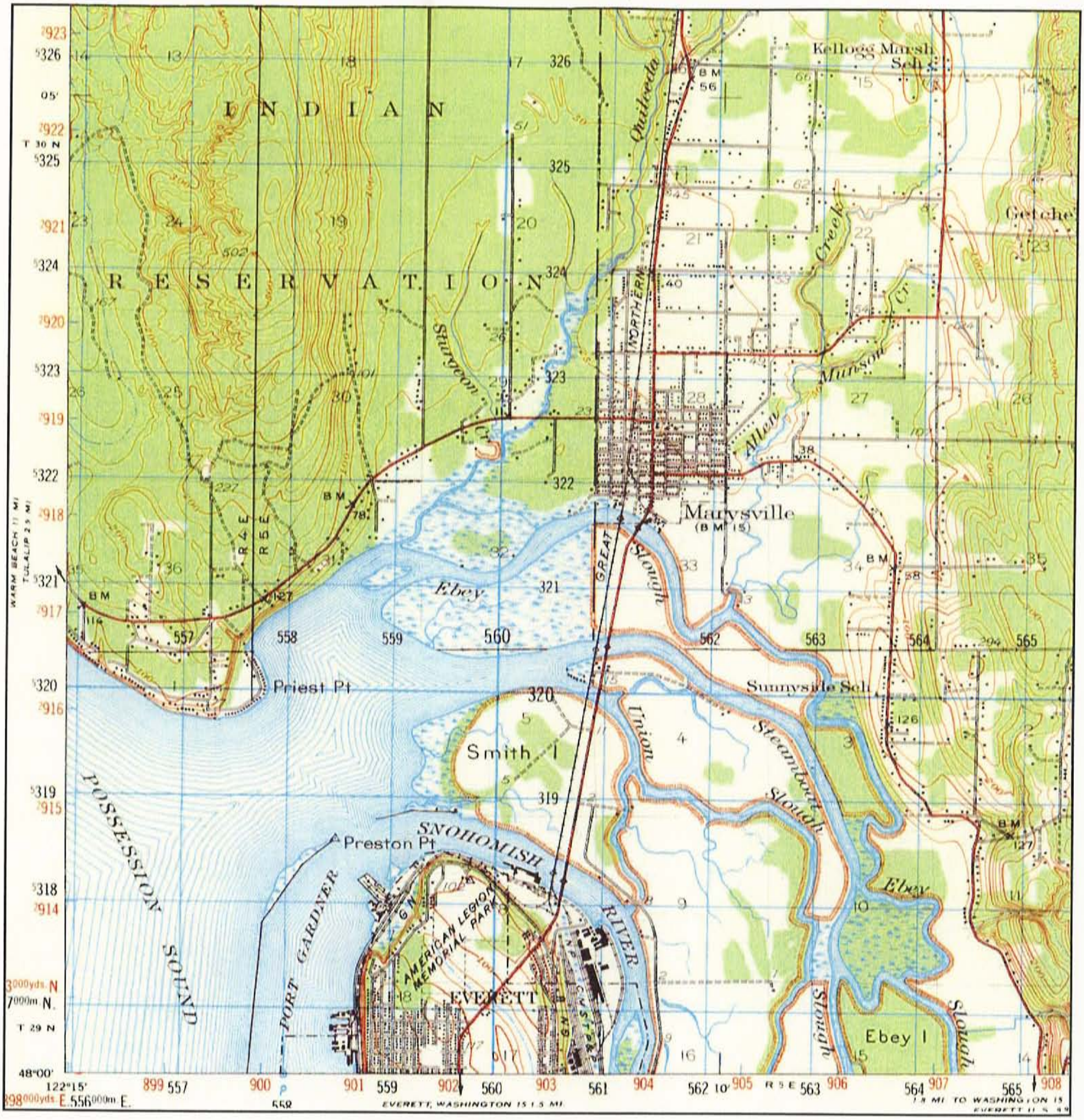
TARGET QUAD
NAME: Everett, WA
MAP YEAR: 1947

SERIES: 15
SCALE: 1:50,000

SITE NAME: Everett Shipyard
ADDRESS: 1016 14th Street
Everett, WA 98201
LAT/LONG: 47.9987 / 122.215

CLIENT: URS Corporation
CONTACT: Al Thatcher
INQUIRY#: 2185666.4
RESEARCH DATE: 04/03/2008

Historical Topographic Map



N

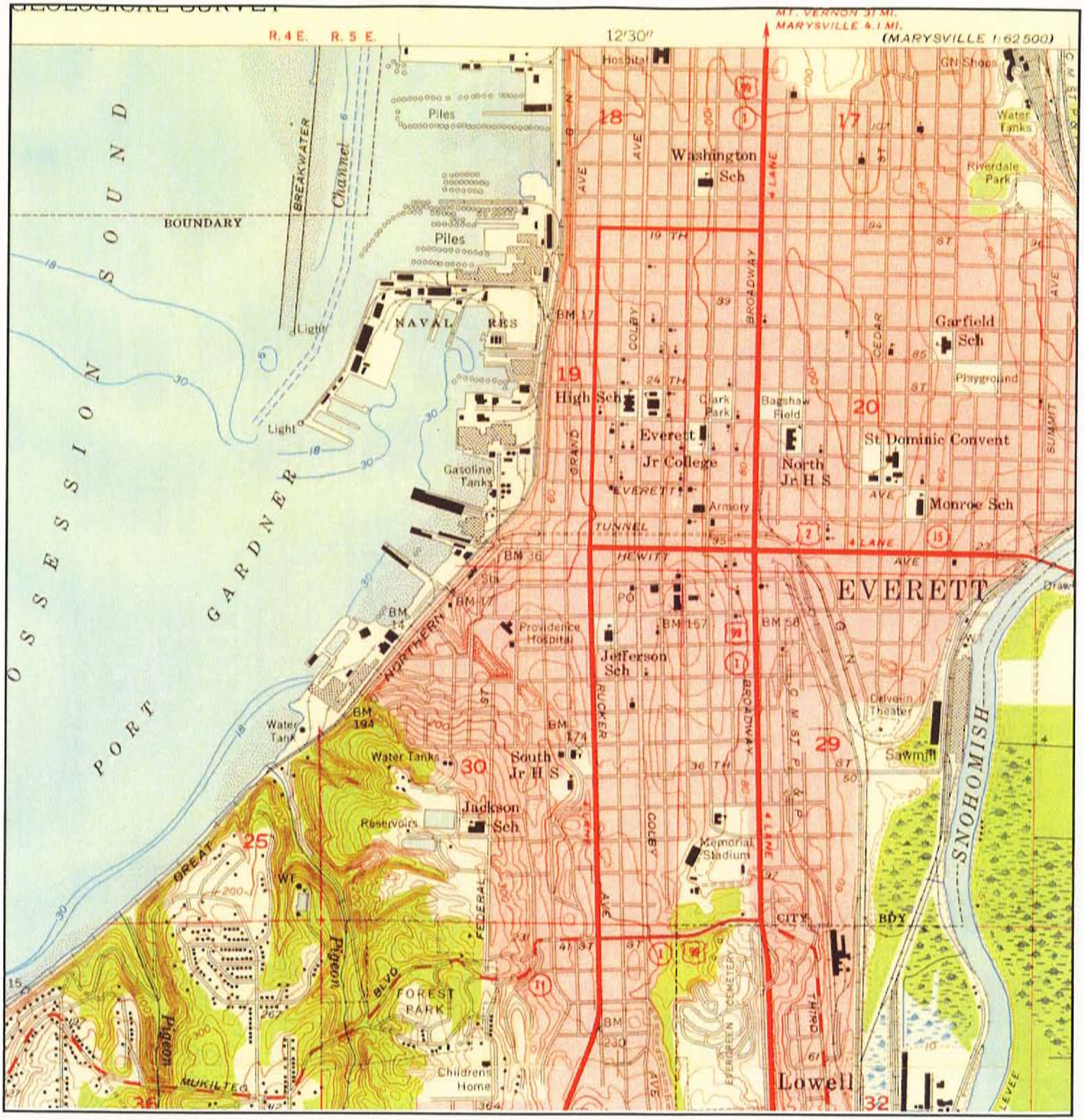
ADJOINING QUAD
NAME: Marysville, WA
MAP YEAR: 1947

SERIES: 15
SCALE: 1:50,000

SITE NAME: Everett Shipyard
ADDRESS: 1016 14th Street
Everett, WA 98201
LAT/LONG: 47.9987 / 122.215

CLIENT: URS Corporation
CONTACT: Al Thatcher
INQUIRY#: 2185666.4
RESEARCH DATE: 04/03/2008

Historical Topographic Map



N

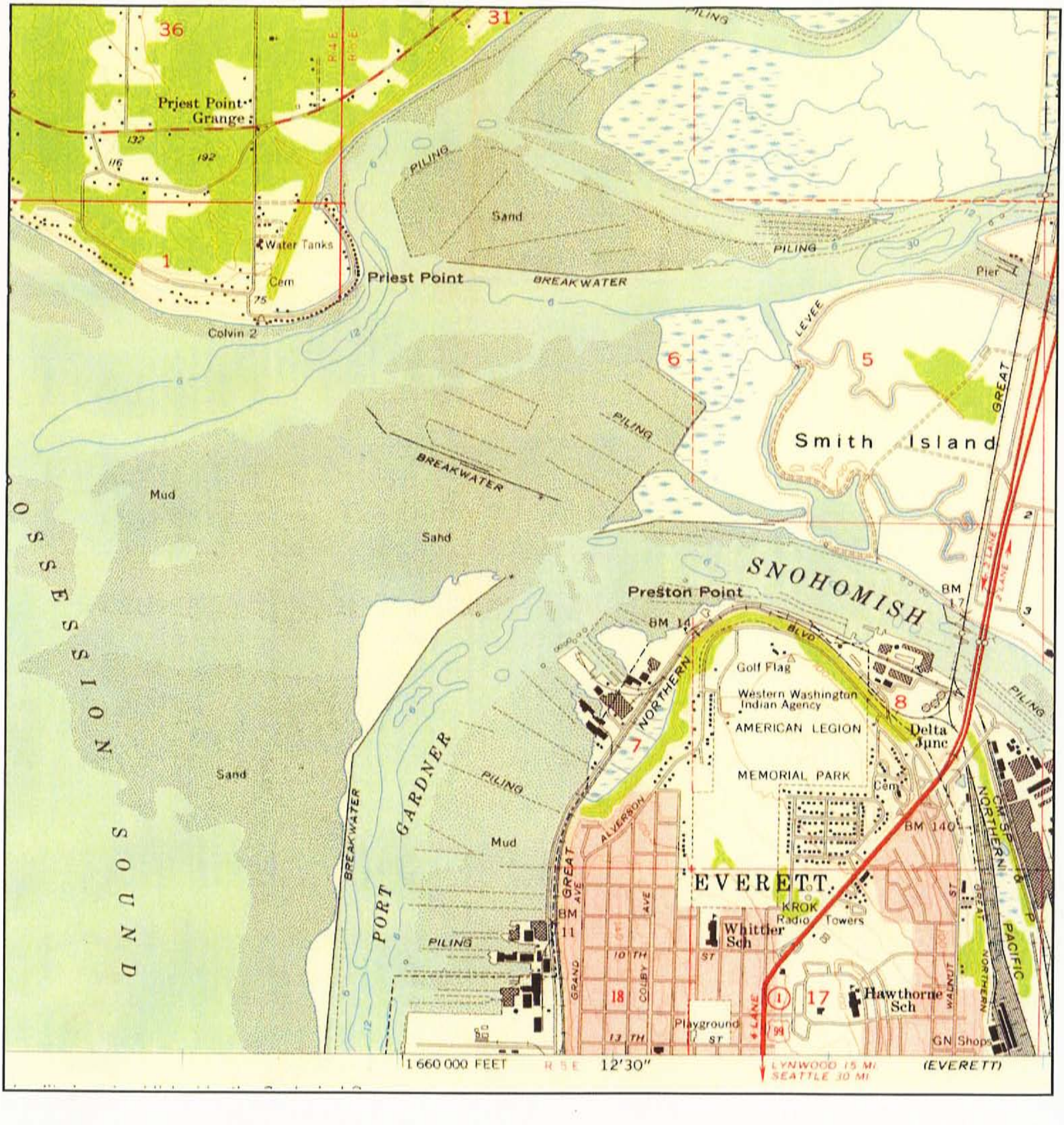
TARGET QUAD
NAME: Everett, WA
MAP YEAR: 1953

SERIES: 7.5
SCALE: 1:24,000

SITE NAME: Everett Shipyard
ADDRESS: 1016 14th Street
Everett, WA 98201
LAT/LONG: 47.9987 / 122.215

CLIENT: URS Corporation
CONTACT: Al Thatcher
INQUIRY#: 2185666.4
RESEARCH DATE: 04/03/2008

Historical Topographic Map



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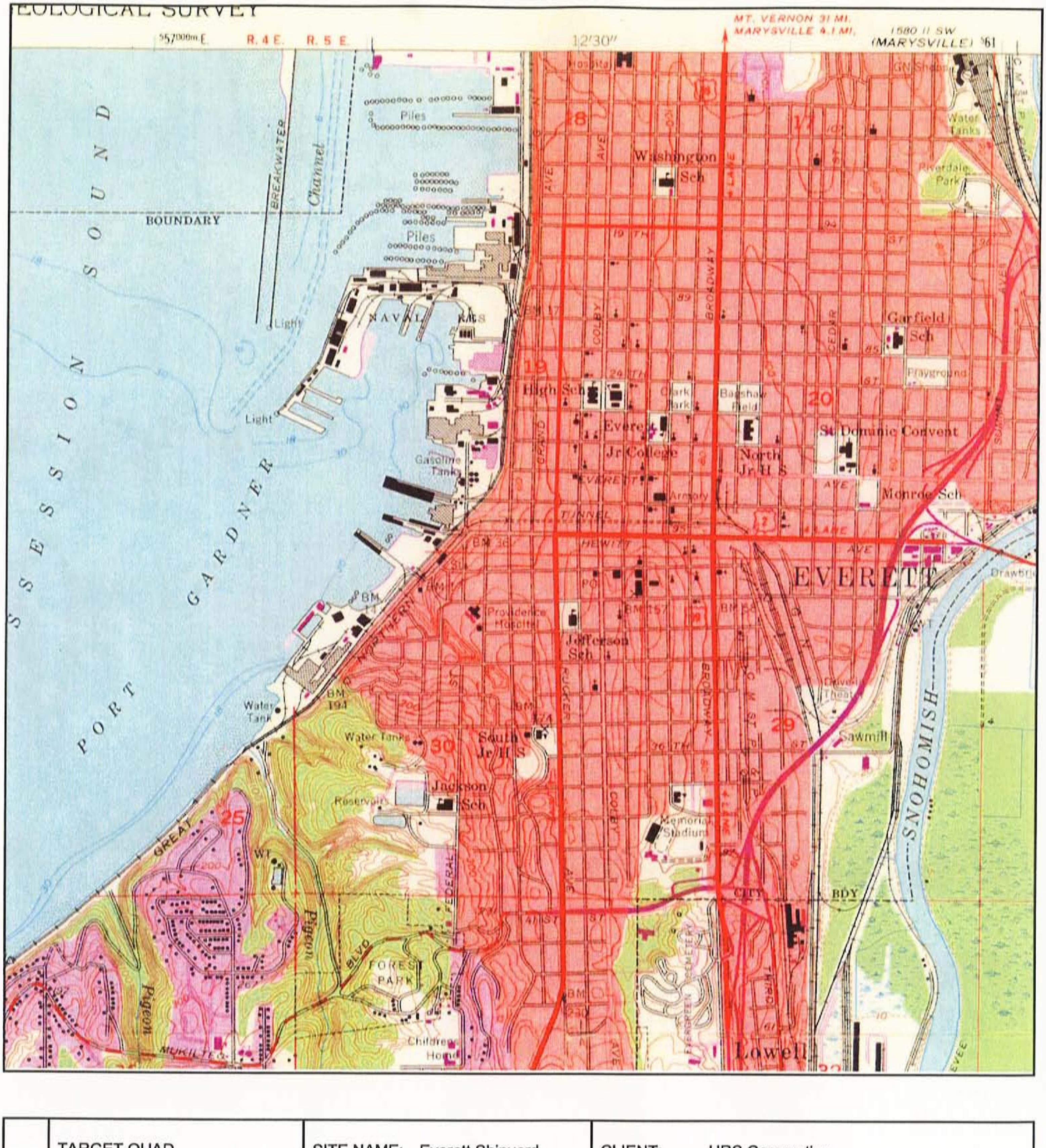
Historical Topographic Map



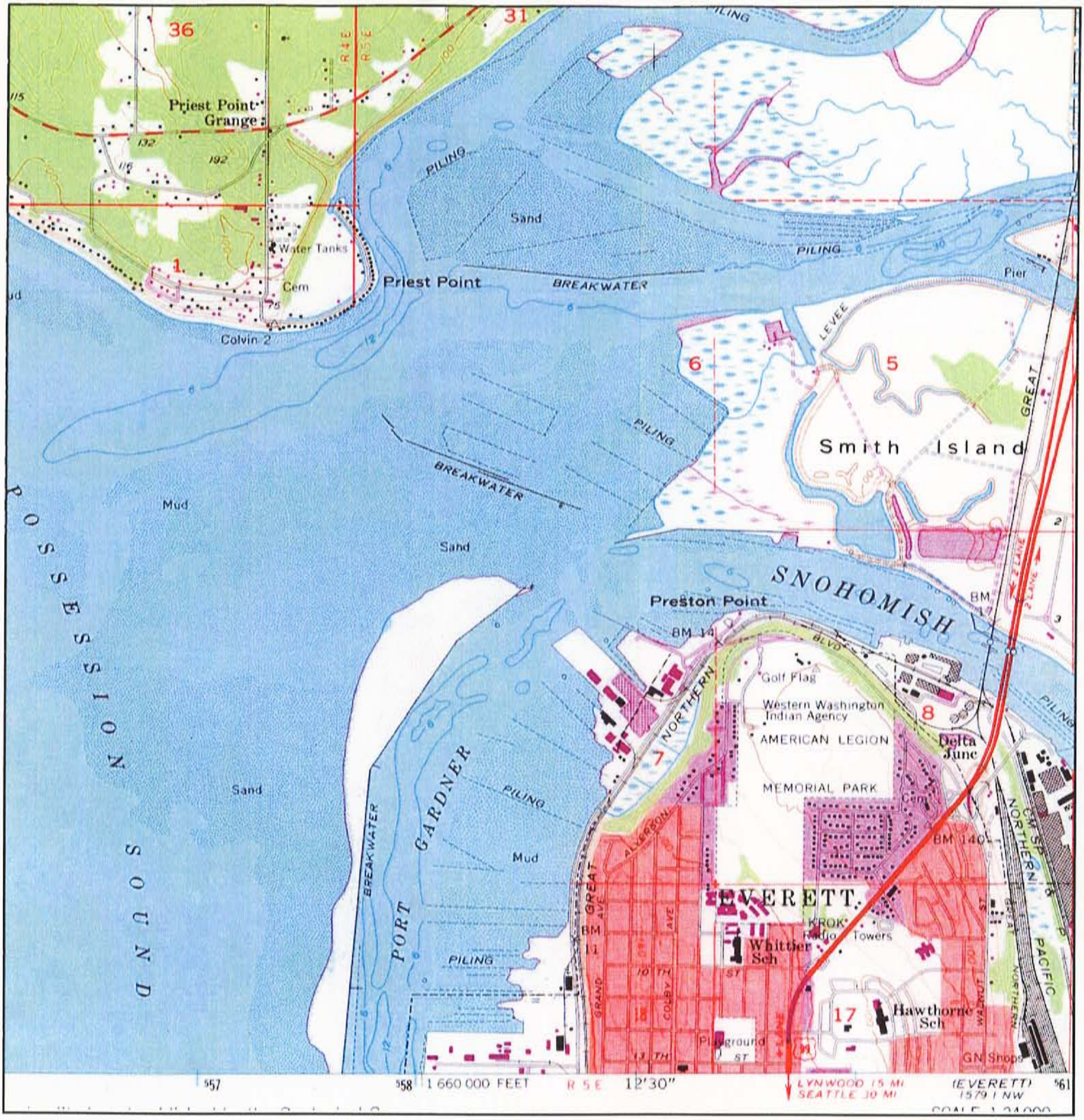
N

TARGET QUAD
NAME: Everett, WA
MAP YEAR: 1968
PHOTOREVISED FROM: 1953
SERIES: 7.5
SCALE: 1:24,000

SITE NAME: Everett Shipyard
ADDRESS: 1016 14th Street
Everett, WA 98201
LAT/LONG: 47.9987 / 122.215

CLIENT: URS Corporation
CONTACT: Al Thatcher
INQUIRY#: 2185666.4
RESEARCH DATE: 04/03/2008

Historical Topographic Map



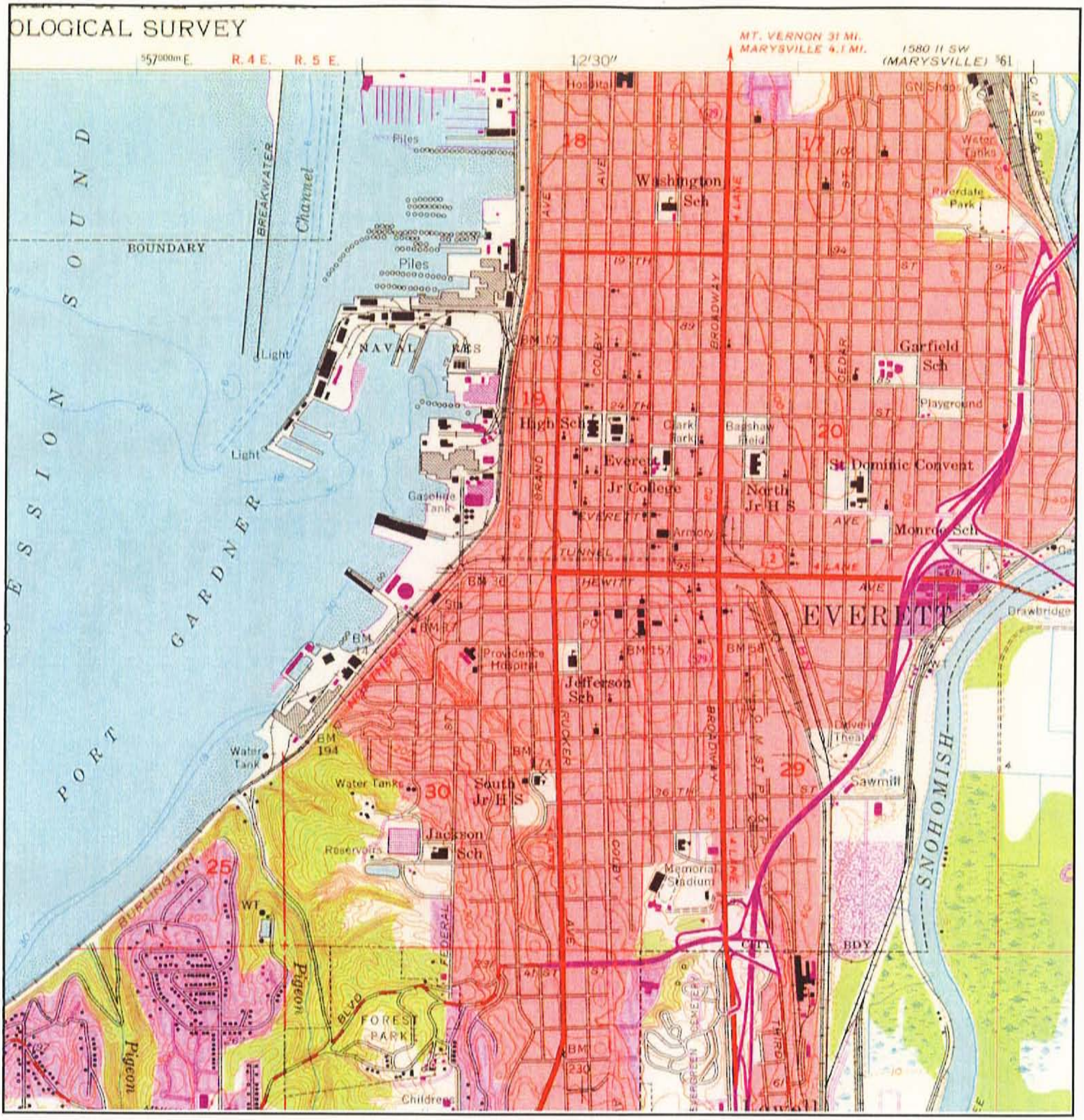
N

ADJOINING QUAD
NAME: Marysville, WA
MAP YEAR: 1968
PHOTOREVISED FROM:1953
SERIES: 7.5
SCALE: 1:24,000

SITE NAME: Everett Shipyard
ADDRESS: 1016 14th Street
Everett, WA 98201
LAT/LONG: 47.9987 / 122.215

CLIENT: URS Corporation
CONTACT: Al Thatcher
INQUIRY#: 2185666.4
RESEARCH DATE: 04/03/2008

Historical Topographic Map



N

TARGET QUAD
NAME: Everett, WA
MAP YEAR: 1973
PHOTOREVISED FROM:1953
SERIES: 7.5
SCALE: 1:24,000

SITE NAME: Everett Shipyard
ADDRESS: 1016 14th Street
Everett, WA 98201
LAT/LONG: 47.9987 / 122.215

CLIENT: URS Corporation
CONTACT: Al Thatcher
INQUIRY#: 2185666.4
RESEARCH DATE: 04/03/2008

Historical Topographic Map

N

ADJOINING QUAD
NAME: Marysville, WA
MAP YEAR: 1973
PHOTOREVISED FROM:1953
SERIES: 7.5
SCALE: 1:24,000

SITE NAME: Everett Shipyard
ADDRESS: 1016 14th Street
Everett, WA 98201
LAT/LONG: 47.9987 / 122.215

CLIENT: URS Corporation
CONTACT: Al Thatcher
INQUIRY#: 2185666.4
RESEARCH DATE: 04/03/2008

APPENDIX C

SCREENING LEVELS AND ANALYTICAL DATA SUMMARY

List of Tables

Table 1a
Screening Levels for Soil
Everett Shipyard

	Screening Levels				
	Method A [a]	**Method B - Soil Direct Contact [a]**		**Protection of Marine Surface Water**	**Most Stringent Value**
	Unrestricted Land Use	Carcinogenic	Non-Carcinogenic	**(WAC 173-201A-240) [b]**	
VOCs (ug/kg) <u>[Method 8260B]</u>					
1,1,1,2-Tetrachloroethane	NE	38,000	2,400,000	NE	38,000
1,1,1-Trichloroethane	2,000	NE	72,000,000	NE	2,000
1,1,2,2-Tetrachloroethane	NE	5,000	NE	NE	5,000
1,1,2-Trichloro-1,2,2-trifluoroethane	NE	NE	2,400,000,000	NE	2,400,000,000
1,1,2-Trichloroethane	NE	18,000	320,000	NE	18,000
1,1-Dichloroethane	NE	NE	16,000,000	NE	16,000,000
1,1-Dichloroethene	NE	NE	4,000,000	NE	4,000,000
1,1-Dichloropropene	NE	NE	NE	NE	NE
1,2,3-Trichlorobenzene	NE	NE	NE	NE	NE
1,2,3-Trichloropropane	NE	140	480,000	NE	140
1,2,4-Trichlorobenzene	NE	NE	800,000	NE	800,000
1,2,4-Trimethylbenzene	NE	NE	4,000,000	NE	4,000,000
1,2-Dibromo-3-chloropropane	NE	710	NE	NE	710
1,2-Dibromoethane (EDB)	5	12	NE	NE	5
1,2-Dichlorobenzene	NE	NE	7,200,000	NE	7,200,000
1,2-Dichloroethane (EDC)	NE	11,000	1,600,000	NE	11,000
1,2-Dichloropropane	NE	15,000	NE	NE	15,000
1,3,5-Trimethylbenzene	NE	NE	4,000,000	NE	4,000,000
1,3-Dichlorobenzene	NE	NE	NE	NE	NE
1,3-Dichloropropane	NE	NE	NE	NE	NE
1,4-Dichlorobenzene	NE	42,000	NE	NE	42,000
2,2-Dichloropropane	NE	NE	NE	NE	NE
2-Butanone (methyl ethyl ketone)	NE	NE	48,000,000	NE	48,000,000
2-Chloroethylvinylether	NE	NE	NE	NE	NE
2-Chlorotoluene	NE	NE	1,600,000	NE	1,600,000
2-Hexanone	NE	NE	NE	NE	NE
4-Chlorotoluene	NE	NE	NE	NE	NE
4-Isopropyltoluene	NE	NE	NE	NE	NE
4-Methyl-2-pentanone (methyl isobutyl ketone)	NE	NE	6,400,000	NE	6,400,000
Acetone	NE	NE	8,000,000	3,200	3,200
Acrolein	NE	NE	1,600,000	NE	1,600,000
Acrylonitrile	NE	1,900	80,000	NE	1,900
Benzene	30	18,000	320,000	NE	30
Bromobenzene	NE	NE	NE	NE	NE
Bromochloromethane	NE	NE	NE	NE	NE
Bromodichloromethane	NE	16,000	1,600,000	NE	16,000
Bromoethane	NE	NE	NE	NE	NE
Bromoform	NE	130,000	1,600,000	NE	130,000
Bromomethane	NE	NE	110,000	NE	110,000
Carbon disulfide	NE	NE	8,000,000	5,600	5,600
Carbon tetrachloride	NE	7,700	56,000	NE	7,700
Chlorobenzene	NE	NE	1,600,000	NE	1,600,000
Chloroethane	NE	NE	NE	NE	NE
Chloroform	NE	160,000	800,000	NE	160,000
Chloromethane	NE	77,000	NE	NE	77,000
cis-1,2-Dichloroethene	NE	NE	800,000	NE	800,000
cis-1,3-dichloropropene	NE	5,600	2,400,000	NE	5,600
Dibromochloromethane	NE	12,000	1,600,000	NE	12,000
Dibromomethane	NE	NE	NE	NE	NE
Dichlorodifluoromethane	NE	NE	16,000,000	NE	16,000,000
Ethylbenzene	6,000	NE	8,000,000	NE	6,000
Hexachloro-1,3-butadiene	NE	13,000	16,000	NE	13,000
Iodomethane	NE	NE	NE	NE	NE
Isopropylbenzene	NE	NE	8,000,000	NE	8,000,000
m,p-xylene	9000 [e]	NE	16,000,000	NE	9,000
Methyl tert-butyl ether (MTBE)	100	560,000	69,000,000	NE	100
Methylene chloride	20	130,000	4,800,000	NE	20
Naphthalene	5,000	NE	1,600,000	NE	5,000
n-Butylbenzene	NE	NE	NE	NE	NE
n-Propylbenzene	NE	NE	NE	NE	NE
o-Xylene	NE	NE	160,000,000	NE	160,000,000
sec-Butylbenzene	NE	NE	NE	NE	NE
Styrene	NE	33,000	16,000,000	NE	33,000
tert-Butylbenzene	NE	NE	NE	NE	NE
Tetrachloroethene	50	1,900	800,000	4.1	4.1
Toluene	7,000	NE	6,400,000	NE	7,000
trans-1,2-Dichloroethene	NE	NE	1,600,000	NE	1,600,000
trans-1,3-Dichloropropene	NE	5,600	2,400,000	NE	5,600
trans-1,4-Dichloro-2-butene	NE	NE	NE	NE	NE
Trichloroethene	30	2,500	24,000	NE	30

Table 1a
Screening Levels for Soil
Everett Shipyard

	Screening Levels				
	Method A [a]	**Method B - Soil Direct Contact [a]**		**Protection of Marine Surface Water (WAC 173-201A-240) [b]**	**Most Stringent Value**
	Unrestricted Land Use	Carcinogenic	Non-Carcinogenic		
Trichlorofluoromethane	NE	NE	24,000,000	NE	24,000,000
Vinyl acetate	NE	NE	80,000,000	NE	80,000,000
Vinyl Chloride	NE	670	240,000	NE	670
SVOCs (ug/kg) [Method 8270D]					
1,2,4-Trichlorobenzene	NE	NE	800,000	NE	800,000
1,2-Dichlorobenzene	NE	NE	7,200,000	NE	7,200,000
1,3-Dichlorobenzene	NE	NE	NE	NE	NE
1,4-Dichlorobenzene	NE	42,000	NE	NE	42,000
1-Methylnaphthalene	NE	NE	24,000	NE	24,000
2,2'-Oxybis(1-chloropropane)	NE	NE	NE	NE	NE
2,4,5-Trichlorophenol	NE	NE	8,000,000	NE	8,000,000
2,4,6-Trichlorophenol	NE	91,000	NE	NE	91,000
2,4-Dichlorophenol	NE	NE	240,000	NE	240,000
2,4-Dimethylphenol	NE	NE	1,600,000	NE	1,600,000
2,4-Dinitrophenol	NE	NE	160,000	NE	160,000
2,4-Dinitrotoluene	NE	NE	160,000	NE	160,000
2,6-Dinitrotoluene	NE	NE	80,000	NE	80,000
2-Chloronaphthalene	NE	NE	NE	NE	NE
2-Chlorophenol	NE	NE	400,000	NE	400,000
2-Methylnaphthalene	NE	NE	320,000	NE	320,000
2-Methylphenol	NE	NE	NE	NE	NE
2-Nitroaniline	NE	NE	NE	NE	NE
2-Nitrophenol	NE	NE	NE	NE	NE
3,3’-Dichlorobenzidine	NE	2,200	NE	NE	2,200
3-Nitroaniline	NE	NE	NE	NE	NE
4,6-Dinitro-2-methylphenol	NE	NE	NE	NE	NE
4-Bromophenyl-phenyl ether	NE	NE	NE	NE	NE
4-Chloro-3-methylphenol	NE	NE	NE	NE	NE
4-Chloroaniline	NE	NE	NE	NE	NE
4-Chlorophenyl-phenyl ether	NE	NE	NE	NE	NE
4-Methylphenol	NE	NE	NE	NE	NE
4-Nitroaniline	NE	NE	NE	NE	NE
4-Nitrophenol	NE	NE	NE	NE	NE
Acenaphthene	NE	NE	4,800,000	65,000	65,290
Acenaphthylene	NE	NE	NE	NE	NE
Anthracene	NE	NE	24,000,000	12,000,000	12,000,000
Benzo(a)anthracene	NE	See Note d	NE	130	130
Benzo(a)pyrene	100	140	NE	350	350
Benzo(b)fluoranthene	NE	See Note d	NE	430	430
Benzo(g,h,i)perylene	NE	NE	NE	NE	NE
Benzo(k)fluoranthene	NE	See Note d	NE	430	430
Benzoic acid	NE	NE	320,000,000	260,000	260,000
Benzyl alcohol	NE	NE	24,000,000	NE	24,000,000
Bis-(2-chloroethoxy)methane	NE	NE	NE	NE	NE
Bis-(2-chloroethyl)ether	NE	910	NE	NE	910
Bis(2-Ethylhexyl)phthalate	NE	71,000	1,600,000	4,900	4,900
Butylbenzylphthalate	NE	NE	16,000,000	360,000	360,000
Carbazole	NE	50,000	NE	NE	50,000
Chrysene	NE	See Note d	NE	140	140
Dibenzo(a,h)anthracene	NE	See Note d	NE	640	640
Dibenzofuran	NE	NE	160,000	NE	160,000
Diethylphthlalate	NE	NE	64,000,000	160,000	160,000
Dimethylphthalate	NE	NE	80,000,000	NE	80,000,000
Di-n-butylphthalate	NE	NE	8,000,000	100,000	100,000
Di-n-octylphthalate	NE	NE	1,600,000	5,300,000	5,300,000
Fluoranthene	NE	NE	3,200,000	89,000	89,000
Fluorene	NE	NE	3,200,000	550,000	550,000
Hexachlorobenzene	NE	630	64,000	NE	630
Hexachlorobutadiene	NE	13,000	16,000	NE	13,000
Hexachlorocyclopentadiene	NE	NE	480,000	NE	480,000
Hexachloroethane	NE	71,000	80,000	NE	71,000
Indeno(1,2,3-cd)pyrene	NE	See Note d	NE	1,300	1,300
Isophorone	NE	1,100,000	16,000,000	NE	1,100,000
Naphthalene	5000 [c]	NE	1,600,000	140,000	5000 [c]
Nitrobenzene	NE	NE	40,000	NE	40,000
N-Nitroso-di-n-propylamine	NE	140	NE	NE	140
N-Nitrosodiphenylamine	NE	200,000	NE	180	180
Pentachlorophenol	NE	8,300	2,400,000	47	47
Phenanthrene	NE	NE	NE	NE	NE
Phenol	NE	NE	48,000,000	5,000,000	5,000,000
Pyrene	NE	NE	2,400,000	3,500,000	2,400,000

Table 1a
Screening Levels for Soil
Everett Shipyard

	Screening Levels				
	Method A [a]	**Method B - Soil Direct Contact** [a]		**Protection of Marine Surface Water (WAC 173-201A-240)** [b]	**Most Stringent Value**
	Unrestricted Land Use	Carcinogenic	Non-Carcinogenic		
PAHs (ug/kg) [Method 8270 SIM]					
1-Methylnaphthalene	NE	NE	24,000	NE	24,000
2-Methylnaphthalene	NE	NE	320,000	NE	320,000
Acenaphthene	NE	NE	4,800,000	NE	4,800,000
Acenaththylene	NE	NE	NE	NE	NE
Anthracene	NE	NE	24,000,000	NE	24,000,000
Benzo(a)anthracene	NE	See Note d	NE	NE	NE
Benzo(a)pyrene	100	140	NE	NE	100
Benzo(b)fluoranthene	NE	See Note d	NE	NE	NE
Benzo(g,h,i)perylene	NE	NE	NE	NE	NE
Benzo(k)fluoranthene	NE	See Note d	NE	NE	NE
Chrysene	NE	See Note d	NE	NE	NE
Dibenzo(a,h)anthracene	NE	See Note d	NE	NE	NE
Dibenzofuran	NE	NE	160,000	NE	160,000
Fluoranthene	NE	NE	3,200,000	NE	3,200,000
Fluorene	NE	NE	3,200,000	NE	3,200,000
Indeno(1,2,3-cd)pyrene	NE	See Note d	NE	NE	NE
Naphthalene	5000 [c]	NE	1,600,000	NE	5000 [c]
Phenanthrene	NE	NE	NE	NE	NE
Pyrene	NE	NE	2,400,000	NE	2,400,000
PCBs (ug/kg) B [Method 8082A]					
Aroclor 1016	NE	NE	5,600	NE	5,600
Aroclor 1221	NE	NE	NE	NE	NE
Aroclor 1232	NE	NE	NE	NE	NE
Aroclor 1242	NE	NE	NE	NE	NE
Aroclor 1248	NE	NE	NE	NE	NE
Aroclor 1254	NE	NE	1,600	NE	1,600
Aroclor 1260	NE	NE	NE	NE	NE
Total PCBs	1,000	500	NE	NE	500
TPH (acid+silica gel cleanup) (mg/kg) [Ecology NWTPH-Dx]					
Diesel-range	2,000	NE	NE	NE	2,000
Oil-range	2,000	NE	NE	NE	2,000
Organotins (ug/kg) [Method PSEP/Krone 1988]					
Tributyltin as TBT Ion	NE	NE	23,000 [f]	7,400 [g]	7,400
Dibutyl Tin Ion	NE	NE	NE	NE	NE
Butyl Tin Ion	NE	NE	NE	NE	NE
Metals (mg/kg) [Method 6010/7471]					
Arsenic	20	0.67	24	0.057	0.057
Antimony	NE	NE	32	NE	32
Beryllium	NE	NE	160	NE	160
Cadmium	2	NE	80	1.2	1.20
Chromium	2,000 (Cr^{+3}) / 19 (Cr^{+6})	NE	120,000 (Cr^{+3}) / 240 (Cr^{+6})	19	19.0
Copper	NE	NE	3,000	1.10	1.10
Lead	250	NE	NE	1,600	250
Mercury	2	NE	24	0.026	0.026
Nickel	NE	NE	1,600	11.0	11.0
Selenium	NE	NE	400	NE	400
Silver	NE	NE	400	0.32	0.32
Thallium	NE	NE	6	NE	5.6
Zinc	NE	NE	24,000	100	100

Notes:

NE - Not established

PCBs - Polychlorinated biphenyls

SVOCs - Semivolatile organic compounds

TPH - Total petroleum hydrocarbons

VOCs - Volatile organic compounds

[a] MTCA - Model Toxics Control Act Cleanup Regulation, WAC 173-340. 2006 MTCA Method A and B values are from Ecology website CLARC tables downloaded April 2008 (https://fortress.wa.gov/ecy/clarc/reporting/CLARCReporting.aspx), when available. If MTCA Method A and B values were not available or not established on the Ecology website CLARC tables, the 2001 MTCA values were used. 2001 Method A values are from Ecology Publication 94-06 amended February 12, 2001. 2001 Method B values are from Model Toxics Control Act Cleanup Levels and Risk Calculations (CLARC) Version 3.1, Ecology Publication #94-145 Updated November 2001.

b The screening levels for protection of surface water were calculated for PCOCs detected in site media using default parameters as described in WAC 173-340-747(4)(b) and the most stringent surface water screening level shown in Table 2. If no surface water screening level was available, the most stringent potable water screening level shown in Table 2 was used. See Table 1b for values used in calculations.

c Screening level based on total of naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene.

[d] Carcinogenic PAH (cPAH) cleanup levels under MTCA are based on the calculated total toxicity of the mixture using the Toxicity Equivalency Methodology in WAC 173-340-780 (8). The mixture of cPAHs shall be considered a single hazardous substance and compared to the applicable MTCA Method A or B cleanup level for benzo(a)pyrene and most stringent surface water screening level shown in Table 2.

[e] The screening level is for total xylenes.

[f] The screening level is for tributyl tin oxide and was calculated using an oral RfD of 0.0003 mg/kg-day. The TBT ion value is based on weights of one mole TBTO and two moles of TBT ion.

[g] TBT ion value calculated by Ecology using marine surface water standard of 0.01 ug/l for TBTO; the TBT ion value is based on the weights of one mole of TBTO and two moles of TBT ion.

Table 1b
Parameters Used to Calculate Soil Screening Levels Protective of Groundwater
Everett Shipyard

	Three-Phase Partition Model Parameters a										
Chemical Detected in Site Media	**Cs (mg/kg)**	**Cw (ug/L)**	**UCF (mg/ug)**	**DF**	**Kd (ml/g)**	**Ow (ml air/ml soil**	**Oa (ml air/ml soil**	**Hcc**	**Pb (kg/L)**	**Koc (ml/g)**	**Foc (g/g)**
2-Butanone	NA	4800	0.001	20	NA	0.3	0.13	NE	1.5	NE	0.001
2-Methylnaphthalene	NA	32	0.001	20	NA	0.3	0.13	NE	1.5	NE	0.001
4-Methylphenol	NA	NE	0.001	20	NA	0.3	0.13	NE	1.5	NE	0.001
Acenaphthene	65.26	640	0.001	20	4.898	0.3	0.13	0.0064	1.5	4,898	0.001
Acenaphthylene	NA	NE	0.001	20	NA	0.3	0.13	NE	1.5	NE	0.001
Acetone	3.21	800	0.001	20	0.00058	0.3	0.13	0.0016	1.5	0.58	0.001
Anthracene	12,064.12	26,000	0.001	20	23	0.3	0.13	0.0027	1.5	23,000	0.001
Aroclor 1254	NA	0.0017	0.001	20	NE	0.3	0.13	NE	1.5	NE	0.001
Aroclor 1260	NA	0.03	0.001	20	820	0.3	0.13	NE	1.5	820,000	0.001
Arsenic	0.057	0.098	0.001	20	29	0.3	0.13	0	1.5	-	-
Benzo(a)anthracene	0.13	0.018	0.001	20	357.537	0.3	0.13	0.00014	1.5	357,537	0.001
Benzo(a)pyrene	0.35	0.018	0.001	20	968.774	0.3	0.13	0.000046	1.5	968,774	0.001
Benzo(b)fluoranthene	0.43	0.018	0.001	20	1200	0.3	0.13	0.0046	1.5	1,200,000	0.001
Benzo(g,h,i)perylene	NA	NE	0.001	20	NA	0.3	0.13	NE	1.5	NE	0.001
Benzo(k)fluoranthene	0.43	0.018	0.001	20	1200	0.3	0.13	0.000034	1.5	1,200,000	0.001
Benzoic Acid	256.77	64,000	0.001	20	0.0006	0.3	0.13	0.000063	1.5	0.6	0.001
bis(2-Ethylhexyl)phthalate	4.90	2.2	0.001	20	111.123	0.3	0.13	0.0000042	1.5	111,123	0.001
Butyl Tin Trichloride	NA	NE	0.001	20	NA	0.3	0.13	NE	1.5	NE	0.001
Butylbenzylphthalate	362.60	1300	0.001	20	13.746	0.3	0.13	0.000052	1.5	13,746	0.001
Cadmium	1.21	8.8	0.001	20	6.7	0.3	0.13	0	1.5	-	-
Carbon Disulfide	5.6	800	0.001	20	0.046	0.3	0.13	1.2	1.5	46	0.001
Chromium (total)	19.2	50	0.001	20	19	0.3	0.13	0	1.5	-	-
Chrysene	0.14	0.018	0.001	20	400	0.3	0.13	0.0039	1.5	400,000	0.001
Copper	1.07	2.4	0.001	20	22	0.3	0.13	0	1.5	-	-
Dibenz(a,h)anthracene	0.64	0.018	0.001	20	1,789	0.3	0.13	0.0000006	1.5	1,789,101	0.001
Dibenzofuran	NA	32	0.001	20	NA	0.3	0.13	NE	1.5	NE	0.001
Dibutyl Tin Dichloride	NA	NE	0.001	20	NA	0.3	0.13	NE	1.5	NE	0.001
Diethylphthalate	157.92	28,000	0.001	20	0.082	0.3	0.13	0.000019	1.5	82	0.001
Dimethylphthalate	NA	72,000	0.001	20	NA	0.3	0.13	NE	1.5	NE	0.001
Di-n-Butylphthalate	102.49	2,900	0.001	20	1.567	0.3	0.13	0.000000039	1.5	1,567	0.001
Di-n-Octyl phthalate	531,201.28	320	0.001	20	83,000	0.3	0.13	0.0027	1.5	83,000,000	0.001
Fluoranthene	88.73	90	0.001	20	49.096	0.3	0.13	0.00066	1.5	49,096	0.001
Fluorene	553.51	3,500	0.001	20	7.707	0.3	0.13	0.0026	1.5	7,707	0.001

Table 1b
Parameters Used to Calculate Soil Screening Levels Protective of Groundwater
Everett Shipyard

Chemical Detected in Site Media	Three-Phase Partition Model Parameters [a] Cs (mg/kg)	Cw (ug/L)	UCF (mg/ug)	DF	Kd (ml/g)	Ow (ml air/ml soil	Oa (ml air/ml soil	Hcc	Pb (kg/L)	Koc (ml/g)	Foc (g/g)
Indeno(1,2,3-cd)pyrene	1.26	0.018	0.001	20	3,500	0.3	0.13	0.000066	1.5	3,500,000	0.001
Lead	1,620.03	8.1	0.001	20	10,000	0.3	0.13	0	1.5	-	-
Mercury	0.026	0.025	0.001	20	52	0.3	0.13	0.47	1.5	-	-
Naphthalene	136.49	4,900	0.001	20	1.191	0.3	0.13	0.02	1.5	1,191	0.001
Nickel	10.69	8.2	0.001	20	65	0.3	0.13	0	1.5	-	-
N-Nitrosodiphenylamine	0.18	6	0.001	20	1.3	0.3	0.13	0.00021	1.5	1,300	0.001
Pentachlorophenol	0.05	3	0.001	20	0.59	0.3	0.13	0.000001	1.5	590	0.001
Phenanthrene	NA	NE	0.001	20	NA	0.3	0.13	NE	1.5	NE	0.001
Phenol	5,038.03	1,100,000	0.001	20	0.029	0.3	0.13	0.000016	1.5	29	0.001
Pyrene	3,545.99	2,600	0.001	20	67.992	0.3	0.13	0.00045	1.5	67,992	0.001
Silver	0.32	1.9	0.001	20	8.3	0.3	0.13	0	1.5	-	-
Tributyltin Oxide	7.57	0.01	0.001	20	37500	0.3	0.13	3860	1.5	37500000	0.001
Tetrachloroethene	0.0041	0.39	0.001	20	0.265	0.3	0.13	0.75	1.5	265	0.001
Total Benzofluoranthenes	NA	NA	0.001	20	NA	0.3	0.13	NE	1.5	NE	0.001
Total PCBs	NA	NA	0.001	20	310	0.3	0.13	NE	1.5	310,000	0.001
Zinc	100.76	81	0.001	20	62	0.3	0.13	0	1.5	-	-

Notes:

Cs - Soil concentration protective of groundwater. Cs=Cw(UCF)DF(Kd+((Ow+OaHcc)/Pb)).
Cw - includes the most stringent surface water screening level, or, if no surface water criteria is available, the most stringent potable groundwater criteria. (See Table 2.)
DF - Dilution Factor (20 for unsaturated zones)
Hcc - Henry's Law Coefficient
g/g - gram/gram
Kd - Distribution Coefficient
kg/l - kilograms/liter
Koc - Soil Organic Carbon-water Partitioning Coefficient
Foc - Soil fraction of organic carbon
mg/kg - milligrams per kilogram
ml - milliliter
ml/g - milliliters per gram
mg/ug - milligram per microgram
NA - Not applicable
NE - Not established
Oa - Air-filled porosity
Ow - Water-filled porosity
Pb - Dry soil bulk density
UCF - Unit Conversion Factor
ug/l - micrograms per liter

[a] Values are were identified in the following references:

MTCA - Model Toxics Control Act Cleanup Regulation, WAC 173-340 and values from Ecology CLARC website tables downloaded October 2008 (https://fortress.wa.gov/ecy/clarc/reporting/CLARCReporting.aspx).

