Compliance Monitoring Plan
Everett Shipyard Site
Everett, Washington

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Prepared for

Port of Everett

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1.0 INTRODUCTION

This Compliance Monitoring Plan (CMP) documents the compliance monitoring program for the planned cleanup action [Washington State Department of Ecology (Ecology 2012)] for the marine sediment portion (Sediment Cleanup Area) of the Everett Shipyard Site (Site) in Everett, Washington (Figure 1). The Port of Everett (Port) entered into a Consent Decree (Consent Decree No.12 20 3430 1) with Ecology to remediate the Site in accordance with the approved Cleanup Action Plan (CAP; Ecology 2012).

A sediment Engineering Design Report (EDR; Landau Associates 2014a) and a Construction Plans and Specifications package (to be included in the Port's final Bid Package) were developed to provide the details required to implement the cleanup action described in the CAP. The cleanup action includes excavation and offsite disposal of marine sediment and an area of upland soil (Area A) with concentrations of indicator hazardous substances (IHS) above the cleanup levels (CULs) developed for this Site, and capping of contaminated sediment adjacent to the bulkhead at three locations immediately adjacent to the 14^{th} Street and Segment C bulkheads.

The Sediment Cleanup Area is subdivided into the North (N) and South (S) dredging areas. The North dredging area is subdivided into four sub-areas (N-1 through N-4) based on location and dredge depth. Subarea N-1 is further divided by the designation of Area N-1A, which consists of a small, isolated area located between adjacent bulkheads in a step-bulkhead system. The south dredge area (Area S) is a small area located about 200 feet (ft) south of the main dredge area that contains localized sediment contamination associated with an outfall present in this area (Outfall C).

An upland area of soil contamination (referred to as Area A) is located adjacent to the existing bulkhead near the northwest corner of the Site. Area A is subdivided into seven subareas based on the depth of excavation, as is discussed further in Section 4.0. Soil in Area A is contaminated with diesel-range petroleum hydrocarbons (URS 2011) and will be remediated in conjunction with the marine sediment cleanup action because it needs to be implemented in conjunction with replacement of the adjacent marine bulkhead. As a result, the excavation and disposal of Area A soil is included as a component of this CMP. The dredge prism areas and upland Area A are shown on Figure 2.

This CMP addresses compliance monitoring for three important aspects of the planned cleanup action: 1) the protection of human health and the environment during cleanup activities, 2) performance of the cleanup action in meeting cleanup standards, and 3) the confirmation of the long-term effectiveness of the cleanup action. This CMP was prepared on behalf of the Port to meet the requirements of the Model Toxics Control Act [MTCA; Washington Administrative Code (WAC) 173-340] and the Washington State Sediment Management Standards (SMS; WAC 173-204), and is consistent with the MTCA compliance monitoring requirements [WAC 173-340-400 (4)(a) and WAC 173-340-410].

2.0 COMPLIANCE MONITORING

This CMP addresses compliance monitoring for the planned cleanup action, consistent with the requirements of the MTCA [WAC 173-340-400 (4)(b), and WAC 173-340-410], which require compliance monitoring for all cleanup actions for the following three purposes:

- **Protection monitoring** to confirm that human health and the environment are adequately protected during construction, operation, and maintenance associated with the cleanup action.
- **Performance monitoring** to confirm that the cleanup action has attained cleanup standards and any other performance standards.
- **Confirmational monitoring** to confirm the long-term effectiveness of the cleanup action once the cleanup standards and other performance standards have been attained.

The remainder of this section provides a description of planned compliance monitoring activities to address the three purposes listed above. These activities, and the purposes they serve, include the following tasks: preparing health and safety plans (HASPs; protection of human health); monitoring air, stormwater, and surface water quality (protection of the environment); monitoring sediment and soil quality post-construction (verification that the cleanup action meets performance standards); and post-construction groundwater monitoring (confirmation of the long-term effectiveness of the cleanup action).

2.1 PROTECTION MONITORING

Protection monitoring will address worker health and safety for activities related to cleanup action construction and excavation activities, as well as protection of both the general public and potential environmental receptors. Protection monitoring is addressed for both sediment cleanup activities as well as upland soil cleanup activities in Area A.

2.1.1 PROTECTION OF HUMAN HEALTH

Monitoring for protection of human health addresses worker safety for activities related to construction, operation, and maintenance of the cleanup action and will be addressed through project-specific HASPs prepared by Landau Associates and the selected construction contractor. The requirements for preparation of a project-specific HASP by the selected contractor will be included in the project construction documents, along with the requirement that it be no less protective than Landau Associates' HASP and the existing Site-specific HASP (Landau Associates 2012) used for previous Site investigation activities.

Site-specific HASPs will address monitoring, and potentially mitigating, physical and chemical hazards associated with Site activities. These HASPs will be consistent with the requirements of MTCA WAC 173-340-810. Anticipated physical hazards during sediment cleanup activities in the Sediment

Cleanup Area include working in proximity to heavy equipment, working over water, and heat stress and/or cold stress. Anticipated physical hazards during soil cleanup activities in Area A include working in proximity to heavy equipment, heat stress and/or cold stress, and vehicular traffic. Anticipated chemical hazards during sediment cleanup activities in the Sediment Cleanup Area include potential exposure to Site contaminants through various exposure pathways (i.e., direct contact, inhalation and ingestion). Anticipated chemical hazards during excavation and offsite disposal of soil in Area A include potential exposure to Site contaminants through various exposure pathways (i.e., direct contact, vapor inhalation, dust inhalation, and ingestion).

2.1.2 PROTECTION OF THE ENVIRONMENT

Monitoring for protection of the environment addresses safeguarding environmental receptors that may be exposed to chemical or physical hazards at levels that may cause adverse effects. The primary receptors of concern in the vicinity of the Site are aquatic organisms in the marine environment. The primary receptors of concern for upland Area A are aquatic organisms in the marine environment that may be affected by releases from Area A.

Protection monitoring for environmental protection during sediment cleanup activities associated with the sediment Cleanup Area will consist of monitoring surface water turbidity and is presented in the *Water Quality Monitoring Plan– Everett Shipyard Site, Everett, Washington* (Landau Associates 2014b). Cleanup activities include dredging, removal of the marine railway and the Travel Lift/Boat Haul-Out facility, removal of floats and float pilings, installation of new float pilings, and backfilling activities.

Environmental protection monitoring during soil cleanup activities associated with upland Area A, will consist of vapor monitoring, dust monitoring, monitoring the performance of best management practices (BMPs) to minimize dust generation and control stormwater runoff and/or groundwater discharge, and monitoring marine surface water for turbidity and visible sheen. The contractor will be required to prepare and implement a SWPPP, as specified in the project plans and specifications. A representative of the Port that is a certified construction erosion and sediment control lead (CESCL) will monitor performance of the BMPs and recommend changes in approach or application, if required.

2.2 PERFORMANCE MONITORING

Monitoring for cleanup action performance addresses verification that cleanup action has attained cleanup standards. Performance monitoring activities include testing samples of affected media (sediment and soil) to verify that the cleanup action has achieved cleanup standards, and construction quality assurance (CQA) monitoring to confirm that the cleanup action is conducted in conformance with the project construction documents.

2.2.1 Sediment Cleanup Area

During construction activities associated with the dredging and removal of contaminated marine sediment, performance monitoring will be limited to verifying that the lateral and vertical extent of sediment removal are achieved as specified in the project plans and specifications. Bathymetric soundings will be used to verify sediment removal adequacy. Specific procedures for verification surveying are presented in the construction plans and specifications.

Performance monitoring of surface sediment quality implemented after dredging will be used to verify that Site CULs have been attained throughout the Site. This verification will provide a basis for determining whether a thin layer of clean sediment is required to address dredging residuals and whether long-term performance and confirmation monitoring is needed. Surface sediment grab samples will be collected from locations within the Sediment Cleanup Area and analyzed for Site sediment indicator hazardous substances (IHS) established in the CAP.

