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Draft Phase 2 Remedial Investigation Work Plan Addendum to Final Work Plan for Remedial Investigation/Feasibility Study and Draft Cleanup Action Plan

JELD-WEN, inc.
Former Nord Door Site
300 West Marine View Drive
Everett, WA 98201

January 24, 2011
Project #108.00228.00032

DRAFT PHASE 2 REMEDIAL INVESTIGATION WORK PLAN

Prepared for:

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This document has been prepared by SLR International Corp. The material and data in this report were prepared under the supervision and direction of the undersigned.

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ACRONYMS

ARARs	applicable or relevant and appropriate requirements
AST	above ground storage tank
bgs	below ground surface
BNAs	semi-volatile organic compounds (sediment)
BTEX	benzene, toluene, ethylbenzene, total xylenes
CAP	Cleanup Action Plan
CFR	Code of Federal Regulations
COPC	contaminants of potential concern
CSL	cleanup screening level
DQO	data quality objective
Ecology	Washington State Department of Ecology
EIS	environmental impact statement
EPA	Environmental Protection Agency
FS	feasibility study
HASP	health and safety plan
HCID	hydrocarbon identification
ICP	inductively coupled plasma-atomic emission spectroscopy
mg/Kg	milligrams per kilogram
mg/L	milligrams per liter
µg/Kg	micrograms per kilogram
µg/L	micrograms per liter
MCL	maximum contaminant level
MSDS	material safety data sheet
MTCA	Model Toxics Control Act
MW	monitoring well
NRCS	National Resource Conservation Service
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCP	pentachlorophenol
ppm	parts per million
PPMETS	priority pollutant metals, antimony, arsenic, beryllium, cadmium, chromium, copper, lead, nickel, selenium, silver, thallium, zinc
PPP	Public Participation Plan
PQL	practical quantitation limit
QA/QC	quality assurance/quality control
QAPP	quality assurance project plan
RI	remedial investigation
SAP	sampling and analysis plan
SAPA	sediment sampling plan appendix
SEPA	State Environmental Policy Act
SMS	Sediment Management Standards
SQS	Sediment Quality Standards
SVOC	semi volatile organic compounds

ACRONYMS (CONTINUED)

TEE	Terrestrial Ecological Evaluation
TEF	toxicity equivalency factor
TEQ	total toxicity equivalence
TPH	total petroleum hydrocarbons
TPH-Gx	total petroleum hydrocarbons as gasoline
TPH-Dx	total petroleum hydrocarbons as diesel
TVS	total volatile solids
UST	underground storage tank
VOC	volatile organic compound
WAC	Washington Administrative Code
WARM	Washington Ranking Method
WQC	water quality criteria

INTRODUCTION

The Phase 2 Remedial Investigation (RI) Work Plan supplements the Final Work Plan, dated October 24, 2008, that contains the work scope for completing the Feasibility Study (FS) and draft Cleanup Action Plan (CAP) for the JELD-WEN former Nord Door facility located at 300 West Marine View Drive, Everett, Washington, 98201 (JELD-WEN Site). The Washington State Department of Ecology (Ecology) approved the Work Plan on October 27, 2008 (2008 Work Plan). This Phase 2 RI Work Plan has been prepared as an addendum to the 2008 Work Plan.

1.1 PURPOSE

The Phase 2 RI Work Plan is intended to describe the work scope that will be performed to complete the remedial investigation at the JELD-WEN Site. This investigation is being performed to meet the objectives in the Agreed Order for RI/FS Study and Draft CAP, dated January 2, 2008.

1.2 OBJECTIVES

The overall objective of the RI/FS is to identify the hazardous substances which have been released to the environment; assess the nature, extent and distribution of these substances; identify the potential migration pathways and receptors; assess the theoretical risk to human health and the environment; and generate or use data of sufficient quality for site characterization, risk assessment and the subsequent analysis and selection of remedial alternatives. This addendum to the 2008 Work Plan has been prepared to complete characterization of upland, marine, and freshwater sediment impacts on or adjacent to the Site.

1.3 GENERAL BACKGROUND

The initial RI investigation was completed between May and October 2009 and was performed in general conformance with the Ecology approved 2008 Work Plan. On November 20, 2009, JELD-WEN submitted an Initial RI Investigation Data Summary (RI Summary) report to Ecology. This document contained a summary of RI field activities, data results, and identified data gaps that warranted further investigation. Ecology provided written comments to the RI Summary report on May 12, 2010, and requested additional assessment. The Phase 2 RI Work Plan has been developed to address Ecology’s comments and to provide additional characterization to allow for completion of the RI/FS and draft CAP.

1.4 GENERAL SITE INFORMATION

Site Name: JELD-WEN

Site Address: 300 West Marine View Drive

City and State: Everett, WA 98201

County: Snohomish

Township/Range/Section: Section 7, Township 29N, Range 5E of the Willamette Meridian

Latitude: 48° 00’ 49.5”

Longitude: 122° 12’ 34.5”

Washington State Department of Ecology (Ecology) Facility Site ID Number: 2757

Ecology Region: Northwest Region

Ecology Project Manager: Andy Kallus, Ecology, Toxics Cleanup Program

Ecology Project Coordinator: Isaac Standen, Ecology, Toxics Cleanup Program

JELD-WEN Project Coordinator: Dwayne Arino (JELD-WEN, inc. Project Manager)

JELD-WEN Project Manager: Scott Miller, SLR

2. INTRODUCTION

The project management plan for completing the Phase 2 RI consists of the work scope described in this Work Plan, project communications plan, project schedule, Sampling and Analysis Plans (SAPs), Quality Assurance Project Plans (QAPPs), and the project specific Health & Safety Plan (HASP).

2.1 PROJECT COMMUNICATIONS

The primary contacts, roles, and contact information for the work scope described in this Work Plan a summarized in the following table:

Ecology	SLR	JELD-WEN
Ecology Project Coordinator Mr. Isaac Standen **Role:** Primary Site Contact Washington State Department of Ecology, Toxics Cleanup Program 300 Desmond Drive Lacey, WA 98503 Phone: 360-407-6776 Email Address: ista461@ECY.WA.GOV	Project Manager Mr. Scott Miller **Role:** Project Manager SLR International Corp 1800 Blankenship Road, Suite 440 West Linn, Oregon 97068 Phone: 503-723-4423 Fax: 503-723-4436 Email Address: smiller@slrconsulting.com	JELD-WEN Project Coordinator Mr. Dwayne Arino **Role:** Contact / Coordination JELD-WEN, inc. P.O. Box 1540 407 Harbor Isles Blvd. Klamath Falls, OR 97601 Phone: 541-883-3373 Email Address: dwaynea@jeld-wen.com

2.2 RI/FS AND DRAFT CAP SCHEDULE

The proposed schedule for completing the Phase 2 RI at the Site will be contingent upon securing access to the BNSF railroad property. The schedule will also be influenced by the availability of subcontractors, weather conditions, tidal stage and/or other factors. Any schedule modifications will be submitted for approval by SLR to the Ecology Project Coordinator.

2.3 SAMPLING AND ANALYSIS PLANS (SAPS)

The SAPs detail the proposed sample collection methods, sampling locations, assessment and sample collection depths, sample analysis, and equipment decontamination procedures. The upland SAP is provided in Appendix A and the sediment SAP is provided in Attachment 1 of the Sediment QAPP (Appendix B of Work Plan). The sediment SAP was prepared by Anchor QEA.

2.4 QUALITY ASSURANCE PROJECT PLAN (QAPP)

The QAPP contains the Quality Assurance/Quality Control (QA/QC) procedures for both field and laboratory procedures. The Upland QAPP is provided in Section 3 of the upland SAP (Appendix A) and the sediment QAPP is provided as Appendix B to the Work Plan. The sediment QAPP was prepared by Anchor QEA.

2.5 SITE HEALTH AND SAFETY PLAN (HASP)

The Site HASPs contain procedures, tools, and equipment that will be used during field activities to monitor and protect worker health and safety. The HASP is provided in Appendix C to the Work Plan.

3. SITE DESCRIPTION AND ENVIRONMENTAL BACKGROUND

3.1 SITE LOCATION

The JELD-WEN Site is located at the confluence of the Snohomish River to the north and Port Gardner Bay (Possession Sound) to the west (Figure 1). The Site consists of five adjoining parcels (29050700100400, 29050700101200, 29050700400100, 29050700401900, and 29050700402000) with a combined land area (both in-water and upland) of approximately 52.6 acres, which includes approximately 36 acres above the tidal mudflats (Figure 2). Copies of the Snohomish County Assessor's parcel maps of the Site were included in Appendix D of the 2008 Work Plan. The Site is bound to the north by vacant land owned by the Port of Everett, to the south by undeveloped land owned by Foss Development, to the east by West Marine View Drive and land owned by the Port of Everett, beyond which is the BNSF railway and vacant marshland (Maulsby Marsh) the western portion of which is owned by BNSF, and to the west by Port Gardner Bay.

Most of the Everett waterfront area, including the area of the Site, was originally developed around the late 1800s and early 1900s when the railroad was laying tracks along Possession Sound and the breakwater piping system was constructed to protect the navigational channels of the Snohomish River. The Site is built on fill that extends into Port Gardner Bay placed after construction of the railroad line to the east. The Site is relatively flat, with a maximum elevation of approximately 15-feet above mean sea level. A portion of the Site lies within the 100-year flood plain.

3.2 SITE HISTORY

A detailed site history was provided in the 2008 Work Plan.

3.3 ENVIRONMENTAL SETTING

The environmental setting was described in detail in the 2008 Work Plan.

3.4 CONCEPTUAL SITE MODEL

The conceptual site model (CSM) was presented in the 2008 Work Plan. Results from the initial upland RI were generally consistent with the CSM presented in the 2008 Work Plan.

3.5 PRELIMINARY CLEANUP LEVELS

The preliminary cleanup levels (Work Plan PCLs) will be used to verify the Contaminants of Potential Concern (COPCs) for soil, sediment, and groundwater at the Site as part of RI. Work Plan PCLs were determined as defined in the 2008 Work Plan.

3.6 REGULATORY HISTORY AND PREVIOUS INVESTIGATIONS

Site regulatory history and previous investigations were summarized in detail in the 2008 Work Plan.

The initial RI investigation was completed between May and October 2009. The initial RI included completion of 13 Geoprobe borings for the collection of soil and groundwater samples

(GP-302 through GP-312, GP-334 and GP-335), two near surface soil samples from the former machine shop and maintenance area (SS-313 and SS-314), seven surface grab samples from areas immediately adjacent to the seven on-site transformers (SS-315 through SS-321), one grab sample of boiler ash (SS-301) from the former hog fuel boiler which remains on the Site, and sampling five of the six on-site groundwater monitoring wells. Monitoring well MW-3 was not sampled because it was inaccessible during the sampling activities. Additionally, SLR collected soil samples from hand auger borings HA-322 through HA-333 on the BNSF Maulsby Marsh property. Groundwater samples were collected from temporary well points in all the hand auger borings, with the exception of HA-332. Due to low well yield, no groundwater sample was collected from hand auger boring HA-332.

A summary of the initial RI field activities was presented in the Initial RI Data Summary Report, dated November 20, 2009. Figure 2 shows the RI sampling locations in addition to other historical sampling locations. Tables 1 through 16 in the RI Data Summary Report presented the initial RI investigation analytical results and comparisons to Work Plan PCLs. Based on the initial RI investigation, the upland sampling identified the following areas, where contaminants in the samples were above the Work Plan PCLs:

- **Hog Fuel Burner Ash** – The grab sample (SS-301) of the burner ash remaining at the Site identified 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) total toxicity equivalence (TEQ) at a concentration above the Work Plan PCL.

- **Former Woodlife Storage and Use Area** – The dioxins/furans analysis of soil sample GP-302-2 identified the 2,3,7,8-TCDD TEQ to be above the Work Plan PCL. Groundwater GP-302-GW also identified the 2,3,7,8-TCDD TEQ to be above the Work Plan PCLs.

- **Southwest Former Unpaved (“grassy”) Area –** Four Geoprobe borings were advanced in the former unpaved area located on the southwestern corner of the Site, which is currently leased to CEMEX. Four soil samples (GP-303-6, GP-304-6, GP-305-7, and GP-306-7) and four groundwater samples (GP-303-GW, GP-304-GW, GP-305-GW, and GP-306-GW) were collected from the borings. Soil samples were analyzed for TPH-HCID, polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals. With the exception of metals, none of the constituents were identified at concentrations above Work Plan PCLs. The metals arsenic, chromium, copper, nickel, silver, thallium, zinc, and mercury were identified in one or more soil samples at concentrations above the Work Plan PCLs.

  Groundwater samples were analyzed for TPH-HCID, with follow up analysis for TPH-Dx (sample GP-304-GW only), VOCs, SVOCs, and metals. With the exception of metals, none of the constituents were identified at concentrations above the Work Plan PCLs. The metals arsenic, cadmium, chromium, copper, lead nickel, silver, and zinc were identified in one or more groundwater samples at concentrations above Work Plan PCLs.

- **South Central Unpaved Area / Former Barrel Storage Area -** Two Geoprobe borings were advanced in the south central unpaved area/former barrel storage area. Two soil samples (GP-307-4 and GP-308-2) and two groundwater samples (GP-307-GW and GP-308-GW) were collected from these borings. Soil samples were submitted for analysis of TPH-HCID, PCBs, VOCs, SVOCs, and metals. With the exception of metals, none of the constituents were identified at concentrations above Work Plan PCLs in the soil samples. The metals arsenic, chromium, copper, nickel, silver, thallium, zinc, and mercury were identified in one or more soil samples at concentrations above the Work Plan PCLs.

Groundwater samples were analyzed for TPH-HCID, with follow up analysis for TPH-Dx (sample GP-308-GW only), VOCs, SVOCs, and metals. With the exception of metals, none of the constituents were identified at concentrations above the Work Plan PCLs. The metals arsenic, cadmium, copper, lead, selenium, silver, and zinc were identified in one or more groundwater samples at concentrations above Work Plan PCLs.

- **Former Casket Manufacturing Area / Area near GP-22 -** Four Geoprobe borings were advanced in the former casket manufacturing area, near former boring GP-22. Four soil samples (GP-309-5, GP-310-4.5, GP-311-3.5 and GP-312-3.5) and four groundwater samples (GP-309-GW, GP-310-GW, GP-311-GW and GP-312-GW) were collected from these borings. Soil samples were analyzed for TPH-HCID, with follow up analysis for NWPTH-Dx (sample GP-311-3.5 only), PCBs, VOCs, SVOCs, and metals. In addition, sample GP-309-5 was also submitted for dioxins/furans analysis. With the exception of metals, none of the constituents were identified at concentrations above Work Plan PCLs. The metals arsenic, chromium, copper, nickel, silver, thallium, zinc, and mercury were identified in one or more soil samples at concentrations above Work Plan PCLs.

  Groundwater samples were analyzed for TPH-HCID, with follow up analysis for TPH-Dx (samples GP-310-GW and GP-312-GW), VOCs, SVOCs, and metals. In addition, given the presence of dioxins/furans in soil sample GP-309-5 (at concentrations below the Work Plan PCLs), groundwater sample GP-309-GW was submitted for follow up dioxins/furans analysis. With the exception of metals and dioxins/furans, none of the constituents were identified at concentrations above the Work Plan PCLs. The metals arsenic, cadmium, chromium, copper, lead, nickel, silver, and zinc were identified in one or more groundwater samples at concentrations above Work Plan PCLs. The dioxin/furan analysis for groundwater sample GP-309-GW identified the 2,3,7,8-TCDD TEQ to be above the PCL. However, the analytical laboratory identified dioxins/furans in the method blank at a concentration higher than the concentration detected in the actual groundwater sample.

- **Machine Shop / Maintenance Area -** Two near surface soil samples (SS-313 and SS-314) were collected using hand tools from immediately below the asphalt pavement and pavement base rock near the former machine shop and maintenance area. The samples were submitted for analysis of TPH-HCID, TPH-Dx and metals. With the exception of metals chromium, copper, and nickel, none of the constituents were identified at concentrations above the Work Plan PCLs.

- **Transformers -** Seven surface soil samples (SS-315 through SS-321) were collected from areas immediately adjacent to the seven on-site transformers (TZ-1 to TZ-7) for PCB analysis. Soil sample SS-319 was additionally analyzed for metals. Due to visible oil staining in the location of SS-321, this sample was submitted for analysis of TPH-Dx. No PCBs were identified at concentrations above the Work Plan PCLs. TPH-Dx in the diesel and residual oil range were identified in surface soil sample SS-321, above the Work Plan PCLs. The metals arsenic, cadmium, chromium, copper, nickel, zinc, and mercury were identified at concentrations equal to or above the Work Plan PCLs in soil sample SS-319.

- **Former Fish Net Storage Building** - Two Geoprobe borings were completed near the former fish net storage building. Four soil samples (GP-334-3, GP-334-9.5, GP-335-7.5, and GP-335-9.5) and two groundwater samples (GP-334-GW and GP-335-GW) were submitted TPH-HCID analysis. Based on the preliminary HCID results, samples GP-334-3 and GP-335-7 were subsequently submitted for TPH-Dx analysis, and sample GP-334-3 was submitted for TPH-Gx analysis. Soil samples GP-334-3, GP-335-7.5 and GP-335-9.5 were also submitted for analysis of PCBs, VOCs, SVOCs, and metals. With the exception of VOCs and metals, none of the constituents were identified above Work Plan PCLs. The VOCs tetrachloroethylene (PCE) in sample GP-334-3 and GP-335-7.5, carbon tetrachloride in sample GP-334-3, and trichloroethylene (TCE) in sample GP-335-7.5, were identified at concentrations slightly above the Work Plan PCLs. The metals arsenic, chromium, copper, nickel, silver, thallium, zinc, and mercury were identified above Work Plan PCLs in one or more samples.

Groundwater samples GP-334-GW and GP-335-GW did not identify concentrations of TPH-HCID, PCBs, VOCs, or SVOCs above the Work Plan PCLs. The metals arsenic, copper and lead were identified in one or both of the samples at concentrations above the Work Plan PCLs.

- **BNSF Property –** Twelve hand auger borings were completed to the east of the BNSF Property, adjacent to Maulsby Marsh (HA-322 through HA-333) and eleven groundwater samples (HA-322-GW through HA-332-GW) were collected from these borings. Soil samples were analyzed for TPH-HCID with follow-up analysis for TPH-Dx, TPH-Gx, VOCs, or SVOCs, depending on the TPH-HCID results. With the exception of diesel and heavy oil range organics identified in HA-329-1, no TPH compounds were identified in soil above the Work Plan PCLs. Of the nine soil samples selected for follow-up VOC analysis, only methylene chloride in HA-322-2, methylcyclohexane in HA-328-1, and acetone HA-332-1 were identified at concentrations above the Work Plan PCLs.

  Fourteen soil samples were selected for follow-up SVOC/polycyclic aromatic hycrocarbon (PAH) analysis. The SVOC analysis identified acenaphthylene and the noncarcinogenic PAHs acenaphthene and naphthalene in soil sample HA-329-1, at concentrations above the Work Plan PCLs. Soil samples from hand auger borings on the BNSF property contained cPAHs, at concentrations above the Work Plan PCLs. The calculated cPAH TEQs in eleven of the fourteen samples also exceeded the Work Plan PCLs.

  Groundwater samples were analyzed for TPH-HCID, with follow-up analysis for TPH-Dx, TPH-Gx, VOCs, or SVOCs; depending on the TPH-HCID results and the volume of sample media available. With the exception of gasoline and diesel range organics identified in HA-329-GW, no TPH compounds were identified above the Work Plan PCLs. With the exception of benzene, no VOCs were identified in groundwater samples selected for VOC analysis at concentrations above Work Plan PCLs.

  Six groundwater samples were selected for follow-up SVOC/PAH analysis. With the exception of carbazole, dibenzofuran, and 2-methylnaphthalene in sample HA-329-GW, and cPAHs in groundwater samples HA-323-GW and HA-329-GW, no SVOCs were identified above Work Plan PCLs. The calculated cPAH TEQs in these groundwater samples from HA-323-GW and HA-329-GW also exceeded the Work Plan PCLs.

- **Monitoring Wells –** Groundwater samples were collected from on-site groundwater monitoring wells MW-1, MW-2, MW-4, MW-5 and MW-6 and submitted for analysis of metals (total and dissolved) and TPH-Dx (MW-1 and MW-4, only). In addition, based on the TPH-Dx results, the groundwater sample from MW-1 was submitted for additional analysis of PCBs. No TPH-Dx or PCBs were identified in groundwater at concentrations above Work Plan PCLs. Dissolved antimony, arsenic, cadmium and nickel were above the Work Plan PCLs.

The Work Plan soil PCLs were developed by selecting the most stringent cleanup value based on protection of human health, protection of terrestrial ecological receptors, and protection of groundwater as surface water. Groundwater PCLs were based on the most restrictive cleanup level for the protection of marine and fresh water surface water. Because these exposure scenarios are not necessarily representative of site conditions, the initial RI data summary included a multi-step screening process designed to select appropriate cleanup levels based on actual site conditions. The additional screening process is described in detail in the initial RI data summary. Based on this additional screening, the following areas were identified where concentrations of contaminants of concern exceeded applicable Site screening level values:

- Dioxin/furan concentrations identified in a burner ash grab sample (SS-301).
- Dioxin/furan concentrations identified in soil sample GP-302-1 and groundwater sample GP-302-GW near the former PCP dip tank area.
- Dioxin/furan concentrations in groundwater sample GP-309-GW. However, as noted above, given the presence of dioxins/furans in the method blank, the analytical results of this analysis are likely to be biased high.
- Thallium was identified in soil samples GP-307-4, GP-310-4, GP-311-3.5, GP-312-3.5, GP-335-7.5, and GP-335-9.5.
- Methylcyclohexane and acenaphthylene in hand auger borings HA-328-1 and HA-329-1, respectively, from the BNSF Maulsby Marsh property.
- cPAH TEQs in soil samples HA-322-1, HA-322-2, HA-323-1, HA-329-1, HA-330-1, HA-332-1, and HA-333-3 collected from the BNSF Maulsby Marsh property.
- TPH in the gasoline and diesel ranges in the groundwater sample from HA-329-GW, collected from the BNSF Maulsby Marsh property.
- The SVOCs carbazole, dibenzofuran, and 2-methylnaphthalene in sample HA-329-GW, collected from the BNSF Maulsby Marsh property.
- cPAH TEQs for groundwater samples HA-323-GW and HA-329-GW, collected from the BNSF Maulsby Marsh property.
- Total metals concentrations (arsenic, cadmium, chromium, lead, and nickel) in groundwater sample GP-304-GW.
- Total arsenic in groundwater samples GP-303-GW, GP-304-GW, GP-305-GW, GP-306-GW, GP-310-GW, GP-311-GW, GP-334-GW, and GP-335-GW.
- Total lead in groundwater samples GP-303-GW, GP-304-GW, and GP-310-GW.

- Total and dissolved antimony concentrations in the groundwater sample from monitoring well MW-5.

4. PHASE 2 RI INVESTIGATION

4.1 INVESTIGATION AREAS

Based on the findings of the initial RI, previous sampling conducted at the Site, and a series of communications with Ecology, the following additional investigation work scope was developed. Potential pathways/area, investigation rational, and proposed sampling is discussed in the following sections. The proposed upland sampling locations are shown on Figure 3, the proposed marine sampling locations are shown on Figure 4, and the proposed sampling locations in Maulsby Marsh are shown on Figure 5. The proposed sample collection methods, sampling locations, assessment and sample collection depths, sample analysis, laboratory practical quantification limits (PQLs), and equipment decontamination procedures are provided in Appendix A (Upland SAP) and Appendix B (Sediment QAPP/SAP).

4.1.1 FORMER WOODLIFE STORAGE AND USE AREA DIOXINS AND FURANS

Dioxin/furan concentrations above the PCL were identified in soil and groundwater samples collected from sample location GP-302, located to the northeast of the main manufacturing building near a former AST containing Woodlife wood treatment solution.

> **Data Gap:** Additional soil and groundwater sampling is needed to further characterize the extent of dioxin/furan impacts in the vicinity of the former Woodlife storage tank. Ecology also requested a groundwater sample be collected from monitoring well MW-6, located downgradient of the former Woodlife storage tank, for dioxin/furan analysis.
>
> **Proposed Additional Assessment:** Three Geoprobe borings (locations 401P through 403P) will be completed in proximity to former boring location GP-302 to evaluate the extent of dioxin/furan impacts to soil and groundwater. The locations of proposed borings are depicted on Figure 3. As presented in the upland SAP, one soil and one groundwater sample from each of the borings will be collected for possible dioxin/furan analysis. Soil samples from each boring, collected from a depth of 3 feet bgs, will be initially submitted for dioxin/furan analysis. Groundwater samples will be collected and archived from temporary well points in borings 401P, 402P, and 403P. The groundwater sample from the probe boring with the highest concentration of dioxin/furan in soil will be submitted for groundwater analysis. The groundwater sample will be centrifuged prior to analysis to remove excess sediment and suspended silts from the sample.
>
> One groundwater sample will be collected from monitoring well MW-6 and submitted for dioxin/furan analysis.

4.1.2 FORMER BURNER AREA DIOXINS AND FURANS

One grab sample of burner ash remaining in a drum below the bag fitter housing at the Site (SS-301) identified elevated concentrations of dioxins and furans. The burner ash drum was located on a concrete paved surface adjacent to the boiler.

> **Data Gap:** Ecology requested soil sampling beneath the pavement in the vicinity of the burner ash drum to evaluate whether soils and potentially groundwater in this area have been impacted by dioxins/furans.

Proposed Additional Assessment: One Geoprobe boring (404P) will be completed in proximity to the ash storage area for the former burner. The location of the proposed boring is depicted on Figure 3. One soil sample will be collected from location 404P at a depth of three feet below ground surface, and a groundwater sample from a temporary well point in the boring will be collected and archived. If the soil sample from location 404P identifies concentrations of dioxins/furans above the Work Plan PCLs, the groundwater sample from the probe boring will be submitted for dioxin/furan analysis. The sample will be centrifuged prior to analysis to remove excess sediment and suspended silts from the sample.

4.1.3 METALS IN GROUNDWATER AT BORING GP-304

Boring GP-304 was collected from a former unpaved ("grassy") area which is currently leased to CEMEX for material storage and batching asphalt pavement. No potential source of metals impacts was identified on this (or other) area(s) of the Site. Total metals concentrations (arsenic, cadmium, chromium, lead, and nickel) in groundwater sample GP-304-GW were above the Work Plan PCLs and were comparatively higher than total metals concentrations identified in other Geoprobe borings around the Site. No metals were identified in the soil sample collected from GP-304 at concentrations above PCLs. This groundwater sample was collected directly from a temporary monitoring well advanced using a Geoprobe. The concentrations detected in these types of groundwater samples are likely to be biased high, due to the turbidity of the groundwater samples and colloidal interference. The groundwater sample was unfiltered and was submitted for total metals analysis. The total metals analysis typically results in higher detected concentrations than samples submitted for dissolved metals analysis.

Data Gap: Additional groundwater data is necessary to determine if the metals concentrations identified in GP-304 are the result of colloidal interference due to the sampling method.

Proposed Additional Assessment: One Geoprobe boring (location 405P) will be completed proximate to former boring GP-304 for the collection of groundwater samples for total and dissolved metals analysis. The location of the proposed boring is depicted on Figure 3. As presented in the upland SAP, the groundwater samples will be filtered in the field using a 0.45-µm in-line filter prior to submittal to the laboratory.

4.1.4 METALS IN GROUNDWATER MONITORING WELLS

Groundwater samples collected from permanent monitoring wells were submitted for total and dissolved metals analysis. The groundwater samples identified dissolved metals concentrations only marginally above the most conservative Work Plan PCLs and at concentrations consistent with MTCA Method B cleanup levels. No evidence of widespread metals impacts to the Site was identified.

Data Gap: Ecology requested additional groundwater sampling to establish the relationship between total and dissolved metals.

Proposed Additional Assessment: Additional groundwater samples will be collected from monitoring wells MW-1 and MW-6 for total and dissolved metals analysis. As presented in the upland SAP, the groundwater samples will be filtered in the field using a 0.45-µm in-line filter prior to submittal to the laboratory.

4.1.5 TPH IN GROUNDWATER MONITORING WELLS

Previous environmental sampling completed along the western side of the Site in the area of Geoprobe boring GP-24 and MW-1 identified TPH in soil. TPH impacts to groundwater were identified in the groundwater sampled from Geoprobe location GP-24. Groundwater samples from the adjacent permanent monitoring well MW-1 were collected in November 2006 and during the initial RI sampling in May 2009. Groundwater samples from MW-1 did not identify TPH concentrations above Work Plan PCLs in either sampling event.

> **Data Gap:** Ecology has requested two additional rounds of groundwater sampling (one at high tide and one at low tide) from monitoring wells MW-1 and MW-5 to fully document that groundwater is not affected by TPH in these locations.
>
> **Proposed Additional Assessment:** Two additional rounds of groundwater samples will be collected from monitoring wells MW-1 and MW-5 and submitted for TPH-HCID analysis, with follow-up analysis for TPH-Dx and/or TPH-Gx; if the HCID analysis shows the presence of this range of petroleum hydrocarbons in the sample. The two sampling events will be scheduled to coordinate with the predicted high tide and predicted low tide times for the Everett area of Possession Sound.

4.1.6 VOCS IN GROUNDWATER NEAR FORMER THINNER TANK

A thinner (toluene) storage tank was formerly located in the northeastern portion of the Site. Previous groundwater sampling in this area for VOCs identified an elevated toluene concentration in boring GP-3. The groundwater sample also had an elevated laboratory detection limit for benzene. A test pit excavation was subsequently completed in this area, which defined the extent of toluene impacts to soil. Ecology has requested additional groundwater sampling in this area of the Site to characterize the extent of groundwater impacts. A groundwater sample from boring GP-2, located approximately 90 feet downgradient of GP-3, did not identify VOCs at concentrations above laboratory method reporting limits.