Table 2
Screening Levels for Groundwater
Everett Shipyard

	Screening Levels [a]																
	Potable Groundwater						Surface Water										
	MTCA			EPA MCLs	EPA MCLGs	State MCLs	MTCA		Toxic Substances Criteria (WAC 173-201A)		National Recommended Water Quality Criteria			National Toxics Rule			Most Stringent Value [k]
	Method A	Method B - Human Health Protection					Method B - Human Health Protection		Marine Water		Saltwater		Human Health	Saltwater		Human Health	
		Carcinogenic	Non-carcinogenic				Carcinogenic	Non-carcinogenic	Acute	Chronic	CMC	CCC	Organism Only	CMC	CCC	Organism Only	
VOCs (ug/L) [Method 8260B]																	
1,1,1,2-Tetrachloroethane	NE	1.7	240	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	1.7
1,1,1-Trichloroethane	200	NE	7,200	200	200	200	NE	420,000	NE	NE	NE	NE	NE	NE	NE	NE	420,000
1,1,2,2-Tetrachloroethane	NE	0.22	NE	NE	NE	NE	6.5	NE	NE	NE	NE	NE	4.0	NE	NE	11	4.0
1,1,2-Trichloro-1,2,2-trifluoroethane	NE	NE	240,000	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	240,000
1,1,2-Trichloroethane	NE	0.77	32	5	3	5	25	2,300	NE	NE	NE	NE	16	NE	NE	42	16
1,1-Dichloroethane	NE	NE	1,600	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	1,600
1,1-Dichloroethene	NE	NE	400	7	7	7	NE	23,000	NE	NE	NE	NE	7,100	NE	NE	3.24	3.24
1,1-Dichloropropene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
1,2,3-Trichlorobenzene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
1,2,3-Trichloropropane	NE	0.0063	48	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0063
1,2,4-Trichlorobenzene	NE	NE	80	70	70	70	NE	230	NE	NE	NE	NE	70	NE	NE	NE	70
1,2,4-Trimethylbenzene	NE	NE	400	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	400
1,2-Dibromo-3-chloropropane	NE	0.031	NE	0.2	0	0.2	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.031
1,2-Dibromoethane (EDB)	0.01	0.00051	NE	0.05	0	0.05	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.00051
1,2-Dichlorobenzene	NE	NE	720	600	600	600	NE	4,200	NE	NE	NE	NE	1,300	NE	NE	NE	1,300
1,2-Dichloroethane (EDC)	5	0.48	160	5	0	5	59	43,000	NE	NE	NE	NE	37	NE	NE	99	37
1,2-Dichloropropane	NE	0.64	NE	5	0	5	23	NE	NE	NE	NE	NE	15	NE	NE	NE	15
1,3,5-Trimethylbenzene	NE	NE	400	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	400
1,3-Dichlorobenzene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	960	NE	NE	NE	960
1,3-Dichloropropane	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
1,4-Dichlorobenzene	NE	1.8	NE	75	75	75	4.9	NE	NE	NE	NE	NE	190	NE	NE	NE	4.9
2,2-Dichloropropane	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
2-Butanone	NE	NE	4,800	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	4,800
2-Chloroethylvinylether	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
2-Chlorotoluene	NE	NE	160	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	160
2-Hexanone	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
4-Chlorotoluene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
4-Isopropyltoluene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
4-Methyl-2-pentanone	NE	NE	640	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	640
Acetone	NE	NE	800	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	800
Acrolein	NE	NE	160	NE	NE	NE	NE	NE	NE	NE	NE	NE	290	NE	NE	780	290
Acrylonitrile	NE	0.081	8	NE	NE	NE	0.4	86	NE	NE	NE	NE	0.25	NE	NE	0.66	0.25
Benzene	5	0.8	32	5	0	5	23	2,000	NE	NE	NE	NE	51	NE	NE	71	23
Bromobenzene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
Bromochloromethane	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
Bromodichloromethane	NE	0.71	160	NE	0	80	28	14,000	NE	NE	NE	NE	17	NE	NE	22	17
Bromoethane	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
Bromoform	NE	5.5	160	80	80	80	220	14,000	NE	NE	NE	NE	140	NE	NE	360	140
Bromomethane	NE	NE	11	NE	NE	NE	NE	970	NE	NE	NE	NE	1,500	NE	NE	4,000	970
Carbon disulfide	NE	NE	800	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	800
Carbon tetrachloride	NE	0.34	5.6	5	0	5	2.7	97	NE	NE	NE	NE	1.6	NE	NE	4.4	1.6
Chlorobenzene	NE	NE	160	100	100	100	NE	5,000	NE	NE	NE	NE	1,600	NE	NE	21,000	1,600
Chloroethane	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
Chloroform	NE	7.2	80	80	0	80	280	6,900	NE	NE	NE	NE	470	NE	NE	470	280
Chloromethane	NE	3.4	NE	NE	NE	NE	130	NE	NE	NE	NE	NE	NE	NE	NE	NE	130
cis-1,2-Dichloroethene	NE	NE	80	70	70	70	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	70
cis-1,3-Dichloropropene	NE	0.24	240	NE	NE	NE	19	41,000	NE	NE	NE	NE	21	NE	NE	1,700 [j]	19
Dibromochloromethane	NE	0.52	160	80	60	80	21	14,000	NE	NE	NE	NE	13	NE	NE	34	13
Dibromomethane	NE	NE	80	5	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	5

Table 2
Screening Levels for Groundwater
Everett Shipyard

	Screening Levels [a]																
	Potable Groundwater						**Surface Water**										
	MTCA			**EPA MCLs**	**EPA MCLGs**	**State MCLs**	**MTCA**		**Toxic Substances Criteria (WAC 173-201A)**		**National Recommended Water Quality Criteria**			**National Toxics Rule**			**Most Stringent Value [k]**
	Method A	**Method B - Human Health Protection**					**Method B - Human Health Protection**		Marine Water		Saltwater		Human Health	Saltwater		Human Health	
		Carcinogenic	Non-carcinogenic				Carcinogenic	Non-carcinogenic	Acute	Chronic	CMC	CCC	Organism Only	CMC	CCC	Organism Only	
VOCs (ug/L) [Method 8260B] (cont.)																	
Dichlorodifluoromethane	NE	NE	1,600	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	1,600
Ethylbenzene	700	NE	800	700	700	700	NE	6,900	NE	NE	NE	NE	2,100	NE	NE	29,000	2,100
Hexachlorobutadiene	NE	0.56	1.6	NE	NE	NE	30	190	NE	NE	NE	NE	NE	NE	NE	NE	30
Iodomethane	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
Isopropylbenzene	NE	NE	800	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	800
m,p-xylene	1,000,000 [b]	NE	16,000	10,000 [b]	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	10,000
Methyl tert-butyl ether (MTBE)	20	24	6900	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	20
Methylene chloride	5	5.8	480	5	0	5	960	170,000	NE	NE	NE	NE	590	NE	NE	1,600	590
Naphthalene	160 [c]	NE	160 [c]	NE	NE	NE	NE	4,900	NE	NE	NE	NE	NE	NE	NE	NE	4,900
n-Butylbenzene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
n-Propylbenzene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
o-Xylene	1,000,000 [b]	NE	16,000	10,000 [b]	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	10,000
sec-Butylbenzene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
Styrene	NE	1.5	1,600	100	100	100	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	1.5
tert-Butylbenzene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
Tetrachloroethene	5	0.081	80	5	0	5	0.39	840	NE	NE	NE	NE	3.3	NE	NE	8.85	0.39
Toluene	1,000	NE	640	1,000	1,000	1,000	NE	19,000	NE	NE	NE	NE	15,000	NE	NE	200,000	15,000
trans-1,2-Dichloroethene	NE	NE	160	100	100	100	NE	33,000	NE	NE	NE	NE	10,000	NE	NE	NE	10,000
trans-1,3-Dichloropropene	NE	0.24	240	NE	NE	NE	19	41,000	NE	NE	NE	NE	21	NE	NE	NE	19
trans-1,4-Dichloro-2-Butene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
Trichloroethene	5	0.11	2.4	5	0	5	1.5	71	NE	NE	NE	NE	30	NE	NE	81	1.5
Trichlorofluoromethane	NE	NE	2,400	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	2,400
Vinyl acetate	NE	NE	8,000	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	8,000
Vinyl chloride	0.2	0.029	24	2	0	2	3.7	6,600	NE	NE	NE	NE	2.4	NE	NE	525	2.4
Low-Level VOCs (ug/L) [Method 8260 SIM]																	
1,1-Dichloroethene	NE	NE	400	7	7	7	NE	23,000	NE	NE	NE	NE	7,100	NE	NE	3.24	3.24
Tetrachloroethene	5	0.081	80	5	0	5	0.39	840	NE	NE	NE	NE	3.3	NE	NE	8.85	0.39
Trichloroethene	5	0.11	2.4	5	0	5	1.5	71	NE	NE	NE	NE	30	NE	NE	81	1.5
Vinyl chloride	0.2	0.029	24	2	0	2	3.7	6,600	NE	NE	NE	NE	2.4	NE	NE	525	2.4
SVOCs (ug/L) [Method 8270D]																	
1,2,4-Trichlorobenzene	NE	NE	80	70	70	70	NE	230	NE	NE	NE	NE	70	NE	NE	NE	70
1,2-Dichlorobenzene	NE	NE	720	600	600	600	NE	4,200	NE	NE	NE	NE	1,300	NE	NE	17,000	1,300
1,3-Dichlorobenzene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	960	NE	NE	2,600	960
1,4-Dichlorobenzene	NE	1.8	NE	75	75	75	4.9	NE	NE	NE	NE	NE	190	NE	NE	2,600	4.9
1-Methylnaphthalene	NE	NE	2.4	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	2.4
2,2'-Oxybis (1-chloropropane)	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
2,4,5-Trichlorophenol	NE	NE	800	NE	NE	NE	NE	NE	NE	NE	NE	NE	3,600	NE	NE	NE	3,600
2,4,6-Trichlorophenol	NE	4	NE	NE	NE	NE	3.9	NE	NE	NE	NE	NE	2.4	NE	NE	6.5	2.4
2,4-Dichlorophenol	NE	NE	24	NE	NE	NE	NE	190	NE	NE	NE	NE	290	NE	NE	790	190
2,4-Dimethylphenol	NE	NE	160	NE	NE	NE	NE	550	NE	NE	NE	NE	850	NE	NE	NE	550
2,4-Dinitrophenol	NE	NE	32	NE	NE	NE	NE	3,500	NE	NE	NE	NE	5,300	NE	NE	14,000	3,500
2,4-Dinitrotoluene	NE	NE	32	NE	NE	NE	NE	1,400	NE	NE	NE	NE	3.4	NE	NE	9.1	3.4
2,6-Dinitrotoluene	NE	NE	16	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	16
2-Chloronaphthalene	NE	NE	NE	NE	NE	NE	NE	1,000	NE	NE	NE	NE	1,600	NE	NE	NE	1,000
2-Chlorophenol	NE	NE	40	NE	NE	NE	NE	97	NE	NE	NE	NE	150	NE	NE	NE	97
2-Methylnaphthalene	NE	NE	32	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	32
2-Methylphenol	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
2-Nitroaniline	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
2-Nitrophenol	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA

Table 2
Screening Levels for Groundwater
Everett Shipyard

	Screening Levels [a]																
	Potable Groundwater						Surface Water										
	Method A	MTCA		EPA MCLs	EPA MCLGs	State MCLs	MTCA		Toxic Substances Criteria (WAC 173-201A)		National Recommended Water Quality Criteria			National Toxics Rule			Most Stringent Value [k]
		Method B - Human Health Protection					Method B - Human Health Protection		Marine Water		Saltwater		Human Health	Saltwater		Human Health	
		Carcinogenic	Non-carcinogenic				Carcinogenic	Non-carcinogenic	Acute	Chronic	CMC	CCC	Organism Only	CMC	CCC	Organism Only	
SVOCs (ug/L) <u>[Method 8270D] (cont.)</u>																	
3,3’-Dichlorobenzidine	NE	0.19	NE	NE	NE	NE	0.046	NE	NE	NE	NE	NE	0.028	NE	NE	0.077	0.028
3-Nitroaniline	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
4,6-Dinitro-2-methylphenol	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	280	NE	NE	765	280
4-Bromophenyl-phenyl ether	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
4-Chloro-3-methylphenol	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
4-Chloroaniline	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
4-Chlorophenyl-phenyl ether	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
4-Methylphenol	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
4-Nitroaniline	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
4-Nitrophenol	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
Acenaphthene	NE	NE	960	NE	NE	NE	NE	640	NE	NE	NE	NE	990	NE	NE	NE	640
Acenaphthylene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
Anthracene	NE	NE	4,800	NE	NE	NE	NE	26,000	NE	NE	NE	NE	40,000	NE	NE	110,000	26,000
Benzo(a)anthracene	See Note d	See Note d	NE	NE	NE	NE	See Noted d	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.018
Benzo(a)pyrene	0.1	0.012	NE	0.2	0	0.2	0.03	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.018
Benzo(b)fluoranthene	See Note d	See Note d	NE	NE	NE	NE	See Noted d	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.018
Benzo(g,h,i)perylene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
Benzo(k)fluoranthene	See Note d	See Note d	NE	NE	NE	NE	See Noted d	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.018
Benzoic acid	NE	NE	64,000	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	64,000
Benzyl alcohol	NE	NE	2,400	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	2,400
Bis-(2-chloroethoxy)methane	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
Bis-(2-chloroethyl)ether	NE	0.04	NE	NE	NE	NE	0.85	NE	NE	NE	NE	NE	0.53	NE	NE	1.4	0.53
bis(2-Ethylhexyl)phthalate	NE	6.3	320	6	0	6	3.6	400	NE	NE	NE	NE	2.2	NE	NE	5.9	2.2
Butylbenzylphthalate	NE	NE	3,200	NE	NE	NE	NE	1,300	NE	NE	NE	NE	1,900	NE	NE	NE	1300
Carbazole	NE	4.4	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	4.4
Chrysene	See Note d	See Note d	NE	NE	NE	NE	See Noted d	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.018
Dibenzo(a,h)anthracene	See Note d	See Note d	NE	NE	NE	NE	See Noted d	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.018
Dibenzofuran	NE	NE	32	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	32
Diethylphthalate	NE	NE	13,000	NE	NE	NE	NE	28,000	NE	NE	NE	NE	44,000	NE	NE	120,000	28,000
Dimethylphthalate	NE	NE	16,000	NE	NE	NE	NE	72,000	NE	NE	NE	NE	1,100,000	NE	NE	2,900,000	72,000
Di-n-butylphthalate	NE	NE	1,600	NE	NE	NE	NE	2,900	NE	NE	NE	NE	4,500	NE	NE	12,000	2,900
Di-n-octylphthalate	NE	NE	320	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	320
Fluoranthene	NE	NE	640	NE	NE	NE	NE	90	NE	NE	NE	NE	140	NE	NE	370	90
Fluorene	NE	NE	640	NE	NE	NE	NE	3,500	NE	NE	NE	NE	5,300	NE	NE	14,000	3,500
Hexachlorobenzene	NE	0.055	13	1	0	1	0.00047	0.24	NE	NE	NE	NE	0.00029	NE	NE	0.00077	0.00029
Hexachlorobutadiene	NE	0.56	1.6	NE	NE	NE	30	190	NE	NE	NE	NE	18	NE	NE	50	18
Hexachlorocyclopentadiene	NE	NE	48	50	50	50	NE	3,600	NE	NE	NE	NE	1,100	NE	NE	17,000	1,100
Hexachloroethane	NE	3.1	8	NE	NE	NE	5.3	30	NE	NE	NE	NE	3.3	NE	NE	8.9	3.3
Indeno(1,2,3-cd)pyrene	See Note d	See Note d	NE	NE	NE	NE	See Noted d	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.018
Isophorone	NE	46	1600	NE	NE	NE	1,600	120,000	NE	NE	NE	NE	960	NE	NE	600	600
Naphthalene	160 [c]	NE	160 [c]	NE	NE	NE	NE	4,900	NE	NE	NE	NE	NE	NE	NE	NE	4,900
Nitrobenzene	NE	NE	4	NE	NE	NE	NE	450	NE	NE	NE	NE	690	NE	NE	1,900	450
N-Nitroso-di-n-propylamine	NE	NE	NE	NE	NE	NE	0.82	NE	NE	NE	NE	NE	0.51	NE	NE	NE	0.51
N-Nitrosodiphenylamine	NE	NE	NE	NE	NE	NE	9.7	NE	NE	NE	NE	NE	6.0	NE	NE	16.0	6.0
Pentachlorophenol	NE	0.73	480	1	0	1	4.9	7,100	13.0	7.9	13	7.9	3.0	13	7.9	8.2	3.0
Phenanthrene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Phenol	NE	NE	4,800	NE	NE	NE	NE	1,100,000	NE	NE	NE	NE	1,700,000	NE	NE	4,600,000	1,100,000
Pyrene	NE	NE	480	NE	NE	NE	NE	2,600	NE	NE	NE	NE	4,000	NE	NE	11,000	2,600

Table 2
Screening Levels for Groundwater
Everett Shipyard

	Screening Levels [a]																
	Potable Groundwater						Surface Water										
	MTCA			EPA MCLs	EPA MCLGs	State MCLs	MTCA		Toxic Substances Criteria (WAC 173-201A)		National Recommended Water Quality Criteria			National Toxics Rule			Most Stringent Value [k]
	Method A	Method B - Human Health Protection					Method B - Human Health Protection		Marine Water		Saltwater		Human Health	Saltwater		Human Health	
		Carcinogenic	Non-carcinogenic				Carcinogenic	Non-carcinogenic	Acute	Chronic	CMC	CCC	Organism Only	CMC	CCC	Organism Only	
PAHs (ug/L) [Method 8270 SIM]																	
1-Methylnaphthalene	NE	NE	2.4	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	2.4
2-Methylnaphthalene	NE	NE	32	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	32
Acenaphthene	NE	NE	960	NE	NE	NE	NE	640	NE	NE	NE	NE	990	NE	NE	NE	640
Acenaphthylene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
Anthracene	NE	NE	4,800	NE	NE	NE	NE	26,000	NE	NE	NE	NE	40,000	NE	NE	110,000	26,000
Benzo(a)anthracene	See Note d	See Note d	NE	NE	NE	NE	See Noted d	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.018
Benzo(a)pyrene	0.1	0.012	NE	0.2	0	0.2	0.03	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.018
Benzo(b)fluoranthene	See Note d	See Note d	NE	NE	NE	NE	See Noted d	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.018
Benzo(g,h,i)perylene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
Benzo(k)fluoranthene	See Note d	See Note d	NE	NE	NE	NE	See Noted d	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.018
Chrysene	See Note d	See Note d	NE	NE	NE	NE	See Noted d	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.018
Dibenzo(a,h)anthracene	See Note d	See Note d	NE	NE	NE	NE	See Noted d	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.018
Dibenzofuran	NE	NE	32	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	32
Fluoranthene	NE	NE	640	NE	NE	NE	NE	90	NE	NE	NE	NE	140	NE	NE	370	90
Fluorene	NE	NE	640	NE	NE	NE	NE	3,500	NE	NE	NE	NE	5,300	NE	NE	14,000	3,500
Indeno(1,2,3-cd)pyrene	See Note d	See Note d	NE	NE	NE	NE	See Noted d	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.018
Naphthalene	160 [d]	NE	160	NE	NE	NE	NE	4,900	NE	NE	NE	NE	NE	NE	NE	NE	4,900
Phenanthrene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
Pyrene	NE	NE	480	NE	NE	NE	NE	2,600	NE	NE	NE	NE	4,000	NE	NE	11,000	2,600
PCBs (ug/L) [Method 8082]																	
Aroclor 1016	NE	NE	1.1	NE	NE	NE	NE	0.0058	NE	NE	NE	NE	NE	NE	0.03	NE	0.0058
Aroclor 1221	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.03	NE	0.03
Aroclor 1232	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.03	NE	0.03
Aroclor 1242	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.03	NE	0.03
Aroclor 1248	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.03	NE	0.03
Aroclor 1254	NE	NE	0.32	NE	NE	NE	NE	0.0017	NE	NE	NE	NE	NE	NE	0.03	NE	0.0017
Aroclor 1260	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.03	NE	0.03
Total PCBs	0.1	0.044	NE	0.5	0	0.5	0.00011	NE	10	0.03	NE	0.03	0.000064	NE	NE	0.00017	0.000064
TPH (mg/L) [Ecology Method NWTPH-Dx]																	
Diesel-range	0.5	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.5
Oil-range	0.5	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.5
Organotins (ug/L) [Method Psep/Krone 1988]																	
Tributyltin as TBT Ion	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.37	0.01	NE	NE	NE	NE	0.01
Dibutyl Tin Ion	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
Butyl Tin Ion	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
Metals (mg/L) [Method 6010B/7421/7470A]																	
Arsenic	0.005	0.0000583	0.0048	0.01	0	0.01	0.000098	0.018	0.069 [e,f]	0.036 [f,g]	0.069	0.036	0.00014	0.069	0.036	0.00014	0.000098
Antimony	NE	NE	0.0064	0.006	0.006	0.006	NE	1	NE	NE	NE	NE	0.64	NE	NE	4.3	0.64
Beryllium	NE	NE	0.032	0.004	0.004	0.004	NE	0.27	NE	NE	NE	NE	NE	NE	NE	NE	0.27
Cadmium	0.005	0.008	0.008	0.005	0.005	0.005	NE	0.02	0.042 [e,f]	0.093 [f,g]	0.04	0.0088	NE	0.042	0.0093	NE	0.0088
Calcium	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
Chromium (total)	0.05	NE	NE	0.1	0.1	0.1	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.05
Chromium^{+3}	NE	NE	24	0.1	NE	0.1	NE	240	NE	NE	NE	NE	NE	NE	NE	NE	240
Chromium^{+6}	NE	NE	0.048	NE	0.1	0.1	NE	0.49	1.1 [e,f,g]	0.05 [f,g]	1.1	0.05	NE	1.1	0.05	NE	0.05
Copper	NE	NE	0.592	1.3	1.3	1.3	NE	2.7	0.0048 [e,f]	0.0031 [f,g]	0.0048	0.0031	NE	0.0024	0.0024	NE	0.0024
Lead	0.015	NE	NE	0.015	0	0.015	NE	NE	0.21 [e,f]	0.0081 [f,g]	0.21	0.0081	NE	0.21	0.0081	NE	0.0081
Magnesium	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
Mercury	0.002	NE	0.0048	0.002	0.002	0.002	NE	NE	0.0018 [e,f]	0.000025 [g]	0.0018	0.00094	0.0003	0.0018	0.000025	0.00015	0.000025
Nickel	NE	NE	0.32	NE	NE	NE	NE	NE	0.074 [e,f]	0.0082 [f,g]	0.074	0.0082	4.6	0.074	0.0082	4.6	0.0082

Table 2
Screening Levels for Groundwater
Everett Shipyard

	Screening Levels [a]																
	Potable Groundwater						**Surface Water**										
	MTCA			**EPA MCLs**	**EPA MCLGs**	**State MCLs**	**MTCA**		**Toxic Substances Criteria (WAC 173-201A)**		**National Recommended Water Quality Criteria**			**National Toxics Rule**			**Most Stringent Value** [k]
	Method A	**Method B - Human Health Protection**					**Method B - Human Health Protection**		Marine Water		Saltwater		Human Health Organism Only	Saltwater		Human Health Organism Only	
		Carcinogenic	Non-carcinogenic				Carcinogenic	Non-carcinogenic	Acute	Chronic	CMC	CCC		CMC	CCC		
Metals (mg/L) <u>[Method 6010B/7421/7470A] (cont.)</u>																	
Selenium	NE	NE	0.08	0.05	0.05	0.05	NE	2.7	0.29	0.071	0.029 [e]	0.071 [e]	4.2	0.29	0.071	NE	0.071
Silver	NE	NE	0.08	0.1 [i]	NE	NE	NE	26	0.0019 [e,i]	NE	0.0019	NE	NE	0.0019	NE	NE	0.0019
Thallium	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
Zinc	NE	NE	4.8	5 [i]	NE	NE	NE	17	0.09 [e,f]	0.081 [f,g]	0.09	0.081	26	0.09	0.081	NE	0.081
Conventional Parameters																	
pH (standard units) [Method 150.1]	NE	NE	NE	6.5 - 8.5	NE	NE	NE	NE	6.5-9.0	6.5-9.0	NE	6.5 - 8.5	NE	NE	NE	NE	6.5 - 9.0
TDS (mg/L) [Method 160.1]	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA

<u>Notes:</u>

CCC - Criteria continuous concentration (chronic)
CMC - Criteria maximum concentration (acute)
MCLs - Maximum contaminant levels
MCLGs - Maximum containment level goals
mg/L - milligrams per liter
ug/L - micrograms per liter
NA - Not applicable
NE - Not established
VOCs - Volatile organic compounds
PCBs - Polychlorinated biphenyls
SVOCs - Semivolatile organic compounds
TDS - Total dissolved solids
TPH - Total petroleum hydrocarbons

[a] Screening levels are based on either standards for potable groundwater or surface water as identified in the following references:
MTCA - Model Toxics Control Act Cleanup Regulation, WAC 173-340. MTCA Method A and B values, EPA MCLs, EPA MCLGs, State MCLs, are from Ecology website CLARC tables downloaded October 2008 (https://fortress.wa.gov/ecy/clarc/reporting/CLARCReporting.aspx).
Water Quality Standards For Surface Waters of the State Of Washington, Toxic Substances Criteria, WAC 173-201A. Last update November 2006.
National Recommended Water Quality Criteria, USEPA, 2006.
National Toxics Rule, 40 CFR 131.36, USEPA 2006.

[b] The screening level shown is for total xylenes.

[c] Screening level based on total of naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene.

[d] Carcinogenic PAH (cPAH) cleanup levels under MTCA are based on the calculated total toxicity of the mixture using the Toxicity Equivalency Methodology in WAC 173-340-780 (8). The mixture of cPAHs shall be considered a single hazardous substance and compared to the applicable MTCA Method A or B cleanup level for benzo(a)pyrene.

[e] The metals criteria are associated with the dissolved fraction of the water column.

[f] A 1-hour average concentration not to be exceeded more than once every three years on the average.

[g] A 4-day average concentration not to be exceeded more than once every three years on the average.

[h] An instantaneous concentration not to be exceeded at any time.

[i] National Secondary Drinking Water Regulation (secondary standard). Secondary standards are non-enforceable guidelines regulating contaminants that may cause cosmetic or aesthetic effects in drinking water. States may choose to adopt them as enforceable standards.

[j] Value is for 1,3-dichloropropene.

[k] Most Stringent Value is the most stringent surface water screening level, or, if no surface water criteria is available, the most stringent (non-zero) potable groundwater screening level.

Table 3
Screening Levels for Sediment
Everett Shipyard

	Sediment Management Standards [a]	
	Sediment Quality Standard (SQS)	Cleanup Screening Levels (CSLs)
VOCs (ug/kg) [Method 8260B]		
1,2,4-Trichlorobenzene*	810	1800
1,2-Dichlorobenzene*	2,300	2,300
1,4-Dichlorobenzene*	3,100	9,000
SVOCs (ug/kg) [Method 8270 SIM]		
2,4-Dimethylphenol	29	29
2-Methylphenol	63	63
4-Methylphenol	670	670
Benzo(b)fluoranthene	230,000**	450,000**
Benzo(k)fluoranthene	230,000**	450,000**
Benzoic Acid	650	650
Benzyl Alcohol	57	73
Pentachlorophenol	360	690
Phenol	420	1,200
2-Methylnapthalene*	38,000	64,000
Acenaphthene*	16,000	57,000
Acenaphthylene*	66,000	66,000
Anthracene*	220,000	1,200,000
Benz[a]anthracene*	110,000	270,000
Benzo[a]pyrene*	99,000	210,000
Benzo[g,h,i]perylene*	31,000	78,000
Bis[2-ethylhexyl]phthalate*	47,000	78,000
Butyl Benzyl Phthalate*	4,900	64,000
Chrysene*	110,000	460,000
Dibenz[a,h]anthracene*	12,000	33,000
Dibenzofuran*	15,000	58,000
Diethyl Phthalate*	61,000	110,000
Dimethyl Phthalate*	53,000	53,000
Di-n-butyl Phthalate*	220,000	1,700,000
Di-n-octyl Phthalate*	58,000	4,500,000
Fluoranthene*	160,000	1,200,000
Fluorene*	23,000	79,000
Indeno[1,2,3-cd]pyrene*	34,000	88,000
Napthalene*	99,000	170,000
N-nitrosodiphenylamine*	11,000	11,000
Phenanthrene*	100,000	480,000
Pyrene*	1,000,000	1,400,000
Total LPAH	370,000	780,000
Total HPAH	960,000	5,300,000
Total Benzofluoranthenes	230,000	450,000
Pesticides (ug/kg) [Method 8081A]		
Hexachlorobenzene*	380	2,300
Hexachlorobutadiene*	3,900	6,200
PCBs (ug/kg) [Method 8082]		
Aroclor 1016	--	--
Aroclor 1221	--	--
Aroclor 1232	--	--
Aroclor 1242	--	--
Aroclor 1248	--	--
Aroclor 1254	--	--
Aroclor 1260	--	--
Total PCBs*	12,000	65,000

Table 3
Screening Levels for Sediment
Everett Shipyard

	Sediment Management Standards [a]	
	Sediment Quality Standard (SQS)	Cleanup Screening Levels (CSLs)
Organotin (µg/L) (Pore Water) [Krone]		
Tetrabutyl Tin	NE	NE
Tributyl Tin Chloride	NE	NE
Dibutyl Tin Dichloride	NE	NE
Butyl Tin Trichloride	NE	NE
TBT as Tin ion	0.05 [b]	0.15 [c]
Organotin (µg/kg) (Bulk) [Krone]		
Tetrabutyl Tin	NE	NE
Tributyl Tin Chloride	NE	NE
Dibutyl Tin Dichloride	NE	NE
Butyl Tin Trichloride	NE	NE
Tributyltin as TBT ion	NE	73 [d]
Metals (mg/kg) [Method 6010/7471]		
Arsenic	57	93
Cadmium	5.1	6.7
Chromium	260	270
Copper	390	390
Lead	450	530
Mercury	0.41	0.59
Silver	6.1	6.1
Zinc	410	960
Ammonia (mg-N/kg) [Method 350.1]		
Ammonia	NE	NE
Total Sulfides (mg/kg) [Method PSEP]		
Total Sulfides	NE	NE
Acid Volatile Sulfides	NE	NE
Total Solids (%)		
Total Solids **[Method 160.3]**	NE	NE
Total Volatile Solids (mg/kg) **[Method 160.4]**	NE	NE
TOC (%) [Method PSEP/Plumb]		
TOC	NE	NE

Notes:

NE - Not established
PCBs - Polychlorinated biphenyls
SVOCs - Semivolatile organic compounds
TOC - Total organic carbon
Total LPAH = The sum of detected naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene.
Total HPAH = The sum of detected fluoranthene, pyrene, benz(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)perylene.
Total benzofluoranthenes= The sum of the b, j, and k isomers.
VOCs - Volatile organic compounds
Laboratory MDLs, RLs, and control limits provided by Analytical Resources, Inc.
* The listed SQS value represents a concentration in parts per billion (ppb) 'normalized' on a TOC basis.
** The listed SQS value represents the sum of the concentrations of the b, j, and k isomers of benzofluoranthene.

[a] Sediment Sampling and Analysis Plan Appendix; Washington State Department of Ecology, Publication 03-09-043, Revised February 2008 (WAC 173-204).

[b] Approximate no affects level (SQS equivalent)

[c] Puget Sound Drilling and Dredging Act (PSDDA) open water disposal screening level criteria.

[d] Preliminary criteria based on bulk equivalent of PSDDA open water disposal screening level criteria for porewater TBT.

Table 4
Soil Analytical Results - 2003
Everett Shipyard

Location:	**Screening Levels**				ESY-SS1-	ESY-SS2-	ESY-SS3-	ESY-SS4-	ESY-SS5-	ESY-SS6-	ESY-S-LB1	ESY-S-LB10 (a)	ESY-S-LB2	ESY-S-LB9	ESY-S-LB10	ESY-S-LB11	ESY-S-LB12	ESY-S-LB13	ESY-S-LB14
Depth (ft):					0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-2	0-2	0-2	0-2	0-2	0-2
Lab ID:	**Method A**	**Method B**		**Protection of Marine Surface Water (WAC 173-201A-240)**	303013-01	303027-02	303013-02	303013-03	303013-04	303027-03	303038-02	303038-03	303038-06	FN08A	FN08B	FN08C	FN08D	FN08E	FN08F
Date Collected:	Unrestricted Land Use	Carcinogenic	Non-Carcinogenic		3/4/2003	3/5/2003	3/4/2003	3/4/2003	3/4/2003	3/5/2003	3/7/2003	3/7/2003	3/7/2003	5/27/2003	5/27/2003	5/27/2003	5/27/2003	5/27/2003	5/27/2003
NWTPH-Dx (mg/kg)																			
Diesel	2,000	NE	NE	NE	25 U	50 U	25 U	570	25 U	25 U	25 U	25 U	25 U	7.6	19	43	15	58	140
Lube Oil (Motor Oil)	2,000	NE	NE	NE	280	680	260	870	450	130	50 U	50 U	50 U	15	200	250	35	170	510
TOTAL METALS (mg/kg)																			
Arsenic	20	0.67	24	0.057	3.4 U	12 U	14 U	84	210	3.1 U	3.0 U	2.8 U	3.0 U	NA	NA	NA	NA	NA	NA
Cadmium	2	NE	80	1.2	0.56 U	2.0 U	2.3 U	2.9	3.2	0.51 U	0.50 U	0.47 U	0.51 U	NA	NA	NA	NA	NA	NA
Chromium	2,000 (Cr^{+3}) / 19 (Cr^{+6})	NE	120,000 (Cr^{+3}) / 240 (Cr^{+6})	19	31	51	150	51	96	18	18	17	13	NA	NA	NA	NA	NA	NA
Copper	NE	NE	3,000	1.10	750	2,000	2,600	1,400	2,000	84	19	16	9.3	NA	NA	NA	NA	NA	NA
Lead	250	NE	NE	1,620	24	28	230	240	550	13	6.0 U	5.6 U	6.1 U	NA	NA	NA	NA	NA	NA
Mercury	2	NE	24	0.026	0.16	0.02 U	0.29	0.34	0.97	0.02 U	0.02 U	0.02 U	0.02 U	NA	NA	NA	NA	NA	NA
Silver	NE	NE	400	0.32	0.79 U	2.8 U	3.2 U	1.5 U	1.4 U	0.72 U	0.70 U	0.66 U	0.71 U	NA	NA	NA	NA	NA	NA
Zinc	NE	NE	24,000	100	1,100	990	3,100	1,600	2,800	120	28	25	18	NA	NA	NA	NA	NA	NA
ORGANOTINS (µg/kg)																			
Tetrabutyl Tin	NE	NE	NE	NE	NA	NA	5.8 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tributyl Tin Chloride	NE	NE	NE	NE	NA	NA	1,200 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibutyl Tin Dichloride	NE	NE	NE	NE	NA	NA	300 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl Tin Trichloride	NE	NE	NE	NE	NA	NA	100 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tributyltin (as TBT ion) [c]	NE	NE	23,000 [d]	7,400	NA	NA	1,100 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs (mg/kg)																			
PCB-1016	NE	NE	5,600	NE	NA	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	NA	NA	NA	NA	NA	NA	NA
PCB-1221	NE	NE	NE	NE	NA	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	NA	NA	NA	NA	NA	NA	NA
PCB-1232	NE	NE	NE	NE	NA	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	NA	NA	NA	NA	NA	NA	NA
PCB-1242	NE	NE	NE	NE	NA	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	NA	NA	NA	NA	NA	NA	NA
PCB-1248	NE	NE	NE	NE	NA	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	NA	NA	NA	NA	NA	NA	NA
PCB-1254	NE	NE	1,600	NE	NA	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	NA	NA	NA	NA	NA	NA	NA
PCB-1260	NE	NE	NE	NE	NA	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	NA	NA	NA	NA	NA	NA	NA
Total PCBs	1,000	500	NE	NE	NA	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	NA	NA	NA	NA	NA	NA	NA
VOLATILES (µg/kg)																			
1,1,1,2-Tetrachloroethane	NE	38,000	2,400,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
1,1,1-Trichloroethane	2,000	NE	72,000,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
1,1,2,2-Tetrachloroethane	NE	5,000	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
1,1,2-Trichloro-1,2,2-trifluoroethane	NE	NE	2,400,000,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.4 U	2.2 U	2.2 U	2.1 U	2.2 U	2.1 U
1,1,2-Trichloroethane	NE	18,000	320,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
1,1-Dichloroethane	NE	NE	16,000,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
1,1-Dichloroethene	NE	NE	4,000,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
1,1-Dichloropropene	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
1,2,3-Trichlorobenzene	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.9 U	5.5 U	5.4 U	5.3 U	5.5 U	5.3 U
1,2,3-Trichloropropane	NE	140	480,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.4 U	2.2 U	2.2 U	2.1 U	2.2 U	2.1 U
1,2,4-Trichlorobenzene	NE	NE	800,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.9 U	5.5 U	5.4 U	5.3 U	5.5 U	5.3 U
1,2-Dichlorobenzene	NE	NE	7,200,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
1,2-Dichloroethane	NE	11,000	1,600,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
1,2-Dichloropropane	NE	15,000	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
1,3,5-Trimethylbenzene	NE	NE	4,000,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
1,3-Dichlorobenzene	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
1,3-Dichloropropane	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
1,4-Dichlorobenzene	NE	42,000	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
2,2-Dichloropropane	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
2-Butanone	NE	NE	48,000,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.9 U	5.5 U	5.4 U	5.3 U	5.5 U	5.3 U
2-Chloroethylvinylether	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.9 U	5.5 U	5.4 U	5.3 U	5.5 U	5.3 U
2-Chlorotoluene	NE	NE	1,600,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
2-Hexanone	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.9 U	5.5 U	5.4 U	5.3 U	5.5 U	5.3 U
4-Chlorotoluene	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
4-Isopropyltoluene	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
4-Methyl-2-Pentanone (MIBK)	NE	NE	6,400,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.9 U	5.5 U	5.4 U	5.3 U	5.5 U	5.3 U
Acetone	NE	NE	8,000,000	3,200	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.9 U	5.5 U	5.4 U	5.3 U	5.5 U	5.3 U
Acrolein	NE	NE	1,600,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	59 U	55 U	54 U	53 U	55 U	53 U
Acrylonitrile	NE	1,900	80,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.9 U	5.5 U	5.4 U	5.3 U	5.5 U	5.3 U
Benzene	30	18,000	320,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Bromobenzene	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Bromochloromethane	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Bromodichloromethane	NE	16,000	1,600,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Bromoethane	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.4 U	2.2 U	2.2 U	2.1 U	2.2 U	2.1 U
Bromoform	NE	130,000	1,600,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Bromomethane	NE	NE	110,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Carbon Disulfide	NE	NE	8,000,000	5,600	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Carbon Tetrachloride	NE	7,700	56,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Chlorobenzene	NE	NE	1,600,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Chloroethane	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Chloroform	NE	160,000	800,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Chloromethane	NE	77,000	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U

Table 4
Soil Analytical Results - 2003
Everett Shipyard

Location:	**Screening Levels**				ESY-SS1-	ESY-SS2-	ESY-SS3-	ESY-SS4-	ESY-SS5-	ESY-SS6-	ESY-S-LB1	ESY-S-LB10 (a)	ESY-S-LB2	ESY-S-LB9	ESY-S-LB10	ESY-S-LB11	ESY-S-LB12	ESY-S-LB13	ESY-S-LB14
Depth (ft):					0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-2	0-2	0-2	0-2	0-2	0-2
Lab ID:	**Method A**	**Method B**		**Protection of Marine Surface Water (WAC 173-201A-240)**	303013-01	303027-02	303013-02	303013-03	303013-04	303027-03	303038-02	303038-03	303038-06	FN08A	FN08B	FN08C	FN08D	FN08E	FN08F
Date Collected:	Unrestricted Land Use	Carcinogenic	Non-Carcinogenic		3/4/2003	3/5/2003	3/4/2003	3/4/2003	3/4/2003	3/5/2003	3/7/2003	3/7/2003	3/7/2003	5/27/2003	5/27/2003	5/27/2003	5/27/2003	5/27/2003	5/27/2003
cis-1,2-Dichloroethene	NE	NE	800,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
cis-1,3-Dichloropropene	NE	5,600	2,400,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Dibromochloromethane	NE	12,000	1,600,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Dibromomethane	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Ethylbenzene	6,000	NE	8,000,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Ethylene Dibromide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Hexachlorobutadiene	NE	13,000	16,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.9 U	5.5 U	5.4 U	5.3 U	5.5 U	5.3 U
Isopropylbenzene	NE	NE	8,000,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
m,p-Xylene	9,000	NE	16,000,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Methyl Iodide	100	560,000	69,000,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Methylene Chloride	20	130,000	4,800,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.4 U	2.2 U	2.2 U	2.1 U	2.2 U	2.1 U
Naphthalene	5,000 (b)	NE	1,600,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.9 U	5.5 U	5.4 U	5.3 U	5.5 U	5.3 U
n-Butylbenzene	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
n-Propylbenzene	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
o-Xylene	NE	NE	160,000,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
sec-Butylbenzene	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Styrene	NE	33,000	16,000,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
tert-Butylbenzene	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Tetrachloroethene	50	1,900	800,000	4.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	2.2 J	2.8 J	1.1 U	1.1 U
Toluene	7,000	NE	6,400,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
trans-1,2-Dichloroethene	NE	NE	1,600,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
trans-1,3-Dichloropropene	NE	5,600	2,400,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
trans-1,4-Dichloro-2-butene	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.9 U	5.5 U	5.4 U	5.3 U	5.5 U	5.3 U
Trichloroethene	30	2,500	24,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Trichlorofluoromethane	NE	NE	24,000,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Vinyl Acetate	NE	NE	80,000,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	R	5.5 U	5.4 U	5.3 U	5.5 U	5.3 U
Vinyl Chloride	NE	670	240,000	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U

NA = Not analyzed
NE = Not established
U = Indicates compound was analyzed for, but was not detected at the given detection limit.
UJ = The analyte was not detected in the sample; the reported sample detection limit is an estimate.
J = Indicates that the analyte was positively identified; the associated numercial value
is the approximate concentration of the analyte in the sample.
R = The sample results are rejected due to serious deficiencies in the ability to analyze the samples and meet quality control criteria.
The presence or absence of the analyte cannot be verified.
(a) Duplicate of ESY-S-LB1
(b) MTCA Method A screening level is a total value for naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene.
(c) TBT ion value calculated by Ecology; the value is based on the weights of one mole of TBTO and two moles of TBT ion.
(d) The screening level is for tributyl tin oxide and was calculated using an oral RfD of 0.0003 mg/kg-day.

Notes:
Shaded results exceed the most stringent screening level.

Table 5
Soil Analytical Results - 2007
Everett Shipyard

Sample ID	**Sample Depth (feet bgs)**	**Sample Date**	**TPH (mg/kg)**		**Total Metals (mg/kg)**					
			Diesel-Range	Motor Oil-Range	Arsenic	Cadmium	Copper	Lead	Mercury	Zinc
BSS-1	1	4/2/2007	5.4 U	36	2.40	0.535 U	10.7 J	4.29	0.106 U	35.2 J
	3	4/2/2007	5.4 U	11 U	5.79	0.561 U	9.02 J	1.80	0.108 U	32.3 J
BSS-2	1	4/2/2007	33*	200	4.38	0.498 U	22.3 J	13.0	0.104 U	163 J
BSS-3	1	4/2/2007	6.2*	51	4.77	1.49	13.3 J	3.88	0.0962 U	198
	2.5	4/2/2007	180*	1,100	5.99	0.533 U	19.2 J	14.2	0.0785 U	71.8 J
BSS-4	1	4/12/2007	5.2 U	10 U	2.54	0.507 U	5.70	1.40	0.103 U	20.6
	3	4/12/2007	--	--	--	--	5.76	--	--	20.9
SS-1	1	4/2/2007	120	190	21.9	0.596 U	51.3 J	16.0	0.105 U	101 J
	3	4/2/2007	--	--	18.1 J	0.602 U	41.9 J	14.2 J	0.120 UJ	111 J
SS-2	1	4/2/2007	5,500	26,000	24.8	0.549	135 J	91.4	0.365	95.5 J
	3	4/2/2007	21*	180	10.8 J	0.540 U	32.7 J	9.17 J	0.109 UJ	73.2 J
SS-4	1	4/2/2007	810*	1,800	16.3	0.600 U	172	82.0	0.418	178
	3	4/2/2007	--	--	4.36	0.552 U	11.8	2.81	0.109 U	31.5
SS-5	1	4/2/2007	720*	3,300*	15.2	0.722	1,280	305	0.449	501
	3	4/2/2007	2,700*	10,000*	16.1	0.660 U	44.6	10.3	0.141	86.4
	5	4/12/2007	890	320	--	--	--	--	--	--
SS-6	1	4/2/2007	68	30	5.58	0.564 U	16.4	3.37	0.110 U	63.5
	3	4/2/2007	--	--	9.21 J	0.556 U	40.2 J	10.3 J	0.108 UJ	73.8 J
SS-7	1	4/2/2007	26	36	3.74	0.546 U	11.5	4.57	0.111 U	35.9
	3	4/2/2007	--	--	5.68 J	0.625 U	15.4 J	6.27 J	0.119 UJ	37.1 J
SS-8	1	4/2/2007	220 J*	590	89.0 J	0.960	1,400	697 J	8.87 J	1,370 J
	1	4/2/2007 (DUP)	130 J	410	27.0 J	0.985	539	189 J	1.86 J	732 J
	3	4/2/2007	--	--	4.19 J	0.562 U	48.0	3.46 J	0.112 UJ	73.9
SS-9	1	4/2/2007	30*	110	9.54	0.437 U	45.9	11.3	0.143	245
	3	4/2/2007	--	--	5.60 J	0.579 U	17.9 J	4.04 J	0.110 UJ	45.2 J
SS-10	1	4/2/2007	140*	460	38.2	0.546	648	190	3.86	668
	3	4/2/2007	--	--	4.84 J	0.562 U	9.87 J	2.69 J	0.109 UJ	28.5 J
Screening Levels	MTCA Method A	Unrestricted Land Use	2,000	2,000	20	2	NE	250	2	NE
	MTCA Method B	Carcinogenic	NE	NE	0.67	NE	NE	NE	NE	NE
		Non-Carcinogenic	NE	NE	24	80	3,000	NE	24	24,000
	Protection of Marine Surface Water or Groundwater		NE	NE	21	1.2	1.1	1,620	0.026	101

Table 5
Soil Analytical Results - 2007
Everett Shipyard

Sample ID	**Sample Depth (feet bgs)**	**Sample Date**	**TPH (mg/kg)**		**Total Metals (mg/kg)**					
			Diesel-Range	Motor Oil-Range	Arsenic	Cadmium	Copper	Lead	Mercury	Zinc
SS-11	1	4/2/2007	25*	120*	79.1	1.01	82.5	79.3	0.109 U	285
	3	4/2/2007	--	--	3.74 J	0.571 U	8.79 J	2.05 J	0.104 UJ	27.7 J
SS-12	1	4/2/2007	220*	570	461	1.25	3,080	810	3.25	1,880
	3	4/2/2007	--	--	6.94	0.482 U	22.6	11.8	0.112 U	252
SS-13	1	4/2/2007	140	870	64.4	1.08	1,310	604	14.3	799
	3	4/2/2007	--	--	8.07 J	0.531 U	47.9 J	17.1 J	0.145 J	59.9 J
SS-14	1	4/12/2007	370*	720	687	2.12	3,350	1,910	2.17	2,100
	3	4/12/2007	--	--	14.5 J	0.479 U	58.1 J	20.8 J	0.112 U	121 J
SS-15	1	4/2/2007	7.7*	34	5.51	0.517 U	8.28	2.21	0.109 U	24.0
	3	4/2/2007	--	--	--	--	23.8	--	--	39.2
SS-16	1	4/2/2007	5.4 U	12*	5.78	0.748	21.4	5.21	0.108 U	462
	3	4/2/2007	--	--	--	--	12.6	--	--	29.7
SS-17	1	4/12/2007	5.3 U	10 U	3.82	0.561 U	18.6	1.85	0.107 U	77.7
	3	4/12/2007	--	--	--	--	202	--	--	116
SS-18	1	4/12/2007	5.2 U	10 U	2.99	0.550 U	7.52	1.66	0.109 U	26.2
	3	4/12/2007	--	--	--	--	40.5	--	--	57.7
SS-19	1	4/12/2007	5.2 U	10 U	4.31	0.532 U	8.40	2.00	0.108 U	25.8
	3	4/12/2007	--	--	--	--	51.8	--	--	87.1
SS-20	1	4/12/2007	970*	1,100	3.19	0.642 U	25.1	3.97	0.122 U	69.3
	3	4/12/2007	30	36	--	--	10.6	--	--	23.4
SS-21	1	4/12/2007	5.5 U	11 U	4.31	0.569 U	9.47	2.09	0.126 U	22.9
	3	4/12/2007	--	--	--	--	7.30	--	--	24.3
SS-22	1	4/12/2007	4,800	110	2.57	0.577 U	10.8	2.06	0.114 U	22.9
	3	4/12/2007	1,200	150*	--	--	69.1	--	--	57.3
	5	4/12/2007	170	14*	--	--	--	--	--	--
SS-23	1	4/12/2007	5.6*	16	4.70	0.645 U	25.8	4.06	0.122 U	40.0
	3	4/12/2007	--	--	--	--	22.4	--	--	54.6
Screening Levels	MTCA Method A	Unrestricted Land Use	2,000	2,000	20	2	NE	250	2	NE
	MTCA Method B	Carcinogenic	NE	NE	0.67	NE	NE	NE	NE	NE
		Non-Carcinogenic	NE	NE	24	80	3,000	NE	24	24,000
	Protection of Marine Surface Water or Groundwater		NE	NE	21	1.2	1.1	1,620	0.026	101

Table 5
Soil Analytical Results - 2007
Everett Shipyard

Sample ID	**Sample Depth (feet bgs)**	**Sample Date**	**TPH (mg/kg)**		**Total Metals (mg/kg)**					
			Diesel-Range	Motor Oil-Range	Arsenic	Cadmium	Copper	Lead	Mercury	Zinc
SS-24	1	4/12/2007	9.2*	28*	6.87	0.538 U	13.3	4.00	0.113 U	221
	3	4/12/2007	--	--	--	--	22.5	--	--	39.1
SS-25	1	4/12/2007	150*	380	196	0.896	1,240	444	1.94	1,830
	3	4/12/2007	140	66	29.8 J	0.696 U	61.1 J	7.16 J	0.145 U	66.0 J
SS-26	1	4/12/2007	53*	180*	4.46	0.606 U	14.2	3.90	0.107 U	49.0
	3	4/12/2007	--	--	--	--	31.9	--	--	49.2
SS-27	1	4/12/2007	40*	150	39.6	0.607 U	207	45.5	0.145	148
	3	4/12/2007	--	--	4.32 J	0.696 U	16.7 J	2.47 J	0.108 U	37.5 J
SS-28	1	4/12/2007	150*	490*	132	1.04	902	189	0.805	1,640
	3	4/12/2007	--	--	3.03 J	0.613 U	9.28 J	2.41 J	0.115 U	31.2 J
SS-29	1	4/12/2007	33*	140	4.17	0.519 U	16.5	5.20	0.350	37.5
	3	4/12/2007	5.8 U	26*	--	--	11.2	--	--	33.8
Screening Levels	MTCA Method A	Unrestricted Land Use	2,000	2,000	20	2	NE	250	2	NE
	MTCA Method B	Carcinogenic	NE	NE	0.67	NE	NE	NE	NE	NE
		Non-Carcinogenic	NE	NE	24	80	3,000	NE	24	24,000
	Protection of Marine Surface Water or Groundwater		NE	NE	0.057	1.2	1.1	1,620	0.026	101

Notes:

Model Toxics Control Act (MTCA) Cleanup Regulation, WAC 173-340. MTCA Method A and B values are from Ecology website CLARC tables downloaded May 2007 (https://fortress.wa.gov/ecy/clarc/reporting/CLARCReporting.aspx)

(A) - MTCA Method A soil cleanup level for unrestricted land use

(B) - MTCA Method B formula values unrestricted land use - direct contact pathway

Protection of marine surface water or groundwater screening levels calculated per WAC 173-340-747(4)(b) (See Table 1b).

bgs - below ground surface
DUP - Field duplicate
TPH - Total petroleum hydrocarbons
J - Estimated value
NE - Not established
U - Parameter was analyzed for but not detected above the reporting limit shown.
UJ - Parameter was analyzed for but not detected above the reporting limit shown. The reporting limit is an estimated value.
* Chromatographic profile does not match the laboratory standard chromatogram.
All values reported on a dry-weight basis.
Shaded results exceed the most stringent screening level.

Table 6
Groundwater Analytical Results - 2003
Everett Shipyard

Dup of ESY-GW-MW2

Location:	**Most Stringent Screening Level (see Table 2)**	ESY-GW LB4	ESY-GW LB5	ESY-GW LB6	ESY-GW LB7	ESY-GW LB8	ESY-GW MW1	ESY-GW MW2	ESY-GW MW10	ESY-GW MW3
Lab ID:		303027-04	303027-05	303038-04	303027-06	303027-07	303071-01	303071-02	303071-04	303071-03
Date Collected:		3/5/2003	3/5/2003	3/7/2003	3/5/2003	3/5/2003	3/19/2003	3/19/2003	3/19/2003	3/19/2003
NWTPH-Dx (µg/L)										
Diesel	500	180	130 U	130 U	130 U	130 U	130 U	130 U	130 U	210
Lube Oil	500	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U
NWTPH-gx (µg/L)										
Gasoline	30 / 100	NA	NA	50 U	NA	NA	NA	NA	NA	NA
CHLORIDE (mg/L)	NE	NA	NA	NA	NA	NA	71	190	190	32
DISSOLVED METALS (mg/L)										
Arsenic	0.000018	0.005 U	0.005 U	NA	NA	NA	NA	NA	NA	NA
Cadmium	0.005	0.005 U	0.005 U	NA	NA	NA	NA	NA	NA	NA
Chromium	0.016	0.01 U	0.01 U	NA	NA	NA	NA	NA	NA	NA
Copper	0.0024	0.006 U	0.006 U	NA	NA	NA	NA	NA	NA	NA
Lead	0.0081	0.003 U	0.003 U	NA	NA	NA	NA	NA	NA	NA
Mercury	0.000025	0.0002 U	0.0002 U	NA	NA	NA	NA	NA	NA	NA
Silver	0.0019	0.007 U	0.007 U	NA	NA	NA	NA	NA	NA	NA
Zinc	0.081	0.007 U	0.007 U	NA	NA	NA	NA	NA	NA	NA
TOTAL METALS (mg/L)										
Arsenic	0.000018	NA	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U
Cadmium	0.005	NA	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 U
Chromium	0.016	NA	NA	NA	NA	NA	0.01 U	0.01 U	0.01 U	0.01 U
Copper	0.0024	NA	NA	NA	NA	NA	0.006 U	0.006 U	0.006 U	0.006 U
Lead	0.0081	NA	NA	NA	NA	NA	0.003 U	0.003 U	0.003 U	0.003 U
Mercury	0.000025	NA	NA	NA	NA	NA	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Silver	0.0019	NA	NA	NA	NA	NA	0.007 U	0.007 U	0.007 U	0.007 U
Zinc	0.081	NA	NA	NA	NA	NA	0.007 U	0.007 U	0.007 U	0.007 U
VOLATILES (µg/L)										
1,1,1,2-Tetrachloroethane	1.7	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
1,1,1-Trichloroethane	200	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
1,1,2,2-Tetrachloroethane	0.17	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
1,1,2-Trichloroethane	0.59	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
1,1-Dichloroethane	1,600	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
1,1-Dichloroethene	0.057	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
1,1-Dichloropropene	NE	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
1,2,3-Trichlorobenzene	NE	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
1,2,3-Trichloropropane	0.0063	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
1,2,4-Trichlorobenzene	35	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
1,2,4-Trimethyl Benzene	400	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
1,2-Dibromo 3-Chloropropane	0.031	NA	10 U	10 U	10 U	NA	10 U	10 U	10 U	NA
1,2-Dibromoethane	0.00051	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
1,2-Dichlorobenzene	420	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
1,2-Dichloroethane	0.38	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
1,2-Dichloropropane	0.5	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
1,3 Dichlorobenzene	320	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA

Table 6
Groundwater Analytical Results - 2003
Everett Shipyard

Dup of ESY-GW-MW2

Location: Lab ID: Date Collected:	**Most Stringent Screening Level (see Table 2)**	ESY-GW LB4 303027-04 3/5/2003	ESY-GW LB5 303027-05 3/5/2003	ESY-GW LB6 303038-04 3/7/2003	ESY-GW LB7 303027-06 3/5/2003	ESY-GW LB8 303027-07 3/5/2003	ESY-GW MW1 303071-01 3/19/2003	ESY-GW MW2 303071-02 3/19/2003	ESY-GW MW10 303071-04 3/19/2003	ESY-GW MW3 303071-03 3/19/2003
VOLATILES (µg/L) (cont.)										
1,3,5-Trimethylbenzene	400	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
1,3-Dichloropropane	NE	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
1,4-Dichlorobenzene	1.8	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
2,2-Dichloropropane	NE	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
2-Butanone	4,800	NA	10 U	10 U	10 U	NA	10 U	10 U	10 U	NA
2-Chlorotoluene	160	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
2-Hexanone		NA	10 U	10 U	10 U	NA	10 U	10 U	10 U	NA
4-Chlorotoluene	NE	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
4-Methyl-2-Pentanone	640	NA	10 U	10 U	10 U	NA	10 U	10 U	10 U	NA
Acetone	800	NA	25 U	25 U	25 U	NA	25 U	25 U	25 U	NA
Acrylonitrile	0.051	NA	10 U	10 U	10 U	NA	10 U	10 U	10 U	NA
Benzene	0.8	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
Bromobenzene	NE	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
Bromochloromethane	NE	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
Bromodichloromethane	0.27	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
Bromoform	4.3	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
Bromomethane	11	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
Carbon Tetrachloride	0.23	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
Chlorobenzene	100	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
Chloroethane	NE	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
Chloroform	5.7	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
Chloromethane	3.4	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
Cis-1,2-Dichloroethene	70	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
Cis-1,3-Dichloropropene	0.24	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
Dibromochloromethane	0.41	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
Dibromomethane	5	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
Dichlorodifluoromethane	1,600	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
Ethylbenzene	530	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
Hexachloro1,3-Butadiene	0.56	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
Isopropylbenzene	800	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
M+P Xylene	10,000	NA	4 U	4 U	4 U	NA	4 U	4 U	4 U	NA
Methyl T-Butyl Ether	20	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
Methylene Chloride	4.6	NA	5 U	5 U	5 U	NA	5 U	5 U	5 U	NA
Naphthalene	NE	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
N-Butylbenzene	NE	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
N-Propyl Benzene	NE	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
O-Xylene	16,000	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
P-Isopropyltoluene	NE	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
S-Butyl Benzene	NE	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
Styrene	1.5	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
T-Butyl Benzene	NE	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
Tetrachloroethylene	0.081	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
Toluene	640	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
Trans-1,2-Dichloroethene	100	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
Trans-1,3-Dichloropropene	0.24	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
Trichloroethene	0.11	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
Trichlorofluoromethane	2,400	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA
Vinyl Chloride	0.025	NA	2 U	2 U	2 U	NA	2 U	2 U	2 U	NA

Table 6
Groundwater Analytical Results - 2003
Everett Shipyard

Dup of ESY-GW-MW2

Location:	**Most Stringent Screening Level (see Table 2)**	ESY-GW LB4	ESY-GW LB5	ESY-GW LB6	ESY-GW LB7	ESY-GW LB8	ESY-GW MW1	ESY-GW MW2	ESY-GW MW10	ESY-GW MW3
Lab ID:		303027-04	303027-05	303038-04	303027-06	303027-07	303071-01	303071-02	303071-04	303071-03
Date Collected:		3/5/2003	3/5/2003	3/7/2003	3/5/2003	3/5/2003	3/19/2003	3/19/2003	3/19/2003	3/19/2003
SEMIVOLATILES (µg/L)										
1,2,4-Trichlorobenzene	35	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
1,2-Dichlorobenzene	420	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
1,3-Dichlorobenzene	320	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
1,4-Dichlorobenzene	1.8	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
1-Methylnaphthalene	2.4	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
2,3,4,6-Tetrachlorophenol	NE	NA	5 U	NA	NA	NA	5 U	5 U	5 U	NA
2,4,5-Trichlorophenol	800	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
2,4,6-Trichlorophenol	1.4	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
2,4-Dichlorophenol	24	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
2,4-Dimethylphenol	160	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
2,4-Dinitrophenol	32	NA	10 U	NA	NA	NA	10 U	10 U	10 U	NA
2,4-Dinitrotoluene	0.11	NA	5 U	NA	NA	NA	5 U	5 U	5 U	NA
2,6-Dichlorophenol	NE	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
2,6-Dinitrotoluene	16	NA	5 U	NA	NA	NA	5 U	5 U	5 U	NA
2-Chloronaphthanlene	1000	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
2-Chlorophenol	40	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
2-Methylnaphthalene	32	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
2-Methylphenol	NE	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
2-Nitroaniline	NE	NA	5 U	NA	NA	NA	5 U	5 U	5 U	NA
2-Nitrophenol	NE	NA	5 U	NA	NA	NA	5 U	5 U	5 U	NA
3,3'-Dichlorobenzidine	0.021	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
3-Nitroaniline	NE	NA	5 U	NA	NA	NA	5 U	5 U	5 U	NA
4,6-Dinitro-2-Methylphenol	13	NA	10 U	NA	NA	NA	10 U	10 U	10 U	NA
4-Bromophenyl-Phenylether	NE	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
4-Chloro-3-Methylphenol	NE	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
4-Chloroaniline	NE	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
4-Chlorophenyl-Phenylether	NE	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
4-Methylphenol	NE	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
4-Nitroaniline	NE	NA	5 U	NA	NA	NA	5 U	5 U	5 U	NA
4-Nitrophenol	NE	NA	10 U	NA	NA	NA	10 U	10 U	10 U	NA
Acenaphthene	670	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Acenaphthylene	NE	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Aniline	NE	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Anthracene	4800	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Azobenzene	NE	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Benzo[a]Anthracene	0.0028	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Benzo[a]pyrene	0.0028	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Benzo[b]fluoranthene	0.0028	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Benzo[g,h,i]perylene	NE	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Benzo[k]fluoranthene	0.0028	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Benzoic Acid	64,000	NA	20 U	NA	NA	NA	20 U	20 U	20 U	NA
Benzyl Alcohol	2400	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Bis(2-Chloroethoxy)Methane	NE	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Bis(2-Chloroethyl)Ether	0.03	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Bis(2-Chloroisopropyl)Ether	NE	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Bis(2-Ethylhexyl)Phthalate	1.2	NA	3 U	NA	NA	NA	3 U	3 U	3 U	NA
Butylbenzylphthalate	1,500	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Carbazole	4.4	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Chrysene	0.0028	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA

Table 6
Groundwater Analytical Results - 2003
Everett Shipyard

Dup of ESY-GW-MW2

Location: Lab ID: Date Collected:	**Most Stringent Screening Level (see Table 2)**	ESY-GW LB4 303027-04 3/5/2003	ESY-GW LB5 303027-05 3/5/2003	ESY-GW LB6 303038-04 3/7/2003	ESY-GW LB7 303027-06 3/5/2003	ESY-GW LB8 303027-07 3/5/2003	ESY-GW MW1 303071-01 3/19/2003	ESY-GW MW2 303071-02 3/19/2003	ESY-GW MW10 303071-04 3/19/2003	ESY-GW MW3 303071-03 3/19/2003
SEMIVOLATILES (µg/L)										
Dibenz[a,h]anthracene	0.0028	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Dibenzofuran	32	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Diethylphthalate	13,000	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Dimethylphthalate	16,000	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Di-N-Butylphthalate	1,600	NA	3 U	NA	NA	NA	3 U	3 U	3 U	NA
Di-N-Octylphthalate	320	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Fluoranthene	130	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Fluorene	640	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Hexachlorobenzene	0.00028	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Hexachlorobutadiene	0.44	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Hexachlorocyclopentadiene	40	NA	10 U	NA	NA	NA	10 U	10 U	10 U	NA
Hexachloroethane	1.4	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Indeno[1,2,3-cd]pyrene	0.0028	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Isophorone	8.4	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Naphthalene	160	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Nitrobenzene	4	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
N-Nitrosodimethylamine	NE	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
N-Nitroso-Di-N-Propylamine	0.005	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
N-Nitrosodiphenylamine	3.3	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Pentachlorophenol	0.27	NA	10 U	NA	NA	NA	10 U	10 U	10 U	NA
Phenanthrene	NE	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Phenol	4,800	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Pyrene	480	NA	2 U	NA	NA	NA	2 U	2 U	2 U	NA
Pyridine	NE	NA	4 U	NA	NA	NA	4 U	4 U	4 U	NA

ug/L = microgram per liter
mg/L = milligram per liter
NE= Not established
NA = Not analyzed.
U = Indicates compound was analyzed for, but was not detected at the given detection limit.
Shaded results exceed the most stringent screening level.