Turbidity generated during the dredging process can result in a thin veneer of residual surface sediment contamination that rapidly dissipates through natural recovery (i.e., deposition of clean sediment) for sites with high sedimentation rates such as the Site. If compliance monitoring indicates that recontamination of the dredged sediment surface has occurred, a cover of clean residual sediment will be placed over the portions of the dredged surface that exceed the sediment CULs instead of re-dredging the surface (sediment monitoring and cover procedures are presented in Section 3.0).

2.2.2 Upland Area A

Performance monitoring of soil quality implemented after excavation and before backfilling will be used to verify that Site CULs have been attained throughout Area A. Soil samples will be collected from locations within Area A and analyzed for relevant Site IHS, which, in Area A, is limited to diesel-range petroleum hydrocarbons (URS 2011). Sampling will include both sidewall and excavation base samples. Performance monitoring will be considered complete for those portions of Area A where soil analytical results comply with Site CULs within the upper 6 inches of the soil (base samples) or along the entire depth of the sidewall (sidewall samples). Specific soil compliance monitoring procedures are presented in Section 4.0.

2.3 CONFIRMATION MONITORING

Long-term confirmation monitoring for sediment cleanup would typically be implemented in instances where contamination is left in-place following cleanup (e.g., capping), or when the potential exists for the sediment to be re-contaminated from an ongoing source. Limited sediment capping is included adjacent to the bulkhead in three areas. As previously indicated, if recontamination of the sediment surface from turbidity during dredging occurs, a thin layer of clean sediment will be placed over the affected areas. As a result, confirmation sampling may be required within the Sediment Cleanup Area. It is anticipated that sediment confirmation sampling, if required, will be conducted as part of the 5-year review for the Site and that the scope for sediment confirmation sampling will be developed with the review and concurrence of Ecology following completion of this cleanup action.

Long-term confirmation monitoring for the soil cleanup in Area A will be addressed through groundwater monitoring, as specified in the CAP. Groundwater monitoring will be conducted quarterly for four consecutive quarters. The CAP requires that groundwater monitoring will occur for at least 2 years, although the frequency of monitoring after the first year can be determined in consultation with Ecology for subsequent events. Detailed groundwater monitoring procedures are presented in the Appendix B (Compliance Monitoring Plan**)** of the *Engineering Design Report Upland Cleanup - Everett Shipyard Site* (Landau Associates 2012).

3.0 SEDIMENT QUALITY MONITORING

This section provides an overview of the planned sediment quality performance and confirmation monitoring activities for the Site compliance monitoring program. These monitoring activities are intended to verify that the cleanup action has achieved cleanup standards. One area (Area N-1A) within the Site sediment cleanup area contains polychlorinated biphenyls (PCBs) concentrations greater than 1 milligram per kilogram (mg/kg), but less than 50 mg/kg. Area N-1A is discussed in Section 3.1.

3.1 MONITORING LOCATIONS

Surface sediment samples (0 to 10 cm interval) for performance monitoring will be collected after dredging is completed. A total of 22 locations have been identified for sediment sample collection from within the dredged area. Locations were chosen to provide adequate spatial coverage of the Sediment Cleanup Area. Sample locations are shown on Figures 3 and 4.

During Site investigation activities, PCBs at four locations within cleanup Area N-1A were detected at concentrations exceeding 1 mg/kg, but less than 50 mg/kg. The cleanup level for PCBs is 1 mg/kg, which is the cleanup level for high occupancy areas under the Toxics Substance Control Act (TSCA). As indicated in Section 1.0, Area N-1A is located in a physically constrained area between two bulkheads in a stepped bulkhead system. The elevation of the sediment surface in this area is about elevation 8 ft mean lower low water (MLLW). Sediment in this area will be dredged "in the dry" during low tide to minimize the potential for redistribution of PCBs elsewhere in the dredging area. Within Area N-1A, surface sediment samples (0 to 10 cm interval) for performance monitoring will be collected after dredging of this area is completed. As the adjacent areas will be dredged as part of the overall planned cleanup activities described in the CAP, sampling adjacent areas will occur after the remainder of Site dredging has been completed. Compliance monitoring sediment sample locations for Area N-1A are shown on Figure 4. Unlike the remainder of the dredge prism, Area N-1A will be re-excavated in any areas that exceed the CUL until the 1 mg/kg TSCA CUL is achieved.

3.2 STATION POSITIONING METHODS

The objective of the station positioning is to accurately establish and record the positions of all sampling locations within ±2 meters (6.56 ft). The northings and eastings of the proposed sediment sampling station locations in State Plane Coordinates are provided in Table 1. Station locations will be surveyed in the field using a differential global positioning system (DGPS) with the use of a known survey control point. Sampling station coordinates will be reported relative to the North American Datum of 1983 (NAD83). Planned sampling location coordinates will be entered into the sampling vessel's onboard GPS unit.

Vertical position control at each location will be evaluated by using a lead line (or weighted tape) to measure from the water surface to the sediment surface. The elevation of the mudline at each location will be calculated by measuring depth of water at each location and subtracting it from the tide elevation. Mudline elevations will be recorded based on the MLLW datum.

3.3 SEDIMENT SAMPLE COLLECTION

Surface sediment samples will be collected either directly from the dredge bucket, or using a powered grab sampler or similar device.

If a power grab or equivalent sampler is used, a hydraulic winch system will be used to deploy the sampler at a rate not exceeding 1 meter/second to minimize the bow wake associated with sampler descent. Once the sampler hits the bottom, the jaws will be activated and then the sampler will be brought to the deck of the vessel at a rate not exceeding 1 meter/second to minimize any washing and disturbance of the sediment within the sampler. The date, time, mudline elevation, sample depth, and location of sample acquisition will be recorded on a sample collection form.

If the sample is collected directly from the dredge bucket, the bucket will be deployed in the same manner as for dredging, at a rate not exceeding 1 meter/second to minimize the bow wake associated with bucket descent. The manner of sample collection will vary depending on the type of dredging equipment used. If a clam shell bucket is use, the same procedure as described above for the power grab sampler will be used. If a fixed arm excavator is used, the sample will be obtained using a single pass of the excavator bucket to obtain an intact, undisturbed sample from the dredge surface. The dredge bucket will be brought to the deck of the vessel at a rate not exceeding 1 meter/second to minimize any washing and disturbance of the sediment within the bucket. The date, time, mudline elevation, sample depth, and location of sample acquisition will be recorded on a sample collection form.

Once onboard, the sampler/bucket will be secured, any overlying water will be carefully siphoned off, and the sample will be inspected to determine acceptability. Criteria used to determine acceptability are those detailed in Puget Sound Estuary Program (PSEP 1997) guidelines. These criteria include, but are not limited to:

- Minimal or no excessive water leakage from the jaws of the sampler/bucket
- No excessive turbidity in the water overlying the sample
- The sampler is not overfilled with sediment
- The sediment surface appears to be intact with minimal disturbance
- The penetration depth is sufficient (10 cm; dependent on grain size).

If the sample meets acceptability criteria, the sediment will be characterized on the field sample collection form. This characterization will include color, odor, sheen, grain size, a soil description consistent with the Visual Manual Method [American Society for Testing and Materials (ASTM) 2009], and field-screening results (e.g., photoionization detector readings). If, after multiple sampling attempts, a surface sample does not meet acceptability criteria (e.g., over-penetration), the sample will still be collected, but the sampler will document the reasons for not meeting criteria on the sample collection form.