> **Data Gap:** Ecology has requested additional groundwater characterization for VOCs in the vicinity of boring GP-3.
>
> **Proposed Additional Assessment:** Groundwater samples collected from proposed borings 401P and 403P will be submitted for VOC analysis. The locations of proposed borings are depicted on Figure 3.

4.1.7 BNSF RAILROAD PROPERTY/MAULSBY MARSH

The initial RI included the collection of groundwater samples from temporary well points installed in hand auger borings along the BNSF railroad tracks at the base of the railroad track ballast (rock fill), along Maulsby Marsh. The purpose of these samples was to delineate the eastern extent of creosote and fuel oil impacts from the Site. Elevated concentrations of TPH and PAHs were identified in groundwater samples collected from hand auger borings HA-326, HA-327, and HA-329 completed on the BNSF railroad property. With the exception of PAHs, no SVOCs were identified at concentrations above Work Plan PCLs. VOC impacts in groundwater were identified in the area of GP-206, GP-208, and HA-329-GW. Benzene was the only VOC that was detected above the PCLs in groundwater sample HA-329-GW.

Data Gap: Additional groundwater data is needed to delineate the extent of groundwater impacts on the BNSF railroad property along Maulsby Marsh. Further, Ecology has requested metals analysis of groundwater samples collected from borings near Maulsby Marsh.

Proposed Additional Assessment: Five additional hand auger borings (406P through 410P) will be completed east of the BNSF tracks along Maulsby Marsh, immediately above the surface water, to delineate the eastern extent of TPH, PAH, and VOC impacts to groundwater. Ecology has also requested total and dissolved metals analysis of groundwater samples collected from these five borings. The locations of the proposed borings are shown on Figure 3. Groundwater samples will be collected from prefabricated 1-inch diameter prepak well screens placed within the borings. If insufficient sample quantity can be obtained from the pre-packed well screens, the screens will be removed and replaced with a slotted PVC pipe for sample collection. If groundwater samples collected from the pre-packed well screens have observable sediments (i.e. cloudy) or if the samples are collected directly from slotted PVC pipe, the samples will be centrifuged at the laboratory prior to analysis to eliminate interferences related to suspended sediments. To avoid sampling percolated rainwater, the samples will be collected after a period of at least one week without measurable precipitation, with no more than 2 inches of precipitation over the previous 2 week period.

Groundwater samples from locations 406P, 407P, and 408P will be submitted for TPH-HCID analysis, with follow-up analysis for TPH-Dx and/or TPH-Gx; if the HCID analysis shows the presence of this range of petroleum hydrocarbons in the sample. Groundwater samples from locations 406P through 410P will be submitted for PAH and VOC analysis. Additionally, samples from locations 406P through 410P will be submitted for total and dissolved metals analysis. The groundwater collected for metals analysis will be filtered in the field using a 0.45-μm in-line filter prior to submittal to the analytical laboratory.

4.1.8 MARINE SEDIMENT

The initial RI sampling identified evidence of COPCs in the marine sediments to the north and south of the Site. These COPCs included dioxins/furans in sediments to the north and south, and PCBs in sediments to the south. The initial RI sampling was performed primarily at stormwater outfalls, and did not delineate the depth or extent of the chemicals identified.

Data Gap: Additional marine sediment sampling is necessary to delineate the extent of dioxin/furan and PCB impacts identified during the initial RI sampling. Due to the presence of PAHs in upland soil and groundwater, Ecology has also requested additional sediment sampling for PAHs.

Proposed Additional Assessment: Surface sediment grab samples and sediment core samples will be collected at 24 locations shown on Figure 4. Sediment core samples will be advanced in fine grained sediment deposits to a 4-foot depth and will be co-located with surface sediment locations. During the initial round of sediment analysis, all 24 surface grab samples will be analyzed for conventional parameters. A total of ten of the surface sediment grab samples in the 0 to 10-cm surface sediment interval, and a sample collected from the second 1-foot interval from the corresponding cores (i.e., 2 to 3 feet below the mudline) will be initially analyzed for the chemicals of concern.

Dioxin/furan analysis is required in the four samples locations to the north and three sample locations to the south (denoted in green on Figure 4). PCB analysis is required in three sample locations to the south (denoted in red). PAH analysis is required in all samples to be immediately analyzed. Surface sediment grab samples from the remaining locations and core samples from the first (10 to 30-cm), third and fourth 1-foot intervals of the cores will be frozen and archived to be tested, in the event that further analysis is needed.

If chemicals of concern are identified at concentrations above SQS screening criteria (QAPP Table 2) in the initial round of analysis and with consultation with Ecology, the archived sample/samples adjacent to contaminated sample will be analyzed. The samples will only be submitted for analysis of those compounds that exceeded screening levels in the initial round sample. Archived samples not submitted for analysis will be disposed of after consultation with Ecology and no samples will be archived for more than one year.

4.1.9 MAULSBY MARSH SEDIMENT

As discussed above, the initial RI identified elevated concentrations of COPCs in groundwater samples installed along the BNSF railroad tracks at the base of the railroad track ballast, adjacent to Maulsby Marsh.

Data Gap: Ecology has requested surface sediment sampling be completed in Maulsby Marsh to evaluate potential impacts from the Site. Additionally, the salinity of the marsh will be evaluated under a variety of tidal conditions to determine whether Maulsby Marsh is freshwater or if it is saline.

Proposed Additional Assessment: Surface sediment samples will be collected at 18 locations within Maulsby Marsh (Figure 5). During the initial round of sediment analysis, all 18 samples will be analyzed for conventional parameters. In addition, the western-most row of samples (purple row on Figure 5) will be analyzed for SVOCs, PCBs, TPH-Dx, organochlorine pesticides, and metals. The four sediment samples with the highest TPH values will also be submitted for EPH testing to distinguish between different ranges of hydrocarbons. The remaining samples (blue and green rows on Figure 5) will be archived. If analytes at sample locations in the purple row are identified at concentrations above the freshwater screening levels (listed in QAPP Table 3), samples in the blue row that are adjacent to the contaminated purple samples will be analyzed. The samples will only be submitted for analysis of those compounds that exceeded screening levels in the initial sampling. If analytes at sample locations in the blue row are identified at concentrations above the freshwater screening levels, samples in the green row that are adjacent to the contaminated blue samples will be analyzed. The samples will only be submitted for analysis of those compounds that exceeded screening levels in the blue row. Archived samples not submitted for analysis will be disposed of after consultation with Ecology and no samples will be archived for more than one year.

Water quality monitoring, to test for salinity levels in the marsh waters, will be performed by assessing water quality at three locations; near the marsh outlet to the south of the proposed sample area, and to the north and south of the of the marsh sampling rows. Water quality measurements will be collected during an incoming tide on two separate events as follows: 1) during an extremely high tide event; and 2) during an average high tide event.

4.2 SAMPLING METHODS AND DATA QUALITY OBJECTIVES

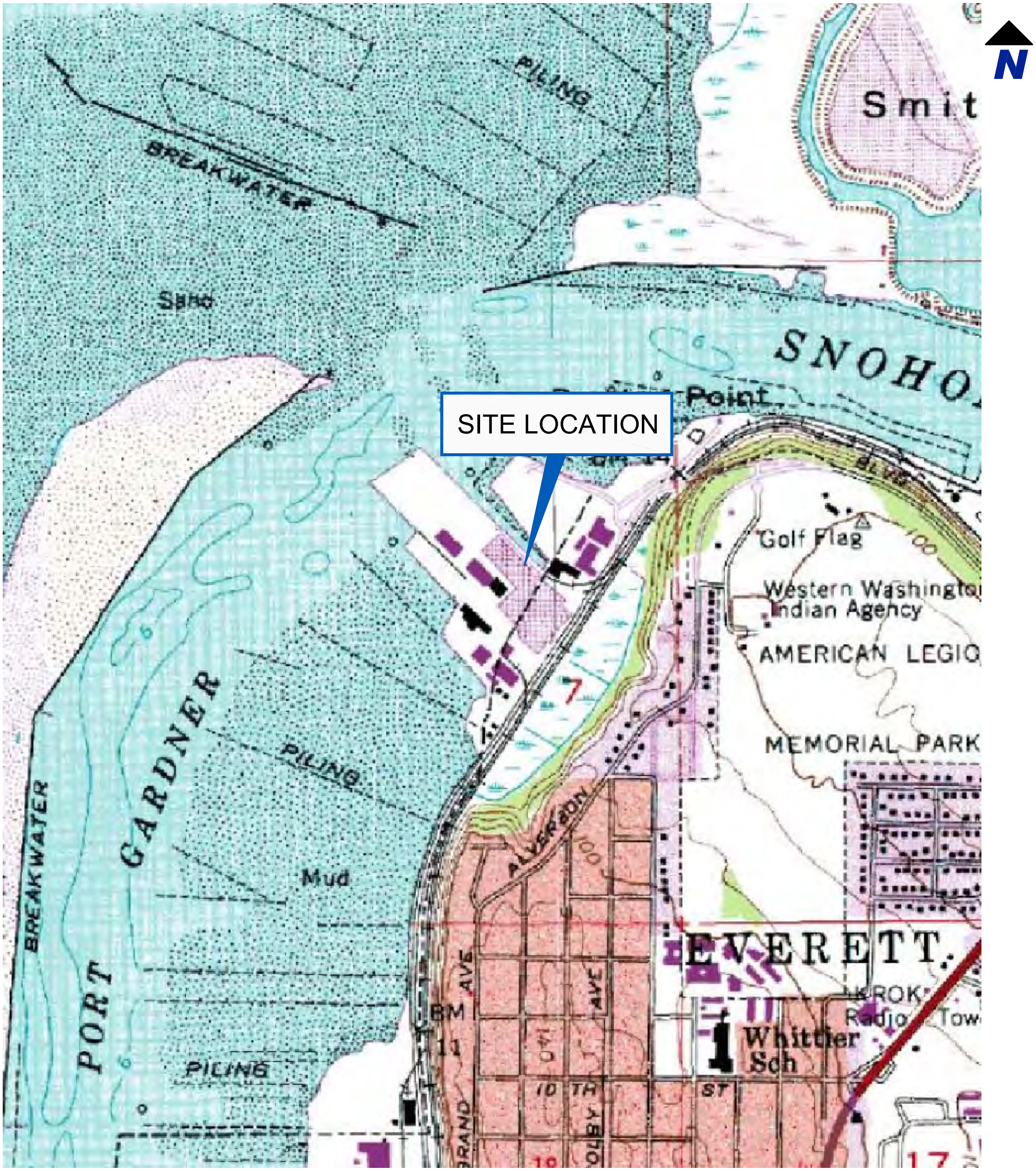
The numbers of sampling locations, sampling depths, types of samples, and types of analysis have been selected to meet the objective of the RI/FS.

The data quality objectives (DQOs) for the RI/FS is designed to ensure that data of sufficient quality and quantity will be available to identify if hazardous compounds are present at the Site, to evaluate risks posed by the presence of hazardous compounds and identify if hazardous compounds may pose unacceptable risk to current and future human and ecological receptors, via direct contact or migration. The DQOs will be used to identify the analytical PQL goals and to establish other quality assurance goals. The DQOs are used to obtain appropriate quantification limits and to meet the requirements of WAC 173-340-820, MTCA. The DQOs are presented in the upland and sediment SAPs, (Appendix A and Appendix B/Attachment 1, respectively). The SAPs detail the proposed sample collection methods, sampling equipment, and decontamination procedures. The QAPPs contain the Quality Assurance/Quality Control (QA/QC) procedures for both field and laboratory procedures. The upland QAPP is provided in the upland SAP. The sediment QAPP is provided in Appendix B.

4.3 DATA SUMMARY REPORT

Upon completion of the Phase 2 RI, a data summary report will be prepared to document the findings from the field work described in this Work Plan. The purpose of this report will be to provide a summary of the Phase 2 RI field activities and data results, and to identify any data gaps that may warrant further investigation. If no additional data gaps are identified, preparation of the RI/FS and Draft CAP will proceed as outlined in the 2008 Work Plan. If additional data gaps are identified, SLR and JELD-WEN will work with Ecology to develop a scope of work for additional assessment.

FIGURES



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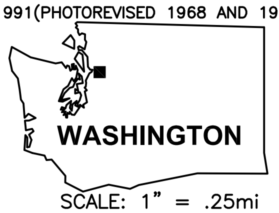

SCALE: 1" = .25mi

0 .25 .5 .75mi

JELD-WEN SITE
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
PHASE 2 RI WORK PLAN

Drawing
SITE LOCATION MAP

Date ----	Scale AS SHOWN	Fig. No. 1
File Name Drawing1-1	Project No. 108.00228.00026	

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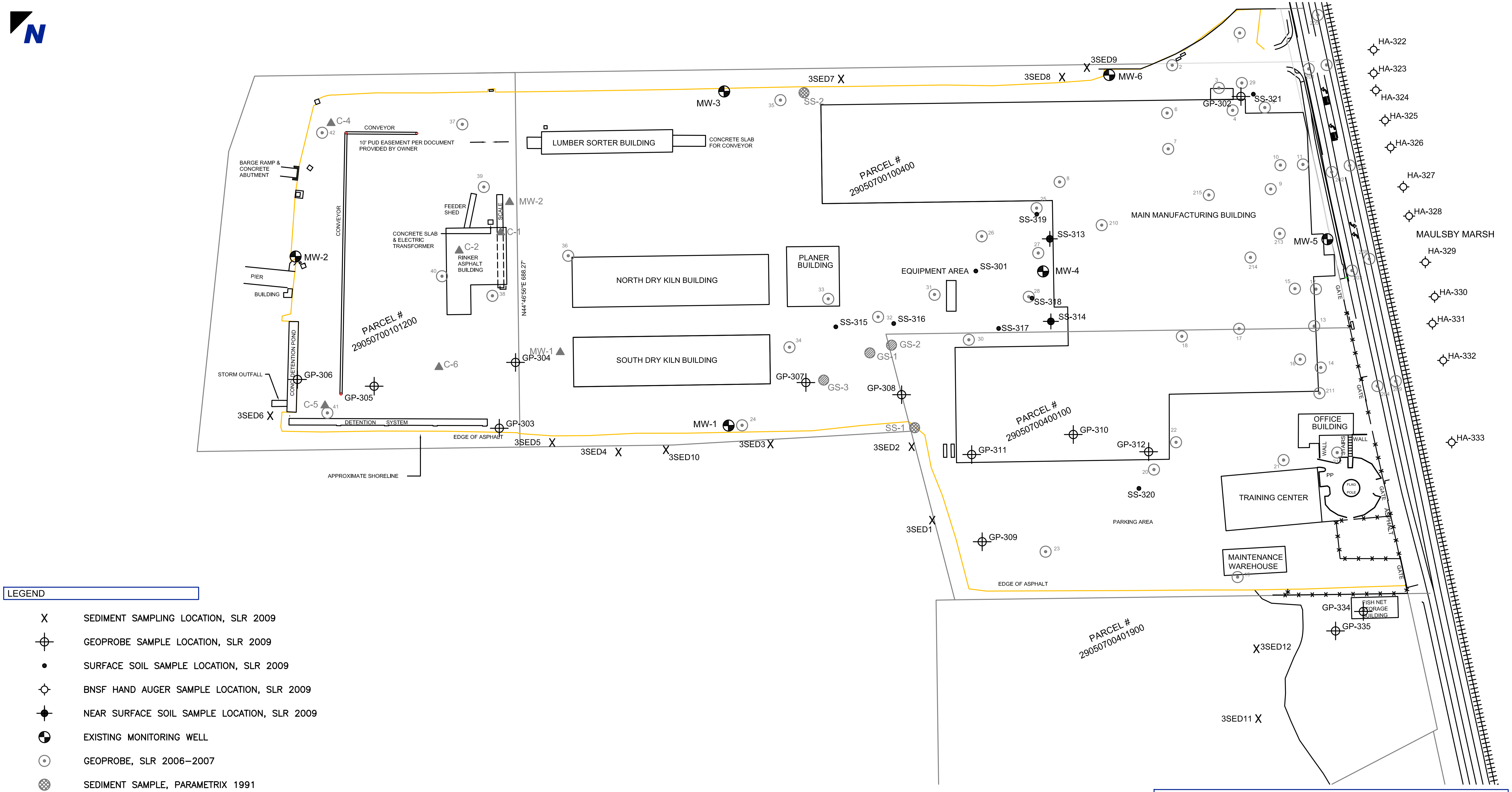


LEGEND

X	SEDIMENT SAMPLING LOCATION, SLR 2009
⊕	GEOPROBE SAMPLE LOCATION, SLR 2009
•	SURFACE SOIL SAMPLE LOCATION, SLR 2009
⌖	BNSF HAND AUGER SAMPLE LOCATION, SLR 2009
✦	NEAR SURFACE SOIL SAMPLE LOCATION, SLR 2009
◐	EXISTING MONITORING WELL
⊙	GEOPROBE, SLR 2006–2007
▩	SEDIMENT SAMPLE, PARAMETRIX 1991
▨	SURFACE SOIL SAMPLES, PARAMETRIX 1991
▬	TEST PITS, SLR 2007
▲	SOIL AND GROUNDWATER SAMPLES, RZA AGRA 1994

SLR

NOTES

THE BUILDINGS, SURFACE UTILITIES, EDGE OF PAVEMENT, AND APPROXIMATE SHORELINE SHOWN ON THIS MAP ARE BASED ON A 2006 SURVEY PERFORMED BY WH PACIFIC.

0 175 350 525'

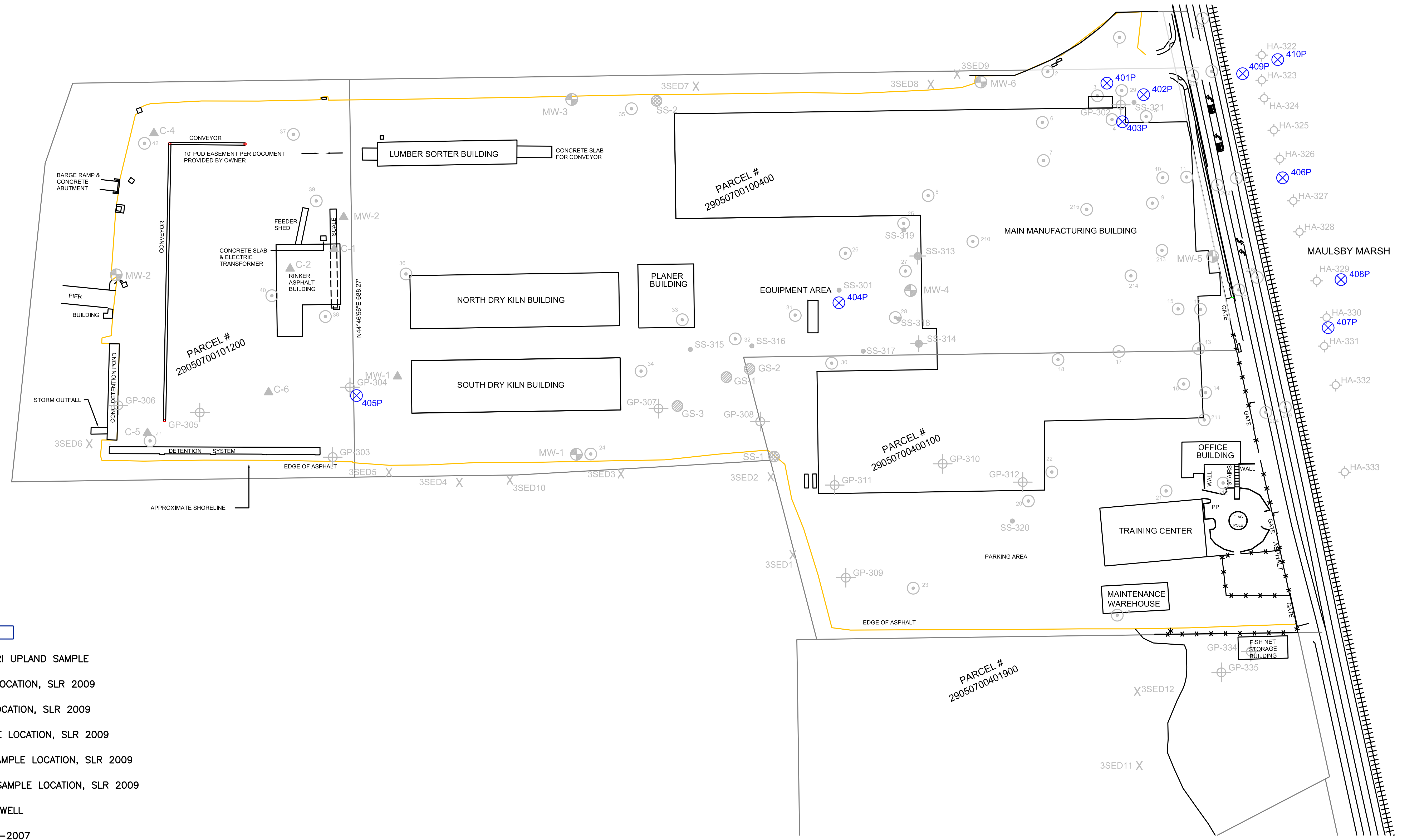
JELD-WEN SITE
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
PHASE 2 RI WORK PLAN

Drawing
SITE PLAN WITH PREVIOUS SAMPLING LOCATIONS

Date	January 17, 2011	Scale	AS SHOWN
File Name	108.00228.00026-3	Project No.	008.00228.00026

Fig. No.
2



LEGEND

- ⊗ PROPOSED PHASE II RI UPLAND SAMPLE
- ✕ SEDIMENT SAMPLING LOCATION, SLR 2009
- ⌖ GEOPROBE SAMPLE LOCATION, SLR 2009
- • SURFACE SOIL SAMPLE LOCATION, SLR 2009
- ⌖ BNSF HAND AUGER SAMPLE LOCATION, SLR 2009
- ✛ NEAR SURFACE SOIL SAMPLE LOCATION, SLR 2009
- ◐ EXISTING MONITORING WELL
- ⊙ GEOPROBE, SLR 2006–2007
- ▩ SEDIMENT SAMPLE, PARAMETRIX 1991
- ▨ SURFACE SOIL SAMPLES, PARAMETRIX 1991
- ▬ TEST PITS, SLR 2007
- ▲ SOIL AND GROUNDWATER SAMPLES, RZA AGRA 1994

NOTES

THE BUILDINGS, SURFACE UTILITIES, EDGE OF PAVEMENT, AND APPROXIMATE SHORELINE SHOWN ON THIS MAP ARE BASED ON A 2006 SURVEY PERFORMED BY WH PACIFIC.

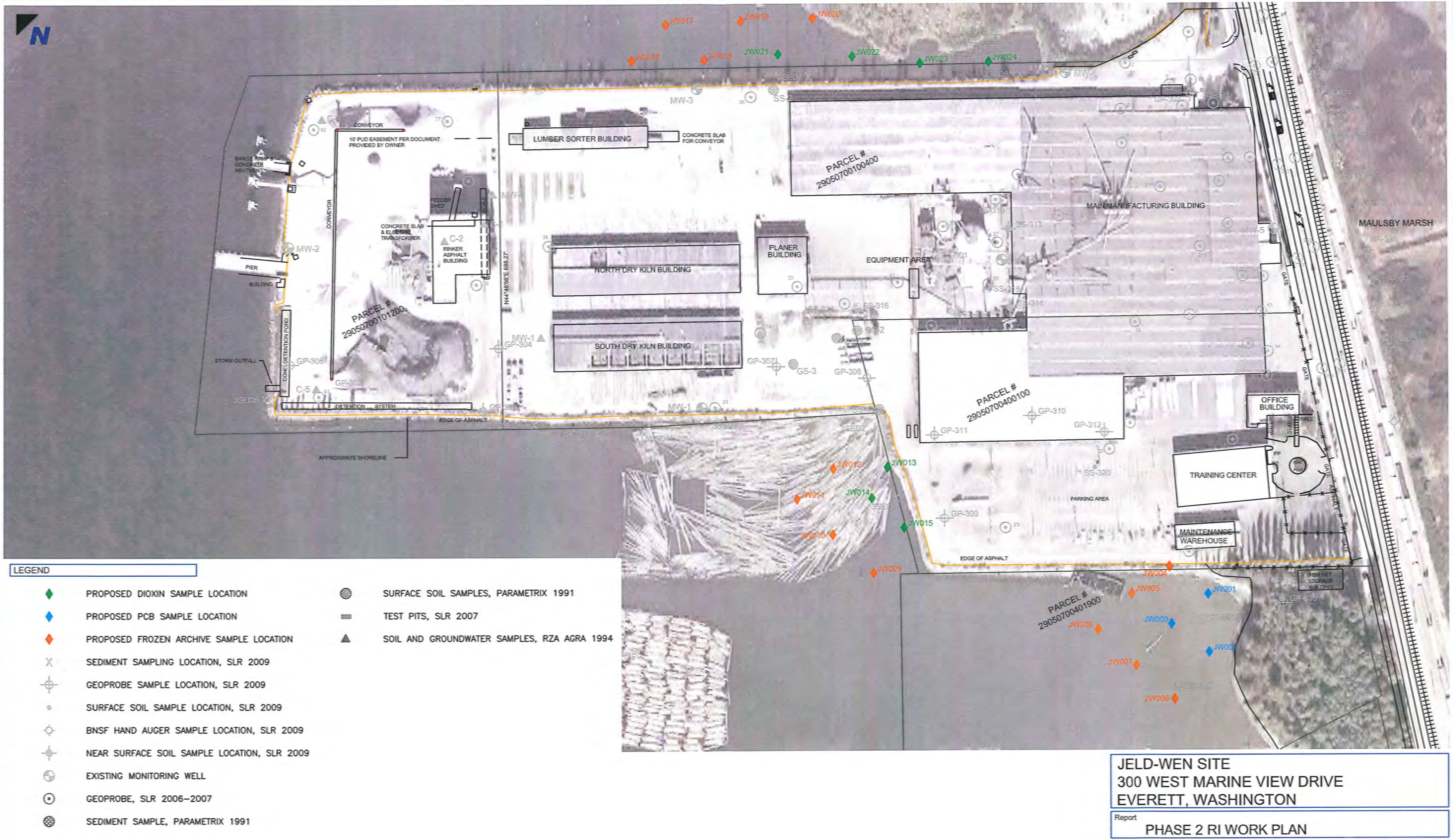
0 175 350 525'

JELD-WEN SITE
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
PHASE 2 RI WORK PLAN

Drawing
SITE PLAN WITH PROPOSED UPLAND SAMPLING LOCATIONS

Date January 17, 2011	Scale AS SHOWN	Fig. No. 3
File Name 108.00228.00026-3	Project No. 008.00228.00026	



SLR

NOTES

THE BUILDINGS, SURFACE UTILITIES, EDGE OF PAVEMENT, AND APPROXIMATE SHORELINE SHOWN ON THIS MAP ARE BASED ON A 2006 SURVEY PERFORMED BY WH PACIFIC.

0 175 350 525'

JELD-WEN SITE
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
PHASE 2 RI WORK PLAN

Drawing
SITE PLAN WITH PROPOSED MARINE SEDIMENT SAMPLE LOCATIONS

Date January 17, 2011	Scale AS SHOWN	Fig. No. 4
File Name 108.00228.00026-3	Project No. 008.00228.00026	

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LEGEND

- 🔹 PROPOSED SAMPLE LOCATION – FIRST ROUND OF ANALYSIS
- 🔷 PROPOSED SAMPLE LOCATION – SECOND ROUND OF ANALYSIS
- 🟩 PROPOSED SAMPLE LOCATION – THIRD ROUND OF ANALYSIS
- ⌖ BNSF HAND AUGER SAMPLE LOCATION, SLR 2009

NOTES

THE BUILDINGS, SURFACE UTILITIES, EDGE OF PAVEMENT, AND APPROXIMATE SHORELINE SHOWN ON THIS MAP ARE BASED ON A 2006 SURVEY PERFORMED BY WH PACIFIC.

0 100 200 300'

JELD-WEN SITE
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
PHASE 2 RI WORK PLAN

Drawing
SITE PLAN WITH PROPOSED FRESHWATER SEDIMENT SAMPLE LOCATIONS IN MAULSBY MARSH

Date	January 17, 2011	Scale	AS SHOWN	Fig. No.	5
File Name	108.00228.00026-3	Project No.	008.00228.00026		

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APPENDICES

Appendix A **Upland Sampling and Analysis Plan**

Appendix B **Quality Assurance Project Plan, Marine and Maulsby Marsh Sediment Characterizations**

Appendix C **Health and Safety Plan**

APPENDIX A

APPENDIX A
PHASE 2 REMEDIAL INVESTIGATION UPLANDS SAMPLING AND ANALYSIS PLAN

JELD WEN, inc.
Former Nord Door Facility
300 West Marine View Drive
Everett, Washington
Ecology No. 2757

Prepared for

JELD-WEN, inc.