Table 7
Sediment Analytical Results - 2003
Everett Shipyard

Sample ID:	**Sediment Management Standards (a)**		ESY-MS1	Dup of ESY-MS1 ESY-MS9	ESY-MS2	ESY-MS3	ESY-MS4	ESY-MS5	ESY-MS6
Depth:									
Lab ID:			FH15A	FH15G	FH15B	FH15C	FH15D	FH15E	FH15F
Sample Date:	Sediment Quality Standard (SQS)	Cleanup Screening Level (CSLs)	3/5/2003	3/5/2003	3/5/2003	3/5/2003	3/5/2003	3/5/2003	3/5/2003
Metals (mg/kg)									
Antimony	NA	NA	10 U	10 U	9 UJ	8 U	10 U	10 U	9 U
Arsenic	57	93	20	20	14	32	10	30	17
Cadmium	5.1	6.7	0.7	0.9	0.5	0.4	0.5	0.6	0.4
Chromium	260	270	64	60	51.5	84.1	48	83	52.9
Copper	390	390	161	174	117	1800	80.1	531	76.9
Lead	450	530	52	46	20	94	13	56	17
Mercury	0.41	0.59	0.29	0.27	0.2	0.53	0.1	0.3	0.1
Nickel	NA	NA	52	52	43	51	41	53	47
Silver	6.1	6.1	0.6 U	0.6 U	0.6 U	0.5 U	0.6 U	0.6 U	0.6 U
Zinc	410	960	178 J	325 J	148	797	107	433	148
PAHs (mg/kg OC)									
2-Methylnaphthalene	38	64	0.74 U	0.73 U	0.90 U	2.1	0.91 U	0.87 U	1.2 U
Acenaphthene	16	57	3.0 J	4.6 J	0.95	5.0	0.91 U	8.7	3.1
Acenaphthylene	66	66	1.4 J	3.1 J	2.0	9.6	1.4	7.8	2.9
Anthracene	220	1,200	4.4 J	8.1 J	5.2	26	3.5	27	6.3
Benzo(a)anthracene	110	270	13 J	25 J	15	96	10	96	16
Benzo(a)pyrene	99	210	8.9 J	18 J	13	54	7.3	33	11
Benzo(b)fluoranthene	230	450	13 J	32 J	19	92	10	57	20
Benzo(g,h,i)perylene	31	78	4.4 J	8.1 J	6.7	18	1.6	7.0	3.1
Benzo(k)fluoranthene	230	450	10 J	17 J	17	38	10	34	18
Chrysene	110	460	17 J	35 J	27	150	17	135	29
Dibenz(a,h)anthracene	12	33	1.9 J	4.2 J	2.9	11	0.91	4.3	1.3
Fluoranthene	160	1,200	35 J	100 J	18	367	8.6	391	41
Fluorene	23	79	1.4 J	2.0 J	1.7	5.8	0.91	7.8	2.5
HPAH (b)(f)	960	5,300	144	333	171	1116	87	1001	192
Indeno(1,2,3-c,d)pyrene	34	88	5.2 J	10 J	8.1	25	2.4	10	4.1
LPAH (b)(d)	370	780	22	32	21	91	10	117	40
Naphthalene	99	170	0.93	1.1	0.95	2.5	0.91 U	1.4	1.3
Phenanthrene	100	480	10	13	10	42	4.5	65	24
Pyrene	1,000	1,400	35 J	85 J	44 J	267	18	235	49
Total Benzofluoranthenes (e)	230	450	23 J	49 J	36	129	21	90	38
SVOCs (mg/kg OC)									
1,2-Dichlorobenzene	2.3	2.3	0.74 U	0.73 U	0.90 U	0.83 U	0.91 U	0.87 U	1.2 U
1,3-Dichlorobenzene	NA	NA	0.74 U	0.73 U	0.90 U	0.83 U	0.91 U	0.87 U	1.2 U
1,4-Dichlorobenzene	3.1	9.0	0.74 U	0.73 U	0.90 U	0.83 U	0.91 U	0.87 U	1.2 U
1,2,4-Trichlorobenzene	0.81	1.8	0.74 U	0.73 U	0.90 U	0.28 U	0.91 U	0.87 U	1.2 U
Hexachlorobenzene	0.38	2.3	0.74 U	0.73 U	0.90 U	0.042 U	0.91 U	0.043 U	1.2 U
Dimethylphthalate	53	53	4.4	4.6	2.5	5.8	0.91 U	3.5	6.3
Diethylphthalate	61	110	0.74 U	0.73 U	0.90 U	0.83 U	0.91 U	2.2	1.2 U
Di-n-Butylphthalate	220	1,700	0.74 U	0.73 U	0.90 U	2.1	0.91 U	2.5	1.2 U
Butylbenzylphthalate	4.9	64	1.4	1.7	0.90 U	46	0.91 U	19	1.9
bis(2-Ethylhexyl)phthalate	47	78	13 UJ	27 J	5.2 U	88	3.8 U	30	16 U

Table 7
Sediment Analytical Results - 2003
Everett Shipyard

Sample ID:	Sediment Management Standards (a)		ESY-MS1	Dup of ESY-MS1 ESY-MS9	ESY-MS2	ESY-MS3	ESY-MS4	ESY-MS5	ESY-MS6
Depth:									
Lab ID:			FH15A	FH15G	FH15B	FH15C	FH15D	FH15E	FH15F
Sample Date:	Sediment Quality Standard (SQS)	Cleanup Screening Level (CSLs)	3/5/2003	3/5/2003	3/5/2003	3/5/2003	3/5/2003	3/5/2003	3/5/2003
SVOCs (mg/kg OC) (cont.)									
Di-n-octyl phthalate	58	4,500	0.74 U	0.73 U	0.90 U	1.2 U	0.91 U	0.87 U	1.3
Dibenzofuran	15	58	0.89	1.2	0.95	3.0	0.91 U	2.3	2.3
Hexachlorobutadiene	3.9	6.2	0.74 U	0.73 U	0.90 U	1.2 U	0.91 U	0.87 U	1.2 U
N-Nitrosodiphenylamine	11	11	0.74 U	0.73 U	0.90 U	1.6 U	0.91 U	1.0 U	1.2 U
Phenol	420	1,200	20 U	19 U	19 U	20 U	20 U	20 U	19 U
2-Methylphenol	63	63	20 U	19 U	19 U	20 U	20 U	20 U	19 U
4-Methylphenol	670	670	20 U	19 U	19 U	140 J	20 U	40 J	20 J
2,4-Dimethylphenol	29	29	20 U	19 U	19 U	20 U	20 U	20 U	19 U
Pentachlorophenol	360	690	98 U	97 U	97 U	160 J	98 U	98 U	96 U
Benzyl Alcohol	57	73	20 UJ	97 UJ	19 U	20 U	20 U	20 U	19 U
Benzoic Acid	650	650	200 U	190 U	190 U	210	200 U	200 U	190 U
Organotin (Pore Water) (µg/L)									
Tetrabutyl Tin	NE	NE	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Tributyl Tin Chloride	NE	NE	0.74	0.73	0.037	0.38	0.025 U	0.23	0.027
Dibutyl Tin Dichloride	NE	NE	0.075	0.073	0.050 U	0.061	0.050 U	0.050 U	0.050 U
Butyl Tin Trichloride	NE	NE	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
TBT as TBT ion	0.05 (g)	0.15 (h)	0.66	0.65	0.033	0.34	0.019 U	0.21	0.024
Organotin (Bulk) (µg/kg)									
Tetrabutyl Tin	NE	NE	18	NA	5.9 U	11	NA	NA	NA
Tributyl Tin Chloride	NE	NE	3400	NA	54	1000	NA	NA	NA
Dibutyl Tin Dichloride	NE	NE	150	NA	14	310	NA	NA	NA
Butyl Tin Trichloride	NE	NE	23 J	NA	5.9 UJ	28 J	NA	NA	NA
TBT as TBT ion	NE	73 (i)	3000	NA	49	900	NA	NA	NA
Conventionals									
Total Organic Carbon (percent)	NE	NE	2.7	2.6	2.1	2.4	2.2	2.3	1.6
Total Solids (percent)	NE	NE	47.7	48.0	50.3	57.2	46.0	45.3	50.8
Total Volatile Solids (percent)	NE	NE							
PCBs (µg/kg dry weight)									
Aroclor 1016	NE	NE	NA	NA	NA	19 U	NA	20 U	NA
Aroclor 1242	NE	NE	NA	NA	NA	19 U	NA	20 U	NA
Aroclor 1248	NE	NE	NA	NA	NA	19 U	NA	20 U	NA
Aroclor 1254	NE	NE	NA	NA	NA	220	NA	47	NA
Aroclor 1260	NE	NE	NA	NA	NA	68 U	NA	38 U	NA
Aroclor 1221	NE	NE	NA	NA	NA	38 U	NA	39 U	NA
Aroclor 1232	NE	NE	NA	NA	NA	19 U	NA	20 U	NA
Total PCBs (f,g) (mg/kg OC)	12,000	65,000	NA	NA	NA	9.2	NA	2.0	NA
VOLATILES (µg/kg dry weight)									
Chloromethane	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
Bromomethane	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
Vinyl Chloride	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
Chloroethane	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
Methylene Chloride	NE	NE	NA	NA	NA	2.7 U	NA	NA	NA

Table 7
Sediment Analytical Results - 2003
Everett Shipyard

Sample ID: Depth: Lab ID: Sample Date:	**Sediment Management Standards (a)** Sediment Quality Standard (SQS)	 Cleanup Screening Level (CSLs)	ESY-MS1 FH15A 3/5/2003	Dup of ESY-MS1 ESY-MS9 FH15G 3/5/2003	ESY-MS2 FH15B 3/5/2003	ESY-MS3 FH15C 3/5/2003	ESY-MS4 FH15D 3/5/2003	ESY-MS5 FH15E 3/5/2003	ESY-MS6 FH15F 3/5/2003
VOLATILES (µg/kg dry weight) (cont.)									
Acetone	NE	NE	NA	NA	NA	59 J	NA	NA	NA
Carbon Disulfide	NE	NE	NA	NA	NA	2.3 J	NA	NA	NA
1,1-Dichloroethene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
1,1-Dichloroethane	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
trans-1,2-Dichloroethene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
cis-1,2-Dichloroethene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
Chloroform	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
1,2-Dichloroethane	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
2-Butanone	NE	NE	NA	NA	NA	16	NA	NA	NA
1,1,1-Trichloroethane	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
Carbon Tetrachloride	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
Vinyl Acetate	NE	NE	NA	NA	NA	6.7 U	NA	NA	NA
Bromodichloromethane	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
1,2-Dichloropropane	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
cis-1,3-Dichloropropene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
Trichloroethene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
Dibromochloromethane	NE	NE	NA	NA	NA	1.3 UJ	NA	NA	NA
1,1,2-Trichloroethane	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
Benzene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
trans-1,3-Dichloropropene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
2-Chloroethylvinylether	NE	NE	NA	NA	NA	6.7 U	NA	NA	NA
Bromoform	NE	NE	NA	NA	NA	1.3 UJ	NA	NA	NA
4-Methyl-2-Pentanone (MIBK)	NE	NE	NA	NA	NA	6.7 U	NA	NA	NA
2-Hexanone	NE	NE	NA	NA	NA	6.7 U	NA	NA	NA
Tetrachloroethene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
1,1,2,2-Tetrachloroethane	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
Toluene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
Chlorobenzene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
Ethylbenzene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
Styrene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
Trichlorofluoromethane	NE	NE	NA	NA	NA	1.3 UJ	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	NE	NE	NA	NA	NA	2.7 U	NA	NA	NA
m,p-Xylene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
o-Xylene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
1,2-Dichlorobenzene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
1,3-Dichlorobenzene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
1,4-Dichlorobenzene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
Acrolein	NE	NE	NA	NA	NA	67 U	NA	NA	NA
Methyl Iodide	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
Bromoethane	NE	NE	NA	NA	NA	2.7 U	NA	NA	NA

Table 7
Sediment Analytical Results - 2003
Everett Shipyard

Sample ID: Depth: Lab ID: Sample Date:	**Sediment Management Standards (a)** Sediment Quality Standard (SQS)	Cleanup Screening Level (CSLs)	ESY-MS1 FH15A 3/5/2003	Dup of ESY-MS1 ESY-MS9 FH15G 3/5/2003	ESY-MS2 FH15B 3/5/2003	ESY-MS3 FH15C 3/5/2003	ESY-MS4 FH15D 3/5/2003	ESY-MS5 FH15E 3/5/2003	ESY-MS6 FH15F 3/5/2003
VOLATILES (µg/kg dry weight) (cont.)									
Acrylonitrile	NE	NE	NA	NA	NA	6.7 U	NA	NA	NA
1,1-Dichloropropene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
Dibromomethane	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
1,1,1,2-Tetrachloroethane	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
1,2-Dibromo-3-chloropropane	NE	NE	NA	NA	NA	6.7 U	NA	NA	NA
1,2,3-Trichloropropane	NE	NE	NA	NA	NA	2.7 U	NA	NA	NA
trans-1,4-Dichloro-2-butene	NE	NE	NA	NA	NA	6.7 UJ	NA	NA	NA
1,3,5-Trimethylbenzene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
1,2,4-Trimethylbenzene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
Hexachlorobutadiene	NE	NE	NA	NA	NA	6.7 UJ	NA	NA	NA
Ethylene Dibromide	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
Bromochloromethane	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
2,2-Dichloropropane	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
1,3-Dichloropropane	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
Isopropylbenzene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
n-Propylbenzene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
Bromobenzene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
2-Chlorotoluene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
4-Chlorotoluene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
tert-Butylbenzene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
sec-Butylbenzene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
4-Isopropyltoluene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
n-Butylbenzene	NE	NE	NA	NA	NA	1.3 U	NA	NA	NA
1,2,4-Trichlorobenzene	NE	NE	NA	NA	NA	6.7 U	NA	NA	NA
Naphthalene	NE	NE	NA	NA	NA	6.7 U	NA	NA	NA
1,2,3-Trichlorobenzene	NE	NE	NA	NA	NA	6.7 UJ	NA	NA	NA

Notes:

NA = Not available
NE = Not established
U = Indicates compound was analyzed for, but was not detected at the given detection limit.
J = Data validation flag indicating the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
M = Indicates an estimated value of analyte detected and confirmed by analyst with low spectral match parameters.
Shaded results exceed the most stringent Sediment Management Standard.
(a) Sediment Sampling and Analysis Plan Appendix; Washington State Department of Ecology, Publication 03-09-043, Revised February 2008 (WAC 173-204).
(b) Where chemical criteria in this table represent the sum of individual compounds or isomers, the following methods shall be applied:
  (i) Where chemical analyses identify an undetected value for every individual compound/isomer, then the single highest detection limit shall represent the sum of the respective compounds/isomers.
  (ii) Where chemical analyses detect one or more individual compounds/isomers, only the detected concentrations will be added to represent the group sum.
(c) All organic data (except phenols, benzyl alcohol, and benzoic acid) are normalized to total organic carbon; this involves dividing the dry weight concentration of the constituent by the fraction of total organic carbon present.
(d) The LPAH criterion represents the sum of the following "low molecular weight polynuclear aromatic hydrocarbon" compounds: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene. The LPAH criterion is not the sum of the criteria values for the individual LPAH compounds listed.
(e) The total benzofluoranthenes criterion represents the sum of the concentrations of the "B," "J," and "K" isomers.
(f) The HPAH criterion represents the sum of the following "high molecular weight polynuclear aromatic hydrocarbon" compounds: fluoranthene, pyrene, benzo(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)perylene. The HPAH criterion is not the sum of the criteria values for the individual HPAH compounds as listed.
(g) Approximate no affects level (SQS equivalent)
(h) Puget Sound Drilling and Dredging Act (PSDDA) open water disposal screening level criteria.
(i) Preliminary criteria based on bulk equivalent of PSDDA open water disposal screening level criteria for porewater TBT.

Table 8
Sediment Analytical Results
Everett Shipyard

Sample ID:	**Sediment Management Standards (a)**		NMA-core-1	NMA-core-1	NMA-core-2	NMA-core-2	NMA-grab-3	NMA-core-3	NMA-core-3	NMA-grab-7	NMA-grab-8	NMA-grab-9	NMA-grab-10
Depth:			0.5-2.0ft	2.0-3.9ft	0.5-3.2ft	3.2-6.3ft	0-10cm	0.5-1.8ft	1.8-3.1ft	0-10cm	0-10cm	0-10cm	0-10cm
Lab ID:			GU97A	GU97B	GU97C	GU97D	GU78A	GW93A	GW93B	GU78E/GW81A	GU78F/GW81B	GU78G/HD32B	GU78H
Sample Date:	Sediment Quality Standard (SQS)	Cleanup Screening Level (CSLs)	7/2/2004	7/2/2004	7/2/2004	7/2/2004	7/1/2004	7/28/2004	7/28/2004	7/1/2004	7/1/2004	7/1/2004	7/1/2004
Metals (mg/kg)													
Arsenic	57	93	45	40	270	22	10 U	9	13	10 U	10 U	10	10 U
Cadmium	5.1	6.7	0.3	0.6	1.4	0.9	0.6	0.6	0.4	0.6	0.6	0.6	0.6
Chromium	260	270	34.7	50.5	100	64.8	59	59.8	37.4	56	57	54	54
Copper	390	390	348	446	1560	1060	96.1	106	56.1	109	101	163	92.1
Lead	450	530	70	110	413	230	19	23	43	26	21	33	17
Mercury	0.41	0.59	0.33	1.62	6.21	10.1	0.11	0.22	0.34	0.13	0.11	0.35	0.12
Silver	6.1	6.1	0.4 U	0.4 U	1 U	0.4 U	0.6 U	0.5 U	0.6 U	0.6 U	0.7 U	0.6 U	0.6 U
Zinc	410	960	410	288	1610	448	117	128	99	123	121	170	117
PAHs (mg/kg OC)													
2-Methylnaphthalene	38	64	2.12 U	1.60 U	5.75	5.41	0.78 U	0.81 U	0.72	3.97 U	0.89 U	1.12 U	0.88 U
Acenaphthene	16	57	17.46	23.77	141.76	73.36	0.78 U	0.81 U	0.70	3.97 U	1.43	1.52	0.88 U
Acenaphthylene	66	66	2.38	3.98	11.88	6.95	0.78 U	0.81 U	0.45	3.97 U	0.89 U	2.25	0.88 U
Anthracene	220	1,200	10.05	18.85	95.79	61.78	0.90	1.03	2.05	5.02	1.56	6.18	1.58
Benzo(a)anthracene	110	270	39.15	73.77	153.26	177.61	2.78	2.01	3.60	22.18	4.91	21.35	4.65
Benzo(a)pyrene	99	210	26.46	49.18	99.62	104.25	1.84	1.97	2.05	10.46	2.77	14.04	3.26
Benzo(b)fluoranthene	230	450	52.91	98.36	145.59	123.55	3.49	2.35	1.88	20.50	4.91	29.21	6.98
Benzo(g,h,i)perylene	31	78	11.11	10.66	20.31	25.10	0.78 U	0.81 U	0.98	3.97	0.89 U	3.26	0.88 U
Benzo(k)fluoranthene	230	450	31.22	49.18	114.94	115.83	3.06	3.33	2.91	15.48	4.11	16.29	4.47
Chrysene	110	460	63.49	106.56	187.74	216.22	4.71	3.97	5.48	29.71	7.59	35.96	8.84
Dibenz(a,h)anthracene	12	33	3.17	3.07	6.51	8.49	0.78 U	0.81 U	0.31 U	3.97 U	0.89 U	1.12	0.88 U
Fluoranthene	160	1,200	121.69	307.38	613.03	694.98	5.49	4.15	5.82	58.58	14.29	61.80	12.09
Fluorene	23	79	11.11	11.48	114.94	50.19	0.78 U	0.81 U	1.10	3.97 U	0.98	1.97	0.88 U
HPAH (b)(f)	960	5,300	458.73	946.11	1828.74	1998.07	26.08	23.76	28.13	211.51	49.96	289.16	53.40
Indeno(1,2,3-c,d)pyrene	34	88	14.29	14.34	27.97	30.12	0.78 U	0.81 U	1.13	4.60	1.12	4.44	1.02
LPAH (b)(d)	370	780	67.41	94.88	854.79	412.74	2.31	3.12	11.03	15.48	7.68	30.79	4.05
Naphthalene	99	170	2.59	2.79	118.77	8.11	0.78 U	0.81 U	1.08	3.97 U	0.89 U	1.46	0.88 U
Phenanthrene	100	480	23.81	34.02	371.65	212.36	1.41	2.09	5.65	10.46	3.71	17.42	2.47
Pyrene	1,000	1,400	95.24	233.61	459.77	501.93	4.71	5.98	4.28	46.03	10.27	56.18	12.09
Total Benzofluoranthenes (e)	230	450	84.13	147.54	260.54	239.38	6.55	5.68	4.79	35.98	9.02	45.51	11.44
SVOCs (mg/kg OC)													
1,2-Dichlorobenzene	2.3	2.3	2.12 U	1.60 U	1.49 U	1.54 U	0.78 U	0.81 U	0.31 U	3.97 U	0.89 U	1.12 U	0.88 U
1,3-Dichlorobenzene	NA	NA	2.12 U	1.60 U	1.49 U	1.54 U	0.78 U	0.81 U	0.31 U	3.97 U	0.89 U	1.12 U	0.88 U
1,4-Dichlorobenzene	3.1	9.0	2.12 U	1.60 U	1.49 U	1.54 U	0.78 U	0.81 U	0.31 U	3.97 U	0.89 U	1.12 U	0.88 U
1,2,4-Trichlorobenzene	0.81	1.8	2.12 U	1.60 U	1.49 U	1.54 U	0.78 U	0.81 U	0.31 U	3.97 U	0.89 U	1.12 U	0.88 U
Hexachlorobenzene	0.38	2.3	2.12 U	1.60 U	1.49 U	1.54 U	0.78 U	0.81 U	0.31 U	3.97 U	0.89 U	1.12 U	0.88 U
Dimethylphthalate	53	53	2.33	2.79	141.76	1.54 U	0.78 U	0.81 U	1.03	3.97 U	0.98	2.47	0.88 U
Diethylphthalate	61	110	2.12 U	1.60 U	1.49 U	1.54 U	0.78 U	0.81 U	0.31 U	3.97 U	0.89 U	1.12 U	0.88 U
Di-n-Butylphthalate	220	1,700	3.65	2.09	2.80	1.54 U	1.65 U	0.81 U	1.03	23.85 U	4.46 U	3.09 U	6.05 U
Butylbenzylphthalate	4.9	64	2.12 U	1.60 U	1.49 U	1.54 U	0.78 U	0.81 U	0.31 U	3.97 U	0.89 U	1.40	0.88 U
bis(2-Ethylhexyl)phthalate	47	78	46.03	31.97	88.12	33.20	3.80 U	2.82	0.80	30.96	5.36 U	22.47	5.58 U
Di-n-octyl phthalate	58	4,500	2.12 U	1.60 U	1.49 U	1.54 U	0.78 U	0.81 U	0.31 U	3.97 U	0.89 U	1.12 U	0.88 U
Dibenzofuran	15	58	2.33	2.95	80.46	28.57	0.78 U	0.81 U	1.51 U	3.97 U	0.89 U	1.12 U	0.88 U
Hexachlorobutadiene	3.9	6.2	2.12 U	1.60 U	1.49 U	1.54 U	0.78 U	0.81 U	0.31 U	3.97 U	0.89 U	1.12 U	0.88 U
N-Nitrosodiphenylamine	11	11	2.12 U	1.60 U	1.49 U	18.92 M	0.78 U	0.81 U	0.31 U	3.97 U	0.89 U	1.12 U	0.88 U
Phenol	420	1,200	40 U	39 U	39 U	40 U	20 U	19 U	18 U	95 U	20 U	20 U	19 U
2-Methylphenol	63	63	40 U	39 U	39 U	40 U	20 U	19 U	18 U	95 U	20 U	20 U	19 U
4-Methylphenol	670	670	40 U	39 U	39 U	40 U	20 U	49	140	95 U	20 U	20 U	19 U
2,4-Dimethylphenol	29	29	40 U	39 U	39 U	40 U	20 U	19 U	18 U	95 U	20 U	20 U	19 U
Pentachlorophenol	360	690	200 U	200 U	200 U	330	99 U	97 U	88 U	470 U	98 U	720	97 U
Benzyl Alcohol	57	73	40 U	39 U	39 U	40 U	20 U	19 U	18 U	95 U	20 U	20 U	19 U
Benzoic Acid	650	650	400 U	390 U	390 U	400 U	200 U	190 U	180 U	950 U	200 U	200 U	190 U

Table 8
Sediment Analytical Results
Everett Shipyard

Sample ID: Depth: Lab ID:	**Sediment Management Standards (a)**		NMA-core-1 0.5-2.0ft GU97A	NMA-core-1 2.0-3.9ft GU97B	NMA-core-2 0.5-3.2ft GU97C	NMA-core-2 3.2-6.3ft GU97D	NMA-grab-3 0-10cm GU78A	NMA-core-3 0.5-1.8ft GW93A	NMA-core-3 1.8-3.1ft GW93B	NMA-grab-7 0-10cm GU78E/GW81A	NMA-grab-8 0-10cm GU78F/GW81B	NMA-grab-9 0-10cm GU78G/HD32B	NMA-grab-10 0-10cm GU78H
Sample Date:	Sediment Quality Standard (SQS)	Cleanup Screening Level (CSLs)	7/2/2004	7/2/2004	7/2/2004	7/2/2004	7/1/2004	7/28/2004	7/28/2004	7/1/2004	7/1/2004	7/1/2004	7/1/2004
Organotin (Pore Water) (µg/L)													
Tributyl Tin Chloride	NE	NE	NA	NA	NA	NA	0.025 U	NA	NA	0.056	0.083	0.12	0.025 U
Dibutyl Tin Dichloride	NE	NE	NA	NA	NA	NA	0.050 U	NA	NA	0.050 U	0.050 U	0.14	0.050 U
Butyl Tin Trichloride	NE	NE	NA	NA	NA	NA	0.050 U	NA	NA	0.050 U	0.050 U	0.050 U	0.050 U
TBT as TBT ion	0.05 (g)	0.15 (h)	NA	NA	NA	NA	0.022 U	NA	NA	0.049	0.074	0.11	0.022 U
Organotin (Bulk) (µg/kg)													
Tetrabutyl Tin	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tributyl Tin Chloride	NE	NE	1700	3200	3500	410	NA	23	5.0 U	5.7 U	33	44	NA
Dibutyl Tin Dichloride	NE	NE	330	290	1100	120	NA	7.8	5.0 U	5.7 U	9.3	14	NA
Butyl Tin Trichloride	NE	NE	19	22	51	5.9 U	NA	5.7 U	5.0 U	5.7 U	5.5 U	5.5 U	NA
TBT as TBT ion	NE	73 (i)	1500	2800	3100	360	NA	21	4.5 U	5.1 U	29	39	NA
Conventionals													
Total Organic Carbon (percent)	NE	NE	1.89	2.44	2.61	2.59	2.55	2.34	5.84	2.39	2.24	1.78	2.15
Total Solids (percent)	NE	NE	77.80	64.20	74.70	72.50	45.10	57.00	51.60	48.60	42.70	50.60	46.60
Total Volatile Solids (percent)	NE	NE	NA	NA	NA	NA	NA	7.67	13.0	NA	NA	NA	NA

Notes

NA = Not available.
NE = Not established
U = Indicates compound was analyzed for, but was not detected at the given detection limit.
J = Data validation flag indicating the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
M = Indicates an estimated value of analyte detected and confirmed by analyst with low spectral match parameters.
Shaded results exceed the most stringent Sediment Management Standard.
(a) Sediment Sampling and Analysis Plan Appendix; Washington State Department of Ecology, Publication 03-09-043, Revised February 2008 (WAC 173-204).
(b) Where chemical criteria in this table represent the sum of individual compounds or isomers, the following methods shall be applied:
  (i) Where chemical analyses identify an undetected value for every individual compound/isomer, then the single highest detection limit shall represent the sum of the respective compounds/isomers.
  (ii) Where chemical analyses detect one or more individual compounds/isomers, only the detected concentrations will be added to represent the group sum.
(c) All organic data (except phenols, benzyl alcohol, and benzoic acid) are normalized to total organic carbon; this involves dividing the dry weight concentration of the constituent by the fraction of total organic carbon present.
(d) The LPAH criterion represents the sum of the following "low molecular weight polynuclear aromatic hydrocarbon" compounds: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene. The LPAH criterion is not the sum of the criteria values for the individual LPAH compounds listed.
(e) The total benzofluoranthenes criterion represents the sum of the concentrations of the "B," "J," and "K" isomers.
(f) The HPAH criterion represents the sum of the following "high molecular weight polynuclear aromatic hydrocarbon" compounds: fluoranthene, pyrene, benzo(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)perylene. The HPAH criterion is not the sum of the criteria values for the individual HPAH compounds as listed.
(g) Approximate no affects level (SQS equivalent)
(h) Puget Sound Drilling and Dredging Act (PSDDA) open water disposal screening level criteria.
(i) Preliminary criteria based on bulk equivalent of PSDDA open water disposal screening level criteria for porewater TBT.

Table 9
Statistical Summary for Soil
Analytical Results
Everett Shipyard

	Most Stringent Screening Criteria (see Table 1)	Number of Reported Results	Mininum Detected Result	Maximum Detected Result	Mininum Reporting Limit	Maximum Reporting Limit	Detection Frequency (%)	Exceedance Frequency (%)	Location of Highest Detection
NWTPH-Dx (mg/kg)									
Diesel	2,000	58	5.6	5,500	5.2 U	50 U	71	5.1	SS-2-1
Lube Oil (Motor Oil)	2,000	58	12	26,000	10 U	50 U	83	5.1	SS-2-1
TOTAL METALS (mg/kg)									
Arsenic	0.057	60	51	210	2.8 U	14 U	38	100	ESY-SS5-0-1
Cadmium	1.2	60	0.546	3.2	0.437 U	2.3 U	25	12	ESY-SS5-0-1
Chromium	19	9	13	150	NA	NA	100	100	ESY-SS3-0-1
Copper	1.1	73	9.3	3350	NA	NA	100	100	ESY-SS3-0-1
Lead	1,600	60	1.4	1910	5.6 U	6.1 U	95	25	ESY-SS5-0-1
Mercury	0.026	60	0.141	0.97	0.02 U	0.145 U	33	100	ESY-SS5-0-1
Silver	0.32	9	NA	NA	0.70 U	3.2 U	0	100	NA
Zinc	101	73	18	3100	NA	NA	100	37	ESY-SS3-0-1
ORGANOTINS (μg/kg)									
Tetrabutyl Tin	NE	1	NA	NA	5.8 UJ	5.8 UJ	0	0	NA
Tributyl Tin Chloride	NE	1	1200	1200	NA	NA	100	0	ESY-SS3-0-1
Dibutyl Tin Dichloride	NE	1	300	300	NA	NA	100	0	ESY-SS3-0-1
Butyl Tin Trichloride	NE	1	100	100	NA	NA	100	0	ESY-SS3-0-1
Tributyltin (as TBT ion)	7,400	1	1100	1100	NA	NA	100	0	ESY-SS3-0-1
PCBs (mg/kg)									
PCB-1016	5,600	3	NA	NA	0.1 U	0.1 U	0	0	NA
PCB-1221	NE	3	NA	NA	0.1 U	0.1 U	0	0	NA
PCB-1232	NE	3	NA	NA	0.1 U	0.1 U	0	0	NA
PCB-1242	NE	3	NA	NA	0.1 U	0.1 U	0	0	NA
PCB-1248	NE	3	NA	NA	0.1 U	0.1 U	0	0	NA
PCB-1254	1,600	3	NA	NA	0.1 U	0.1 U	0	0	NA
PCB-1260	NE	3	NA	NA	0.1 U	0.1 U	0	0	NA
Total PCBs	500	3	NA	NA	0.1 U	0.1 U	0	0	NA
VOLATILES (μg/kg)									
1,1,1,2-Tetrachloroethane	38,000	6	NA	NA	1.1 U	1.2 U	0	0	NA
1,1,1-Trichloroethane	2,000	6	NA	NA	1.1 U	1.2 U	0	0	NA
1,1,2,2-Tetrachloroethane	5,000	6	NA	NA	1.1 U	1.2 U	0	0	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	NE	6	NA	NA	2.1 U	2.4 U	0	0	NA
1,1,2-Trichloroethane	18,000	6	NA	NA	1.1 U	1.2 U	0	0	NA
1,1-Dichloroethane	16,000,000	6	NA	NA	1.1 U	1.2 U	0	0	NA
1,1-Dichloroethene	4,000,000	6	NA	NA	1.1 U	1.2 U	0	0	NA
1,1-Dichloropropene	NE	6	NA	NA	1.1 U	1.2 U	0	0	NA
1,2,3-Trichlorobenzene	NE	6	NA	NA	5.3 U	5.9 U	0	0	NA
1,2,3-Trichloropropane	140	6	NA	NA	2.1 U	2.4 U	0	0	NA
1,2,4-Trichlorobenzene	800,000	6	NA	NA	5.3 U	5.9 U	0	0	NA
1,2-Dichlorobenzene	7,200,000	6	NA	NA	1.1 U	1.2 U	0	0	NA
1,2-Dichloroethane	11,000	6	NA	NA	1.1 U	1.2 U	0	0	NA
1,2-Dichloropropane	15,000	6	NA	NA	1.1 U	1.2 U	0	0	NA
1,3,5-Trimethylbenzene	4,000,000	6	NA	NA	1.1 U	1.2 U	0	0	NA
1,3-Dichlorobenzene	NE	6	NA	NA	1.1 U	1.2 U	0	0	NA
1,3-Dichloropropane	NE	6	NA	NA	1.1 U	1.2 U	0	0	NA
1,4-Dichlorobenzene	42,000	6	NA	NA	1.1 U	1.2 U	0	0	NA
2,2-Dichloropropane	NE	6	NA	NA	1.1 U	1.2 U	0	0	NA
2-Butanone	48,000,000	6	NA	NA	5.3 U	5.9 U	0	0	NA
2-Chloroethylvinylether	NE	6	NA	NA	5.3 U	5.9 U	0	0	NA
2-Chlorotoluene	1,600,000	6	NA	NA	1.1 U	1.2 U	0	0	NA
2-Hexanone	NE	6	NA	NA	5.3 U	5.9 U	0	0	NA
4-Chlorotoluene	NE	6	NA	NA	1.1 U	1.2 U	0	0	NA
4-Isopropyltoluene	NE	6	NA	NA	1.1 U	1.2 U	0	0	NA

Table 9
Statistical Summary for Soil
Analytical Results
Everett Shipyard

	Most Stringent Screening Criteria (see Table 1)	Number of Reported Results	Mininum Detected Result	Maximum Detected Result	Mininum Reporting Limit	Maximum Reporting Limit	Detection Frequency (%)	Exceedance Frequency (%)	Location of Highest Detection
VOLATILES (µg/kg) (cont.)									
4-Methyl-2-Pentanone (MIBK)	6,400,000	6	NA	NA	5.3 U	5.9 U	0	0	NA
Acetone	3,200	6	NA	NA	5.3 U	5.9 U	0	0	NA
Acrolein	1,600,000	6	NA	NA	53 U	59 U	0	0	NA
Acrylonitrile	1,900	6	NA	NA	5.3 U	5.9 U	0	0	NA
Benzene	30	6	NA	NA	1.1 U	1.2 U	0	0	NA
Bromobenzene	NE	6	NA	NA	1.1 U	1.2 U	0	0	NA
Bromochloromethane	NE	6	NA	NA	1.1 U	1.2 U	0	0	NA
Bromodichloromethane	16,000	6	NA	NA	1.1 U	1.2 U	0	0	NA
Bromoethane	NE	6	NA	NA	2.1 U	2.4 U	0	0	NA
Bromoform	130,000	6	NA	NA	1.1 U	1.2 U	0	0	NA
Bromomethane	110,000	6	NA	NA	1.1 U	1.2 U	0	0	NA
Carbon Disulfide	5,600	6	NA	NA	1.1 U	1.2 U	0	0	NA
Carbon Tetrachloride	7,700	6	NA	NA	1.1 U	1.2 U	0	0	NA
Chlorobenzene	1,600,000	6	NA	NA	1.1 U	1.2 U	0	0	NA
Chloroethane	NE	6	NA	NA	1.1 U	1.2 U	0	0	NA
Chloroform	160,000	6	NA	NA	1.1 U	1.2 U	0	0	NA
Chloromethane	77,000	6	NA	NA	1.1 U	1.2 U	0	0	NA
cis-1,2-Dichloroethene	800,000	6	NA	NA	1.1 U	1.2 U	0	0	NA
cis-1,3-Dichloropropene	5,600	6	NA	NA	1.1 U	1.2 U	0	0	NA
Dibromochloromethane	12,000	6	NA	NA	1.1 U	1.2 U	0	0	NA
Dibromomethane	NE	6	NA	NA	1.1 U	1.2 U	0	0	NA
Ethylbenzene	6,000	6	NA	NA	1.1 U	1.2 U	0	0	NA
Ethylene Dibromide	NE	6	NA	NA	1.1 U	1.2 U	0	0	NA
Hexachlorobutadiene	13,000	6	NA	NA	5.3 U	5.9 U	0	0	NA
Isopropylbenzene	NE	6	NA	NA	1.1 U	1.2 U	0	0	NA
m,p-Xylene	9,000	6	NA	NA	1.1 U	1.2 U	0	0	NA
Methyl Iodide	100	6	NA	NA	1.1 U	1.2 U	0	0	NA
Methylene Chloride	20	6	NA	NA	2.1 U	2.4 U	0	0	NA
Naphthalene	5,000	6	NA	NA	5.3 U	5.9 U	0	0	NA
n-Butylbenzene	NE	6	NA	NA	1.1 U	1.2 U	0	0	NA
n-Propylbenzene	NE	6	NA	NA	1.1 U	1.2 U	0	0	NA
o-Xylene	160,000,000	6	NA	NA	1.1 U	1.2 U	0	0	NA
sec-Butylbenzene	NE	6	NA	NA	1.1 U	1.2 U	0	0	NA
Styrene	33,000	6	NA	NA	1.1 U	1.2 U	0	0	NA
tert-Butylbenzene	NE	6	NA	NA	1.1 U	1.2 U	0	0	NA
Tetrachloroethene	4.1	6	2.2 J	2.8 J	1.1 U	1.2 U	33	0	ESY-S-LB12-0-2
Toluene	7,000	6	NA	NA	1.1 U	1.2 U	0	0	NA
trans-1,2-Dichloroethene	1,600,000	6	NA	NA	1.1 U	1.2 U	0	0	NA
trans-1,3-Dichloropropene	5,600	6	NA	NA	1.1 U	1.2 U	0	0	NA
trans-1,4-Dichloro-2-butene	NE	6	NA	NA	5.3 U	5.9 U	0	0	NA
Trichloroethene	30	6	NA	NA	1.1 U	1.2 U	0	0	NA
Trichlorofluoromethane	NE	6	NA	NA	1.1 U	1.2 U	0	0	NA
Vinyl Acetate	NE	6	NA	NA	5.3 U	5.5 U	0	0	NA
Vinyl Chloride	670	6	NA	NA	1.1 U	1.2 U	0	0	NA

NA = Not applicable or not available
NE = Not established
U = Indicates compound was analyzed for, but was not detected at the given detection limit.
UJ = The analyte was not detected in the sample; the reported sample detection limit is an estimate.
J = Indicates that the analyte was positively identified; the associated numercial value is the approximate concentration of the analyte in the sample.
mg/kg = milligrams per kilograms
µg/kg = micrograms per kilograms

Table 10
Statistical Summary for Groundwater Analytical Results
Everett Shipyard

	Most Stringent Screening Criteria (see Table 2)	Number of Reported Results	Mininum Detected Result	Maximum Detected Result	Minimum Reporting Limit	Maximum Reporting Limit	Detection Frequency (%)	Exceedance Frequency (%)	Location of Highest Detection
NWTPH-Dx (µg/L)									
Diesel	500	9	180	210	130 U	130 U	22	0	MW3
Lube Oil	500	9	NA	NA	250 U	250 U	0	0	NA
NWTPH-gx (µg/L)									
Gasoline	800 / 1,000	1	NA	NA	50 U	50 U	0	0	NA
CHLORIDE (mg/L)	NE	4	32	190	NA	NA	100	0	MW10
DISSOLVED METALS (mg/L)									
Arsenic	0.000018	2	NA	NA	0.005 U	0.005 U	0	100	NA
Cadmium	0.005	2	NA	NA	0.005 U	0.005 U	0	0	NA
Chromium	0.016	2	NA	NA	0.01 U	0.01 U	0	0	NA
Copper	0.0024	2	NA	NA	0.006 U	0.006 U	0	100	NA
Lead	0.0081	2	NA	NA	0.003 U	0.003 U	0	0	NA
Mercury	0.000025	2	NA	NA	0.0002 U	0.0002 U	0	100	NA
Silver	0.0019	2	NA	NA	0.007 U	0.007 U	0	100	NA
Zinc	0.081	2	NA	NA	0.007 U	0.007 U	0	0	NA
TOTAL METALS (mg/L)									
Arsenic	0.000018	4	NA	NA	0.005 U	0.005 U	0	100	NA
Cadmium	0.005	4	NA	NA	0.005 U	0.005 U	0	0	NA
Chromium	0.016	4	NA	NA	0.01 U	0.01 U	0	0	NA
Copper	0.0024	4	NA	NA	0.006 U	0.006 U	0	100	NA
Lead	0.0081	4	NA	NA	0.003 U	0.003 U	0	0	NA
Mercury	0.000025	4	NA	NA	0.0002 U	0.0002 U	0	100	NA
Silver	0.0019	4	NA	NA	0.007 U	0.007 U	0	100	NA
Zinc	0.081	4	NA	NA	0.007 U	0.007 U	0	0	NA
VOLATILES (µg/L)									
1,1,1,2-Tetrachloroethane	1.7	6	NA	NA	2 U	2 U	0	100	NA
1,1,1-Trichloroethane	200	6	NA	NA	2 U	2 U	0	0	NA
1,1,2,2-Tetrachloroethane	0.17	6	NA	NA	2 U	2 U	0	100	NA
1,1,2-Trichloroethane	0.59	6	NA	NA	2 U	2 U	0	100	NA
1,1-Dichloroethane	1,600	6	NA	NA	2 U	2 U	0	0	NA
1,1-Dichloroethene	0.057	6	NA	NA	2 U	2 U	0	100	NA
1,1-Dichloropropene	NE	6	NA	NA	2 U	2 U	0	0	NA
1,2,3-Trichlorobenzene	NE	6	NA	NA	2 U	2 U	0	0	NA
1,2,3-Trichloropropane	0.0063	6	NA	NA	2 U	2 U	0	100	NA
1,2,4-Trichlorobenzene	35	6	NA	NA	2 U	2 U	0	0	NA
1,2,4-Trimethyl Benzene	400	6	NA	NA	2 U	2 U	0	0	NA
1,2-Dibromo 3-Chloropropane	0.031	6	NA	NA	10 U	10 U	0	100	NA
1,2-Dibromoethane	0.00051	6	NA	NA	2 U	2 U	0	100	NA
1,2-Dichlorobenzene	420	6	NA	NA	2 U	2 U	0	0	NA
1,2-Dichloroethane	0.38	6	NA	NA	2 U	2 U	0	100	NA
1,2-Dichloropropane	0.5	6	NA	NA	2 U	2 U	0	100	NA
1,3 Dichlorobenzene	320	6	NA	NA	2 U	2 U	0	0	NA
1,3,5-Trimethylbenzene	400	6	NA	NA	2 U	2 U	0	0	NA
1,3-Dichloropropane	NE	6	NA	NA	2 U	2 U	0	0	NA
1,4-Dichlorobenzene	1.8	6	NA	NA	2 U	2 U	0	100	NA

Table 10
Statistical Summary for Groundwater
Analytical Results
Everett Shipyard

	Most Stringent Screening Criteria (see Table 2)	Number of Reported Results	Mininum Detected Result	Maximum Detected Result	Minimum Reporting Limit	Maximum Reporting Limit	Detection Frequency (%)	Exceedance Frequency (%)	Location of Highest Detection
2,2-Dichloropropane	NE	6	NA	NA	2 U	2 U	0	0	NA
2-Butanone	4,800	6	NA	NA	10 U	10 U	0	0	NA
2-Chlorotoluene	160	6	NA	NA	2 U	2 U	0	0	NA
2-Hexanone		6	NA	NA	10 U	10 U	0	0	NA
4-Chlorotoluene	NE	6	NA	NA	2 U	2 U	0	0	NA
4-Methyl-2-Pentanone	640	6	NA	NA	10 U	10 U	0	0	NA
Acetone	800	6	NA	NA	25 U	25 U	0	0	NA
Acrylonitrile	0.051	6	NA	NA	10 U	10 U	0	100	NA
Benzene	0.8	6	NA	NA	2 U	2 U	0	100	NA
Bromobenzene	NE	6	NA	NA	2 U	2 U	0	0	NA
Bromochloromethane	NE	6	NA	NA	2 U	2 U	0	0	NA
Bromodichloromethane	0.27	6	NA	NA	2 U	2 U	0	100	NA
Bromoform	4.3	6	NA	NA	2 U	2 U	0	0	NA
Bromomethane	11	6	NA	NA	2 U	2 U	0	0	NA
Carbon Tetrachloride	0.23	6	NA	NA	2 U	2 U	0	100	NA
Chlorobenzene	100	6	NA	NA	2 U	2 U	0	0	NA
Chloroethane	NE	6	NA	NA	2 U	2 U	0	0	NA
Chloroform	5.7	6	NA	NA	2 U	2 U	0	0	NA
Chloromethane	3.4	6	NA	NA	2 U	2 U	0	0	NA
Cis-1,2-Dichloroethene	70	6	NA	NA	2 U	2 U	0	0	NA
Cis-1,3-Dichloropropene	0.24	6	NA	NA	2 U	2 U	0	83	NA
Dibromochloromethane	0.41	6	NA	NA	2 U	2 U	0	100	NA
Dibromomethane	5	6	NA	NA	2 U	2 U	0	0	NA
Dichlorodifluoromethane	1,600	6	NA	NA	2 U	2 U	0	0	NA
Ethylbenzene	530	6	NA	NA	2 U	2 U	0	0	NA
Hexachloro1,3-Butadiene	0.56	6	NA	NA	2 U	2 U	0	100	NA
Isopropylbenzene	800	6	NA	NA	2 U	2 U	0	0	NA
M+P Xylene	10,000	6	NA	NA	4 U	4 U	0	0	NA
Methyl T-Butyl Ether	20	6	NA	NA	2 U	2 U	0	0	NA
Methylene Chloride	4.6	6	NA	NA	5 U	5 U	0	100	NA
Naphthalene	NE	6	NA	NA	2 U	2 U	0	0	NA
N-Butylbenzene	NE	6	NA	NA	2 U	2 U	0	0	NA
N-Propyl Benzene	NE	6	NA	NA	2 U	2 U	0	0	NA
O-Xylene	16,000	6	NA	NA	2 U	2 U	0	0	NA
P-Isopropyltoluene	NE	6	NA	NA	2 U	2 U	0	0	NA
S-Butyl Benzene	NE	6	NA	NA	2 U	2 U	0	0	NA
Styrene	1.5	6	NA	NA	2 U	2 U	0	100	NA
T-Butyl Benzene	NE	6	NA	NA	2 U	2 U	0	0	NA
Tetrachloroethylene	0.081	6	NA	NA	2 U	2 U	0	100	NA
Toluene	640	6	NA	NA	2 U	2 U	0	0	NA
Trans-1,2-Dichloroethene	100	6	NA	NA	2 U	2 U	0	0	NA
Trans-1,3-Dichloropropene	0.24	6	NA	NA	2 U	2 U	0	100	NA
Trichloroethene	0.11	6	NA	NA	2 U	2 U	0	100	NA
Trichlorofluoromethane	2,400	6	NA	NA	2 U	2 U	0	83	NA
Vinyl Chloride	0.025	6	NA	NA	2 U	2 U	0	0	NA

Table 10
Statistical Summary for Groundwater
Analytical Results
Everett Shipyard

	Most Stringent Screening Criteria (see Table 2)	Number of Reported Results	Mininum Detected Result	Maximum Detected Result	Minimum Reporting Limit	Maximum Reporting Limit	Detection Frequency (%)	Exceedance Frequency (%)	Location of Highest Detection
SEMIVOLATILES (µg/L)									
1,2,4-Trichlorobenzene	35	4	NA	NA	2 U	2 U	0	0	NA
1,2-Dichlorobenzene	420	4	NA	NA	2 U	2 U	0	0	NA
1,3-Dichlorobenzene	320	4	NA	NA	2 U	2 U	0	0	NA
1,4-Dichlorobenzene	1.8	4	NA	NA	2 U	2 U	0	100	NA
1-Methylnaphthalene	2.4	4	NA	NA	2 U	2 U	0	0	NA
2,3,4,6-Tetrachlorophenol	NE	4	NA	NA	5 U	5 U	0	0	NA
2,4,5-Trichlorophenol	800	4	NA	NA	2 U	2 U	0	0	NA
2,4,6-Trichlorophenol	1.4	4	NA	NA	2 U	2 U	0	100	NA
2,4-Dichlorophenol	24	4	NA	NA	2 U	2 U	0	0	NA
2,4-Dimethylphenol	160	4	NA	NA	2 U	2 U	0	0	NA
2,4-Dinitrophenol	32	4	NA	NA	10 U	10 U	0	0	NA
2,4-Dinitrotoluene	0.11	4	NA	NA	5 U	5 U	0	100	NA
2,6-Dichlorophenol	NE	4	NA	NA	2 U	2 U	0	0	NA
2,6-Dinitrotoluene	16	4	NA	NA	5 U	5 U	0	0	NA
2-Chloronaphthanlene	1000	4	NA	NA	2 U	2 U	0	0	NA
2-Chlorophenol	40	4	NA	NA	2 U	2 U	0	0	NA
2-Methylnaphthalene	32	4	NA	NA	2 U	2 U	0	0	NA
2-Methylphenol	NE	4	NA	NA	2 U	2 U	0	0	NA
2-Nitroaniline	NE	4	NA	NA	5 U	5 U	0	0	NA
2-Nitrophenol	NE	4	NA	NA	5 U	5 U	0	0	NA
3,3'-Dichlorobenzidine	0.021	4	NA	NA	2 U	2 U	0	100	NA
3-Nitroaniline	NE	4	NA	NA	5 U	5 U	0	0	NA
4,6-Dinitro-2-Methylphenol	13	4	NA	NA	10 U	10 U	0	0	NA
4-Bromophenyl-Phenylether	NE	4	NA	NA	2 U	2 U	0	0	NA
4-Chloro-3-Methylphenol	NE	4	NA	NA	2 U	2 U	0	0	NA
4-Chloroaniline	NE	4	NA	NA	2 U	2 U	0	0	NA
4-Chlorophenyl-Phenylether	NE	4	NA	NA	2 U	2 U	0	0	NA
4-Methylphenol	NE	4	NA	NA	2 U	2 U	0	0	NA
4-Nitroaniline	NE	4	NA	NA	5 U	5 U	0	0	NA
4-Nitrophenol	NE	4	NA	NA	10 U	10 U	0	0	NA
Acenaphthene	670	4	NA	NA	2 U	2 U	0	0	NA
Acenaphthylene	NE	4	NA	NA	2 U	2 U	0	0	NA
Aniline	NE	4	NA	NA	2 U	2 U	0	0	NA
Anthracene	4800	4	NA	NA	2 U	2 U	0	0	NA
Azobenzene	NE	4	NA	NA	2 U	2 U	0	0	NA
Benzo[a]Anthracene	0.0028	4	NA	NA	2 U	2 U	0	75	NA
Benzo[a]pyrene	0.0028	4	NA	NA	2 U	2 U	0	100	NA
Benzo[b]fluoranthene	0.0028	4	NA	NA	2 U	2 U	0	100	NA
Benzo[g,h,i]perylene	NE	4	NA	NA	2 U	2 U	0	0	NA
Benzo[k]fluoranthene	0.0028	4	NA	NA	2 U	2 U	0	100	NA
Benzoic Acid	64,000	4	NA	NA	20 U	20 U	0	0	NA
Benzyl Alcohol	2400	4	NA	NA	2 U	2 U	0	0	NA

Table 10
Statistical Summary for Groundwater
Analytical Results
Everett Shipyard

	Most Stringent Screening Criteria (see Table 2)	Number of Reported Results	Mininum Detected Result	Maximum Detected Result	Minimum Reporting Limit	Maximum Reporting Limit	Detection Frequency (%)	Exceedance Frequency (%)	Location of Highest Detection
Bis(2-Chloroethoxy)Methane	NE	4	NA	NA	2 U	2 U	0	0	NA
Bis(2-Chloroethyl)Ether	0.03	4	NA	NA	2 U	2 U	0	100	NA
Bis(2-Chloroisopropyl)Ether	NE	4	NA	NA	2 U	2 U	0	0	NA
Bis(2-Ethylhexyl)Phthalate	1.2	4	NA	NA	3 U	3 U	0	100	NA
Butylbenzylphthalate	1,500	4	NA	NA	2 U	2 U	0	0	NA
Carbazole	4.4	4	NA	NA	2 U	2 U	0	0	NA
Chrysene	0.0028	4	NA	NA	2 U	2 U	0	100	NA
Dibenz[a,h]anthracene	0.0028	4	NA	NA	2 U	2 U	0	100	NA
Dibenzofuran	32	4	NA	NA	2 U	2 U	0	0	NA
Diethylphthalate	13,000	4	NA	NA	2 U	2 U	0	0	NA
Dimethylphthalate	16,000	4	NA	NA	2 U	2 U	0	0	NA
Di-N-Butylphthalate	1,600	4	NA	NA	2 U	2 U	0	0	NA
Di-N-Octylphthalate	320	4	NA	NA	2 U	2 U	0	0	NA
Fluoranthene	130	4	NA	NA	2 U	2 U	0	0	NA
Fluorene	640	4	NA	NA	2 U	2 U	0	0	NA
Hexachlorobenzene	0.00028	4	NA	NA	2 U	2 U	0	100	NA
Hexachlorobutadiene	0.44	4	NA	NA	2 U	2 U	0	100	NA
Hexachlorocyclopentadiene	40	4	NA	NA	10 U	10 U	0	0	NA
Hexachloroethane	1.4	4	NA	NA	2 U	2 U	0	100	NA
Indeno[1,2,3-cd]pyrene	0.0028	4	NA	NA	2 U	2 U	0	100	NA
Isophorone	8.4	4	NA	NA	2 U	2 U	0	0	NA
Naphthalene	160	4	NA	NA	2 U	2 U	0	0	NA
Nitrobenzene	4	4	NA	NA	2 U	2 U	0	0	NA
N-Nitrosodimethylamine	NE	4	NA	NA	2 U	2 U	0	0	NA
N-Nitroso-Di-N-Propylamine	0.005	4	NA	NA	2 U	2 U	0	100	NA
N-Nitrosodiphenylamine	3.3	4	NA	NA	2 U	2 U	0	0	NA
Pentachlorophenol	0.27	4	NA	NA	10 U	10 U	0	100	NA
Phenanthrene	NE	4	NA	NA	2 U	2 U	0	0	NA
Phenol	4,800	4	NA	NA	2 U	2 U	0	0	NA
Pyrene	480	4	NA	NA	2 U	2 U	0	0	NA
Pyridine	NE	4	NA	NA	4 U	4 U	0	0	NA

NA = Not analyzed or not applicable
NE = Not established
U = Indicates compound was analyzed for, but was not detected at the given detection limit.
µg/L = micrograms per liters
mg/L = milligrams per liters

Table 11
Statistical Summary for
Sediment Analytical Results
Everett Shipyard

	Sediment Management Standards (a)		**Number of Reported Results**	**Minimum Detected Result**	**Maximum Detected Result**	**Minimum Reporting Limit**	**Maximum Reporting Limit**	**Detection Frequency (%)**	**Exceedance Frequency (%)**	**Location of Highest Detection**
	Sediment Quality Standard (SQS)	Cleanup Screening Level (CSLs)								
Metals (mg/kg)										
Antimony	NA	NA	7	NA	NA	8 U	10 U	0	0	NA
Arsenic	57	93	32	7	270	6 U	10 U	59	3	NMA-core-2-0.5-3.2ft
Cadmium	5.1	6.7	32	0.3	1.4	0.2 U	0.3 U	59	0	NMA-core-2-0.5-3.2ft
Chromium	260	270	32	25.2	100	NA	NA	100	0	NMA-core-2-0.5-3.2ft
Copper	390	390	32	19.3	1800	NA	NA	100	16	ESY-MS3
Lead	450	530	32	4	413	NA	NA	100	0	NMA-core-2-0.5-3.2ft
Mercury	0.41	0.59	32	0.05	10.1	0.06 U	0.07 U	91	13	NMA-core-2-3.2-6.3ft
Nickel	NA	NA	7	41	53	NA	NA	100	0	ESY-MS5
Silver	6.1	6.1	32	41	53	0.4 U	1.0 U	22	0	ESY-MS5
Zinc	410	960	32	41.7	1610	0.5 U	0.6 U	78	16	NMA-core-2-0.5-3.2ft
PAHs (mg/kg OC)										
2-Methylnaphthalene	38	64	32	0.72	5.7	0.36 U	4.0 U	22	0	NMA-core-2-0.5-3.2ft
Acenaphthene	16	57	32	0.70	142	0.36 U	4.0 U	66	16	NMA-core-2-0.5-3.2ft
Acenaphthylene	66	66	32	0.45	12	0.36 U	4.0 U	53	0	NMA-core-2-0.5-3.2ft
Anthracene	220	1,200	32	0.90	96	0.36 U	3.5 U	81	0	NMA-core-2-0.5-3.2ft
Benzo(a)anthracene	110	270	32	2.0	178	0.36 U	3.5 U	91	6	NMA-core-2-3.2-6.3ft
Benzo(a)pyrene	99	210	32	1.5	104	0.36 U	3.5 U	91	6	NMA-core-2-3.2-6.3ft
Benzo(b)fluoranthene	230	450	32	1.9	146	0.36 U	3.5 U	91	0	NMA-core-2-0.5-3.2ft
Benzo(g,h,i)perylene	31	78	32	0.98	25	0.36 U	3.5 U	63	0	NMA-core-2-3.2-6.3ft
Benzo(k)fluoranthene	230	450	32	2.1	116	0.36 U	3.5 U	91	0	NMA-core-2-3.2-6.3ft
Chrysene	110	460	32	4.0	216	0.36 U	3.5 U	91	13	NMA-core-2-3.2-6.3ft
Dibenz(a,h)anthracene	12	33	32	0.91	11	0.31 U	4.0 U	38	0	ESY-MS3
Fluoranthene	160.0	1,200	32	4.1	695	0.36 U	3.5 U	91	16	NMA-core-2-3.2-6.3ft
Fluorene	23	79	32	0.91	115	0.36 U	4.0 U	66	6	NMA-core-2-0.5-3.2ft
HPAH(f)	960	5,300	32	24	1998	0.36 U	3.5 U	91	13	NMA-core-2-3.2-6.3ft
Indeno(1,2,3-c,d)pyrene	34	88	32	1.0	30	0.36 U	3.5 U	72	0	NMA-core-2-3.2-6.3ft
LPAH(d)	370	780	32	1.8	855	0.36 U	3.5 U	91	6	NMA-core-2-0.5-3.2ft
Naphthalene	99	170	32	0.71	119	0.36 U	4.0 U	53	3	NMA-core-2-0.5-3.2ft
Phenanthrene	100	480	32	1.4	372	0.36 U	3.5 U	91	6	NMA-core-2-0.5-3.2ft
Pyrene	1,000	1,400	32	4.3	502	0.36 U	3.5 U	91	0	NMA-core-2-3.2-6.3ft
Total Benzofluoranthenes (e)	230	450	32	4.7	261	0.36 U	3.5 U	91	6	NMA-core-2-0.5-3.2ft
SVOCs (mg/kg OC)										
1,2-Dichlorobenzene	2.3	2.3	32	NA	NA	0.31 U	4.0 U	0	16	NA
1,3-Dichlorobenzene	NA	NA	32	NA	NA	0.31 U	4.0 U	0	0	NA
1,4-Dichlorobenzene	3.1	9.0	32	NA	NA	0.31 U	4.0 U	0	13	NA
1,2,4-Trichlorobenzene	0.81	1.8	32	NA	NA	0.28 U	4.0 U	0	78	NA
Hexachlorobenzene	0.38	2.3	32	NA	NA	0.042 U	4.0 U	0	88	NA
Dimethylphthalate	53	53	32	0.98	142	0.36 U	4.0 U	41	3	NMA-core-2-0.5-3.2ft
Diethylphthalate	61	110	32	2.2	2.2	0.31 U	4.0 U	3	0	ESY-MS5
Di-n-Butylphthalate	220	1,700	32	1.0	3.7	0.36 U	24 U	19	0	NMA-core-1-0.5-2.0ft
Butylbenzylphthalate	4.9	64	32	1.4	46	0.31 U	4.0 U	19	6	ESY-MS3
bis(2-Ethylhexyl)phthalate	47	78	32	0.80	88	0.36 U	16 U	34	6	ESY-MS3
Di-n-octyl phthalate	58	4,500	32	1.3	3.5	0.31 U	4.0 U	6	0	NMA-grab-5-0-10cm
Dibenzofuran	15	58	32	0.80	80	0.36 U	4.0 U	50	6	NMA-core-2-0.5-3.2ft
Hexachlorobutadiene	3.9	6.2	32	NA	NA	0.31 U	4.0 U	0	3	NA
N-Nitrosodiphenylamine	11	11	32	NA	NA	0.31 U	19 U	0	3	NA