Once the sample has been characterized, the sediment will then be homogenized and sub-sampled for chemical analysis. Sediment will be collected from the predominantly biologically active zone (top 10 cm of the sediment) from an area large enough to ensure adequate sample volume and excluding portions that are in contact with the power-grab sampler. This collected sediment will exclude large, unrepresentative material (e.g., shells, woody debris). Sediment will be homogenized to obtain a smooth consistency (based on color and texture) in decontaminated stainless-steel bowls, using a decontaminated stainless-steel spoon. After sufficient homogenization, sediment will be placed into laboratory-supplied containers, placed on ice, and stored in coolers at approximately 4°C until transported to the laboratory.

3.4 EQUIPMENT DECONTAMINATION

All field sampling equipment, including the pneumatic power grab sampler, stainless-steel bowls, and spoons will be decontaminated in the following manner:

- Rinsed with clean site water
- Scrubbed with Alconox
- Rinsed with clean site water.

If the sample is collected using the dredge bucket, the bucket will be decontaminated by rinsing with marine water until the bucket is free from all sediment or other particulate matter.

3.5 SAMPLE DOCUMENTATION AND HANDLING

A complete record of field activities will be maintained. Documentation necessary to meet quality assurance (QA) objectives for this project include: field notes and sampling forms, sample container labels, and sample chain-of-custody forms. All original documentation will be kept in the Landau Associates project files. The documentation and other project records will be safeguarded to prevent loss, damage, or alteration.

If an error is made on a document, corrections will be made by drawing a single line through the error and entering the correct information. The erroneous information will not be obliterated.

Corrections will be initialed and dated, and, if necessary, a footnote explaining the correction will be added. Errors will be corrected by the person who made the entry, whenever possible. Documentation will include:

- Recordkeeping by field personnel of primary field activities
- Recordkeeping of all samples collected for analysis
- Use of sample labels and chain-of-custody tracking forms for all samples collected for analysis.

Field report forms will provide descriptions of all sampling activities, sampling personnel, weather conditions, and a record of all modifications to the procedures and plans identified in this CMP. The field report forms are intended to provide sufficient data and observations to enable participants to reconstruct events that occurred during the sampling period.

After sample collection, the following information will be recorded on the field log sheet:

- Sample identification
- Date, time, of sample collection
- Name of person collecting the sample
- Sample location coordinates
- Depth of water at the location
- Surface water elevation at the time of sample collection
- Physical observations including presence of debris (e.g., wood debris), color, presence of sheen (or other visible contamination), apparent grain size, and odor.

Analytical results will be compared with the Site CULs to evaluate compliance with the cleanup objectives. If a surface sediment sample contains a constituent (or constituents) at a level exceeding the cleanup objective, placement of a thin layer of clean sediment to address dredging residuals and post-cleanup confirmation sampling may be required, as discussed in Section 3.6.

Sample nomenclature will provide information regarding the sample type (SG, for sediment grab); sample area [excluding dashes (i.e., Area N-3 would be written N3)]; sample location; and the upper elevation (in ft MLLW) of the sample as demonstrated with the following example:

- SG-N3-1(-12): Sediment grab, Area N-3, sample location 1, sample upper elevation is -12 ft MLLW.

Samples collected outside of the dredged area will be designated as perimeter samples, and their area designation will be 'P'.

- SG-P-1(-8): Sediment grab, perimeter area, sample location 1, sample upper elevation is -8 ft MLLW.

3.5.1 SEDIMENT LABORATORY ANALYSES

Compliance monitoring sediment samples will be analyzed by Analytical Resources Inc. (ARI) in Tukwila, Washington for the following Site IHS, in accordance with the CAP:

- Metals:
  - Arsenic, copper, lead, mercury, silver and zinc by U.S. Environmental Protection Agency (EPA) Method 6010B/6020 or 7471A/245.5
- Organotins: Porewater Tributyltin (TBT) by Krone et al. 1989
- Semivolatile Organic Compounds (SVOCs), including the carcinogenic polycyclic aromatic hydrocarbons (cPAHs) by EPA Method 8270C/1625C
- PCBs (total PCBs) by EPA Method 8082.

Compliance monitoring sediment sample chemical analyses, analytical methods, and CULs are presented in Table 2. The CULs identified in Table 2 consist of the Site-specific CULs defined in the CAP. Sediment sample containers, preservatives, and holding times are presented in Table 3.

The target reporting limits are only goals because instances may arise where sample concentration, heterogeneity of samples, or matrix interferences preclude achieving the desired reporting limits and associated quality control (QC) criteria. If this occurs, the laboratory will report the reason(s) for deviations from these reporting limits or noncompliance with QC criteria.

3.6 CORRECTIVE ACTIONS

If sediment CULs are exceeded during sediment performance monitoring, corrective action will be taken. This will include placing a minimum 6-inch cover of clean soil/sediment (thin layer cap) over the portion of the dredged surface that exceeds the sediment CULs, rather than re-dredging the surface. In the event that a thin layer sediment cap is necessary, confirmation sampling may also be required. It is anticipated that sediment confirmation sampling would be conducted as part of the 5-year review for the Site and that the scope will be developed with the review and concurrence of Ecology.

4.0 UPLAND AREA A SOIL QUALITY MONITORING

This section provides an overview of the planned soil confirmation monitoring activities for the Site upland Area A compliance monitoring program. As described in the EDR, upland Area A has been subdivided into seven subsections, which will each be excavated to different grades. Confirmation soil samples will be collected at the base of each subsection and along the excavation sidewalls. Soil samples will be collected using the same procedure followed at the completed portion of the upland site. This procedure is presented in the Appendix B (Compliance Monitoring Plan**)** of the *Engineering Design Report Upland Cleanup* **-** *Everett Shipyard Site* (Landau Associates 2012). All confirmation soil samples will be analyzed for diesel-range petroleum hydrocarbons. Because Area A is physically separated from the historic boatyard activities, the remaining Site IHS will not be analyzed for during this compliance monitoring. Analytical testing for Area A soil compliance monitoring is described in Section 4.3 and presented in Table 4.

Confirmation sample locations were selected to provide approximately equal coverage throughout each individual subsection in order to evaluate residual soil quality following excavation. Excavation base samples will be collected from the 11 locations presented on Figure 5. The sample spacing provides a sufficient number of samples to support the calculation of an upper confidence interval for the mean contaminant concentrations remaining at the base of the excavation. In upland Area A, the collection of 11 samples will result in sample spacing of one sample per approximately 400 square feet (ft^2). When combined with the existing data that was collected during the remedial investigation (RI) from below the contaminated zones, these samples will result in a comprehensive data set to assess final *in-situ* conditions.

Confirmation soil samples will be also collected from the excavation sidewalls to evaluate whether the lateral limits of contamination have been removed. Sidewall sampling will occur around all excavation boundaries that are adjacent to areas that will not be excavated and, additionally, where soil excavation results in a sidewall between excavation areas greater than 1 ft in height. Excavation sidewall samples will be collected from 19 locations, consisting of 10 exterior perimeter sample locations and 9 internal samples between excavation sub-areas. Internal samples will not be collected between subareas if the difference in bottom elevation is less than 2 ft. Sidewall confirmation sampling locations are presented on Figure 6.

Two petroleum hydrocarbon underground storage tanks (USTs) may be present in Area A-7 based on a geophysical survey conducted during the RI; the potential location of the two USTs are shown on Figures 5 and 6. If present, the USTs will be decommissioned and additional UST-specific confirmation sampling will be conducted. Sampling in and around the excavations for the USTs will be conducted in general compliance with Ecology UST regulations (WAC 173-360, including WAC 173-

360-385). However, because the excavation will be significantly larger than a typical UST decommissioning excavation, and the USTs may be a significant distance from the excavation sidewalls, the UST-specific confirmation sampling may be limited to additional bottom samples immediately below the USTs.