Updated January 2011

Prepared by

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1800 Blankenship Rd; Suite 440
West Linn, Oregon 97068

Project 008.0228.00017

CONTENTS

ACRONYMS AND ABBREVIATIONS

ASTM	American Society for Testing and Materials
bgs	below ground surface
BNAs	semi-volatile organic compounds (sediment)
DQO	data quality objective
Ecology	Washington State Department of Ecology
GC/MS	gas chromatograph/mass spectrophotometer
GRO	gas range organics
HASP	health and safety plan
HCID	hydrocarbon identification
ICP	inductively coupled plasma-atomic emission spectroscopy
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
MLLW	Mean lower low water (datum)
MRLs	method reporting limits
MTCA	Model Toxics Control Act
MW	Monitoring well
NAPL	nonaqueous phase liquid
NAVD	North American Vertical Datum
NGVD	National Geodetic Vertical Datum of 1929
PCB	polychlorinated biphenyl
PCP	Pentachlorophenol
PPMETS	Priority pollutant metals, antimony, arsenic, beryllium, cadmium, chromium, copper, lead, nickel, selenium, silver, thallium, zinc
QA/QC	quality assurance/quality control
QAPP	quality assurance project plan
RI	remedial investigation
RI/FS	remedial investigation/feasibility study
SAP	sampling and analysis plan
SVOC	Semi volatile organic compounds
TC	Toxicity Characteristic
TCLP	Toxicity Characteristic Leaching Procedure
TDS	total dissolved solids
TEF	toxicity equivalency factor

ACRONYMS AND ABBREVIATIONS (Continued)

TEQ	total toxicity equivalence
TOC	total organic carbon
TSS	total suspended solids
TPH	total petroleum hydrocarbons
TPH-Gx	total petroleum hydrocarbons as gasoline
TPH-Dx	total petroleum hydrocarbons as diesel
TSS	total suspended solids
TVS	total volatile solids
VOA	volatile organic analysis
WAC	Washington Administrative Code

1 INTRODUCTION

1.1 Purpose

This uplands Sampling and Analysis Plan (uplands SAP) is being prepared as part of the Phase 2 Remedial Investigation (Phase 2 RI) for the former Nord Door facility in Everett, Washington. This SAP is provided to identify the purpose and objectives of the uplands data collection in support of the work plan for remedial investigation/feasibility study (RI/FS) and Cleanup Action Plan (CAP) “Work Plan”, specify field procedures, identify quality assurance (QA) procedures to be implemented during sampling activities and laboratory analyses, and to meet the requirements of WAC 173-340-820, Model Toxics Control Act (MTCA).

1.2 Sampling and Analysis Plan Organization

The Sampling and Analysis Plan is organized in three sections. A brief description of each section is presented below.

Section 1—Introduction. Section 1 contains an overview of the Uplands Sampling and Analysis Plan.

Section 2—Field Sampling Plan. Section 2 identifies the sampling locations and depths, and presents the procedures to be used in field sampling. Included are procedures for: soil sample, temporary well installation, groundwater sample collection, boring abandonment, water and product measurements, residuals management, sample splitting, sample labeling, shipping, and custody.

Section 3—Quality Assurance Project Plan. Section 3 identifies the project organization and includes QA procedures for field activities and laboratory analyses.

1.3 Project Organization and Responsibilities

Noted below are the responsibilities of key project personnel.

Dwayne Arino, Project Coordinator for JELD-WEN. Responsible for overseeing the implementation of the Agreed Order for JELD-WEN. Coordinates with the Department of Ecology (Ecology) and SLR International Corp (SLR). Provides oversight of program activities. Reviews project work scope, resource needs, and requests.

Isaac Standen, Project Coordinator for Ecology. Responsible for overseeing the implementation of the Agreed Order for Ecology. Coordinates with JELD-WEN, Ecology and SLR. Provides oversight of all program activities. Reviews project work scope. Defines and coordinated Ecology resources.

Scott Miller, Project Manager, SLR. Provides technical oversight of all SLR project activities at the Site and senior review of all project activities. Oversees project performance and provides technical expertise to accomplish project objectives. Ensures that project tasks are successfully completed within the project time periods. Coordinates with JELD-WEN.

SLR Field Personnel. Geologists, scientists, engineers, and technicians are responsible for implementing the SAP.

Laboratories. Provide analytical support. Perform all required quality control analyses including analytical duplicates, blanks, and matrix spikes. Initiate and document required corrective action. Perform preliminary review of data for completeness, transcription, or analytical errors. Follow U.S. Environmental Protection Agency (EPA) guidelines and good laboratory practices. The project laboratory for the uplands sampling is Environmental Science Corp. (ESC) located in Mt. Juliet, Tennessee. Some of the soil and groundwater samples will be subcontracted by ESC to Analytical Resource, Inc. (ARI). ARI is located in Tukwila, Washington. Dioxin/Furan samples will be analyzed by Analytical Perspectives, Inc (AP) in Wilmington, North Carolina. ESC (C1915), ARI (C1235) and AP (C901-10) are accredited by Ecology.

1.4 Remedial Investigation Schedule

The schedule for the uplands sampling that will be completed as part of the Phase 2 RI is presented in the Work Plan (Section 2). Any schedule modifications will be submitted for approval by SLR to the Ecology Project Coordinator.

2 FIELD SAMPLING PLAN

2.1 Sampling Needs and Objectives

The Phase 2 RI sampling activities to be performed at the Site are intended to provide additional information to support site characterization and cleanup decision making. Sampling will supplement the initial results and previous testing conducted on the Site. Specific sampling objectives are as follows:

- Perform additional sampling in the vicinity of former Woodlife storage, piping, and use area to provide further assessment dioxins and furans in soil and groundwater near sampling location GP-302.

- Perform soil sampling in the vicinity of the burner ash drum to evaluate whether soils in this area have been impacted by dioxins/furans found in boiler ash.

- Perform additional assessment for metals in groundwater near former boring GP-304.

- Collect groundwater samples from monitoring wells MW-1 and MW-6 to help establish the relationship between total and dissolved metals in groundwater.

- Sample existing groundwater monitoring wells MW-1 and MW-5 at high water and at low water to fully document that groundwater is not affected by TPH these locations.

- Perform additional groundwater characterization for VOCs in the vicinity of former thinner tank.

- Perform additional groundwater characterization to the east of the Site on the BNSF railroad property near Maulsby Marsh for TPH, PAHs, VOCs, and total and dissolved metals.

2.2 Sampling Locations, Types, Frequency, and Analyses

This section generally describes proposed sampling locations. Proposed sample locations are depicted in Figure 3 of the Phase 2 RI Work Plan. A summary of the proposed sampling areas, proposed sampling location labels, and the proposed analysis is summarized in Table 1 (attached). A description of the samples to be collected at each sampling location, the proposed frequency of sampling, and the analyses to be performed is also described in this section. Sampling methods and sampling procedures are described in Section 2.3. Examples of field boring logs and sample Chain of Custody are included as Appendix B.

Former Woodlife Storage and Use Area Dioxins and Furans. Three Geoprobe borings (locations 401P through 403P) will be completed in proximity to former boring location GP-302 to evaluate the extent of dioxin/furan impacts to soil and groundwater. One soil sample from each boring will be collected from a approximate depth of 3 feet below ground surface (bgs) and submitted for dioxin/furan analysis per EPA Method 1613. One groundwater sample from each boring will be collected and held by the laboratory pending receipt of the results of the soil samples from the three borings. The groundwater sample from the soil boring exhibiting the highest total toxicity equivalence (TEQ) concentration of dioxin/furan will be submitted for analysis of dioxins and furans by EPA Method 1613. The groundwater sample will be centrifuged by the laboratory prior to analysis to remove excess sediment and suspended silts from the sample.

One groundwater sample will be collected from monitoring well MW-6, located downgradient of the former Woodlife storage and use area, and submitted for dioxin/furan analysis.

Former Burner Area Dioxins and Furans. One Geoprobe boring (404P) will be completed in proximity to the ash storage area for the former burner. One soil sample will be collected from location 404P at a depth of 3 feet bgs and analyzed for dioxin and furans per EPA Method 1613. A groundwater sample from a temporary well point in the boring will be collected and archived by the laboratory pending receipt of the results of the soil sample. If the soil sample from location 404P identifies concentrations of dioxins/furans above the Work Plan PCLs, the groundwater sample from the probe boring will be submitted for dioxin/furan analysis per EPA Method 1613. The sample will be centrifuged prior to analysis to remove excess sediment and suspended silts from the sample.

Metals in Groundwater at Boring GP-304. One Geoprobe boring (GP-405P) will be completed proximate to former boring GP-304 for the collection of groundwater samples for total and dissolved metals analysis by EPA 6000/7000 series metals. The groundwater samples will be filtered in the field using a 0.45-μm in-line filter prior to submittal to the laboratory.

Metals in Groundwater Monitoring Wells. Groundwater samples will be collected from monitoring wells MW-1 and MW-6 for total and dissolved metals analysis by EPA

6000/7000 series metals. The groundwater samples will be filtered in the field using a 0.45-µm in-line filter prior to submittal to the laboratory.

TPH in Groundwater Monitoring Wells. Two additional rounds of groundwater samples will be collected from monitoring wells MW-1 and MW-5 for TPH-HCID analysis, with follow-up analysis for TPH-Dx and/or TPH-Gx. The two sampling events will be scheduled to coordinate with the predicted high tide and predicted low tide times for the Everett area of Possession Sound.

VOCs Near Former Thinner Tank. Groundwater samples collected from proposed borings 401P and 403P (former Woodlife storage and use area) will be submitted for VOC analysis by EPA Method 8260.

BNSF Railroad Property/Maulsby Marsh. Five additional hand auger borings (406P through 410P) will be completed east of the BNSF tracks along Maulsby Marsh, immediately above the surface water, for analysis of TPH-HCID (with follow-up analysis for TPH-Dx and/or TPH-Gx), PAHs by EPA Method 8270-SIM, and VOCs by EPA Method 8260. Groundwater samples will also be submitted for total and dissolved metals analysis by EPA 6000/7000 series. The groundwater samples for metals analysis will be filtered in the field using a 0.45-µm in-line filter prior to submittal to the laboratory.

2.2.1 Field Quality Assurance Samples

Field QA will be maintained through compliance with the sampling plan, collection of field QA samples, and documentation of sampling plan alterations.

2.3 Sampling Methods and Procedures

This section generally describes the methods and procedures for fieldwork associated with the proposed soil and groundwater sampling.

2.3.1 Utility Location

All drilling and excavation locations will be checked for underground utilities prior to the start of field activities. Boring locations may be moved due to underground or aboveground utilities, structures, features or site operational constraints seen during site visits. The field geologist/engineer may approve relocations within 25 feet of the original site and will notify the SLR project manager. Relocations greater than 25 feet from the original boring location will require approval by both the SLR project manager and the JELD-WEN project manager before drilling commences.

2.3.2 Soil Sampling

Soil samples will be collected using the following general procedures:

A. All sampling equipment and reusable materials that will contact the sample will be decontaminated on site in accordance with procedures identified in Section 2.3.8. The field staff will use clean neoprene, nitrile, or vinyl gloves for handling each sample.

B. The sample container labels will be filled out and attached to the appropriate containers as described in Section 2.3.9.

C. Soil samples collected for chemical analysis will be transferred directly from the sampler into sample containers.

D. Laboratory provided glass jars will be filled for analyses at each sample interval, if sample volume permits. If the soil volume from a sampling interval does not adequately fill the soil jars, an additional sample will be collected from the depth interval immediately below it. Soil will be transferred directly from the stainless-steel bowl (composite samples), or from the sampling sleeve (Geoprobe samples) to the sample containers. Each container will be filled as full as possible to minimize headspace.

E. A PID will be used to monitor each sample for volatile constituents after the sampler is first opened. The PID reading will be recorded on a Field Sampling Data Form or on a Boring Log Form (Section 3.4).

F. After filling the sample jars, the remaining sample will be logged on a Boring Log Form or a Field Sampling Data Form as described in Section 3.4. If free product contamination is observed in any sample interval, that sample will also be transferred into sample containers. For the purposes of this investigation, free product contamination is defined as a nonaqueous phase liquid that is adsorbed to the soil and is in soil pore spaces, causing staining, iridescent sheens, and an odor characteristic of petroleum or polycyclic aromatic hydrocarbons.

After being filled, the sample container(s) will be placed on ice in a cooler and handled as described in Section 2.3.9. The sample coolers will be sent to the laboratory within 36 hours of sampling.

Soil samples will be identified by the Geoprobe or hand auger location which they are collected. The prefix "GP-" will precede all Geoprobe boring numbers. Geoprobe soil samples will be numbered according to the top of the depth range sampled. For example, GP-401-5 would denote a Geoprobe soil sample from soil boring location 301 collected from a depth of 5 feet bgs.

Geoprobe Soil Borings. The Geoprobe borings will be advanced using a truck-mounted, Geoprobe direct-push drilling rig. The Geoprobe rig will be equipped with nominal 2-foot-long or 4-foot-long, 2-inch-diameter probes fitted with acetate sampling sleeves. The Geoprobe borings will be advanced to approximately 15 feet bgs. As is discussed in Section 2.3.3 below, temporary well screens will be installed in each of the Geoprobe borings. Following sampling, the Geoprobe soil borings will be abandoned as described in Section 2.3.4.

Geoprobe borings will require coring of asphalt or concrete in paved areas. Subsurface soil samples in the Geoprobe borings will be collected continuously from the ground surface to the maximum explored depth of 15 feet bgs. Soil samples will be taken from the continuous core sample (contained within the plastic sample sleeve) by hand packing the soil into a clean glass jar supplied by the project laboratory. Lithologic descriptions of the sampled soil will be recorded on a Boring Log Form. Soil samples will be collected for chemical analyses.

Soil samples from each boring will be field screened for the presence of petroleum hydrocarbons and volatile organic compounds (VOCs) by using visual appearance, odors, and a photoionization detector (PID). The soil samples will be submitted for laboratory analysis based on the highest PID measurement or visual evidence of impacts. If there is no visual evidence of impact and the PID measurements are below detection limits, the sample will be collected from a depth just above the groundwater table as observed during the field work. Field equipment will be decontaminated according to the procedures outlined in Section 2.3.9 prior to moving to the next sampling location.

2.3.3 Groundwater Sampling Procedures

Groundwater samples from existing monitoring wells will be collected using the following general procedures:

A. Depth to water will be measured before sampling. The water level will be measured by using an electric well probe or oil-water interface probe to the nearest 0.01 foot from a surveyed notch in the well casing. Water depths will be recorded on a Field Sampling Data Form and will include date, time, and sampler's initials. If floating product is present, the thickness will be measured with an oil-water interface probe or a combination of water finding paste and product paste. Groundwater samples will not be collected from wells with floating product.

B. The monitoring wells will be purged using low-flow procedures. Groundwater samples will be collected using a peristaltic pump fitted with silicon tubing and either Tygon® or polyethylene tubing. Pump tubing will be lowered to a mid-screen depth for purging and sampling. Monitoring wells will be purged at a rate of 0.25 to 0.5 liters per minute.

C. Field parameters (temperature, pH, specific conductance, dissolved oxygen, and oxidation redox potential [ORP]) will be measured in purged groundwater as it is discharging through a flow-through cell. Groundwater will be passed through the cell and discharged into a temporary storage container. Field parameters will be periodically measured and recorded during well purging and upon stabilization. Field parameters will be measured using a multi-parameter meter that includes a thermometer, pH/conductivity meter, dissolved oxygen meter, and ORP meter. The multi-parameter meter will be calibrated before the start of field work. Field parameter measurements will be recorded as follows:

- Temperature to ±0.5°C
- pH to ±0.01 units
- Specific conductance to ±1 µS/cm (measured specific conductance ≤ 999 µS/cm), ±10 µS/cm (999 µS/cm < specific conductance <10,000 µS/cm), or ±100 µS/cm (measured specific conductance >10,000 µS/cm)
- Dissolved oxygen to 0.1 mg/L
- Turbidity to 0.1 NTU
- ORP to ± 15 mV

D. Groundwater samples will be collected after the field parameters have stabilized to within 10 percent of the previous reading. If the groundwater parameters do not stabilize, a maximum of three casing volumes will be purged prior to sampling. Residuals will be managed as described in Section 2.13.

E. Groundwater samples will be collected from discharge line of the peristaltic pump (prior to removal of the discharge line after purging the well). All samples will be transferred in the field from the sampling equipment into a container prepared for the given parameters by the analytical laboratory.

E. Groundwater samples collected from the temporary well points (Geoprobe or hand auger borings) and monitoring wells will not be filtered, with the exception of those samples collected for metals analysis. Groundwater samples collected for metals analysis will be filtered in the field using a 0.45-µm in-line filter prior to submittal to the laboratory.

F. Groundwater samples collected for dioxin/furan analysis will be centrifuged in the lab prior to analysis. In addition, groundwater samples collected from temporary well points in the hand auger borings on the BNSF property may also be centrifuged based on the appearance of the sample (i.e. suspended sediment/cloudy) and/or the sample collection methodology (slotted PVC pipe). Samples to be centrifuged prior to analysis will be identified on the chain of custody.

G. Samples will be labeled, handled, and shipped using the procedures described in Section 2.16. Sample custody will be maintained until delivery to the analytical laboratory. All sampling field activity and data will be recorded on a Field Sampling Data Form.

H. The sampler(s) will wear new neoprene or vinyl gloves at each sampling location. New Tygon or polyethylene tubing will be used at each sampling location.

I. All reusable sampling equipment will be decontaminated using the procedures described in Section 2.15.

Groundwater samples from existing monitoring wells will be labeled with the monitoring well designation (described above) and a date suffix. The date suffix will include the month and year. For example, MW-5-811 would represent the water sample collected from MW-5 in August 2011.

Geoprobe Borings. Groundwater samples will be collected from temporary well points installed in the Geoprobe borings. The temporary wells will be constructed of 1 inch diameter PVC blank well casing and machine-slotted well screen. Groundwater samples will be collected using dedicated polyethylene tubing and a peristaltic pump. Approximately three well casing volumes will be purged prior to sampling. Conductivity, pH, and temperature will be monitored during the purging of groundwater from the temporary wells, and the groundwater samples will be collected once these parameters have stabilized. The groundwater samples will be transferred directly from the polyethylene tubing into the laboratory-provided sampling containers, stored on ice, and delivered to project laboratory for analyses. Groundwater samples collected for analysis of organic parameters will not be filtered prior to analysis. Groundwater samples collected for metals analysis will be filtered in the field using a 0.45-µm in-line filter prior to submittal to the laboratory. Development details, including discharge volume, discharge rate, development parameters, and appearance will be recorded on a Field Sampling Data Form. Development water will be handled as described in Section 2.11.1. After collecting the groundwater samples, the temporary wells will be abandoned as described in Section 2.3.6.

Groundwater samples collected from Geoprobe or hand auger locations will be suffixed with "GW." For example, GP-401-GW would denote a groundwater sample from Geoprobe location 401.

Hand Auger Borings. Hand augured soil borings (locations 406P to 410P) are proposed from areas east of the BNSF railroad tracks. The hand auger borings will be completed to approximately five feet below the water table as encountered during the field work and temporary sampling points will be installed in each boring for the collection of groundwater samples. The temporary wells will be constructed of prefabricated 1-inch diameter prepak well screens placed within the borings. If insufficient sample quantity can be obtained from the pre-packed well screens, the screens will be removed and replaced with a slotted PCV pipe for sample collection. Groundwater samples will be collected using dedicated polyethylene tubing and a peristaltic pump. Approximately three well casing volumes will be purged prior to sampling. Conductivity, pH, and temperature will be monitored during the purging of groundwater from the temporary wells, and the groundwater samples will be collected once these parameters have stabilized. The groundwater samples will be transferred directly from the polyethylene tubing into the laboratory-provided sampling containers, stored on ice, and delivered to project laboratory for analyses. Development details, including discharge volume, discharge rate, development parameters, and appearance will be recorded on a Field Sampling Data Form. Development water will be handled as described in Section 2.3.6.

2.3.4 Boring Abandonment

Boring abandonment will be conducted per the requirements of WAC 173-160-560. All soil borings and hand auger borings will be abandoned by simultaneously adding bentonite chips to the boring while the probe, auger, or casing is removed. Bentonite chips placed above the water table will be hydrated with water. The abandoned borings will be sealed at the surface with concrete or gravel, depending on the surrounding surface material.

2.3.5 Water and Product Measurements

Water levels and floating product levels, if present, will be measured before sampling in each well within the monitoring well network. Depth-to-water measurements will be obtained using an electric water level indicator or a combination of water finding paste and product paste. Depths will be measured to the nearest 0.01 foot relative to the top of the well casing rim (north side). Measurements will be recorded to the nearest 0.01 foot in the field logbook. Sampling records will note the measured depth to water, depth to product, measurement date, time, and sampler's initials.

2.3.6 Residuals Management - Handling Procedures

All residual soil, water, product, and used decontamination solutions will be handled appropriately. Residual soil and water will be managed in accordance with all applicable local, state, and federal requirements, and in a manner consistent with *Guidance for Remediation of Petroleum Contaminated Soils* (Ecology, 1995). There are no specific Snohomish Health District requirements for storage of residual soil or water. Used disposable clothing and equipment will be handled as solid waste. Appropriate personal protective clothing will be worn during residuals transfers because of potential skin contact and splash hazards. The following residuals management procedures will be used:

- All soil generated during drilling will be containerized or stockpiled on-site. If possible, soil will be segregated to separate potentially contaminated soil from potentially uncontaminated soil. Soil disposition will be determined by JELD-WEN.

- Water generated from drilling, sampling, and decontamination will be kept separate, to the extent possible, from residual soil. Water will be placed in 55-gallon drums or tanks.

- Drums and tanks will be labeled with a label stating the drum contains investigation derived waste – pending analysis. The label will provide the site name, address, accumulation date, and contents (including approximate quantity).

- Drums and tanks will be sealed and secured daily. An on-site staging area for the accumulation of drums and tanks will be identified by JELD-WEN. Drums and tanks containing water will be stored in the designated temporary holding area as necessary until shipped off site.

- A record of all generated residuals that have been drummed, stockpiled, or otherwise stored will be maintained to expedite characterization and disposal upon completion of field activities.

- Disposable clothing and equipment will be placed in plastic bags and disposed of as solid waste.

- JELD-WEN will be responsible for the proper disposal of all wastes. SLR will coordinate with JELD-WEN for appropriate disposal procedures.

2.3.7 Guidelines for Splitting Samples

If requested by Ecology, JELD-WEN's on-site representative will provide for the collection of split or replicate samples. The following sample splitting procedures will be followed:

- Samples will be collected as described above.
- If sufficient sample is available in the Geoprobe or auger barrel from which JELD-WEN's representative is collecting a sample, then either Ecology (or representative) or JELD-WEN's representative will collect a split sample concurrently.
- If insufficient sample is available in the Geoprobe or auger barrel from which JELD-WEN's representative is collecting a sample, then an additional split spoon drive or hand auger sample will be collected in the same sampling interval, if desired by Ecology, or immediately below the JELD-WEN sampling interval.

2.3.8 Decontamination Procedures

A decontamination area will be established for cleaning the drilling rig and well materials. All down-hole drilling equipment and the working area of the drill rig will be steam-cleaned or hot water pressure-washed prior to beginning drilling and between drilling each boring. Hand-auger equipment, split-spoon samplers, spoons, bowls, and other sampling equipment that will contact samples will be decontaminated prior to initial use, between sampling locations, and between different sampling depths at the same location. Soil, groundwater, and surface water sampling equipment will be decontaminated by following procedure:

- Tap water rinse
- Alcohol rinse (if equipment visibly stained with product)
- Tap water rinse
- Nonphosphatic detergent and tap water wash
- Tap water rinse
- Second alcohol rinse (if equipment visibly stained with product)
- Tap water rinse
- Distilled water rinse

The electric well probe and oil/water interface probe will be rinsed with alcohol and distilled water between uses in different monitoring wells. All labels and binding tape will be removed from well materials prior to steam cleaning or washing. New sampling tubing will be used at each well.

Decontamination of personnel involved in sampling activities will be accomplished as described in the site Health and Safety Plan.

2.3.9 Sample Labeling, Shipping, and Chain-of-Custody

Sample Labeling. Sample container labels will be completed immediately before or immediately after sample collection. Container labels will include the following information:

- Project name
- Sample number (including sample depth, if applicable)
- Name of collector
- Date and time of collection

Sample Shipping. Soil and water samples will be shipped to the selected analytical laboratory as follows:

- Sample containers will be transported in a sealed, iced cooler.

- In each shipping container, glass bottles will be separated by a shock-absorbing and absorbent material to prevent breakage and leakage.

- Ice or "blue ice," sealed in separate plastic bags, will be placed into each shipping container with the samples.

- All sample shipments will be accompanied by a Chain-of-Custody Form. The completed form will be sealed in a plastic bag and taped to the inside lid of the shipping container.

- Signed and dated chain-of-custody seals will be placed on all shipping containers, unless samples will be picked up at the site by the laboratory.

- The analytical laboratory's name and address and SLR’s name and office (return) address will be placed on each shipping container prior to shipping.

Chain-of-Custody. Once a sample is collected, it will remain in the custody of the sampler or other SLR personnel until shipment to the laboratory. Upon transfer of sample containers to subsequent custodians, a Chain-of-Custody/Analysis Request Form will be signed by the persons transferring custody of the sample container. A signed and dated chain-of-custody seal will be placed on each shipping container prior to shipping.

Upon receipt of samples at the laboratory, the shipping container seal will be broken, and the condition of the samples will be recorded by the receiver. Chain-of-custody records will be included in the analytical report prepared by the laboratory.

3 QUALITY ASSURANCE PROJECT PLAN

3.1 Introduction

The purpose of this Quality Assurance Project Plan (QAPP) is to present the quality assurance and quality control activities developed for the SAP. This QAPP covers the soil and groundwater sampling work to be undertaken by SLR International Corp during this investigation.

3.1.1 Project Organization

Primary responsibility for project quality rests with SLR International Corp project manager (PM), Mr. Scott Miller. The PM will review all project deliverables before submittal to Ecology or other appropriate regulatory agency. Where quality assurance problems or deficiencies are observed, the PM will identify the appropriate corrective action to be initiated.

3.1.2 Data Quality Objectives

This section presents the data quality objectives (DQO's) for the Remedial Investigation. This environmental assessment is being conducted to help ensure that data of sufficient quality and quantity will be available to identify if hazardous compounds are present at the Site and to evaluate risks posed by the presence of hazardous compounds in the soil and groundwater at the Site. Information is needed to identify if hazardous compounds associated with historical industrial activities have entered the subsurface and if these compounds, and the previously identified compounds, may pose unacceptable risk to current and future human and ecological receptors via direct contact or migration.

The data collected during the environmental assessment and the previously completed site assessments will be used to assess whether Site related contaminants of interest (COIs) may result in unacceptable risk to human and/or ecological receptors (current or likely future).

The numbers of sampling locations, sampling depths, types of samples, and types of analysis have been selected to meet the DQOs. The sampling proposed in this work plan represents the minimum sampling required to meet the DQOs. If observations made during the field work indicate a release of chemicals in an assessment area, additional sampling may be completed in that area to help assess the extent of the chemical release in soil and groundwater. These DQOs will be applied to facilitate data adequacy reviews and identify data gaps. Additionally, the DQOs will be used to identify the analytical practical quantification limit (PQL) and to establish other quality assurance goals with the QAPP and the SAP. The PQL is defined as the lowest levels which can be routinely quantified and reported by a laboratory. Thresholds for PQLs from WAC 173-340-707 include that the PQL may be no greater than ten times the laboratory method detection limit (MDL); or that the PQL for a hazardous substance, medium and analytical procedure may be no greater than the PQL established by the US EPA and used in 40 CFR 136, 40 CFR 141 through 143, or 40 CFR through 270. An important DQO for this project is to obtain appropriate quantitation limits and to meet the requirements of WAC 173-340-820, MTCA. The PQLs for the proposed soil and groundwater sample analysis at the former Nord Door site are presented in Tables 2 through 7 (attached). The Preliminary Cleanup Levels (PCLs) for the Site have been calculated in accordance with MTCA Cleanup Regulation, Chapter 173-340 WAC, as is described in the Work Plan (Section 4.1). As is shown in the tables, the calculated PCLs for some analytes are lower than the PQLs which can be achieved by the laboratory. In these instances the PCL has defaulted to the laboratory PQL. When necessary to meet the PCL, PAHs will be analyzed by EPA Method 8270 SIM SS, which will provide lower PQL than Method 8270.

3.2 Data Quality Assurance Objectives

The applicable data quality assurance objectives are dictated by the intended use of the data and the nature of the analytical methods. The accuracy, precision, representativeness, completeness, and comparability data quality assurance objectives are explained below.

3.2.1 Accuracy

Accuracy is the agreement between the measured value and the true value. Accuracy can be expressed as the difference between two values or the difference as a percentage of the reference or true value (ratio). Accuracy depends on the magnitude of the systematic (bias) and random (precision) errors in the measurement. Bias due to sample matrix effects will be assessed by spiking samples with known standards and calculating the recovery of the standards.

3.2.2 Precision

Precision is a measurement of mutual agreement among individual measurements of the same property under prescribed similar conditions. It is expressed in terms of the standard deviation or relative percent difference (RPD). Precision is determined through laboratory quality control parameters such as surrogate recoveries, matrix spikes, or quality control check samples. Separate field control samples will not be collected for this scope of work. Quality control objectives for surrogate recovery, percent recovery, and RPD for matrix spikes will be those currently established by the testing laboratory.

3.2.3 Representativeness

Representativeness is a measure of how closely the measured results reflect the actual concentration or distribution of chemical compounds in the media sampled. Sampling plan design, sampling techniques, and sample handling protocols are included in the SAP to ensure that samples collected are representative of site conditions within the limitations of the collection technologies. Sampling locations were selected based on their representativeness in further assessing the extent of contamination is soil and groundwater at the site. This documentation establishes protocols for assurance of sample identification and integrity.

3.2.4 Completeness

Completeness is a measure of the amount of valid data obtained from the analytical system compared to the total data collected. The completeness of the data will be assessed during quality control reviews. Audits, internal control checks, and preventative maintenance will be implemented to help maintain the above quality assurance objectives.

3.2.5 Comparability

Comparability expresses the confidence with which one data set can be compared to another. Data comparability will be ensured by monitoring the control of sample collection, analytical methods, and data recording. Comparability of laboratory and field data will be maintained by using EPA-defined procedures, where available. Data comparability will be maintained by use of consistent methods and units. The laboratory predicted method detection limits (MDL) and method reporting limits (MRL) for the proposed sampling protocol are included as Attachment 1 to this document. Actual detection limits will depend on the sample matrix and will be reported as defined for the specific samples.

3.3 Field Data Quality Assurance Objectives

This QAPP also presents the field data quality assurance objectives for the ESA at the former JELD-WEN Site. The field data quality assurance objectives include field measurements and observations, field equipment calibration, chain-of-custody procedures, and sample handling procedures.