Table 11
Statistical Summary for
Sediment Analytical Results
Everett Shipyard

	Sediment Management Standards (a)		**Number of Reported Results**	**Minimum Detected Result**	**Maximum Detected Result**	**Minimum Reporting Limit**	**Maximum Reporting Limit**	**Detection Frequency (%)**	**Exceedance Frequency (%)**	**Location of Highest Detection**
	Sediment Quality Standard (SQS)	Cleanup Screening Level (CSLs)								
SVOCs (µg/kg)										
Phenol	420	1,200	32	53	53	18 U	95 U	3	0	NMA-grab-4-0-10cm
2-Methylphenol	63	63	32	NA	NA	18 U	95 U	0	3	NA
4-Methylphenol	670	670	32	49	140	19 U	95 U	13	0	ESY-MS3
2,4-Dimethylphenol	29	29	32	NA	NA	18 U	95 U	0	19	NA
Pentachlorophenol	360	690	32	330	720	88 U	470 U	6	6	NMA-grab-9-0-10cm
Benzyl Alcohol	57	73	32	NA	NA	18 U	97 U	0	6	NA
Benzoic Acid	650	650	32	210	210	180 U	950 U	3	3	ESY-MS3
Organotin (Pore Water) (µg/L)										
Tetrabutyl Tin	NE	NE	7	NA	NA	0.025 U	0.025 U	0	NA	NA
Tributyl Tin Chloride	NE	NE	17	0.027	0.74	0.025 U	0.025 U	59	NA	ESY-MS1
Dibutyl Tin Dichloride	NE	NE	17	0.061	0.14	0.05 U	0.05 U	24	NA	NMA-grab-9-0-10cm
Butyl Tin Trichloride	NE	NE	17	NA	NA	0.05U	0.05U	0	NA	NA
TBT as TBT ion	0.05	0.15	17	0.024	0.66	0.019 U	0.022 U	59	58	ESY-MS1
Organotin (Bulk) (µg/kg)										
Tetrabutyl Tin	NE	NE	3	11	18	5.9 U	5.9 U	67	NA	ESY-MS1
Tributyl Tin Chloride	NE	NE	22	5.7	3500	5.0 U	5.9 U	50	NA	NMA-core-2-0.5-3.2ft
Dibutyl Tin Dichloride	NE	NE	22	7.8	1100	5.0 U	5.9 U	45	NA	NMA-core-2-0.5-3.2ft
Butyl Tin Trichloride	NE	NE	22	19	51	5.0 U	5.9 U	23	NA	NMA-core-2-0.5-3.2ft
TBT as TBT ion	NE	73	22	5.1	3100	4.5 U	5.7 U	50	50	NMA-core-2-0.5-3.2ft
Conventionals										
Total Organic Carbon (percent)	NE	NE	32	0.564	5.8	NA	NA	100	NA	NMA-core-3-1.8-3.1ft
Total Solids (percent)	NE	NE	32	42.7	79.1	NA	NA	100	NA	NMA-core-5-2.8-4.8ft
Total Volatile Solids (percent)	NE	NE	2	7.67	13	NA	NA	100	NA	NMA-core-3-1.8-3.1ft
PCBs (µg/kg dry weight)										
Aroclor 1016	NE	NE	2	NA	NA	19 U	20 U	0	NA	NA
Aroclor 1242	NE	NE	2	NA	NA	19 U	20 U	0	NA	NA
Aroclor 1248	NE	NE	2	NA	NA	19 U	20 U	0	NA	NA
Aroclor 1254	NE	NE	2	47	220	NA	NA	100	NA	ESY-MS3
Aroclor 1260	NE	NE	2	NA	NA	38 U	68 U	0	NA	NA
Aroclor 1221	NE	NE	2	NA	NA	38 U	39 U	0	NA	NA
Aroclor 1232	NE	NE	2	NA	NA	19 U	20 U	0	NA	NA
Total PCBs (b,c) (mg/kg OC)	12,000	65,000	2	2.0	9.2	NA	NA	100	0	
VOLATILES (µg/kg dry weight)										
Chloromethane	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
Bromomethane	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
Vinyl Chloride	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
Chloroethane	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
Methylene Chloride	NE	NE	1	NA	NA	2.7 U	2.7 U	0	NA	NA
Acetone	NE	NE	1	59	59	NA	NA	100	NA	ESY-MS3
Carbon Disulfide	NE	NE	1	NA	NA	2.3 U	2.3 U	0	NA	NA
1,1-Dichloroethene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
1,1-Dichloroethane	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
trans-1,2-Dichloroethene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
cis-1,2-Dichloroethene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
Chloroform	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
1,2-Dichloroethane	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
2-Butanone	NE	NE	1	16	16	NA	NA	100	NA	ESY-MS3
1,1,1-Trichloroethane	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
Carbon Tetrachloride	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
Vinyl Acetate	NE	NE	1	NA	NA	6.7 U	6.7 U	0	NA	NA
Bromodichloromethane	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA

Table 11
Statistical Summary for
Sediment Analytical Results
Everett Shipyard

	Sediment Management Standards (a)		**Number of Reported Results**	**Minimum Detected Result**	**Maximum Detected Result**	**Minimum Reporting Limit**	**Maximum Reporting Limit**	**Detection Frequency (%)**	**Exceedance Frequency (%)**	**Location of Highest Detection**
	Sediment Quality Standard (SQS)	Cleanup Screening Level (CSLs)								
1,2-Dichloropropane	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
cis-1,3-Dichloropropene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
Trichloroethene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
Dibromochloromethane	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
1,1,2-Trichloroethane	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
Benzene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
trans-1,3-Dichloropropene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
2-Chloroethylvinylether	NE	NE	1	NA	NA	6.7 U	6.7 U	0	NA	NA
Bromoform	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
4-Methyl-2-Pentanone (MIBK)	NE	NE	1	NA	NA	6.7 U	6.7 U	0	NA	NA
2-Hexanone	NE	NE	1	NA	NA	6.7 U	6.7 U	0	NA	NA
Tetrachloroethene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
1,1,2,2-Tetrachloroethane	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
Toluene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
Chlorobenzene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
Ethylbenzene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
Styrene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
Trichlorofluoromethane	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	NE	NE	1	NA	NA	2.7 U	2.7 U	0	NA	NA
m,p-Xylene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
o-Xylene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
1,2-Dichlorobenzene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
1,3-Dichlorobenzene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
1,4-Dichlorobenzene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
Acrolein	NE	NE	1	NA	NA	67 U	67 U	0	NA	NA
Methyl Iodide	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
Bromoethane	NE	NE	1	NA	NA	2.7 U	2.7 U	0	NA	NA
Acrylonitrile	NE	NE	1	NA	NA	6.7 U	6.7 U	0	NA	NA
1,1-Dichloropropene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
Dibromomethane	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
1,1,1,2-Tetrachloroethane	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
1,2-Dibromo-3-chloropropane	NE	NE	1	NA	NA	6.7 U	6.7 U	0	NA	NA
1,2,3-Trichloropropane	NE	NE	1	NA	NA	2.7 U	2.7 U	0	NA	NA
trans-1,4-Dichloro-2-butene	NE	NE	1	NA	NA	6.7 U	6.7 U	0	NA	NA
1,3,5-Trimethylbenzene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
1,2,4-Trimethylbenzene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
Hexachlorobutadiene	NE	NE	1	NA	NA	6.7 U	6.7 U	0	NA	NA
Ethylene Dibromide	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
Bromochloromethane	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
2,2-Dichloropropane	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
1,3-Dichloropropane	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
Isopropylbenzene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA

Table 11
Statistical Summary for
Sediment Analytical Results
Everett Shipyard

	Sediment Management Standards (a)		**Number of Reported Results**	**Minimum Detected Result**	**Maximum Detected Result**	**Minimum Reporting Limit**	**Maximum Reporting Limit**	**Detection Frequency (%)**	**Exceedance Frequency (%)**	**Location of Highest Detection**
	Sediment Quality Standard (SQS)	Cleanup Screening Level (CSLs)								
n-Propylbenzene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
Bromobenzene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
2-Chlorotoluene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
4-Chlorotoluene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
tert-Butylbenzene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
sec-Butylbenzene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
4-Isopropyltoluene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
n-Butylbenzene	NE	NE	1	NA	NA	1.3 U	1.3 U	0	NA	NA
1,2,4-Trichlorobenzene	NE	NE	1	NA	NA	6.7 U	6.7 U	0	NA	NA
Naphthalene	NE	NE	1	NA	NA	6.7 U	6.7 U	0	NA	NA
1,2,3-Trichlorobenzene	NE	NE	1	NA	NA	6.7 U	6.7 U	0	NA	NA

NE = not established
U = Indicates compound was analyzed for, but was not detected at the given detection limit.
J = Indicates an estimated concentration when the value is less than the calculated reporting limit.
NA = Not applicable or not available
µg/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

(a) SMS Sediment Quality Standard (Chapter 173-204 WAC).

(b) All organic data (except phenols, benzyl alcohol, and benzoic acid) are normalized to total organic carbon; this involves dividing the dry weight concentration of the constituent by the fraction of total organic carbon present.
(c) Where chemical criteria in this table represent the sum of individual compounds or isomers, the following methods shall be applied:

(i) Where chemical analyses identify an undetected value for every individual compound/isomer, then the single highest detection limit shall represent the sum of the respective compounds/isomers.
(ii) Where chemical analyses detect one or more individual compounds/isomers, only the detected concentrations will be added to represent the group sum.
(d) The LPAH criterion represents the sum of the following "low molecular weight polynuclear aromatic hydrocarbon" compounds: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene. The LPAH criterion is not the sum of the criteria values for the individual LPAH compounds listed.
(e) The total benzofluoranthenes criterion represents the sum of the concentrations of the "B," "J," and "K" isomers.
(f) The HPAH criterion represents the sum of the following "high molecular weight polynuclear aromatic hydrocarbon" compounds: fluoranthene, pyrene, benzo(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)perylene. The HPAH criterion is not the sum of the criteria values for the individual HPAH compounds as listed.

APPENDIX D

SIMPLIFIED TERRESTRIAL ECOLOGICAL EVALUATION

Washington State Department of Ecology
Toxics Cleanup Program

Table 749-1

Simplified Terrestrial Ecological Evaluation-Exposure Analysis Procedure

Estimate the area of contiguous (connected) undeveloped land on the site or within 500 feet of any area of the site to the nearest 1/2 acre (1/4 acre if the area is less than 0.5 acre).	
1) From the table below, find the number of points corresponding to the area and enter this number in the field to the right.	
Area (acres) — Points 0.25 or less — 4 0.5 — 5 1.0 — 6 1.5 — 7 2.0 — 8 2.5 — 9 3.0 — 10 3.5 — 11 4.0 or more — 12	4
2) Is this an industrial or commercial property? If yes, enter a score of 3. If no, enter a score of 1	1
3)[a] Enter a score in the box to the right for the habitat quality of the site, using the following rating system[b]. High=1, Intermediate=2, Low=3	3
4) Is the undeveloped land likely to attract wildlife? If yes, enter a score of 1 in the box to the right. If no, enter a score of 2.[c]	2
5) Are there any of the following soil contaminants present: Chlorinated dioxins/furans, PCB mixtures, DDT, DDE, DDD, aldrin, chlordane, dieldrin, endosulfan, endrin, heptachlor, benzene hexachloride, toxaphene, hexachlorobenzene, pentachlorophenol, pentachlorobenzene? If yes, enter a score of 1 in the box to the right. If no, enter a score of 4.	4
6) Add the numbers in the boxes on lines 2-5 and enter this number in the box to the right. If this number is larger than the number in the box on line 1, the simplified evaluation may be ended.	10

Notes for Table 749-1

[a] It is expected that this habitat evaluation will be undertaken by an experienced field biologist. If this is not the case, enter a conservative score of (1) for questions 3 and 4.

[b] **Habitat rating system.** Rate the quality of the habitat as high, intermediate or low based on your professional judgment as a field biologist. The following are suggested factors to consider in making this evaluation:

> **Low:** Early successional vegetative stands; vegetation predominantly noxious, nonnative, exotic plant species or weeds. Areas severely disturbed by human activity, including intensively cultivated croplands. Areas isolated from other habitat used by wildlife.

High: Area is ecologically significant for one or more of the following reasons: Late-successional native plant communities present; relatively high species diversity; used by an uncommon or rare species; priority habitat (as defined by the Washington Department of fish and Wildlife); part of a larger area of habitat where size or fragmentation may be important for the retention of some species.

Intermediate: Area does not rate as either high or low.

[c] Indicate "yes" if the area attracts wildlife or is likely to do so. Examples: Birds frequently visit the area to feed; evidence of high use b mammals (tracks, scat, etc.); habitat "island" in an industrial area; unusual features of an area that make it important for feeding animals; heavy use during seasonal migrations.

[Area Calculation Aid] [Aerial Photo with Area Designations] [TEE Table 749-1] [Index of Tables]

[Exclusions Main] [TEE Definitions] [Simplified or Site-Specific?] [Simplified Ecological Evaluation] [Site-Specific Ecological Evaluation] [WAC 173-340-7493]

[TEE Home]

APPENDIX E

FINAL UPLAND SAMPLING AND ANALYSIS PLAN
REMEDIAL INVESTIGATION AND FEASIBILITY STUDY
EVERETT SHIPYARD

FINAL UPLAND SAMPLING AND ANALYSIS PLAN
EVERETT SHIPYARD
EVERETT, WASHINGTON

Prepared for
Everett Shipyard
URS Project No. 33760902

Prepared by
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1501 4th Avenue, Suite 1400
Seattle, Washington 98101-1616

October 24, 2008

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STANDARD OPERATING PROCEDURE ATTACHMENTS

A.1 INTRODUCTION

ESY, Inc., formerly Everett Shipyard, Inc. (ESY) operated a ship building, maintenance and repair facility at 1016 14th Street in Everett, Washington ("Site") from 1957-2008. The Port of Everett (Port) has owned and/or operated vessel and marine-related services on or adjacent to the Site. The Site covers approximately four acres. It is located west of Marine View Drive and adjacent to the North Marina, which is located within Port Gardner Bay. A marine railway extends into the North Marina from the Site and is used to transport marine vessels onshore.

ESY leases the upland portion of the Site from the Port. On March 31, 2008, ESY sold substantially all of its assets to Everett Ship Repair & Drydock, Inc. (ESRD), a wholly owned subsidiary of Todd Shipyard Corporation. ESRD is in the process of relocating its operations. Previous investigations conducted on the area leased by ESY and in the adjacent North Marina area, identified hazardous substances in soil exceeding potentially applicable cleanup levels (Landau 2003; URS 2007b).

On April 2, 2008, the Washington Department of Ecology (Ecology), ESY (then Everett Shipyard, Inc.) and the Port entered into Agreed Order No.: DE 5271 to conduct a Remedial Investigation/Feasibility Study (RI/FS) per WAC 173-340-350, and to develop a draft Cleanup Action Plan per WAC 173-340-350 through 173-340-380 addressing both potential upland and in-water (i.e., adjacent marine sediment) contamination for the Site (Ecology 2008). The Agreed Order requires the preparation of an RI/FS Work Plan to the further investigation of soil, groundwater and sediment conditions at the Site. This Sampling and Analysis Plan (SAP) has been prepared to guide the investigation which will be performed on the upland portion of the Site to collect the data necessary to support selection of a cleanup action. This SAP is a component of the RI/FS Work Plan.

A.1.1 RATIONALE AND OBJECTIVES

The objective of this SAP is to provide protocols for field sampling and analytical testing to further characterize and delineate the limits of potential impacts to soil and groundwater quality on and adjacent to the site. As described in the RI/FS Work Plan, the available data for the potential constituents of concern (PCOCs) are not sufficient to accurately estimate the lateral and vertical limits of the soil that exceeds the preliminary cleanup levels or to develop a specific cleanup plan.

The SAP and associated Health and Safety Plan (HSP) (see Appendix A of the RI/FS Work Plan) are intended to meet the requirements specified in the Washington Model Toxics Control Act (MTCA) (WAC 173-340-350, 173-340-810, and 173-340-820), and applicable regulatory guidance documents including the RCRA Ground-Water Monitoring Technical Enforcement Guidance Document (U.S. EPA, 1986) and The Guidance on Sampling and Data Analysis Methods (Ecology, 1995). Field methods to be implemented are consistent with standard, generally accepted methods and, where appropriate, other U.S. Environmental Protection Agency (EPA) (1993a, b) and Ecology (1991) guidance documents and standard methods of the American Society for Testing and Materials (ASTM) (1996a, b, c). Quality assurance (QA) and quality control (QC) procedures are described in a separate Quality Assurance Project Plan (QAPP) (see

Appendix G of the RI/FS Work Plan) which will be implemented to ensure that data obtained from the chemical analyses are representative of the field conditions, valid, and accurately reported.

Included as attachments are Standard Operating Procedures (SOPs) provided for easy reference by field personnel. The SOPs are intended to promote the following:

- Consistent field procedures
- Accurate documentation of field observations, sampling procedures, and decontamination procedures
- Collection of representative samples from the site
- Properly calibrated field equipment to obtain accurate field measurements
- Minimization of cross-contamination and the introduction of artificial contaminants
- Information that is accurate and defensible and is of adequate technical quality to meet the objectives of the project.

A.1.2 ORGANIZATION AND RESPONSIBILITY

Qualified URS field personnel will perform the remedial investigations in accordance with the RI/FS Work Plan including this SAP, and associated HSP. The principal field duties of these personnel will include: (a) monitoring the utility locating, concrete coring, and drilling subcontractors and ensuring that any requirements for working within the Site are being followed, (b) making field observations and field parameter measurements, (c) field screening and describing soil samples, (d) specifying modified sampling intervals based on field screening and the criteria in this SAP, (e) groundwater sampling, (f) labeling and submitting samples to the analytical laboratory under chain-of-custody protocols, (g) communicating with the URS Project Manager if any issues arise or significant deviations from the Work Plan are needed, (h) interacting with the Site Field Coordinator, or other personnel at the site, as appropriate, and (i) ensuring compliance with the provisions of the HSP. All field personnel will have the required health and safety training specified in the state and federal regulations as outlined in the HSP. Samples collected during the investigation for chemical analysis will be analyzed for the analytical parameters specified in this plan at Analytical Resources Inc. (ARI) in Tukwila, Washington

A.2 SCOPE OF WORK

A.2.1 SOIL

A.2.1.1 Sample Locations

Proposed sampling locations in the upland area of the Site are shown on Figure 7 of the RI/FS Work Plan. The locations should be considered approximate. Actual locations will be confirmed in the field based on site conditions including locations of underground and overhead utilities.

The objectives of the soil investigation are to better define the nature and extent of the shallow soil contamination previously detected on the southwestern portion of the Site in 2003 and 2007 and to further investigate other areas of the site to determine whether significant releases of hazardous substance occurred in these areas. The sampling program is summarized in Table A-1.

Surface Soil Samples

- Twelve surface soil samples (SS-30 through SS-41) will be collected from the unpaved southwest portion of the Site where abrasive grit is evident to characterize the near surface soil. An effort will be made to co-locate these samples with previous sampling locations if abrasive grit is present at the surface in close proximity with prior sampling locations. Based on field observations and previous analytical results (samples SS-3, SS-4, SS-5), the surface soil in the area investigated in 2007 with borings SS-1 through SS-29 and including the area immediately south of the marine railway is assumed to contain indicator hazardous substances above the cleanup levels and therefore additional investigations to define the lateral extent these substances in the surface soil within the previously investigated area is not planned. Additional surface soil samples will be collected to verify that concentrations of metals located at the edge of the undocumented cleanup are below MTCA cleanup levels (SS-39 through 41).

Direct Push/Hollow-Stem Auger Borings

- Four borings (borings SB-1, SB-2, SB-29, and 30) in the area east of the wood shop to assess the effectiveness of the reported soil cleanup in this area in the late 1980s;
- Six borings (borings SB-13, SB-14, SB-15, MW-4, MW-5, MW-6) near the western and southern boundaries of the Site to assess the lateral extent of metals and petroleum hydrocarbons previously detected at borings SS-1, SS-2, SS-5, SS-13, and SS-25;
- Four borings (borings SB-3, SB-4, SB-5 and MW-7) west and southwest of the Everett Engineering buildings to assess the lateral extent of metals detected in previous borings SS-8 and SS-12 and areas that appear to have been used for vessel maintenance activities, including abrasive blasting;
- Four borings (borings SB-6 through SB-9) in the interior of the Everett Engineering buildings where oil staining was observed on the floors near floor penetrations that may provide pathways to the subsurface;
- One boring (boring SB-10) southwest of the steam box to assess the stained soil in this area;
- One boring (boring MW-8) located west of the Everett Engineering Machine Shop near an area of stained soil;
- Five borings (borings SB-11, SB-12, SB-16, SB-17 and MW-9) to the east, northeast and southeast of the weld shop to assess potential releases from historic operations in these areas;
- Three borings inside the weld shop (borings SB-18, SB-19, and SB-20) to assess potential releases from weld shop operations and historic operations in these areas prior to the structural additions to the weld shop;

- Two borings (borings SB-21 and SB-22) to the west and northwest of the weld shop to assess potential releases from historic operations in these areas;
- Three borings (borings SB-23, SB-24 and SB-25) at the approximate locations of previous borings SS-2, SS-5 and SS-22 where elevated levels of petroleum hydrocarbons were previously detected to assess whether other hazardous substances (i.e., SVOCs and PCBs) are contained within these affected soils;
- One boring in the vicinity of the marine railway (boring SB-26) to assess potential releases from historic operations in this area;
- Two borings (SB-27 and SB-28) located along the north edge of the leasehold to investigate potential releases associated with historic operations in this area (e.g., historic boat shed and the office);
- Three borings (SB-31, SB-40 and SB-41) located south and southeast of Building 9 within the area formerly used by Everett Shipyard prior to construction of the Fish Processing Building to investigate potential contamination associated with historic operations in this area;
- One boring (SB-32) along the south edge of the leasehold to investigate the lateral extent of potential contamination in this area;
- Two borings (SB-33 and SB-34) along the west edge of the leasehold to investigate the lateral extent of potential contamination in this area and in the vicinity of the marine railway;
- Five borings (SB-35 to SB-39) to investigate potential contamination that may have come to be located between the west edge of the leasehold and the bulkhead as a result of site activities; and,
- One boring (SB-42) adjacent to the former Net Shed Building (outside of the current and historic leasehold boundaries and reported Everett Shipyard operations) to investigate potential contamination that may have come to be located be in this area.

Sample Depth Intervals

Surface soil samples (samples SS-30 through SS-41) will be collected at depths of 0.0 to 0.5 feet bgs.

Samples collected from direct-push or hollow-stem auger borings will be collected at the following approximate depth intervals in unpaved areas:

- 0.0 to 0.5 feet bgs
- 1.0 to 2.0 feet bgs
- 2.0 to 3.0 feet bgs
- 4.0 to 5.0 feet bgs (soil borings SB-1, SB-2, SB-7, SB-8, SB-9 and SB-19 only)

If asphalt or concrete pavement is present at the sampling location, then the samples depths will be modified so that the first sample is collected directly beneath the pavement and underlying base course and the samples depths for deeper samples will be adjusted downward consistent with the intervals specified above.

Soil samples will also be collected and analyzed at other depth intervals if field screening (e.g., visual observations such as staining or the presence of abrasive grit, olfactory evidence or elevated PID readings) indicates that other intervals would provide useful information. This includes drilling deeper and collecting samples at depth greater than 3.0 feet bgs if field screening indicates that hazardous substances may be present.

Where necessary to obtain sufficient sample volume for the specified interval, a second boring may be drilled adjacent to the initial boring.

A.2.1.2 Analyses

The soil sampling analyses are presented in Table A-1.

Surface soil samples will be analyzed for petroleum hydrocarbons, metals and carcinogenic PAHs (cPAHs) for all surface samples, and organotins, PCBs, and SVOCs for two selected samples.

The shallow sample in each boring will be analyzed for diesel- and oil-range petroleum hydrocarbons, cPAHs, and/or metals (Table A-1). If petroleum hydrocarbons, cPAHs or metals are detected above the preliminary cleanup levels in the shallow sample, then within the allowable soil sample holding time the next deeper sample will be analyzed for the compounds/analytes that exceeded the preliminary cleanup level.

Samples from borings SB-1, SB-2, SB-29 and SB-30 will be analyzed to confirm the effectiveness of the reported but undocumented soil cleanup in this area. One sample from each boring will be collected from the apparent backfill material and a second sample from each boring will also be collected from the base of the cleanup excavation and analyzed for petroleum hydrocarbons, cPAHs, metals, SVOCs and organotins.

Approximately 10 additional samples collected from the borings with the highest petroleum hydrocarbon concentrations will also be analyzed for PCBs and SVOCs to assess whether these constituents are present at elevated levels in Site soils.

Approximately 10 additional samples collected from soil borings that show evidence of abrasive grit in the shallow or intermediate depth samples will also be analyzed for organotins to assess the extent of organotins.

Soil samples will be screened in the field with a PID using standard the field screening procedures (see Attachment A-3). If elevated PID readings are measured, soil samples will also be submitted for VOC analyses. If no elevated PID readings are measured, a minimum of eight soil samples will be analyzed for VOCs. The samples selected for analysis will be either stained soil samples or samples collected directly above the water table in areas where solvents may have been used or stored. Deeper samples may also be analyzed for petroleum hydrocarbons and/or metals based on field screening (e.g., staining or odor for petroleum hydrocarbons; abrasive grit for metals).

Specific analytes, analytical methods and detection limits are outlined in the QAPP (see Appendix G of the RI/FS Work Plan).

A.2.2 ACCUMULATED SOLIDS IN CATCH BASINS

The catch basins on the Site will be visually inspected to confirm their location and the volume of accumulated solids will be estimated by removing grates and visual inspection. If a significant accumulation of sediment is evident, the thickness will be estimated by using a wooden or steel probe to identify the bottom of the catch basin. Observations and measurements (e.g., catch basin dimension and thickness of accumulated solids) will be recorded on the daily field log described in Attachment A-5. No additional sampling and analysis of the accumulated solids within the catch basins is recommended. Sampling and analysis of these materials should be completed during the cleanup action for disposal characterization. The connection of the existing catch basins to outfalls that discharge into the North Marina will be confirmed through dye testing.

A.2.3 GROUNDWATER

A.2.3.1 Sample Locations

The objectives of the groundwater investigation are to further assess whether groundwater beneath the Site has been impacted by site operations and to confirm the direction of groundwater flow. The groundwater sampling program is summarized in Table A-2. To accomplish these objectives, new groundwater monitoring wells will be installed, groundwater sampling will be conducted and water level elevations will be measured. The following scope of work is proposed:

- Samples of existing wells MW-1 and MW-2 located on the west side of the Site (i.e., downgradient of the weld shop and the wood shop);
- Attempt to locate well MW-3, determine the condition of the well and sample the well if a representative groundwater sample can be collected, otherwise the well will be decommissioned in accordance with WAC 173-160 if it can be located;
- Installation of three new wells (wells MW-4, MW-5 and MW-6) adjacent to the west (i.e., downgradient) of the areas where elevated levels of petroleum hydrocarbons and metals were detected in soil during the 2007 soil investigation;
- Installation of two new wells (wells MW-7 and MW-8) located downgradient of the Everett Engineering buildings to assess potential impacts related to operations within these buildings and historic operations prior to building construction; and
- Installation of two upgradient wells (wells MW-9 and MW-10) located along the eastern property boundary to provide additional water level data and upgradient groundwater water quality.

To assess the potential presence of localized areas of groundwater impacts, shallow groundwater samples and deep subsurface (4-5 ft bgs) soil samples would also be collected from direct push soil borings at the following locations:

- Borings SB-1 and SB-2 located east of the wood shop to assess groundwater conditions beneath the area that was reportedly cleaned up in the late 1980s;
- Borings SB-7, SB-8, SB-9 within the Everett Engineering buildings to asses groundwater quality near floor penetrations where staining was evident on the building floor and to assess potential impacts related to historic operations prior to building construction.
- Boring SB-19 located in the eastern portion of the weld shop to assess potential releases from the weld shop and historic operations in this area prior to construction of the eastern addition to the weld shop.

A.2.3.2 Analyses

Samples from the monitoring wells will be analyzed for diesel- and oil-range petroleum hydrocarbons, PCB, SVOCs (including PAHs), VOCs, organotins, and total and dissolved metals. The wells will be sampled twice: once following installation and then again in approximately three months. The timing of the sampling events will be selected to correspond with a period following low tide so that the samples will be representative of Site conditions. Water levels in all the wells will be measured before and after the sampling (i.e., at the beginning and end of the sampling event) to assess the degree of water level fluctuation in response to tidal fluctuations. The need for additional monitoring events would be evaluated based on the results of these two rounds of sampling.

Groundwater samples from the borings will be analyzed for petroleum hydrocarbons and dissolved metals. Two samples collected from inside existing buildings (SB-7 and SB-19) will be analyzed for VOCs. If elevated PID readings are detected in headspace reading for soil samples collected from the other borings, the groundwater samples would also be analyzed for VOCs. If elevated levels of petroleum hydrocarbons or dissolved metals are detected in the boring samples, monitoring wells may be installed at these locations during a subsequent phase of investigation and analyses for additional PCOCs may be performed, if warranted.

Specific analytes, analytical methods and detection limits are outlined in the QAPP (see Appendix G of the RI/FS Work Plan).

A.2.4 SCHEDULE AND REPORTING

The results of field measurements and laboratory analyses will be documented in the RI/FS Report as described in the RI/FS Work Plan. The report will include a map showing the locations of soil borings, a tabular summary of analytical results and pertinent field measurements, geologic logs of soil borings, COC forms, and laboratory analytical reports including appropriate quality assurance reports. The report will be submitted to Ecology in accordance with the schedule in the RI/FS Work Plan.

A.3 STANDARD OPERATING PROCEDURES

A.3.1 SOIL INVESTIGATION PROCEDURES

Presented in the following sections are the methods that will be used to collect soil samples. Multiple methods may be used based on field conditions, location, density of the soils, desired sampling depth, and access.

Prior to the investigation utility drawings will be reviewed as available. The Utility Notification Center will be notified to identify utilities coming onto and within the property. A private utility locating contractor will be contracted to conduct a buried utility survey and clear the proposed sampling locations.

All non-dedicated sampling equipment will be decontaminated between samples using the SOP for decontamination (Attachment A-1).

A.3.1.1 SURFACE SOIL SAMPLING

Surface soils will be collected using dedicated high-density polyethylene (HDPE) disposable scoops and new nitrile gloves. If the ground surface is too indurated to collect an adequate sample it will first be loosened with a pick, shovel of similar hand tool. These tools will be decontaminated between sample locations in accordance with the SOP described in Attachment A-1. Once a sufficient amount of material has been collected, the soil will be homogenized, field screened, logged, and placed into laboratory provided sample containers in accordance with the SOP described in Attachment A-3.

A.3.1.2 DIRECT PUSH

This method will be used for shallow sample locations where a hand auger can not sufficiently penetrate and deeper locations and in areas where groundwater samples will be collected with the direct push sampling equipment. The method can collect a nearly continuous core of soil form the surface to the bottom of the boring. A stainless steel sampling rod is driven into the soil with a vehicle-mounted hydraulic ram and/or percussion hammer attached to a vehicle. The hammer and static weight of the vehicle are used to drive a small-diameter (1- to 2-inch outer diameter) rod with a soil sample tube at its end into the soil. Upon reaching the desired sample depth the rod is withdrawn and the sample removed from the rod within an acrylic sample sleeve. The sleeve is then cut open allowing immediate access to the sampled soil material. To continue the boring the sample rod is decontaminated, a new acrylic sample sleeve is inserted, and the rod is retuned to the hole and driven down an additional four feet.

A.3.1.3 HOLLOW STEM AUGER DRILLING

Deep soil borings through unconsolidated material can be advanced using a truck-mounted rig equipped with hollow stem auger (HSA) equipment. The HSA consists of approximately 4- to 6-inch-inner-diameter pipe with auger flights attached to the outside of the pipe. The outside diameter of the HSA for soil borings will be approximately 7 to 8 inches. A cutting bit is attached to the tip of the lead auger. During drilling the hydraulic system on the drill rig is used to apply downward pressure to the rotating auger. Soil cuttings are transported to the ground surface by the action of the auger flights. A plug or lead bit attached to rods is typically placed within the HSA to prevent cuttings from entering the interior of the HSA. When the desired sampling depth is achieved the interior plug/bit is removed to allow soil sampling and soil samples from HSA-advanced borings will be collected with a split spoon sampler attached to a sampling rod and lowered through the auger string to the bottom of the borehole. The sampler is driven into soil with a 140-pound weight dropped through a 30-inch interval. When the split spoon is brought to the surface, it is disassembled and the core removed. Additional details on hollow stem auger drilling are provided by ASTM D5784-95.

A.3.1.4 BOREHOLE ABANDONMENT

Boreholes not completed as monitoring wells will be filled with a hydrated bentonite borehole sealing product, bentonite grout, or neat cement-bentonite mixture and the surface sealed with concrete in accordance with WAC 173-160-010. Approximately one cubic yard of the cement-bentonite mix shall consist of the following:

- 16½ sacks of Class A Portland cement (94 lb. Sacks)
- $^{1}/_{5}$ to 1 sack of sodium bentonite (50 lb. Sack)
- 139 gallons of water

The sealing material shall be placed in drilled boreholes using a tremie pipe, or slowly hand poured down the drill casing or hollow stem auger as it is removed. Hand-augered borings and probe borings will be sealed by pouring sealing material into each the open borehole.

Boreholes drilled through concrete slabs shall be filled to between 6 and 12 inches below the base of the slab. Sand shall be placed at 6-inch to 12-inch intervals at the base of the slab, then the final seal of concrete of the appropriate strength for the current operations in the area. The borehole abandonment method approximate amount of grout material sued will be recorded on the boring log.

A.3.1.5 SOIL SAMPLE COLLECTION

All soil sampling procedures and observations will be recorded in the field log notebook or the Field Report Form including sampling techniques employed, sampling equipment used, decontamination procedures utilized, calibration of measuring and test equipment, preservatives added, and methods utilized. The sample Chain of Custody (COC) forms will have the unique identification numbers, dates and times of collection, and sample depths.

Appropriate soil sampling procedures will be followed at all times to ensure that representative soil samples are provided for analysis, and that the act of sampling does not contribute to potential contaminant migration or cross-contamination at a site. All techniques employed will be thoroughly documented to ensure the defensibility of the data.

Soil sampling will be performed in accordance with Method II-I from Characterization of Hazardous Waste Sites - A Methods Manual: Volume II, Available Sampling Methods, 2nd Edition (EPA-600/4-84-076):

1. Collect adequate volume of sample to completely fill the sample container indicated in Table A-1. Where necessary to obtain sufficient sample volume for the specified interval, a second boring may be drilled adjacent to the initial boring.
2. Samples for volatile organic compounds (VOCs) will be collected using a new laboratory-provided sampling tool compliant with EPA Method 5035A.
3. Once a sufficient amount of material has been collected for VOC analysis, place the remaining soil in a decontaminated stainless steel bucket or bowl.
4. Thoroughly homogenize the soil using a mechanical mixer such as a portable drill with paint stirrer until the sediment color and texture are as uniform as possible.
5. Transfer the homogenized soil to containers appropriate for the remaining analyses by hand with new nitrile gloves and placed into 4 or 8 ounce borosilicate jars.
6. Remove and properly store contaminated personal protective clothing (e.g., latex gloves), as required for disposal.
7. After collection, label the sample, enter it in the field log book and fill out the sample COC form.
8. Place sample in cooler chilled to <4ºC with double-bagged ice and prepare for packing.

Outlined below are the SOPs (attached) applicable to soil sampling:

Decontamination. To reduce the potential for introduction of artificial contamination and/or cross-contamination between discrete samples within a boring or between borings, field equipment used during sampling will be decontaminated prior to use at each sampling location and during sampling. Drilling and sampling equipment will be decontaminated by the procedure for decontamination (Attachment A-1).

Equipment calibration. To obtain reliable and accurate data from the use of field screening instruments, these instruments will be calibrated as described by the procedures for equipment calibration (Attachment A-2). The types of field instruments that will be used include an organic vapor monitor (OVM) equipped with a photoionization detector (PID).

Field documentation. Accurate documentation of field procedures will be guided by the procedure for field documentation (Attachment A-3). A detailed log of the soil materials encountered, field screening data, and pertinent sampling and drilling details will be prepared in the field by the field personnel. A daily field report will also be prepared which summarizes the daily activities. Sample collection data and requested analyses will be recorded on COC forms.

Sample collection and field screening. Soil samples for chemical analysis will be collected, field screened, and handled per the procedures for soil sampling (Attachment A-3). Soils retrieved as cuttings and discrete samples will be visually examined for evidence of PCOCs and classified in accordance with the Unified Soil Classification System (ASTM D 2487-93). All soil samples will be visually assessed and field screened for organic vapors with a PID. In addition to olfactory and visual screening, sheen tests will be conducted when there is visual/olfactory evidence of contamination, or when air monitoring indicates clear evidence of contamination.

Field Duplicate Samples. At least one duplicate soil sample will be collected, after which one duplicate will be collected for every 20 samples collected.

A.3.1.6 SELECTION OF SOIL SAMPLING DEPTHS

Target sample depths are specified Table A-1. If necessary to assess the vertical extent of soil with visual (e.g., anomalous staining or soil moisture) or field measured (e.g., elevated organic vapors) evidence of PCOCs, borehole completion depths and the number of samples within them may be increased. Borings and test pits will be extended either into native soils that are absent of field evidence of contamination or until refusal. Field personnel may determine that other sampling requirements are necessary based upon encountering unexpected conditions. Such conditions will be discussed with the Project Manager.

A.3.1.7 SELECTION OF SOIL SAMPLES FOR LABORATORY ANALYSIS

Criteria for the selection of the depth and number of samples for chemical analysis are outlined in the Table A-1 Prior to specifying which samples will be analyzed, field personnel will discuss the field observations in each of the borings in the area with the URS Project Manager who will confirm the appropriate sample selection.

QA/QC samples will include trip blanks and duplicates. Where dedicated sampling equipment is not used, equipment rinsate blanks will also be collected. Frequency and method for QA/QC sample collection is discussed in QAPP (see Appendix G of the RI/FS Work Plan).

A.3.1.8 CHEMICAL ANALYTICAL METHODS FOR SOIL SAMPLES

Chemical testing will be performed at the ARI in Tukwila, Washington, for one or more of the chemical analyses presented in Table A-1. Analytical methods used to analyze soil samples are identified in Table A-3 and in the QAPP (see Appendix G of the RI/FS Work Plan). QA/QC samples will include trip blanks and duplicates. Where dedicated sampling equipment is not used, equipment rinsate blanks will also be collected. Frequency and method for QA/QC sample collection is discussed in QAPP (see Appendix G of the RI/FS Work Plan).

A.3.2 GROUNDWATER INVESTIGATION PROCEDURES

A.3.2.1 DIRECT PUSH PROBE GRAB SAMPLE

This groundwater sampling technique uses the same rig described in Section A.3.1.2, in which a stainless steel sampling probe is driven into the ground with a vehicle-mounted hydraulic ram and/or percussion hammer. A four-foot long stainless steel sintered screen is placed within the sample rod and driven to the desired depth at which the rod is withdrawn and the screen exposed. A groundwater sample is extracted using a disposable HDPE tube running from the screen to a peristaltic pump ate the surface. Groundwater is purged from the sample screen until the water either runs clear or no significant improvement in water clarity is achieved.

A.3.2.2 GROUNDWATER MONITORING WELL CONSTRUCTION AND DEVELOPMENT

Groundwater monitoring wells will be constructed within boreholes using hollow-stem augers in accordance with applicable regulations and guidelines. Wells will be constructed of 2-inch Schedule-40-PVC casing with threaded couplings with an end plug placed at the bottom of the casing. Groundwater has been encountered at approximately 3.5 to 5.0 feet bgs at the Site and monitoring wells will be screened between 2.5 and 12.5 feet bgs with 0.010-inch mill-slotted PVC well screen to intercept the water table. In accordance with Washington state requirements for sealing a resource protection well (WAC 173-160-450), the annular space of each well will be backfilled with No. 10-20 Colorado silica sand or equivalent to approximately one foot above the top of the well screen, or about 1.5 feet bgs.. The upper 1.5 feet of the annular well space will consist of a concrete seal (in accordance with WAC 173-160-450(4)(b)(iii)). A steel, flush-mount, traffic grade, watertight monument will be anchored within the concrete seal.

Each groundwater well will be developed to remove fine-grained materials from within and around the sand pack by pumping and surging with a positive displacement pump, stainless-steel or PVC bailer, surge block, centrifugal or positive-displacement bladder pump, or combination of these technologies. The well will be alternately surged and overpumped until the discharge water is clear of fine materials (fines) or a minimum of 10 well casing volumes have been removed. Water quality parameters (pH, temperature, specific conductance, and turbidity) will be monitored periodically during development. Development water will be managed as Investigation Derived Waste (Section A.4).

A.3.2.3 GROUNDWATER SAMPLING METHODS

At least 24 hours after development, groundwater will be monitored by URS field personnel in the newly constructed wells in accordance with the procedure for groundwater sampling (Attachment A-4). The depth to water in each well will be gauged before groundwater samples are collected. The wells will be purged and sampled using low flow sampling procedures. As wells are purged, groundwater will be monitored for temperature, pH, conductivity, dissolved oxygen, and turbidity using an electric water quality monitor (or equivalent). Groundwater samples will be collected once these parameters have stabilized reflecting ambient groundwater has been drawn into the well. Groundwater will then be collected into appropriate containers, labeled, and placed in a cooler on ice at 4ºC for transport to ARI in Tukwila, Washington, under a COC form. Samples for dissolved metals analyses will be filtered with a new 0.45 micron filter placed on the sample hose (per Attachment A-4). At least one duplicate sample will be collected, after which one duplicate will be collected for every 20 samples collected.

A.3.2.4 CHEMICAL ANALYTICAL METHODS FOR GROUNDWATER SAMPLES

Chemical testing will be performed at the ARI in Tukwila, Washington, for one or more of the chemical analyses presented in Table A-2. Analytical methods used to analyze groundwater samples are identified in Table A-4 and in the QAPP (see Appendix G of the RI/FS Work Plan). QA/QC samples will include trip blanks and duplicates. Where dedicated sampling equipment is not used, equipment rinsate blanks will also be collected. Frequency and method for QA/QC sample collection is discussed in QAPP (see Appendix G of the RI/FS Work Plan).

A.3.3 SAMPLE LABEL DESIGNATIONS

A.3.3.1 SOIL SAMPLES

Each soil sample will be labeled with the sample type (SS- for surface sample or hand auger boring and SB- for direct-push or hollow-stem auger soil borings), station number, and depth below the ground surface (bgs). For example, SB-3-2.5-4.0 would be a sample collected at a depth of 2.5 to 4.0 feet below ground surface from boring SB-3.

A.3.3.2 GROUNDWATER SAMPLES

Each groundwater sample will be labeled with the boring (SB-) or monitoring well (MW-) number and the date. For example, sample MW-4-071908 would be a sample from Well 4 collected on July 19, 2008.

A.3.3.3 QA/QC SAMPLE NUMBERS

Field duplicate samples will be not be identified in the sample label to ensure unbiased analysis by the laboratory, but will be clearly identified in the field log.

Trip blank samples will be designated with "TB" followed by the day of sample shipment. For example, a trip blank accompanying samples shipped on August 10, 1998 would be labeled: TB-081098. If more than one trip blank is submitted on the same day then these samples will be labeled in sequences as follows: TB1-081097, TB2-081079, etc.

A.3.4 SAMPLE CONTAINERS, PRESERVATION, STORAGE, AND HOLDING TIMES

The types of sample containers that will be used to store and ship samples are based on the analytical plan requirements. Tables A-3 and A-4 list the type of analysis, sample preservation, storage, and holding time requirements that will govern the handling of each sample. ARI will provide clean sample bottles for all samples.

A.3.5 SAMPLE HANDLING, SHIPPING, AND LABORATORY RECEIPT

A.3.5.1 CHAIN OF CUSTODY

COC forms identifying analytical requests will be maintained separately from all other documentation. This form will be completed by the sample collector before releasing the cooler containing the samples for transportation. The COC form will be routed with the samples through transportation and analysis requests. A copy of the COC form completed by the field team will be submitted to the QA/QC Manager, and COC forms will be retained in the master job file.

A.3.5.2 TRANSPORTATION

Shipping dates and method of shipment will be recorded on the field report form and on the COC forms. Transport containers will be coolers chilled with ice, sealed with signed custody seals. COC forms will be placed in a plastic bag and taped to the inside of the cooler lid. If shipped by courier (e.g., FedEx or UPS), a copy of the shipping receipt if transported via courier and COC will be submitted to the URS Project Manager and will be retained in the master job file.

A.3.5.3 LABORATORY RECEIPT AND ANALYTICAL REQUESTS

When a batch of samples arrive at the laboratory, the personnel receiving the sample cooler will sign the COC form and enter a laboratory number for the sample batch on the form. In addition, laboratory identification numbers are assigned to each sample and used by the laboratory for internal tracking of the samples. Samples will be assigned to particular analytical procedures either on the COC or on a sample analysis request form which may be submitted to the laboratory separate from the samples following review of the field data. The analytical methods which will be used are listed in Tables A-3 and A-4. Both the laboratory batch number and sample numbers assigned in the field will be cited when analyses are requested. The laboratory will sign the COC and laboratory request forms and send a carbon copy to the URS Project Manager for placement in the master job file. Analysis request forms transmitted by facsimile will be followed by hard copies sent via U.S. mail.

Damaged sample containers, sample labeling discrepancies between sample container labels and COC forms, and analytical request discrepancies will be noted on the COC form, and the QA/QC Manager will be notified for problem identification and resolution.

A.4 INVESTIGATIVE DERIVED WASTES (IDW)

The environmental investigation work will generate soil cuttings, rock chips, decontamination fluids, and monitoring well development and purge waters. This material will be stored in clean labeled, 55-gallon drums at a designated location on the Site until analytical results have been received allowing the IDW to be profiled for disposal. It is anticipated that all IDW will be disposed of offsite at a permitted disposal facility following waste profiling.

Uncontaminated disposable personal protective equipment (PPE) will consist primarily of nitrile gloves at a rate of three to eight pairs per day per person. Miscellaneous solid wastes consist of paper, plastic wrappers, aluminum cans, and other miscellaneous types of debris. Total volume is expected to be one large plastic bag per day, which will be disposed of in municipal waste containers at the plant. Highly contaminated PPE, if generated, will be managed as a dangerous waste, if appropriate.

A.5 REFERENCES

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STANDARD OPERATING PROCEDURES

(SOPs)

ATTACHMENT A-1
PROCEDURE FOR DECONTAMINATION

OVERVIEW

The purpose of this procedure is to ensure that all non-dedicated sampling, field screening, and water filtering equipment that contacts the sample material is clean and does not cause cross contamination between samples.

MOBILIZATION

Assemble the appropriate equipment.

- Alconox detergent (or equivalent)
- Potable water
- De-ionized water
- Three 5-gallon or larger buckets
- Two brushes
- 5-gallon garden sprayer
- Plastic sheeting
- Sealing plastic bags

Drilling contractor provided equipment

- Steam cleaner
- Visqueen plastic
- Containment for steam cleaning water and removed soil

DECONTAMINATION

1) Drilling and well installation equipment:

- Set up a decontamination station at the location(s) designated by client.
- Verify that the drilling contractor has required equipment at the designated decontamination area and *thoroughly* cleans the equipment (inside and outside) with a high-pressure steam cleaning unit (water at 200 °F and 1500 psi) prior to use at each boring/well location. All augers, drill steel, and drill casing should be decontaminated prior to use in each boring. Cleaned equipment should be placed on a visqueen covered surface following decontamination. Samplers can also be steamed clean in lieu of the decontamination procedure outlined below.
- Verify proper containment of water and soils generated by steam cleaning.
- Document decontamination procedures in the daily field report.

2) Sampling equipment during sampling:

- Rinse thoroughly with potable water.
- Scrub with Alconox/water wash to remove any visible dirt.
- Rinse with potable water.
- Double-rinse with deionized water.
- Replace wash and rinse water prior to sampling near each SWMU/AOC, or more often if warranted.
- Store in a clean area on visqueen plastic sheeting during sampling.
- Wrap in plastic for storage unless equipment will be used immediately.
- Document decontamination procedures in the daily field report.

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ATTACHMENT A-2
PROCEDURE FOR FIELD INSTRUMENT CALIBRATION

OVERVIEW

The purpose of instrument calibration is to ensure that the instruments used for field screening and field measurements are functioning correctly and accurately. Verify that the instrument case contains the operations manuals supplied by the manufacturer and see the calibration procedures in the operations manuals for calibration and for troubleshooting procedures. A summary of the general calibration procedures for various instruments is provided below. Manufacturer's specific procedures should be followed if these differ from the general procedure outlined below.

Note: Verify that the instrument is charged and running correctly before going out in the field. Recharge instruments with rechargeable batteries every night. Check instruments with replaceable batteries and replace batteries if necessary. **Make sure there is an extra charged battery and set of replaceable batteries each day the equipment is used.**

CALIBRATION PROCEDURES

1) pH Meter

- Turn on the instrument and allow to warm.
- Determine and record the temperature of each buffered solution.
- Place the probe in the pH 7.0 buffer solution and set the temperature-adjust knob to the temperature of the buffer solution.
- Adjust the unit output to 7.0 using the zero control.
- Rinse the probe with deionized water and place the probe in the pH 4.0 buffer solution.
- Adjust the unit output using the slope control.
- Verify the slope is adjusted correctly by rinsing the probe with deionized water and placing the probe in the pH 10.0 buffer solution.
- Store the probe in pH 4.0 solution when not in use.
- Record all readings in the daily field report.

Frequency. Conduct pH meter calibration at the beginning of each day. Periodically throughout the day, make one-point calibration checks using the pH 7.0 buffer solution. If the check indicates that the calibration has changed, repeat the two-point calibration and record results in the daily field report.

2) Conductivity Meter

- Turn on the instrument and allow to warm.
- Set the adjust knob to zero.
- Place the probe in the calibration solution.
- Adjust the unit output to the conductivity of the calibration solution using the calibration control knob.
- Record all readings on the field report form.

Frequency. Conduct conductivity meter calibration at the beginning of each day and record all readings on the field report form. Make calibration checks periodically throughout each day and record all readings in daily field report.

3) Water-Level Indicator and Immiscible Product Interface Probes

- Turn on the switch to “on”.
- Lower the probe into a bucket of water and verify the audible indicator for water goes on when the probe enters the water.
- In order to check whether an interface probe is detecting non-aqueous phase fluids (e.g., LNAPL or DNAPL), lower the probe into a bucket of water with a thin layer of oil added to it to verify the audible indicator for LNAPL goes on when the probe enters the oil. An alternative method is to test the probe in an oil/water separator with visible oil or another container containing hydrocarbons, if available.

<u>Frequency</u> Check water level indicator/interface probe at the beginning of each day and document this in daily field report.

4) Photoionization Detector (PID)

The PID will be calibrated according to the manufacturer's procedures. " Zero air" and "span gases" are used to calibrate the instruments. The zero air is introduced to the PID in order to determine the "background" signal. The concentration of the span gas is then selected and introduced to the instruments. The instrument makes all of the necessary calculations to arrive at a "calibration constant". The manufacturer's manual will be located in the instrument carrying case for reference for calibration and troubleshooting procedures.

<u>Frequency</u> Conduct meter calibration at the beginning of each day and periodically throughout each day or more frequently when apparent anomalous readings are obtained. Record all readings in the daily field report and on the calibration form in the project health and safety plan.

5) Dissolved Oxygen Meter

- Turn the meter on and place the probe in water.
- Expose the probe to air.
- Turn the calibration knob until the display reads 20.9% oxygen. This is the average composition of clean air.
- Record the calibration readings in the daily field report.

<u>Frequency</u> Calibrate at the beginning of each day and during the day as appropriate if potentially anomalous reading are obtained. Record all readings in the daily field report form.

6) Oxidation-Reduction Potential Meter

- Turn the meter on, place the probe in the calibration fluid, and check the reading to confirm it is within the calibration range.
- Record the calibration reading in the daily field report.

ATTACHMENT A-3
PROCEDURE FOR SOIL SAMPLING

OVERVIEW

The purpose of the procedures for collecting soil samples is to ensure that the samples are representative of the physical and chemical conditions encountered in each boring. Selected samples will be tested and analyzed to: (1) evaluate the presence and, if present, nature and extent of dangerous constituents in soil and (2) determine the hydrologic and other physical properties of soils encountered. Therefore, it is important to obtain undisturbed samples, if feasible. In addition, the samples shall be collected in a manner that does not cause cross-contamination of samples.

MOBILIZATION

Review the SAP, QAPP, and HSP and work plan. Coordinate each sampling event with the Site contact. Perform utility drawings review and arrange underground utility survey. Notify the laboratory of sample collection and delivery dates. Verify containers received from laboratory and preservations are appropriate relative to analytical methods as outlined in Tables A-1 and A-2 in the project SAP. Arrange for concrete coring, if needed, and drilling/hydraulic probing contractor. Assemble appropriate equipment as follows:

- Decontamination Equipment per Attachment A-1
- Field copies of the workplan, including the SAP, QAPP, and HSP
- Dames & Moore U-type or equivalent split spoon sampler, hand auger and core sampler, and associated equipment
- 3-inch or 6-inch long thin-walled stainless steel sleeves, plastic end caps, pre-cut Teflon end sheets, and duct tape; and/or laboratory provided, glass sample jars
- Photoionization detector (PID) or organic vapor analyzer (OVA) and calibration gases
- pH meter and calibration fluids (if applicable)
- Tape measure and water level indicator
- Sample labels and field forms (geologic boring logs, daily field report, chain of custody, etc. as outlined in Attachment A-3)
- Insulated cooler, ice, packing material, duct tape, sealing plastic bags, sample custody seals
- Personal protection equipment per the HSP

Decontamination and Field Instrument Calibration

See procedures for decontamination (Attachment A-1) and field equipment calibration (Attachment A-2). Calibrate field equipment prior to initiating drilling and sampling and decontaminate sampling equipment as required. Record calibration data in the daily field report.

SAMPLE COLLECTION

- Check the Work Plan to determine the sampling interval and methodology to be used at each area.
- Prior to collecting each soil sample, screen for the presence of organic vapors at the top of the open borehole, auger flight, or drill/probe casing using the PID/OVA and record the highest and sustained measurements on the geologic log (Attachment A-5B). The cuttings and worker's breathing zone will also be screened for organic vapors a minimum of once for every 5 feet drilled.

- For samples collected during drilling, count and record the number of blows per six inch increment of sampler driven (applicable for HSA and rotary drilling techniques). The number of blow counts during the *last 12 inches* of sampling indicate the density of the material.
- Record the recovered length of the sample. Open the split barrel or extrude the sample as appropriate and screen for organic vapors with the PID/OVA. Record reading on the geologic log. Collect samples as outlined below.

Samples for Volatile Organic Compounds (VOCs) – Place sample material for analysis of VOCs into laboratory provided glassware as soon as possible and before otherwise disturbing the sample material.

Homogenization – If a disturbed sample is to be collected, first place sample material in a new or decontaminated container (e.g., stainless steel bowl) and completely homogenize using a new or decontaminated tool (e.g., stainless steel spoon or spatula). Then place the soil in the appropriate sample jar with a clean tool. Pack the jar as tightly as feasible to minimize headspace in the jar. Label each sample as outlined above and place the sample in a cooler containing ice.

Field Screening Sample – Place remaining soil not saved in a sealed plastic bag labeled with the borehole number and depth of sample. After allowing the sample to volatilize for at least 5 minutes, insert the PID probe into the bag, obtain a headspace reading for volatile organics, and record the reading on the geologic log. Retain samples until the completion of the borehole drilling to allow geologic correlation purposes.