4.1.1 SAMPLE COLLECTION PROCEDURES

Compliance monitoring samples representative of the soil remaining at the base of the excavation will be collected from within the upper 1 ft of soil located at the base of the excavation. A shallow hole will be hand-dug at each sample location using decontaminated hand implements, including stainless-steel spoons and steel shovels, picks, and similar equipment. If the base of the excavation is not accessible to sampling personnel due to soft soil conditions or the presence of groundwater, the sample will be collected from an excavator bucket.

Compliance monitoring samples collected from the excavation sidewalls will be collected from a depth interval extending the full length of the contaminated soil depth. For excavations in unpaved areas, the sample will be collected from the ground surface to the base of the excavation. The surface of the excavation sidewalls will be scraped using decontaminated hand implements to expose a fresh surface for sample collection. Equal amounts of soil from the sidewalls will be collected using a decontaminated stainless-steel spoon, placed in a decontaminated stainless-steel bowl, homogenized, and transferred to the appropriate sample container. Similar to bottom samples, if the excavation sidewalls are not accessible to sampling personnel, the sample will be collected using an excavator bucket.

Material greater than about ¼ -inch will be removed from the sample prior to placing the soil in the sample container. Excavation compliance monitoring sample locations will be verified in the field with a Global Positioning System (GPS). However, if there is visual or olfactory evidence of contamination observed in the excavation, additional vertical or lateral excavation may be conducted prior to the confirmation sampling. Soil sample containers, preservatives, and holding times are presented in Table 5.

Sample nomenclature will provide information regarding the sample type (BS or SW for base or sidewall), sample area, and sample location, as demonstrated with the following examples:

- BS-A1-1 (Base sample, Area A1, sample location 1)
- SW-A2-2 (Sidewall sample, Area A2, sample location 2).

If additional excavation is conducted based on the results of confirmation sampling, the new sample will be collected at the new base elevation or extended sidewall location. The new sample will be named similar to the sample that it replaces, with the addition of the suffix “a”, “b”, “c”, etc.

- SW-A2-2a (Sidewall sample collected after additional excavation at location SW-A2-2).

4.2 EQUIPMENT DECONTAMINATION

All field sampling equipment, including the stainless-steel bowls, stainless-steel spoons, etc., will be decontaminated in the following manner:

- Scrub surfaces of equipment using an Alconox solution
- Rinse with clean tap water
- Rinse equipment with de-ionized water.

Decontamination of sampling equipment that contains a visible sheen will include a hexane rinse (or other appropriate solvent) prior to the tap water rinse. If an excavator is used to collect soil compliance monitoring samples, the excavator bucket will be cleaned using a hot water pressure washer prior to each sample collected.

4.3 SAMPLE DOCUMENTATION AND HANDLING

The transportation and handling of soil and sediment samples will be accomplished in a manner that not only protects the integrity of the sample, but also prevents any detrimental effects due to the release of samples. Samples will be logged on a chain-of-custody form and will be kept in coolers on ice, maintained at 4ºC until delivery to the analytical laboratory. The chain-of-custody form will accompany each shipment of samples to the laboratory.

Compliance monitoring soil samples will be analyzed by ALS Labs for diesel-range and oil-range total petroleum hydrocarbons (TPH-D and TPH-O) by Method NWTPH-Dx. Compliance monitoring soil sample chemical analyses, analytical method, CULs, and reporting limit goals are presented in Table 4. The target reporting limits are only goals because instances may arise where sample concentration, heterogeneity of samples, or matrix interferences preclude achieving the desired reporting limits and associated QC criteria. If this occurs, the laboratory will report the reason(s) for deviations from these reporting limits or noncompliance with QC criteria.

4.3.1 SOIL SAMPLE DATA EVALUATION

Following completion of compliance monitoring soil sampling activities within each excavation, and validation of the analytical results, the compliance monitoring data will be compared to the diesel-range petroleum hydrocarbon CUL provided in Table 4. If concentrations exceed the CUL, further excavation will be conducted and additional confirmation soil samples will be collected from the base of the re-excavated areas. The sequence of excavation and collection of confirmation soil samples will proceed iteratively until cleanup has been achieved and demonstrated, or until it is determined with Ecology concurrence that further excavation is impracticable.

If a statistical approach is used to demonstrate compliance with the CUL, the evaluation will be in accordance with Ecology guidance documents (Ecology 1992, 1993) and MTCA [WAC 173-340-740(7)(d)]. MTCA allows for a Site to meet cleanup goals using a statistical approach and the CAP reiterates that may be appropriate at this Site. If a statistical approach is used to demonstrate attainment of cleanup, the following three requirements will be satisfied:

- The upper 95 percent confidence limit (UCL) on the true mean shall be less than the soil CUL (confidence interval test).[1]
- No single sample concentration will be greater than two times the soil CUL.
- Less than 10 percent of the sample concentrations will exceed the soil CUL.

A statistical approach, if used, will be based on sample areas, and will not be used on an excavation area basis.

4.4 CORRECTIVE ACTIONS

Additional excavation may be required in order to remove contamination that exceeds Site CULs. Soil excavation and subsequent confirmation soil sampling will continue in an iterative manner until concentrations remaining in the soil at the Site meet the CULs or until a decision is made with Ecology's concurrence that any remaining contaminated soil can be contained in-place, subject to appropriate institutional controls and compliance monitoring.

[1] In accordance with WAC 173-340-740(7)(c)(iii), the appropriate statistical methods for calculating the UCL will be determined based on the distribution (i.e., normal or lognormal distribution) of the sample data for each IHS. Ecology's statistics software package (MTCAStat, Version 2.0) will be used to determine the distribution of the sample data and to perform the confidence interval test.

5.0 QUALITY ASSURANCE/QUALITY CONTROL

The sediment and soil analytical results must be accurate, precise, representative, complete, and comparable. Accuracy of the data will be determined through recovery of spiked surrogates, matrix spikes, and spiked laboratory control samples. Control limits for spike recovery will be laboratory acceptance limits generated according to EPA guidelines. For each analysis, the following quality control samples will be collected to evaluate accuracy:

- **Laboratory Control Sample.** A minimum of one laboratory control sample per 20 samples, not including QC samples, or one laboratory control sample per sample batch if fewer than 20 samples are obtained, will be analyzed for all parameters.
- **Method Blank.** A minimum of one method blank sample will be performed for each analysis and each batch of samples analyzed.

Precision of the data will be determined through evaluation of the relative percent difference between duplicate samples. To evaluate precision, the following quality control sample will be collected and/or analyzed:

- **Blind Field Duplicate.** One blind field duplicate sediment and one blind field duplicate soil sample will be collected and analyzed for the same constituents as the parent sample. The blind field duplicate will consist of a split sample collected at a single sample location. Blind field duplicates will be collected by alternately filling sample containers for both the original and the corresponding duplicate sample at the same location to decrease variability between the duplicates.

Representativeness of the data will be optimized through appropriate selection of sampling locations and methods. Analyses will be performed promptly within established holding times identified in Tables 3 and 5.

Completeness for the project will be established as the proportion of data generated that is determined to be valid. The data quality objective for completeness is 90 percent.

Comparability is an expression of the confidence with which one data set can be compared to another. In this project, standard methods, promulgated by EPA or Ecology where available, will be used. Data generated will be reported in units consistent with Ecology or EPA guidelines.

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This document has been prepared under the supervision and direction of the following key staff.