3.3.1 Field Measurement and Observation

Field measurements and observations will be recorded in the project log notes. Sufficient information will be recorded so that all field activities can be reconstructed without reliance on personnel memory. Entries will be recorded directly in waterproof ink and legibly and will be signed and dated by the person conducting the work. If changes are made, the changes will not obscure the previous entry, and the changes will be initiated and dated. At a minimum, the following data will be recorded:

- Location of activity
- Description of sampling reference point(s)
- Date and time of any activity
- Sample number and volume or number of containers
- Field measurements made
- Calibration records for field instruments
- Relevant comments regarding field activities
- Initials of responsible personnel

3.3.2 Field Instrument Calibration

The field instruments to be used during field activities will be calibrated at the beginning and as required according to manufacturers' specifications. Calibration records will be recorded in the project log notes including date, project number, instrument make and model, and instrument response to calibration.

3.3.3 Chain-of-Custody Procedures

The management of samples collected in the field will follow specific procedures to ensure sample integrity. To ensure sample integrity, the samples will be handled by as few people as possible and the sample collector will be responsible for the care and custody of the samples. Sample possession will be tracked from collection to analysis. Each time the samples are transferred between parties, both the sender and receiver will sign and date the chain-of-custody form and specify what samples have been transferred. When a sample shipment is sent to the laboratory, the original form will be placed with the samples and transmitted to the laboratory. A copy of the form will be retained in the project files. A chain-of-custody record will be completed for each batch of samples hand delivered or shipped to the laboratory.

The following information will be included on the chain-of-custody form:

- Sample number

- Sampler signature
- Sample collection date and time
- Site Name
- Sample type
- Inclusive dates of possession
- Signature of sender and receiver

In addition to the chain-of-custody form, other components of sample tracking will include the sample labels and seals, field logs, sample shipment receipt, and laboratory log book. The sample labels and seals will include the following information:

- Project name and number
- Name of sampler
- Date and time of sample collection
- Sample location and number
- Preservation

3.3.4 Sample Handling Procedures

Sampling plan design, sampling techniques, sampling location, and sample handling protocols are included in the SAP to ensure that samples collected are representative of site conditions within the limitations of the collection technologies.

The following table summarizes the soil sample handling requirements:

Analysis	Sample Container	Container Size	Preservation and Handling	Holding Times
Dioxins & Furans	Glass Jar	8 oz	Fill jar leaving minimal air space; keep in dark; cool to 4°C	30 days

The following table summarizes the groundwater sample handling requirements:

Analysis	Sample Container	Container Size	Preservation and Handling	Holding Times
Total Petroleum Hydrocarbon - Diesel (TPH-Dx)	Amber Glass Bottle	1 Liter	Fill bottle leaving no air space; keep in dark; cool to 4°C; HCL to pH<2	7 days
Total Petroleum Hydrocarbon - Gasoline (TPH-Gx)	Voa Vial	3 Voa Vials	Fill bottle leaving no air space; keep in dark; cool to 4°C; HCL to pH<2	14 days

Analysis	Sample Container	Container Size	Preservation and Handling	Holding Times
Priority Pollutant Metals - Total	Plastic Bottle	500 mL	Fill bottle leaving no air space; keep in dark; cool to 4°C; HNO_3 to pH<2	6 Months
Priority Pollutant Metals-Dissolved	Plastic Bottle	500 mL	Fill bottle leaving no air space; keep in dark; cool to 4°C	6 Months
Volatile Organic Analysis (VOA)	Voa Vial	3 Voa Vials	Fill vial leaving no air space; keep in dark; cool to 4°C; HCL to pH<2	14 days
Semi-Volatile Organic Compounds (BNA)	Amber Glass Bottle	1 Liter	Fill bottle leaving no air space; keep in dark; cool to 4°C	7 days
Dioxins & Furans	Plastic Bottle	Two -1 Liter	Fill bottle leaving no air space; keep in dark; cool to 4°C Laboratory centrifuge sample to remove suspended sediment	30 days

3.4 Quality Control

Quality control checks consist of measurements and tests performed in the field and laboratory. The analytical methods that will be performed as a part of this project have routine quality control checks performed to evaluate the precision and accuracy, and to determine whether the data are within the quality control limits.

3.4.1 Laboratory Quality Control Methods

Specific procedures and frequencies for laboratory quality control are detailed by the analytical method in the laboratory's Quality Assurance Plan. A general description of the types of laboratory quality control samples is as follows:

- **Method Blanks –** A minimum of one laboratory method blank will be analyzed per twenty samples or one per batch (whichever is greater) to assess possible laboratory contamination. Method blanks will contain all reagents and undergo all procedural steps used for analysis.
- **Control Samples –** A minimum of one laboratory control sample per twenty samples or one per batch (whichever is greater) will be analyzed for inorganics to verify the precision of the laboratory equipment. The control sample will be at a concentration within the calibration range, but at a different concentration than the standards used to establish the calibration curve.
- **Matrix Spike -** A minimum of one laboratory matrix spike sample will be analyzed per twenty samples or one per batch (whichever is greater) to monitor recoveries and assure that extraction and concentration levels are acceptable for quality assurance and quality control review. The laboratory matrix spike will be analyzed on a separate groundwater sample collected from one of the wells.

3.5 Data Management

This section addresses issues related to data sources, data processing, and data evaluation. Raw data generated in the field or received from analytical laboratories will be validated, entered into a computerized database, and verified for consistency and correctness.

3.5.1 Field Data Management

Accurate documentation of field activities (e.g., field parameters measurements, field notes) will be maintained using field log-books and field data forms. Entries will be made in sufficient detail to provide an accurate record of field activities without reliance on memory.

Field log entries will be dated and include a chronological description of task activities, names of individuals present, names of visitors, weather conditions, etc. All entries will be legibly entered in ink and initialed. A record of drilling, including the boring name and location, sampling intervals, sample names, and lithologic and field screening observations, will be included on a boring log.

Copies of standard SLR field forms are included in Appendix B.

3.5.2 Analytical Data Management

Following validation, all analytical data will be entered into a computerized database. The data may require some manipulation, such as common unit conversions and extraction from support information. To accomplish these manipulations, data reduction and tabulation techniques will be applied to the data and documented.

Several different tabular reports will be generated from the database. All analytical, locational, and tracking data will be stored in the database. Data reports for each type of analysis will be generated to produce standard reports.

All data validation, document control, and locational and analytical information generated by this project will be entered, stored, and generated by PC-compatible machines. Standardized software products will be used.

The volume of digital data anticipated on this project may be accommodated on a single PC work station. Project data backups will be made on a weekly basis or whenever major additions or modifications have been made to the various data management systems. Access to the database will be limited to the data manager and the authorized project personnel.

3.5.3 Sample Management

The sample management system forms the foundation of all other analytical data collection, verification, and validation tasks. Analytical data cannot be considered valid unless all the proper steps have been carried out with respect to sample management. These include:

- Sample properly documented in daily field log
- Chain-of-custody requirements met
- All sample-related documents filed
- Use of unique sample identification numbers

Data that do not pass the validation process either will be assigned data qualifiers to restrict or modify usage, or will be rejected for use. Modifications to the use of data will be documented in data validation reports.

3.5.4 Data Reporting Requirements

Quality assured data will be submitted to Ecology electronically in Environmental Information Management System (EIM) format. The electronic data will be verified to be compatible with EIM prior to delivery to Ecology.

TABLES

Table 1
Uplands SAP Summary Analytical Table
JELD-WEN Site, Forer Nord Door
Everett, Washington

Area	Work Completed To-Date (May 2007)	Proposed RI Sampling	2nd Round RI Sampling	Matrix	TPH-HCID	TPH-Dx	TPH-Gx	Dioxins & Furans	Metals	PAHs	VOC
Woodlife Storage and Use Area (Work Plan Section 4.1.1 and 4.1.6)	6 GPs near Woodlife storage, piping, and use area 1 at Paint Room 2 near thinner tank 2 near boiler chemical storage (11 total GPs) 1 test pit (Test Pit 1) near the thinner tank	1 Geoprobe boring for soil and groundwater sampling (Location 302-P) Figure 11A	3 Geoprobes (401P, 402P, 403P) for soil and groundwater dioxin/furan, sample MW-6 for dioxin/furan Sample 401P and 403P for VOCs	Soil				3			
				Water				2			2
Hog Fuel Burner Ash (Work Plan Section 4.1.2)		1 sample of the ash from the hog fuel burner (sample location 301-P) Figure 11A	1 Geoprobe (404P) boring for soil and groundwater sampling near SS-301 (archive GW)	Soil				1			
								1(1)			
Southwest Un-Paved Area/ RZA Assessment Area (Work Plan Section 4.1.3)	1992 sampling by RZA AGRA for Serling Asphalt (now Rinkers) and one Geoprobe sampling (GP41) completed in 2006 (SLR).	4 Geoprobe borings for soil and groundwater sampling (Locations 303-P to 306-P) Figure 11B	1 Geoprobe boring near boring location GP-304 (405P) for total and disssolved metals in GW	Soil							
				Water					2		
Existing Groundwater Monitoring Wells (Metals and TPH) (Work Plan Section 4.1.4 and 4.1.5)	1992 sampling by RZA AGRA for Serling Asphalt (now Rinkers) included analysis for lead at five locations (C1, C2, C6, MW-1, and MW-2).	Sampling the six existing monitoring wells for total metals Sampling the two existing monitoring wells (MW-1 and MW-4) for TPH-Dx, with follow up analyis for PCBs Figure 11A	Sample existing monitoring wells MW-1 and MW-6 for total and dissolved metals Sample MW-1 and MW-5 for TPH during high water and low water	Soil							
				Water	4	4(2)	4(2)		4		
BNSF Railroad/Maulsby Marsh (Work Plan Section 4.1.7)	9 Geoprobe borings completed in West Marine View Drive for soil and groundwater sampling in 2006.	12 hand auger sampling locations with temporary well points for groundwater sampling Locations 322-P to 333-P Figure 11E	Groundwater samples from hand auger borings 406P, 407P, 408P for TPH, and 406P through 410P for VOCs, PAHs, and metals (total and dissolved)	Soil							
				Water	3	3(2)	3(2)		10	5	5

Notes:

(1) - If dioxin/furan is detected in the soil sample, then the groundwater sample will be analyzed.

(2) - Run analysis only if TPH is detected in this range by the TPH-HCID analysis

TPH-Dx- Total Petroleum Hydrocarbons Diesel Range (Ecology Method NWTPH-Dx)

TPH-Gx- Total Petroleum Hydrocarbons Gasoline Range (Ecology Method NWTPH-Gx)

Dioxins and Furans-EPA Method 1613B

Metals: Arsenic, Cadmium, Total Chromium, Chromium VI, Copper, Lead, Nickel, Selenium, and Zinc (EPA Method 6010B), Mercury- Mercury Cold Vapor Atomic Absorption (EPA Method 7471A)

PAHs - EPA Method 8270-SIM

VOC- Volatile Organic Compounds (EPA Method 8260)

Table 2
Soil PQLs and PCLs
Dioxin/Furan
JELD-WEN Site, Former Nord Door
Everett, WA

Analyte	Laboratory MDL [A] (mg/Kg)	Laboratory PQL [B] (mg/Kg)	Selected PCLs [C] (mg/Kg)
Total Dioxin/Furan [D]			
Dioxin/Furan Total TEQ [E]	5.10E-08	3.80E-08	0.000011[F]

Notes:

A - Method Detection Limit (MDL) from Environmental Sciences Corp environmental laboratory
B - Practical Quantitation Limit (PQL) from Environmental Sciences Corp environmental laboratory
C - Soil PCLs calculated as shown in Attachment 2 of Work Plan
D - Dioxins/Furans by EPA Method 1613
E - Dioxin/Furans total toxicity equivalence (TEQ) using the toxicity equivalency factor (TEF) methodology
F - MTCA Method B Cleanup Level - Ingestion, per Ecology comment number 89h to DRAFT RI/FS and CAP Work Plan

Table 3
Groundwater PQLs and PCLs
SVOCs and PAHs
JELD-WEN Site, Former Nord Door
Everett, WA

Analyte	Laboratory MDL [A] (µg/L)	Laboratory PQL [B] (µg/L)	Selected PCL [C] (µg/L)
Semivolatile Organic Compounds [D] (SVOCs)			
acenaphthylene	0.874	10	10
acetophenone	0.107	1	800
atrazine	0.909	1	1
benzaldehyde	1.36	10	800
biphenyl; 1,1-	0.422	1	400
bis(2-chloroethyl)ether	0.146	1	1
bis(2-chloroethoxy) methane	0.129	1	1
bis(2-chloroisopropyl) ether	0.24	1	1,400
bis(2-chloro-1-methylethyl)ether	0.24	1	37
bis(2-ethylhexyl) phthalate	0.162	1	1.2
bromophenyl-phenylether; 4-	0.059	1	1
butyl benzyl phthalate	0.173	1	1,300
caprolactam	0.259	10	8,000
carbazole	0.079	1	4.4
chloro-3-methylphenol;4-	0.116	1	1
chloroaniline;4-	0.191	1	32
chlorophenol;2-	0.109	1	97
chloronaphthalene;2-	0.106	1	1,000
chlorophenyl-phenyl ether;4-	0.097	1	1
dibenzofuran	0.081	1	32
dichlorobenzidine;3,3-	0.221	1	1
dichlorophenol;2,4-	0.101	1	77
diethyl phthalate	0.128	1	17,000
dimethyl phthalate	0.176	1	72,000
dimethylphenol;2,4-	2.97	10	380
di-n-butylphthalate	0.129	1	2,000
di-n-octylphthalate	0.189	1	320
dinitro-2-methylphenol: 4,6-	2.36	10	10
dinitrophenol;2,4-	2.03	10	69
dinitrotoluene;2,4-	1.63	10	10
dinitrotoluene;2,6-	1.27	10	16
hexachlorobenzene	0.126	1	1
hexachlorobutadiene	0.151	1	1
hexachlorocyclopentadiene	2.13	10	40
hexachloroethane	0.191	1	1.4
isophorone	0.141	1	8.4
methylnaphthalene; 2	0.116	1	32
methylphenol;2-	1.71	10	400
methylphenol;4-	0.958	10	40
nitroaniline;2-	1.68	10	10
nitroaniline;3-	1.36	10	10
nitroaniline;4-	0.126	1	1
nitrobenzene	0.128	1	17
nitrophenol;2-	3.14	10	10
nitrophenol;4-	0.823	10	10
nitrosodiphenylamine; N-	0.087	1	3.3
nitroso-di-n-propylamine;N-	0.127	1	1
pentachlorophenol	2.18	10	10
phenol	0.686	10	21,000
tetrachlorobenzene;1,2,4,5-	0.127	1	1
tetrachlorophenol;2,3,4,6-	1.19	10	480
trichlorophenol;2,4,5-	0.171	1	1,800
trichlorophenol;2,4,6-	0.111	1	1.4

Table 3
Groundwater PQLs and PCLs
SVOCs and PAHs
JELD-WEN Site, Former Nord Door
Everett, WA

Analyte	Laboratory MDL [A] (µg/L)	Laboratory PQL [B] (µg/L)	Selected PCL [C] (µg/L)
Carcinogenic Polycyclic Aromatic Compounds(cPAHs) [E]			
benzo[a]anthracene	0.624	0.1	0.1
benzo[a]pyrene	0.137	0.1	0.1
benzo[b]fluoranthene	0.16	0.1	0.1
benzo[k]fluoranthene	0.115	0.1	0.1
chrysene	0.102	0.1	0.1
dibenzo[a,h]anthracene	0.17	0.1	0.1
indeno[1,2,3-cd]pyrene	0.138	0.1	0.1
Non-Carcinogenic PAHs (PAHs) [E]			
acenaphthene	0.114	0.1	640
anthracene	0.623	0.1	8,300
benzo[ghi]perylene [F]	0.105	0.1	830
fluoranthene	0.834	0.1	90
fluorene	0.076	0.1	1,100
naphthalene	0.105	0.1	4,900
phenanthrene [G]	0.082	0.1	640
pyrene	1.19	0.1	830

Notes:

A - Method Detection Limit (MDL) from Environmental Sciences Corp environmental laboratory

B - Practical Quantitation Limit (PQL) from Environmental Sciences Corp environmental laboratory

C - Groundwater Preliminary Cleanup Levels (PCLs) calculated as shown in Attachment 2 of Work Plan

D - SVOCs per EPA Method 8270C

E- cPAHs and PAHs will be analyzed per 8270 SIM (low level)

F - Toxicity information is not available for benzo(ghi)perylene. Pyrene has been used as surrogate

G - Toxicity information is not available for phenanthrene. Anthracene has been used as surrogate

Table 4
Groundwater PQLs and PCLs VOCs
JELD-WEN Site, Former Nord Door
Everett, WA

Analyte	Laboratory MDL [A] (µg/L)	Laboratory PQL [B] (µg/L)	Selected PCL [C] (µg/L)
Volatile Organic Compounds (VOCs) [D]			
acetone	8.92	25	800
benzene	0.288	0.5	1.2
bromochloromethane	0.44	0.5	0.5
bromodichloromethane	0.37	0.5	0.5
bromoform	0.51	0.5	4.3
bromomethane	0.5	0.8900	47
butanone;2- (MEK)	1.42	2.5	4,800
carbon disulfide	0.32	0.5	800
carbon tetrachloride	0.31	0.5	0.5
chlorobenzene	0.26	0.5	130
chloroethane	0.856	0.5	15
chloroform	0.33	0.5	5.7
chloromethane	0.251	0.5	130
cyclohexane	0.3	1	1
dibromo-3-chloropropane;1,2-	0.48	1	1
dibromochloromethane	0.42	0.5	0.5
dibromoethane; 1,2-	0.48	0.5	0.5
dichlorobenzene; 1,2-	0.29	0.5	420
dichlorobenzene; 1,3-	0.189	0.5	320
dichlorobenzene; 1,4-	0.3	0.5	4.9
dichlorodifluoromethane	0.3	0.5	1,600
dichloroethane;1,1-	0.31	0.5	800
dichloroethane;1,2-	0.274	0.5	1
dichloroethylene;1,1-	0.495	0.5	1
dichloroethylene;1,2-,cis	0.38	0.5	80
dichloroethylene;1,2-,trans	0.3	0.5	10,000
dichloropropane;1,2-	0.52	0.5	1
dichloropropene;1,3-,cis	0.26	0.5	0.5
dichloropropene;1,3-,trans	0.24	0.5	0.5
dioxane;1,4-	33	100	100
ethylbenzene	0.222	0.5	530
hexanone-2	1.57	2.5	2.5
isopropylbenzene	0.189	0.5	800
methyl acetate	6.666	20	8,000
methyl-2-pentanone; 4- (MIK)	1.42	2.5	640
methyl tert-butyl ether	0.193	0.5	20
methylene chloride	0.295	0.02	4.6
methylcyclohexane	0.333	1	1
styrene	0.38	0.5	1.5
tetrachloroethane;1,1,2,2-	0.22	0.5	0.5
tetrachloroethylene	0.293	0.5	0.5
toluene	0.269	0.5	1,300
trichloro-1,2,2-trifluoroethane;1,1,2-	0.217	0.5	240,000
trichlorobenzene; 1,2,3-	0.24	7	0.5
trichlorobenzene; 1,2,4-	0.265	0.5	35
trichloroethane; 1,1,1-	0.27	0.5	420,000
trichloroethane; 1,1,2-	0.451	2	1
trichloroethylene	0.37	0.0033	1.5
trichlorofluoromethane	0.286	0.5	2,400
vinyl chloride	0.067	0.2	0.2
xylenes (total)	0.86	1.5	1,000

Notes:

A - Laboratory Method Detection Limit (MDL) from Environmental Sciences Corp environmental laboratory

B - Practical Quantitation Limit (PQL) from Environmental Sciences Corp environmental laboratory

C - Groundwater Preliminary Cleanup Levels (PCLs) calculated as shown in Attachment 2 of Work Plan

D - VOCs per EPA Method 8260

Table 5

Groundwater PQLs and PCLs

Metals, TPH, and Dioxin/Furan

JELD-WEN Site, Former Nord Door

Everett, WA

Analyte	Laboratory MDL [A] (µg/L)	Laboratory PQL [B] (µg/L)	Selected PCL [C] (µg/L)
Metals [D]			
Antimony	0.22	1	5.6
Arsenic	0.15	1	1
Beryllium	0.24	1	270
Cadmium	0.24	1	1
Chromium [E]	0.32	1	10
Copper	0.45	1	2.4
Lead	0.22	1	1
Nickel	0.34	1	8.2
Selenium	0.43	1	5
Silver	0.12	0.5	0.5
Thallium	0.09	1	1
Zinc	2.98	10	32
Mercury	0.0439	0.2	0.2
Total Petroleum Hydrocarbons (TPH) [F]			
TPH-Dx	33	100	500
TPH-Gx	31	100	1,000 / 800 [G]
Dioxins / Furans (EPA Method 1613) [H]			
2,3,7,8-Tetra TCDD[I] TEQ	1.19E-09	1.00E-08	0.00000001

Notes:

A - Method Detection Limit (MDL) from Environmental Sciences Corp environmental laboratory

B - Practical Quantitation Limit (PQL) from Environmental Sciences Corp environmental laboratory

C - Groundwater Preliminary Cleanup Levels (PCLs) calculated as shown in Attachment 2 of Work Plan

D - Metals per EPA Method 6020, Mercury per EPA Method 7470A

E - Chromium VI

F - Total Petroleum Hydrocarbons per NWTPH Method

G - Gasoline Range Organics 1,000 µg/L with no detectable benzene in groundwater, 800 µg/L if present in groundwater

H - Dioxins/Furans by EPA Method 1613

I - Dioxin/Furans total toxicity equivalence (TEQ) using the toxicity equivalency factor (TEF) methodology

APPENDIX A

STANDARD SLR FIELD FORMS

Project:		Boring/Well Name: MW-
Boring Location:	Job #:	
Drilling Company:	Logged by:	
Equipment:	Start Date/Time:	
Sampling Method:	Finish Date/Time:	
Hammer Weight:	Monitoring Device: PID	
Screened Interval (bgs):	First Water (bgs):	

Sample I.D.	Sample Interval	Recovery (%)	PID (ppm)	Blow Counts	Depth (feet bgs)	USCS Code	Graphic Log	Lithologic Description	Boring Abandonment or Well Construction Details
					0				
					5				
					10				
					15				
					20				

Depth of Boring (bgs):	Filter Pack:
Depth of Well (bgs):	Annulus Seal:
	Surface Seal:

SLR
1800 Blankenship Road, Suite 440
West Linn, OR 97068

Alternate billing information:

Report to:

Email to:

Analysis/Container/Preservative

Page ___ of ___ of Custody

Prepared by:

ENVIRONMENTAL SCIENCE CORP.
12065 Lebanon Road
Mt. Juliet, TN 37122

Phone (615) 758-5858
Phone (800) 767-5859
FAX (615) 758-5859

Project Description:

City/Sate Collected

Phone: (503) 723-4423
FAX:

Client Project #:

ESC Key:

Collected by:

Site/Facility ID#:

P.O.#:

Collected by (signature):

Packed on Ice N ____ Y ____

Rush? (Lab MUST Be Notified)
____ Same Day. 200%
____ Next Day.. . . . . . . 100%
____ Five Day 25%

Date Results Needed:
Email? __No__Yes
FAX? __No__Yes

CoCode SLRWLOR (lab use only)
Template/Prelogin
Shipped Via:

Sample ID	Comp/Grab	Matrix*	Depth	Date	Time	No. of Cntrs									Remarks/Contaminant	Sample # (lab use only)

*Matrix: **SS** - Soil/Solid **GW** - Groundwater **WW** - WasteWater **DW** - Drinking Water **OT** - Other__________

pH ____________ Temp ____________

Flow ____________ Other ____________

Remarks:

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Samples returned via: ☐ UPS ☐ FedEx ☐ Courier ☐ ______	Condition: (lab use only)
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Temp:	Bottles Received:
Relinquished by: (Signature)	Date:	Time:	Received for lab by: (Signature)	Date:	Time:
				pH Checked:	NCF:

GROUNDWATER LEVEL DATA SHEET

PROJECT: SITE: PROJECT #:

CLIENT: RECORDED BY: MEASURING DEVICE: Solinst

SITE LOCATION:

WELL ID	DATE	TIME	TOP OF CASING ELEVATION	DEPTH TO WATER	DEPTH TO PRODUCT	GROUNDWATER ELEVATION	APPARENT PRODUCT THICKNESS	DEPTH TO BOTTOM	ODOR/ SHEEN	COMMENTS

SLR International Corp

GROUNDWATER SAMPLING FIELD DATA SHEET

PROJECT #:
PURGED BY:
WELL I.D.:
CLIENT NAME:
SAMPLED BY:
SAMPLE I.D.:
LOCATION:
QA SAMPLES:

DATE PURGED
START (2400hr)
END (2400hr)
DATE SAMPLED
SAMPLE TIME (2400hr)
SAMPLE TYPE: Groundwater X Surface Water Treatment Effluent Other

CASING DIAMETER:	2"	3"	4"	5"	6"	8"	Other
Casing Volume: (gallons per foot)	(0.17)	(0.38)	(0.67)	(1.02)	(1.50)	(2.60)	( )

DEPTH TO BOTTOM (feet) =
DEPTH TO WATER (feet) =
WATER COLUMN HEIGHT (feet) =
CASING VOLUME (gal) =
CALCULATED PURGE (gal) =
ACTUAL PURGE (gal) =

FIELD MEASUREMENTS

DATE	TIME (2400hr)	VOLUME (L)	TEMP. (degrees C)	CONDUCTIVITY (μS/cm)	pH (units)	DO	ORP	TURBIDITY (visual)

SAMPLE INFORMATION

SAMPLE DEPTH TO WATER:
SAMPLE TURBIDITY:

80% RECHARGE: YES NO
ANALYSES:
ODOR:
SAMPLE VESSEL / PRESERVATIVE:

PURGING EQUIPMENT

- Bladder Pump
- Centrifugal Pump
- Submersible Pump
- Peristaltic Pump
- Bailer (Teflon)
- Bailer (PVC)
- Bailer (Stainless Steel)
- Dedicated

Other:
Pump Depth:

SAMPLING EQUIPMENT

- Bladder Pump
- Centrifugal Pump
- Submersible Pump
- Peristaltic Pump
- Bailer (Teflon)
- Bailer (PVC or disposable)
- Bailer (Stainless Steel)
- Dedicated

Other:

WELL INTEGRITY:
LOCK#:
REMARKS:

SIGNATURE:
Page of

APPENDIX B

REPORT

QUALITY ASSURANCE PROJECT PLAN
MARINE AND MAULSBY MARSH SEDIMENTS CHARACTERIZATION
JELD-WEN FORMER NORD DOOR SITE

Prepared for
Jeld-Wen, Inc.

Prepared by
Anchor QEA, LLC
1423 Third Avenue, Suite 300
Seattle, Washington 98101

January 2011

QUALITY ASSURANCE PROJECT PLAN

MARINE AND MAULSBY MARSH SEDIMENTS CHARACTERIZATION

JELD-WEN FORMER NORD DOOR SITE

Prepared for

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Seattle, Washington 98101

January 2011

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1 INTRODUCTION

This *Quality Assurance Project Plan* (QAPP) establishes the quality assurance (QA) objectives for conducting sampling and evaluation activities described in the *Sampling and Analysis Plan* (SAP; Attachment 1). The methods and QA procedures described here will be followed by Jeld-Wen and its contractors during various data collection activities beginning in 2011.

The goal of the QAPP is to ensure that data of sufficiently high quality are generated to support the project data quality objectives (DQOs). The QAPP will address project management responsibilities, sampling and analytical procedures, assessment and oversight, and data reduction, validation, and reporting.

The QAPP was prepared following Washington State Department of Ecology (Ecology) *Guidance for Quality Assurance Project Plans* (Lombard and Kirchner 2004) and Ecology's *Sediment Sampling and Analysis Plan Appendix* (SAPA) guidance document (Lee 2003). Analytical quality assurance/quality control (QA/QC) procedures were also developed based on the analytical protocols and quality assurance guidance of the Puget Sound Estuary Program (PSEP 1986, 1997a, b, and c), U.S. Environmental Protection Agency's (EPA's) *Test Methods for the Evaluation of Solid Waste: Physical/Chemical Methods, 3rd Edition* (EPA 1986), and the *U.S. EPA Contract Laboratory Program National Functional Guidelines for Data Review* (EPA 1999, 2004).

1.1 Project Overview

The discussion below outlines the tasks necessary to complete investigations of both the marine sediment and the sediment in Maulsby Marsh adjacent to the Jeld-Wen Site.

1.1.1 Marine Sediment Overview

The Phase 1 Remedial Investigation (Phase 1 RI) sampling found evidence of chemicals in the marine sediments to the north and south of the Jeld-Wen site (Figure 1). Dioxins were found in the sediments found to the north and south, while polychlorinated biphenyls (PCBs) were found only in the south. Neither the depth nor the full distribution of these chemicals were delineated during the Phase 1 RI. In addition, polycyclic aromatic hydrocarbons (PAHs) have been found in upland soil and groundwater and may be present in subsurface sediments. This QAPP and the attached SAP address the tasks necessary to delineate the dioxins, PCBs, and PAHs adjacent to the Jeld-Wen Site. The primary tasks addressed are the collection, processing, and analysis of surface and subsurface sediment samples as required by Ecology.

1.1.2 Maulsby Marsh Overview

Maulsby Marsh is immediately east of the Jeld-Wen Site and is on the other side of Marine View Drive and the Burlington Northern Santa Fe (BNSF) railroad tracks (Figure 1). Previous sampling in Maulsby Marsh has identified total petroleum hydrocarbons (TPH) and PAHs as chemicals of potential concern (COPCs). Metals have also been identified as COPCs in Maulsby Marsh. Additional sediment sampling is necessary to determine the nature and extent of the chemical distribution in this area. It is also necessary to evaluate whether Maulsby March is freshwater or if it is saline due to tides. The primary tasks addressed for Maulsby Marsh are the collection, processing, and analysis of surface sediment samples, as well as an evaluation of salinity under a variety of tidal conditions.