GEOLOGIC LOGGING

Describe the following soil characteristics of each sample using the Unified Soil Classification System (USCS, ASTM D 2488-84) on the geologic log (Attachment A-3B). **Note**: Use of the following order facilitates preparation of the final computer generated log:

- Soil group symbol (e.g., SM, SP, etc.)
- Color (per Munsell color chart)
- Group name (e.g., silty sands, poorly-graded sand, etc.)
- Particle size range (e.g., fine to medium)
- Moisture content (dry, moist, wet)
- Density (based on blows required to drive sampler) of granular soils or stiffness of clays
- Plasticity of fines
- Texture or structure (e.g., laminated)
- Geologic name (e.g., fill, glacial till, etc.).
- Staining, odor, or other evidence of dangerous constituents (if appropriate).
- Additional pertinent comments.

For example: SM, Dark Gray, Silty Fine Sand with trace of fine gravel (moist) (very dense) (glacial till) (discontinuous orange staining and strong odor)

ATTACHMENT A-3
PROCEDURE FOR SOIL SAMPLING

DECONTAMINATION

Decontaminate the sampler and other sampling equipment prior to collection of each sample in accordance with the procedure outlined in Attachment A-1.

BOREHOLE ABANDONMENT

After borehole completion, verify that the drilling contractor seals the borehole per the SAP. Record the borehole abandonment method and approximate amount of grout material on the geologic log.

SAMPLE HANDLING

- **Sample packing -** Place the sample containers in an ice chest cooled with sufficient ice to maintain the samples at or below 4ºC. The frozen ice packs shall be placed within sealed plastic bags and placed below, within and on top of the samples. The ice chest shall remain closed except when placing samples in or removing sample. There should be foam or other appropriate packing material on the base of the ice chest, between sample containers, and on top of the sample containers to prevent breakage of glass sample jars. The packing shall be sufficient to prevent excessive movement of the containers which could affect sample integrity. The ice chest shall remain in the sampler's possession at all times until delivery to the laboratory or secure temporary storage.
- **Use of chain of custody form -** Be sure to complete *all* areas of the COC form (which is printed in triplicate) consistent with the documentation procedure described in Attachment A-5. Place the COC form in a sealed plastic bag and place it in the ice chest with the samples listed on the form for transport to the laboratory.
- **Sample custody -** Keep samples in your possession. If the samples are left unattended (i.e., in a locked vehicle), place chain-of-custody seals on the cooler to ensure the cooler has not been opened.
- **Sample shipping -** Each day, or as necessary, hand deliver or arrange for transport of the soil samples to the contract laboratory.
- **Disposal of investigative waste materials -** handle the drill cuttings and decontamination water in accordance with the SAP.

ATTACHMENT A-4
PROCEDURE FOR GROUNDWATER SAMPLING

OVERVIEW

The purpose of the groundwater sampling procedures is to ensure that representative samples of groundwater are provided for analysis and that the act of sampling does *not* contribute to further contamination at the site or cross-contamination of samples. The purpose of collecting groundwater levels is to calculate groundwater elevations and estimate flow direction. Groundwater elevations will be used to evaluate groundwater flow direction for an area of the site if at least three wells are present

CAUTION

Take care opening sample bottles. Some of the sample bottles may contain concentrated acid preservatives which will burn your skin and damage your clothing. The bottle labels should identify the preservative or they may have a red or yellow sticker on them which indicates "preservative". *If you do spill the preservative, immediately flush with water for at least five minutes and implement other appropriate actions per the project Health and Safety Plan.*

MOBILIZATION

Review the work plan, SAP, QAPP, and HSP. Coordinate the sampling event with the appropriate client contact and arrange for containers for purge water. Notify the laboratory of sample collection and delivery dates and request sample bottles. Verify containers received from laboratory and preservations are appropriate relative to analytical methods as outlined in Tables A-1 and A-2 in the project SAP. Assemble appropriate equipment as follows:

- Decontamination equipment per Attachment A-1
- Field copies of the work plan, SAP, QAPP, and HSP
- Electronic water level indicator and/or Interface probe (for measuring potential immiscible product layers)
- Folding ruler or measuring tape (marked in 0.01 foot increments)
- Sampling and purging equipment (e.g., peristaltic pump, disposable tubing, and filters)
- Sample containers (with preservatives added as appropriate)
- Indelible marker
- Field screening equipment: PID specific conductivity meter, pH meter, calibration solutions and gases, thermometer, extra batteries
- Tool kit
- Appropriate disposable gloves and other personal protective equipment per the HSP
- Keys to well locks and wrench for surface monuments
- Calculator
- Sample labels and field forms: well construction forms, COC forms, daily field report, water sampling forms
- Packaging material: insulated coolers, ice, packing material, duct tape, sealing plastic bags, sample custody seals

ATTACHMENT A-4
PROCEDURE FOR GROUNDWATER SAMPLING

CALIBRATING THE FIELD SCREENING INSTRUMENTS

Prior to initiating purging and sampling, calibrate the field instruments per the procedures for field instrument calibration (Attachment A-2).

INSPECTING THE WELL

On the field report, record the well identification number, condition of the surface monument and surface seal, and any conditions of surrounding ground surface which could impact well integrity (e.g., ponded water, stained ground surface, cracked asphalt, etc.). Also record the nature of any observed problems on the daily field report form and report them to the project manager.

OPENING THE WELL

Remove the locking and protective caps. Sample the air in the well head for organic vapors using a PID. Record measurements on the daily field report and groundwater collection form.

MEASURING FLUID LEVELS IN A WELL

Note: measure fluid levels for all wells in an area within a 24-hour period. Measure levels in a well prior to purging and prior to sampling.

- Turn the meter on and place in the well.
- Fluid level measurements from the top of the casing should always be taken from the same side of the casing (usually the North side) in all wells so that groundwater elevations are consistently calculated each time.
- Lower the probe to the liquid surface in the well and monitor the audible output to determine if the probe detects water, or LNAPL on the groundwater surface if an interface probe is used, and record the depth to the nearest 0.01 foot below the top of the well casing.
- If LNAPL is detected, lower the probe and monitor the audible output to determine when the probe detects the groundwater surface in the well and record the depth to the nearest 0.01 foot.
- Lower the probe below the groundwater surface and then slowly raise the probe to check the depth to groundwater and, if present, LNAPL surface.
- Repeat procedure until measurements can be duplicated.
- Record final measurements on the groundwater sampling form, well construction detail form, or daily field report, as appropriate. Calculate the water elevation by subtracting the measured depth in feet from the reference elevation of the well.
- Decontaminate the probe and portion of the cable which was in contact with the fluids prior to use in each well using the procedure for decontamination (Attachment A-1).

COLLECTING SAMPLES

Groundwater samples will be collected from shallow wells with low flow techniques using a peristaltic pump and disposable polyethylene tubing. The end of the tubing will be placed near the center of the well screen interval and the groundwater will be pumped at a rate of approximately 1 liter per minute. As groundwater is purged from the well it will be monitored for temperature, pH, conductivity, dissolved oxygen, and turbidity using an electric water quality monitor (or equivalent). Groundwater samples will be collected once these parameters have stabilized reflecting ambient groundwater has been drawn into the well. **Note: Do not allow preserved sample containers to overflow.**

If a well is purged to dryness, sampling may be initiated upon 70% recovery. If water does not sufficiently recover within 30 minutes, it will be considered “dry” and will not be sampled.

FILTERING OF SAMPLES

Samples for dissolved metals analyses will be filtered in the field. Place a new 0.45 micron filter onto the sample hose coming off the peristaltic pump and collect the metals sample aliquot directly into a HDPE bottle with nitric acid for preservative. The sample bottle should be clearly marked *dissolved metals*.

LABELING OF SAMPLES

Label each sample container according to the sample number, date, and time of collection in accordance with the project sampling scheme. Upon completion of labeling, place the sample in a cooled ice chest for storage and transport to the laboratory. Record date, time, and sample appearance on the daily field report and water collection form. Record all other required sampling information on the water sampling form.

SAMPLE HANDLING

- **Sample packing -** Place the sample containers in an ice chest cooled with sufficient ice to maintain the samples at or below 4 degrees Centigrade. The frozen ice packs shall be placed within sealed plastic bags and placed below, within and on top of the samples. The ice chest shall remain closed except when placing samples in or removing sample. There should be foam or other appropriate packing material on the base of the ice chest, between sample containers, and on top of the sample containers to prevent breakage of glass sample jars. The ice chest shall remain in the sampler’s possession at all times until delivery to the laboratory or secure temporary storage.
- **Use of chain of custody form -** Be sure to complete *all* areas of the COC form (which is printed in triplicate) consistent with the documentation procedure described in Attachment A-5. Place the COC form in a sealed plastic bag and place it in the ice chest with the samples listed on the form for transport to the laboratory.
- **Sample custody -** Keep samples in your possession. If the samples are left unattended (i.e., in a locked vehicle), place chain-of-custody seals on the cooler to ensure the cooler has not been opened.
- **Sample shipping -** Each day, or as necessary, hand deliver or arrange for transport of the water samples to the contract laboratory.
- **Disposal of investigative waste materials -** handle the purge and decontamination water in accordance with the SAP.

ATTACHMENT A-5
PROCEDURE FOR FIELD DOCUMENTATION

OVERVIEW

Each field team will maintain a daily field report and complete other logs and sampling forms to provide a daily record of events and document data and sample collection. All notes in the daily field report and other logs and forms should be clear, concise, and legally defensible. The use of each type of data record is described below, and examples of the logs and forms are included.

DAILY FIELD LOG

All documentation in daily field reports will be in ink. If an error is made, make corrections by crossing a line through the error and entering the correct information. Date and initial corrections. No entries will be obliterated or rendered unreadable. Sign and date each page.

Daily entries

- Job name and number
- Date
- Time
- Meteorological conditions
- Field personnel present
- Documentation of site safety meeting
- Level of personnel protection
- List of on-site visitors and the level of personal protection
- Field observations and conditions
- Building or general location being investigated
- Identification of sampling points consistent with project labeling scheme on area plan
- Description of reason for modifying sample locations on plan
- References to photographs (if applicable)
- Number of samples taken and general time of sample collection at each location
- Number of QA/QC samples taken
- Telephone contacts made regarding project and general purpose of discussion
- Visitor's names, affiliation, time of visit and purpose
- Unique field observations, difficulties, or modifications to specified scope or methods
- Documentation of decontamination
- All calibration measurements made (e.g., pH, temperature, specific conductance, etc.)
- Sample distribution (i.e., storage at site, direct delivery to contract analytical laboratory)
- Shipping date, method of shipment, destination, and the shipment identification number (if samples shipped)
- Summary of daily activities
- Other pertinent information.

ATTACHMENT A-5
PROCEDURE FOR FIELD DOCUMENTATION

GEOLOGIC LOG

Record the boring/monitoring well identification number, drilling contractor and method, field geologist/engineer's observations, description of soils encountered, USCS classification of soils, field screening measurements for soils, sample collection depths, and sample identification numbers on this log. In addition, notes regarding the drilling operation including site conditions, drilling rate, blow counts required to drive samples, assessment of drilling cuttings, depth to groundwater if encountered, borehole sealing material, and other pertinent subsurface conditions shall be recorded on the geologic log. All project information on the log shall also be completed and the preparer shall initial and date the log. Furthermore, if a well is constructed within the boring, this form will include the details of the materials used to construct that well and depth of placement of those materials.

GROUNDWATER SAMPLING DATA SHEET

Document groundwater water sampling procedures and data collected during well purging on the Groundwater Sampling Data Sheet. Be sure to complete all areas of the form and properly label the samples in accordance with the project sample labeling scheme. The sampler shall date and sign the form.

SAMPLE LABEL

A laboratory provided sample label will be placed on all samples collected. The label will be completed with the following information:

- Project number and name
- Date and time of sample collection
- Boring or monitoring well number
- Sample identification number and depth (soils only)
- Sample type (soil, groundwater, etc.)
- Sampler's initials

CUSTODY SEALS

When securing a cooler for sample shipment to the laboratory, seal the cooler with a laboratory provided signed custody seal to document that the cooler has not been tampered with during shipping.

CHAIN OF CUSTODY FORM

Use a standard URS COC or one provided by the laboratory. Complete *all* areas of the COC form in triplicate. Retain one copy of the COC and provide it to the project manager for the master job file. Send two copies of the COC with samples shipped to the laboratory. If samples are hand delivered, obtain the signature of the receiving personnel and leave the second copy with the laboratory. The third copy is placed in the job file. The laboratory will provide a copy of the final COC with the analytical reports.

Table A-1
Soil Sampling Locations and Analyses
Everett Shipyard
Everett, Washington

				Laboratory Analyses					
Area of Concern/Rationale	**Boring and Monitoring Well IDs**	**Sample Type**	**Approximate Sample Depth Interval (feet bgs)**	**Diesel- and Oil-Range Petroleum Hydrocarbons**	**cPAHs**	**Metals**	**Organotins**	**SVOCs and PCBs**	**VOCs**
Surface soils in areas where cleaning, abrasive blasting, and repairing marine vessels occurred	SS-30 through SS-41	Surface grab	0 - 0.5	X	X	X	X (SS-33, SS-37)	X (SS-33, SS-37)	NA
Area east of the wood shop where undocumented soil cleanup occurred in the late 1980s	SB-1, SB-2, SB-29, SB-30	Boring	0 - 0.5	X	X	X	X	X	Soil samples will be screened in the field with a PID using standard headspace technique. If elevated PID readings are measured, soil samples will also be submitted for VOC analyses. If no (or only a few) elevated PID readings are measured, a minimum, 8 soil samples will be analyzed for VOCs. The samples selected for analysis will be either stained soil samples or deeper samples collected in close proximity to the water table in areas where solvents were likely used or stored.
			1.0 - 2.0	Hold	Hold	Hold	Hold	Hold	
			2.0 - 3.0	X	X	X	Hold	Hold	
			4.0 - 5.0	X (SB-1)	Hold	Hold	Hold	Hold	
Lateral extent of metals and petroleum hydrocarbons detected in previous borings in the southwestern portion of the Site	SB-3, SB-4, SB-5, SB-13, SB-14, SB-15, SB-32, SB-33, MW-4, MW-5, MW-6, MW-7	Boring	0 - 0.5	X	X	X	Approximately 10 samples collected from shallow and intermediate depths will be analyzed. Preference will be given to analyzing samples that show evidence of abrasive grit and samples collected from areas most likely to be impacted.	Approximately 10 soil samples with the highest concentrations of petroleum hydrocarbons will also be analyzed for SVOCs and PCBs to assess whether these constituents are present at elevated levels in Site soils.	
			1.0 - 2.0	Hold	Hold	Hold			
			2.0 - 3.0	Hold	Hold	Hold			
Oil staining on the floors near floor penetrations that may provide pathways to the subsurface	SB-6, SB-7, SB-8, SB-9	Boring	0 - 0.5	X	X	X			
			1.0 - 2.0	Hold	Hold	Hold			
			2.0 - 3.0	Hold	Hold	Hold			
			4.0 - 5.0	X (SB-7, SB-8, SB-9)	Hold	Hold			
Soil staining adjacent to Steam Box	SB-10	Boring	0 - 0.5	X	X	X			
			1.0 - 2.0	Hold	Hold	Hold			
			2.0 - 3.0	Hold	Hold	Hold			
			4.0 - 5.0	X	Hold	Hold			
Historic operations east, southeast and northeast of weld shop	SB-11, SB-12, SB-16, SB-17, MW-9	Boring	0 - 0.5	X	X	X			
			1.0 - 2.0	Hold	Hold	Hold			
			2.0 - 3.0	Hold	Hold	Hold			
			4.0 - 5.0	X (SB-11)	Hold	Hold			
Stained soil west of Everett Engineering Machine Shop	MW-8	Boring	0 - 0.5	X	X	X			
			1.0 - 2.0	Hold	Hold	Hold			
			2.0 - 3.0	Hold	Hold	Hold			
Weld shop operations and historic operations adjacent to the original weld shop structure	SB-18, SB-19, SB-20	Boring	0 - 0.5	X	X	X			
			1.0 - 2.0	Hold	Hold	Hold			
			2.0 - 3.0	Hold	Hold	Hold			
			4.0 - 5.0	X (SB-19)	Hold	Hold			
Historic operations west and northwest of weld shop	SB-21, SB-22	Boring	0 - 0.5	X	X	X			
			1.0 - 2.0	Hold	Hold	Hold			
			2.0 - 3.0	Hold	Hold	Hold			
Marine Railway	SB-26, SB-34	Boring	0 - 0.5	X	X	X			
			1.0 - 2.0	Hold	Hold	Hold			

Table A-1
Soil Sampling Locations and Analyses
Everett Shipyard
Everett, Washington

				Laboratory Analyses					
Area of Concern/Rationale	**Boring and Monitoring Well IDs**	**Sample Type**	**Approximate Sample Depth Interval (feet bgs)**	**Diesel- and Oil-Range Petroleum Hydrocarbons**	**cPAHs**	**Metals**	**Organotins**	**SVOCs and PCBs**	**VOCs**
			2.0 - 3.0	Hold	Hold	Hold			
Historic operations (e.g., boat shed) located north of the weld shop	SB-27, SB-28	Boring	0 - 0.5	X	X	X			
			1.0 - 2.0	Hold	Hold	Hold			
			2.0 - 3.0	Hold	Hold	Hold			
Area between west edge of leasehold and bulkhead that may have been impacted by site activities	SB-35, SB-36, SB-37, SB-38, SB-39	Boring	0 - 0.5	X	X	X			
			1.0 - 2.0	Hold	Hold	Hold			
			2.0 - 3.0	Hold	Hold	Hold			
Historic operations in location of former Fish Processing Building	SB-31, SB-40, SB-41	Boring	0 - 0.5	X	X	X			
			1.0 - 2.0	Hold	Hold	Hold			
			2.0 - 3.0	Hold	Hold	Hold			
Area north of Former Net Shed outside leasehold and reporeted ESY operation areas	SB-42	Boring	0 - 0.5	X	X	X			
			1.0 - 2.0	Hold	Hold	Hold			
			2.0 - 3.0	Hold	Hold	Hold			
Areas where elevated concentrations of petroleum hydrocarbons were previously detected	SB-23, SB-24, SB-25	Boring	1.0 - 2.0	Hold	Hold	Hold	NA	X	
			2.0 - 3.0	Hold	Hold	Hold	NA	X	

Notes:
X - Analyze soil samples from designated interval from all borings at area of concern for indicated analytes
X (SB-1) - Analyze soil samples from designated interval from boring(s) identifed in parantheses for indicated analytes
bgs - below ground surface; Sample depth intervals are below ground surface or below asphalt/concrete and base course, if present
Diesel- and oil-range petroleum hydrocarbons by Ecology Method NWTPH-Dx
Metals by EPA Methods 6010/7421
Organotins by Method PSEP/Krone 1988
SVOCs - Semivolatile organic compounds by EPA Method 8270D
cPAHs - Carcinogenic polynuclear aromatic hydrocarbons by EPA Method 8270 SIM
PCBs - Polychlorinated biphenyls by EPA Method 8082A
VOCs - Volatile organic compounds by EPA Method 8260B
Hold - Samples will be placed on hold at the analytical laboratory pending receipt of results for shallow samples
Deeper samples will then be analyzed for constituents that exceed preliminary cleanup levels in the shallow soil samples
NA - Not analyzed
See Appendix G for sampling procedures and complete analyte list and detection limits for analyses

Table A-2
Groundwater Sampling Locations and Analyses
Everett Shipyard
Everett, Washington

Area of Concern/Rationale	Monitoring Well and Boring IDs	Sample Type	Approximate Sample Depth Interval (feet bgs)	Laboratory Analyses							
				Total Dissolved Soilds	Diesel- and Oil-Range Petroleum Hydrocarbons	Total Metals	Dissolved Metals	Organotins	SVOCs and PAHs	PCBs	VOCs
Weld Shop	MW-1 (existing well)	Monitoring Well	5-15	X	X	X	X	X	X	X	X
Wood Shop and Paint Shed	MW-2 (existing well)	Monitoring Well	5-15	X	X	X	X	X	X	X	X
Downgradient (west) of areas of known soil impacts	MW-3 (existing well if usable) MW-4, MW-5, MW-6	Monitoring Well	5-15	X	X	X	X	X	X	X	X
Downgradient (west of Everett Engineering Buildings)	MW-7, MW-8	Monitoring Well	5-15	X	X	X	X	X	X	X	X
Upgradient Background	MW-9, MW-10	Monitoring Well	5-15	X	X	X	X	X	X	X	X
Area east of the wood shop where undocumented soil cleanup occurred in the late 1980s	SB-1	Direct-push grab sample	5 - 9	NA	X	NA	X	NA	NA	NA	NA
Oil staining on the floors near floor penetrations that may provide pathways to the subsurface	SB-7	Direct-push grab sample	5 - 9	NA	X	NA	X	NA	X	NA	X
Oil staining on the floors near floor penetrations that may provide pathways to the subsurface	SB-8, SB-9	Direct-push grab sample	5 - 9	NA	X	NA	X	NA	NA	NA	NA
Soil staining adjacent to Steam Box	SB-10	Direct-push grab sample	5 - 9	NA	X	X	X	NA	NA	NA	NA
Historic Operations east of Weld Shop	SB-11	Direct-push grab sample	5 - 9	NA	X	NA	X	NA	NA	NA	NA
Historic Operations inside eastern portion of Weld Shop	SB-19	Direct-push grab sample	5 - 9	NA	X	NA	X	NA	X	NA	X

Notes:
bgs - below ground surface
Total dissolved solids by EPA Method 160.1
Diesel- and oil-range petroleum hydrocarbons by Ecology Method NWTPH-Dx
Total and dissolved metals by EPA Methods 6010B/7421/7470A; Dissolved metals will be field filtered using 0.45 micron filter.
Organotins by Method PSEP/Krone 1988
SVOCs - Semivolatile organic compounds by EPA Method 8270D
PAHs - Polynuclear aromatic hydrocarbons EPA Method 8270 SIM
PCBs - Polychlorinated biphenyls by EPA Method 8082
VOCs - Volatile organic compounds by EPA Method 8260B
See Appendix G for sampling procedures and complete analyte list and detection limits for analyses.
Well MW-3 could not be located.

Table A-3
Soil Sample Collection, Preservation, And Holding Time Criteria
Everett Shipyard
Everett, Washington

Parameter	Analytical Method	Container Type	Preservation	Extraction Holding Time	Analysis Holding Time
Volatile Organic Compounds (VOCs)	EPA SW-846 5035A/8260B Mod.	2-40 mL VOA vials with sodium bisulfate (from Easy-Draw Syringe), 1-40 mL VOA vial with MeOH (from Easy-Draw Syringe), and 2-oz glass jar with teflon-lined lid (minimize headspace)	Sodium Bisulfate (for VOA vial) Methanol (for VOA vial) No headspace (for 2-oz glass jar) Cool to 4ºC [5 gms of sample for 5 mls of preservative]	NA	14 days
Semivolatile Organic Compounds (SVOCs)	EPA SW-846 8270D	8-oz glass jar with teflon-lined lid	Cool to 4ºC	14 days	40 days *
Polynuclear Aromatic Hydrocarbons (PAH)	EPA SW-846 8270 and 8270-SIM	8-oz glass jar with teflon-lined lid	Cool to 4ºC	NA	14 days
Polychlorinated Biphenyls (PCBs)	EPA SW-846 8082A	8-oz glass jar with teflon-lined lid	Cool to 4ºC	14 days	40 days *
Diesel-Range and Heavy Oil-Range Total Petroleum Hydrocarbons	Ecology NWTPH-Dx	8-oz glass jar with teflon-lined lid	Cool to 4ºC	14 days	40 days *
Organotin	PSEP/Krone 1988	8-oz glass jar with teflon-lined lid	Cool to 4ºC	NA	14 days
Metals	EPA SW-846 6010B / 7000A Series	4-oz glass jar with teflon-lined lid	Cool to 4ºC	NA	6 months (28 days for Mercury)

* - Days from extraction date

Note:

Other allowable containers for soil samples include stainless steel rings with teflon-lined plastic caps for analyses other than volatile parameters.

Table A-4
Groundwater Sample Collection, Preservation, And Holding Time Criteria
Everett Shipyard
Everett , Washington

Parameter	Analytical Method	Container Type	Preservation	Extraction Holding Time	Analysis Holding Time
Volatile Organic Compounds (VOCs) and low-level VOCs	EPA SW-846 8260B	5-40 ml VOA glass vials with teflon septum[1] (No Headspace)	HCI pH<2, cool to 4ºC	NA	14 days
Low-Level VOCs (1,1-DCE, PCE, TCE, and vinyl chloride)	EPA SW-846 8260-SIM	5-40 ml VOA glass vials with teflon septum[1] (No Headspace)	HCI pH<2, cool to 4ºC	NA	14 days
Semivolatile Organic Compounds (SVOCs)	EPA SW-846 8270D	2-500 ml amber glass, Teflon lined cap	Cool to 4ºC	7 days	40 days*
Polynuclear Aromatic Hydrocarbons (PAHs)	EPA SW-846 8270-SIM (Low-Level)	2-500 ml amber glass, Teflon lined cap	Cool to 4ºC	7 days	40 days*
Polychlorinated Biphenyls (PCBs) Low-Level	EPA SW-846 8082A Low-Level (1-liter hexane extraction)	2-1 L amber glass, Teflon lined cap	Cool to 4ºC	7 days	40 days*
Diesel-Range and Heavy Oil-Range Total Petroleum Hydrocarbons (TPH)	PSEP/Krone 1988	2-500 ml amber glass, Teflon lined cap	Cool to 4ºC	7 days	40 days*
Organotin Compounds	PSEP/Krone 1988	2-500 ml amber glass, Teflon lined cap	Cool to 4ºC	NA	7 days
Total and Dissolved Metals [2]	EPA SW-846 200/6010B/7000A Series	500 ml HDPE	HNO_3 to pH <2, cool to 4ºC	NA	6 months (Mercury is 28 days)

* - Days from extraction date

Notes:

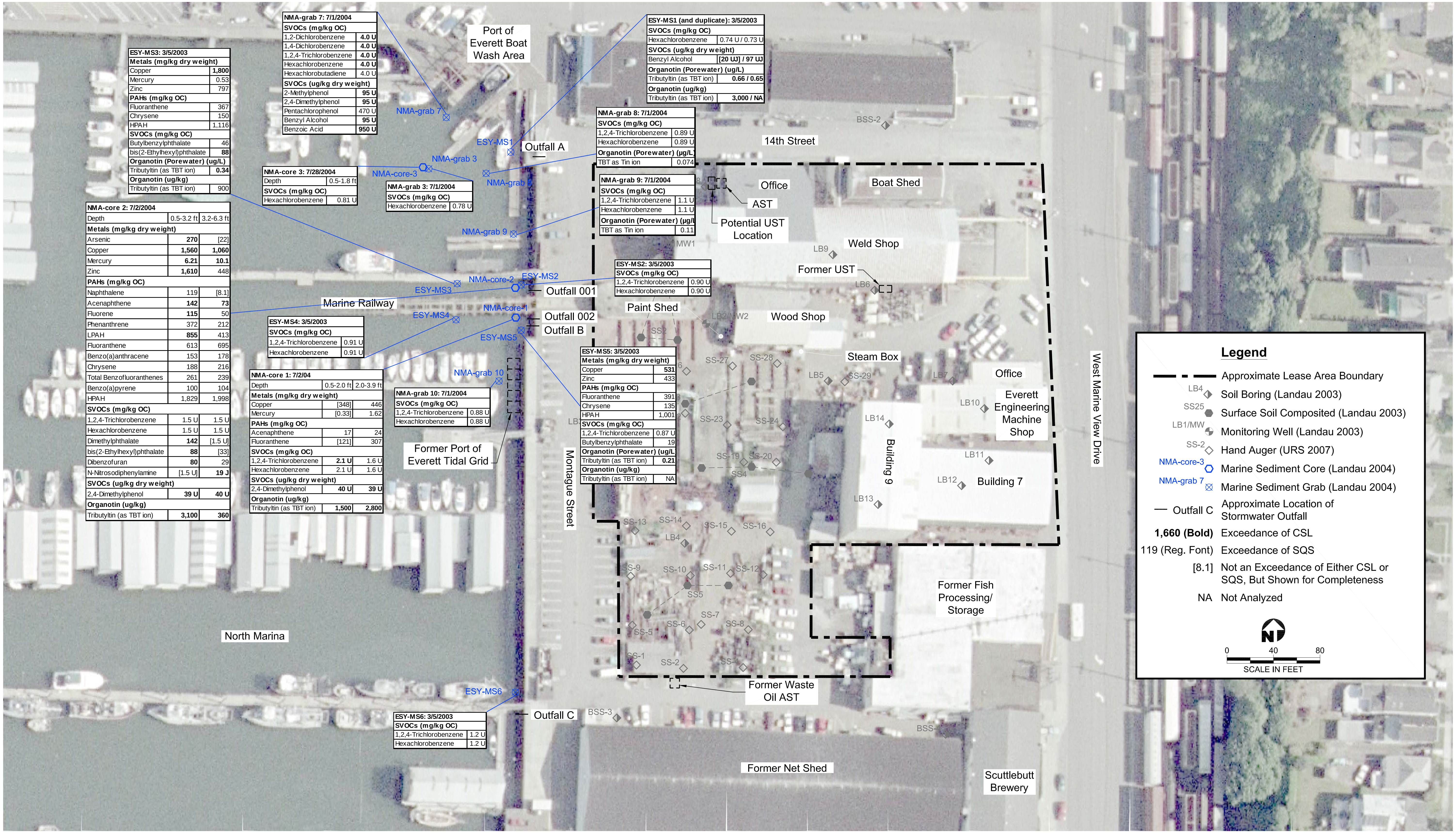
1,1-DCE - 1,1-Dichloroethene

PCE - Tetrachloroethene

TCE - Trichloroethene

[1] If analysis for VOCs and low-level VOCs are required on the same sample, collect 5-40 mL vials.

[2] Samples for dissolved metals analysis will be preserved by the laboratory after filtration, or pre-preserved containers will be used for samples filtered in the field.



ESY-MS3: 3/5/2003	
Metals (mg/kg dry weight)	
Copper	**1,800**
Mercury	0.53
Zinc	797
PAHs (mg/kg OC)	
Fluoranthene	367
Chrysene	150
HPAH	1,116
SVOCs (mg/kg OC)	
Butylbenzylphthalate	46
bis(2-Ethylhexyl)phthalate	**88**
Organotin (Porewater) (ug/L)	
Tributyltin (as TBT ion)	**0.34**
Organotin (ug/kg)	
Tributyltin (as TBT ion)	900

NMA-grab 7: 7/1/2004	
SVOCs (mg/kg OC)	
1,2-Dichlorobenzene	**4.0 U**
1,4-Dichlorobenzene	**4.0 U**
1,2,4-Trichlorobenzene	**4.0 U**
Hexachlorobenzene	**4.0 U**
Hexachlorobutadiene	4.0 U
SVOCs (ug/kg dry weight)	
2-Methylphenol	**95 U**
2,4-Dimethylphenol	**95 U**
Pentachlorophenol	470 U
Benzyl Alcohol	**95 U**
Benzoic Acid	**950 U**

ESY-MS1 (and duplicate): 3/5/2003	
SVOCs (mg/kg OC)	
Hexachlorobenzene	0.74 U / 0.73 U
SVOCs (ug/kg dry weight)	
Benzyl Alcohol	**[20 UJ] / 97 UJ**
Organotin (Porewater) (ug/L)	
Tributyltin (as TBT ion)	**0.66 / 0.65**
Organotin (ug/kg)	
Tributyltin (as TBT ion)	**3,000 / NA**

NMA-grab 8: 7/1/2004	
SVOCs (mg/kg OC)	
1,2,4-Trichlorobenzene	0.89 U
Hexachlorobenzene	0.89 U
Organotin (Porewater) (µg/L)	
TBT as Tin ion	0.074

NMA-core 3: 7/28/2004	
Depth	0.5-1.8 ft
SVOCs (mg/kg OC)	
Hexachlorobenzene	0.81 U

NMA-grab 3: 7/1/2004	
SVOCs (mg/kg OC)	
Hexachlorobenzene	0.78 U

NMA-grab 9: 7/1/2004	
SVOCs (mg/kg OC)	
1,2,4-Trichlorobenzene	1.1 U
Hexachlorobenzene	1.1 U
Organotin (Porewater) (µg/L	
TBT as Tin ion	0.11

NMA-core 2: 7/2/2004		
Depth	0.5-3.2 ft	3.2-6.3 ft
Metals (mg/kg dry weight)		
Arsenic	**270**	[22]
Copper	**1,560**	**1,060**
Mercury	**6.21**	**10.1**
Zinc	**1,610**	448
PAHs (mg/kg OC)		
Naphthalene	119	[8.1]
Acenaphthene	**142**	**73**
Fluorene	**115**	50
Phenanthrene	372	212
LPAH	**855**	413
Fluoranthene	613	695
Benzo(a)anthracene	153	178
Chrysene	188	216
Total Benzofluoranthenes	261	239
Benzo(a)pyrene	100	104
HPAH	1,829	1,998
SVOCs (mg/kg OC)		
1,2,4-Trichlorobenzene	1.5 U	1.5 U
Hexachlorobenzene	1.5 U	1.5 U
Dimethylphthalate	**142**	[1.5 U]
bis(2-Ethylhexyl)phthalate	**88**	[33]
Dibenzofuran	**80**	29
N-Nitrosodiphenylamine	[1.5 U]	**19 J**
SVOCs (ug/kg dry weight)		
2,4-Dimethylphenol	**39 U**	**40 U**
Organotin (ug/kg)		
Tributyltin (as TBT ion)	**3,100**	**360**

ESY-MS2: 3/5/2003	
SVOCs (mg/kg OC)	
1,2,4-Trichlorobenzene	0.90 U
Hexachlorobenzene	0.90 U

ESY-MS4: 3/5/2003	
SVOCs (mg/kg OC)	
1,2,4-Trichlorobenzene	0.91 U
Hexachlorobenzene	0.91 U

ESY-MS5: 3/5/2003	
Metals (mg/kg dry weight)	
Copper	**531**
Zinc	433
PAHs (mg/kg OC)	
Fluoranthene	391
Chrysene	135
HPAH	1,001
SVOCs (mg/kg OC)	
1,2,4-Trichlorobenzene	0.87 U
Butylbenzylphthalate	19
Organotin (Porewater) (ug/L)	
Tributyltin (as TBT ion)	**0.21**
Organotin (ug/kg)	
Tributyltin (as TBT ion)	NA

NMA-core 1: 7/2/04		
Depth	0.5-2.0 ft	2.0-3.9 ft
Metals (mg/kg dry weight)		
Copper	[348]	446
Mercury	[0.33]	1.62
PAHs (mg/kg OC)		
Acenaphthene	17	24
Fluoranthene	[121]	307
SVOCs (mg/kg OC)		
1,2,4-Trichlorobenzene	**2.1 U**	1.6 U
Hexachlorobenzene	2.1 U	1.6 U
SVOCs (ug/kg dry weight)		
2,4-Dimethylphenol	**40 U**	**39 U**
Organotin (ug/kg)		
Tributyltin (as TBT ion)	**1,500**	**2,800**

NMA-grab 10: 7/1/2004	
SVOCs (mg/kg OC)	
1,2,4-Trichlorobenzene	0.88 U
Hexachlorobenzene	0.88 U

ESY-MS6: 3/5/2003	
SVOCs (mg/kg OC)	
1,2,4-Trichlorobenzene	1.2 U
Hexachlorobenzene	1.2 U

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Figure 1-1

Marine Sediment Sample Exceedances

Everett Shipyard
Everett, Washington
SEDIMENT SAMPLING AND ANALYSIS PLAN

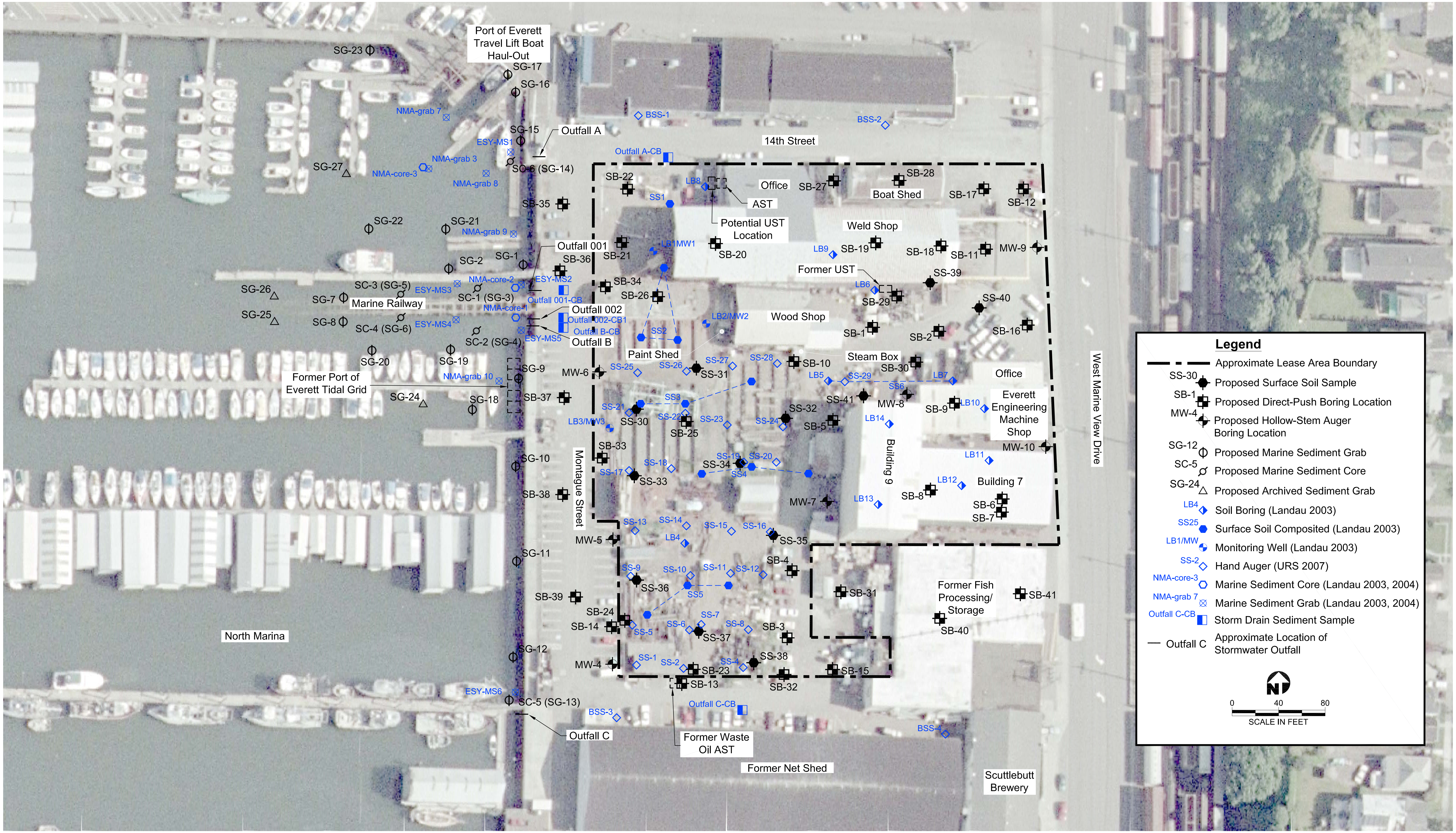

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Figure 2-1

Proposed Sample Locations

Everett Shipyard
Everett, Washington
SEDIMENT SAMPLING AND ANALYSIS PLAN

APPENDIX F

DRAFT FINAL MARINE SEDIMENT SAMPLING AND ANALYSIS PLAN
REMEDIAL INVESTIGATION AND FEASIBILITY STUDY
EVERETT SHIPYARD

FINAL SEDIMENT SAMPLING AND ANALYSIS PLAN
EVERETT SHIPYARD
EVERETT, WASHINGTON

Prepared for
Everett Shipyard
URS Project No. 33760902

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October 24, 2008

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TABLES

ATTACHMENT A

Sample Preparation, Practical Quantitation Limits, and Quality Control Procedures

1.0 INTRODUCTION AND BACKGROUND INFORMATION

ESY, Inc. (ESY), formerly Everett Shipyard, Inc., operated a ship building, maintenance and repair facility at 1016 14th Street in Everett, Washington (“Site”) from 1957-2008. The Port of Everett (Port) has owned and/or operated vessel and marine-related services on or adjacent to the Site. The Site covers approximately four acres. It is located west of Marine View Drive and adjacent to the North Marina, which is located within Port Gardner Bay. A marine railway extends into the North Marina from the Site and is used to transport marine vessels onshore.

ESY leases the upland portion of the Site from the Port. On March 31, 2008, ESY sold substantially all of its assets to Everett Ship Repair & Drydock, Inc. (ESRD), a wholly owned subsidiary of Todd Shipyard Corporation. ESRD is in the process of relocating its operations. Previous investigations conducted in the adjacent North Marina area identified hazardous substances in sediment exceeding potentially applicable cleanup levels (Landau 2003 and 2004).

On April 2, 2008, the Washington Department of Ecology (Ecology), ESY (then Everett Shipyard, Inc.) and the Port entered into Agreed Order No. DE 5271 to conduct a Remedial Investigation/Feasibility Study (RI/FS) per WAC 173-340-350, and to develop a draft Cleanup Action Plan per WAC 173-340-350 through 173-340-380 addressing both potential upland and in-water (i.e., adjacent marine sediment) contamination for the Site (Ecology 2008). The Agreed Order requires the preparation of an RI/FS Work Plan to further the investigation of soil, groundwater and sediment conditions at the Site. This Sampling and Analysis Plan (SAP) has been prepared to guide the marine sediment investigation which will be performed to collect the data necessary to support selection of a cleanup action if one is necessary. This SAP is a component of the RI/FS Work Plan.

1.1 SITE DESCRIPTION

ESY leases approximately 4 acres in the North Marina Area of the Port of Everett. The site is relatively flat and is estimated to be less than 10 feet above sea level. The current site includes a fabrication building (~12,000 square feet) for construction and repair of vessels, a smaller wood shop (~3,000 square feet), and several small outbuildings. Two additional buildings were previously sublet by ESY to Everett Engineering. A marine railway for hauling vessels from the marina to the shipyard is located west of the ESY lease area.

1.2 SITE HISTORY

As discussed in the RI/FS Work Plan, the history of the Site development and operations was prepared by reviewing historical records and interviewing Everett Shipyard personnel. Figure 3 of the RI/FS Work Plan shows the current structures on the Site. Table 1 of the RI/FS Work Plan lists the current and historic structures and Site operations, and provides a general description of the activities completed at each building and area, including chemical use, storage and disposal practices. The Site development and operational history are described below.

1.2.1 Site Development

The Site appears to have been part of Port Gardner Bay in the earliest topographic maps dated 1897 and 1944 and Sanborn Fire Insurance maps dated 1902 and 1914. By 1947, the property had been filled and the bulkhead to the west of the Site appears to have been constructed. A building was present at the location of the western portion of the present day weld shop and office, and boat skids were located on the western portion of the property. The limited nature of the vegetation on the Site in 1947 suggests recent completion of filling behind the bulkhead. Two ancillary paint shop and re-saw buildings were present in the 1950 Sanborn Fire Insurance Map.

By the late 1960s, development of the property increased to include the marine railway extending into the North Marina, construction of the wood shop building, different location for the paint shop, additional skids on the northeast portion of the property, and the presence of small-scale boat storage and fish processing operations.

In the 1970s development included construction of the east end of the weld shop, and a boat shed north of the northeast portion of the present day weld shop. The 1980s included development of the buildings historically occupied by Everett Engineering including the Machine Shop, and Buildings 7 and 9.

The fish processing building was no longer apparent in the 1984 aerial photograph. The skids on the northeast portion of the property were no longer apparent by 1991.

The North Marina area adjacent to the shipyard has been owned and operated as a marina since at least 1959. Prior to this time, at least one saw mill operated adjacent to the marina. Periodic maintenance dredging was required to maintain navigable water depths. The most recent dredging occurred in 1990 and 2001. The 1990 event involved dredging throughout the North Marina area adjacent to the shipyard except in the immediate vicinity of the marine railway and floating dock to the north. This dredging resulted in water depths of -10 to -13 feet mean lower low water (MLLW) in the area offshore of the shipyard. The 2001 event was more limited in scope, as it did not include any dredging south of the floating dock and marine railway. The 2001 dredging resulted in typical water depths of -11 to -14 feet MLLW in the area north of the floating dock.

The Port operates a Travel lift boat haul-out facility approximately 150 feet north of the marine railway. The Port's haul out facility and adjacent areas were routinely used by the Port and Port tenants or customers for vessel painting and other maintenance. The Port's haul out facility is evident in aerial photographs beginning in 1965 and was present when ESY began operating at the Site in 1959. Historically, the Port also operated a boat wash grid facility in the nearshore area south of the marine railway. The grid was used for washing ships' hulls, painting and other maintenance activities. The grid is evident in aerial photographs from 1969 until 1991.

1.2.2 Operations

Since its founding as Fishermen's Boat Shop in 1947, the Site has been used for cleaning, painting, and repairing marine vessels. Currently, the facility conducts repair work on marine vessels up to 110 feet long. In more recent decades, grit blasting and welding have been added as marine repair activities. The repair work involves bilge evacuations via vacuum trucks for off-site disposal, equipment disassembly, abrasive blasting, woodwork and metalwork, painting/coating, and mechanical repairs. The operations have not included engine repairs; this work was sent offsite. Fishermen's Boat Shop became a corporation in 1961. In January 2002, Fisherman's Boat Shop changed its corporate name to Everett Shipyard, Inc. In April 2008, Everett Shipyard Inc. changed its name to ESY Inc.

Chemicals used on Site include: paint and polymer coatings, coating strippers, paint thinner, rust preventer, creosote, anti-biofouling agents, xylene, diesel, lubricants, hydraulic fluid, fuel oil, and other petroleum products.

Abrasive blasting at the Site has been performed by contractors retained for specific projects. Grit used for abrasive blasting historically included the use of copper slag. By the mid 1980s, the grit used included "Green Diamond" and "Kleen Blast." Historically the grit remained onsite and was removed when it accumulated to the point that it interfered with Site operations. Aerial photographs reviewed suggest that abrasive grit was historically present on the ground surface through out most of the central and southern portions of the Site. The apparent maximum lateral extent of the grit based on aerial photographs from the late 1970s and early 1980s is depicted on Figure 3. Most of the grit was removed from the site in the late 1980s at the time contractors performing abrasive blasting were required to remove the grit following each project.

Historically, storm water from the Site was collected in catch basins. The catch basins discharged into the North Marina at Outfalls 001 and 002 north and south of the Marine Railway, respectively. In 2002, Everett Shipyard reconfigured the catch basin discharge in the operations area to discharge to the sanitary sewer. Outfall 002 is no longer in use. The only storm water that discharges directly to Outfall 001 is limited to roof runoff from the weld shop. Storm water monitoring has been performed at that Site in accordance with National Pollution Discharge Elimination System (NPDES) permit requirements since the late 1990s.

ESY also constructed a sump to catch wash water from boats being washed on the railway. The collection sump for the wash down facility discharges into the sanitary sewer.
In addition to the Everett Shipyard operations, Everett Engineering subleased three buildings at the Site. Buildings were constructed for Everett Engineering's operations between 1965 and 1984. The buildings included: the office/machine shop, Building 7 and Building 9. The operations in the office/machine shop building started in the late 1960s and activities in all three buildings ceased in 2007. The buildings are currently vacant. Operations in these buildings have included the use of cutting oils, lube oils, hydraulic fluids and solvents. Special foundations for heavy equipment, including a foundation slab below the floor grade, were observed in Building 9.

Based on review of historical city directories, land ownership maps, and buildings plans and permits, other tenants of the subject property have included: Northwest Propeller and Aquatic Industries.

1.3 REGULATORY FRAMEWORK

The SAP and associated and Health and Safety Plan (see Appendix A of the RI/FS Work Plan) are intended to meet the requirements for these plans as specified in the Washington Model Toxics Control Act (MTCA) (WAC 173-340-350, 173-340-810), the Sediment Management Standards (SMS) for the State of Washington (WAC 173-204-600**)**.

1.4 SUMMARY OF PREVIOUS SEDIMENT QUALITY INVESTIGATIONS

1.4.1 Landau Phase II Environmental Site Assessment - 2003

In 2003, on behalf of the Port, Landau Associates conducted a Phase II ESA to determine whether historical and current industrial site activities may have resulted in threatened or actual releases of hazardous substances to Site media (e.g., soil, ground water, adjacent marine sediment) and whether any cleanup was warranted (Landau 2003). Sample locations and a summary of marine sediment analytical results exceeding State sediment criteria are presented on Figure 1-1. The findings from the sediment investigations are summarized below.

Storm Drain Sediment

Six catchbasin sediment and two storm drain sediment samples were collected and analyzed for total metals and bulk tributyltin (TBT). The results are summarized in Table 3 of the RI/FS Work Plan. They were compared to both the MTCA cleanup level criteria and the state Sediment Management Standards (SMS), because of the potential for release to the marine environment. Exceedances of one or both standards were found for arsenic, copper, and zinc in every sample. Select samples also had exceedances for cadmium, lead, and mercury. All samples also exceeded the preliminary TBT criterion used in the ESA for screening the marine sediment results.

Marine Sediments

Shallow marine sediment (0 to 10 cm) samples were collected from six locations using a van Veen sampler. Two samples were collected close to the bulkhead in locations corresponding to the north and south boundaries of the Site. The other four samples were collected along the edges of the marine railway, two within 20 feet of the shore and the other two approximately 60 feet offshore (Figure 4 of the RI/FS Work Plan). These samples were analyzed for metals, SVOCs, and organotins in porewater. Three of the samples were also analyzed for bulk organotins, two samples were also analyzed for PCBs, and one sample was also analyzed for volatiles.

1.4.2 Landau Sediment Quality Investigation - 2004

In 2004, Landau collected another round of marine sediment samples from the North Marina area. This sampling included both shallow 0 to 10 cm samples and sediment cores (Landau 2004). Sampling was performed in two areas: adjacent to the western end of the peninsula north of the shipyard and in the northern portion of the nearshore area adjacent to the shipyard.

A total of five shallow grab samples and three cores were collected in the area just west of the shipyard. One grab was collected in the general vicinity of a Port boat wash south of the marine railway. The other four grab samples were collected in the general area of the Port's travel lift dock and boat wash facility at the north end of the bulkhead. Two of the cores were collected approximately 25 feet offshore and closely adjacent to the sides of the marine railway. The third core was collected in the general vicinity of the boat wash facility at the north end of the bulkhead. Each of the cores was sectioned into two samples.

The core logs do not appear to include definitive evidence of recent deposition or observations of native material. The boundary between the samples for the cores does not appear to coincide with a distinct change in physical characteristics.

All of the samples were analyzed for metals and semivolatiles. All of the grab samples were also analyzed for organotins in porewater. Three of the grab samples and all of the six samples prepared from the sediment cores were also analyzed for bulk organotins. The report included a tabulation of the analytical data, but did not compare the results to potentially applicable standards.

1.4.3 Discussion of Sediment Results

Exceedances of both the state sediment quality standards (SQS) and contaminant screening levels (CSL) were observed in the 2003 marine sediment data samples (Figure 6 of the RI/FS Work Plan). Most of the exceedances were found in samples from two locations (ESY-MS3 and ESY-MS5) adjacent to the marine railway and directly offshore of the primary historical storm drain outfall serving the shipyard area (Figure 6). The CSL value for copper was exceeded in these two locations. The SQS for zinc was also exceeded at these locations and the SQS for mercury was exceeded at one of the same railway locations.

The SQS value for three PAHs was exceeded at the same two locations near the railway. The CSL for one semivolatile phthalate was exceeded at one of the marine railway locations and the SQS for another phthalate was exceeded at both of the railway locations.

SQS and CSL criteria have not been formally established for the organotin compounds. Recent practice in characterizing marine sediments commonly involves comparisons to working criteria, e.g., values used in assessing sediments for possible open-water disposal under the Puget Sound Dredged Disposal Analysis (PSDDA) program. The less stringent criterion of 0.15 µg/L (treated as equivalent to a CSL value) for porewater organotin was exceeded at the two railway locations where the greatest number of exceedances were observed and also in the sample collected at the north end of the bulkhead near the Port boat wash area. The working bulk organotin criterion of 73 µg/kg was also exceeded at one of the railway locations and the northern boat wash area location.

In general, the detection limits achieved during the 2003 investigation were below the state sediment management standards. The primary exceptions were two semivolatile chlorinated benzene compounds (1,2,4-Trichlorobenzene and Hexachlorobenzene); the detection limits for these compounds exceeded the SQS for most of the samples.

During the 2004 investigation, exceedances of both SQS and CSL criteria were again found. The greatest number and variety of exceedances were found in the samples prepared from the core collected just north of the marine railway (NMA-core-2). Most of the remaining observed exceedances were from samples collected along the south side of the railway (Core 1) and from a grab sample collected near the Port's travel lift dock northwest of the Site (NMA-grab-7).

The CSL value for copper was exceeded in both samples from Core 2 (0.5 to 3.2 ft and 3.2 to 6.3 ft) and in the lower sample from Core 1 (2.0 to 3.9 ft). The CSL for zinc was exceeded in the upper sample from Core 2 and the SQS for zinc was exceeded in the lower Core 2 sample. The CSL for arsenic was also exceeded in the upper Core 2 sample.

Exceedances were also observed for a variety of low and high molecular weight PAHs (LPAHs and HPAHs) in both samples from Core 2. Most of these exceedances were of the SQS, but several LPAHs were measured at concentrations exceeding the CSLs. A limited number of PAH exceedances of the SQS were also noted in the Core 1 samples.

Detection limits elevated above the regulatory criteria were more of an issue in the 2004 sediment analysis than had been the case in the 2003 investigation. Non-detects above the SQS or CSL were observed for several chlorinated benzene compounds and ionizable SVOCs (i.e., phenols, benzyl alcohol, and benzoic acid). Several instances of detection limits above either the SQS or CSL were recorded for each of the samples from Cores 1 and 2. All of the exceedances of the criteria for Grab 7 were due to elevated detection limits. The only exceedances observed for two of the grab samples and the third core involve one or two non-detects exceeding the SQS value.

As noted previously, formal criteria have not been established for the organotins. However, using the same approach noted above, exceedances of the criterion of 0.15 µg/L for organotin in porewater were observed for two grab samples collected between the marine railway and the boat wash facility to the north. Exceedances of the bulk organotin criterion of 73 µg/kg were found in all four samples prepared from Cores 1 and 2.

The number and location of samples collected (see Figure 6 of the RI/FS Work Plan), as well as the analytical findings including elevated detection limits reported for some analytes prevent a full delineation of the nature and extent of contamination in the marine sediments west of the shipyard and further investigation of sediment quality appears to be warranted.

2.0 OBJECTIVES AND DESIGN OF SEDIMENT INVESTIGATION

2.1 OBJECTIVE

The goal of the RI/FS process is to collect, develop and evaluate sufficient information to select cleanup actions consistent with the requirements of WAC 173-340-350 through WAC 173-340-390. Recent marine sediment data collected in the vicinity of the shipyard's historical stormwater outfall are comparatively limited and not sufficient to define the lateral and vertical extent of potential constituents of concerns (PCOCs) in this area. In several cases, non-detections were reported for some analytes at levels exceeding regulatory criteria, leaving further uncertainty as to the actual levels of these analytes present in the sediments. Therefore, additional sediment data are needed to meet the project objectives.

2.2 SAMPLING STANDARDS

Current Ecology guidance *Sediment Sampling and Analysis Plan Appendix* (SAPA) (Ecology 2008) for developing SAPs was used to ensure that analytical requirements in the SMS are met. Sampling procedures and collection will follow current Puget Sound Estuary Program (PSEP) (U.S. EPA 1997) protocols. Sediment samples will be collected in accordance with standard environmental sample handling and custody procedures.

The sediment samples will be analyzed for the full suite of 47 SMS chemicals and conventional sediment variables presented in Washington Administrative Code (WAC) 173-204-400 (Ecology, 1995). Grab samples will be analyzed for bulk and porewater organotins, and core samples will be analyzed for bulk organotins.

2.3 OVERALL SAMPLING DESIGN

The investigations conducted to date have identified the following areas of concern:

- The sediments have been potentially impacted by the historical stormwater outfalls that discharged north and south of the marine railway. Samples of surface sediment collected in 2003 and sediment cores collected in 2004 revealed a variety of chemicals exceeding the SMS criteria. The existing data are insufficient to define either the lateral or vertical extent of contamination in this area.
- The sediments beneath the marine railway have been accumulating since the railway was constructed, and thus have the potential to contain contaminants deposited over an extended period of time. For this reason, the accumulation of sediments beneath and adjacent to the marine railway and elevated above the surrounding dredged areas represents the primary area of concern directly connected to shipyard operations. At least some portion of these sediments closest to the shoreline and historical outfalls may have been impacted by discharges from the stormwater outfalls.
- The sediments in the nearshore area along the bulkhead have not likely been affected by periodic navigation dredging of the North Marina and only limited sediment characterization has been performed throughout most of the nearshore area. Sediments in the vicinity of outfalls draining the shipyard site (such as Outfall C) may have received

contaminants including sandblast grit and antifouling compounds. There is a terrestrial buffer in the form of a roadway and parking area between the Site and the marine environment, and historical shipyard discharges to the marine environment were limited to the immediate vicinity of the marine railway. However, comparatively undisturbed residual sediments along the bulkhead have the potential to include accumulations of contaminations from other adjacent sources.

- Other possible sources include discharges from other nearby outfalls, discharges and releases associated with the Port's boat wash grid located south of the marine railway and the Port's travel lift dock and boat wash facilities northwest of the Site. Other possible sources of contamination include releases associated with vessels moored at and transiting the North Marina and discharges of stormwater from other terrestrial properties in the area. These potential sources are not considered areas of concern related to the Site, but releases from these areas may be detected during the planned sediment investigation.