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Data Source: Esri 2012

G:\Projects\147\036\030\034\Compliance Monitoring Plan\F01_VicMap.mxd 1/27/2014 NAD 1983 StatePlane Washington North FIPS 4601 Feet

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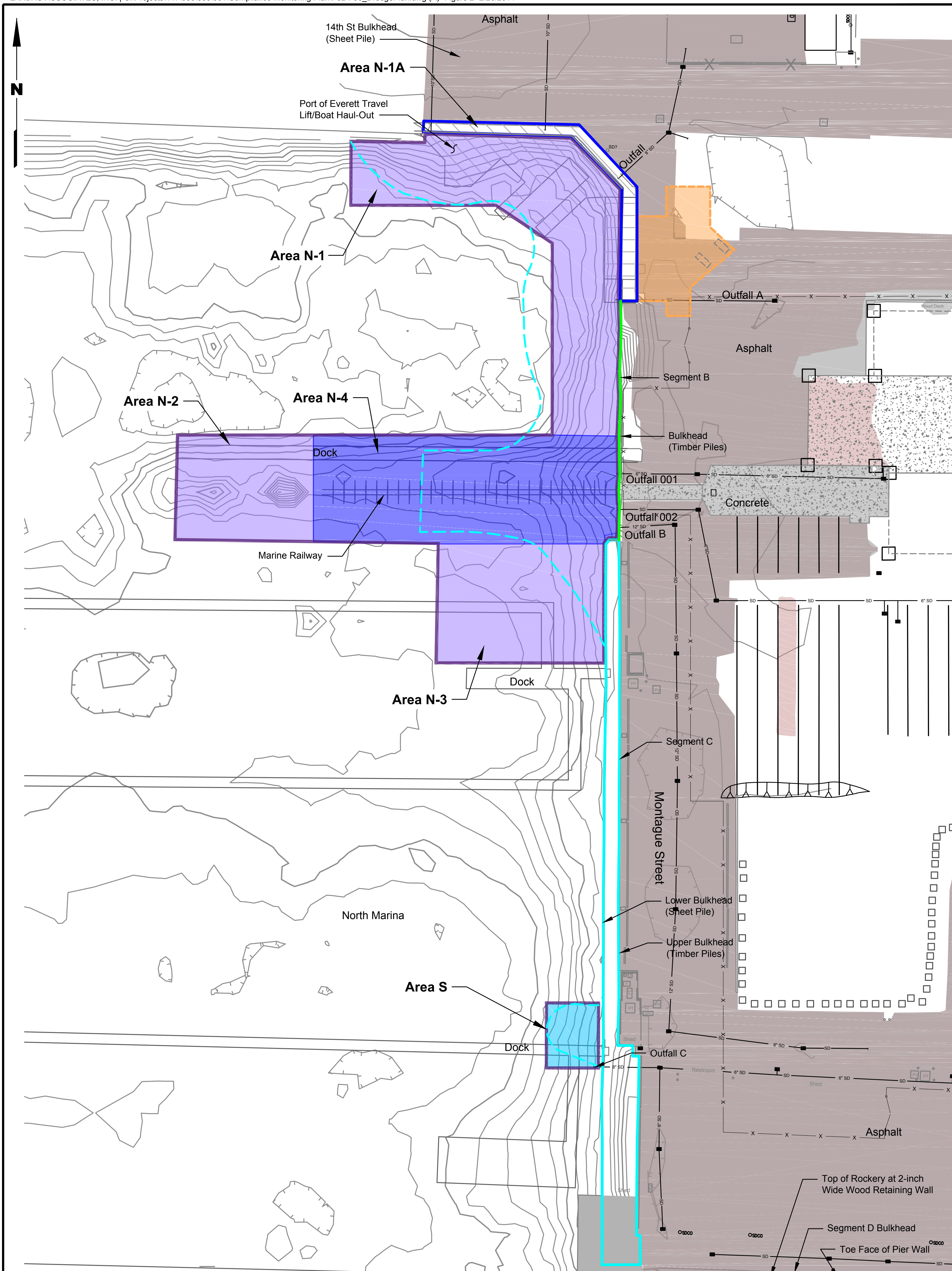
Compliance Monitoring Plan For Sediment Cleanup Everett Shipyard Site Everett, Washington	**Vicinity Map**	Figure 1



Legend

- Segment A Bulkhead
- Segment B Bulkhead
- Segment C Bulkhead
- Extent of SMS Exceedances Presented in RI/FS
- Potential UST Location (Identified and Located by GPR Survey 2012 (URS))
- Sediment Cleanup Action Area
- Dredge to -14 ft
- Dredge to -12 ft
- Dredge to -8 ft
- Upland Soil Excavation Area A

Notes

1. Pacific Geomatic Services, Inc. Bathymetric Survey 3/16/12; feet, MLLW
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Source: AMEC 2012, URS 2012

0 60 120
Scale in Feet

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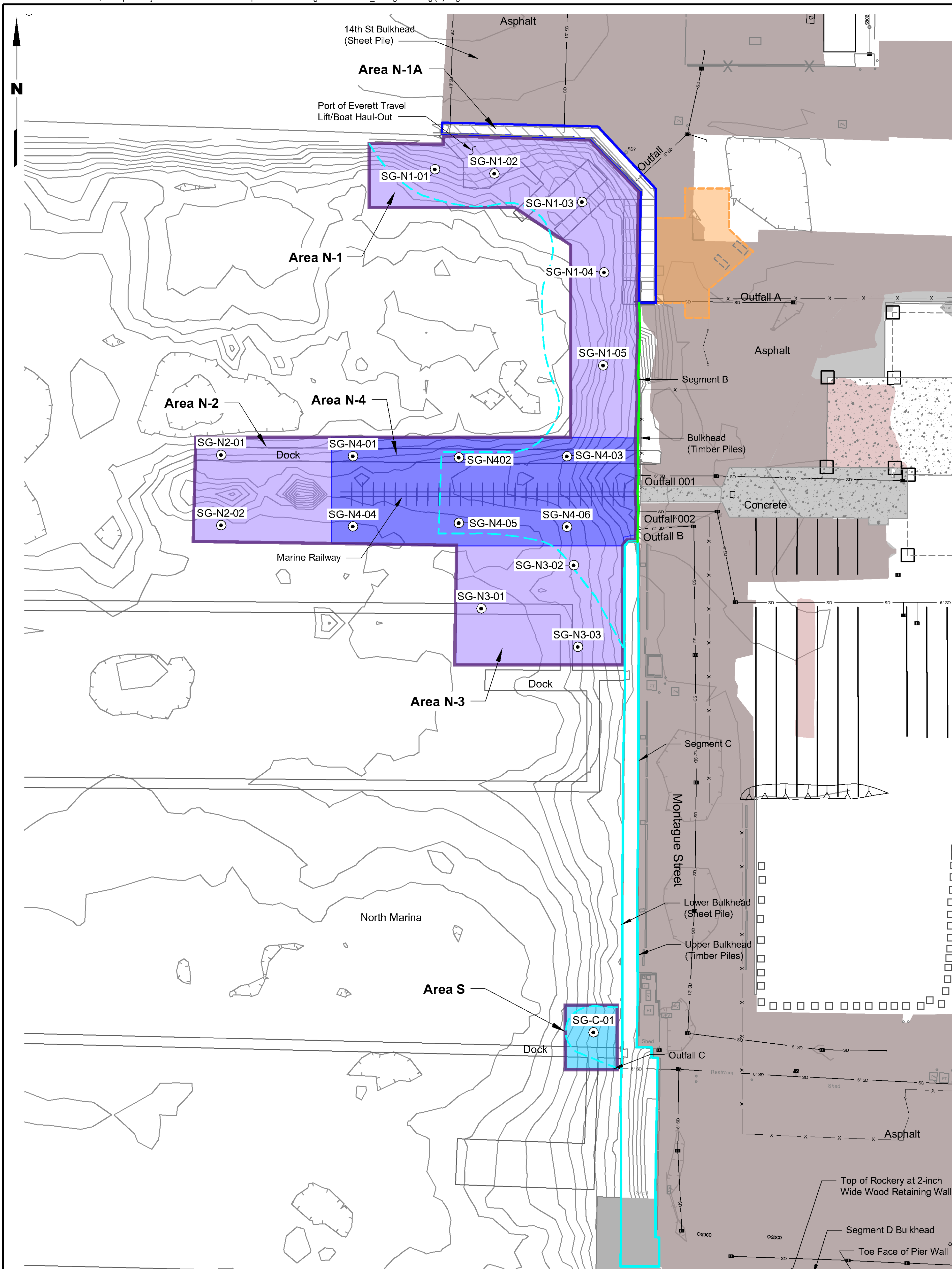
Compliance Monitoring Plan
For Sediment Cleanup
Everett Shipyard Site
Everett, Washington