1.2 Document Organization

This QAPP was prepared in accordance with Ecology guidance for developing QAPPs (Lombard and Kirchner 2004). Ecology's guidance specifies four groups of information that must be included in QAPP (Project Management, Data Generation and Acquisition, Assessment and Oversight, and Data Validation and Usability). Each group includes several QAPP elements, and Ecology's guidance provides a suggested outline for these QAPP elements. However, the guidance indicates that certain elements may not be applicable to a given project, and that the elements need not be presented in the order presented in the guidance. The remainder of this QAPP is organized into the following sections:

- Section 2 – Project Management
- Section 3 – Data Generation and Acquisition
- Section 4 – Assessments and Response Actions
- Section 5 – Data Validation and Usability
- Section 6 – References

A SAP detailing the sample collection procedures is provided as Attachment 1 of this QAPP. Should additional environmental sampling be required in the future for the Site, additional attachments may be added to this QAPP. A site specific health and safety plan (HASP) is provided as Attachment 2 of this QAPP.

2 PROJECT MANAGEMENT

This section identifies key project personnel, describes the rationale for conducting the monitoring studies, identifies the studies to be performed and their respective schedules, outlines project DQOs and criteria, lists training and certification requirements for sampling personnel, and describes documentation and record keeping procedures.

2.1 Project/Task Organization

Responsibilities of the team members, as well as laboratory project managers, are described in the following paragraphs. Because the individuals listed below may change over time, this QAPP has been written to include "designee" as an alternate to the current project organization. The following paragraphs define their functional responsibilities.

The Anchor QEA Project Manager is James Keithly. The Anchor QEA Project Manager will act as the direct line of communication between Anchor QEA and Jeld-Wen, and is responsible for implementing activities described in this QAPP. He will also be responsible for production of work plans, producing all project deliverables, and performing the administrative tasks needed to ensure timely and successful completion of these studies. The Anchor QEA Project Manager will provide the overall programmatic guidance to support staff and will ensure that all documents, procedures, and project activities meet the objectives contained within this QAPP. The Anchor QEA Project Manager will also be responsible for resolving project concerns or conflicts related to technical matters. The Anchor QEA Project Manager will notify Jeld-Wen of any long-term changes in core personnel.

David Gillingham will serve as the Anchor QEA Field Coordinator (FC). The FC is responsible for day-to-day technical and QA/QC oversight. He will ensure that appropriate protocols for sample collection, preservation, and holding times are observed and will submit environmental samples to the designated laboratories for chemical and physical analyses.

Delaney Peterson will serve as the Anchor QEA QA/QC Manager. She will provide QA oversight for both the field sampling and laboratory programs, ensuring that samples are collected and documented appropriately, coordinating with the analytical laboratories, ensuring data quality, overseeing data validation, and supervising project QA coordination. Independent third-party data review and validation will be performed.

The Data Manager, **Laurel Menoche** of Anchor QEA, will compile field observations and analytical data into a database, review the data for completeness and consistency, append the database with qualifiers assigned by the data validator, and ensure that the data obtained are in a format suitable for inclusion in Ecology's electronic information management (EIM) and Anchor QEA's databases.

Sue Dunnihoo of Analytical Resources, Inc. (ARI) will serve as the Laboratory Manager and will oversee all laboratory operations associated with the receipt of the environmental samples, chemical/physical analyses, and laboratory report preparation for this project. The Laboratory Manager will review all laboratory reports and prepare case narratives describing any anomalies and exceptions that occurred during analysis.

The analytical testing laboratory will be responsible for the following:

- Perform the methods outlined in this QAPP, including those methods referenced for each analytical procedure
- Follow documentation, chain-of-custody (COC), and sample logbook procedures
- Implement QA/QC procedures required by the Puget Sound Estuary Program (PSEP 1986, 1997a, b, and c) or other guidelines
- Meet all reporting and QA/QC requirements
- Deliver electronic data files as specified in this QAPP
- Meet turnaround times for deliverables as described in this QAPP
- Allow Ecology and the QA/QC contractor to perform laboratory and data audits

Stella Cuenco of Laboratory Data Consultants (LDC) is the data validation Project Manager and will oversee all validation efforts on the final data packages. Ms. Cuenco will be responsible for reviewing this QAPP, along with *U.S. EPA Test Methods for the Evaluation of Solid Waste: Physical/Chemical Methods, 3rd Edition* (EPA 1986), *U.S. EPA Contract Laboratory Program National Functional Guidelines for Data Review* (EPA 1999, 2004) and *U.S. EPA Region 9 Superfund Data Evaluation/Validation Guidance R9QA/006.1* (2001) to ensure all data verification and data validation criteria are met.

2.2 Problem Definition/Background

2.2.1 Marine Sediment Investigation

This QAPP and the attached SAP address the tasks necessary to delineate surface and subsurface sediment concentrations of the dioxins, PCBs, and PAHs in the marine sediments adjacent to the Jeld-Wen Site. The primary tasks addressed are the collection, processing, and analysis of surface and subsurface sediment samples as required by Ecology.

2.2.2 Maulsby Marsh Investigation

This QAPP and the attached SAP address the tasks necessary to delineate surface sediment concentrations of the TPH, PAHs, and metals in Maulsby Marsh proximate to the Jeld-Wen Site. The primary tasks addressed are the collection, processing, and analysis of surface sediment samples as required by Ecology. An evaluation of the salinity of Maulsby Marsh water is also included to determine whether fresh or marine sediment quality standards should be applied.

2.3 Project/Task Description and Schedule

Sampling activities described in these documents will be initiated following Ecology's approval of the QAPP and SAP.

2.4 Data Quality Objectives and Criteria

The DQO for this project is to ensure that the data collected are of known and acceptable quality so that the project objectives described in the SAP (Attachment 1) can be achieved. The quality of the laboratory data is assessed by precision, accuracy, representativeness, comparability, and completeness (the "PARCC" parameters). Definitions of these parameters and the applicable quality control (QC) procedures are presented below. Applicable quantitative goals for these data quality parameters are listed or referenced in Table 1.

2.4.1 Precision

Precision is the ability of an analytical method or instrument to reproduce its own measurement. It is a measure of the variability, or random error, in sampling, sample handling, and in laboratory analysis. The American Society of Testing and Materials (ASTM

2002) recognizes two levels of precision: repeatability—the random error associated with measurements made by a single test operator on identical aliquots of test material in a given laboratory, with the same apparatus, under constant operating conditions—and reproducibility—the random error associated with measurements made by different test operators, in different laboratories, using the same method but different equipment to analyze identical samples of test material.

In the laboratory, "within-batch" precision is measured using replicate sample or QC analyses and is expressed as the relative percent difference (RPD) between the measurements. The "batch-to-batch" precision is determined from the variance observed in the analysis of standard solutions or laboratory control samples from multiple analytical batches.

Field precision will be evaluated by the collection of blind field duplicates for chemistry samples at a frequency of one in 20 samples. Field chemistry duplicate precision will be screened against a RPD of 50 percent for sediment samples. However, no data will be qualified based solely on field homogenization duplicate precision.

Precision measurements can be affected by the nearness of a chemical concentration to the method detection limit (MDL), where the percent error (expressed as RPD) increases. The equation used to express precision is as follows:

$$\text{RPD} = \frac{(C_1 - C_2) \times 100\%}{(C_1 + C_2)/2}$$

Where:

RPD = relative percent difference

C_1 = larger of the two observed values

C_2 = smaller of the two observed values

2.4.2 Accuracy

Accuracy is a measure of the closeness of an individual measurement (or an average of multiple measurements) to the true or expected value. Accuracy is determined by calculating the mean value of results from ongoing analyses of laboratory-fortified blanks, standard reference materials, and standard solutions. In addition, laboratory-fortified (i.e., matrix-spiked) samples are also measured; this indicates the accuracy or bias in the actual sample matrix. Accuracy is expressed as percent recovery (%R) of the measured value, relative to the true or expected value. If a measurement process produces results for which the mean is not the true or expected value, the process is said to be biased. Bias is the systematic error either inherent in a method of analysis (e.g., extraction efficiencies) or caused by an artifact of the measurement system (e.g., contamination). Analytical laboratories utilize several QC measures to eliminate analytical bias, including systematic analysis of method blanks, laboratory control samples, and independent calibration verification standards. Because bias can be positive or negative, and because several types of bias can occur simultaneously, only the net, or total, bias can be evaluated in a measurement.

Laboratory accuracy will be evaluated against quantitative matrix spike and surrogate spike recovery performance criteria provided by the laboratory. Accuracy can be expressed as a percentage of the true or reference value, or as a %R in those analyses where reference materials are not available and spiked samples are analyzed. The equation used to express accuracy is as follows:

$$\%R = 100\% \times (S-U)/C_{sa}$$

Where:

$\%R$ = percent recovery

S = measured concentration in the spiked aliquot

U = measured concentration in the unspiked aliquot

C_{sa} = actual concentration of spike added

Field accuracy will be controlled by adherence to sample collection procedures outlined in the SAP (Attachment 1).

2.4.3 Bias

Bias is the systematic or persistent distortion of a measurement process that causes errors in one direction. Bias assessments for environmental measurements are made using personnel, equipment, and spiking materials or reference materials as independent as possible from those used in the calibration of the measurement system. When possible, bias assessments should be based on analysis of spiked samples, rather than reference materials, so that the effect of the matrix on recovery is incorporated into the assessment. A documented spiking protocol and consistency in following that protocol are important to obtaining meaningful data quality estimates.

2.4.4 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent an environmental condition. For the Jeld-Wen Site, the list of analytes has been identified to provide a comprehensive assessment of the potential contaminants in the nearshore zone marine sediments and in Maulsby Marsh sediments.

2.4.5 Comparability

Comparability expresses the confidence with which one data set can be evaluated in relation to another data set. For this program, comparability of data will be established through the use of standard analytical methodologies and reporting formats, and of common traceable calibration and reference materials.

2.4.6 Completeness

Completeness is a measure of the amount of data that is determined to be valid in proportion to the amount of data collected. Completeness will be calculated as follows:

$$C = \frac{\text{(Number of acceptable data points) x 100}}{\text{(Total number of data points)}}$$

The DQO for completeness for all components of this project is 95 percent. Data that have been qualified as estimated because the QC criteria were not met will be considered valid for the purpose of assessing completeness. Data that have been qualified as rejected will not be considered valid for the purpose of assessing completeness.

2.4.7 Sensitivity

Analytical sensitivities must be consistent with or lower than the regulated criteria values as listed in Tables 2 and 3 in order to demonstrate compliance with this QAPP. When they are achievable, target detection limits specified in this QAPP will be at least a factor of 2 less than the analyte's corresponding regulated criteria value.

The MDL is defined as the minimum concentration at which a given target analyte can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. Laboratory practical quantitation limits (PQLs) or reporting limits (RLs) are defined as the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. Laboratory MDLs and RLs will be used to evaluate the method sensitivity and/or applicability prior to the acceptance of a method for this program.

The sample-specific MDL and RL will be reported by the laboratory and will take into account any factors relating to the sample analysis that might decrease or increase the reporting limit (e.g., dilution factor, percent moisture, sample volume, and sparge volume). In the event that the MDL and RL are elevated for a sample due to matrix interferences and subsequent dilution or reduction in the sample aliquot, the data will be evaluated by Anchor QEA and the laboratory to determine if an alternative course of action is required or possible. If this situation cannot be resolved readily (i.e., detection limits less than criteria are achieved), Ecology will be contacted to discuss an acceptable resolution.

2.5 Special Training Requirements/Certifications

For sample preparation tasks, it is important that field crews are trained in standardized data collection requirements, so that the data collected are consistent among the field crew. All field crew are fully trained in the collection and processing of subsurface and surface sediment, decontamination protocols, visual inspections, and COC procedures.

In addition, the 29 CFR 1910.120 Occupational Safety and Health Administration (OSHA) regulations require training to provide employees with the knowledge and skills enabling them to perform their jobs safely and with minimum risk to their personal health. All sampling personnel will have completed the 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training course and 8-hour refresher courses, as necessary, to meet the OSHA regulations.

2.6 Documentation and Records

This project will require central project files to be maintained at Anchor QEA. Project records will be stored and maintained in a secure manner. Each project team member is responsible for filing all necessary project information or providing it to the person responsible for the filing system. Individual team members may maintain files for individual tasks, but must provide such files to the central project files upon completion of each task. A project-specific index of file contents is to be kept with the project files. Hard copy documents will be kept on file at Anchor QEA throughout the duration of the project, and all electronic data will be maintained in the database at Anchor QEA.

2.6.1 Field Records

All documents generated during the field effort are controlled documents that become part of the project file.

2.6.1.1 Field Logs

Field team members will keep a daily record of significant events, observations, and measurements in a field log. All field activities will be recorded in a bound, paginated field logbook maintained by the FC or his designee for each activity. Field logbooks will be the main source of field documentation for all field activities. The on-site field representative will record information pertinent to the investigation program in the field logbook. The sampling documentation will contain information on each sample collected including, at a minimum, the following information:

- Project name
- Field personnel on site
- Site visitors
- Weather conditions
- Field observations and any deviations from the SAP
- Maps and/or drawings

- Date and time sample collected
- Sampling method and description of activities
- Identification or serial numbers of instruments or equipment used
- Deviations from the QAPP and SAP
- Conferences associated with field sampling activities

Entries for each day will begin on a new page. The person recording information must enter the date and time and initial each entry. Additional specific field reporting requirements and checklists for each study are defined in the SAP. In general, sufficient information will be recorded during sampling so that reconstruction of the event can occur without relying on the memory of the field personnel.

The field logbooks will be permanently bound and durable for adverse field conditions. All pages will be numbered consecutively. All pages will remain intact, and no page will be removed for any reason. Notes will be taken in indelible, waterproof blue or black ink. Errors will be corrected by crossing out with a single line, dating, and initialing. The front and inside of each field logbook will be marked with the project name, number, and logbook number. The field logbooks will be stored in the project files when not in use and upon completion of each sampling event.

Sample collection checklists will be prepared prior to each sampling program. The checklist will include location designations, types of samples to be collected, and whether any QC samples are to be collected.

2.6.2 Analytical and Chemistry Records

Analytical data records will be retained by the laboratory and in the Anchor QEA central project files. For all analyses, the data reporting requirements will include those items necessary to complete data validation, including copies of all raw data. The analytical laboratory will be required, where applicable, to report the following:

- **Project Narrative.** This summary, in the form of a cover letter, will discuss problems, if any, encountered during any aspect of analysis. This summary should discuss, but not be limited to, QC, sample shipment, sample storage, and analytical difficulties.

Any problems encountered, actual or perceived, and their resolutions will be documented in as much detail as appropriate.

- **Chain-of-Custody (COC) Records.** Legible copies of the COC forms will be provided as part of the data package. This documentation will include the time of receipt and condition of each sample received by the laboratory. Additional internal tracking of sample custody by the laboratory will also be documented on a sample receipt form. The form must include all sample shipping container temperatures measured at the time of sample receipt.
- **Sample Results.** The data package will summarize the results for each sample analyzed. The summary will include the following information when applicable:
  - Field sample identification code and the corresponding laboratory identification code
  - Sample matrix
  - Date of sample extraction
  - Date and time of analysis
  - Weight and/or volume used for analysis
  - Final dilution volumes or concentration factor for the sample
  - Identification of the instrument used for analysis
  - MDLs
  - Method reporting limits accounting for sample-specific factors (e.g., dilution, total solids)
  - Analytical results with reporting units identified
  - Data qualifiers and their definitions
  - A computer disc with the data in a format specified in advance by Anchor QEA
- **QA/QC Summaries.** This section will contain the results of the laboratory QA/QC procedures. Each QA/QC sample analysis will be documented with the same information required for the sample results (see above). No recovery or blank corrections will be made by the laboratory. The required summaries are listed below; additional information may be requested.
- **Calibration Data Summary.** This summary will report the concentrations of the initial calibration and daily calibration standards, and the date and time of analysis. The response factor, percent relative standard deviation, percent difference, and

retention time for each analyte will be listed, as appropriate. Results for standards to indicate instrument sensitivity will be documented.

- **Internal Standard Area Summary.** The stability of internal standard areas will be reported.
- **Method Blank Analysis.** The method blank analyses associated with each sample and the concentration of all compounds of interest identified in these blanks will be reported.
- **Surrogate Spike Recovery.** This will include all surrogate spike recovery data for organic compounds. The name and concentration of all compounds added, %R, and range of recoveries will be listed.
- **Matrix Spike Recovery.** This will report all matrix spike recovery data for organic and metal compounds. The name and concentration of all compounds added, %R, and range of recoveries will be listed. The RPD for all duplicate analyses will be included.
- **Matrix Duplicate.** This will include the %R and associated RPD for all matrix duplicate analyses.
- **Laboratory Control Sample.** All laboratory control sample recovery data for organic and metal compounds will be reported. The names and concentrations of all compounds added, %R, and range of recoveries will be listed. The RPDs for all duplicate analyses will be included.
- **Relative Retention Time.** This will include a report of the relative retention time of each analyte detected in the samples for both primary and conformational analyses.
- **Original Data.** Legible copies of the original data generated by the laboratory will include:
    - Sample extraction, preparation, identification of extraction method used, and cleanup logs
    - Instrument specifications and analysis logs for all instruments used on days of calibration and analysis
    - Reconstructed ion chromatograms for all samples, standards, blanks, calibrations, spikes, replicates, and reference materials
    - Enhanced spectra of detected compounds with associated best-match spectra for each sample

- Printouts of full scan chromatograms and quantitation reports for each instrument used, including reports for all samples, standards, blanks, calibrations, spikes, replicates, and reference materials
- Original data quantification reports for each sample
- Original data for blanks and samples not reported

All instrument data shall be fully restorable at the laboratory from electronic backup. Laboratories will be required to maintain all records relevant to project analyses for a minimum of 7 years. Data validation reports will be maintained in the central project files with the analytical data reports.

2.6.3 Data Reduction

Data reduction is the process by which original data (analytical measurements) are converted or reduced to a specified format or unit to facilitate analysis of the data. Data reduction requires that all aspects of sample preparation that could affect the test result, such as sample volume analyzed or dilutions required, be taken into account in the final result. It is the laboratory analyst's responsibility to reduce the data, which are subjected to further review by the Laboratory Manager, the Project Manager, the QA/QC Manager, and independent reviewers. Data reduction may be performed manually or electronically. If performed electronically, all software used must be demonstrated to be true and free from unacceptable error.

2.6.4 Data Report

A *Sediment Evaluation Data Report* will be prepared and submitted to Ecology for review and approval. The data report will document the results of the sampling and analysis program and, at a minimum, will contain the following information:

- A statement of the purpose of the investigation.
- A summary of the field sampling, field data, and laboratory analytical procedures (reference will be made to the final SAP). Deviations, whether intended or unintended, will be documented. Failure to meet sampling objectives or DQOs of sufficient magnitude to lead to rejection of results will be well documented, as necessary.

- A general vicinity map showing the location of the Site with respect to familiar landmarks and a sampling station map. Coordinates will be reported in an accompanying table for all stations. All geographical coordinates submitted to Ecology for inclusion in the EIM database will be in the North American Datum (NAD) 83, State Plane, Washington North Zone.
- Chemical analysis results data tables summarizing chemical and conventional variables, as well as all pertinent QA/QC data.
- An interpretation of the results against the appropriate regulatory criteria. Any additional data gaps (and necessary sampling and analysis activities necessary to fill these data gaps) will be discussed.
- Copies of complete laboratory data packages, as appendices or attachments.
- Laboratory QA/QC reports, as appendices or attachments.
- Copies of applicable sections of the field log, as appendices or attachments.
- Copies of signed COC forms, as appendices or attachments.
- Copies of validation reports and/or findings.

Chemistry data will be presented with accompanying regulatory criteria. Data exceeding the regulatory criteria will be highlighted or boxed, rather than shaded, to allow for photocopying. EIM templates (in the appropriate format) will be submitted with the data report to Ecology's Sediment Management Unit via electronic email. Additional information may be required in the data reports and is described in detail in the SAP (Attachment 1).

3 OVERVIEW OF DATA GENERATION AND ACQUISITION

The rationale for the sampling design and design assumptions for locating and selecting environmental samples are detailed in the SAP (Attachment 1). The methods and procedures for collection of field samples are provided in the SAP.

All sampling will be conducted following standard procedures documented in the SAP. In general, all sampling procedures will comply with PSEP protocols or other approved sample collection standards established for the Site.

3.1 Analytical Methods

The methods of chemical analysis and associated laboratory sample handling requirements are identified in the SAP (Attachment 1).

In completing chemical analyses for this project, the laboratory is expected to meet the following minimum requirements:

- Adhere to the methods outlined in this QAPP, including methods referenced for each analytical procedure
- Provide a detailed discussion to any modifications made to approved analytical methods (e.g., Standard Operating Procedures [SOPs])
- Deliver fax, hard copy, and electronic data as specified
- Meet reporting requirements for deliverables
- Meet turnaround times for deliverables
- Implement QA/QC procedures, including the QAPP data quality requirements, laboratory QA requirements, and performance evaluation testing requirements
- Allow laboratory and data audits to be performed, if deemed necessary
- Comply with current EPA Region 10 *Guidance for Data Deliverables from Laboratories Utilizing SW846 methods 8081 and 8082 for the Analysis of Pesticides and PCB Aroclors* (EPA 2005)

This QAPP presents the analysis methods and the target reporting limits for the proposed sediment samples and field QA/QC samples (i.e., field replicates and rinsate blanks).

3.2 Quality Assurance and Quality Control

Field and laboratory activities must be conducted in such a manner that the results meet specified quality objectives and are fully defensible. Guidance for QA/QC is derived from the protocols developed for the PSEP (1997a, b, and c), EPA 1986, the EPA Contract Laboratory Program (EPA 1999, 2004), and the cited methods.

3.2.1 Field Quality Control

Anchor QEA personnel will identify and label samples in a consistent manner to ensure that field samples are traceable and that labels provide all information necessary for the laboratory to conduct required analyses properly. Samples will be placed in appropriate containers and preserved for shipment to the laboratory.

3.2.1.1 Sample Containers

Sample containers and preservatives will be provided by the laboratory. The laboratory will maintain documentation certifying the cleanliness of bottles and the purity of preservatives provided. Specific container requirements are included in Table 5.

3.2.1.2 Sample Identification and Labels

Each sample will have an adhesive plastic or waterproof paper label affixed to the container and will be labeled at the time of collection. The following information will be recorded on the container label at the time of collection:

- Project name
- Sample identification
- Date and time of sample collection
- Preservative type (if applicable)
- Analysis to be performed

Samples will be uniquely identified with a sample identification number that, at a minimum, specifies sample matrix, sample number, sample location and type of sample. Specific sample ID schemes are provided in the SAP (Attachment 1). Table 4 lists the station locations, sample identification, and the sample matrix summary for marine sediment and Maulsby Marsh samples.

3.2.1.3 Sample Custody and Shipping Requirements

Samples are considered to be in one's custody if they are: 1) in the custodian's possession or view; 2) in a secured location (under lock) with restricted access; or 3) in a container that is secured with an official seal(s) such that the sample cannot be reached without breaking the seal(s).

COC procedures will be followed for all samples throughout the collection, handling, and analysis process. The principal document used to track possession and transfer of samples is the COC form (Figure 2). Each sample will be represented on a COC form the day it is collected. All data entries will be made using indelible ink pen. Corrections will be made by drawing a single line through the error, writing in the correct information, then dating and initialing the change. Blank lines/spaces on the COC form will be lined-out, dated, and initialed by the individual maintaining custody.

A COC form will accompany each container of samples to the analytical laboratories. Each person who has custody of the samples will sign the COC form and ensure that the samples are not left unattended unless properly secured. Copies of all COC forms will be retained in the project files.

All samples will be shipped or hand delivered to the analytical laboratory no later than the day after collection. Samples collected on Friday may be held until the following Monday for shipment provided that this does not jeopardize any hold time requirements. Specific sample shipping procedures are as follows:

- Each cooler or container containing the samples for analysis will be shipped via overnight delivery to the appropriate analytical laboratory. In the event that Saturday delivery is required, the FC will contact the analytical laboratory before 3 p.m. on Friday to ensure that the laboratory is aware of the number of containers shipped and the airbill tracking numbers for those containers. Following each shipment, the FC will call the laboratory and verify the shipment from the day before has been received and is in good condition.

- Coolant ice will be sealed in separate double plastic bags and placed in the shipping containers.
- Individual sample containers will be placed in a sealable plastic bag, packed to prevent breakage, and transported in a sealed ice chest or other suitable container.
- Glass jars will be separated in the shipping container by shock absorbent material (e.g., bubble wrap) to prevent breakage.
- The shipping containers will be clearly labeled with sufficient information (name of project, time and date container was sealed, person sealing the container and consultant's office name and address) to enable positive identification.
- The shipping waybill number will be documented on all COC forms accompanying the samples.
- A sealed envelope containing COC forms will be enclosed in a plastic bag and taped to the inside lid of the cooler.
- A minimum of two signed and dated COC seals will be placed on adjacent sides of each cooler prior to shipping.
- Each cooler will be wrapped securely with strapping tape, labeled "Glass – Fragile" and "This End Up," and will be clearly labeled with the laboratory's shipping address and the consultant's return address.

Upon transfer of sample possession to the analytical laboratory, the persons transferring custody of the sample container will sign the COC form. Upon receipt of samples at the laboratory, the shipping container seal will be broken and the receiver will record the condition of the samples on a sample receipt form. COC forms will be used internally in the lab to track sample handling and final disposition.

3.2.1.4 Field Quality Assurance Sampling

Field QA procedures will consist of following acceptable practices for collecting and handling of samples. Adherence to these procedures will be complemented by periodic and routine equipment inspection.

Field QA samples will be collected along with the environmental samples. Field QA samples are useful in identifying possible problems resulting from sample collection or sample processing in the field. The collection of field QA samples is described in detail in the SAP (Attachment 1), and includes equipment rinsates, rinsate blanks, and homogenization duplicates. Field QA samples consisting of an equipment rinsate, rinsate blank, and homogenization duplicates will be collected at a frequency of one in 20 samples processed.

Field QA samples will also include the collection of additional sample volume, to ensure that the laboratory has sufficient sample volume to run the program-required analytical QA/QC samples for analysis as specified in Table 6. Additional sample volume to meet this requirement will be collected at a frequency of one in 20 samples processed.

All field QA samples will be documented in the field logbook and verified by the QA/QC Manager or designee.

3.2.2 Laboratory Quality Control

Laboratory QC procedures, where applicable, include initial and continuing instrument calibrations, standard reference materials, laboratory control samples, matrix replicates, matrix spikes, surrogate spikes (for organic analyses), and method blanks. Table 6 lists the frequency of analysis for laboratory QA/QC samples, and Table 1 summarizes the DQOs for precision, accuracy, and completeness.

Results of the QC samples from each sample group will be reviewed by the analyst immediately after a sample group has been analyzed. The QC sample results will then be evaluated to determine if control limits have been exceeded. If control limits are exceeded in the sample group, the QA/QC Manager will be contacted immediately, and corrective action (e.g., method modifications followed by reprocessing the affected samples) will be initiated prior to processing a subsequent group of samples.

3.2.2.1 Laboratory Instrument Calibration and Frequency

An initial calibration will be performed on each laboratory instrument to be used at the start of the project, after each major interruption to the analytical instrument, and when any ongoing calibration does not meet method control criteria. A calibration verification will be analyzed following each initial calibration and will meet method criteria prior to analysis of samples. Continuing calibrations will be performed daily prior to any sample analysis to track instrument performance. The frequency of continuing calibration will be one blank for every 10 samples analyzed, or daily, whichever is more frequent. If the ongoing continuing calibration is out of control, the analysis must come to a halt until the source of the control failure is eliminated or reduced to meet control specifications. All project samples analyzed while instrument calibration was out of control will be reanalyzed.

Instrument blanks or continuing calibration blanks provide information on the stability of the baseline established. Continuing calibration blanks will be analyzed immediately prior to continuing calibration verification at the instrument for each type of applicable analysis.

3.2.2.2 Laboratory Duplicates/Replicates

Analytical duplicates provide information on the precision of the analysis and are useful in assessing potential sample heterogeneity and matrix effects. Analytical duplicates and replicates are subsamples of the original sample that are prepared and analyzed as a separate sample.

3.2.2.3 Matrix Spikes and Matrix Spike Duplicates

Analysis of matrix spike samples provides information on the extraction efficiency of the method on the sample matrix. By performing duplicate matrix spike analyses, information on the precision of the method is also provided for organic analyses.

3.2.2.4 Method Blanks

Method blanks are analyzed to assess possible laboratory contamination at all stages of sample preparation and analysis. The method blank for all analyses must contain less than five times the method detection limit of any single target analyte/compound. If a laboratory method blank exceeds this criterion for any analyte/compound, and the concentration of the analyte/compound in any of the samples is less than five times the concentration found in the blank, analyses must stop and the source of contamination must be eliminated or reduced.

3.2.2.5 Laboratory Control Samples

Laboratory control samples are analyzed to assess possible laboratory bias at all stages of sample preparation and analysis. The laboratory control sample is a matrix-dependent spiked sample prepared at the time of sample extraction along with the preparation of sample and matrix spikes. The laboratory control sample will provide information on the precision of the analytical process, and when analyzed in duplicate, will provide accuracy information as well.

3.2.2.6 Laboratory Deliverables

Data packages will be checked for completeness immediately upon receipt from the laboratory to ensure that data and QA/QC information requested are present. Data quality will be assessed based on PSEP (1997b) protocols by considering the following:

- Holding times
- All compounds of interest reported
- Reporting limits
- Surrogate spike results
- Matrix spike/matrix spike duplicate results
- Blank spikes
- Laboratory control samples/laboratory control sample duplicates
- Standard reference material results
- Method blanks
- Detection limits

3.3 Instrument/Equipment Testing, Inspection, and Maintenance Requirements

This section describes procedures for testing, inspection, and maintenance of field and laboratory equipment.

3.3.1 Field Instruments/Equipment

Field QC procedures will consist of following standard instrument operation procedures and using consistent, acceptable practices for collecting salinity measurements. Adherence to these procedures will be complemented by periodic and routine equipment inspection and calibration.