To further investigate these areas of concern, sediment samples will be collected for chemical analysis at locations shown on Figure 2-1 and summarized in Table 2-1. The rationale for the sampling program is summarized in Table 2-2. Depending on the results of the chemical analysis, a second round of sediment sampling may be conducted to support biological testing. Samples for biological analysis will be collected at locations previously sampled for chemical analysis. It is anticipated that sampling for biological analysis will be conducted within six months of the chemical analysis and that as long as no substantive change in site conditions has occurred no chemical reanalysis will be required. Plans for sampling for biological testing will be documented in a future addendum to this plan.

2.3.1 Historical Shipyard Outfalls and Marine Railway

A total of 17 shallow (0 to 10 cm) grab samples and 4 cores will be collected to assess sediment quality in the general area of historical shipyard stormwater Outfall 001 and the marine railway. One grab (location SG-1) will be collected immediately north of the floating dock north of the railway and due north of the 2003 nearshore location adjacent to the north edge of the railway. A second grab sample (SG-2) will be collected immediately north of the floating dock and due north of the outermost location sampled north of the railway in 2003.

Two cores (SC-1 and SC-2) will be collected in the vicinity of the railway, approximately 40 feet west of the shoreline and 30 feet south and north of the center of the railway. These cores will be driven to native material if conditions permit. Ideally, individual samples will be made up by homogenizing material from one-foot intervals of these cores. If the usable sediment volume in a one-foot interval is insufficient to meet overall sample volume requirements, Ecology staff will be consulted regarding homogenizing up to two feet of the core to make up the necessary volume. Subsurface contamination was previously observed where cores were collected on each side of the railway close to shore, so the primary goal of this sampling is to define the maximum depth of contamination. For this reason, the deepest sample from each core (or the first interval below the native horizon) will be analyzed. Samples will also be prepared from every other alternate interval to the surface. These other samples will be frozen and archived for possible future analysis depending on the results from the deepest sample. If the deepest sample is found to be free of exceedances, the next higher archived sample will be analyzed. Two 0 to 10 cm grab samples (SG-3 and SG-4) will be collected using a van Veen sampler at the core locations to characterize the surface sediments.

Two additional cores (SC-3 and SC-4) will be collected immediately north and south of the railway and approximately 120 feet from the shoreline. Ideally, these cores will also be driven to native material. These cores will also be divided into one-foot horizons for sample preparation unless sample volume requirements dictate otherwise. These locations have not been previously sampled. The primary goal of this sampling is to define the maximum depth of contamination. For this reason, the deepest sample from each core (or first interval below the native horizon) will be analyzed and samples will be prepared from every other interval to the surface. The other samples will be frozen and archived for possible future analysis depending on the results. If the deepest sample is found to be free of exceedances, the next higher archived sample will be analyzed. Two 0 to 10 cm grab samples (SG-5 and SG-6) will be collected at core stations SC-3 and SC-4 using a van Veen sampler to characterize the shallow sediments in these locations.

Two additional 0 to 10 cm grab samples (SG-7 and SG-8) will be collected immediately north and south of the railway, approximately 160 feet from the shore.

Five additional 0 to 10 cm grabs (SG-18, SG-19, SG-20, SG-21, and SG-22) will be collected from locations not previously sampled and more distant from the railway and Outfall 001. The goal of these samples is to attempt to establish the horizontal limits to contamination. Location SG-18 is approximately 40 feet west of the bulkhead and 90 feet south of the railway. Locations SG-19 and SG-20 are approximately 40 feet south of the railway and 60 feet and 130 feet west of the bulkhead, respectively. Locations SG-21 and SG-22 are approximately 70 feet north of the railway and 80 feet and 130 feet west of the bulkhead, respectively.

Another group of four 0 to 10 cm grab samples will be collected from locations not previously sampled and even more distant from Outfall 001 and the marine railway. These samples will be frozen and archived as a contingency for possible future analysis to establish the horizontal limits of contamination in case the outermost analyzed grab samples exhibit exceedances. Each of the archived samples will be linked to one or more of the grab samples being analyzed from the railway area. Should chemical exceedances be observed for any of the linked samples, the archived sample will be retrieved and analyzed for the exceeding chemicals. Location SG-24 is approximately 90 feet west of the bulkhead and 90 feet south of the railway. Archived sample SG-24 will be linked to grabs SG-18 and SG-20. Locations SG-25 and SG-26 are closely south and north of the railway and approximately 240 feet offshore. Sample SG-25 will be linked to grab SG-8 and sample SG-26 will be linked to grab SG-7. Location SG-27 is approximately 170 west of the bulkhead and 120 feet north of the railway. Sample SG-27 is linked to grab SG-22.

2.3.2 Nearshore Bulkhead

In addition to the sampling in the vicinity of the marine railway and historical shipyard Outfall 001, grab and core samples will also be collected in nearshore areas to the south and north of the marine railway.

Four 0 to 10 cm grab samples (SG-9 through SG-12) will be collected at roughly 80-foot intervals at the toe of the slope along the bulkhead running south from the marine railway. The intent is to sample sediment accumulation in nearshore areas not typically addressed during maintenance dredging. One sediment core (SC-5), driven to native material if conditions permit, will be collected in the vicinity of Outfall C at the south end of the bulkhead. This core will be processed in the same manner as cores SC-1 through SC-4. A 0 to 10 cm grab (SG-13) will be collected at this same location to characterize shallow sediments in the vicinity of this outfall.

One sediment core to native material (SC-6) will also be collected in close proximity to Outfall A, approximately in line with the north lease area boundary. This core will be processed in the same manner as SC-1 through SC-5. A 0 to 10 cm grab (SG-14) will be collected at this location to characterize the shallow sediments. Four 0 to 10 cm grab samples (SG-15, SG-16, SG-17, and SG-23) will also be collected from nearshore locations north and northwest of Outfall A. These samples will be collected close to the bulkhead and other shore structures, as access permits. The intent is to characterize sediments closest to shore that appear unlikely to have been affected by maintenance dredging. Locations SG-17 and SG-23 are also in the vicinity of one or more historical outfalls.

2.4 SAMPLE STATION LOCATIONS

Sampling station locations for a total of 27 grab samples and 6 cores are shown on Figure 2-1 and summarized in Table 2-1. Analytical data from this reference station will be used for comparison with samples collected from the North Marina study area.

Ecology guidance recommends sampling in sequence from least likely impacted areas to most likely impacted areas. As conditions permit, the proposed sampling sequence is as follows:

- Archive locations SG-24, SG-25, SG-26, and SG-27
- Marine railway locations SG-7, SG-8, SG-18, SG-19, SG-20, SG-21, and SG-22
- Bulkhead locations SG-9, SG-10, SG-11, and SG-12
- Outfall locations SG-1, SG-2, SG-3, SG-4, SG-5, SG-6, SG-13, SG-14, SG-15, SG-16, SG-17, SG-23, SC-1, SC-2, SC-3, SC-4, SC-5, and SC-6

Table 2-1
Sediment Station Coordinates

Station Number	Latitude (Decimal Degrees//Degrees, Minutes, Seconds)	Longitude (Decimal Degrees//Degrees, Minutes, Seconds)	Estimated Water Depth (feet)	Proposed Sample Depth Below Sediment Surface
SC-1	47.99857089//47° 59' 54.855"	-122.21597962//-122° 12' 57.5244"	10	0 ft to native material
SC-2	47.99847026//47° 59' 54.4914"	-122.21598095//-122° 12' 57.528"	10	0 ft to native material
SC-3	47.99855334//47° 59' 54.7908"	-122.21624875//-122° 12' 58.4922"	10	0 ft to native material
SC-4	47.99849846//47° 59' 54.5922"	-122.21624697//-122° 12' 58.485"	10	0 ft to native material
SC-5	47.99760215//47° 59' 51.3672"	-122.21584259//-122° 12' 57.0306"	8	0 ft to native material
SC-6	47.99887052//47° 59' 55.9356"	-122.21587224//-122° 12' 57.1392"	10	0 ft to native material
SG-1	47.99862802//47° 59' 55.0602"	-122.21582072//-122° 12' 56.9514"	6	0 to 10 cm
SG-2	47.99861556//47° 59' 55.017"	-122.21608177//-122° 12' 57.8916"	7	0 to 10 cm
SG-3	47.99857089//47° 59' 54.855"	-122.21597962//-122° 12' 57.5244"	5	0 to 10 cm
SG-4	47.99847026//47° 59' 54.4914"	-122.21598095//-122° 12' 57.528"	10	0 to 10 cm
SG-5	47.99855334//47° 59' 54.7908"	-122.21624875//-122° 12' 58.4922"	10	0 to 10 cm
SG-6	47.99849846//47° 59' 54.5922"	-122.21624697//-122° 12' 58.485"	10	0 to 10 cm
SG-7	47.9985432//47° 59' 54.7542"	-122.21644905//-122° 12' 59.2158"	10	0 to 10 cm
SG-8	47.99848637//47° 59' 54.549"	-122.21644911//-122° 12' 59.2158"	10	0 to 10 cm
SG-9	47.99836003//47° 59' 54.0954"	-122.21582978//-122° 12' 56.9838"	6	0 to 10 cm
SG-10	47.99815299//47° 59' 53.3508"	-122.21583426//-122° 12' 57.0024"	6	0 to 10 cm
SG-11	47.99792963//47° 59' 52.5474"	-122.21582508//-122° 12' 56.9694"	6	0 to 10 cm
SG-12	47.997704//47° 59' 51.7338"	-122.21583138//-122° 12' 56.991"	6	0 to 10 cm
SG-13	47.99760215//47° 59' 51.3672"	-122.21584259//-122° 12' 57.0306"	8	0 to 10 cm
SG-14	47.99887052//47° 59' 55.9356"	-122.21587224//-122° 12' 57.1392"	10	0 to 10 cm
SG-15	47.99891992//47° 59' 56.1114"	-122.21583751//-122° 12' 57.0126"	6	0 to 10 cm
SG-16	47.99903406//47° 59' 56.5224"	-122.21585821//-122° 12' 57.0882"	6	0 to 10 cm
SG-17	47.9990752//47° 59' 56.6694"	-122.21588639//-122° 12' 57.189"	6	0 to 10 cm
SG-18	47.99828475//47° 59' 53.826"	-122.21598996//-122° 12' 57.5598"	10	0 to 10 cm
SG-19	47.99842498//47° 59' 54.3294"	-122.21607026//-122° 12' 57.852"	10	0 to 10 cm
SG-20	47.99841981//47° 59' 54.312"	-122.21634622//-122° 12' 58.8456"	11	0 to 10 cm
SG-21	47.99870872//47° 59' 55.3518"	-122.21609474//-122° 12' 57.9378"	13	0 to 10 cm
SG-22	47.99870619//47° 59' 55.341"	-122.21636486//-122° 12' 58.9098"	14	0 to 10 cm
SG-23	47.99912695//47° 59' 56.8572"	-122.21637193//-122° 12' 58.935"	6	0 to 10 cm
SG-24	47.99829479//47° 59' 53.8614"	-122.21616299//-122° 12' 58.1826"	10	0 to 10 cm
SG-25	47.99848223//47° 59' 54.5352"	-122.21668995//-122° 13' 0.0804	9	0 to 10 cm
SG-26	47.99854237//47° 59' 54.7512"	-122.21669274//-122° 13' 0.0906"	9	0 to 10 cm
SG-27	47.99883367//47° 59' 55.8024"	-122.21644728//-122° 12' 59.2092"	12	0 to 10 cm

Notes:
Coordinates are provided in Degrees, Minutes, and Decimal Seconds to meet Ecology reporting guidance and in Decimal Degrees for internal operational purposes
ft - feet
cm - centimeter

Table 2-2
Sediment Sampling Rationale

Station Number	Station Type	Sampling Rationale
SG-1, SG-2, SG-3, and SG-4	Baseline	Located near the end of historical stormwater outfall 001
SG-5, SG-6, SG-7, and SG-8	Baseline	Offshore along marine railway in sediments likely to be removed once railway is demolished
SG-9	Baseline	Along bulkhead south of railway in location of the former boat wash grid
SG-10, SG-11, and SG-12	Baseline	Along bulkhead south of railway in sediments comparatively unaffected by navigation dredging
SG-13	Baseline	In close proximity to Outfall C, in sediments likely unaffected by navigation dredging
SG-14	Baseline	In close proximity to Outfall A, in sediments likely unaffected by navigation dredging
SG-15 and SG-16	Baseline	In nearshore areas north of Outfall A, in sediments likely unaffected by navigation dredging
SG-17 and SG-23	Baseline	In nearshore areas in proximity to outfalls and travel lift boat haulout
SG-18, SG-19, SG-20, SG-21, and SG-22	Baseline	On periphery of marine railway area, in locations where historical data are insufficient to establish horizontal limits of contamination
SG-24, SG-25, SG-26, and SG-27	Baseline	Contingent samples to be archived for possible subsequent analysis should exceedances be found in periphery of railway area
SC-1 and SC-2	Baseline	Near stormwater outfall 001
SC-3 and SC-4	Baseline	Offshore along marine railway in sediments likely to be removed once railway is demolished
SC-5	Baseline	In close proximity to Outfall C, in sediments likely unaffected by navigation dredging
SC-6	Baseline	In close proximity to Outfall A, in sediments likely unaffected by navigation dredging

3.0 FIELD SAMPLING METHODS

3.1 SAMPLE COLLECTION

Each sample station will be located using a differentially corrected global positioning system (DGPS), with the use of a known survey point. All station coordinates will be reported in the Washington State Plane North Zone coordinate system [North American Datum (NAD) 83]. To ensure accuracy to within +/- 3 meters, the DGPS antenna will be positioned above the winch cable. The depth to bottom will be determined by a fathometer and corrected for tidal elevation.

3.1.1 Shallow Sediments

To minimize the loss of fine grained material during collection in sub tidal environments, marine surface sediments will be collected using a 0.1 m^2 stainless steel van Veen sediment sampler. The sampler will be first lowered to within a couple of meters of the bottom. Once it has been verified the sampling vessel is positioned over the target station, the van Veen sampler will be lowered at a rate of one foot per second until impact with the bottom. The van Veen sampler will be retrieved from the bottom at the same rate.

The grab sampler will be placed on a processing stand and overlying water removed using a siphon tube or suction bulb. The contents of the sampler will then be inspected to ensure that the following acceptability criteria are satisfied:

- The sampler is not over-filled with sample, resulting in the loss of the finer grained surface material. A corrective measure would involve the removal of weights from the grab sampler.
- The overlying water is not excessively turbid (indicating sample disturbance).
- The sediment surface is relatively flat and not eroded due to incomplete closure of the grab sampler caused by obstructions in the jaws.
- The desired penetration depth is achieved (i.e., several centimeters [cm] more than the targeted sample depth of 10 cm). Coarse sands and gravel may limit the penetration depth of the van Veen grab, in which case it may be necessary to add weights to the sampler to achieve the desired penetration. If successive attempts to achieve the desired penetration depth fail, these conditions will be noted in the field log and the recovered sediments will be processed.

Any samples that do not meet these criteria will be discarded.

The collected sediment sample will be carefully inspected and characterized in the field notebook (see Section 3.5). At each station, the upper 10 cm of the sediment are desired for chemical analysis. Unrepresentative material such as woody debris, shells, large biota, fragments, or rocks will be removed from the grab and documented in the field notes. Sediments representing the upper 10 cm will be mechanically mixed in a stainless steel mixing bowl or container in order to achieve more homogeneous and representative samples. The sample crew will ensure that any sediment that comes in contact with the van Veen sampler will be excluded from that portion submitted for chemical analysis. Portions of the homogenized sediments will be placed into clean laboratory supplied sample containers using a stainless steel spoon. Sample containers will be placed into a laboratory supplied cooler containing ice. All unused sediments will be placed in a 55-gallon drum and managed as described in Section 3.6.

3.1.2 Deeper Sediments

Deeper sediments will be collected using vibracores which are hydraulic, pneumatic or electric powered, mechanical vibrators located at the upper end of a coring tube. The vibrating head induces vertical vibrations onto the coring tube to help penetration into the sediment. Depending on the horsepower rating of the vibrating head and its weight, the core tube is capable of penetrations up to 6 meters in compact sediments (U.S. EPA, 2001).

Vibracoring will be performed following the recommended steps.

- Locate the sampling station with an appropriate field positioning system
- Triple anchor the boat or platform to ensure keeping it on station
- Measure the water depth adjusted to the water line.
- Core liners are inserted in the core barrel and held in place by a cutting tip and will contain a core catcher.
- With an electric or hydraulic winch, suspend and lower the vibracorer slowly until the core contacts the bottom. A measuring tape attached to the top shackle of the vibracore is used to calculate the penetration depth.
- Turn on the vibration head and continue penetration until the unit meets refusal or the core tube is fully buried, ensuring the core tube remains vertical.
- Turn off the vibration head.
- Slowly withdraw the core tube by winch, using the vibration only if extraction is difficult.
- Upon reaching the surface, keep the core tube in a vertical position.
- After removing the core catcher, place a plastic cap on the lower end and tape it in place.
- Using a weighed tape, measure the distance from the top of the sediment tube to the surface of the recovered sediment.
- Drill a small hole at the sediment-water interface to drain off all the water above the sample. Cut this section off and place a cap on the top end and tape it in place.
- Label the upper end of the core with date, time, penetration depth, retention amount, recovery, and unique station number. Transfer core ashore to an established processing location or laboratory.
- Protect core from sunlight, heat and physical disturbance as much as possible.

Due to the nature of the sediments, the recovery within the core tube may not be uniform throughout the core sample. Compaction of the sediment core can occur in cohesionless or saturated soils. The friction within the core barrel increases with penetration and the length of the sample present in the core tube. Compaction causes the recovered sediments to be under-represented in the recovered core sample. Field collection of penetration and recovery data allows for the identification of under-represented strata.

If refusal is encountered before reaching 75 percent of the target penetration, the vessel will be repositioned and another attempt made. If refusal is met on the second attempt before reaching 75 percent of the target penetration, the vessel will again be repositioned and a third attempt made. If refusal is met on the third attempt before reaching 75 percent of the target penetration, samples will be prepared from the third core, with sample preparation adapted as necessary.

Once sampling is complete, the vibracore is retrieved and the core liner removed from the core barrel. The core sample will be examined at each end to verify that sufficient sediment was retained for the particular sample. Overlying water will be siphoned from the core tube. If the sample is acceptable, each end of the tube will be capped and sealed with duct tape. Depending on the length of the core, the core sample may be sectioned prior to processing, and each end capped. All core sections will be labeled with the station number, date, time of collection, depth, and directional arrows indicating the top end. The station number, station coordinates, date and time of collection, field crew, and weather conditions will be recorded in the field log. The cores will be stored on ice aboard the vessel until they are processed either on board the boat or onshore.

Core Logging

The sediment core is usually processed at an established shore facility in order to describe its structure and create subsamples for chemical analysis. It is important to document the core content and to maintain sample quality. Prior to inspection of the samples, the unlined core tubes or plastic core liners are cut lengthwise. This is accomplished using electric reciprocating saws for the thick walled tubes and hooked bladed knives for the thin walled plastic liners. However, Lexan plastics are very tough, and cutting with a razor knife can be dangerous and difficult to control without cutting into the core.

Once the upper portion of the core tube cover is removed, a clean knife or spatula should be used to expose an outer portion of the core that was not in contact with the core liner. Care should be taken that the blade is not introducing contaminants into other segments of the recovered core. Prior to describing the core, a moveable light is positioned and a tape measure is positioned for the full length of the core.

The core will then be visually described in the core log including the following characteristics:

- Station number
- Date and time of collection
- Station coordinates
- Weather conditions
- Names of persons collecting and logging the sample
- Sample recovery

- Physical soil description in accordance with the Unified Soil Classification System (USCS)
- Odor (e.g., hydrogen sulfide, petroleum)
- Visual stratifications and lenses
- Vegetation
- Debris
- Biological activity (e.g., detritus, shells, tubes, bioturbation, live or dead organisms)
- Presence of oil sheen
- Photograph information (time, direction of photograph, roll number/frame number). Photographs should overlap previous core sections.
- Any other distinguishing characteristics or features

Core samples are acceptable if the core has penetrated to an acceptable depth and the core was inserted vertically. Interval measurements for sample preparation will be adjusted based on the percent retention.

Collect analytical samples from each core interval, as pre-determined in the SAP, from the undisturbed core interior with a clean, stainless steel spoon or spatula. Place the sediment from an individual core interval will be placed into a clean stainless steel mixing bowl. The sediment will be mixed with a clean stainless steel spoon thoroughly or until visually homogeneous.

3.2 DECONTAMINATION

Prior to collection of sediments at each sampling station, the van Veen grab sampler and other sampling equipment will be decontaminated. The grab sampler will be washed with ambient seawater to remove attached sediments. At each sample station the grab sampler will be washed with laboratory grade detergent (Alconox) and rinsed with distilled water prior to sampling. If repeated grabs are required to obtain sufficient sample volume, the sampling vessel will relocate downcurrent of the station so attached sediments can be removed from the sampler by repeated dips in ambient seawater. The grab sampler will be rinsed using ambient seawater only when repeated grabs occur at the same station.

3.3 HOMOGENIZING SEDIMENT SAMPLES

Sediment aliquots to be analyzed for volatile organic compounds (VOCs) should be collected from the desired grab sample or core horizon and placed in the appropriate sample collection container prior to homogenizing the sediment sample.

The general approach for sample homogenizing is as follows:

1. Collect aliquot for volatiles analysis.
2. Place each 1-foot core segment or grab sample in a decontaminated stainless steel bucket.
3. Homogenize the sediment thoroughly using a mechanical mixer such as a portable drill with paint stirrer until the sediment color and texture are as uniform as possible.

4. Transfer the homogenized sediment to containers appropriate for the desired analysis.

3.4 DOCUMENTATION

All field activities will be documented in a project-dedicated bound field logbook and on field forms. Complete documentation of sample collection and handling will be maintained by URS in the master job file. Specific records to be kept include sample collection forms, chain-of-custody (COC) forms, sediment logs, and analysis request forms. General information typically recorded in the field log book will include:

- Sampling personnel
- Initial and changing weather information
- Sampling vessel and crew names
- Times of events such as leaving and returning to the dock, arrival at stations, sample collection times, phone conversations related to the project, problems encountered
- Sample identification numbers
- A listing of sample analyses and container types
- List of project contacts, shipping address, and phone numbers
- Station name, DGPS coordinates, and water depth
- Date and time
- Gear type and grab number
- Penetration depth (cm) of the grab sampler into the sediment.
- Core sampler penetration depth and recovered interval thickness
- Degree of leakage or sediment surface disturbance
- A description of the sediment texture using the Unified Soil Classification System
- Sediment color using a Munsell color chart
- Sediment texture (i.e. very soft, soft, firm, very firm)
- Biological organisms visually present
- Wood, shell, rock, and anthropogenic material observed
- Sediment stratifications, redox layers
- Presence and types of odors or sheens

If multiple grabs are required at a station in order to obtain sufficient sample volume, additional physical sediment descriptions will not be required after the first grab, provided similar sediment characteristics are encountered. If different characteristics are noted in multiple grabs from the same station, they will be documented in the field log.

3.5 LABELING

Labels will be attached to the outside of all sample containers prior to collection of the samples. The following information will be indicated on each sample label with a waterproof marker:

- sampling identification
- project name
- laboratory name
- date and time, initials of sampler
- analysis to be performed; and preservatives used (if any).

Clear tape will be placed around the jar and label to ensure secure label attachment. Sediment sample labels will consist of site name, specific sampling location (e.g., SC or SG, for sediment core or sediment grab, respectively), and, in the case of cores, depth; e.g., sample SC-7-4 would be a sample from a depth of 4 feet from Sediment Core 7.

3.6 DISPOSAL OF CONTAMINATED SEDIMENTS

If the investigation generates waste sediment, this material will be stored in labeled, United Nations-approved, 55-gallon drums at a designated location on the Site until analytical results have been received allowing material to be profiled for disposal.

Uncontaminated disposable personal protective equipment (PPE) will consist primarily of nitrile gloves at a rate of three to eight pairs per day per person. Miscellaneous solid wastes consist of paper, plastic wrappers, aluminum cans, and other miscellaneous types of debris. Total volume is expected to be one large plastic bag per day, which will be disposed of in municipal waste containers. Highly contaminated PPE, if generated, will be managed as a dangerous waste, if appropriate.

4.0 SAMPLE HANDLING PROCEDURES

If a permanent modification of an approved sampling protocol is necessary, the modification will be included in this document. Temporary modifications in response to non-typical field conditions or equipment malfunction shall be recorded in the field log and field forms. The URS Project Manager will be notified of the modification by telephone. The URS Project Manager will notify the ESY and Ecology Project Managers of the modification. Depending on the nature of the modification, a decision will be made whether to resample at the location where the modification occurred.

Sample containers, preservatives, and holding times will be appropriate for the type of sample collected and the analytical method to be used as outlined in the QAPP and summarized in Tables 4-1 and 4-2. Maximum sample holding times will be strictly adhered to.

4.1 CUSTODY AND STORAGE

After placement of the sample in the associated sample container, a signed and dated custody seal will be placed across the lid. Each sample container will be placed in a bubble wrap pouch and then in a cooler containing bagged ice and a temperature blank. The samples will be maintained at a temperature of 4ºC ± 2ºC. A Chain of Custody (COC) form will be completed for samples in each cooler before being sent to the laboratory. The COC form will list the project name, the sample numbers, individual collection dates and times, sample matrix type, requested analysis, the name of the relinquishing sampler, the laboratory name, laboratory contract number, and the URS point of contact. Prior to delivery of the samples to the laboratory, the COC will be signed and dated with the appropriate carbon copies placed in the cooler and the remaining carbon copy retained by the field sampling personnel. Copies of the COC will be placed in a Ziploc bag and taped to the inside of each cooler cover. Signed and dated custody seals will be placed on all four sides of each sample cooler lid.

A sample is under an individual's custody if one or more of the following criteria are met:

- it is in the sampler's possession
- it is in the sampler's view after being in possession
- it is in the sampler's possession and secured to prevent tampering
- it is in a secure location (e.g., locked room, locked vehicle, etc.)

Strict COC procedures will be adhered to in order to maximize sample integrity and accountability. These procedures are detailed in Section 4.

4.1.1 Field Custody Procedures

A limited number of people will handle the samples. The sampler will be personally responsible for completion of the COC Form and the care and custody of collected samples until they are transferred to another person.

4.1.2 Transfer of Custody

When samples transfer possession, the individuals relinquishing and receiving the samples will sign the COC Form and document the date and time of transfer. The sample collector will sign the form in the first signature space. The sample receiver will then sign the form in the second signature space.

4.1.3 Laboratory Custody Procedures

A designated sample custodian in the laboratory will accept custody of the samples. The custodian will verify that the sample identification numbers match those on the chain-of-custody record. The laboratory will maintain sample security and custody as appropriate.

4.2 DELIVERY OF SAMPLES TO ANALYTICAL LABORATORY

The samples will either be hand delivered to the laboratory by sampling personnel or shipped by Federal Express.

Upon receipt at the laboratory, the custody seals will be broken by laboratory personnel, the condition of the samples noted and recorded, and the COC signed by laboratory personnel. Storage temperature and maximum holding time will be determined based on the analyses to be performed. The holding time and conditions of the samples will be reported along with the test results. Section 5 presents the sample holding times for the chemical analysis to be performed. Table 4-1 lists the maximum holding times for the physical/chemical analyses.

5.0 LABORATORY ANALYTICAL METHODS

5.1 CHEMICAL ANALYSES

A summary of the chemical parameters to be tested, analytical methods, container sizes and types, and sample holding times is presented in Table 5-1. Where phased analyses are planned or archived samples are proposed, mercury will be analyzed initially to meet the holding time. Pre-cleaned sample containers with preservative as required, will be obtained from the laboratory performing the chemical analysis. Quality control samples will be collected during the field-sampling program as outlined in the QAPP (see Appendix G of the RI/FS Work Plan).

The chemical parameters to be investigated include those that have been assigned numerical criteria in the SMS. Analytical methods, the list of analytes and practical quantitation limits for chemical testing of sediments are summarized in Appendix G of the RI/FS Work Plan. Grain size will follow PSEP methods.

Samples submitted to the laboratory will have an estimated 30-day turn around time for reporting the analytical results. Analytical Resources Inc. (ARI), an Ecology-accredited laboratory, has been selected to perform the chemical analyses for this project.

5.2 CORRECTIVE ACTIONS

5.2.1 Actions to Achieve Practical Quantitation Limits

Reasonable adjustments to sample volume used for analysis will be made to account for total solids content and total organic carbon (TOC) in an effort to achieve the SQS criteria. However, low TOC levels (0.1% to 0.3%) have been observed in Puget Sound sediments such that an increase in sample volume used for analysis may not achieve the criteria due to other factors such as matrix interferences that can't be overcome through cleanups due to the sample volume used. The TOC-normalized laboratory reporting limits for several compounds may exceed SQS criteria if TOC content in sediments is very low (0.1% to 0.3%); therefore, the results will also be reported on a dry weight basis and compared to the dry weight analogs of the SMS criteria.

Analyses will target the Practical Quantitation Limits (PQLs) in Table 5 of the Sediment Sampling Plan Appendix (SAPA, Ecology 2008). The pertinent portions of that table are reproduced here as Attachment A-1. In the event that the laboratory reporting limits exceed SQS criteria, every effort will be made by the laboratory to resolve the cause of the exceedance and achieve the requested criteria. The laboratory will immediately contact the URS project chemist regarding the circumstances and options to resolve the reporting limit exceedances. These efforts may include extracting additional sample volume and performing additional cleanup procedures. The laboratory method detection limits (MDLs) will meet the SQS criteria even with correction for anticipated low TOC. If low TOC results impact the ability to clearly assess if chemical concentrations are above or below SQS criteria, the data for these compounds will be reviewed based on the MDL and a determination will be made as to whether it is appropriate to report an estimated value between the MDL and the RL if it appears the compound is present or to report as not detected at the MDL if it is not present.

5.2.2 Other Corrective Actions

Other corrective actions are summarized in tables from the SAPA that are included as attachments to Section 6 below.

Table 5-1
Chemical Parameters and Methods

Parameter	Analytical Method	Container Type	Preservation Requirements	Extraction Holding Time	Analysis Holding Time
VOCs	EPA SW846 8260B	2 oz Wide-Mouth Glass (No Headspace)	Cool to 4°C	NA	14 Days*
SVOCs	EPA SW846 8270D/8270-SIM	32 oz Wide-Mouth Glass	Cool to 4°C	14 Days	40 Days*
			Freeze to -18°C	NA	1 Year
PCBs	EPA SW846 8082A	32 oz Wide-Mouth Glass	Cool to 4°C	14 Days	40 Days*
			Freeze to -18°C	NA	1 Year
Pesticides	EPA SW846 8081A	32 oz Wide-Mouth Glass	Cool to 4°C	14 Days	40 Days*
			Freeze to -18°C	NA	1 Year
Organotin Compounds	PSEP/Krone 1988	8 oz Wide-Mouth Glass bulk and 2 32 oz Wide-Mouth Glass (porewater)	Cool to 4ºC	NA	14 days
			Freeze to -18°C	NA	1 Year
Total Metals**	EPA SW846 6010B/7471A	16 oz Wide-Mouth Glass	Cool to 4°C	NA	6 Months (28 days for Mercury)
			Freeze to -18°C	NA	2 Years***
Nitrogen as Ammonia	EPA SW846 350.1	16 oz Wide-Mouth Glass	Cool to 4°C	NA	7 Days
Total Organic Carbon (TOC)	Plumb, 1981	16 oz Wide-Mouth Glass	Cool to 4°C	NA	28 Days
Total Solids	PSEP Method (1986a)	16 oz Wide-Mouth Glass	Cool to 4°C	NA	7 Days
			Freeze to -18°C	NA	6 Months
Total Volatile Solids	EPA 160.4 2540 B, E	16 oz Wide-Mouth Glass	Cool to 4°C	NA	7 Days
Total Sulfides	PSEP Method (1986a)	16 oz Wide-Mouth Glass	Cool to 4°C	NA	7 Days
Grain Size	PSEP Method (1986a)	16 oz Wide-Mouth Plastic or Glass	Cool to 4°C	NA	6 Months

* - Days from extraction date

** Total metals include arsenic, cadmium, chromium, copper, lead, silver and zinc by EPA Method 6010B and mercury by EPA Method 7471A.

*** Mercury samples can be frozen for 28 days. Where phased analyses are planned or archived samples are proposed, mercury will be analyzed initially to meet the holding time.

Table 5-2
Environmental and Quality Control Sample Quantities for Marine Sediment Analyses

Analyses	**Analytical Method**	**Environmental Samples**	**Field Duplicates**	**Matrix QC***	**Field Blanks****	**Total Samples**
Total Metals	EPA SW846 6010B/7471A	30	2	2/2+2	3	41
VOCs	EPA SW846 8260B	30	2	2/2+2	6	44
SVOCs	EPA SW846 8270D/8270-SIM	30	2	2/2+2	3	41
Pesticides	EPA SW846 8081A	30	2	2/2+2	3	41
PCBs	EPA SW846 8082	30	2	2/2+2	3	41
Grain Size	PSEP Method (1986a)	30	2	0	0	32
TOC	Plumb, 1981	30	2	0	0	32
Ammonia	Plumb, 1981-modified	30	2	0	0	32
Total sulfides	EPA SW846 9030B	30	2	0	0	32
Total Solids	PSEP Method (1986a)	30	2	0	0	32
Total Volatile Solids (TVS)	EPA 160.4 2540 B, E	30	2	0	0	32
Tribultyltin (bulk)	Method PSEP/Krone 1988	30	2	2/2+2	3	41
Tributyltin (porewater)	Method PSEP/Krone 1988	24	2	2/2+2	3	35

* Matrix QC – MS/MSD and/or laboratory duplicate analyses.
** Field blanks include equipment rinsate and trip blanks (VOC analysis only)

6.0 QUALITY ASSURANCE AND QUALITY CONTROL REQUIREMENTS

6.1 QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES

Attention to laboratory quality assurance and quality control (QA/QC) procedures increases the likelihood that data of high quality are collected. A key factor in obtaining high quality data is regular communication between the project QA/QC manager and the laboratory performing the analyses. The laboratory will alert the project QA/QC manager in timely fashion to any difficulty in achieving project-specific requirements and discuss potential corrective actions. Attachments A-2 through A-5 summarize QC procedures pertinent to analyses of sediments for organic compounds, metals, conventional sediment variables, and biological analyses, respectively. These tables are reproduced from the SAPA (Ecology 2008).

The overall QA/QC procedures for the RI/FS as a whole are presented in a separate Quality Assurance Project Plan (QAPP) included as Appendix G of the RI/FS Work Plan. The QAPP will be implemented to ensure that data obtained from the chemical analyses are representative of the field conditions, valid, and accurately reported.

6.2 DATA QUALITY ASSURANCE REVIEW

The laboratory will provide a complete data package including summarized sample results and quality assurance/quality control results as well as raw data. The analytical data will be reviewed by a URS chemist for correctness and compliance with analytical methods and project requirements. Data found to be unreliable or incomplete will be returned to the laboratory for correction of the errors. In the event that laboratory control limits are not met, data qualifiers will be assigned as needed using guidance from EPA National Functional Guidelines (US EPA 1999 and 2004). Data qualifiers will be shown on the data tables and documented in a data review report. Qualifiers that may be assigned to sample results include:

- U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
- J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
- R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.
- DNR – Do Not Report. Another result is available that is more appropriate or reliable.

7.0 DATA ANALYSIS, RECORD KEEPING AND REPORTING REQUIREMENTS

7.1 ANALYSIS AND INTERPRETATION OF DATA

For comparison purposes, the analytical data will be presented alongside the preliminary cleanup levels, as described in Work Plan Section 6.2.3. Data will be presented in both dry-weight and TOC-normalized units, where applicable. Chemicals that are not detected in the lab analysis will be reported as “undetected”. Undetected results will be presented as the numeric detection limit for the sample, followed by a “U” qualifier. In the event that results are reported between the MDL and the RL, the result will be considered an estimate and the result will be flagged with a “J” qualifier. Any data that exceed the chemical criteria will be highlighted in the data tables using bold text and highlighting to note the distinction between SQS and CSL exceedances.

7.2 RECORD KEEPING AND REPORTING PROCEDURES

The sediment data will be included in the draft RI/FS Report prepared for ESY and submitted to Ecology as specified in the SAPA (Ecology, 2008). The report will summarize the field activities, including deviations, station coordinates, and analytical data. The data tables will include a comparison to SMS criteria and a table prepared comparing dry weight-normalized data to the dry weight equivalents to the SMS criteria. The sample, field duplicate, and rinsate blank results will be summarized in data tables. In addition to the written report and data tables, all data will be submitted to Ecology in electronic format (Excel.xls and EIM). Furthermore, the records, reports, documents, and underlying data will be retained for ten (10) years from the date of completion of the work performed pursuant to the Agreed Order No. DE 5271.

8.0 HEALTH AND SAFETY PLAN

The HSP was prepared in compliance with Federal health and safety regulations set forth in 29 CFR 1910 and 1926, and WAC 173-340-820. The HSP is included as Appendix A of the RI/FS Work Plan.

9.0 PROJECT SCHEDULE

The schedule for the Everett Shipyard RI/FS is presented in the RI/FS Work Plan. It is anticipated that the sediment sampling will be completed during fall 2008.

10.0 PROJECT PERSONNEL AND RESPONSIBILITIES

The project personnel and responsibilities are described in the RI/FS Work Plan and in the QAPP. It is essential that all individuals have defined responsibilities for their functional areas and that they are clearly aware of the entire project organization and the interrelationships of various roles.

Project responsibilities are briefly summarized here.

- ESY is responsible for establishing the objectives for the project, coordinating with regulatory agencies and the Port of Everett, and acquiring permits. ESY will monitor progress through communications with the URS Project Manager. They have the authority to modify the delivery order to address changing project requirements or unforeseen circumstances, if such modifications are deemed necessary to achieve the project objectives.
- The URS Project Manager has overall responsibility for project activities and progress. The URS Project Manager is responsible for planning, scheduling, cost control, and completion of project tasks. He also has overall responsibility for overseeing the development and implementation of all parts of the SAP, monitoring the quality of the technical and managerial aspects of the project, interfacing with ESY, and ensuring the timeliness of all project deliverables.
- The URS QA/QC Officers will provide senior review to ensure the SAP meets the project QA objectives. They will work directly with project personnel, be notified if problems occur, and approve changes to the SAP if such changes are warranted. In the event that changes are needed, the appropriate URS QA/QC Officer will notify the URS Project Manager, who will discuss the proposed changes with the ESY Project Manager and Ecology prior to implementing those changes. Changes in the SAP will not be made without prior approval from the ESY Project Manager unless conditions require immediate response in the field or laboratory.
- The URS Project Chemist will be the daily manager for analytical chemistry. She will provide oversight of field analysis and the analytical laboratory and will direct the desk-top review and validation of chemical data. She will work closely with the URS Project Manager, the URS Field Investigation Manager, and the analytical laboratory.
- The URS Project Health and Safety Manager will work directly with the URS Project Manager and field staff. He has the responsibility for monitoring and verifying that the work is performed in accordance with the HSP. The URS Project Health and Safety Manager will advise the URS Project Manager regarding health and safety issues, but will function independently.
- The URS Field Manager is responsible for the overall performance of the field operations, including adherence to the SAP and HSP, scheduling, sample logging and custody. The Field Manager will also be the Site Safety Officer for this project. He has the responsibility to monitor and verify that field operations are conducted in accordance with the SWP.

- The marine sampling services subcontractor is responsible for providing equipment and personnel appropriately trained and skilled to perform the sediment sampling activities according to the SAP. The marine sampling subcontractor will operate under the immediate direction of the URS Field Manager.
- The analytical laboratory (e.g., Analytical Resources, Inc. [ARI], Tukwila, Washington) is responsible for performing all chemical analyses for the project according to the specifications established in the SAP. The laboratory will coordinate closely with the URS Project Manager, URS QA/QC Officer, URS Project Chemist, and the URS Field Manager. The analytical laboratory will be subcontracted by and under the direction of URS.

Table 10-1
Project Contacts

Key Role	Name	Telephone
Everett Shipyard		
CEO	Nick Eitel	(425) 259-0137
URS Corporation		
URS Project Manager	James Flynn L.G.	(206) 438-2113
URS Marine Sediment Investigation Manager	Paul Johanson P.E.	(206) 438-2164
URS Quality Assurance Officer	David Raubvogel	(206) 438-2284
Project Chemist	Jen Garner	(206) 438-2063
URS Health and Safety Representative	Jennifer Allen	(206) 438-2120
URS Field Manager	Geoff Garrison	(206) 438-2128
Laboratory Services-Analytical Resources Inc.		
Contract Administrator and Quality Assurance	Kelly Bottem	(206) 695-6210

11.0 REFERENCES

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Attachment A

Sample Preparation, Practical Quantitation Limits, and Quality Control Procedures

Attachment A-1: Excerpted from SAPA TABLE 5. RECOMMENDED SAMPLE PREPARATION METHODS, CLEANUP METHODS, ANALYTICAL METHODS, AND PRACTICAL QUANTITATION LIMITS FOR SEDIMENTS

Chemical	Recommended Sample Preparation Methods[a]	Recommended Sample Cleanup Methods[b]	Recommended Analytical Methods[c]	Recommended Practical Quantitation Limits[d,e]
Metals				**(mg/kg dry weight)**
Antimony	PSEP/3050B	--	6010B/6020/B7041	50
Arsenic	PSEP/3050B	--	6010B/6020/7061A	19
Cadmium	PSEP/3050B	--	6010B/6020/7131A	1.7
Chromium	PSEP/3050B	--	6010B/6020/7191	87
Copper	PSEP/3050B	--	6010B/6020	130
Lead	PSEP/3050B	--	6010B/6020	150
Mercury	--[f]	--	7471A/245.5	0.14
Nickel	PSEP/3050B		6010B/6020	47
Silver	PSEP/3050B	--	6010B/6020	2
Zinc	PSEP/3050B	--	6010B/6020	137
Nonionizable Organic Compounds				**(µg/kg dry weight or as listed)**
LPAH Compounds				
Naphthalene	3540C/3550B/3545	3640A/3660B	8270C/1625C	700
Acenaphthylene	3540C/3550B/3545	3640A/3660B	8270C/1625C	433
Acenaphthene	3540C/3550B/3545	3640A/3660B	8270C/1625C	167
Fluorene	3540C/3550B/3545	3640A/3660B	8270C/1625C	180
Phenanthrene	3540C/3550B/3545	3640A/3660B	8270/1625C	500
Anthracene	3540C/3550B/3545	3640A/3660B	8270C/1625C	320
2-Methylnaphthalene	3540C/3550B/3545	3640A/3660B	8270C/1625C	223
HPAH Compounds				
Fluoranthene	3540C/3550B/3545	3640A/3660B	8270C/1625C	567
Pyrene	3540C/3550B/3545	3640A/3660B	8270C/1625C	867
Benz[a]anthracene	3540C/3550B/3545	3640A/3660B	8270C[h]/1625C	433
Chrysene	3540C/3550B/3545	3640A/3660B	8270C[h]/1625C	467
Total benzo fluoranthenes[g]	3540C/3550B/3545	3640A/3660B	8270[h]/1625C	1067
Benzo[a]pyrene	3540C/3550B/3545	3640A/3660B	8270C[h]/1625C	533
Indeno[1,2,3-cd]pyrene	3540C/3550B/3545	3640A/3660B	8270C[h]/1625C	200
Dibenz[a,h]anthracene	3540C/3550B/3545	3640A/3660B	8270C[h]/1625C	77
Benzo[ghi]perylene	3540C/3550B/3545	3640A/3660B	8270C/1625C	223
Chlorinated Benzenes				
1,2-Dichlorobenzene	3540C/3550B/3545	3640A/3660B	8270C[h]/1625C	35
1,3-Dichlorobenzene	3540C/3550B/3545	3640A/3660B	8270C[h]/1625C	57
1,4-Dichlorobenzene	3540C/3550B/3545	3640A/3660B	8270C[h]/1625C	37
1,2,4-Trichloro benzene	3540C/3550B/3545	3640A/3660B	8270C/[h]/1625C	31
Hexachlorobenzene	3540C/3550B/3545	3640A/3660B	8270C[h]/1625C	22
Phthalate Esters				
Dimethyl phthalate	3540C/3550B/3545	3640A/3660B	8270C/1625C	24
Diethyl phthalate	3540C/3550B/3545	3640/A3660B	8270C/1625C	67
Di-n-butyl phthalate	3540C/3550B/3545	3640A/3660B	8270C/1625C	467
Butyl benzyl phthalate	3540C/3550B/3545	3640A/3660B	8270C/1625C	21

Chemical	**Recommended Sample Preparation Methods**[a]	**Recommended Sample Cleanup Methods**[b]	**Recommended Analytical Methods**[c]	**Recommended Practical Quantitation Limits**[d,e]
Bis[2-ethylhexyl] phthalate	3540C/3550B/3545	3640A/3660B	8270C/1625C	433
Di-n-octyl phthalate	3540C/3550B/3545	3640A/3660B	8270C/1625C	2067
Miscellaneous Extractable Compounds				**(µg/kg dry weight or as listed)**
Dibenzofuran	3540C/3550B/3545	3640A/3660B	8270C/1625C	180
Hexachlorobutadiene	3540C/3550B/3545	3640A/3660B	8270C/1625C	11
Hexachloroethane	3540C/3550B/3545	3640A/3660B	8270C/1625C	47
N-nitroso diphenylamine	3540C/3550B/3545	3640A/3660B	8270C/1625C	28
PCBs				
PCB Aroclors®	3540/3550	3620B/3640A/3660B	8082	6
Volatile Organic Compounds				
Ethylbenzene	--[i]	--	8260B/1624C	3.2
Tetrachloroethene	--[i]	--	8260B/1624C	3.2
Total xylene	--[i]	--	8260B/1624C	3.2
Trichloroethene	--[i]	--	8260B/1624C	3.2
Ionizable Organic Compounds				
Phenol	3540C/3550B/3545	3640A/3660B	8270C/1625C	140
2-Methylphenol	3540C/3550B/3545	3640A/3660B	8270C/1625C	63
4-Methylphenol	3540C/3550B/3545	3640A/3660B	8270C/1625C	223
2,4-Dimethylphenol	3540C/3550B/3545	3640A/3660B	8270C/1625C	29
Pentachlorophenol	3540C/3550B/3545	3640A/3660B	8270C/1625C	120
Benzyl alcohol	3540C/3550B/3545	3640A/3660B	8270C/1625C	57
Benzoic acid	3540C/3550B/3545	3640A/3660B	8270C/1625C	217
Conventional Sediment Variables				
Ammonia	--[j]	--	Plumb (1981)	100 mg/L
Grain size	--[j]	--	Plumb (1981)	1%
Total solids	--[j]	--	PSEP	0.1% (wet wt)
Total organic carbon (TOC)	--[j]	--	9060	0.1%
Total sulfides	--[j]	--	Plumb (1981)/ 9030B	10 (mg/kg)
Acid Volatile Sulfides			AVS (U.S. EPA 1991)	10 (mg/kg)
Site Specific Compounds				**(µg/kg dry weight or as listed)**
Ammonia	--[j]	--	See above	100
Organotin complexes			Bulk sediment: Krone (1989);	1 - 5
			Interstitial water: Krone (1989) extraction, performance based analysis	3 - 5 ug/L
Petroleum compounds (e.g., benzene, toluene, ethylbenzene, xylene)	--	--	8021**B**/8260B/1624C	50
Total petroleum hydrocarbons	--	--	8440 Ecology method - pub. 97-602 (1997)	20 mg/kg (gasoline), 50 mg/kg (#2 diesel), 100 mg/kg (lmotor oil) based on 100% solids

Notes:
AVS - acid volatile sulfide
EPA - U.S. Environmental Protection Agency
GPC - gel permeation chromatography
HPAH - high molecular weight polycyclic aromatic hydrocarbon
LPAH - low molecular weight polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl
PSEP - Puget Sound Estuary Program
TOC - total organic carbon

[a] Recommended sample preparation methods are:
PSEP (1997a)
Method 3050B and 3500 series - sample preparation methods from SW-846 (U.S. EPA 1996) and subjected to changes by EPA updates.

[b] Recommended sample cleanup methods are:
Sample extracts subjected to GPC cleanup follow the procedures specified by EPA SW-846 Method 3640A. Special care should be used during GPC to minimize loss of analytes.
If sulfur is present in the samples (as is common in most marine sediments), cleanup procedures specified by EPA SW-846 Method 3660B should be used.
All PCB extracts should be subjected to sulfuric acid/permanganate cleanup as specified by EPA SW-846 Method 3665A.
Additional cleanup procedures may be necessary on a sample-by-sample basis. Alternative cleanup procedures are described in PSEP (1997b) and U.S. EPA (1986).

[c] Recommended analytical methods are:
Method 6000, 7000, 8000, and 9000 series - analytical methods from SW-846 (U.S. EPA 1986) and updates
The SW-846 and updates are available from the web site at:
http://www.epa.gov/epaoswer/hazwaste/test/sw846.htm

Method 1613 - analytical method from U.S. EPA-821/B-94-005 (1994)
Method 1624C/1625C - isotope dilution method (U.S. EPA 1989)
NCASI – analytical methods from the National Council for Air and Stream Improvement, Inc.
Plumb (1981) - U.S. EPA/U.S. Army Corps of Engineers Technical Report EPA/CE-81-1
PSEP (1986a)
Acid volatile sulfide method for sediment (U.S. EPA 1991).
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To achieve the recommended practical quantitation limits for organic compounds, it may be necessary to use a larger sample size approximately 100 g), a smaller final extract volume for gas chromatography/mass spectrometry analyses (0.5 mL), and one of the recommended sample cleanup methods as necessary to reduce interference, using different analytical methods with better sensitivity. Detection limits are on a dry-weight basis unless otherwise indicated. For sediment samples with low TOC, it may be necessary to achieve even lower detection limits for certain analytes in order to compare the TOC-normalized concentrations with applicable numerical criteria (see Table 1).

[e] The recommended practical quantitation limits are based on a value equal to one third of the 1988 dry weight lowest apparent effects threshold value (LAET, Barrick et al 1988) except for the following chemicals: 1,2-dichlorobenzene, 1,2,4-trichlorobenzene, hexachlorobenzene, hexachlorobutadiene, n-nitrosodiphenylamine, 2-methylphenol, 2,4-dimethylphenol, and benzyl alcohol, for which the recommended maximum detection limit is equal to the full value of the 1988 dry weight LAET.

[f] The sample digestion method for mercury is described in the analytical method (Method 7471A, September 1994).

[g] Total benzofluoranthenes represent the sum of the b, j, and k isomers.

[h] Selected ion monitoring may improve the sensitivity of method 8270C and is recommended in cases when detection limits must be lowered to human health criteria levels or when TOC levels elevate detection limits above ecological criteria levels. See PSEP organics chapter, appendix B–Guidance for Selected Ion Monitoring (1997b).

[i] Sample preparation methods for volatile organic compound analyses are described in the analytical methods.

[j] Sample preparation methods for sediment conventional analyses are described in the analytical methods.

Attachment A-2: SAPA TABLE 11. QUALITY CONTROL PROCEDURES FOR ORGANIC ANALYSES

Quality Control Procedure	Frequency	Control Limit	Corrective Action
Instrument Quality Assurance/Quality Control			
Initial Calibration[a]	See reference method(s) in Table 5	See reference method(s) in Table 5	Laboratory to recalibrate and reanalyze affected samples
Continuing Calibration[a]	See reference method(s) in Table 5	See reference method(s) in Table 5	Laboratory to recalibrate if correlation coefficient or response factor does not meet method requirements
Method Quality Assurance/Quality Control			
Holding Times[ab]	Not applicable	See Table 10	Qualify data or collect fresh samples in cases of extreme holding time or temperature exceedance
Detection Limits[ab]	Annually	See Table 5	Laboratory must initiate corrective actions (which may include additional cleanup steps as well as other measures, see Table 5) and contact the QA/QC coordinator and/or project manager immediately.
Method Blanks[ab]	One per sample batch or every 20 samples, whichever is more frequent, or when there is a change in reagents	Analyte concentration < PQL	Laboratory to eliminate or greatly reduce laboratory contamination due to glassware or reagents or analytical system; reanalyze affected samples
Analytical (Laboratory) Replicates[ab] and Matrix Spike Duplicates[ab]	1 duplicate analysis with every sample batch or every 20 samples, whichever is more frequent; Use analytical replicates when samples are expected to contain target analytes. Use matrix spike duplicates when samples are not expected to contain target analytes	Compound and matrix specific RPD ≤ 35 % applied when the analyte concentration is > PQL	Laboratory to redigest and reanalyze samples if analytical problems suspected, or to qualify the data if sample homogeneity problems suspected and the project manager consulted
Matrix Spikes[ab]	One per sample batch or every 20 samples, whichever is more frequent; spiked with the same analytes at the same concentration as the LCS	Compound and matrix specific	Matrix interferences should be assessed and explained in case narrative accompanying the data package.
Surrogate Spikes[ab]	Added to every organics sample as specified in analytical protocol	Compound specific	Follow corrective actions specified in SW-846.
Laboratory Control Samples (LCS), Certified or Standard Reference Material[ab]	One per analytical batch or every 20 samples, whichever is more frequent	Compound specific, recovery and relative standard deviation for repeated analyses should not exceed the control limits specified in the method of Table 5 or performance based intralaboratory control limits, whichever is lower	Laboratory to correct problem to verify the analysis can be performed in a clean matrix with acceptable precision and recovery; then reanalyze affected samples

Field Quality Assurance/Quality Control			
Field Replicates	At project manager's discretion	Not applicable	Not applicable
Field Blanks	At project manager's discretion	Analyte concentration ≤ PQL	Compare to method blank results to rule out laboratory contamination; modify sample collection and equip-ment decontamination procedures

Notes:

CLP - Contract Laboratory Program (EPA)
COV - coefficient of variation
EPA - U.S. Environmental Protection Agency
PCB - polychlorinated biphenyl
PQL - practical quantitation limit
RPD - relative percent difference
RSD - relative standard deviation
SVOC - semivolatile organic compound
VOC - volatile organic compound

[a] Subject to QA2 review
[b] Subject to QA1 review

Attachment A-3: SAPA TABLE 12. QUALITY CONTROL PROCEDURES FOR METAL ANALYSES

Quality Control Procedure	Frequency	Control Limit	Corrective Action
Instrument Quality Assurance/Quality Control			
Initial Calibration [a]	Daily	Correlation coefficient ≥0.995	Laboratory to optimize and recalibrate the instrument and reanalyze any affected samples
Initial Calibration Verification [a]	Immediately after initial calibration	90–110 % recovery for ICP-AES, ICP-MS and GFAA (80–120 % for mercury), or performance based intralaboratory control limits, whichever is lower	Laboratory to resolve discrepancy prior to sample analysis
Continuing Calibration Verification [a]	After every 10 samples or every 2 hours, whichever is more frequent, and after the last sample	90–110 % recovery for ICP-AES and GFAA, 85-115 % for ICP-MS (80–120 % for mercury)	Laboratory to recalibrate and reanalyze affected samples
Initial and Continuing Calibration Blanks [a]	Immediately after initial calibration, then 10 percent of samples or every 2 hours, whichever is more frequent, and after the last sample	Analyte concentration < PQL	Laboratory to recalibrate and reanalyze affected samples
ICP Interelement Interference Check Samples [a]	At the beginning and end of each analytical sequence or twice per 8 hour shift, whichever is more frequent	80–120 percent of the true value	Laboratory to correct probl-em, recalibrate, and reana-lyze affected samples
Method Quality Assurance/Quality Control			
Holding Times [ab]	Not applicable	See Table 10	Qualify data or collect fresh samples
Detection Limits [ab]	Not applicable	See Table 5	Laboratory must initiate corrective actions and contact the QA/QC coordinator and/or the project manager immediately
Method Blanks [ab]	With every sample batch or every 20 samples, whichever is more frequent	Analyte concentration ≤ PQL	Laboratory to redigest and reanalyze samples with analyte concentrations < 10 times the highest method blank
Analytical (Laboratory) Replicates [ab] and Matrix Spike Duplicates [ab]	1 duplicate analysis with every sample batch or every 20 samples, whichever is more frequent; Use analytical replicates when samples are expected to contain target analytes. Use matrix spike replicates when samples are not expected to contain target analytes	RPD ≤ 20 % applied when the analyte concentration is > PQL	Laboratory to redigest and reanalyze samples if analytical problems suspected, or to qualify the data if sample homogeneity problems suspected and the project manager consulted
Matrix Spikes [ab]	With every sample batch or every 20 samples, whichever is more frequent	75–125 % recovery applied when the sample concentration is < 4 times the spiked concentration for a particular analyte	Laboratory may be able to correct or minimize problem; or qualify and accept data
Laboratory Control Samples, Certified	Overall frequency of 5 percent of field	80– 20 % recovery, or performance based	Laboratory to correct problem to verify the analysis can be performed in

Quality Control Procedure	**Frequency**	**Control Limit**	**Corrective Action**
or Standard Reference Material [a][b]	samples	intralaboratory control limits, whichever is lower	a clean matrix with acceptable precision and recovery; then reanalyze affected samples
Field Quality Assurance/Quality Control			
Field Replicates	At project manager's discretion	Not applicable	Not applicable
Field Blanks	At project manager's discretion	Analyte concentration ≤ PQL	Compare to method blank results to rule out laboratory contamination; modify sample collection and equipment decontamination procedures

Notes:
CLP - Contract Laboratory Program (EPA)
EPA - U.S. Environmental Protection Agency
GFAA - graphite furnace atomic absorption
ICP-MS - inductively coupled plasma/mass spectrometry
ICP-AES - inductively coupled plasma/atomic emission spectrometry
PQL - practical quantitation limit
RPD - relative percent difference

Instrument and method QA/QC monitor the performance of the instrument and sample preparation procedures, and are the responsibility of the analytical laboratory. When an instrument or method control limit is exceeded, the laboratory is responsible for correcting the problem and reanalyzing the samples. Instrument and method QA/QC results reported in the final data package should always meet control limits (with a very small number of exceptions that apply to difficult analytes as specified by EPA for the CLP). If instrument and method QA/QC procedures meet control limits, laboratory procedures are deemed to be adequate. Matrix and field QA/QC procedures monitor matrix effects and field procedures and variability. Although poor analytical procedures may also result in poor spike recovery or duplicate results, the laboratory is not held responsible for meeting control limits for these QA/QC samples. Except in the possible case of unreasonably large exceedances, any reanalyses will be performed at the request and expense of the project manager.