Sediment Dredge Prism and Upland Soil Excavation Area A

Figure
2



Legend

SG-N1A-1 ⊙ Proposed Sediment Confirmation Sample Location

Segment A Bulkhead

Segment B Bulkhead

Segment C Bulkhead

Extent of SMS Exceedances Presented in RI/FS

Potential UST Location (Identified and Located by GPR Survey 2012 (URS))

Sediment Cleanup Action Area

Dredge to -14 ft

Dredge to -12 ft

Dredge to -8 ft

Upland Soil Excavation Area A

Notes

1. Pacific Geomatic Services, Inc. Bathymetric Survey 3/16/12; feet, MLLW

2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Source: AMEC 2012, URS 2012

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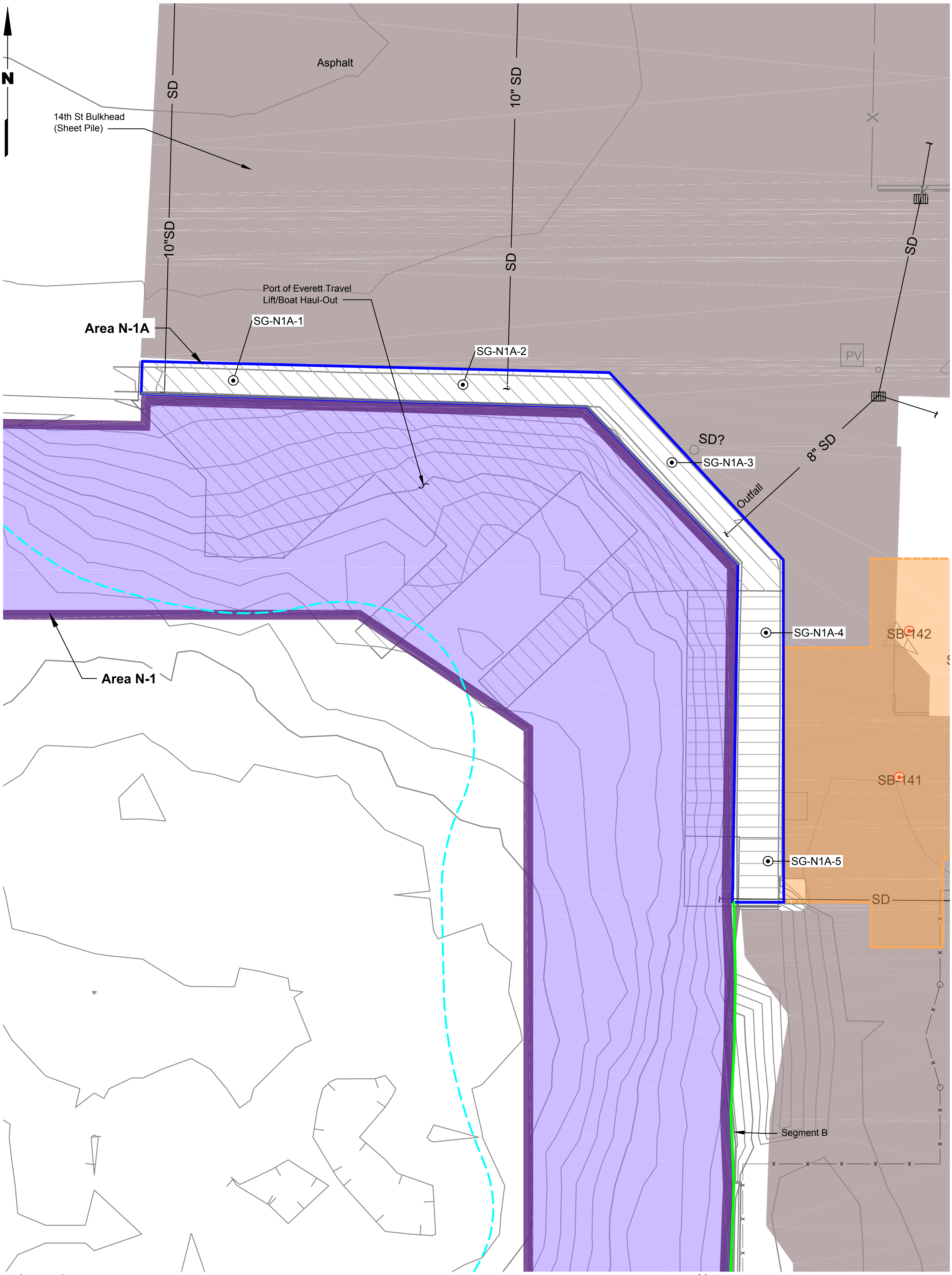
0 60 120
Scale in Feet

Compliance Monitoring Plan
For Sediment Cleanup
Everett Shipyard Site
Everett, Washington

Proposed Sediment Confirmation Sample Locations

Figure 3



Legend

- SG-N1A-1 ⊙ Proposed Sediment Sample Location
- Segment A Bulkhead
- Segment B Bulkhead
- Segment C Bulkhead
- Extent of SMS Exceedances Presented in RI/FS
- Sediment Cleanup Action Area
- Dredge to -14 ft
- Dredge to -12 ft
- Dredge to -8 ft
- Upland Soil Excavation Area A

Notes

1. Pacific Geomatic Services, Inc. Bathymetric Survey 3/16/12; feet, MLLW
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Source: AMEC 2012, URS 2012