3.3.2 Field Instrument/Equipment Calibration

The water quality meter used for salinity measurements will be calibrated prior to use. Ongoing calibration checks will be made periodically throughout the day as deemed necessary by the lead field sampler based on equipment observations and any potentially anomalous readings. If the meter registers outside user manual-specified accuracy upon calibration check, the instrument will be recalibrated prior to continuing with the monitoring event. Calibration information will be recorded on the field data forms. Monitoring equipment will be handled according to manufacturer's recommendations. Unusual or questionable readings will be noted and duplicate readings made.

The subcontractor responsible for navigation will confirm proper operation of the navigation equipment daily. This verification may consist of internal diagnostics or visiting a location with known coordinates to confirm the coordinates indicated by the navigation system. No other field equipment requires testing or calibration. The winch line and sampling equipment will be inspected daily for fraying, misalignment of jaws, loose connections, and any other applicable mechanical problems. Any problems will be noted in the field logbook and corrected prior to continuing sampling operations.

3.3.3 Laboratory Instruments/Equipment

In accordance with the QA program, the laboratory shall maintain an inventory of instruments and equipment and the frequency of maintenance will be based on the manufacturer's recommendations and/or previous experience with the equipment.

The laboratory preventative maintenance program, as detailed in their QA Plan, is organized to maintain proper instrument and equipment performance, and to prevent instrument and equipment failure during use. The program considers instrumentation, equipment, and parts that are subject to wear, deterioration, or other changes in operational characteristics, the availability of spare parts, and the frequency at which maintenance is required. Any equipment that has been overloaded, mishandled, gives suspect results, or has been determined to be defective will be taken out of service, tagged with the discrepancy noted, and stored in a designated area until the equipment has been repaired. After repair, the equipment will be tested to ensure that it is in proper operational condition. The client will be promptly notified in writing if defective equipment casts doubt on the validity of analytical data. The client will also be notified immediately regarding any delays due to instrument malfunctions that could impact holding times.

The analytical laboratory will be responsible for the preparation, documentation, and implementation of the preventative maintenance program. All maintenance records will be checked according to the schedule on an annual basis and recorded by the responsible individual. The Laboratory QA/QC Manager, or designee, shall be responsible for verifying compliance.

3.3.4 Laboratory Instrument/Equipment Calibration

Proper calibration of equipment and instrumentation is an integral part of the process that provides quality data. Instrumentation and equipment used to generate data must be calibrated at a frequency that ensures sufficient and consistent accuracy and reproducibility. As part of their QC program, laboratories perform two types of calibrations. A periodic calibration is performed at prescribed intervals (i.e., balances, drying ovens, refrigerators and thermometers), and operational calibrations are performed daily, at a specified frequency, or prior to analysis (i.e., initial calibrations) according to method requirements. Calibration procedures and frequency are discussed in the laboratory QA Plan. Calibrations are discussed in the laboratory SOPs for analyses.

The Laboratory QA/QC Manager will be responsible for ensuring that the laboratory instrumentation is calibrated in accordance with specifications. Implementation of the calibration program shall be the responsibility of the respective laboratory Group Supervisors. Recognized procedures (EPA, ASTM, or manufacturer's instructions) shall be used when available.

Physical standards (i.e., weights or certified thermometers) shall be traceable to nationally recognized standards such as the National Institute of Standards and Technology (NIST).

Chemical reference standards shall be NIST Standard Reference Materials (SRMs) or vendor-certified materials traceable to these standards.

The calibration requirements for each method and respective corrective actions shall be accessible, either in the laboratory SOPs or the laboratory's QA Plan for each instrument or analytical method in use. All calibrations shall be preserved on electronic media.

3.4 Inspection/Acceptance Requirements for Supplies and Consumables

Inspection and acceptance of field supplies, including laboratory-prepared sampling bottles, will be performed by the FC. All primary chemical standards and standard solutions used in this project either in the field or laboratory will be traceable to documented, reliable, commercial sources. Standards will be validated to determine their accuracy by comparison with an independent standard. Any impurities found in the standard will be documented.

3.5 Data Management

Field data sheets will be checked for completeness and accuracy by the FC prior to delivery to the Data Manager. All data generated in the field will be documented on hard copy and provided to the office Data Manager, who is responsible for the data's entry into the database. All manually entered data will be checked by a second party. Field documentation will be filed in the main project file after data entry and checking are complete.

Laboratory data will be provided to the Data Manager in the EQuIS electronic format. The laboratory data that are provided electronically and loaded into the database will undergo a 10 percent check against the laboratory hard copy data. Data will be validated or reviewed manually, and qualifiers, if assigned, will be entered manually. The accuracy of all manually entered data will be verified by a second party. Data tables and reports will be exported from EQuIS to MS Excel tables.

4 ASSESSMENTS AND RESPONSE ACTIONS

Once data are received from the laboratory, a number of QC procedures will be followed to provide an accurate evaluation of the data quality. Specific procedures will be followed to assess data precision, accuracy, and completeness.

A full data quality review will be performed by LDC, in accordance with *EPA National Functional Guidelines* (EPA 1999, 2004). The data will be evaluated in accordance with this QAPP. All chemical data will be reviewed with regard to the following, as appropriate to the particular analysis:

- COC documentation
- Holding times
- Instrument calibration
- Method blanks
- Detection limits
- Reporting limits
- Surrogate recoveries
- Matrix spike/matrix spike duplicate recoveries
- Laboratory control sample recoveries
- Laboratory and field duplicate RPDs

The results of the data quality review, including text assigning qualifiers in accordance with the *EPA National Functional Guidelines* and a tabular summary of qualifiers, will be generated by the Data Manager and submitted to the project QA/QC Manager for final review and confirmation of the validity of the data (EPA 1999, 2004). A copy of the LDC validation report will be submitted by the QA/QC Manager and will be presented as an appendix to the *Sediment Data Evaluation Report*.

4.1 Compliance Assessments

Laboratory and field performance audits consist of on-site reviews of QA systems and equipment for sampling, calibration, and measurement. Laboratory audits will not be conducted as part of this study; however, all laboratory audit reports will be made available to the project QA/QC Manager upon request. The laboratory is required to have written procedures addressing internal QA/QC; these procedures have been submitted and will be reviewed by the project QA/QC Manager to ensure compliance with the QAPP. The laboratory must ensure that personnel engaged in sampling and analysis tasks have appropriate training. The laboratory will, as part of the audit process, provide for consultant's review written details of any and all method modifications planned.

4.2 Response and Corrective Actions

The following paragraphs identify the responsibilities of key project team members and actions to be taken in the event of an error, problem, or nonconformance to protocols identified in this document.

4.2.1 Field Activities

The FC will be responsible for correcting equipment malfunctions during the field sampling effort. The project QA/QC Manager will be responsible for resolving situations identified by the FC that may result in noncompliance with this QAPP. All corrective measures will be immediately documented in the field logbook.

4.2.2 Laboratory

The laboratory is required to comply with their SOPs. The Laboratory Manager will be responsible for ensuring that appropriate corrective actions are initiated as required for conformance with this QAPP. All laboratory personnel will be responsible for reporting problems that may compromise the quality of the data.

The Laboratory Manager will be notified immediately if any QC sample exceeds the project-specified control limits. The analyst will identify and correct the anomaly before continuing with the sample analysis. The Laboratory Manager will document the corrective action taken in a memorandum submitted to the QA/QC Manager within 5 days of the initial notification. A narrative describing the anomaly, the steps taken to identify and correct the anomaly, and the treatment of the relevant sample batch (i.e., recalculation, reanalysis, and re-extraction) will be submitted with the data package in the form of a cover letter.

4.3 Reports to Management

Quality assurance reports to management include verbal status reports, and data validation reports. These reports shall be the responsibility of the QA/QC Manager.

A final project report will be prepared by the FC after validated data are available for each sampling event. These reports will be delivered electronically to the Anchor QEA Project Manager.

5 DATA VALIDATION AND USABILITY

This section describes the processes that will be used to review project data quality.

5.1 Data Review, Validation, and Verification

During the validation process, analytical data will be evaluated for method and laboratory QC compliance, and their validity and applicability for program purposes will be determined. Based on the findings of the validation process, data validation qualifiers may be assigned. The validated project data, including qualifiers will be entered into the project database, thus enabling this information to be retained or retrieved, as needed.

5.2 Validation and Verification Methods

Data validation includes signed entries by the field and laboratory technicians on field data sheets and laboratory datasheets, respectively; review for completeness and accuracy by the FC and Laboratory Manager; review by the Data Manager for outliers and omissions; and the use of QC criteria to accept or reject specific data. All data will be entered into the EQuIS database and a raw data file will be printed. One hundred percent verification of the database raw data file will be performed by a second data manager or designee. Any errors found will be corrected on the raw data printout sheet. After the raw data is checked, the top sheet will be marked with the date the checking is completed and the initials of the person doing the checking. Any errors in the raw data file will be corrected, and the database will be established.

All laboratory data will be reviewed and verified to determine whether all DQOs have been met, and that appropriate corrective actions have been taken, when necessary. The project QA/QC Manager or designee will be responsible for the final review of all data generated from analyses of samples.

The first level of review will take place in the laboratory as the data are generated. The laboratory department manager or designee will be responsible for ensuring that the data generated meet minimum QA/QC requirements and that the instruments were operating under acceptable conditions during generation of data. DQOs will also be assessed at this point by comparing the results of QC measurements with pre-established criteria as a measure of data acceptability.

The analysts and/or laboratory department manager will prepare a preliminary QC checklist for each parameter and for each sample delivery group (SDG) as soon as analysis of an SDG has been completed. Any deviations from the DQOs listed on the checklist will be brought to the attention of the Laboratory Manager to determine whether corrective action is needed and to determine the impact on the reporting schedule.

Data packages will be checked for completeness immediately upon receipt from the laboratory to ensure that data and QA/QC information requested are present. Data quality will be assessed by a reviewer using current Functional Guidelines data validation requirements (EPA 1999, 2004) by considering the following:

1. Holding times
2. Initial calibrations
3. Continuing calibrations
4. Method blanks
5. Surrogate recoveries
6. Detection limits
7. Reporting limits
8. Laboratory control samples
9. Matrix spike/matrix spike duplicate samples
10. Standard reference material results

The data will be validated in accordance with the project specific DQOs described above, analytical method criteria, and the laboratory's internal performance standards based on their SOPs.

5.3 Reconciliation with User Requirements

The QA/QC Manager will review data after each survey to determine if DQOs have been met. If data do not meet the project's specifications, the QA/QC Manager will review the errors and determine if the problem is due to calibration/maintenance, sampling techniques, or other factors, and will suggest corrective action. It is expected that any problem would be able to be corrected by retraining, revision of techniques, or replacement of supplies/equipment; if not, the DQOs will be reviewed for feasibility. If specific DQOs are not achievable, the QA/QC Manager will recommend appropriate modifications. Any revisions will require approval by Ecology.

6 REFERENCES

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TABLES

Table 1
Data Quality Objectives

Parameter	Precision	Accuracy[1]	Completeness
Grain size	± 20% RPD	NA	95%
Total solids	± 20% RPD	NA	95%
Ammonia	± 20% RPD	75-125% R	95%
Total sulfides	± 20% RPD	75-125% R	95%
Total organic carbon	± 20% RPD	65-135% R	95%
Metals	± 30% RPD	75-125% R	95%
Polycyclic Aromatic Hydrocarbons (PAHs)	±35 % RPD	50-150% R	95%
Polychlorinated biphenyls (PCBs)	±35 % RPD	50-150% R	95%
Dioxins/Furans	±35 % RPD	50-150% R	95%
Total petroleum hydrocarbons	±35 % RPD	50-150% R	95%
Extractable petroleum hydrocarbons	±35 % RPD	50-150% R	95%

Notes:

RPD = Relative percent difference
R = Recovery
MS/MSD = matrix spike/matrix spike duplicate
LCS = Laboratry Control Sample
NA = Not Applicable

[1] Applies to LCS and MS/MSD %R

Table 2
Parameters for Analysis, Evaluation Criteria, Methods, and Practical Quantitation Limits—Marine Sediments

Parameter	Unit	Sediment Quality Standards	Cleanup Screening Levels	Analytical Method	Practical Quantitation Limit
Conventional Parameters					
Grain size	%	---	---	Plumb 1981	1
Ammonia	%	---	---	Plumb 1981	0.1
Total sulfides	%	---	---	Plumb 1981	0.1
Total solids	%	---	---	PSEP	0.1
Total organic carbon	%	---	---	9060	0.1
Aromatic Hydrocarbons[a]					
Total LPAH[b]	mg/kg OC	370	780	8270C	
Naphthalene	mg/kg OC	99	170	8270C	20 µg/kg
Acenaphthylene	mg/kg OC	66	66	8270C	20 µg/kg
Acenaphthene	mg/kg OC	16	57	8270C	20 µg/kg
Fluorene	mg/kg OC	23	79	8270C	20 µg/kg
Phenanthrene	mg/kg OC	100	480	8270C	20 µg/kg
Anthracene	mg/kg OC	220	1,200	8270C	20 µg/kg
2-Methylnaphthalene	mg/kg OC	38	64	8270C	20 µg/kg
Total HPAH[c]	mg/kg OC	960	5,300	8270C	
Fluoranthene	mg/kg OC	160	1,200	8270C	20 µg/kg
Pyrene	mg/kg OC	1,000	1,400	8270C	20 µg/kg
Benz[a]anthracene	mg/kg OC	110	270	8270C	20 µg/kg
Chrysene	mg/kg OC	110	460	8270C	20 µg/kg
Total benzofluoranthenes[d]	mg/kg OC	230	450	8270C	40 µg/kg
Benzo[a]pyrene	mg/kg OC	99	210	8270C	20 µg/kg
indeno[1,2,3-c,d]pyrene	mg/kg OC	34	88	8270C	20 µg/kg
Dibenz[a,h]anthracene	mg/kg OC	12	33	8270C	20 µg/kg
Benzo[g,h,i]perylene	mg/kg OC	31	78	8270C	20 µg/kg

Table 2
Parameters for Analysis, Evaluation Criteria, Methods, and Practical Quantitation Limits—Marine Sediments

Parameter	Unit	Sediment Quality Standards	Cleanup Screening Levels	Analytical Method	Practical Quantitation Limit
Dioxin/Furan					
Dioxins					
2,3,7,8-TCDD	ng/kg dry wt	-	-	1613B	1.0
1,2,3,7,8-PeCDD	ng/kg dry wt	-	-	1613B	5.0
1,2,3,4,7,8-HxCDD	ng/kg dry wt	-	-	1613B	5.0
1,2,3,6,7,8-HxCDD	ng/kg dry wt	-	-	1613B	5.0
1,2,3,7,8,9-HxCDD	ng/kg dry wt	-	-	1613B	5.0
1,2,3,4,6,7,8-HpCDD	ng/kg dry wt	-	-	1613B	5.0
OCDD	ng/kg dry wt	-	-	1613B	10
Furans					
2,3,7,8-TCDF	ng/kg dry wt	-	-	1613B	1.0
1,2,3,7,8-PeCDF	ng/kg dry wt	-	-	1613B	5.0
2,3,4,7,8,-PeCDF	ng/kg dry wt	-	-	1613B	5.0
1,2,3,4,7,8-HxCDF	ng/kg dry wt	-	-	1613B	5.0
1,2,3,6,7,8-HxCDF	ng/kg dry wt	-	-	1613B	5.0
1,2,3,7,8,9-HxCDF	ng/kg dry wt	-	-	1613B	5.0
2,3,4,6,7,8-HxCDF	ng/kg dry wt	-	-	1613B	5.0
1,2,3,4,6,7,8-HpCDF	ng/kg dry wt	-	-	1613B	5.0
1,2,3,4,7,8,9-HpCDF	ng/kg dry wt	-	-	1613B	5.0
OCDF	ng/kg dry wt	-	-	1613B	10
Polychlorinated Biphenyls (PCBs)[a]					
Aroclor 1016	mg/kg OC	-	-	8082	10 µg/kg
Aroclor 1221	mg/kg OC	-	-	8082	10 µg/kg
Aroclor 1232	mg/kg OC	-	-	8082	10 µg/kg
Aroclor 1242	mg/kg OC	-	-	8082	10 µg/kg
Aroclor 1248	mg/kg OC	-	-	8082	10 µg/kg
Aroclor 1254	mg/kg OC	-	-	8082	10 µg/kg
Aroclor 1260	mg/kg OC	-	-	8082	10 µg/kg
Aroclor 1262	mg/kg OC	-	-	8082	10 µg/kg

Table 2
Parameters for Analysis, Evaluation Criteria, Methods, and Practical Quantitation Limits—Marine Sediments

Parameter	Unit	Sediment Quality Standards	Cleanup Screening Levels	Analytical Method	Practical Quantitation Limit
Aroclor 1268	mg/kg OC	-	-	8082	10 µg/kg
Total PCBs	mg/kg OC	12	65	8082	10 µg/kg

Notes:

a Concentrations are in ppm normalized on a total organic carbon basis.

b Total LPAH criterion under the SMS represents the sum of the concentrations of the following LPAH compounds: naphthalene, acenaphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene

c Total HPAH criterion under the SMS represents the sum of the concentrations of the following HPAH compounds: fluoranthene, pyrene, benz[a]anthracene, chrysene, total benzofluranthenes, benzo[a]pyrene, indeno[1,2,3-c,d]pyrene, dibenzo[a,h]anthracene, and benzo[g,h,i]perylene.

d The total benzofluoranthenes criterion represents the sum of the concentrations of the b, j, and k isomers of benzofluoranthene.

mg/kg OC = milligrams per kilogram, organic carbon-normalized
µg/kg dry wt = micrograms per kilogram, dry weight basis
ng/kg dry wt = nanograms per kilogram, dry weight basis
PSEP = Puget Sound Estuary Program

Table 3
Parameters for Analysis, Evaluation Criteria, Methods, and Practical Quantitation Limits—Maulsby Marsh Surface Sediments

Parameter	Unit	Freshwater Screening Level[a]	Freshwater Screening SL1 Level[b]	Freshwater Screening SL2 Level[c]	Recommended Analytical Method	Practical Quantitation Limit
Conventional Parameters						
Grain Size	%	-	-	-	Plumb 1981	1
Ammonia	µg/kg dry weight	230	230	300	Plumb 1981	76.7
Total Sulfides	µg/kg dry weight	39	39	61	Plumb 1981/9030B	13
Total Solids	%	-			PSEP	0.1
Total Organic Carbon (TOC)	%	9.82			9060	0.1
Metals						
Antimony	mg/kg dry weight	0.3	0.3	1.2	6010B/6020	0.1
Arsenic	mg/kg dry weight	14	14	120	6010B/6020	4.67
Cadmium	mg/kg dry weight	0.6	2.1	5.4	6010B/6020	0.2
Chromium	mg/kg dry weight	72	72	82	6010B/6020	24
Copper	mg/kg dry weight	80	400	1200	6010B/6020	26.7
Lead	mg/kg dry weight	336	360	>1300	6010B/6020	111.7
Mercury	mg/kg dry weight	0.5	0.66	0.8	7471	0.14
Nickel	mg/kg dry weight	26	26	110	6010B/6020	8.67
Silver	mg/kg dry weight	0.545	0.58	1.7	6010B/6020	0.18
Zinc	mg/kg dry weight	140	3200	>4200	6010B/6020	46.7
Aromatic Hydrocarbons						
Naphthalene	µg/kg dry weight	500			8270C	166.7
Acenaphthylene	µg/kg dry weight	470			8270C	156.7
Acenaphthene	µg/kg dry weight	1,060			8270C	167
Fluorene	µg/kg dry weight	1,000			8270C	180
Retene	µg/kg dry weight	6,020			8270C	2006.7
Phenanthrene	µg/kg dry weight	6,100			8270C	500
Anthracene	µg/kg dry weight	1,200			8270C	320
2-Methylnaphthalene	µg/kg dry weight	469			8270C	156.3
Total LPAH	µg/kg dry weight	6,590			--	--
Fluoranthene	µg/kg dry weight	11,000			8270C	567
Pyrene	µg/kg dry weight	8,790			8270C	867
Benz[a] anthracene	µg/kg dry weight	4,260			8270C	433

Table 3
Parameters for Analysis, Evaluation Criteria, Methods, and Practical Quantitation Limits—Maulsby Marsh Surface Sediments

Parameter	Unit	Freshwater Screening Level[a]	Freshwater Screening SL1 Level[b]	Freshwater Screening SL2 Level[c]	Recommended Analytical Method	Practical Quantitation Limit
Chrysene	µg/kg dry weight	5,940			8270C	467
Total benzofluoranthenes	µg/kg dry weight	11,000			8270C	1067
Benzo[a]pyrene	µg/kg dry weight	3,300			8270C	533
indeno[1,2,3-c,d]pyrene	µg/kg dry weight	4,120			8270C	200
Dibenzo[a,h]anthracene	µg/kg dry weight	800			8270C	77
Benzo[g,h,i]perylene	µg/kg dry weight	4,020			8270C	223
Total HPAH	µg/kg dry weight	31,000			8270C	--
Total PAH	µg/kg dry weight	--	17,000	30,000	8270C	--
Total Petroleum Hydrocarbons						
Diesel Range TPH (total)	µg/kg dry weight	340	340	510	NWTPH-Dx	113
Motor Oil Range TPH (total)	µg/kg dry weight	3,600	3,600	8,400	NWTPH-Dx	1200
Diesel Motor Oil Range TPH (ind. ranges)	µg/kg dry weight	-			EPH	5000

Notes:

a = Freshwater screening criteria provided by Ecology in Comments to Phase I RI

b = Freshwater screening criteria from Avocet 2010; SL1 is equivalent to the SQS

c = Freshwater screening criteria from Avocet 2010; SL2 is equivalent to the CSL

µg/kg = micrograms per kilogram

mg/kg = milligrams per kilogram

Table 4
Container Size, Holding Time, and Preservation for Physical/Chemical Analyses

Parameter	Sample Size	Container Size and Type	Holding Time	Preservative
Polychlorinated biphenyls (PCBs)	150 g	16-oz Glass	14 days until extraction	Cool/4^{o} C
			1 year until extraction	Freeze -20°C
			40 days after extraction	Cool/4^{o} C
Organochlorine pesticides	150 g	From PCB container	14 days until extraction	Cool/4^{o} C
			1 year until extraction	Freeze -20°C
			40 days after extraction	Cool/4^{o} C
Dioxins/Furans	150 g	From PCB container	1 year to extraction	Freeze -20°C
			40 days after extraction	Cool/4^{o} C
Semivolatile organic compounds (SVOCs)	150 g	16-oz Glass	14 days until extraction	Cool/4^{o} C
			1 year until extraction	Freeze -20°C
			40 days after extraction	Cool/4^{o} C
Total Petroleum Hydrocarbons	150 g	From SVOC container	14 days until extraction	Cool/4^{o} C
			1 year until extraction	Freeze -20°C
			40 days after extraction	Cool/4^{o} C
Metals (except mercury)	10 g	4-oz glass	6 months	Cool/4^{o} C
			2 years	Freeze -20°C
Mercury	10 g	From metals container	28 days	Cool/4°C/freeze -20°C
Total solids (TS)	25 g	8-oz Glass	14 days	Cool/4^{o} C
			6 months	Freeze -20°C
Total Sulfides	50 g	2-oz glass	7 days	Cool/4^{o} C/ZnOAC
Ammonia	50 g	From TS container	7 days	Cool/4^{o} C
Total organic carbon	20 g	From TS container	14 days	Cool/4^{o} C
			6 months	Freeze -20°C
Grain size	500 g	16-oz Plastic	6 months	Cool/4^{o} C

Table 5
Station Locations and Sample Matrix Summary for Maulsby Marsh Sediments and Marine Sediment Samples

	Station Coordinates (Washington SP NAD 83 North Zone)		Parameter	PCBs	Dioxin/Furan	PAH	Archive	Metals	SVOCs	TPH	EPH Archive	Grain Size	TS, TOC	Ammonia	Total Sulfides
			Container	8-oz WM-G	8-oz WM-G	8-oz WM-G		8-oz WM-G	8-oz WM-G	8-oz WM-G	8-oz WM-G	16-oz Plastic	8-oz WM-G	4-oz WM-G	4-oz WM-G
			Preservative	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	ZnAc
Station ID	Northing (ft)	Easting (ft)	Laboratory Sample ID[a]												
Maulsby Marsh Surface Sediments															
MM001	373077.56	1303979.67	MM001-SS-YYMMDD	X				X	X	X	X	X	X	X	X
MM002	372978.11	1303931.35	MM002-SS-YYMMDD	X				X	X	X	X	X	X	X	X
MM003	372894.59	1303875.23	MM003-SS-YYMMDD	X				X	X	X	X	X	X	X	X
MM004	372775.78	1303796.66	MM004-SS-YYMMDD	X				X	X	X	X	X	X	X	X
MM005	372647.60	1303699.82	MM005-SS-YYMMDD	X				X	X	X	X	X	X	X	X
MM006	372548.97	1303630.14	MM006-SS-YYMMDD	X				X	X	X	X	X	X	X	X
MM007	372467.30	1303563.41	MM007-SS-YYMMDD	X				X	X	X	X	X	X	X	X
MM008	372385.61	1303502.08	MM008-SS-YYMMDD	X				X	X	X	X	X	X	X	X
MM009	372309.63	1303436.06	MM009-SS-YYMMDD	X				X	X	X	X	X	X	X	X
MM010	372354.63	1303529.92	MM010-SS-YYMMDD	X			X				X				X
MM011	372541.05	1303675.10	MM011-SS-YYMMDD	X			X				X				X
MM012	372696.53	1303809.03	MM012-SS-YYMMDD	X			X				X				X
MM013	372813.93	1303884.24	MM013-SS-YYMMDD	X			X				X				X
MM014	373006.50	1304013.12	MM014-SS-YYMMDD	X			X				X				X
MM015	372896.00	1303996.54	MM015-SS-YYMMDD	X			X				X				X
MM016	372732.84	1303887.00	MM016-SS-YYMMDD	X			X				X				X
MM017	372581.45	1303782.63	MM017-SS-YYMMDD	X			X				X				X
MM018	372428.01	1303640.71	MM018-SS-YYMMDD	X			X				X				X
Field Homogenization Duplicate			MMXXX(+100)-SS-YYMMDD	X				X	X	X	X	X	X	X	X
Rinsate Blank			MM-SSRB-YYMMDD	X				X	X	X					
Deionized Water Blank			MM-SSFB-YYMMDD	X				X	X	X					
Marine Surface Sediment Samples															
JW001	372450.96	1302986.03	JW001-SS-YYMMDD	X		X						X	X	X	X
JW002	372374.43	1302904.40	JW002-SS-YYMMDD	X		X						X	X	X	X
JW003	372464.41	1302896.83	JW003-SS-YYMMDD	X		X						X	X	X	X
JW004	372543.46	1302975.09	JW004-SS-YYMMDD				X					X	X	X	X
JW005	372561.12	1302885.05	JW005-SS-YYMMDD				X					X	X	X	X
JW006	372360.98	1302790.81	JW006-SS-YYMMDD				X					X	X	X	X
JW007	372461.05	1302787.44	JW007-SS-YYMMDD				X					X	X	X	X
JW008	372564.48	1302788.28	JW008-SS-YYMMDD				X					X	X	X	X
JW009	372956.56	1302578.58	JW009-SS-YYMMDD				X					X	X	X	X
JW010	373065.64	1302578.58	JW010-SS-YYMMDD				X					X	X	X	X
JW011	373164.05	1302582.14	JW011-SS-YYMMDD				X					X	X	X	X
JW012	373152.91	1302681.83	JW012-SS-YYMMDD				X					X	X	X	X
JW013	373073.69	1302750.03	JW013-SS-YYMMDD		X	X						X	X	X	X
JW014	373056.79	1302680.66	JW014-SS-YYMMDD		X	X						X	X	X	X
JW015	372971.16	1302681.25	JW015-SS-YYMMDD		X	X						X	X	X	X
JW016	373974.89	1302992.83	JW016-SS-YYMMDD				X					X	X	X	X
JW017	373972.59	1303090.77	JW017-SS-YYMMDD				X					X	X	X	X
JW018	373872.41	1303091.34	JW018-SS-YYMMDD				X					X	X	X	X
JW019	373870.69	1303190.43	JW019-SS-YYMMDD				X					X	X	X	X
JW020	373771.08	1303291.25	JW020-SS-YYMMDD				X					X	X	X	X
JW021	373772.24	1303191.58	JW021-SS-YYMMDD		X	X						X	X	X	X
JW022	373661.70	1303288.94	JW022-SS-YYMMDD		X	X						X	X	X	X
JW023	373556.80	1303367.81	JW023-SS-YYMMDD		X	X						X	X	X	X

Table 5
Station Locations and Sample Matrix Summary for Maulsby Marsh Sediments and Marine Sediment Samples