[a] Subject to QA2 review
[b] Subject to QA1 review

Attachment A-4: SAPA TABLE 13. QUALITY CONTROL PROCEDURES FOR CONVENTIONAL ANALYSES

	Suggested Control Limit						
Analyte	**Initial Calibration**[a]	**Continuing Calibration**[a]	**Calibration Blanks**[a]	**Laboratory Control Samples**	**Matrix Spikes**[ab]	**Laboratory Triplicates**[ab]	**Method Blank**[ab]
Ammonia	Correlation coefficient ≥0.995	90–110 percent recovery	Analyte concentration ≤ PQL	80–120 percent recovery	75–125 percent recovery	20 % RSD	Analyte concentration ≤ PQL
Grain size	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	20 % RSD	Not applicable
Total organic carbon	Correlation coefficient ≥0.995	90–110 percent recovery	Analyte concentration ≤ PQL	80–120 percent recovery	75–125 percent recovery	20 % RSD	Analyte concentration ≤ PQL
Total sulfides	Correlation coefficient ≥0.990	85–115 percent recovery	Not applicable	65–135 percent recovery	65–135 percent recovery	20 % RSD	Analyte concentration ≤ PQL
Total solids	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	20 % RSD	Analyte concentration ≤ PQL

Notes:

EPA - U.S. Environmental Protection Agency
PSEP - Puget Sound Estuary Program
PQL - practical quantitation limit
QA/QC - quality assurance and quality control
RSD - relative standard deviation

[a] Subject to QA2 review
[b] Subject to QA1 review

EPA and PSEP control limits are not available for conventional analytes. The control limits provided above are suggested limits only. They are based on EPA control limits for metals analyses (see Table 12), and an attempt has been made to take into consideration the expected analytical accuracy using PSEP methodology. Corrective action to be taken when control limits are exceeded is left to the Project Manager's discretion. The corrective action indicated for metals in Table 12 may be applied to conventional analytes.

When applicable, the QA/QC procedures indicated in this table should be completed at the same frequency as for metals analyses (see Table 12).

Attachment A-5: SAPA TABLE 14. MARINE AND ESTUARINE SEDIMENT TOXICITY TEST CONDITIONS

Toxicity Test ***Test Species***	**Frequency of Water Quality Monitoring**		**Control Limits**			**Control Samples**			**Performance Standards**[a,f]
	Temperature, Salinity, Dissolved Oxygen, pH	Sulfides, Ammonia	Temp (°C)	Salinity (ppt)	Dissolved Oxygen (% saturation)	Negative Control	Positive Control	Reference Sediment	
Acute Effects Tests									
Amphipod *Rhepoxynius abronius*	Daily	Beginning/ end	15±1	28±1	NA[b]	Clean sediment	Reference toxicant in seawater	Yes	Mean mortality in control sediment <10 percent and mean mortality in reference sediment <25 percent.
Amphipod *Ampelisca abdita*	Daily	Beginning/ end	20±1	28±1	NA[b]	Clean sediment	Reference toxicant in seawater	Yes	Mean mortality in control sediment <10 percent and mean mortality in reference sediment <25 percent.
Amphipod *Eohaustorius estuarius*	Daily	Beginning/ end	15±1	Ambient (same as interstitial)	NA[b]	Clean sediment	Reference toxicant in seawater	Yes	Mean mortality in control sediment <10 percent and mean mortality in reference sediment <25 percent.
Larval Oyster (*Crassostrea gigas*)	Daily	Beginning/ end	20±1	28±1	>60[c]	Clean seawater	Reference toxicant in seawater	Yes	Mean normal survivorship in seawater control ≥70 at time final
Larval Mussel (*Mytilus* sp.)[d]	Daily	Beginning/ end	16±1	28±1	>60[c]	Clean seawater	Reference toxicant in seawater	Yes	Mean normal survivorship in seawater control ≥70 at time final.
Larval Sand dollar (*Dendraster excentricus*)	Daily	Beginning/ end	15±1	28±1	>60[c]	Clean seawater	Reference toxicant in seawater	Yes	Mean normal survivorship in seawater control ≥70 at time final.
Larval Sea urchin (*Strongylocentrotus purpuratus* or *S. droebachiensis*)	Daily	Beginning/ end	15±1	28±1	>60[c]	Clean seawater	Reference toxicant in seawater	Yes	Mean normal survivorship in seawater control ≥70 at time final.

Toxicity Test ***Test Species***	**Frequency of Water Quality Monitoring**		**Control Limits**			**Control Samples**			**Performance Standards**[a,f]
Chronic Effects Tests									
Juvenile polychaete *Neanthes* sp.	Every third day	Beginning/ end (optional)	20±1	28±2	NA[b]	Clean sediment	Reference toxicant in seawater	Yes	Mean mortality in control sediment <10 %, Mean individual growth rate ≥ 0.72 mg/ind/day. And Test failed when growth rate < 0.38 mg/ind/da . Mean individual growth rate in reference sediment ≥80 percent of mean individual growth rate in control sediment.
Microtox (porewater) *Vibrio fisheri*	$7.9 \le pH \le 8.2$	NA	15	See Subappendix B	50-100	Deioized or distilled water. See Subappendix B to adjust salinity.	Reference toxicant	Yes	Mean light output of final control ≥ 80 percent of mean light output of initial control. Reference final mean light output > 80% of control final mean light output.

Notes:
NA - not applicable
ppt - parts per thousand

[a] Performance standards in WAC 173-204-315(2).

[b] Continuous aeration is required by the protocol, so the dissolved oxygen concentration should not be cause for concern.

[c] Aeration should be initiated if the dissolved oxygen concentration declines below 60 percent of saturation.

[d] PSEP (1995) and the SMS refer only to the use of *Mytilus edulis* in this test. However, it may be more accurate to refer to the test organisms used as members of the *Mytilus edulis* sibling species complex. Recent taxonomic studies of west coast mussels (McDonald and Koehn 1988; McDonald et al. 1991; Geller et al. 1993) indicate that the mussels in Washington state are either *M. trossulus* (a more northerly species) or *M. galloprovincialis* (a more southerly species). The mussel species being used by most biological laboratories in the northwest is *M. galloprovincialis*. *M. edulis* does not occur locally and is therefore unlikely to be used in toxicity tests. This does not constitute a change in test organisms, but an acknowledgment that the organisms may have been previously misidentified.

[e] Formerly known as *Photobacterium phosphoreum*.

[f] Subject to QA and QA2 review. Please see SEDQUAL Bioassay Sediment Quality Value Groups for specific performance standards recommendations.

APPENDIX G

QUALITY ASSURANCE PROJECT PLAN

FINAL QUALITY ASSURANCE
PROJECT PLAN
EVERETT SHIPYARD RI/FS

Prepared for

EVERETT SHIPYARD
EVERETT, WASHINGTON
URS Corporation
October 24, 2008

QUALITY ASSURANCE PROJECT PLAN

EVERETT SHIPYARD RI/FS
EVERETT, WASHINGTON

	Approval	Date
ESY, Inc.	Nick Eitel	10/20/08
Project Manager (URS)	James Flynn, LHG	10/22/08
QA/QC Manager (URS)	Jennifer B. Garner	10/22/2008

CONTENTS

TABLES

ABBREVIATIONS AND ACRONYMS LIST

ARI	Analytical Resources, Inc.
COC	chain-of-custody
DQO	data quality objectives
Ecology	Washington State Department of Ecology
MCL	Maximum contaminant level
MDL	method detection limit
MS/MSD	matrix spike / matrix spike duplicate
MTCA	Model Toxics Control Act
PE	performance evaluation
QA/QC	quality assurance / quality control
QAPP	quality assurance project plan
RI/FS	Remedial Investigation / Feasibility Study
RL	reporting limit
RPD	relative percent difference
SAP	sampling and analysis plan
URS	URS Corporation
USEPA	United States Environmental Protection Agency
WAC	Washington Administrative Code

QUALITY ASSURANCE PROJECT PLAN
EVERETT SHIPYARD RI/FS
EVERETT, WASHINGTON

1.0 PROJECT DESCRIPTION

This document presents the Quality Assurance Project Plan (QAPP) for the Remedial Investigation/Feasibility Study (RI/FS) to be conducted at the Everett Shipyard in Everett, Washington. The RI/FS is being conducted under Agreed Order No. DE 5271 effective April 2, 2008 between Washington State Department of Ecology (Ecology), ESY, Inc. (formerly Everett Shipyard, Inc.), and the Port of Everett. This QAPP has been prepared in accordance with the Washington Department of Ecology (Ecology) publication *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies* (Ecology, 2004). The procedures outlined in this QAPP govern all aspects of chemical data collection activities associated with the RI/FS sampling and analysis plans (SAPs). The purpose of the QAPP and SAPs is to ensure that the data are representative of the conditions in the field and that analytical data are valid and accurately reported.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

The project team will consist of personnel from Ecology, ESY Inc. (ESY), and URS Corporation (URS) and their subcontractors including Analytical Resources Inc. (ARI). The following paragraphs describe the major positions and responsibilities of the team along with the approach to quality assurance management. Key project personnel and regulatory personnel and their responsibilities for quality assurance (QA) activities are described below.

2.1 PROJECT MANAGERS

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The Project Managers are responsible for implementation of all aspects of the work plans, SAPs, and QAPP (project plans) for which their respective companies are responsible. Specific responsibilities include review and approval of revisions to project plans, ensuring that all technical procedures are followed, reporting of deviations from the Ecology-approved project plans to the ESY and Ecology Project Managers, and ensuring that the data collected will satisfy the Data Quality Objectives (DQOs) discussed in Section 3 of this document. In addition, they provide technical review of reports.

2.2 QA/QC MANAGER

- Jennifer B. Garner

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The QA/QC Manager is responsible for developing and managing procedures described in the QAPP, interfacing with the project laboratory and data quality assessment personnel, reviewing QA/QC audit reports, coordinating audit procedures, implementing necessary corrective action procedures, reviewing and evaluating analytical laboratory results, reviewing data quality assessment reports, and reporting to the URS Project Manager.

2.3 ANALYTICAL LABORATORY PROJECT MANAGER

- Kelly Bottem

  Analytical Resources, Inc.
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The analytical laboratory project manager is responsible for reviewing and reporting all analytical data generated during the project, responding to questions or concerns regarding the quality of the data that the project managers, QA/QC manager, or data quality assessment personnel may have, and implementing any corrective actions deemed necessary by these individuals with regards to laboratory operations.

2.4 ENVIRONMENTAL MEDIA SAMPLING PERSONNEL

- Various URS or Other Contract Personnel

The field sampling personnel are responsible for implementing the sampling and handling procedures as specified in the project plans, ensuring all field procedures follow the appropriate project plan, notifying the Project Manager and QA/QC Manager of any difficulties encountered during the field program, and implementing corrective actions to the field procedures as approved by the Project Manager.

3.0 DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) are qualitative and/or quantitative statements of the precision (a measure of the random error), bias (a measure of systematic error), representativeness, completeness, and comparability necessary for the data to serve the objectives of the RI/FS. The objectives of the RI/FS are discussed in detail in the work plan. During plan implementation, field as well as laboratory data will be generated. The quality of the field data will be evaluated based on successful calibration of each instrument supplying the data and the stated accuracy and precision by the manufacturer. The quality of laboratory data will be evaluated based on the relative precision, bias, representativeness, completeness, and comparability of the data generated by each type of analysis. These terms are defined below:

Precision	Precision is a measure of the scatter in the data due to random error. For most environmental measurements, the major sources of random error are sampling and analytical procedures. Sampling and analytical precision is expressed as the relative percent difference (RPD). The RPD for laboratory duplicates, matrix spike and matrix spike duplicates (MS/MSD) and field duplicates will be used to assess sampling and analytical precision.
Bias	Bias is a measure of the difference between the analytical result for a parameter and the true value due to systematic errors. Potential sources of systematic errors include sample collection, physical/chemical instability of samples, interference effects, calibration of the measurement system, and artificial contamination. Bias will be assessed based on laboratory control sample (LCS) results, MS/MSD recoveries, surrogate recoveries (organic analyses), and method blanks.

Representativeness	Representativeness of the environmental conditions at the time of sampling is achieved by selecting sampling locations and methods so that the data describe the site conditions that the project seeks to evaluate.
Completeness	Completeness refers to the amount of usable data produced in the project.
Comparability	Comparability refers to the ability to compare the data from the project to other data collected at this site.

Project DQOs for method detection limits (MDLs) and laboratory reporting limits (RLs) are summarized in Tables 1 through 3. The methods were selected to achieve reporting limits that are equal to or below regulatory screening levels also shown in the tables. However, there are selected target analytes in groundwater and soil that will not achieve RLs below one or more of the screening levels with the selected methods. These compounds and the associated screening guidance are summarized in Table 4. Based on the current knowledge of the sediment organic carbon contents, RLs below the sediment screening levels should be achievable.

The DQOs for precision and bias are assessed based on the laboratory control limits provided in Tables 1 through 3. Representativeness of the data collected will be ensured by collecting samples in the locations and with the methods described in the SAPs. In addition, representative samples will also be ensured through following proper protocols for sample handling (storage, preservation, packaging, custody, and transportation), sample documentation, and laboratory sample handling and documentation procedures. Samples for diesel- and oil-range petroleum hydrocarbon analyses may also undergo acid and/or silica gel cleanup to mitigate biogenic interference.

Comparability of the data will be ensured by selecting standard USEPA and/or state analytical methodologies for sample analysis. Data will be reported from the laboratory to the Project Manager both electronically and in paper copy form. The laboratory-provided data will be converted by ARI into a suitable database formats specified by URS. The electronic and paper copy analytical reports will be checked by URS to ensure reporting accuracy. Data quality will be assessed in terms of precision, bias, representativeness, completeness and comparability using specific data quality assessment procedures outlined in Section 10. Results of these assessments, along with any data that is qualified, will be submitted to the QA/QC manager in a data review memorandum for review and, if necessary, additional assessment.

4.0 SAMPLING PROCEDURES

Specific sampling procedures are discussed in the SAPs. Pertinent information obtained during sampling - including field measurements, physical description of the sample, time and date collected and person collecting the sample - will be recorded on a sample form or in a field logbook as described in the SAP. The SAP describes the format for field data entry and field procedures for assuring accuracy. Specific sampling procedures for collecting groundwater, soil, and sediment as part of the RI/FS are described in the SAP.

Containers, sample size, preservation, and holding times are provided in Tables 5 through 7 for groundwater, soil, and sediment for each analytical methodology that may be used to analyze these media. Samples will be identified according to the sample designation system described in the applicable SAP on waterproof labels with indelible markers. Sample custody will be tracked with a chain-of-custody (COC) form in accordance with the procedures outlined in the applicable project plan. Samples will remain in the custody of the sample collector until transport to the laboratory, unless a secure storage area is available.

5.0 ANALYTICAL PROCEDURES

The analytical procedures that may be used in the field and by the contract laboratory are outlined in Tables 1 through 3 and discussed in Sections 5.1 and 5.2 below.

5.1 FIELD ANALYTICAL PROCEDURES

Groundwater will be analyzed for dissolved oxygen (DO) (low flow purging only), pH, conductivity, and temperature in the field using portable testing equipment as described in the SAP. Soil samples may be field screened for organic vapor emissions using a portable organic vapor monitor as indicated in the specific project plan. The portable instruments used for field measurements will be operated, maintained, and calibrated in accordance with the manufacturer’s operations manual specific for the instrument.

Water samples requiring dissolved metals analysis will be field-filtered and preserved at the time of sample collection. In the event that field filtration cannot be performed, samples shall be collected in a nonpreserved container, shipped to the laboratory, and filtered and preserved by the laboratory within 24 hours of collection. Additionally, field personnel should contact the URS project manager if samples are not filtered in the field.

5.2 LABORATORY ANALYTICAL PROCEDURES

The analytical methodologies, including MDLs and laboratory RLs, that will be used to analyze water, soil, and sediment samples are derived from *SW-846, EPA Test Methods for Evaluating Solid Waste* (USEPA, 2008), *Methods for Chemical Analysis of Water and Wastes,* March 1983 (USEPA, 1983), Washington State Department of Ecology's document *Analytical Methods for Petroleum Hydrocarbons* (Ecology, 1997), Puget Sound Estuary Program (PSEP) Methods, or EPA protocols as identified in *Sediment Sampling and Analysis Plan Appendix* (Ecology, 2008). ARI will perform all organic and inorganic analyses of groundwater, soil, and sediment samples collected during the RI/FS in general accordance with the appropriate specific methodology. Physical testing, such as grain size analysis, will also be performed by ARI. All method-required QC will be completed by the laboratory conducting the analyses/tests and reported along with the analytical and testing results. Analytical methods and reporting limits will be reviewed prior to plan implementation.

6.0 DATA REDUCTION, REVIEW AND REPORTING

Data reduction is the process of converting raw data to final results. Data from direct-reading field instruments will be obtained from the instrument and recorded onto a sample collection form, or other appropriate field form as described in the applicable project plan. Laboratory analytical data reduction, review and reporting will be conducted by the laboratory in accordance with their standard operating procedures discussed in their Quality Assurance Manual and requirements of the appropriate project plan. Data deliverables will include the project sample results and QC results in electronic format and standard paper report format. The data will be submitted to URS electronically and in paper form for data quality assessment and database formatting as directed by the project plan or project managers. The data assessment will consist of ensuring that the laboratory has met the QC control limits established for surrogate recovery, matrix spike/matrix spike duplicate recovery and RPD, sample duplicate RPDs, and that the samples were properly preserved and analyzed within the recommended holding times for each analysis. Once the data have been assessed and input into the database, electronic and hard copies of the data, including qualifications, if any, will be submitted to the ESY and URS Project Managers along with the data quality assessment reports. In conjunction with the data quality assessment, the database information will be spot checked with the hard copy analytical results. If transcription errors are discovered by URS, the laboratory will be notified and the discrepancy corrected.

Data will be summarized in Excel tables. Under certain circumstances, more than one result for the same analyte may be reported by the laboratory. For samples that are extracted and/or analyzed multiple times due to laboratory QC procedures, the most appropriate data to report will be evaluated individually during data assessment. When evaluating the appropriate data to report, factors such as hold time, QC parameters, and agreement between analyses will be reviewed and the rationale for the decision will be documented in the data assessment report.

Results will be compared to the preliminary cleanup level identified in the RI/FS Work Plan. Data assessment procedures are outlined in Section 10.

7.0 QUALITY CONTROL PROCEDURES

Quality control procedures provide the means of evaluating and controlling the precision and bias of the analytical results. Careful adherence to established procedures for sample collection, preservation, and storage will minimize errors due to sampling and sample instability.

7.1 FIELD QC PROCEDURES

The types of field QC samples that will be collected during the remedial investigation and their purpose in relation to the DQOs discussed in Section 3 are listed below.

7.1.1 Field Blanks

Field blanks can indicate bias in analytical results caused by artificially introduced contamination from sample containers, sampling equipment, filtration equipment, preservation reagents, transportation and storage practices, and other samples. Two kinds of field blanks may be used: trip blanks and rinsate (decontamination or equipment) blanks.

Trip blanks will accompany all volatile samples as they are transported to and from the sampling site and then to the laboratory. They will consist of 40-ml glass vials filled with distilled/carbon-free water provided by the laboratory. One trip blank will be included with each cooler of sample containers destined for volatiles analysis. Trip blanks will be prepared by the laboratory at the time sample containers are prepared for the site sampling.

If non-dedicated sampling equipment is used during sample collection of any media, one rinsate blank should be prepared each day sampling is conducted with non-dedicated equipment or at the frequency described in the applicable project plan. This sample will consist of deionized water provided by the laboratory poured over the non-dedicated sampling equipment after the equipment has been cleaned in accordance with the procedures specified in the applicable project plan. The rinsate water will be collected in the appropriate sample jar provided by the laboratory for the type of analysis to be conducted.

7.1.2 Field Duplicates

Field duplicates are samples that are collected at the same time and location, and are preserved, stored, and analyzed under identical conditions as the parent sample. Generally, the most significant source of random error is the sampling procedures. The sampling error cannot be measured directly, although it may be the largest source of error in the results. Evaluation of the difference between the analytical results of field duplicates can provide an estimate of the sampling error for project samples. A good estimate of the random error due to sampling can only be made if the results of the field duplicates are significantly above the RL for a particular analysis. Hence, samples selected for duplication should be those expected to produce positive results, if possible. In addition, to provide a better estimate of the standard deviation of field duplicate results, it is important to collect several pairs of duplicates. Collection of at least one duplicate per 20 samples of a specific media (i.e., groundwater, soil, and sediment) collected should provide a sufficient number of duplicates. Field duplicates will not be identified to the laboratory but will be recorded on the sample collection forms or other appropriate field forms for identification after analysis has been conducted. A list of field duplicates will be provided to the data quality assessment personnel.

7.2 LABORATORY QC PROCEDURES

Laboratory QC samples are used to assess if analytical results are within quality control limits and documented. The types of QC samples the laboratory will employ depend on the particular analytical methodology that will be used to analyze the samples. Each analytical method has required QC that must meet laboratory developed acceptance limits in order for the data to be considered valid. In addition, as part of the laboratory's annual accreditation program, performance evaluation samples and MDL studies are conducted to evaluate the laboratory's capability of performing the method accurately and precisely. Matrix spike/matrix spike duplicates shall be performed on project samples at a rate of one per 20 samples collected for each matrix and analysis. In some cases, this will require the collection of additional sample volume in the field. If so, the SAPs will specify the sample volume required.

The control limits provided in Tables 1 through 3 were obtained from ARI during formulation of this QAPP. In general, these control limits were statistically calculated for each analytical method and matrix in accordance with SW-846 guidance based on actual sample results from a sample population which includes samples from multiple projects from many sites. In some cases, the control limits are defined by the analytical method. The control limits therefore represent the normal laboratory variability associated with analysis of samples from many sites. Matrix spike, laboratory control sample, and surrogate recoveries are reviewed by the laboratory to assess whether the recoveries indicate an out-of-control situation and to determine if corrective action is necessary. The laboratory will document the findings of their QC review and the corrective actions performed in the case narrative for the analytical reports.

8.0 PERFORMANCE AND SYSTEM AUDITS

Two types of audits may be conducted to determine whether procedures outlined in the project plans and laboratory QA program are being followed, or to detect problems so that corrective action can be initiated. The two different types of audits are described below.

8.1 PERFORMANCE AUDITS

In a performance audit, performance evaluation (PE) samples are submitted to the laboratory and analyzed for the purpose of evaluating the performance of the measurement or analytical procedures used by the laboratory. The PE sample consists of some type of environmental matrix (e.g., soil, water) which contains a known amount of a particular analyte(s). The laboratory analyzes the sample using routine procedures and then reports their results. ARI is an Ecology-accredited laboratory and routinely participates in performance audits of their routine procedures. Results of these audits are available from the laboratory. Review of the audit results that are part of Ecology’s accreditation program may be conducted if there are questions concerning the capability of the laboratory in performing any of the series of analytical measurements of this interim action.

Field measurement systems such as pH meters, etc. are assumed to be performing adequately if they can be successfully calibrated in accordance with the manufacturer's operating instructions and the calibration is documented in the field notes.

8.2 SYSTEM AUDITS

System audits are conducted in order to determine if the requirements described in the applicable project plan are being properly carried out. A system audit may cover the field and laboratory portions of the project. The project manager, upon recommendation by the QA/QC manager, may request that a system audit of the field or laboratory operations be performed. Results of system audits will be reported to the project managers and project coordinators. Any corrective actions required should be implemented as discussed in Section 11.

9.0 PREVENTATIVE MAINTENANCE

Preventative maintenance procedures and schedule for field sampling equipment and measurement equipment will be conducted in accordance with the manufacturer's operations manual for each piece of equipment. Any critical spare parts or sampling equipment disposables such as small tools, disposable bailers, sample containers and other small items should be inventoried by field personnel in order to prevent and/or minimize equipment downtime. The laboratory will be responsible for preventative maintenance of its measurement equipment.

10.0 DATA ASSESSMENT PROCEDURES

When the results of the measurements have been obtained, the URS Project Manager and QA/QC manager will determine whether the project DQOs have been achieved. Whether the overall project DQOs have been met will be assessed by review of the analytical data quality assessment reports generated by the data quality assessment personnel. The responsibility of these personnel will be to ensure that the analytical DQOs have been met through review of the QC results associated with the project analytical data. Data quality assessment reports will discuss the completeness of the data and will document the reasons for any data qualifiers that are assigned. Specific procedures to be used in the data quality assessment of project data precision, bias, and completion are discussed in this section.

In order to ensure that data is of a known and acceptable quality, all analytical data generated for the corrective action program will undergo a data quality review. This data review is an assessment of data precision and accuracy using quality control summary sheet results provided by the laboratory for each data package. If outliers occur during calibration or calibration verification or other analytical problems are identified, the laboratory will contact the URS QA/QC manager to discuss the problems/outliers. Professional judgment will be used to determine necessary actions, if any. The problems/outliers will be identified and the remedial measures implemented will be noted in the case narrative from the laboratory. Data will be evaluated and data qualifiers assigned based on the method requirements and guidance for qualification outlined in the USEPA documents *USEPA Contract Laboratory Program (CLP) National Functional Guidelines for Organic Data Review* (USEPA, 1999) and *USEPA Contract Laboratory Program (CLP) National Functional Guidelines for Inorganic Data Review* (USEPA, 2004). If several problems or deficiencies are encountered or specific data appear to be problematic based on the initial data review, more extensive data review will be implemented such as review of raw data. The data review consists of the following elements:

- Verification that sample numbers and analyses match the chain-of-custody request.
- Verification that sample preservation and holding times are met.
- Verification that field and laboratory blanks were performed at the proper frequency and that no analytes were present in the blanks.
- Verification that field and laboratory duplicates, matrix spikes, and laboratory control samples were run at the proper frequency and that control limits were met.
- Verification that surrogate compound analyses have been performed and that results met the QC criteria.
- Verification that established reporting limits have been achieved.

Data quality assessment will also include a review of the precision, bias, and completeness of analytical data. Precision will be assessed based on the relative percent difference (RPD) of matrix spike / matrix spike duplicate (MS/MSD) or laboratory duplicate pairs. Calculated RPDs will be compared to the control limits and if the RPD is within these limits, then the precision of the analysis will be assumed to meet the DQOs of the project. Bias will be reviewed by comparing the percent recoveries of surrogates, matrix spikes, and laboratory control samples to the appropriate control limits. The control limits provided in Tables 1 through 3 were provided by the laboratory during development of this QAPP.

Completeness will be expressed as the percentage of the total tests (including sample and field QC results) conducted that are valid and considered usable for project objectives. Analytical results qualified as estimated based on data quality assessment are considered usable but the reason for qualification should be considered when using the data for site assessment or remedial evaluation. Rejected data are not usable.

11.0 CORRECTIVE ACTION

Evaluation of field and laboratory QC data and/or audits conducted for field operations and/or laboratory operations may indicate the need for a corrective action. Problems with analytical QC data will be addressed by the laboratory QC officer. Problems arising during field operations, however, will be addressed by the QA/QC manager through communication of the identified problem and a potential corrective action to the URS and/or ESY Project Manager. The Project Manager will then relay this information to the field personnel for implementation. The field personnel will then report back to the Project Manager upon successful implementation of the corrective action. Ecology will be notified of variances to the QAPP or applicable project plans through status reports, data review reports, quarterly reports, or other written correspondence as deemed appropriate.

12.0 QUALITY ASSURANCE REPORTS

A data assessment report will be prepared for the analytical data generated for each sampling event. The data assessment reports will indicate if DQOs were met and identify QA problems, if any, and the recommended and/or implemented corrective actions. Data assessment reports will also include summaries and reasons for data qualifiers assigned during the QA review. Data assessment reports will be submitted to the QA/QC manger and the URS Project Manager for review prior to the final reporting of analytical data. Data assessment reports, including analytical laboratory reports, will be included as an appendix to the RI/FS report required by the Agreed Order.

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Table 1
Data Quality Objectives for Groundwater
Everett Shipyard
2008 Sampling

	Screening Criteria [a]																**Laboratory Reporting and Control Limit Criteria[b]**							
	Groundwater						**Surface Water**																	
	MTCA Groundwater Screening Levels			**EPA MCLs (Drinking Water)**	**EPA MCLGs**	**Washington State MCLs**	**MTCA**		**Toxic Substances Criteria (WAC 173-201A)**		**National Recommended Water Quality Criteria**			**National Toxics Rule**			MDL	RL	Surrogate (%)	LCS/LCSD (%)	LCS/LCSD RPD (%)	MS/MSD (%)	MS/MSD RPD (%)	Duplicate RPD (%)
	Method A	**Method B**					**Method B - Human Health Protection**		Marine Water		Saltwater		Human Health	Saltwater		Human Health								
		Carcinogenic	on-carcinogen				Carcinogenic	Non-carcinogenic	Acute	Chronic	CMC	CCC	Organism Only	CMC	CCC	Organism Only								
VOCs (ug/L) [Method 8260B]																								
1,1,1,2-Tetrachloroethane	NE	1.7	240	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.103	0.2	--	75-120	30	75-120	30	30
1,1,1-Trichloroethane	200	NE	7,200	200	200	200	NE	420,000	NE	NE	NE	NE	NE	NE	NE	NE	0.099	0.2	--	76-121	30	76-121	30	30
1,1,2,2-Tetrachloroethane	NE	0.22	NE	NE	NE	NE	6.5	NE	NE	NE	NE	NE	4.0	NE	NE	11	0.121	0.2	--	78-128	30	78-128	30	30
1,1,2-Trichloro-1,2,2-trifluoroethane	NE	NE	240,000	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.047	0.2	--	75-131	30	75-131	30	30
1,1,2-Trichloroethane	NE	0.77	32	5	3	5	25	2,300	NE	NE	NE	NE	16	NE	NE	42	0.069	0.2	--	80-120	30	80-120	30	30
1,1-Dichloroethane	NE	NE	1600	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.067	0.2	--	70-125	30	70-125	30	30
1,1-Dichloroethene	NE	NE	400	7	7	7	NE	23,000	NE	NE	NE	NE	7,100	NE	NE	3.2	0.059	0.2	--	66-127	30	66-127	30	30
1,1-Dichloropropene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.055	0.2	--	80-120	30	80-120	30	30
1,2,3-Trichlorobenzene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.165	0.5	--	63-120	30	63-120	30	30
1,2,3-Trichloropropane	NE	0.0063	48	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.157	0.5	--	71-125	30	71-125	30	30
1,2,4-Trichlorobenzene	NE	NE	80	70	70	70	NE	230	NE	NE	NE	NE	70	NE	NE	NE	0.098	0.5	--	68-120	30	68-120	30	30
1,2,4-Trimethylbenzene	NE	NE	400	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.087	0.2	--	80-123	30	80-123	30	30
1,2-Dibromo-3-chloropropane	NE	0.031	NE	0.2	0	0.2	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.29	0.5	--	61-120	30	61-120	30	30
1,2-Dibromoethane (EDB)	0.01	0.00051	NE	0.05	0	0.05	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.112	0.2	--	74-121	30	74-121	30	30
1,2-Dichlorobenzene	NE	NE	720	600	600	600	NE	4,200	NE	NE	NE	NE	1300	NE	NE	NE	0.091	0.2	--	78-120	30	78-120	30	30
1,2-Dichloroethane (EDC)	5	0.48	160	5	0	5	59	43,000	NE	NE	NE	NE	37	NE	NE	99	0.07	0.2	--	71-129	30	71-129	30	30
1,2-Dichloropropane	NE	0.64	NE	5	0	5	23	NE	NE	NE	NE	NE	15	NE	NE	NE	0.1	0.2	--	78-120	30	78-120	30	30
1,3,5-Trimethylbenzene	NE	NE	400	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.054	0.2	--	80-123	30	80-123	30	30
1,3-Dichlorobenzene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	960	NE	NE	NE	0.054	0.2	--	79-120	30	79-120	30	30
1,3-Dichloropropane	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.11	0.2	--	76-123	30	76-123	30	30
1,4-Dichlorobenzene	NE	1.8	NE	75	75	75	4.9	NE	NE	NE	NE	NE	190	NE	NE	NE	0.067	0.2	--	80-120	30	80-120	30	30
2,2-Dichloropropane	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.054	0.2	--	75-126	30	75-126	30	30
2-Butanone	NE	NE	4,800	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.594	1	--	60-130	30	60-130	30	30
2-Chloroethylvinylether	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.108	0.5	--	36-145	30	36-145	30	30
2-Chlorotoluene	NE	NE	160	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.085	0.2	--	72-127	30	72-127	30	30
2-Hexanone	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.25	3	--	62-131	30	62-131	30	30
4-Chlorotoluene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.061	0.2	--	80-125	30	80-125	30	30
4-Isopropyltoluene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.056	0.2	--	80-124	30	80-124	30	30
4-Methyl-2-pentanone	NE	NE	640	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.266	1	--	61-126	30	61-126	30	30
Acetone	NE	NE	800	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.537	3	--	56-142	30	56-142	30	30
Acrolein	NE	NE	160	NE	NE	NE	NE	NE	NE	NE	NE	NE	290	NE	NE	780	0.905	5	--	55-128	30	55-128	30	30
Acrylonitrile	NE	0.081	8	NE	NE	NE	0.4	86	NE	NE	NE	NE	0.25	NE	NE	0.66	0.179	1	--	60-136	30	60-136	30	30
Benzene	5	0.8	32	5	0	5	23	2,000	NE	NE	NE	NE	51	NE	NE	71	0.065	0.2	--	80-121	30	80-121	30	30
Bromobenzene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.095	0.2	--	79-120	30	79-120	30	30
Bromochloromethane	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.131	0.2	--	69-124	30	69-124	30	30
Bromodichloromethane	NE	0.71	160	NE	0	80	28	14,000	NE	NE	NE	NE	17	NE	NE	22	0.046	0.2	--	78-124	30	78-124	30	30
Bromoethane	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.051	0.2	--	75-125	30	75-125	30	30
Bromoform	NE	5.5	160	80	80	80	220	14,000	NE	NE	NE	NE	140	NE	NE	360	0.143	0.2	--	66-130	30	66-130	30	30
Bromomethane	NE	NE	11	NE	NE	NE	NE	970	NE	NE	NE	NE	1,500	NE	NE	4,000	0.101	0.2	--	43-136	30	43-136	30	30
Carbon disulfide	NE	NE	800	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.061	0.2	--	68-132	30	68-132	30	30
Carbon tetrachloride	NE	0.34	5.6	5	0	5	2.7	97	NE	NE	NE	NE	1.6	NE	NE	4.4	0.097	0.2	--	78-129	30	78-129	30	30
Chlorobenzene	NE	NE	160	100	100	100	NE	5,000	NE	NE	NE	NE	1,600	NE	NE	21,000	0.057	0.2	--	80-121	30	80-121	30	30
Chloroethane	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.055	0.2	--	54-129	30	54-129	30	30
Chloroform	NE	7.2	80	80	0	80	280	6,900	NE	NE	NE	NE	470	NE	NE	470	0.077	0.2	--	75-121	30	75-121	30	30
Chloromethane	NE	3.4	NE	NE	NE	NE	130	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.079	0.2	--	35-134	30	35-134	30	30
cis-1,2-Dichloroethene	NE	NE	80	70	70	70	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.122	0.2	--	70-120	30	70-120	30	30
cis-1,3-Dichloropropene	NE	0.24	240	NE	NE	NE	19	41,000	NE	NE	NE	NE	21	NE	NE	1,700 [1]	0.061	0.2	--	79-122	30	79-122	30	30
Dibromochloromethane	NE	0.52	160	80	60	80	21	14,000	NE	NE	NE	NE	13	NE	NE	34	0.067	0.2	--	76-130	30	76-130	30	30
Dibromomethane	NE	NE	80	5	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.118	0.2	--	79-122	30	79-122	30	30
Dichlorodifluoromethane	NE	NE	1,600	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.059	0.2	--	10-147	30	10-147	30	30
Ethylbenzene	700	NE	800	700	700	700	NE	6,900	NE	NE	NE	NE	2,100	NE	NE	29,000	0.065	0.2	--	72-130	30	72-130	30	30
Hexachlorobutadiene	NE	0.56	1.6	NE	NE	NE	30	190	NE	NE	NE	NE	NE	NE	NE	NE	0.281	0.5	--	60-136	30	60-136	30	30
VOCs (ug/L) [Method 8260B] (contd.)																								
Iodomethane	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.08	0.2	--	48-144	30	48-144	30	30
Isopropylbenzene	NE	NE	800	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.071	0.2	--	79-124	30	79-124	30	30
m,p-xylene	1,000,000 [c]	NE	16,000	10,000 [c]	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.087	0.4	--	80-130	30	80-130	30	30
Methyl tert-butyl ether (MTBE)	20	24	6900	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.069	0.2	--	64-130	30	64-130	30	30

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2008 Sampling

	Screening Criteria [a]																Laboratory Reporting and Control Limit Criteria[b]							
	Groundwater						Surface Water																	
	MTCA Groundwater Screening Levels			EPA MCLs (Drinking Water)	EPA MCLGs	Washington State MCLs	MTCA		Toxic Substances Criteria (WAC 173-201A)		National Recommended Water Quality Criteria			National Toxics Rule			MDL	RL	Surrogate (%)	LCS/LCSD (%)	LCS/LCSD RPD (%)	MS/MSD (%)	MS/MSD RPD (%)	Duplicate RPD (%)
	Method A	Method B					Method B - Human Health Protection		Marine Water		Saltwater		Human Health	Saltwater		Human Health								
		Carcinogenic	on-carcinogen				Carcinogenic	Non-carcinogenic	Acute	Chronic	CMC	CCC	Organism Only	CMC	CCC	Organism Only								
Methylene chloride	5	5.8	480	5	0	5	960	170,000	NE	NE	NE	NE	590	NE	NE	1,600	0.168	0.5	--	68-129	30	68-129	30	30
Naphthalene	160[d]	NE	160[d]	NE	NE	NE	NE	4,900	NE	NE	NE	NE	NE	NE	NE	NE	0.108	0.5	--	54-123	30	54-123	30	30
n-Butylbenzene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.135	0.2	--	78-131	30	78-131	30	30
n-Propylbenzene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.104	0.2	--	67-138	30	67-138	30	30
o-Xylene	1,000,000[c]	NE	16,000	10,000[c]	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.062	0.2	--	71-124	30	71-124	30	30
sec-Butylbenzene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.094	0.2	--	66-137	30	66-137	30	30
Styrene	NE	1.5	1600	100	100	100	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.055	0.2	--	69-128	30	69-128	30	30
tert-Butylbenzene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.066	0.2	--	75-120	30	75-120	30	30
Tetrachloroethene	5	0.081	80	5	0	5	0.39	840	NE	NE	NE	NE	3.3	NE	NE	8.85	0.087	0.2	--	80-124	30	80-124	30	30
Toluene	1,000	NE	640	1,000	1,000	1,000	NE	19,000	NE	NE	NE	NE	15,000	NE	NE	200,000	0.062	0.2	--	80-120	30	80-120	30	30
trans-1,2-Dichloroethene	NE	NE	160	100	100	100	NE	33,000	NE	NE	NE	NE	10,000	NE	NE	NE	0.111	0.2	--	68-127	30	68-127	30	30
trans-1,3-Dichloropropene	NE	0.24	240	NE	NE	NE	19	41,000	NE	NE	NE	NE	21	NE	NE	NE	0.132	0.2	--	79-124	30	79-124	30	30
trans-1,4-Dichloro-2-Butene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.176	1	--	70-129	30	70-129	30	30
Trichloroethene	5	0.11	2.4	5	0	5	1.5	71	NE	NE	NE	NE	30	NE	NE	81	0.062	0.2	--	80-117	30	80-117	30	30
Trichlorofluoromethane	NE	NE	2,400	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.065	0.2	--	65-133	30	65-133	30	30
Vinyl acetate	NE	NE	8,000	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.085	0.2	--	10-196	30	10-196	30	30
Vinyl chloride	0.2	0.029	24	2	0	2	3.7	6,600	NE	NE	NE	NE	2.4	NE	NE	525	0.061	0.2	--	53-132	30	53-132	30	30
d4-1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	64-146	--	--	--	--	--
d8-Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	78-125	--	--	--	--	--
4-Bromofluorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	71-120	--	--	--	--	--
d4-1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	80-121	--	--	--	--	--
Low-Level VOCs (ug/L) [Method 8260 SIM]																								
1,1-Dichloroethene	NE	NE	400	7	7	7	NE	23,000	NE	NE	NE	NE	7,100	NE	NE	3.2	0.00693	0.02	--	79-126	30	79-126	30	30
Tetrachloroethene	5	0.081	80	5	0	5	0.39	840	NE	NE	NE	NE	3.3	NE	NE	8.85	0.00388	0.02	--	75-123	30	75-123	30	30
Trichloroethene	5	0.11	2.4	5	0	5	1.5	71	NE	NE	NE	NE	30	NE	NE	81	0.00613	0.02	--	79-120	30	79-120	30	30
Vinyl chloride	0.2	0.029	24	2	0	2	3.7	6,600	NE	NE	NE	NE	2.4	NE	NE	525	0.00333	0.02	--	76-120	30	76-120	30	30
d4-1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	80-136	--	--	--	--	--
d8-Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	80-120	--	--	--	--	--
SVOCs (ug/L) [Method 8270D]																								
1,2,4-Trichlorobenzene	NE	NE	80	70	70	70	NE	230	NE	NE	NE	NE	70	NE	NE	NE	0.235	1	--	36-92	30	36-92	30	30
1,2-Dichlorobenzene	NE	NE	720	600	600	600	NE	4,200	NE	NE	NE	NE	1,300	NE	NE	17,000	0.213	1	--	37-89	30	37-89	30	30
1,3-Dichlorobenzene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	960	NE	NE	2,600	0.216	1	--	35-86	30	35-86	30	30
1,4-Dichlorobenzene	NE	1.8	NE	75	75	75	4.9	NE	NE	NE	NE	NE	190	NE	NE	2,600	0.233	1	--	35-87	30	35-87	30	30
1-Methylnaphthalene	NE	NE	2.4	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.253	1	--	48-104	30	48-104	30	30
2,2'-Oxybis (1-chloropropane)	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.287	1	--	49-103	30	49-103	30	30
2,4,5-Trichlorophenol	NE	NE	800	NE	NE	NE	NE	NE	NE	NE	NE	NE	3,600	NE	NE	NE	1.591	5	--	51-109	30	51-109	30	30
2,4,6-Trichlorophenol	NE	4	NE	NE	NE	NE	3.9	NE	NE	NE	NE	NE	2.4	NE	NE	6.5	1.65	5	--	51-109	30	51-109	30	30
2,4-Dichlorophenol	NE	NE	24	NE	NE	NE	NE	190	NE	NE	NE	NE	290	NE	NE	790	1.661	5	--	53-107	30	53-107	30	30
2,4-Dimethylphenol	NE	NE	160	NE	NE	NE	NE	550	NE	NE	NE	NE	850	NE	NE	NE	0.272	1	--	35-102	30	35-102	30	30
2,4-Dinitrophenol	NE	NE	32	NE	NE	NE	NE	3,500	NE	NE	NE	NE	5,300	NE	NE	14,000	2.417	10	--	10-207	30	10-207	30	30
2,4-Dinitrotoluene	NE	NE	32	NE	NE	NE	NE	1,400	NE	NE	NE	NE	3.4	NE	NE	9.1	0.916	5	--	57-110	30	57-110	30	30
2,6-Dinitrotoluene	NE	NE	16	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	1.182	5	--	54-114	30	54-114	30	30
2-Chloronaphthalene	NE	NE	NE	NE	NE	NE	NE	1,000	NE	NE	NE	NE	1,600	NE	NE	NE	0.231	1	--	48-99	30	48-99	30	30
2-Chlorophenol	NE	NE	40	NE	NE	NE	NE	97	NE	NE	NE	NE	150	NE	NE	NE	0.324	1	--	53-97	30	53-97	30	30
2-Methylnaphthalene	NE	NE	32	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.254	1	--	46-99	30	46-99	30	30
2-Methylphenol	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.323	1	--	52-96	30	52-96	30	30
2-Nitroaniline	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	1.254	5	--	57-113	30	57-113	30	30
2-Nitrophenol	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	1.555	5	--	53-102	30	53-102	30	30
3,3'-Dichlorobenzidine	NE	0.19	NE	NE	NE	NE	0.046	NE	NE	NE	NE	NE	0.028	NE	NE	0.077	1.017	5	--	43-127	30	43-127	30	30
3-Nitroaniline	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	1.066	5	--	67-120	30	67-120	30	30
4,6-Dinitro-2-methylphenol	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	280	NE	NE	765	2.512	10	--	22-153	30	22-153	30	30
4-Bromophenyl-phenyl ether	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.138	1	--	60-104	30	60-104	30	30
4-Chloro-3-methylphenol	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	1.529	5	--	54-113	30	54-113	30	30
4-Chloroaniline	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	1.027	5	--	32-146	30	32-146	30	30
4-Chlorophenyl-phenyl ether	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.242	1	--	52-109	30	52-109	30	30
4-Methylphenol	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.22	1	--	53-103	30	53-103	30	30
4-Nitroaniline	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	1.29	5	--	44-116	30	44-116	30	30
4-Nitrophenol	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.454	5	--	10-80	30	10-80	30	30
Acenaphthene	NE	NE	960	NE	NE	NE	NE	640	NE	NE	NE	NE	990	NE	NE	NE	0.214	1	--	54-101	30	54-101	30	30
Acenaphthylene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.235	1	--	54-104	30	54-104	30	30

Table 1
Data Quality Objectives for Groundwater
Everett Shipyard
2008 Sampling

	Screening Criteria[a]																**Laboratory Reporting and Control Limit Criteria[b]**							
	Groundwater						**Surface Water**																	
	MTCA Groundwater Screening Levels			**EPA MCLs (Drinking Water)**	**EPA MCLGs**	**Washington State MCLs**	**MTCA**		**Toxic Substances Criteria (WAC 173-201A)**		**National Recommended Water Quality Criteria**			**National Toxics Rule**			MDL	RL	Surrogate (%)	LCS/LCSD (%)	LCS/LCSD RPD (%)	MS/MSD (%)	MS/MSD RPD (%)	Duplicate RPD (%)
	Method A	**Method B**					**Method B - Human Health Protection**		Marine Water		Saltwater		Human Health	Saltwater		Human Health								
		Carcinogenic	on-carcinogen				Carcinogenic	Non-carcinogenic	Acute	Chronic	CMC	CCC	Organism Only	CMC	CCC	Organism Only								
Anthracene	NE	NE	4,800	NE	NE	NE	NE	26,000	NE	NE	NE	NE	40,000	NE	NE	110,000	0.155	1	--	61-101	30	61-101	30	30
Benzo(a)anthracene	See Note e	See Note e	NE	NE	NE	NE	See Noted e	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.131	1	--	59-110	30	59-110	30	30
Benzo(a)pyrene	0.1	0.012	NE	0.2	0	0.2	0.03	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.155	1	--	62-105	30	62-105	30	30
Benzo(b)fluoranthene	See Note e	See Note e	NE	NE	NE	NE	See Noted e	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.185	1	--	61-110	30	61-110	30	30
Benzo(g,h,i)perylene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.115	1	--	47-116	30	47-116	30	30
Benzo(k)fluoranthene	See Note e	See Note e	NE	NE	NE	NE	See Noted e	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.198	1	--	59-114	30	59-114	30	30
Benzoic acid	NE	NE	64,000	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.883	10	--	10-71	30	10-71	30	30
Benzyl alcohol	NE	NE	2,400	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.789	5	--	43-98	30	43-98	30	30
Bis-(2-chloroethoxy)methane	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.298	1	--	57-104	30	57-104	30	30
Bis-(2-chloroethyl)ether	NE	0.04	NE	NE	NE	NE	0.85	NE	NE	NE	NE	NE	0.53	NE	NE	1.4	0.308	1	--	55-100	30	55-100	30	30
bis(2-Ethylhexyl)phthalate	NE	6.3	320	6	0	6	3.6	400	NE	NE	NE	NE	2.2	NE	NE	5.9	0.226	1	--	50-124	30	50-124	30	30
Butylbenzylphthalate	NE	NE	3,200	NE	NE	NE	NE	1,300	NE	NE	NE	NE	1,900	NE	NE	NE	0.122	1	--	54-121	30	54-121	30	30
Carbazole	NE	4.4	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.168	1	--	58-108	30	58-108	30	30
Chrysene	See Note e	See Note e	NE	NE	NE	NE	See Noted e	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.129	1	--	56-109	30	56-109	30	30
Dibenzo(a,h)anthracene	See Note e	See Note e	NE	NE	NE	NE	See Noted e	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.096	1	--	50-112	30	50-112	30	30
Dibenzofuran	NE	NE	32	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.207	1	--	56-102	30	56-102	30	30
Diethylphthlalate	NE	NE	13,000	NE	NE	NE	NE	28,000	NE	NE	NE	NE	44,000	NE	NE	120,000	0.41	1	--	61-110	30	61-110	30	30
Dimethylphthalate	NE	NE	16,000	NE	NE	NE	NE	72,000	NE	NE	NE	NE	1,100,000	NE	NE	2,900,000	0.196	1	--	63-106	30	63-106	30	30
Di-n-butylphthalate	NE	NE	1,600	NE	NE	NE	NE	2900	NE	NE	NE	NE	4,500	NE	NE	12,000	0.106	1	--	66-110	30	66-110	30	30
Di-n-octylphthalate	NE	NE	320	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.107	1	--	60-114	30	60-114	30	30
Fluoranthene	NE	NE	640	NE	NE	NE	NE	90	NE	NE	NE	NE	140	NE	NE	370	0.148	1	--	57-113	30	57-113	30	30
Fluorene	NE	NE	640	NE	NE	NE	NE	3,500	NE	NE	NE	NE	5,300	NE	NE	14,000	0.223	1	--	54-109	30	54-109	30	30
Hexachlorobenzene	NE	0.055	13	1	0	1	0.00047	0.24	NE	NE	NE	NE	0.00029	NE	NE	0.00077	0.238	1	--	59-104	30	59-104	30	30
Hexachlorobutadiene	NE	0.56	1.6	NE	NE	NE	30	190	NE	NE	NE	NE	18	NE	NE	50	0.187	1	--	27-87	30	27-87	30	30
Hexachlorocyclopentadiene	NE	NE	48	50	50	50	NE	3,600	NE	NE	NE	NE	1,100	NE	NE	17,000	0.871	5	--	17-95	30	17-95	30	30
Hexachloroethane	NE	3.1	8	NE	NE	NE	5.3	30	NE	NE	NE	NE	3.3	NE	NE	8.9	0.254	1	--	30-80	30	30-80	30	30
Indeno(1,2,3-cd)pyrene	See Note e	See Note e	NE	NE	NE	NE	See Noted e	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.12	1	--	47-114	30	47-114	30	30
Isophorone	NE	46	1600	NE	NE	NE	1,600	120,000	NE	NE	NE	NE	960	NE	NE	600	0.246	1	--	59-111	30	59-111	30	30
Naphthalene	160[d]	NE	160	NE	NE	NE	NE	4,900	NE	NE	NE	NE	NE	NE	NE	NE	0.267	1	--	45-98	30	45-98	30	30
Nitrobenzene	NE	NE	4	NE	NE	NE	NE	450	NE	NE	NE	NE	690	NE	NE	1,900	0.296	1	--	53-103	30	53-103	30	30
N-Nitroso-di-n-propylamine	NE	NE	NE	NE	NE	NE	0.82	NE	NE	NE	NE	NE	0.51	NE	NE	NE	1.113	5	--	53-109	30	53-109	30	30
N-Nitrosodiphenylamine	NE	NE	NE	NE	NE	NE	9.7	NE	NE	NE	NE	NE	6.0	NE	NE	16.0	0.177	1	--	50-131	30	50-131	30	30
Pentachlorophenol	NE	0.73	480	1	0	1	4.9	7,100	13.0	7.9	13	7.9	3.0	13	7.9	8.2	0.993	5	--	40-119	30	40-119	30	30
Phenanthrene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.151	1	--	62-102	30	62-102	30	30
Phenol	NE	NE	4,800	NE	NE	NE	NE	1,100,000	NE	NE	NE	NE	1,700,000	NE	NE	4,600,000	0.13	1	--	10-88	30	10-88	30	30
Pyrene	NE	NE	480	NE	NE	NE	NE	2,600	NE	NE	NE	NE	4,000	NE	NE	11,000	0.149	1	--	51-115	30	51-115	30	30
d4-2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	42-93	--	--	--	--	--
d4-1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	41-87	--	--	--	--	--
2,4,6-Tribromophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	51-105	--	--	--	--	--
2-Fluorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	23-74	--	--	--	--	--
d5-Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	10-66	--	--	--	--	--
d5-Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	45-98	--	--	--	--	--
2-Fluorobiphenyl	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	53-89	--	--	--	--	--
d14-p-Terphenyl	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	46-119	--	--	--	--	--
PAHs (ug/L) [Method 8270 SIM]																								
1-Methylnaphthalene	NE	NE	2.4	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.00383	0.01	--	30-160	30	30-160	30	30
2-Methylnaphthalene	NE	NE	32	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.00475	0.01	--	30-160	30	30-160	30	30
Acenaphthene	NE	NE	960	NE	NE	NE	NE	640	NE	NE	NE	NE	990	NE	NE	NE	0.00173	0.01	--	41-111	30	41-111	30	30
Acenaphthylene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.00225	0.01	--	38-108	30	38-108	30	30
Anthracene	NE	NE	4,800	NE	NE	NE	NE	26,000	NE	NE	NE	NE	40,000	NE	NE	110,000	0.00257	0.01	--	38-106	30	38-106	30	30
Benzo(a)anthracene	See Note e	See Note e	NE	NE	NE	NE	See Noted e	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.00195	0.01	--	44-112	30	44-112	30	30
Benzo(a)pyrene	0.1	0.012	NE	0.2	0	0.2	0.03	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.00135	0.01	--	13-102	30	13-102	30	30
Benzo(b)fluoranthene	See Note e	See Note e	NE	NE	NE	NE	See Noted e	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.00165	0.01	--	40-122	30	40-122	30	30
Benzo(g,h,i)perylene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.00273	0.01	--	40-119	30	40-119	30	30
Benzo(k)fluoranthene	See Note e	See Note e	NE	NE	NE	NE	See Noted e	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.00358	0.01	--	39-127	30	39-127	30	30
Chrysene	See Note e	See Note e	NE	NE	NE	NE	See Noted e	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.00191	0.01	--	44-126	30	44-126	30	30
Dibenzo(a,h)anthracene	See Note e	See Note e	NE	NE	NE	NE	See Noted e	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.00139	0.01	--	44-109	30	44-109	30	30
Dibenzofuran	NE	NE	32	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.00247	0.01	--	33-116	30	33-116	30	30
Fluoranthene	NE	NE	640	NE	NE	NE	NE	90	NE	NE	NE	NE	140	NE	NE	370	0.00141	0.01	--	46-123	30	46-123	30	30
Fluorene	NE	NE	640	NE	NE	NE	NE	3,500	NE	NE	NE	NE	5,300	NE	NE	14,000	0.00359	0.01	--	45-118	30	45-118	30	30
Indeno(1,2,3-cd)pyrene	See Note e	See Note e	NE	NE	NE	NE	See Noted e	NE	NE	NE	NE	NE	0.018	NE	NE	0.031	0.00173	0.01	--	44-110	30	44-110	30	30
Naphthalene	160[d]	NE	160	NE	NE	NE	NE	4,900	NE	NE	NE	NE	NE	NE	NE	NE	0.00712	0.01	--	30-109	30	30-109	30	30
Phenanthrene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.00249	0.01	--	49-118	30	49-118	30	30
Pyrene	NE	NE	480	NE	NE	NE	NE	2,600	NE	NE	NE	NE	4,000	NE	NE	11,000	0.00233	0.01	--	40-124	30	40-124	30	30
d10-2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	40-114	--	--	--	--	--
d14-Dibenzo(a,h)anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	17-122	--	--	--	--	--

Table 1
Data Quality Objectives for Groundwater
Everett Shipyard
2008 Sampling

	Screening Criteria [a]																**Laboratory Reporting and Control Limit Criteria**[b]							
	Groundwater						**Surface Water**																	
	MTCA Groundwater Screening Levels			**EPA MCLs (Drinking Water)**	**EPA MCLGs**	**Washington State MCLs**	**MTCA**		**Toxic Substances Criteria (WAC 173-201A)**		**National Recommended Water Quality Criteria**			**National Toxics Rule**			MDL	RL	Surrogate (%)	LCS/LCSD (%)	LCS/LCSD RPD (%)	MS/MSD (%)	MS/MSD RPD (%)	Duplicate RPD (%)
	Method A	**Method B**					**Method B - Human Health Protection**		Marine Water		Saltwater		Human Health	Saltwater		Human Health								
		Carcinogenic	on-carcinogen				Carcinogenic	Non-carcinogenic	Acute	Chronic	CMC	CCC	Organism Only	CMC	CCC	Organism Only								
PCBs (ug/L) [Method 8082]																								
Aroclor 1016	NE	NE	1.1	NE	NE	NE	NE	0.0058	NE	NE	NE	NE	NE	NE	0.03	NE	0.002	0.01	--	36-110	30	36-110	30	30
Aroclor 1221	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.03	NE		0.01	--	--	--	--	--	30
Aroclor 1232	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.03	NE	--	0.01	--	--	--	--	--	30
Aroclor 1242	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.03	NE	--	0.01	--	--	--	--	--	30
Aroclor 1248	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.03	NE	--	0.01	--	--	--	--	--	30
Aroclor 1254	NE	NE	0.32	NE	NE	NE	NE	0.0017	NE	NE	NE	NE	NE	NE	0.03	NE	--	0.01	--	--	--	--	--	30
Aroclor 1260	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.03	NE	0.0014	0.01	--	45-123	30	45-123	30	30
Total PCBs	0.1	0.044	NE	0.5	0	0.5	0.00011	NE	10	0.03	NE	0.03	0.000064	NE	NE	0.00017	--	0.01	--	--	--	--	--	--
Tetrachlorometaxylene (TCMX)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	30-98	--	--	--	--	--
Decachlorobiphenyl (DCBP)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	19-121	--	--	--	--	--
TPH (mg/L) **[Ecology Method NWTPH-Dx]**																								
Diesel-range	0.5	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0123	0.25	--	61-98	30	61-98	30	30
Oil-range	0.5	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.051	0.50	--	--	--	--	--	30
o-Terphenyl	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	45-121	--	--	--	--	--
Organotins (ug/L) [Method Psep/Krone 1988]																								
Tributyltin as TBT Ion	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.37	0.01	NE	NE	NE	NE	0.103	0.2	--	29-138	30	29-138	30	30
Dibutyl Tin Ion	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.165	0.3	--	26-116	30	26-116	30	30
Butyl Tin Ion	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.167	0.2	--	10-105	30	10-105	30	30
Tripentyl Tin	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	29-115	--	--	--	--	--
Tripropyl Tin	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	21-85	--	--	--	--	--
Metals (mg/L) **[Method 6010B/7421/7470A]**																								
Arsenic	0.005	0.0000583	0.0048	0.01	0	0.01	0.069 [f,g]	0.036 [g,h]	0.069 [f,g]	0.036 [f,h]	0.069	0.036	0.00014	0.069	0.036	0.00014	0.00427	0.05	--	80-120	20	75-125	20	20
Antimony	NE	NE	0.0064	0.006	0.006	0.006	NE	NE	NE	NE	NE	NE	0.64	NE	NE	4.3	0.00695	0.05	--	80-120	20	75-125	20	20
Beryllium	NE	NE	0.032	0.004	0.004	0.004	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.00009	0.001	--	80-120	20	75-125	20	20
Cadmium	0.005	0.008	0.008	0.005	0.005	0.005	0.042 [f,g]	0.093 [g,h]	0.042 [f,g]	0.093 [f,h]	0.04	0.0088	NE	0.042	0.0093	NE	0.00026	0.002	--	80-120	20	75-125	20	20
Calcium	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.00578	0.005	--	80-120	20	75-125	20	20
Chromium (total)	0.05	NE	NE	0.1	0.1	0.1	NE	NE	1.1 (Cr^{+6}) [f,g]	0.05 (Cr^{+6}) [f,h]	1.1 (Cr^{+3}) / 0.016 (Cr^{+6})	0.05 (Cr^{+6})	NE	1.1 (Cr^{+6})	0.05 (Cr^{+6})	NE	0.0024	0.005	--	80-120	20	75-125	20	20
Chromium^{+3}	NE	NE	24	0.1	NE	0.1	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA	NA	--	NA	NA	NA	NA	NA
Chromium^{+6}	NE	NE	0.048	NE	0.1	0.1	1.1 [f,g,h]	0.05 [g,h]	1.1 [f,g,h]	0.05 [f,h]	1.1	0.05	NE	1.1	0.05	NE	NA	NA	--	NA	NA	NA	NA	NA
Copper	NE	NE	0.592	1.3	1.3	1.3	0.0048 [f,g]	0.0031 [g,h]	0.0048 [f,g]	0.0031 [f,h]	0.0048	0.0031	NE	0.0024	0.0024	NE	0.00055	0.002	--	80-120	20	75-125	20	20
Lead	0.015	NE	NE	0.015	0	0.015	0.21 [f,g]	0.0081 [g,h]	0.21 [f,g]	0.0081 [f,h]	0.21	0.0081	NE	0.21	0.0081	NE	0.00056	0.001	--	80-120	20	75-125	20	20
Magnesium	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.01672	0.05	--	80-120	20	75-125	20	20
Mercury	0.002	NE	0.0048	0.002	0.002	0.002	0.0018 [f,g]	0.000025 [h]	0.0018 [f,g]	0.000025 [h]	0.0018	0.00094	0.0003	0.0018	0.000025	0.00015	0.000015	0.0001	--	80-120	20	75-125	20	20
Nickel	NE	NE	0.32	NE	NE	NE	0.074 [f,g]	0.0082 [g,h]	0.074 [f,g]	0.0082 [f,h]	0.074	0.0082	4.6	0.074	0.0082	4.6	0.00281	0.01	--	80-120	20	75-125	20	20

Table 1
Data Quality Objectives for Groundwater
Everett Shipyard
2008 Sampling

	Screening Criteria [a]																Laboratory Reporting and Control Limit Criteria[b]							
	Groundwater						Surface Water																	
	MTCA Groundwater Screening Levels			EPA MCLs (Drinking Water)	EPA MCLGs	Washington State MCLs	MTCA		Toxic Substances Criteria (WAC 173-201A)		National Recommended Water Quality Criteria			National Toxics Rule			MDL	RL	Surrogate (%)	LCS/LCSD (%)	LCS/LCSD RPD (%)	MS/MSD (%)	MS/MSD RPD (%)	Duplicate RPD (%)
	Method A	Method B					Method B - Human Health Protection		Marine Water		Saltwater		Human Health	Saltwater		Human Health								
		Carcinogenic	on-carcinogen				Carcinogenic	Non-carcinogenic	Acute	Chronic	CMC	CCC	Organism Only	CMC	CCC	Organism Only								
Selenium	NE	NE	0.08	0.05	0.05	0.05	0.29	0.071	0.29	0.071	0.29 [f]	0.071 [f]	4.2	0.29	0.071	NE	0.00005	0.05	--	80-120	20	75-125	20	20
Silver	NE	NE	0.08	0.1 i	NE	NE	0.0019 [f,k]	NE	0.0019 [f,i]	NE	0.0019	NE	NE	0.0019	NE	NE	0.0004	0.003	--	80-120	20	75-125	20	20
Thallium	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.00047	NE	NE	0.0063	0.00005	0.05	--	80-120	20	75-125	20	20
Zinc	NE	NE	4.8	5 i	NE	NE	0.09 [f,h]	0.081 [g,h]	0.09 [f,g]	0.081 [f,h]	0.09	0.081	26	0.09	0.081	NE	0.00416	0.01	--	80-120	20	75-125	20	20
Conventional Parameters																								
pH (standard units) [Method 150.1]	NE	NE	NE	6.5 - 8.5	NE	NE	NE	NE	6.5-9.0	6.5-9.0	NE	6.5 - 8.5	NE	NE	NE	NE	--	0.01	--	--	--	--	--	20
TDS (mg/L) [Method 160.1]	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	--	10	--	--	--	--	--	20

Notes:

CCC - Criteria continuous concentration (chronic)

CMC - Criteria maximum concentration (acute)

I - MTCA cleanup level for industrial property

LCS/LCSD - Laboratory control sample/laboratory control sample duplicate

MCLs - Maximum contaminant levels

MCLGs - Maximum contaminant level goals

MS/MSD - Matrix spike/matrix spike duplicate

NE - Not established

PCBs - Polychlorinated biphenyls

R - MTCA cleanup level for unrestricted land use

RPD - Relative percent difference

SVOCs - Semivolatile organic compounds

TDS - Total dissolved solids

TPH - Total petroleum hydrocarbons

VOCs - Volatile organic compounds

[a] Screening criteria are based on the following references:

MTCA - Model Toxics Control Act Cleanup Regulation, WAC 173-340. MTCA Method A and B, MCL, MCLG and State MCL values are from Ecology website CLARC tables downloaded October 2008 (https://fortress.wa.gov/ecy/clarc/reporting/CLARCReporting.aspx).