0 20 40
Scale in Feet

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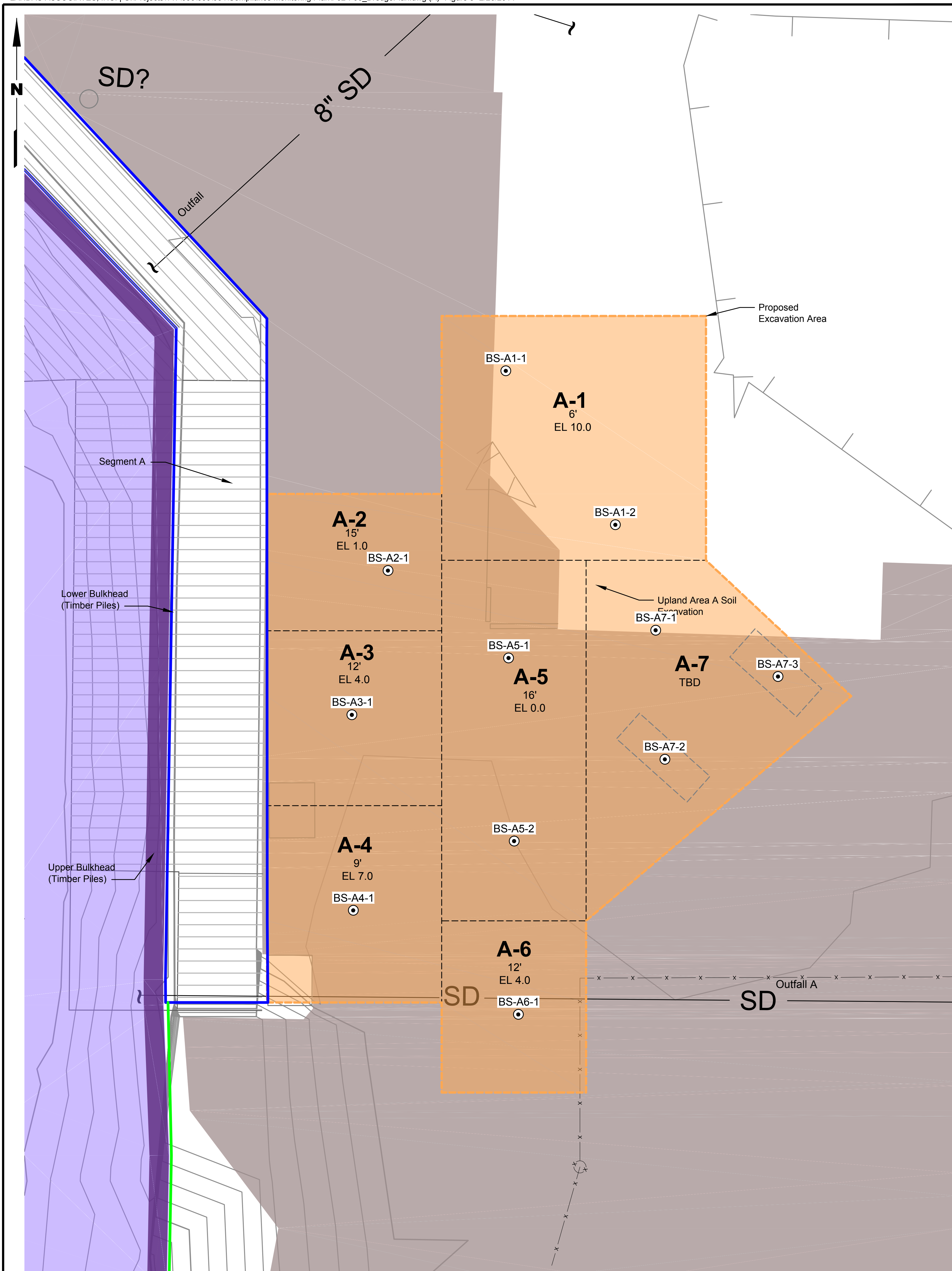
Compliance Monitoring Plan
For Sediment Cleanup
Everett Shipyard Site
Everett, Washington

Proposed Sediment Sample Locations Area N-1A

Figure 4



Legend

- BS-A6-1 ⦿ Proposed Soil Sample Location
- Segment A Bulkhead
- Segment B Bulkhead
- Segment C Bulkhead
- Extent of SMS Exceedances Presented in RI/FS
- Potential UST Location (Identified and Located by GPR Survey 2012 (URS))
- Sediment Cleanup Action Area
- Dredge to -14 ft
- Dredge to -12 ft
- Dredge to -8 ft
- Upland Soil Excavation Area A

Notes

1. Pacific Geomatic Services, Inc. Bathymetric Survey 3/16/12; feet, MLLW
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Source: AMEC 2012, URS 2012

0 10 20
Scale in Feet

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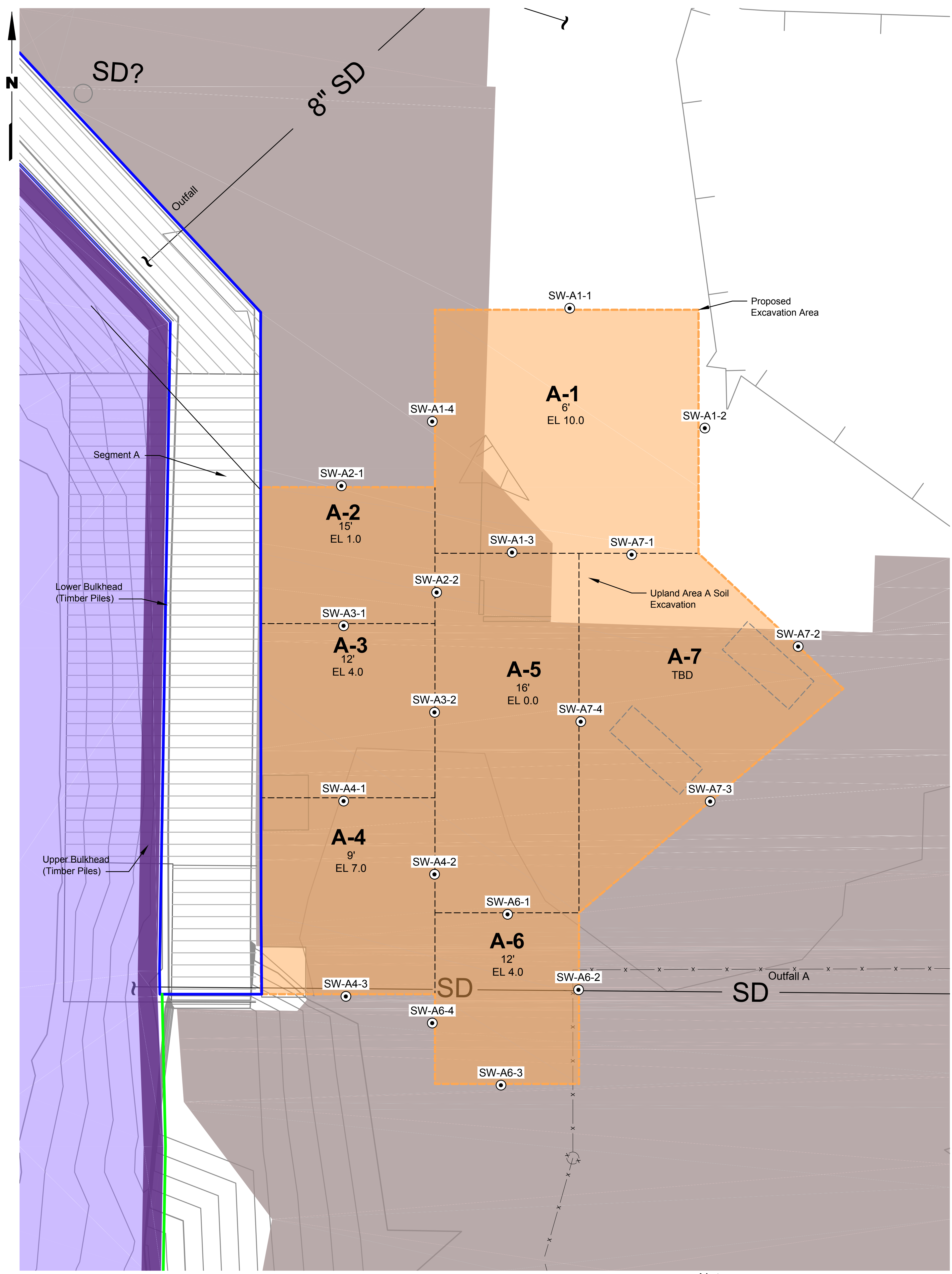
Compliance Monitoring Plan
For Sediment Cleanup
Everett Shipyard Site
Everett, Washington

Proposed Base Soil Sample Locations Area A

Figure
5

LANDAU ASSOCIATES, INC. | G:\Projects\147\036\030\034\Compliance Monitoring Plan\F02-F06_DredgePlan.dwg (A) "Figure 6" 2/26/2014



Legend

- SW-A1-1 ⊙ Proposed Sidewall Soil Sample Location
- Segment A Bulkhead
- Segment B Bulkhead
- Segment C Bulkhead
- Extent of SMS Exceedances Presented in RI/FS
- Potential UST Location (Identified and Located by GPR Survey 2012 (URS))
- Sediment Cleanup Action Area
- Dredge to -14 ft
- Dredge to -12 ft
- Dredge to -8 ft
- Upland Soil Excavation Area A