	Station Coordinates (Washington SP NAD 83 North Zone)		Parameter	PCBs	Dioxin/Furan	PAH	Archive	Metals	SVOCs	TPH	EPH Archive	Grain Size	TS, TOC	Ammonia	Total Sulfides
			Container	8-oz WM-G	8-oz WM-G	8-oz WM-G		8-oz WM-G	8-oz WM-G	8-oz WM-G	8-oz WM-G	16-oz Plastic	8-oz WM-G	4-oz WM-G	4-oz WM-G
			Preservative	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	ZnAc
Station ID	**Northing (ft)**	**Easting (ft)**	**Laboratory Sample ID[a]**												
JW024	373460.52	1303459.80	JW024-SS-YYMMDD		X	X						X	X	X	X
Field Homogenization Duplicate			JWXXX(+100)-SS-YYMMDD	X	X	X						X	X	X	X
Rinsate Blank			JW-SSRB-YYMMDD	X	X	X									
Deionized Water Blank			JW-SSFB-YYMMDD	X	X	X									
Marine Sediment Core Samples															
JW001	372450.96	1302986.03	JW001-SC-A-YYMMDD				X								
			JW001-SC-B-YYMMDD	X		X						X	X	X	X
			JW001-SC-C-YYMMDD				X								
			JW001-SC-D-YYMMDD				X								
JW002	372374.43	1302904.40	JW002-SC-A-YYMMDD				X								
			JW002-SC-B-YYMMDD	X		X						X	X	X	X
			JW002-SC-C-YYMMDD				X								
			JW002-SC-D-YYMMDD				X								
JW003	372464.41	1302896.83	JW003-SC-A-YYMMDD				X								
			JW003-SC-B-YYMMDD	X		X						X	X	X	X
			JW003-SC-C-YYMMDD				X								
			JW003-SC-D-YYMMDD				X								
JW004	372543.46	1302975.09	JW004-SC-A-YYMMDD				X								
			JW004-SC-B-YYMMDD				X								
			JW004-SC-C-YYMMDD				X								
			JW004-SC-D-YYMMDD				X								
JW005	372561.12	1302885.05	JW005-SC-A-YYMMDD				X								
			JW005-SC-B-YYMMDD				X								
			JW005-SC-C-YYMMDD				X								
			JW005-SC-D-YYMMDD				X								
JW006	372360.98	1302790.81	JW006-SC-A-YYMMDD				X								
			JW006-SC-B-YYMMDD				X								
			JW006-SC-C-YYMMDD				X								
			JW006-SC-D-YYMMDD				X								
JW007	372461.05	1302787.44	JW007-SC-A-YYMMDD				X								
			JW007-SC-B-YYMMDD				X								
			JW007-SC-C-YYMMDD				X								
			JW007-SC-D-YYMMDD				X								
JW008	372564.48	1302788.28	JW008-SC-A-YYMMDD				X								
			JW008-SC-B-YYMMDD				X								
			JW008-SC-C-YYMMDD				X								
			JW008-SC-D-YYMMDD				X								
JW009	372956.56	1302578.58	JW009-SC-A-YYMMDD				X								
			JW009-SC-B-YYMMDD				X								
			JW009-SC-C-YYMMDD				X								
			JW009-SC-D-YYMMDD				X								
JW010	373065.64	1302578.58	JW010-SC-A-YYMMDD				X								
			JW010-SC-B-YYMMDD				X								
			JW010-SC-C-YYMMDD				X								
			JW010-SC-D-YYMMDD				X								

Table 5
Station Locations and Sample Matrix Summary for Maulsby Marsh Sediments and Marine Sediment Samples

Station ID	Station Coordinates (Washington SP NAD 83 North Zone)		Parameter	PCBs	Dioxin/Furan	PAH	Archive	Metals	SVOCs	TPH	EPH Archive	Grain Size	TS, TOC	Ammonia	Total Sulfides
			Container	8-oz WM-G	8-oz WM-G	8-oz WM-G		8-oz WM-G	8-oz WM-G	8-oz WM-G	8-oz WM-G	16-oz Plastic	8-oz WM-G	4-oz WM-G	4-oz WM-G
			Preservative	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	ZnAc
	Northing (ft)	Easting (ft)	Laboratory Sample ID[a]												
JW011	373164.05	1302582.14	JW011-SC-A-YYMMDD				X								
			JW011-SC-B-YYMMDD				X								
			JW011-SC-C-YYMMDD				X								
			JW011-SC-D-YYMMDD				X								
JW012	373152.91	1302681.83	JW012-SC-A-YYMMDD				X								
			JW012-SC-B-YYMMDD				X								
			JW012-SC-C-YYMMDD				X								
			JW012-SC-D-YYMMDD				X								
JW013	373073.69	1302750.03	JW013-SC-A-YYMMDD				X								
			JW013-SC-B-YYMMDD		X	X						X	X	X	X
			JW013-SC-C-YYMMDD				X								
			JW013-SC-D-YYMMDD				X								
JW014	373056.79	1302680.66	JW014-SC-A-YYMMDD				X								
			JW014-SC-B-YYMMDD		X	X						X	X	X	X
			JW014-SC-C-YYMMDD				X								
			JW014-SC-D-YYMMDD				X								
JW015	372971.16	1302681.25	JW015-SC-A-YYMMDD				X								
			JW015-SC-B-YYMMDD		X	X						X	X	X	X
			JW015-SC-C-YYMMDD				X								
			JW015-SC-D-YYMMDD				X								
JW016	373974.89	1302992.83	JW016-SC-A-YYMMDD				X								
			JW016-SC-B-YYMMDD				X								
			JW016-SC-C-YYMMDD				X								
			JW016-SC-D-YYMMDD				X								
JW017	373972.59	1303090.77	JW017-SC-A-YYMMDD				X								
			JW017-SC-B-YYMMDD				X								
			JW017-SC-C-YYMMDD				X								
			JW017-SC-D-YYMMDD				X								
JW018	373872.41	1303091.34	JW018-SC-A-YYMMDD				X								
			JW018-SC-B-YYMMDD				X								
			JW018-SC-C-YYMMDD				X								
			JW018-SC-D-YYMMDD				X								
JW019	373870.69	1303190.43	JW019-SC-A-YYMMDD				X								
			JW019-SC-B-YYMMDD				X								
			JW019-SC-C-YYMMDD				X								
			JW019-SC-D-YYMMDD				X								
JW020	373771.08	1303291.25	JW020-SC-A-YYMMDD				X								
			JW020-SC-B-YYMMDD				X								
			JW020-SC-C-YYMMDD				X								
			JW020-SC-D-YYMMDD				X								
JW021	373772.24	1303191.58	JW021-SC-A-YYMMDD				X								
			JW021-SC-B-YYMMDD		X	X						X	X	X	X
			JW021-SC-C-YYMMDD				X								
			JW021-SC-D-YYMMDD				X								

Table 5
Station Locations and Sample Matrix Summary for Maulsby Marsh Sediments and Marine Sediment Samples

	Station Coordinates (Washington SP NAD 83 North Zone)		Parameter	PCBs	Dioxin/Furan	PAH	Archive	Metals	SVOCs	TPH	EPH Archive	Grain Size	TS, TOC	Ammonia	Total Sulfides
			Container	8-oz WM-G	8-oz WM-G	8-oz WM-G		8-oz WM-G	8-oz WM-G	8-oz WM-G	8-oz WM-G	16-oz Plastic	8-oz WM-G	4-oz WM-G	4-oz WM-G
			Preservative	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	ZnAc
Station ID	**Northing (ft)**	**Easting (ft)**	**Laboratory Sample ID[a]**												
JW022	373661.70	1303288.94	JW022-SC-A-YYMMDD				X								
			JW022-SC-B-YYMMDD		X	X						X	X	X	X
			JW022-SC-C-YYMMDD				X								
			JW022-SC-D-YYMMDD				X								
JW023	373556.80	1303367.81	JW023-SC-A-YYMMDD				X								
			JW023-SC-B-YYMMDD		X	X						X	X	X	X
			JW023-SC-C-YYMMDD				X								
			JW023-SC-D-YYMMDD				X								
JW024	373460.52	1303459.80	JW024-SC-A-YYMMDD				X								
			JW024-SC-B-YYMMDD		X	X						X	X	X	X
			JW024-SC-C-YYMMDD				X								
			JW024-SC-D-YYMMDD				X								
Field Homogenization Duplicate			JWXXX(+100)-SC-YYMMDD	X	X	X						X	X	X	X
Equipment Rinsate			JW-RB-YYMMDD	X	X	X									
Deionized Water Blank			JW-FB-YYMMDD	X	X	X									

[a] Labortory IDs are defined below:

SS = surface sediment
SC = Sediment Core
TS = Total Solids
TVS = Total Volatile Solids

Note:
TOC = total organic carbon
WM-G = wide mouth glass jar
PAH = Polycyclic aromatic hydrocarbon
NA = not applicable

PCB = polychlorinated biphenyls
SVOC = semivolatile organic compounds
TPH = Total Petroleum Hydrocarbons
EPH = Extractable Petroleum Hydrocarbons

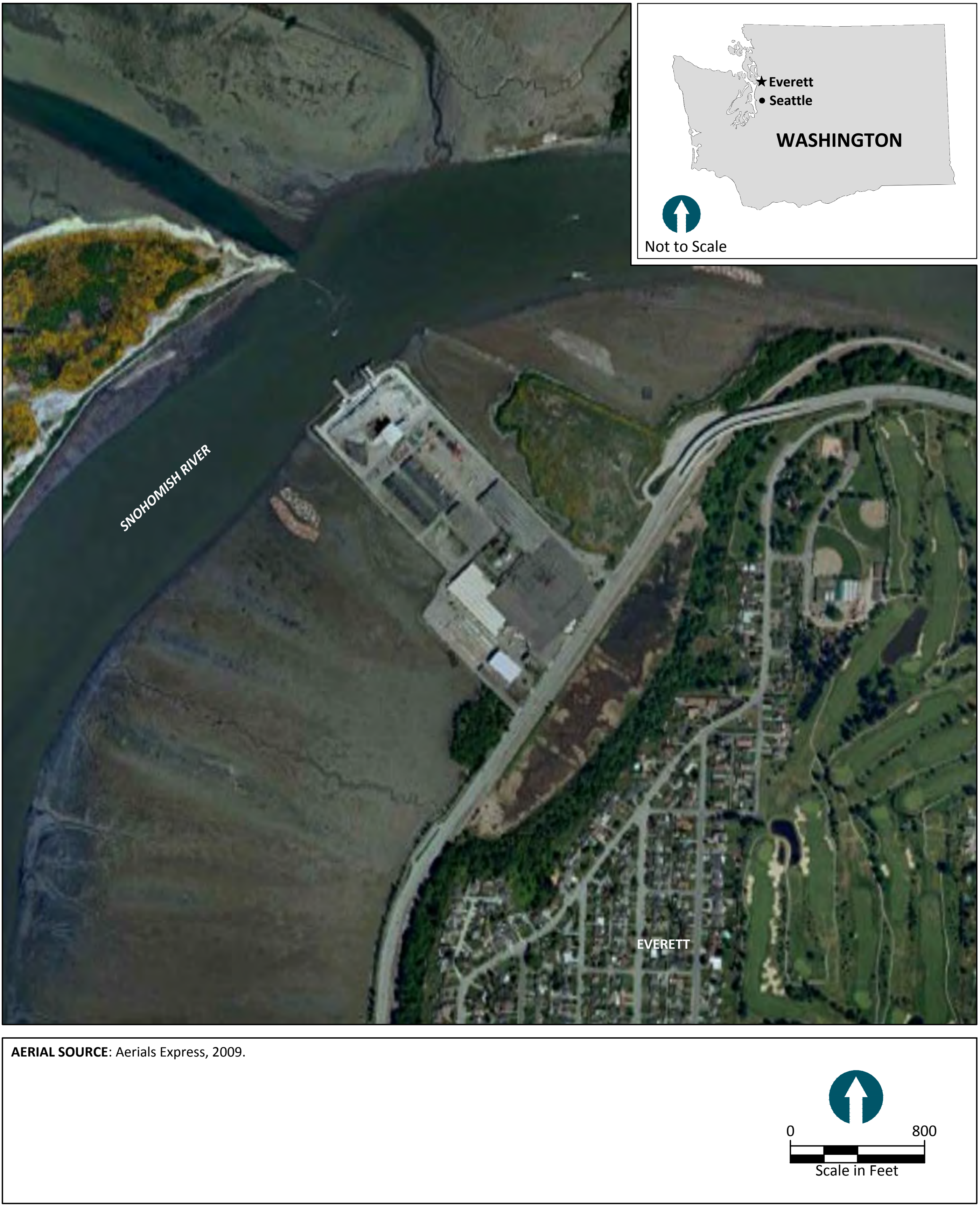
Table 6
Laboratory Quality Control Sample Analysis Summary

Analysis Type	Initial Calibration	Ongoing Calibration	Standard Reference Material[e]	Replicates	Matrix Spikes	Matrix Spike Duplicates	Method Blanks	Surrogate Spikes	Laboratory Control Samples
Grain size	Each batch[a]	NA	NA	1 per 20 samples	NA	NA	NA	NA	NA
Total solids	Daily[d]	NA	NA	1 per 20 samples	NA	NA	NA	NA	NA
Total suspended solids	Daily[d]	NA	NA	1 per 20 samples	NA	NA	NA	NA	NA
Total organic carbon	Daily or each batch	1 per 10 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	NA	Each batch	NA	1 per 20 samples
Total sulfides	Daily or each batch	1 per 10 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	NA	Each batch	NA	1 per 20 samples
Ammonia	Daily or each batch	1 per 10 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	NA	Each batch	NA	1 per 20 samples
Metals	Daily or each batch	1 per 10 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	NA	Each batch	NA	1 per 20 samples
Chlorinated Pesticides	As needed[c]	1 per 10 samples	1 per 20 samples	NA	1 per 20 samples	1 per 20 samples	Each batch	Every sample	1 per 20 samples
Dioxins/Furans	As needed [c]	Every 12 hours	1 per 20 samples	NA	NA[f]	NA[f]	1 per 20 samples	NA[f]	NA[f]
Polychorinated biphenyls (PCBs)	As needed[c]	1 per 10 samples	1 per 20 samples	NA	1 per 20 samples	1 per 20 samples	Each batch	Every sample	1 per 20 samples
Semivolatile organic compounds (SVOCs)	As needed [c]	Every 12 hours	1 per 20 samples	NA	1 per 20 samples	1 per 20 samples	Each batch	Every sample	1 per 20 samples
Total Petroleum Hydrocarbons	As needed[c]	1 per 10 samples	1 per 20 samples	NA	1 per 20 samples	1 per 20 samples	Each batch	Every sample	1 per 20 samples
Extractable Petoleum Hydrocarbons	As needed[c]	1 per 10 samples	1 per 20 samples	NA	1 per 20 samples	1 per 20 samples	Each batch	Every sample	1 per 20 samples
Organochlorine pesticides	As needed[c]	1 per 10 samples	1 per 20 samples	NA	1 per 20 samples	1 per 20 samples	Each batch	Every sample	1 per 20 samples
Dioxins/Furans	As needed[c]	Prior to 12 hour analytical batch	1 per 20 samples	NA	NA	NA	Each batch	Every sample	1 per 20 samples
Ammonia-N	As needed[c]	1 per 10 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	Each batch	NA	1 per 20 samples
Cyanide	As needed[c]	1 per 10 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	Each batch	NA	1 per 20 samples
Hexavalent chromium	As needed[c]	1 per 10 samples	NA	1 per 20 samples	1 per 20 samples	1 per 20 samples	Each batch	NA	1 per 20 samples

Notes:

a Calibration and certification of drying ovens and weighing scales are conducted bi-annually.
b Initial calibration verification and calibration blank must be analyzed at the beginning of each batch.
c Initial calibrations are considered valid until the ongoing continuing calibration no longer meets method specifications. At that point, a new initial calibration is performed.
d Scale should be calibrated with class 5 weights daily; weights must bracket the weight of sample and weighing vessel.
e When a Standard Reference Material is available.
f Isotope dilution required by method
NA Not applicable

FIGURES



AERIAL SOURCE: Aerials Express, 2009.

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Jan 10, 2011 1:08pm cdavidson

Figure 1
Vicinity Map
Quality Assurance Project Plan
Jeld-Wen Former Nord Door Site

ANCHOR QEA

ANCHOR QEA

Chain of Custody Record & Laboratory Analysis Request

Anchor QEA
1423 3rd Avenue, Suite 300
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131

Turnaround Requested: **Anchor Contact:** **Page ___ of ____**

Lab Contact:	Project:
Lab:	
Address:	Proj. No.:
City, etc: :	Sampler:
Phone:	Shipping Method:
Fax:	AirBill #:

Sample ID	Sample Date	Sample Time	Sample Matrix	Number of Containers	Analyses Requested										**Notes/ Comments:**

Relinquished: (Signature)	Relinquished: (Signature)	Relinquished: (Signature)	Special Instructions/Notes	
Printed Name:	Printed Name:	Printed Name:		
Company:	Company:	Company:		
Date/Time:	Date/Time:	Date/Time:		
Received By:	Received By:	Received By:		
Printed Name:	Printed Name:	Printed Name:		
Company:	Company:	Company:	# of Coolers:	Cooler Temp(s):
Date/Time:	Date/Time:	Date/Time:	COC Seals Intact?	Bottles Intact?

ATTACHMENT 1
SAMPLING AND ANALYSIS PLAN

ATTACHMENT 1

SAMPLING AND ANALYSIS PLAN

MARINE AND MAULSBY MARSH SEDIMENT CHARACTERIZATION

JELD-WEN FORMER NORD DOOR SITE

Prepared for

Jeld-Wen, Inc.

Prepared by

Anchor QEA, LLC

1423 Third Avenue, Suite 300

Seattle, Washington 98101

January 2011

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1 INTRODUCTION

This attachment to the Quality Assurance Project Plan (QAPP; Anchor 2010) describes the procedures for sampling and analysis activities associated with the proposed marine sediment evaluation at the Jeld-Wen Former Nord Door Site, the freshwater sediments evaluation in the adjacent Maulsby Marsh, and the salinity evaluation of surface waters within Maulsby Marsh. A project vicinity map is provided as Figure 1. The QAPP provides quality assurance information applicable to all studies conducted as part of the sediment and water salinity evaluation. This Sampling and Analysis Plan (SAP) provides information specific to the collection and analysis of surface sediment samples and subsurface sediment core samples in the marine sediments at locations shown in Figure 2, and surface sediment samples and salinity measurements in Maulsby Marsh shown in Figure 3.

This SAP was prepared consistent with current Puget Sound Estuary Program (PSEP) and U.S. Environmental Protection Agency (EPA) protocols for sampling and analysis (EPA 1993, PSEP 1986, PSEP 1997a, b, and c) and *Test Methods for the Evaluation of Solid Waste: Physical/Chemical Methods, 3rd Edition* (EPA 1986). The contents and structure of this SAP are in line with guidance provided in Ecology's *Sediment Source Control Standards User Manual, Appendix B: Sediment Sampling and Analysis Plan Appendix* (Lee 2003). The following sections provide details for the collection, handling, and analysis of marine sediment core and surface sediment samples and surface sediment samples from Maulsby Marsh.

2 SAMPLING PROCESS DESIGN

The purpose of this SAP is to provide guidance for all aspects of the fieldwork and laboratory analysis to address additional data collection identified in comments received from the Washington State Department of Ecology's (Ecology) comments to the Phase 1 Remedial Investigation (Phase 1 RI) data report. Key objectives and sampling and analysis activities proposed to address the Ecology comments for the marine sediments and the adjacent freshwater sediments in Maulsby Marsh are differentiated below.

2.1 Marine Sediments

The Phase 1 RI sampling found evidence of chemicals in the marine sediments to the north and south of the Jeld-Wen site (Figure 1). Dioxins were found in the sediments to the north and south, while polychlorinated biphenyls (PCBs) were found only in the south. Neither the depth nor the full distribution of these chemicals were delineated during the Phase 1 RI. In addition, polycyclic aromatic hydrocarbons (PAHs) have been found in upland soil and groundwater and may be present in subsurface sediments. This SAP and the QAPP to which it is attached address the tasks necessary to delineate the dioxins, PCBs, and PAHs adjacent to the Jeld-Wen Site. The primary tasks addressed are the collection, processing, and analysis of surface and subsurface sediment samples as required by Ecology.

Additional sampling is needed to address these issues will include:

- A total of ten surface sediment grab samples will be collected and analyzed for the chemicals of concern in the 0 to 10-cm surface sediment interval. An additional 14 surface grabs will be collected and archived in the event that further testing is needed. All grab samples will be collected during one field mobilization.
- Conventional chemistry will be analyzed in all the surface sediment grab samples to capture that information prior to the archival process.
- Collection of cores will be co-located where surface sediments are collected. Cores will be advanced to a 4-foot depth. A sample collected from the second 1-foot interval of the cores will be analyzed for the chemicals of concern. Samples from the first (10 to 30-cm), third, and fourth 1-foot intervals of the cores will be frozen and archived to be tested in the event that further analysis is needed.
- A total of ten cores will be collected and analyzed. An additional 14 cores will be

collected and archived in the event further testing is needed. All cores will be collected during one field mobilization.

- Required sampling locations are presented in Figure 2. The analyses to be performed, the appropriate analytical methods, screening levels, and practical quantitation limits (PQLs) are listed on QAPP Table 2. Dioxin/furan analysis is required in at least four samples to the north and at least three samples to the south (denoted in green on Figure 2). PCB analysis is required in at least three samples to the south (denoted in red). PAH analysis is required in all samples to be immediately analyzed and any archive sample that is adjacent to a sample with a sediment quality standard (SQS) exceedence of PAHs. Only those analytes with SQS exceedences in the primary samples will be analyzed in any archive sample. SQS screening criteria are listed in QAPP Table 2.

2.2 Maulsby Marsh Surface Sediments

Maulsby Marsh is immediately east of the Jeld-Wen Site and is on the other side of Marine View Drive and the Burlington Northern Santa Fe (BNSF) railroad tracks (Figure 1). Previous sampling in Maulsby Marsh has identified total petroleum hydrocarbons (TPH) and PAHs as chemicals of potential concern (COPCs). Metals have also been identified as COPCs in Maulsby Marsh. Additional sediment sampling is necessary to determine the nature and extent of the chemical distribution in this area. It is also necessary to evaluate whether Maulsby March is freshwater or if it is saline due to tides. The primary tasks addressed for Maulsby Marsh are the collection, processing, and analysis of surface sediment samples, as well as an evaluation of salinity under a variety of tidal conditions. The proposed additional sampling locations for Maulsby Marsh are illustrated in Figure 3. Samples will be analyzed for metals, PAH compounds, PCBs, TPH-Dx (diesel range), extractable petroleum hydrocarbon (EPH), and conventional sediment parameters. The analyses to be performed, the appropriate methods, screening levels, and PQLs are listed on QAPP Table 3. Tiered sample analysis will be performed as follows:

- All samples will be collected during one sampling event
- The row of purple samples (shown in Figure 3) will be analyzed immediately. The row of purple samples should be analyzed first while the other two rows (blue and green) are archived.

- If analytes at stations in the purple row are above the freshwater screening levels for this project, listed on QAPP Table 3, samples in the blue row that are adjacent to the contaminated purple samples will be analyzed. Only those analytes that exceed screening levels in the purple row samples will be analyzed.
- If analytes at stations in the blue row are above screening levels, samples in the green row that are adjacent to the contaminated blue samples will be analyzed. Only those analytes that exceed screening levels in the blue row samples will be analyzed.
- A portion of each sample will be archived to allow for EPH testing. All TPH testing will be initially conducted using the Northwest Total Petroleum Hydrocarbon (NWTPH) methods. Of the four samples with the highest results from the NWTPH method, EPH testing will be performed in order to distinguish between different ranges of hydrocarbons.
- Immediate collection and preservation of the sulfides sample is required prior to disturbing the sediments (e.g., prior to placing in a stainless bowl and homogenizing).

2.3 Maulsby Marsh Salinity Measurements

Water quality monitoring to test for salinity levels in the marsh waters will be performed within Maulsby Marsh. Water quality will be assessed at three locations: at the marsh inlet, and in the north and south portions of the marsh. Exact sample locations will be determined in the field. Water quality measurements for salinity will be collected during an incoming tide on two separate events as follows: 1) during an extremely high tide event; and 2) during an average high tide event.

3 SAMPLING METHODS REQUIREMENTS

This section addresses the sampling program requirements for sample collection and processing.

3.1 Marine Sediment Sample Collection

Surface sediment and subsurface sediment core samples will be collected at 24 locations, (Figure 2). QAPP Table 5 includes a list of all stations, sample identifiers, and analyses. The sample identification scheme is described below.

3.1.1 Marine Surface Sediment Sample Identification

Each surface sediment sample will be assigned a unique alphanumeric identifier according the following method:

- Each location will be identified by JW (Jeld-Wen), and a number 001 through 024, identifying the station identifier (e.g., JW007).
- Individual surface sediment samples at each location will be identified by the same alphanumeric used to identify the station followed by a two digit matrix identifier of SS (surface sediment), followed by the six digit date code YYMMDD format (e.g., JW007-SS-110115 represents the surface sediment sample collected from Station JW007 on January 15, 2011).
- The homogenization duplicate collected from a surface sediment sample will be indicated using the JW site code followed with XXX-SS-YYMMDD, where XXX is the station number plus 100, and the date is appended in the YYMMDD format (e.g., JW107-SS-110115 represents the homogenization sample duplicate from the surface sediment sample collected from station JW007).
- For rinsate blank and field blank samples, RB or FB, respectively, will be appended to the sample identification number followed by the sampling date in YYMMDD format (e.g., JW007-SSRB-110115 represents the rinsate blank of the decontaminated surface sediment sample processing equipment collected on January 15, 2011 following decontamination of the processing equipment used for the sample collected at JW007).

3.1.2 Marine Subsurface Sediment Core Sample Identification

Each subsurface sediment sample will be assigned a unique alphanumeric identifier according to the following method:

- Each location will be identified by JW (Jeld-Wen), and a number 001 through 024, identifying the station identifier (e.g., JW007).
- Individual subsurface sediment samples at each location will be identified by the same alphanumeric used to identify the station followed by a two digit matrix identifier of SC (sediment core), followed by a depth code from A-D and the six digit date code YYMMDD format (e.g., JW007-SC-B-110115 represents the 2-foot layer sediment sample collected from Station JW007 on January 15, 2011). The depth coded A indicates that the sample is from the 1-foot (10 to 30 cm) interval, B indicates that the sample is from the 1 to 2-foot depth interval, and so forth. Note that the surface (0 to 10 cm) interval is to be collected and processed separately as a co-located surface sediment grab sample described below in Section 3.1.3).
- The homogenization duplicate collected from a subsurface sediment sample will be indicated using the JW site code followed with XXX-SC-B-YYMMDD, where XXX is the station number plus 100, and B indicates the 1 to 2 foot section of the core, and the date is appended in the YYMMDD format (e.g., JW107-SC-B-110115 represents the homogenization sample duplicate from 1 to 2 foot depth interval of the sample collected from station JW007).
- For rinsate blank and field blank samples, RB or FB, respectively, will be appended to the sample identification number followed by the sampling date in YYMMDD format (e.g., JW007-SCRB-110115 represents the rinsate blank of the decontaminated core sample processing equipment collected on January 15, 2011 following decontamination of the processing equipment used for core JW007).

3.1.3 Marine Surface Sediment Sample Collection Procedures

Surface sediment grab samples will be collected using a van Veen grab or similar sampling device. Sediment grabs are collected by lowering the grab device through the water column, either by hand or under winch control, and the grab penetrates the sediment by means of its weight. The following steps outline the general procedure for the collection of surface sediment samples:

- Maneuver the sampling vessel to the proposed sampling location (within 3 meters) using the navigation system.
- Follow decontamination procedures of the grab sampler as outlined below in Section 3.4.
- Slowly lower the grab to the sediment surface.
- Once on the bottom, give the grab sufficient slack to allow the tripping mechanism to release.
- Maintain vertical control over the sampling position prior to lifting the grab so that the grab can be lifted vertically off the bottom.
- Upon retrieval of the grab to the water surface, use care not to disturb the sample by banging against the side of the vessel.
- After the grab sampler is retrieved aboard and placed in a stable position the sediment sample will be evaluated against Puget Sound Estuary Program (PSEP) sample acceptance protocols (PSEP 1997a, b, and c). PSEP acceptability criteria include:
    - Sampler is not overfilled (i.e., there is no sediment surface against top doors of sampler
    - Sediment surface is relatively flat, indicating minimal disturbance or winnowing
    - Overlying water is present, indicating minimal leakage
    - Overlying water has low turbidity, indicating minimal sample disturbance
    - Desired penetration depth is achieved
- When sample criteria are deemed sufficient, overlying water in the sampler is removed to expose the sediment surface.

3.1.4 Marine Surface Sediment Sample Processing Procedures

Sediment grab processing will be conducted on board the sampling vessel. The steps for processing the samples are listed below:

- Place the grab on a stable surface. Remove any overlying water using a siphon hose or turkey baster. Follow grab acceptance criteria listed above in Section 3.1.3 to determine whether the grab is acceptable.
- After noting their presence, remove any large objects or debris from the sediment surface.

- If total sulfides are to be sampled, this material is to be taken immediately upon opening the grab as described below in Section 3.1.5.
- Prior to sampling, color photographs will be taken and a sediment description will be recorded on a standard grab processing log (Appendix 1). The description of the grab sample will be described on the grab log form for the following parameters as appropriate and present:
  - Sample recovery (depth in inches or centimeters of recovery measured in the center of the grab sampler.
  - Physical sediment description of the grab in accordance with the Unified Soil Classification System (includes sediment type, density/consistency of sediment, moisture, and color)
  - Odor (e.g., hydrogen sulfide, petroleum, etc.)
  - Note any vegetation
  - Debris
  - Biological activity (e.g., detritus, shells, tubes, bioturbation, live or dead organisms)
  - Presence of oil sheen
  - Any other distinguishing characteristics or features
- Using a decontaminated stainless steel spoon, place sample material from the 0 to 10-cm grab depth into a cleaned stainless steel bowl. To avoid cross contamination, only sediment that has not come into contact with the sides or bottom of the grab will be removed. When sufficient material has been removed, the sample will be homogenized until a uniform color and consistency is achieved.
- Using a clean, stainless steel spoon, completely fill pre-labeled sample containers for analytes listed in QAPP Table 4.
- Immediately after filling the sample container with sediment, place the screw cap on the sample container and tighten.
- Thoroughly check all sample containers for proper identification, analysis type, and lid tightness.
- Pack each container carefully to prevent breakage and place inside of a cooler with ice for storage at the proper temperature (4° ± 2°C for all samples).

3.1.5 Subsampling Total Sulfides in Surface Sediment Grabs

The total sulfide sample will be collected prior to removing sediment from the grab sampler. Subsample material will be collected along the entire depth of the representative sampling interval, transferred to a 120-mL glass container, fixed with 5 mL of 2N zinc acetate, capped, and shaken vigorously. The sample label will clearly indicate the addition of zinc acetate preservative. Pre-cleaned stainless steel instruments will be used to collect sample material. Samples will be stored in the dark at 4° ± 2°C.