Water Quality Standards For Surface Waters of the State Of Washington, Toxic Substances Criteria, WAC 173-201A. Last update November 2006.

National Recommended Water Quality Criteria, USEPA, 2006.

National Toxics Rule, 40 CFR 131.36, USEPA 2006.

[b] Laboratory control limits provided by Analytical Resources, Inc.

[c] The screening level shown is for total xylenes.

[d] Cleanup level based on total of naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene.

[e] Carcinogenic PAH (cPAH) cleanup levels under MTCA are based on the calculated total toxicity of the mixture using the Toxicity Equivalency Methodology in WAC 173-340-780 (8). The mixture of cPAHs shall be considered a single hazardous substance and compared to the applicable MTCA Method A or B cleanup level for benzo(a)pyrene.

[f] The metals criteria are associated with the dissolved fraction of the water column.

[g] A 1-hour average concentration not to be exceeded more than once every three years on the average.

[h] A 4-day average concentration not to be exceeded more than once every three years on the average.

[i] An instantaneous concentration not to be exceeded at any time.

[k] National Secondary Drinking Water Regulation (secondary standard). Secondary standards are non-enforceable guidelines regulating contaminants that may cause cosmetic or aesthetic effects in drinking water. States may choose to adopt them as enforceable standards.

[l] Value is for 1,3-dichloropropene.

Table 2
Data Quality Objectives for Soil
Everett Shipyard
2008 Sampling

	Screening Criteria [a]				**Laboratory Reporting and Control Limit Criteria** [b]							
	Method A	**Method B** [c]		**Protection of Marine Surface Water (WAC 173-201A-240)**	Method Detection Limit	Reporting Limit	Surrogate (%)	LCS/LCSD (%)	LCS/LCSD RPD (%)	MS/MSD (%)	MS/MSD RPD (%)	Duplicate RPD (%)
	Unrestricted Land Use	Carcinogenic	Non-Carcinogenic									
VOCs (ug/kg) <u>[Method 8260B]</u>												
1,1,1,2-Tetrachloroethane	NE	38,000	2,400,000	NE	0.400	1	--	71-135	30	71-135	30	30
1,1,1-Trichloroethane	2,000	NE	72,000,000	NE	0.496	1	--	80-135	30	80-135	30	30
1,1,2,2-Tetrachloroethane	NE	5,000	NE	NE	0.264	1	--	80-120	30	80-120	30	30
1,1,2-Trichloro-1,2,2-trifluoroethane	NE	NE	2,400,000,000	NE	0.398	2	--	67-142	30	67-142	30	30
1,1,2-Trichloroethane	NE	18,000	320,000	NE	0.233	1	--	79-124	30	79-124	30	30
1,1-Dichloroethane	NE	NE	16,000,000	NE	0.428	1	--	80-124	30	80-124	30	30
1,1-Dichloroethene	NE	NE	4,000,000	NE	0.374	1	--	73-135	30	73-135	30	30
1,1-Dichloropropene	NE	NE	NE	NE	0.418	1	--	80-133	30	80-133	30	30
1,2,3-Trichlorobenzene	NE	NE	NE	NE	0.259	5	--	80-130	30	80-130	30	30
1,2,3-Trichloropropane	NE	140	480,000	NE	0.226	2	--	80-120	30	80-120	30	30
1,2,4-Trichlorobenzene	NE	NE	800,000	NE	0.208	5	--	76-140	30	76-140	30	30
1,2,4-Trimethylbenzene	NE	NE	4,000,000	NE	0.220	1	--	80-140	30	80-140	30	30
1,2-Dibromo-3-chloropropane	NE	710	NE	NE	0.372	5	--	68-122	30	68-122	30	30
1,2-Dibromoethane (EDB)	5	12	NE	NE	0.285	1	--	80-124	30	80-124	30	30
1,2-Dichlorobenzene	NE	NE	7,200,000	NE	0.051	1	--	80-124	30	80-124	30	30
1,2-Dichloroethane (EDC)	NE	11,000	1,600,000	NE	0.370	1	--	74-131	30	74-131	30	30
1,2-Dichloropropane	NE	15,000	NE	NE	0.341	1	--	80-124	30	80-124	30	30
1,3,5-Trimethylbenzene	NE	NE	4,000,000	NE	0.203	1	--	80-140	30	80-140	30	30
1,3-Dichlorobenzene	NE	NE	NE	NE	0.173	1	--	80-133	30	80-133	30	30
1,3-Dichloropropane	NE	NE	NE	NE	0.237	1	--	80-123	30	80-123	30	30
1,4-Dichlorobenzene	NE	42,000	NE	NE	0.094	1	--	80-126	30	80-126	30	30
2,2-Dichloropropane	NE	NE	NE	NE	0.574	1	--	78-141	30	78-141	30	30
2-Butanone (methyl ethyl ketone)	NE	NE	48,000,000	NE	1.228	5	--	73-125	30	73-125	30	30
2-Chloroethylvinylether	NE	NE	NE	NE	1.035	5	--	52-138	30	52-138	30	30
2-Chlorotoluene	NE	NE	1,600,000	NE	0.405	1	--	80-138	30	80-138	30	30
2-Hexanone	NE	NE	NE	NE	1.293	5	--	62-134	30	62-134	30	30
4-Chlorotoluene	NE	NE	NE	NE	0.299	1	--	80-136	30	80-136	30	30
4-Isopropyltoluene	NE	NE	NE	NE	0.240	1	--	80-146	30	80-146	30	30
4-Methyl-2-pentanone (methyl isobutyl ketone)	NE	NE	6,400,000	NE	1.466	5	--	71-130	30	71-130	30	30
Acetone	NE	NE	8,000,000	3,200	2.577	5	--	59-128	30	59-128	30	30
Acrolein	NE	NE	1,600,000	NE	1.725	50	--	62-120	30	62-120	30	30
Acrylonitrile	NE	1,900	80,000	NE	0.737	5	--	75-122	30	75-122	30	30
Benzene	30	18,000	320,000	NE	0.325	1	--	80-126	30	80-126	30	30
Bromobenzene	NE	NE	NE	NE	0.200	1	--	80-124	30	80-124	30	30
Bromochloromethane	NE	NE	NE	NE	0.467	1	--	80-129	30	80-129	30	30
Bromodichloromethane	NE	16,000	1,600,000	NE	0.311	1	--	76-136	30	76-136	30	30
Bromoethane	NE	NE	NE	NE	0.363	2	--	70-134	30	70-134	30	30
Bromoform	NE	130,000	1,600,000	NE	0.201	1	--	74-126	30	74-126	30	30
Bromomethane	NE	NE	110,000	NE	0.311	1	--	49-144	30	49-144	30	30
Carbon disulfide	NE	NE	8,000,000	5,600	0.403	1	--	76-132	30	76-132	30	30
Carbon tetrachloride	NE	7,700	56,000	NE	0.467	1	--	76-136	30	76-136	30	30
Chlorobenzene	NE	NE	1,600,000	NE	0.372	1	--	80-124	30	80-124	30	30
Chloroethane	NE	NE	NE	NE	0.548	1	--	74-127	30	74-127	30	30
Chloroform	NE	160,000	800,000	NE	0.370	1	--	80-125	30	80-125	30	30
Chloromethane	NE	77,000	NE	NE	0.697	1	--	54-133	30	54-133	30	30
cis-1,2-Dichloroethene	NE	NE	800,000	NE	0.206	1	--	80-124	30	80-124	30	30
cis-1,3-dichloropropene	NE	5,600	2,400,000	NE	0.428	1	--	80-124	30	80-124	30	30
Dibromochloromethane	NE	12,000	1,600,000	NE	0.271	1	--	74-124	30	74-124	30	30
Dibromomethane	NE	NE	NE	NE	0.154	1	--	80-125	30	80-125	30	30
Dichlorodifluoromethane	NE	NE	16,000,000	NE	0.420	1	--	25-145	30	25-145	30	30
Ethylbenzene	6,000	NE	8,000,000	NE	0.412	1	--	80-135	30	80-135	30	30
Hexachloro-1,3-butadiene	NE	13,000	16,000	NE	0.346	5	--	78-147	30	78-147	30	30
Iodomethane	NE	NE	NE	NE	0.141	1	--	32-189	30	32-189	30	30
Isopropylbenzene	NE	NE	8,000,000	NE	0.259	1	--	80-140	30	80-140	30	30
m,p-xylene	9,000	NE	16,000,000	NE	0.617	1	--	80-135	30	80-135	30	30
Methyl tert-butyl ether (MTBE)	100	560,000	69,000,000	NE	0.197	1	--	74-131	30	74-131	30	30
Methylene chloride	20	130,000	4,800,000	NE	0.281	2	--	77-121	30	77-121	30	30
Naphthalene	5,000	NE	1,600,000	NE	0.112	5	--	74-127	30	74-127	30	30
n-Butylbenzene	NE	NE	NE	NE	0.239	1	--	80-147	30	80-147	30	30
n-Propylbenzene	NE	NE	NE	NE	0.098	1	--	80-142	30	80-142	30	30
o-Xylene	NE	NE	160,000,000	NE	0.271	1	--	77-131	30	77-131	30	30
sec-Butylbenzene	NE	NE	NE	NE	0.316	1	--	80-146	30	80-146	30	30
Styrene	NE	33,000	16,000,000	NE	0.293	1	--	74-142	30	74-142	30	30
tert-Butylbenzene	NE	NE	NE	NE	0.304	1	--	80-143	30	80-143	30	30

Table 2
Data Quality Objectives for Soil
Everett Shipyard
2008 Sampling

	Screening Criteria [a]				Laboratory Reporting and Control Limit Criteria [b]							
	Method A	**Method B** [c]		**Protection of Marine Surface Water (WAC 173-201A-240)**	Method Detection Limit	Reporting Limit	Surrogate (%)	LCS/LCSD (%)	LCS/LCSD RPD (%)	MS/MSD (%)	MS/MSD RPD (%)	Duplicate RPD (%)
	Unrestricted Land Use	Carcinogenic	Non-Carcinogenic									
Tetrachloroethene	50	1,900	800,000	4.1	0.423	1	--	80-137	30	80-137	30	30
Toluene	7,000	NE	6,400,000	NE	0.402	1	--	80-127	30	80-127	30	30
trans-1,2-Dichloroethene	NE	NE	1,600,000	NE	0.307	1	--	80-126	30	80-126	30	30
trans-1,3-Dichloropropene	NE	5,600	2,400,000	NE	0.283	1	--	78-130	30	78-130	30	30
trans-1,4-Dichloro-2-butene	NE	NE	NE	NE	0.699	5	--	70-128	30	70-128	30	30
Trichloroethene	30	2,500	24,000	NE	0.335	1	--	80-129	30	80-129	30	30
Trichlorofluoromethane	NE	NE	24,000,000	NE	0.688	1	--	66-137	30	66-137	30	30
Vinyl acetate	NE	NE	80,000,000	NE	0.734	5	--	80-128	30	80-128	30	30
Vinyl Chloride	NE	670	240,000	NE	0.772	1	--	62-132	30	62-132	30	30
d4-1,2-Dichloroethane	--	--	--	--	--	--	72-134	--	--	--	--	--
d8-Toluene	--	--	--	--	--	--	78-124	--	--	--	--	--
4-Bromofluorobenzene	--	--	--	--	--	--	66-120	--	--	--	--	--
d4-1,2-Dichlorobenzene	--	--	--	--	--	--	80-124	--	--	--	--	--
SVOCs (ug/kg) [Method 8270D]												
1,2,4-Trichlorobenzene	NE	NE	800,000	NE	16.1	67	--	44-85	30	44-85	30	30
1,2-Dichlorobenzene	NE	NE	7,200,000	NE	18.2	67	--	43-80	30	43-80	30	30
1,3-Dichlorobenzene	NE	NE	NE	NE	15.8	67	--	42-79	30	42-79	30	30
1,4-Dichlorobenzene	NE	42,000	NE	NE	13.9	67	--	42-78	30	42-78	30	30
1-Methylnaphthalene	NE	NE	24,000	NE	16.2	67	--	50-90	30	50-90	30	30
2,2'-Oxybis(1-chloropropane)	NE	NE	NE	NE	14.6	67	--	31-102	30	31-102	30	30
2,4,5-Trichlorophenol	NE	NE	8,000,000	NE	64.7	330	--	47-97	30	47-97	30	30
2,4,6-Trichlorophenol	NE	91,000	NE	NE	65.3	330	--	44-98	30	44-98	30	30
2,4-Dichlorophenol	NE	NE	240,000	NE	117.5	330	--	48-91	30	48-91	30	30
2,4-Dimethylphenol	NE	NE	1,600,000	NE	31.2	67	--	45-87	30	45-87	30	30
2,4-Dinitrophenol	NE	NE	160,000	NE	105.5	670	--	10-198	30	10-198	30	30
2,4-Dinitrotoluene	NE	NE	160,000	NE	102.3	330	--	47-113	30	47-113	30	30
2,6-Dinitrotoluene	NE	NE	80,000	NE	114.9	330	--	48-106	30	48-106	30	30
2-Chloronaphthalene	NE	NE	NE	NE	14.1	67	--	48-88	30	48-88	30	30
2-Chlorophenol	NE	NE	400,000	NE	12.1	67	--	49-83	30	49-83	30	30
2-Methylnaphthalene	NE	NE	320,000	NE	16.2	67	--	50-87	30	50-87	30	30
2-Methylphenol	NE	NE	NE	NE	23.4	67	--	48-91	30	48-91	30	30
2-Nitroaniline	NE	NE	NE	NE	80.0	330	--	46-105	30	46-105	30	30
2-Nitrophenol	NE	NE	NE	NE	61.5	330	--	47-91	30	47-91	30	30
3,3’-Dichlorobenzidine	NE	2,200	NE	NE	213.2	330	--	11-110	30	11-110	30	30
3-Nitroaniline	NE	NE	NE	NE	143.9	330	--	25-118	30	25-118	30	30
4,6-Dinitro-2-methylphenol	NE	NE	NE	NE	350.7	670	--	21-151	30	21-151	30	30
4-Bromophenyl-phenyl ether	NE	NE	NE	NE	16.8	67	--	51-97	30	51-97	30	30
4-Chloro-3-methylphenol	NE	NE	NE	NE	61.8	330	--	51-96	30	51-96	30	30
4-Chloroaniline	NE	NE	NE	NE	202.5	330	--	17-98	30	17-98	30	30
4-Chlorophenyl-phenyl ether	NE	NE	NE	NE	15.6	67	--	49-96	30	49-96	30	30
4-Methylphenol	NE	NE	NE	NE	33.0	67	--	51-94	30	51-94	30	30
4-Nitroaniline	NE	NE	NE	NE	190.0	330	--	32-106	30	32-106	30	30
4-Nitrophenol	NE	NE	NE	NE	102.2	330	--	19-111	30	19-111	30	30
Acenaphthene	NE	NE	4,800,000	65,000	16.8	67	--	50-90	30	50-90	30	30
Acenaphthylene	NE	NE	NE	NE	14.5	67	--	52-91	30	52-91	30	30
Anthracene	NE	NE	24,000,000	12,000,000	14.2	67	--	53-95	30	53-95	30	30
Benzo(a)anthracene	NE	See Note e	NE	130	16.0	67	--	53-100	30	53-100	30	30
Benzo(a)pyrene	100	140	NE	350	16.7	67	--	57-102	30	57-102	30	30
Benzo(b)fluoranthene	NE	See Note e	NE	430	27.3	67	--	56-108	30	56-108	30	30
Benzo(g,h,i)perylene	NE	NE	NE	NE	9.9	67	--	35-109	30	35-109	30	30
Benzo(k)fluoranthene	NE	See Note e	NE	430	14.5	67	--	53-110	30	53-110	30	30
Benzoic acid	NE	NE	320,000,000	260,000	166.3	670	--	42-111	30	42-111	30	30
Benzyl alcohol	NE	NE	24,000,000	NE	148.5	330	--	26-89	30	26-89	30	30
Bis-(2-chloroethoxy)methane	NE	NE	NE	NE	15.9	67	--	48-88	30	48-88	30	30
Bis-(2-chloroethyl)ether	NE	910	NE	NE	15.4	67	--	45-86	30	45-86	30	30
Bis(2-Ethylhexyl)phthalate	NE	71,000	1,600,000	4,900	27.2	67	--	43-124	30	43-124	30	30
Butylbenzylphthalate	NE	NE	16,000,000	360,000	7.7	67	--	54-108	30	54-108	30	30
Carbazole	NE	50,000	NE	NE	7.7	67	--	52-102	30	52-102	30	30
Chrysene	NE	See Note e	NE	140	14.7	67	--	54-100	30	54-100	30	30
Dibenzo(a,h)anthracene	NE	See Note e	NE	640	13.5	67	--	45-107	30	45-107	30	30
Dibenzofuran	NE	NE	160,000	NE	15.1	67	--	54-91	30	54-91	30	30
Diethylphthlalate	NE	NE	64,000,000	160,000	20.0	67	--	56-100	30	56-100	30	30

Table 2
Data Quality Objectives for Soil
Everett Shipyard
2008 Sampling

	Screening Criteria[a]				**Laboratory Reporting and Control Limit Criteria**[b]							
	Method A	**Method B**[c]		**Protection of Marine Surface Water (WAC 173-201A-240)**	Method Detection Limit	Reporting Limit	Surrogate (%)	LCS/LCSD (%)	LCS/LCSD RPD (%)	MS/MSD (%)	MS/MSD RPD (%)	Duplicate RPD (%)
	Unrestricted Land Use	Carcinogenic	Non-Carcinogenic									
Dimethylphthalate	NE	NE	80,000,000	NE	16.9	67	--	56-95	30	56-95	30	30
Di-n-butylphthalate	NE	NE	8,000,000	100,000	7.1	67	--	60-104	30	60-104	30	30
Di-n-octylphthalate	NE	NE	1,600,000	5,300,000	16.8	67	--	47-115	30	47-115	30	30
Fluoranthene	NE	NE	3,200,000	89,000	6.0	67	--	53-106	30	53-106	30	30
Fluorene	NE	NE	3,200,000	550,000	17.6	67	--	52-95	30	52-95	30	30
Hexachlorobenzene	NE	630	64,000	NE	14.7	67	--	52-96	30	52-96	30	30
Hexachlorobutadiene	NE	13,000	16,000	NE	14.5	67	--	36-91	30	36-91	30	30
Hexachlorocyclopentadiene	NE	NE	480,000	NE	212.3	330	--	19-109	30	19-109	30	30
Hexachloroethane	NE	71,000	80,000	NE	15.8	67	--	39-78	30	39-78	30	30
Indeno(1,2,3-cd)pyrene	NE	See Note e	NE	1,300	12.0	67	--	42-106	30	42-106	30	30
Isophorone	NE	1,100,000	16,000,000	NE	17.8	67	--	52-92	30	52-92	30	30
Naphthalene	5,000	NE	1,600,000	140,000	15.0	67	--	46-85	30	46-85	30	30
Nitrobenzene	NE	NE	40,000	NE	14.4	67	--	47-85	30	47-85	30	30
N-Nitroso-di-n-propylamine	NE	140	NE	NE	67.2	330	--	44-94	30	44-94	30	30
N-Nitrosodiphenylamine	NE	200,000	NE	180	16.3	67	--	48-129	30	48-129	30	30
Pentachlorophenol	NE	8,300	2,400,000	47	171.5	330	--	34-107	30	34-107	30	30
Phenanthrene	NE	NE	NE	NE	13.4	67	--	54-96	30	54-96	30	30
Phenol	NE	NE	48,000,000	5,000,000	33.5	67	--	49-89	30	49-89	30	30
Pyrene	NE	NE	2,400,000	3,500,000	15.3	67	--	51-103	30	51-103	30	30
d4-2-Chlorophenol	--	--	--	--	--	--	32-91	--	--	--	--	--
d4-1,2-Dichlorobenzene	--	--	--	--	--	--	35-85	--	--	--	--	--
2,4,6-Tribromophenol	--	--	--	--	--	--	25-117	--	--	--	--	--
2-Fluorophenol	--	--	--	--	--	--	11-106	--	--	--	--	--
d5-Phenol	--	--	--	--	--	--	31-91	--	--	--	--	--
d5-Nitrobenzene	--	--	--	--	--	--	34-91	--	--	--	--	--
2-Fluorobiphenyl	--	--	--	--	--	--	37-94	--	--	--	--	--
d14-p-Terphenyl	--	--	--	--	--	--	33-106	--	--	--	--	--
PAHs (ug/kg) [Method 8270 SIM]												
1-Methylnaphthalene	NE	NE	24,000	NE	1.17	5.0	--	130-160	30	130-160	30	30
2-Methylnaphthalene	NE	NE	320,000	NE	0.90	5.0	--	44-96	30	44-96	30	30
Acenaphthene	NE	NE	4,800,000	NE	1.19	5.0	--	44-98	30	44-98	30	30
Acenaththylene	NE	NE	NE	NE	1.03	5.0	--	41-99	30	41-99	30	30
Anthracene	NE	NE	24,000,000	NE	0.97	5.0	--	48-103	30	48-103	30	30
Benzo(a)anthracene	NE	See Note e	NE	NE	0.81	5.0	--	51-111	30	51-111	30	30
Benzo(a)pyrene	100	140	NE	NE	1.47	5.0	--	52-110	30	52-110	30	30
Benzo(b)fluoranthene	NE	See Note e	NE	NE	1.23	5.0	--	54-116	30	54-116	30	30
Benzo(g,h,i)perylene	NE	NE	NE	NE	1.25	5.0	--	36-118	30	36-118	30	30
Benzo(k)fluoranthene	NE	See Note e	NE	NE	0.88	5.0	--	55-114	30	55-114	30	30
Chrysene	NE	See Note e	NE	NE	1.73	5.0	--	54-109	30	54-109	30	30
Dibenzo(a,h)anthracene	NE	See Note e	NE	NE	0.96	5.0	--	42-117	30	42-117	30	30
Dibenzofuran	NE	NE	160,000	NE	0.98	5.0	--	46-96	30	46-96	30	30
Fluoranthene	NE	NE	3,200,000	NE	0.27	5.0	--	53-120	30	53-120	30	30
Fluorene	NE	NE	3,200,000	NE	0.65	5.0	--	47-101	30	47-101	30	30
Indeno(1,2,3-cd)pyrene	NE	See Note e	NE	NE	0.86	5.0	--	40-117	30	40-117	30	30
Naphthalene	5,000	NE	1,600,000	NE	1.28	5.0	--	39-99	30	39-99	30	30
Phenanthrene	NE	NE	NE	NE	1.02	5.0	--	47-106	30	47-106	30	30
Pyrene	NE	NE	2,400,000	NE	1.24	5.0	--	50-107	30	50-107	30	30
d10-2-Methylnaphthalene	--	--	--	--	--	--	37-106	--	--	--	--	--
d14-Dibenzo(a,h)anthracene	--	--	--	--	--	--	16-118	--	--	--	--	--
PCBs (ug/kg) B [Method 8082A]												
Aroclor 1016	NE	NE	5,600	NE	2.91	33	--	56-100	30	56-100	30	30
Aroclor 1221	NE	NE	NE	NE	--	33	--	--	--	--	--	--
Aroclor 1232	NE	NE	NE	NE	--	33	--	--	--	--	--	--
Aroclor 1242	NE	NE	NE	NE	--	33	--	--	--	--	--	--
Aroclor 1248	NE	NE	NE	NE	--	33	--	--	--	--	--	--
Aroclor 1254	NE	NE	1,600	NE	--	33	--	--	--	--	--	--
Aroclor 1260	NE	NE	NE	NE	3.34	33	--	56-127	30	56-127	30	30
Total PCBs	1,000	500	NE	NE	--	33	--	--	--	--	--	--
Tetrachlorometaxylene (TCMX)	--	--	--	--	--	--	61-118	--	--	--	--	--
Decachlorobiphenyl (DCBP)	--	--	--	--	--	--	59-122	--	--	--	--	--
TPH (acid+silica gel cleanup) (mg/kg) [Ecology NWTPH-Dx]												
Diesel-range	2,000	NE	NE	NE	0.497	5.0	--	50-91	30	50-91	30	30
Oil-range	2,000	NE	NE	NE	3.27	10	--	--	--	--	--	30
o-Terphenyl	--	--	--	--	--	--	33-117	--	--	--	--	--

Table 2
Data Quality Objectives for Soil
Everett Shipyard
2008 Sampling

	Screening Criteria [a]				Laboratory Reporting and Control Limit Criteria [b]							
	Method A	**Method B** [c]		**Protection of Marine Surface Water (WAC 173-201A-240)**	Method Detection Limit	Reporting Limit	Surrogate (%)	LCS/LCSD (%)	LCS/LCSD RPD (%)	MS/MSD (%)	MS/MSD RPD (%)	Duplicate RPD (%)
	Unrestricted Land Use	Carcinogenic	Non-Carcinogenic									
Organotins (ug/kg) [Method PSEP/Krone 1988]												
Tributyltin as TBT Ion	NE	NE	23,000 [f]	7,400 [h]	1.773	4	--	59-143	30	59-143	30	30
Dibutyl Tin Ion	NE	NE	NE	NE	3.175	6	--	48-115	30	48-115	30	30
Butyl Tin Ion	NE	NE	NE	NE	4.089	4	--	20-113	30	20-113	30	30
Tripentyl Tin	--	--	--	--	--	--	30-136	--	--	--	--	--
Tripropyl Tin	--	--	--	--	--	--	25-96	--	--	--	--	--
Metals (mg/kg) [Method 6010/7471]												
Arsenic	20	0.67	24	0.057	0.057	5.0	--	80-120	20	75-125	20	20
Antimony	NE	NE	32	NE	32	5.0	--	80-120	20	75-125	20	20
Beryllium	NE	NE	160	NE	160	0.1	--	80-120	20	75-125	20	20
Cadmium	2	NE	80	1.2	1.20	0.2	--	80-120	20	75-125	20	20
Chromium	2,000 (Cr^{+3}) / 19 (Cr^{+6})	NE	120,000 (Cr^{+3}) / 240 (Cr^{+6})	19	19.0	0.5	--	80-120	20	75-125	20	20
Copper	NE	NE	3,000	1.1	1.10	0.2	--	80-120	20	75-125	20	20
Lead	250	NE	NE	1,600	250	2.0	--	80-120	20	75-125	20	20
Mercury	2	NE	24	0.026	0.026	0.05	--	80-120	20	75-125	20	20
Nickel	NE	NE	1,600	11.0	11.0	1.0	--	80-120	20	75-125	20	20
Selenium	NE	NE	400	NE	400	5.0	--	80-120	20	75-125	20	20
Silver	NE	NE	400	0.32	0.32	0.3	--	80-120	20	75-125	20	20
Thallium	NE	NE	6	NE	5.6	5.0	--	80-120	20	75-125	20	20
Zinc	NE	NE	24,000	100	100	1.0	--	80-120	20	75-125	20	20

Notes:

I - MTCA cleanup level for industrial property

LCS/LCSD - Laboratory control sample/laboratory control sample duplicate

MS/MSD - Matrix spike/matrix spike duplicate

NE - Not established

PCBs - Polychlorinated biphenyls

R - MTCA cleanup level for unrestricted land use

RPD - Relative percent difference

SVOCs - Semivolatile organic compounds

TPH - Total petroleum hydrocarbons

VOCs - Volatile organic compounds

[a] MTCA - Model Toxics Control Act Cleanup Regulation, WAC 173-340. 2006 MTCA Method A and B values are from Ecology website CLARC tables downloaded April 2008 (https://fortress.wa.gov/ecy/clarc/reporting/CLARCReporting.aspx), when available. If MTCA Method A and B values were not available or not established on the Ecology website CLARC tables, the 2001 MTCA values were used. 2001 Method A values are from Ecology Publication 94-06 amended February 12, 2001. 2001 Method B values are from Model Toxics Control Act Cleanup Levels and Risk Calculations (CLARC) Version 3.1, Ecology Publication #94-145 Updated November 2001.

[b] Laboratory Control Limits provided by Analytical Resources, Inc.

[c] The Simplified Terrestrial Ecological Evaluation completed in accordance with WAC 173-340-7492(2)(a)(ii) indicates that the site does not have a substantial potential for posing a threat of significant adverse effects to terrestrial ecological receptors. Therefore, Ecological Indicator soil concentrations were not considered applicable screening levels.

[d] Cleanup level based on total of naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene.

[e] Carcinogenic PAH (cPAH) cleanup levels under MTCA are based on the calculated total toxicity of the mixture using the Toxicity Equivalency Methodology in WAC 173-340-780 (8). The mixture of cPAHs shall be considered a single hazardous substance and compared to the applicable MTCA Method A or B cleanup level for benzo(a)pyrene.

[f] The screening level is for tributyl tin oxide and was calculated using an oral RfD of 0.0003 mg/kg-day. The TBT ion value is based on weights of one mole TBTO and two moles of TBT ion.

[g] The screening level is for total xylenes.

[h] TBT ion value calculated by Ecology using marine surface water standard of 0.01 ug/l for TBTO; the TBT ion value is based on the weights of one mole of TBTO and two moles of TBT ion.

Table 3
Data Quality Objectives for Sediment
Everett Shipyard
2008 Sampling

	Sediment Management Standards [a]		**Laboratory Reporting Limits and Quality Control Criteria**							
	Sediment Quality Standard (SQS)	Cleanup Screening Level (CSLs)	Method Detection Limit	Reporting Limit	Surrogate (%)	LCS/SRM (%)	LCS/SRM RPD (%)	MS/MSD (%)	MS/MSD RPD (%)	Duplicate RPD (%)
VOCs (ug/kg) [Method 8260B]										
1,2,4-Trichlorobenzene*	810	1,800	0.208	5.0	--	76-140	30	76-140	30	30
1,2-Dichlorobenzene*	2,300	2,300	0.051	1.0	--	80-124	30	80-124	30	30
1,4-Dichlorobenzene*	3,100	9,000	0.094	1.0	--	80-126	30	80-126	30	30
d4-1,2-Dichloroethane (Surrogate)	--	--	--	--	72-134	--	--	--	--	--
d8-Toluene (Surrogate)	--	--	--	--	78-124	--	--	--	--	--
4-Bromofluorobenzene (Surrogate)	--	--	--	--	66-120	--	--	--	--	--
d4-1,2-Dichlorobenzene (Surrogate)	--	--	--	--	80-124	--	--	--	--	--
SVOCs (ug/kg) [Method 8270 SIM]										
2,4-Dimethylphenol	29	29	14.8	20	--	23-85	30	23-85	30	30
2-Methylphenol	63	63	14.2	20	--	40-86	30	40-86	30	30
4-Methylphenol	670	670	12.8	20	--	40-92	30	40-92	30	30
Benzo(b)fluoranthene	230,000**	450,000**	9.53	20	--	43-105	30	43-105	30	30
Benzo(k)fluoranthene	230,000**	450,000**	9.26	20	--	40-108	30	40-108	30	30
Benzoic Acid	650	650	115	200	--	29-104	30	29-104	30	30
Benzyl Alcohol	57	73	14.5	20	--	25-90	30	25-90	30	30
Pentachlorophenol	360	690	47.7	100	--	34-94	30	34-94	30	30
Phenol	420	1,200	13.7	20	--	37-92	30	37-92	30	30
2-Methylnapthalene*	38,000	64,000	8.19	20	--	44-82	30	44-82	30	30
Acenaphthene*	16,000	57,000	8.22	20	--	42-85	30	42-85	30	30
Acenaphthylene*	66,000	66,000	8.66	20	--	44-84	30	44-84	30	30
Anthracene*	220,000	1,200,000	7.74	20	--	42-87	30	42-87	30	30
Benz[a]anthracene*	110,000	270,000	5.91	20	--	42-94	30	42-94	30	30
Benzo[a]pyrene*	99,000	210,000	8.17	20	--	41-95	30	41-95	30	30
Benzo[g,h,i]perylene*	31,000	78,000	6.77	20	--	18-106	30	18-106	30	30
Bis[2-ethylhexyl]phthalate*	47,000	78,000	11.0	20	--	34-111	30	34-111	30	30
Butyl Benzyl Phthalate*	4,900	64,000	11.2	20	--	41-105	30	41-105	30	30
Chrysene*	110,000	460,000	6.63	20	--	45-92	30	45-92	30	30
Dibenz[a,h]anthracene*	12,000	33,000	8.57	20	--	32-104	30	32-104	30	30
Dibenzofuran*	15,000	58,000	7.57	20	--	46-84	30	46-84	30	30
Diethyl Phthalate*	61,000	110,000	16.4	20	--	46-94	30	46-94	30	30
Dimethyl Phthalate*	53,000	53,000	7.77	20	--	44-91	30	44-91	30	30
Di-n-butyl Phthalate*	220,000	1,700,000	12.4	20	--	48-99	30	48-99	30	30
Di-n-octyl Phthalate*	58,000	4,500,000	8.34	20	--	32-107	30	32-107	30	30
Fluoranthene*	160,000	1,200,000	7.91	20	--	43-98	30	43-98	30	30
Fluorene*	23,000	79,000	8.96	20	--	44-88	30	44-88	30	30
Indeno[1,2,3-cd]pyrene*	34,000	88,000	8.60	20	--	28-101	30	28-101	30	30
Napthalene*	99,000	170,000	8.69	20	--	41-80	30	41-80	30	30
N-nitrosodiphenylamine*	11,000	11,000	8.67	100	--	40-111	30	40-111	30	30
Phenanthrene*	100,000	480,000	8.40	20	--	45-90	30	45-90	30	30
Pyrene*	1,000,000	1,400,000	7.76	20	--	39-99	30	39-99	30	30
Total LPAH	370,000	780,000	--	--	--	--	--	--	--	--
Total HPAH	960,000	5,300,000	--	--	--	--	--	--	--	--
Total Benzofluoranthenes*	230,000	450,000	--	--	--	--	--	--	--	--
2-Chlorophenol-d4 (Surrogate)	--	--	--	--	30-84	--	--	--	--	--
1,2-Dichlorobenzene-d4 (Surrogate)	--	--	--	--	25-82	--	--	--	--	--
2,4,6-Tribromophenol (Surrogate)	--	--	--	--	25-103	--	--	--	--	--
2-Fluorophenol (Surrogate)	--	--	--	--	10-114	--	--	--	--	--
Phenol-d5 (Surrogate)	--	--	--	--	29-85	--	--	--	--	--
Nitrobenzene-d5 (Surrogate)	--	--	--	--	29-87	--	--	--	--	--
2-Fluorobiphenyl (Surrogate)	--	--	--	--	32-88	--	--	--	--	--
p-Terphenyl-d14 (Surrogate)	--	--	--	--	21-97	--	--	--	--	--
Pesticides (ug/kg) [Method 8081A]										
Hexachlorobenzene*	380	2,300	0.225	1.0	--	50-150	30	50-150	30	30
Hexachlorobutadiene*	3,900	6,200	0.415	1.0	--	50-150	30	50-150	30	30
Tetrachlorometaxylene (Surrogate)	--	--	--	--	53-112	--	--	--	--	--
Decachlorobiphenyl (Surrogate)	--	--	--	--	65-125	--	--	--	--	--

Table 3
Data Quality Objectives for Sediment
Everett Shipyard
2008 Sampling

	Sediment Management Standards [a]		**Laboratory Reporting Limits and Quality Control Criteria**							
	Sediment Quality Standard (SQS)	Cleanup Screening Level (CSLs)	Method Detection Limit	Reporting Limit	Surrogate (%)	LCS/SRM (%)	LCS/SRM RPD (%)	MS/MSD (%)	MS/MSD RPD (%)	Duplicate RPD (%)
PCBs (ug/kg) [Method 8082]										
Aroclor 1016	--	--	1.3	4.0	--	57-101	30	57-101	30	30
Aroclor 1221	--	--	--	4.0	--	--	--	--	--	30
Aroclor 1232	--	--	--	4.0	--	--	--	--	--	30
Aroclor 1242	--	--	--	4.0	--	--	--	--	--	30
Aroclor 1248	--	--	--	4.0	--	--	--	--	--	30
Aroclor 1254	--	--	--	4.0	--	--	--	--	--	30
Aroclor 1260	--	--	2.76	4.0	--	57-126	30	57-126	30	30
Total PCBs*	12,000	65,000	--	4.0	--	--	--	--	--	30
Tetrachlorometaxylene (Surrogate)	--	--	--	--	61-118	--	--	--	--	--
Decachlorobiphenyl (Surrogate)	--	--	--	--	59-122	--	--	--	--	--
Organotins (ug/kg) [Method PSEP/Krone 1988]										
Tributyltin as TBT Ion	NE	73	1.773	4	--	59-143	30	59-143	30	30
Dibutyl Tin Ion	NE	NE	3.175	6	--	48-115	30	48-115	30	30
Butyl Tin Ion	NE	NE	4.089	4	--	20-113	30	20-113	30	30
Tripentyl Tin	--	--	--	--	30-136	--	--	--	--	--
Tripropyl Tin	--	--	--	--	25-96	--	--	--	--	--
Organotins-Porewater (ug/L) [Method PSEP/Krone 1988]										
Tributyltin as TBT Ion	0.05	0.15	0.00413	0.02	--	23-133	30	23-133	30	30
Dibutyl Tin Ion	NE	NE	0.00914	0.03	--	30-118	30	30-118	30	30
Butyl Tin Ion	NE	NE	0.00691	0.02	--	10-113	30	10-113	30	30
Tripentyl Tin	--	--	--	--	58-120	--	--	--	--	--
Tripropyl Tin	--	--	--	--	36-107	--	--	--	--	--
Metals (mg/kg) [Method 6010/7471]										
Arsenic	57	93	0.52	5.0	--	80-120	20	75-125	20	20
Cadmium	5.1	6.7	0.02	0.2	--	80-120	20	75-125	20	20
Chromium	260	270	0.28	0.5	--	80-120	20	75-125	20	20
Copper	390	390	0.04	0.2	--	80-120	20	75-125	20	20
Lead	450	530	0.2	2.0	--	80-120	20	75-125	20	20
Mercury	0.41	0.59	0.005	0.05	--	80-120	20	75-125	20	20
Silver	6.1	6.1	0.11	0.3	--	80-120	20	75-125	20	20
Zinc	410	960	0.28	1.0	--	80-120	20	75-125	20	20
Ammonia (mg-N/kg) [Method 350.1]										
Ammonia	--	--	0.011	1.0	--	75-125	20	75-125	20	20
Total Sulfides (mg/kg) [Method PSEP]										
Total Sulfides	--	--	0.15	1.0	--	75-125	20.00	75-125	20	20
Acid Volatile Sulfides	--	--	0.045	1.0	--	75-125	20	75-125	20	20
Total Solids (%)										
Total Solids **[Method 160.3]**	--	--	--	0.01	--	--	--	--	--	20
Total Volatile Solids (mg/kg) **[Method 160.4]**	--	--	--	0.01	--	--	--	--	--	20
TOC (%) [Method PSEP/Plumb]										
TOC	--	--	0.0041	0.02	--	75-125	20	75-125	20	20

Notes:

LCS/LCSD - Laboratory control sample/laboratory control sample duplicate
MS/MSD - Matrix spike/matrix spike duplicate
NE - Not established
PCBs - Polychlorinated biphenyls
RPD - Relative percent difference
SRM - Standard reference material
SVOCs - Semivolatile organic compounds
TOC - Total organic carbon
VOCs - Volatile organic compounds
Laboratory MDLs, RLs, and control limits provided by Analytical Resources, Inc.
* The listed SQS value represents a concentration in parts per billion (ppb) 'normalized' on a TOC basis.
** The listed SQS value represents the sum of the concentrations of the b, j, and k isomers of benzofluoranthene.
[a] Sediment Sampling and Analysis Plan Appendix; Washington State Department of Ecology, Publication 03-09-043, Revised February 2008 (WAC 173-204).

Total LPAH = The sum of detected naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene.
Total HPAH = The sum of detected fluoranthene, pyrene, benz(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)per
Total benzofluoranthenes= The sum of the b, j, and k isomers.

Table 4
Target Compounds Above Screening Levels
Everett Shipyard
2008 Sampling

Analyte/Method	Screening Level
Groundwater	
Volatile Organic Compounds (ug/L)	
1,2,3-Trichloropropane	MTCA B (GW)
1,2-Dibromo-3-chloropropane	MTCA B (GW) EPA MCL EPA MCLG WA MCL
1,2-Dibromoethane (EDB)	MTCA A (GW) MTCA B (GW) EPA MCL EPA MCLG WA MCL
1,2-Dichloroethane (EDC)	EPA MCLG
1,2-Dichloropropane	EPA MCLG
Acrylonitrile	MTCA B (GW) MTCA B (SW) HHOO NTR-HHOO
Benzene	EPA MCLG
Bromodichloromethane	EPA MCLG
Carbon Tetrachloride	EPA MCLG
Chloroform	EPA MCLG
Methylene Chloride	EPA MCLG
Semivolatile Organic Compounds (ug/kg)	
2,4,6-Trichlorophenol	MTCA B (GW) MTCA B (SW) HHOO
2,4-Dinitrotoluene	HHOO
3,3’-Dichlorobenzidine	MTCA B (GW) MTCA B (SW) HHOO NTR-HHOO
Bis-(2-chloroethyl)ether	MTCA B (GW) MTCA B (SW) HHOO NTR-HHOO
bis(2-Ethylhexyl)phthalate	EPA MCLG
Hexachlorobenzene	MTCA B (GW) EPA MCLG MTCA B (SW) HHOO NTR-HHOO
Hexachlorobutadiene	MTCA B (GW)
N-Nitroso-di-n-propylamine	MTCA B (SW) HHOO
Pentachlorophenol	MTCA B (GW) EPA MCL EPA MCLG WA MCL MTCA B (SW) HHOO
Polychlorinated Biphenyls (PCBs, ug/L)	
Aroclor 1016	MTCA B (SW)
Aroclor 1254	MTCA B (SW)
Total PCBs	EPA MCLG MTCA B (SW) HHOO NTR-HHOO

Table 4
Target Compounds Above Screening Levels
Everett Shipyard
2008 Sampling

Analyte/Method	Screening Level
Groundwater (continued)	
Organotins (ug/L)	
Tributyltin as TBT Ion	CCC
Metals (mg/L)	
Arsenic	MTCA A (GW) MTCA B (GW) EPA MCLG WA MCL MTCA B (SW) WAC 173-201A (Chronic) CCC HHOO NTR-CCC NTR-HHOO
Antimony	MTCA B (GW) EPA MCL EPA MCLG WA MCL
Mercury	WAC 173-201A (Chronic) CCC NTR-CCC
Nickel	WAC 173-201A (Chronic) CCC NTR-CCC
Silver	WAC 173-201A (Acute) CMC NTR-CMC
Soil	
Semivolatile Organic Compounds (ug/kg)	
N-Nitroso-di-n-propylamine	MTCA B (Soil)
Pentachlorophenol	Protection of Surface Water
Metals (mg/kg)	
Arsenic	MTCA B (Soil) Protection of Surface Water
Mercury	Protection of Surface Water

Notes:

CCC = National Recommended Water Quality Criteria, Salt Water Criteria Continuous Concentration (Chronic) Criteria.
CMC = National Recommended Water Quality Criteria, Salt Water Criteria Maximum Concentration (Acute) Criteria.
EPA-MCL = EPA Maximum Contaminant Level for drinking water
EPA-MCLG = EPA Maximum Contaminant Level goal for drinking water
HHOO = National Recommended Water Quality Criteria, Marine Water Human Health (consumption), Organism Only Criteria.
MTCA A (GW) = Model Toxics Control Act Cleanup Regulation, WAC 173-340 Groundwater Method A Cleanup Level.
MTCA B (GW) = Model Toxics Control Act Cleanup Regulation, WAC 173-340 Groundwater Method B Cleanup Level.
MTCA B (Soil) = Model Toxics Control Act Cleanup Regulation, WAC 173-340 Soil Method B Cleanup Level.
MTCA B (SW)= Model Toxics Control Act Cleanup Regulation, WAC 173-340 Surface Water Method B Cleanup Level.
NTR-CCC = National Toxics Rule, Salt Water Criteria, Continuous Concentration (Chronic)
NTR-CMC = National Toxics Rule, Salt Water Criteria, Continuous Maximum Concentration Acute)
NTR-HHOO = National Toxics Rule, Marine Water Human Halth (consumption), Organism Only Criteria
Protection of Surface Water = WAC-173-201A-240
WAC 173-201A (Acute) = Marine Water Toxic Substance Criteria, WAC 173-201A.
WAC 173-201A (Chronic) = Marine Water Toxic Substance Criteria, WAC 173-201A.
WA-MCL = Washington State Maximum Contaminant Level for drinking water

Table 5
Water Sample Collection, Preservation, And Holding Time Criteria
Everett Shipyard
2008 Sampling

Parameter	Analytical Method	Container Type	Preservation	Extraction Holding Time	Analysis Holding Time
Volatile Organic Compounds (VOCs) and low-level VOCs	EPA SW-846 8260B	5-40 ml VOA glass vials with teflon septum[1] (No Headspace)	HCI pH<2, cool to 4ºC	NA	14 days
Low-Level VOCs (1,1-DCE, PCE, TCE, and vinyl chloride)	EPA SW-846 8260-SIM	5-40 ml VOA glass vials with teflon septum 1 (No Headspace)	HCI pH<2, cool to 4ºC	NA	14 days
Semivolatile Organic Compounds (SVOCs)	EPA SW-846 8270D	2-500 ml amber glass, Teflon lined cap	Cool to 4ºC	7 days	40 days*
Polynuclear Aromatic Hydrocarbons (PAHs)	EPA SW-846 8270-SIM (Low-Level)	2-500 ml amber glass, Teflon lined cap	Cool to 4ºC	7 days	40 days*
Polychlorinated Biphenyls (PCBs) Low-Level	EPA SW-846 8082A Low-Level (1-liter hexane extraction)	2-1 L amber glass, Teflon lined cap	Cool to 4ºC	7 days	40 days*
Diesel-Range and Heavy Oil-Range Total Petroleum Hydrocarbons (TPH)	PSEP/Krone 1988	2-500 ml amber glass, Teflon lined cap	Cool to 4ºC	7 days	40 days*
Organotin Compounds	PSEP/Krone 1988	2-500 ml amber glass, Teflon lined cap	Cool to 4ºC	NA	7 days
Total and Dissolved Metals[2]	EPA SW-846 200/6010B/7000A Series	500 ml HDPE	HNO_3 to pH <2, cool to 4ºC	NA	6 months (Mercury is 28 days)
Total Dissolved Solids (TDS)	EPA SW-846 160.1	1 L HDPE	Cool to 4ºC	NA	7 days

* - Days from extraction date
1,1-DCE - 1,1-Dichloroethene
HDPE - High-density polyethylene
PCE - Tetrachloroethene
TCE - Trichloroethene

[1] If analysis for VOCs and low-level VOCs are required on the same sample, collect 5-40 mL vials.

[2] Samples for dissolved metals analysis will be preserved by the laboratory after filtration, or pre-preserved containers will be used for samples filtered in the field.

Table 6
Soil Sample Collection, Preservation, And Holding Time Criteria
Everett Shipyard
2008 Sampling

Parameter	Analytical Method	Container Type	Preservation	Extraction Holding Time	Analysis Holding Time
Volatile Organic Compounds (VOCs)	EPA SW-846 5035A/8260B Mod.	2-40 mL VOA vials with sodium bisulfate (from Easy-Draw Syringe), 1-40 mL VOA vial with MeOH (from Easy-Draw Syringe), and 2-oz glass jar with teflon-lined lid (minimize headspace)	Sodium Bisulfate (for VOA vial) Methanol (for VOA vial) No headspace (for 2-oz glass jar) Cool to 4ºC [5 gms of sample for 5 mls of preservative]	NA	14 days
Semivolatile Organic Compounds (SVOCs)	EPA SW-846 8270D	8-oz glass jar with teflon-lined lid	Cool to 4ºC	14 days	40 days *
Polynuclear Aromatic Hydrocarbons (PAH)	EPA SW-846 8270 and 8270-SIM	8-oz glass jar with teflon-lined lid	Cool to 4ºC	NA	14 days
Polychlorinated Biphenyls (PCBs)	EPA SW-846 8082A	8-oz glass jar with teflon-lined lid	Cool to 4ºC	14 days	40 days *
Diesel-Range and Heavy Oil-Range Total Petroleum Hydrocarbons	Ecology NWTPH-Dx	8-oz glass jar with teflon-lined lid	Cool to 4ºC	14 days	40 days *
Organotin	PSEP/Krone 1988	8-oz glass jar with teflon-lined lid	Cool to 4ºC	NA	14 days
Metals	EPA SW-846 6010B / 7000A Series	4-oz glass jar with teflon-lined lid	Cool to 4ºC	NA	6 months (28 days for Mercury)

* - Days from extraction date

Note: Other allowable containers for soil samples include stainless steel rings with teflon-lined plastic caps for analyses other than volatile parameters.

Table 7
Sediment Sample Collection, Preservation, And Holding Time Criteria
Everett Shipyard
2008 Sampling

Parameter	Analytical Method	Container Type	Preservation Requirements	Extraction Holding Time	Analysis Holding Time
VOCs	EPA SW846 8260B	2 oz Wide-Mouth Glass (No Headspace)	Cool to 4°C	NA	40 Days*
SVOCs	EPA SW846 8270D/8270-SIM	32 oz Wide-Mouth Glass	Cool to 4°C	14 Days	40 Days*
			Freeze to -18°C	NA	1 Year
PCBs	EPA SW846 8082A	32 oz Wide-Mouth Glass	Cool to 4°C	14 Days	40 Days*
			Freeze to -18°C	NA	1 Year
Pesticides	EPA SW846 8081A	32 oz Wide-Mouth Glass	Cool to 4°C	14 Days	40 Days*
			Freeze to -18°C	NA	1 Year
Organotin Compounds	PSEP/Krone 1988	8 oz Wide-Mouth Glass	Cool to 4ºC	NA	14 days
			Freeze to -18°C	NA	1 Year
Total Metals**	EPA SW846 6010B/7471A	16 oz Wide-Mouth Glass	Cool to 4°C	NA	6 Months (28 days for Mercury)
			Freeze to -18°C	NA	2 Years***
Nitrogen as Ammonia	EPA SW846 350.1	16 oz Wide-Mouth Glass	Cool to 4°C	NA	7 Days
Total Organic Carbon (TOC)	Plumb, 1981	16 oz Wide-Mouth Glass	Cool to 4°C	NA	28 Days
Total Solids	PSEP Method (1986a)	16 oz Wide-Mouth Glass	Cool to 4°C	NA	7 Days
			Freeze to -18°C	NA	6 Months
Total Volatile Solids	PSEP Method (1986a)	16 oz Wide-Mouth Glass	Cool to 4°C	NA	7 Days
Total Sulfides	PSEP Method (1986a)	16 oz Wide-Mouth Glass	Cool to 4°C	NA	7 Days
Grain Size	PSEP Method (1986a)	16 oz Wide-Mouth Plastic or Glass	Cool to 4°C	NA	6 Months

* - Days from extraction date

** Total metals include arsenic, cadmium, chromium, copper, lead, silver and zinc by EPA Method 6010B and mercury by EPA Method 7471A.

*** Mercury samples can be frozen for 28 days.