Notes

1. Pacific Geomatic Services, Inc. Bathymetric Survey 3/16/12; feet, MLLW
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Source: AMEC 2012, URS 2012

0 10 20
Scale in Feet

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Compliance Monitoring Plan
For Sediment Cleanup
Everett Shipyard Site
Everett, Washington

Proposed Sidewall Soil Sample Locations Area A

Figure 6

TABLE 1
PROPOSED SEDIMENT SAMPLE LOCATIONS AND DESIGNATIONS
EVERETT SHIPYARD SITE
EVERETT, WASHINGTON

Sample Location Name	Coordinates (Feet) (a) Northing	Easting
SG-C-01	366942	1301950
SG-N1-01	367477	1301852
SG-N1-02	367475	1301888
SG-N1-03	367457	1301943
SG-N1-04	367413	1301956
SG-N1-05	367356	1301956
SG-N2-01	367278	1301734
SG-N3-01	367231	1301915
SG-N3-02	367179	1301912
SG-N4-01	367275	1301810
SG-N4-02	367288	1301866
SG-N4-03	367280	1301933
SG-N1A-1	367502	1301875
SG-N1A-2	367501	1301922
SG-N1A-3	367485	1301965
SG-N1A-4	367450	1301985
SG-N1A-5	367403	1301985

(a) Washington State Plane North Zone; North American Datum of 1983 (NAD83).

TABLE 2
SEDIMENT CLEANUP LEVELS AND LABORATORY ANALYTICAL METHODS
EVERETT SHIPYARD SITE
EVERETT, WASHINGTON

	SQS (a)	CSL (b)	Recommended Method
Metals (mg/kg)			
Arsenic	57	93	6010B/6020 or 7471A/245.5
Copper	390	390	6010B/6020 or 7471A/245.6
Lead	450	530	6010B/6020 or 7471A/245.7
Mercury	0.41	0.59	6010B/6020 or 7471A/245.8
Silver	6.1	6.1	6010B/6020 or 7471A/245.9
Zinc	410	960	6010B/6020 or 7471A/245.10
PAHs	(mg/kg OC)	(mg/kg OC)	
Naphthalene	99	170	8270C/1625C
Acenaphthylene	66	66	8270C/1625C
Acenaphthene	16	57	8270C/1625C
Fluorene	23	79	8270C/1625C
Phenanthrene	100	480	8270C/1625C
Anthracene	220	1200	8270C/1625C
2-Methylnaphthalene	38	64	8270C/1625C
Fluoranthene	160	1200	8270C/1625C
Pyrene	1000	1400	8270C/1625C
Benzo(a)anthracene	110	270	8270C/1625C
Chrysene	110	460	8270C/1625C
Total Benzofluoranthenes	230	450	8270C/1625C
Benzo(a)pyrene	99	210	8270C/1625C
Indeno(1,2,3-c,d)pyrene	34	88	8270C/1625C
Dibenz(a,h)anthracene	12	33	8270C/1625C
Benzo(g,h,i)perylene	31	78	8270C/1625C
SVOCs (mg/kg OC)			
1,2-Dichlorobenzene	2.3	2.3	8270C/1625C
1,3-Dichlorobenzene			8270C/1625C
1,4-Dichlorobenzene	3.1	9	8270C/1625C
1,2,4-Trichlorobenzene	0.81	1.8	8270C/1625C
Hexachlorobenzene	0.38	2.3	8270C/1625C
Dimethylphthalate	53	53	8270C/1625C
Diethylphthalate	61	110	8270C/1625C
Di-n-Butylphthalate	220	1700	8270C/1625C
Butylbenzylphthalate	4.9	64	8270C/1625C
bis(2-Ethylhexyl)phthalate	47	78	8270C/1625C
Di-n-octyl phthalate	58	4500	8270C/1625C
Dibenzofuran	15	58	8270C/1625C
Hexachlorobutadiene	3.9	6.2	8270C/1625C
N-Nitrosodiphenylamine	11	11	8270C/1625C

TABLE 2
SEDIMENT CLEANUP LEVELS AND LABORATORY ANALYTICAL METHODS
EVERETT SHIPYARD SITE
EVERETT, WASHINGTON

	SQS (a)	CSL (b)	Recommended Method
SVOCs (µg/kg)			
Phenol	420	1200	8270C/1625C
2-Methylphenol	63	63	8270C/1625C
4-Methylphenol	670	670	8270C/1625C
2,4-Dimethylphenol	29	29	8270C/1625C
Pentachlorophenol	360	690	8270C/1625C
Benzyl Alcohol	57	73	8270C/1625C
Benzoic Acid	650	650	8270C/1625C
Organotin (Pore Water) (µg/L)			
Tributyl Tin Chloride	NA	NA	Krone et al. 1989
Dibutyl Tin Dichloride	NA	NA	Krone et al. 1989
Butyl Tin Trichloride	NA	NA	Krone et al. 1989
TBT as Tin ion	0.05	0.15	Krone et al. 1989
PCBs (mg/kg OC)	12	65	8082
Conventionals			
Total Organic Carbon (percent)	NA	NA	9060

mg/kg = milligrams per kilogram
µg/kg = micrograms per kilogram
µg/L = micrograms per liter
SQS = Sediment Quality Standard
CSL = Cleanup Screening Level
SMS = Sediment Management Standards
NA = Not Analyzed
OC = Organic Carbonized
PAHs = Polycyclic Aromatic Hydrocarbons
SVOCs = Semivolatile Organic Compounds
PCBs = Polychlorinated Biphenyls
WAC = Washington Administrative Code

(a) SMS sediment quality standard (Chapter 173-204 WAC).
(b) SMS cleanup screening level (Chapter 173-204 WAC).

TABLE 3
SEDIMENT SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES
EVERETT SHIPYARD SITE
EVERETT, WASHINGTON

Sample Type	Container	Preservation	Maximum Holding Time
Metals	8 oz - WMG with teflon-lined lid	Cool, 4^o C	6 months, 28 days for mercury
Semivolatiles	8 oz - WMG with teflon-lined lid	Cool, 4^o C	14 days (a), 1 year (b)
PCBs	8 oz - WMG with teflon-lined lid	Cool, 4^o C	14 days (a), 1 year (b)
Organotins (Porewater)	2, 32-oz Glass	Cool, 4°C; Zero Head Space	7 Days until Pore Water Extraction; 7 Days until Organotin Extraction; 40 Days after Extraction
TOC	4 oz - WMG with teflon-lined lid	Cool, 4^o C	28 days, 6 months (b)

PCBs = Polychlorinated Biphenyls
TOC= Total Organic Carbon
WMG = Wide Mouth Glass
oz = ounces
^{o} C = degrees Celsius

(a) Holding time shown is from sample collection to extraction; holding time from extraction to analysis is 40 days.
(b) Holding time shown is from sample collection to extraction if sample is frozen.

TABLE 4
SOIL CLEANUP LEVELS, LABORATORY ANALYTICAL METHODS, AND REPORTING LIMITS GOALS
EVERETT SHIPYARD SITE
EVERETT, WASHINGTON

Constituent	Cleanup Level	Laboratory Analytical Method	Reporting Limit Goal
Total Petroleum Hydrocarbons (TPH; mg/kg)			
Diesel range	2,000	NWTPH-Dx	25
Oil range	2,000	NWTPH-Dx	50

mg/kg = milligrams per kilogram.

TABLE 5
SOIL SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES
EVERETT SHIPYARD SITE
EVERETT, WASHINGTON

Constituent	Soil Sample Containers	Sample Preservation	Holding Time
Total Petroleum Hydrocarbons			
Diesel range	8-oz Jar	Cool to 4 degrees Celcius	14 days
Oil range			

oz = Ounces