3.1.6 Marine Sediment Core Sample Collection Procedures

Sediment core samples will be collected with an electrically powered vibrocorer, which is lowered through the water column under winch control, and penetrates the sediment by means of its weight and intense vibration. The following steps outline the procedure for the collection of cores using a vibrocorer:

- Maneuver the sampling vessel to the proposed sampling location using the navigation system. Alternatively, the vessel can be anchored on location for greater station control.
- Check to ensure that the metal core barrel is securely fastened to the powerhead of the vibrocorer, and insert a decontaminated core liner inside the metal core barrel. An alternate method is to use a decontaminated aluminum core barrel without a liner.
- Insert a core catcher so that the catcher fingers will extend into the core liner, and attach the core nose onto the bottom of the core barrel.
- Signal the winch operator to hoist the corer and swing it over the stern or side of the vessel at the marked sampling location. Reposition the vessel if necessary. Record the measured water depth, and enter the tidal elevation on the core collection log sheet. Calculate the mudline elevation, and then determine the number of feet of penetration required to reach the project-required depth.
- Signal the winch operator to lower the corer through the water column. Determine the depth of the corer in the water column and track its subsequent penetration into the sediment either by marking the winch line in 1-foot increments, or by attaching a flexible tape measure to the powerhead. In either case, the reference will be 0 feet at the tip of the core nose.

- Prior to the core nose making contact with the bottom, energize the corer by actuating the circuit breaker on the generator control panel.
- Slow the descent speed of the corer in order to determine when the core nose is entering the sediment. Maintain tension on the winch line throughout the coring process to keep the corer from toppling over. The worker monitoring the penetration of the corer into the sediment will signal the winch operator when to pay out more line.
- If refusal is encountered or if the measured distance to the tip of the core nose indicates that project depth has been reached, stop paying out line and de-energize the corer. Do not power down the generator. Refusal is indicated by less than 6 inches of penetration in a given 30-second interval.
- Signal the winch operator to bring the winch line taut. Maneuver the boom or the boat until the winch pulley is directly above the corer in the sediment, as indicated by the winch line being as close to true vertical as possible. Record the position of the actual coring location.
- Signal the winch operator to retrieve the corer. Swing the corer over the deck, and lower the corer to a holding rack. Note and record the length of smearing on the outside of the core barrel, which gives an indication of the amount of penetration.
- Remove the core nose and retain any sediment in the core nose and catcher for examination and possible use.
- Pull the core liner out of the core barrel, remove the catcher, if necessary, and immediately cap the bottom end of the core liner with a plastic cap and secure the bottom cap with duct tape.
- Secure the core on the vessel in an upright position and allow material to settle within the core and then drain the overhead water from the core and remove excess core liner from the core and cap the top securely.
- Cores sections will be stored on the vessel and during transport to the processing facility in a vertical position.

Each core will be evaluated for acceptance criteria prior to moving to the next station. Acceptance criteria for a sediment core sample are as follows:

- The core penetrated to and retained material to project-required depth or refusal.
- Cored material did not extend out the top of the core tube or contact any part of the

sampling apparatus at the top of the core tube.

- There are no obstructions in the cored material that might have blocked the subsequent entry of sediment into the core tube and resulted in incomplete core collection.
- If sample acceptance criteria are not achieved, the sample will be rejected. If repeated deployment within 20 feet of the proposed location does not result in a sample that meets the appropriate acceptance criteria, the Project Manager will make decisions regarding relocating the proposed sample location.

3.1.7 Marine Sediment Core Processing Procedures

Sediment core processing will be at a land-based processing facility. Collected cores will be transported and stored in an upright position up to the time of processing to preserve core sediment integrity. All working surfaces and instruments use will be thoroughly cleaned, decontaminated, and covered with aluminum foil to minimize outside contamination. Disposable gloves will be discarded after processing each core station and core section. The steps for processing the core samples are listed below:

- Cores will be placed onto a table and cut longitudinally using a circular saw or with cutting snippers, taking care not to penetrate the sediment while cutting. Two longitudinal cuts along the sides of the core will be made so that the core can be opened to expose the sediment.
- The sediment core will be split with decontaminated stainless steel wire core splitters or spatulas to expose the center of the two halves for sampling.
- Total sulfide material will to be taken immediately upon opening the core as described below in Section 3.1.8.
- Prior to sampling, color photographs will be taken and a sediment description of each core will be recorded on a standard core processing log sheet (attached in Appendix 1). The description of the core sample will be recorded on the core log form for the following parameters as appropriate:
  - Sample recovery (depth in feet of penetration compared to recovery)
  - Physical soil description along the entire length of the core in accordance with the Unified Soil Classification System including soil type, moisture content, density/consistency of soil, and color as described below.

- Odor (e.g., hydrogen sulfide, petroleum, etc.)
- Note any vegetation
- Debris
- Biological activity (e.g., detritus, shells, tubes, bioturbation, live or dead organisms)
- Presence and depth (in feet) of the redox potential discontinuity layer
- Presence of oil sheen
- Any other distinguishing characteristics or feature

Using a clean spoon, sample material from the desired core section will be placed into a cleaned stainless steel bowl removing only material that has not come into contact with the sides of the core barrel as contaminates may have migrated during core collection. Representative material from the entire core section to be sampled will be removed. The sample will be homogenized until a uniform color and consistency is achieved. The material will be homogenized using a stainless steel paddle and variable speed drill or by hand.

Sample containers will be thoroughly checked for proper identification, analysis type, and lid tightness. Each container will be carefully packed to prevent breakage and placed inside of a cooler with ice for storage at the proper temperature (4° ± 2°C for all samples).

3.1.8 Subsampling Total Sulfides in Core Samples

The total sulfides subsample will be collected from each core section prior to sample compositing. Subsample material will be collected along the entire length of the representative core section, transferred to the 120-mL glass container, and fixed with 5 mL of 2N zinc acetate. The sample label will clearly indicate the addition of zinc acetate preservative. Pre-cleaned stainless steel instruments will be used to collect sample material. Samples will be stored in the dark at 4° ± 2°C.

3.2 Maulsby Marsh Surface Sediment Sampling

This section describes the sample collection, processing, and handling procedures for the collection of surface sediment samples in the Maulsby Marsh area. Surface sediment samples will be collected at 18 locations within the Maulsby Marsh location (Figure 3). QAPP Table

5 includes a list of all stations, sample identifiers, and analyses. The sample identification scheme is described below.

3.2.1 Maulsby Swamp Surface Sediment Sample Identification

The Maulsby Marsh surface sediment samples will be assigned a unique alphanumeric identifier according to the following method:

- Each location will be identified by MM (Maulsby Marsh), and a number 001 through 024, identifying the station identifier (e.g., MM004).
- Individual sediment samples at each location will be identified by the same alphanumeric used to identify the station followed by a two digit matrix identifier of SS for surface sediment followed by the sampling date in YYMMDD format (e.g., MM004-SS-110115 represents the surface sediment sample collected from Station MM004 on January 15, 2011).
- The homogenization duplicate collected from a surface sediment sample will be identified by MMXXX where the XXX is the station number plus 100, followed by the two-digit matrix identifier of SS followed by the sampling date in YYMMDD format.
- The rinsate blank and deionized water blank samples, RB or FB, respectively, will be appended to the sample matrix identification followed by the sampling date in YYMMDD format (e.g., MM004-SSRB-110115 represents the rinsate blank of the decontaminated sampling equipment after surface sediment samples from Station MS004 are collected on January 15, 2011).

3.2.2 Maulsby Marsh Surface Sediment Sample Collection Procedures

Surface sediment samples will be collected from the 0 to 10-cm sediment interval for chemical and physical testing using a Ekman type grab sample or by using a hand operated coring device if sediments are covered by water and the sample grab is hindered by heavy surface vegetation, or by hand if sediments are exposed in accordance with PSEP protocols (PSEP 1997a).

If samples are collected using an Ekman type grab sampler, where sediments are covered with water, samples will be collected in the following manner:

- The station will be located using a differential global positioning system (DGPS).

Actual sample locations will be assessed in the field and will be recorded for each sample location.

- Follow decontamination procedures of the grab sampler as outlined below in Section 3.2.4.
- Slowly lower the grab to the sediment surface. The mechanism for closing the jaws of the grab will be triggered by either sending a messenger down the line or using a push rod attached to the top of the grab.
- Upon retrieval of the grab to the water surface, use care not to disturb the sample by banging against the side of the vessel.
- After the grab sampler is retrieved aboard and placed in a stable position, the sediment sample will be evaluated against PSEP sample acceptance protocols (PSEP 1997). PSEP acceptability criteria include:
  - Sampler is not overfilled (i.e., there is no sediment surface against top doors of sampler
  - Sediment surface is relatively flat, indicating minimal disturbance or winnowing
  - Overlying water is present, indicating minimal leakage
  - Overlying water has low turbidity, indicating minimal sample disturbance
  - Desired penetration depth is achieved
- When sample criteria are deemed sufficient, overlying water in the sampler will be removed to expose the sediment surface.

If samples are collected using a piston type coring device, where sediments are covered with water, samples will be collected in the following manner:

- Sample locations will be accessed using waders or an inflatable vessel if water depths are too deep for waders. Actual sample locations will be recorded for each sample location.
- A decontaminated 3-inch polycarbonate tube attached to a piston core device will be inserted into the surface layer of the sediments to a depth sufficient to retain a sample of the top 10 cm.

Sampled material will be extruded directly into a decontaminated stainless steel bowl. Additional material will be collected from the same location if additional material is needed to fill all the sampling containers.

If samples are collected by hand at a water level that exposes the sediments, samples will be collected in the following manner:

- The station will be located. Actual sample locations will be recorded for each sample location.
- A square (measuring 1 square meter) will be established.
- Roughly equal volumes of sediment from the 0 to 10 cm layer will be collected from each corner of the square using a stainless steel trowel and placed in a stainless steel bowl.
- Observations (i.e., texture, odor, presence/absence of vegetation, debris, and any other distinguishing characteristics) will be recorded on the sample collection forms.

3.2.3 Maulsby Marsh Surface Sediment Sample Processing Procedures

Sediments will be placed into a decontaminated bowl and homogenized using a stainless steel spoon until the sediment appears uniform in color and texture. Total sulfides samples will be collected prior to sample homogenization as described above for surface grab samples in Section 3.1.8. Homogenized sediment will then be placed into appropriate pre-labeled sample containers (certified) and stored in a cooler equipped with ice or another cold source to keep the samples at 4°±2°C prior to final packing for transport to the appropriate laboratory. QAPP Table 4 lists container size, holding times, and preservation for the categories of analytes. Sediments collected will be described using the following list of observations:

- Sample recovery
- Physical soil description in accordance with the Unified Soil Classification System including soil type, moisture content, density/consistency of soil, and color as described below.
- Odor (e.g., hydrogen sulfide, petroleum, etc.)
- Note any vegetation
- Debris

- Biological activity (e.g., detritus, shells, tubes, bioturbation, live or dead organisms)
- Presence and depth (in feet) of the redox potential discontinuity layer
- Presence of oil sheen
- Any other distinguishing characteristics or feature

At a minimum, each sample label will include the following information:

- Project name and number
- Sample identifier
- Date of collection
- Initials of field personnel responsible for sample collection
- Analyses required
- Preservative (if applicable)

3.3 Maulsby Marsh Salinity Sampling Procedures

Salinity measurements in the Maulsby Marsh waters will be performed to assess the impacts of potentially saline tidal water inputs into the marsh. Salinity levels will be assessed at three locations: at the marsh inlet, and in the north and south portions of the marsh. Exact sample locations will be determined in the field. Salinity measurements will be made during an incoming tide on two separate events: 1) during an extremely high tide event; and 2) during an average high tide event.

Salinity measurement locations will be accessed by using a small vessel. Sampling locations will be selected in the field and will generally be located centrally in the north and south end of the marsh and at the inlet of the marsh. Actual measurement locations will be identified using DGPS and will be recorded in the field log book. Salinity measurements will be made using a Hydrolab® multiprobe. Appropriate multiprobe parameters pertinent to the salinity measurement (i.e., pH, and conductivity) will be calibrated prior to each sampling event.

Measurements will be taken by deploying the Hydrolab® over the side of the vessel. Salinity measurements will be recorded at two water depths at each location. If the water depth is greater than 3 feet, measurements will include readings at 1 foot below the water surface and approximately 1 foot above the sediment surface. If the water depth is less than 3 feet, one measurement will be recorded at the mid-water column depth.

3.4 Sampling Equipment Decontamination Procedures

To prevent sample cross-contamination, all sampling and processing equipment in contact with the sediment samples will undergo the following decontamination procedures prior to and between collection activities:

- Rinse with site water and wash with scrub brush until free of sediment
- Wash with phosphate-free detergent and tap water
- Final rinse with distilled water

3.5 Horizontal Positioning and Vertical Control

Horizontal positioning will be determined by the DGPS based on target coordinates shown in QAPP Table 5. The horizontal datum will be North American Datum (NAD) 83, Washington State Plane, North Zone. Measured geographical coordinates for station positions will be recorded and reported to the nearest 0.01 second. In addition, state plane coordinates will be reported to the nearest foot. The DGPS accuracy is less than 1 meter and generally less than 30 cm depending upon the satellite coverage and the number of the data points collected (i.e., sampling interval).

Vertical elevation of each sediment core collection station will be measured using a fathometer or lead line and converted to mean lower low water (MLLW) elevation. Tidal elevations will be determined using measured data from the National Oceanic and Atmospheric Administration's (NOAA's) automated tide gage located in Port Gardiner, Washington.

3.6 Field Documentation

Documentation will consist of a field logbook and sample collection forms (Attachment 1). The field logbook will consist of bound, numbered pages. All data entries will be made using indelible ink pen. Corrections will be made by drawing a single line through the error, writing in the correct information, then dating and initialing the change. The field logbook is intended to provide sufficient data and observations to enable readers to reconstruct events that occurred during the sampling period. Examples of information to be recorded are field personnel, weather conditions, complications, and other general details associated with the sampling effort. At a minimum, the following information will be included in this log:

- Names of FC and person(s) collecting and logging the sample
- Health and safety discussions
- The sample station number
- Date and collection time of each sediment sample
- Observations made during sample collection including weather conditions, complications, vessel traffic, and other details associated with the sampling effort
- Qualitative notation of apparent resistance of sediment column to sampling, including notes on debris
- Any deviations from the approved sampling plan

In addition to maintaining a field logbook, sample collection forms will be completed for each sample. The sample collection forms will include standards entries for station identifier, station coordinates, date and time of sample location, type of samples collected, type of analyses for each sample, and specific information pertaining to the matrix being collected. For sediment samples, the collection form will include information regarding penetration of the sampler and physical characteristics of the sediment such as texture, color, odor, stratification, and sheens.

3.7 Field Quality Assurance Samples

Field quality assurance (QA) samples will be used to evaluate the efficiency of field decontamination and processing procedures. Although validation guidelines have not been established for field QA samples, their analysis is useful in identifying possible problems resulting during sample collection or sample processing in the field. All field QA samples will be documented in the field logbook and verified by the Quality Assurance/Quality Control (QA/QC) Manager or designee.

3.7.1 Field Blanks

Field blank samples will be collected to evaluate the efficiency of field decontamination procedures. Based on the number of samples proposed for each media, one equipment rinsate blank and one distilled water blank will be collected at a frequency of one per 20 samples processed during sediment sampling.

3.7.1.1 Field Blanks for Sediment

For sediment samples, equipment rinsate blanks will be collected for each sampling method. Deionized water for the equipment rinsate blank will be provided by the laboratory. The equipment rinsate blank consists of pouring deionized water over the sampling equipment after sample collection and decontamination and collecting the rinsate water into sample jars. The rinsate blank will be prepared by placing laboratory-supplied deionized water directly into sampling containers prior to sample collection.

3.7.2 Field Homogenization Duplicate

At least one field homogenization sample will be collected and analyzed for every 20 sediment samples processed in the field. The field homogenization sample consists of collecting additional sediment from one location, processing that sample consistent with procedures outlined in this SAP, then submitting a blind split of that sample to the laboratory.

3.7.3 Additional Sediment Volume for Lab QA/QC

Field QA samples will include the collection of additional sediment volume to ensure that the laboratory has sufficient sample volume to run the program-required analytical QA/QC samples for analysis. Additional sample volume to meet this requirement will be collected at a frequency of once per sampling event.

3.8 Field-Generated Waste Disposal

All sediment remaining after sampling will be washed overboard at the collection site prior to moving to the next sampling station. Any sediment spilled on the deck of the sampling vessel will be washed into the surface waters at the collection site. Sediment remaining following grab sample processing will be returned to the sampling location. Sediment remaining following sediment core processing will be retained and disposed according to results of analytical testing.

All disposable sampling materials and personnel protective equipment used in sample processing, such as disposable coveralls, gloves, and paper towels, will be placed in heavy duty garbage bags or other appropriate containers. Disposable supplies will be placed in a normal refuse container for disposal as solid waste.

4 SAMPLE HANDLING AND CUSTODY

The section addresses the sampling program requirements for maintaining custody of the samples throughout the sample collection and shipping process, and provides specific procedures for sample shipping.

4.1 Sample Custody Procedures

Samples are considered to be in one's custody if they are: 1) in the custodian's possession or view; 2) in a secured location (under lock) with restricted access; or 3) in a container that is secured with an official seal(s) such that the sample cannot be reached without breaking the seal(s).

Chain-of-custody (COC) procedures will be followed for all samples throughout the collection, handling, and analysis process. The principal document used to track possession and transfer of samples is the COC form. Each sample will be represented on a COC form the day it is collected. All data entries will be made using indelible ink pen. Corrections will be made by drawing a single line through the error, writing in the correct information, then dating and initialing the change. Blank lines/spaces on the COC form will be lined-out and dated and initialed by the individual maintaining custody.

A COC form will accompany each container of samples to the analytical laboratories. Each person who has custody of the samples will sign the COC form and ensure that the samples are not left unattended unless properly secured. Copies of all COC forms will be retained in the project files.

4.2 Sample Shipping and Receipt Requirements

All samples will be shipped or hand delivered to the analytical laboratory no later than the day after collection. If samples are collected on Friday, they may be held until the following Monday for shipment, provided that this does not adversely impact holding time requirements. Specific sample shipping procedures are as follows:

- Each cooler or container containing the samples for analysis will be shipped via overnight delivery or hand delivered to the appropriate analytical laboratory. In the event that Saturday delivery is required, the Field Coordinator will contact the analytical laboratory before 3 p.m. on Friday to ensure that the laboratory is aware of the number of coolers shipped and the airbill tracking numbers for those coolers. Following each shipment, the FC will call the laboratory and verify the shipment from the day before has been received and is in good condition.

- Coolant ice will be sealed in separate double plastic bags and placed in the shipping containers.
- Individual sample containers will be placed in a sealable plastic bag, packed to prevent breakage, and transported in a sealed ice chest or other suitable container.
- Glass jars will be separated in the shipping container by shock absorbent material (e.g., bubble wrap) to prevent breakage.
- The shipping containers will be clearly labeled with sufficient information (name of project, time and date container was sealed, person sealing the container and consultant's office name and address) to enable positive identification.
- The shipping waybill number will be documented on all COC forms accompanying the samples.
- A sealed envelope containing COC forms will be enclosed in a plastic bag and taped to the inside lid of the cooler.
- A minimum of two signed and dated COC seals will be placed on adjacent sides of each cooler prior to shipping.
- Each cooler will be wrapped securely with strapping tape, labeled "Glass – Fragile" and "This End Up," and will be clearly labeled with the laboratory's shipping address and the consultant's return address.

Upon transfer of sample possession to the analytical laboratory, the persons transferring custody of the sample container will sign the COC form. Upon receipt of samples at the laboratory, the shipping container seal will be broken and the receiver will record the condition of the samples on a sample receipt form. COC forms will be used internally in the lab to track sample handling and final disposition.

5 ANALYTICAL METHODS

This section summarizes the target physical and chemical analyses for the various media sampled. All sample analyses will be conducted in accordance with Ecology-approved methods and the QAPP. Prior to analysis, all samples will be maintained according to the appropriate holding times and temperatures for each analysis (QAPP Table 4). QAPP Tables 2 and 3 present the proposed analytes, the analytical methods to be used, and the targeted detection limits for the evaluation of sediment, and field QA/QC samples. The analytical laboratory will prepare a detailed report in accordance with the QAPP, to be included as an appendix in the *Sediment Evaluation Data Report*.

Prior to the analysis of the samples, the laboratory will calculate method detection limits for each analyte of interest, where applicable. Method detection limits will be below the sediment quality criteria specified in QAPP Tables 2 and 3, respectively, if technically feasible. To achieve the required detection limits, some modifications to the methods may be necessary. These modifications from the specified analytical methods will be provided by the laboratory at the time of establishing the laboratory contract, and must be approved by Ecology prior to implementation.

Chemical/physical testing will be conducted at Analytical Resources Inc. (ARI), located in Tukwila, Washington. ARI is an Ecology-accredited laboratory and is also accredited under the National Environmental Laboratories Accreditation Program (NELAP). All chemical and physical testing will adhere to the most recent PSEP QA/QC procedures (PSEP 1997b) and PSEP analysis protocols. If more current analytical methods are available, the laboratory will use them.

In completing chemical analyses for this project, the contract laboratory is expected to meet the following minimum requirements:

- Adhere to the methods outlined in this SAP, including methods referenced for each analytical procedure (QAPP Tables 2 and 3)
- Deliver facsimile, hard copy, and electronic data as specified
- Meet reporting requirements for deliverables
- Meet turnaround times for deliverables

- Implement QA/QC procedures, including data quality objectives discussed in the QAPP (QAPP Table 1), laboratory QC requirements (QAPP Table 6), and performance evaluation testing requirements.
- Notify the project QA/QC Manager of any QAPP QA/QC problems when they are identified to allow for quick resolution.
- Allow laboratory and data audits to be performed, if deemed necessary.

6 REFERENCES

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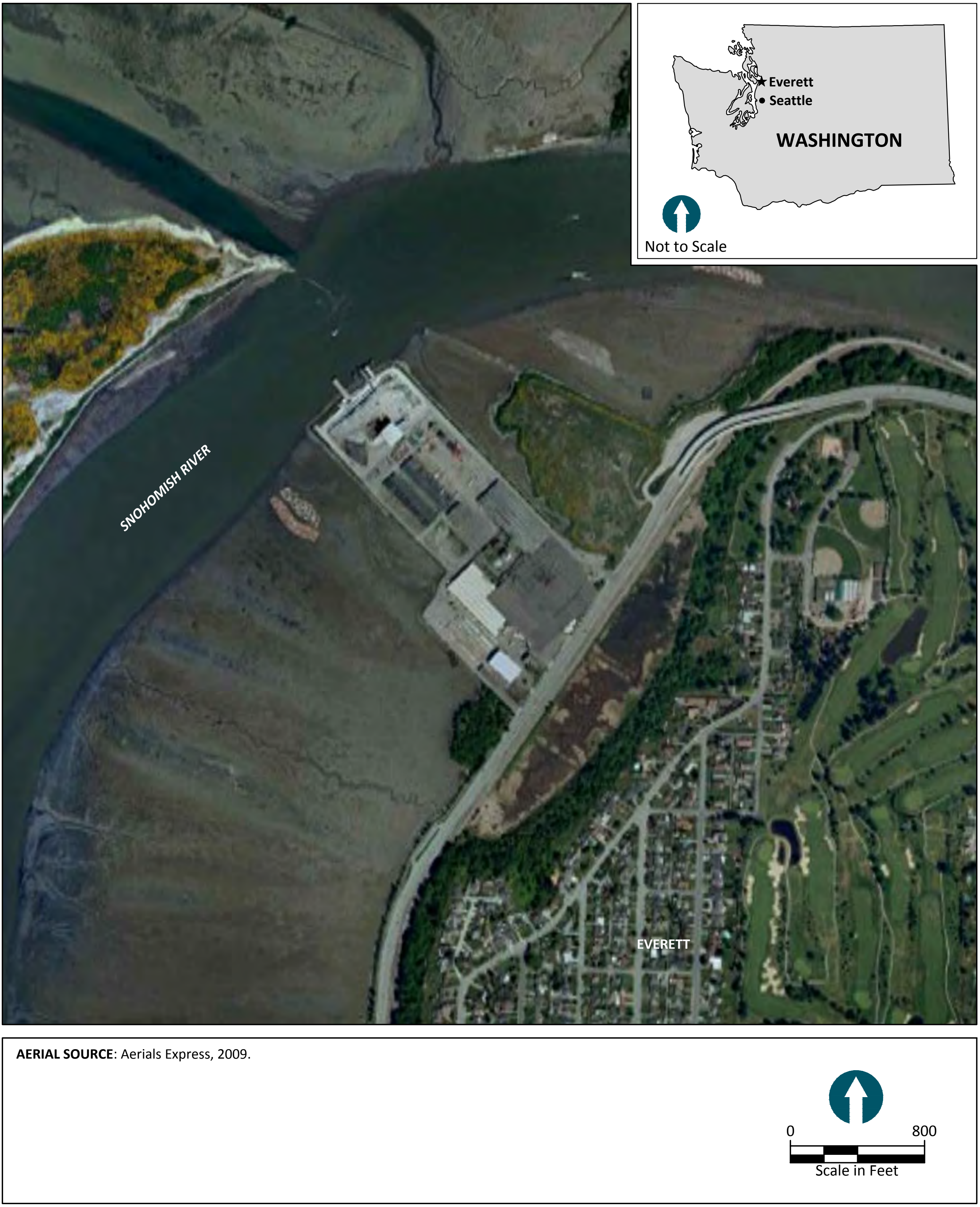
FIGURES



AERIAL SOURCE: Aerials Express, 2009.

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Figure 1
Vicinity Map
Attachment 1 - Sampling and Analysis Plan
Jeld-Wen Former Nord Door Site

ANCHOR
QEA

LEGEND:

JW015 ● Proposed Dioxin Sample Location

JW001 ● Proposed PCB Sample Location

JW009 ● Proposed Frozen Archive Sample Location

AERIAL SOURCE: Aerials Express, 2009.

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Figure 2

Proposed Marine Sediments Sampling Locations
Attachment 1 - Sampling and Analysis Plan
Jeld-Wen Former Nord Door Facility

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LEGEND:

FS52757-HA-327 ● Existing Sample Location

MS009 ● Proposed Sample Location - First Round of Analysis

MS009 ● Proposed Sample Location - Second Round of Analysis

MS009 ● Proposed Sample Location - Third Round of Analysis

AERIAL SOURCE: Aerials Express, 2009.

0 300
Scale in Feet

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Figure 3

Proposed Sampling Locations in Maulsby Marsh
Attachment 1 - Sampling and Analysis Plan
Jeld-Wen Former Nord Door Facility

ANCHOR QEA

APPENDIX 1
FIELD DATA COLLECTION FORMS

ANCHOR QEA

Surface Sediment Field Sample Record

Project Name: **Project No:** **Station ID:**

Sampling Crew: ______________________________

Sample Date: ____________________ Sampling Method: ____________________

Sampling Vessel: ____________________ ____________________

Subcontractor(s): ____________________ Weather: ____________________

Station Coordinates: N / Lat. ____________________ ____________________

E / Long. ____________________ ____________________

Datum: NAD 83 / WGS 84 zone:

Sample ID: ____________________

Analysis: Metals / TBT / SVOCs / VOCs / PCBs / Pest

TS / TVS / Grain Size / TOC / Ammonia / Sulfides

(Circle Appropriate Analyses)

Other: ____________________

Other: ____________________

Grab Number: _________ Water Depth:_________ft. Grab Recovery:__________cm Time: ____________

Tide Level:___________ft. Sample Interval:__________cm

Bioassay / Chemistry Depth MLLW: ________ft.

Sediment Type:	Sediment Color:	Density:	Sediment Odor:		Sheen:	Moisture:
cobble	D.O.	Very soft/Loose	none	H2S	none	Dry
gravel	gray	soft/loose	slight	Petroleum	trace	Damp
sand C M F	black	mod dense/stiff	moderate	other:	slight	Moist
silt clay	brown	dense/stiff	strong		moderate	Wet
organic matter	brown surface	very dense/stiff	overwhelming		heavy	

Comments:

Grab Number: _________ Water Depth:_________ft. Grab Recovery:__________cm Time: ____________

Tide Level:___________ft. Sample Interval:__________cm

Bioassay / Chemistry Depth MLLW: ________ft.

Sediment Type:	Sediment Color:	Density:	Sediment Odor:		Sheen:	Moisture:
cobble	D.O.	Very soft/Loose	none	H2S	none	Dry
gravel	gray	soft/loose	slight	Petroleum	trace	Damp
sand C M F	black	mod dense/stiff	moderate	other:	slight	Moist
silt clay	brown	dense/stiff	strong		moderate	Wet
organic matter	brown surface	very dense/stiff	overwhelming		heavy	

Comments:

Grab Number: _________ Water Depth:_________ft. Grab Recovery:__________cm Time: ____________

Tide Level:___________ft. Sample Interval:__________cm

Bioassay / Chemistry Depth MLLW: ________ft.

Sediment Type:	Sediment Color:	Density:	Sediment Odor:		Sheen:	Moisture:
cobble	D.O.	Very soft/Loose	none	H2S	none	Dry
gravel	gray	soft/loose	slight	Petroleum	trace	Damp
sand C M F	black	mod dense/stiff	moderate	other:	slight	Moist
silt clay	brown	dense/stiff	strong		moderate	Wet
organic matter	brown surface	very dense/stiff	overwhelming		heavy	

Comments:

Date/Time Lab Drop Off:

Recorded by:____

ANCHOR ENVIRONMENTAL, L.L.C.

Sediment Core Collection Log

Page __ of __

Job:
Job No:
Field Staff:
Contractor:
Vertical Datum:

Station ID:
Attempt No.
Date:
Logged By:
Horizontal Datum:

Field Collection Coordinates:

Lat/Northing:
Long/Easting:

A. Water Depth

DTM Depth Sounder:
DTM Lead Line:

B. Tide Measurements

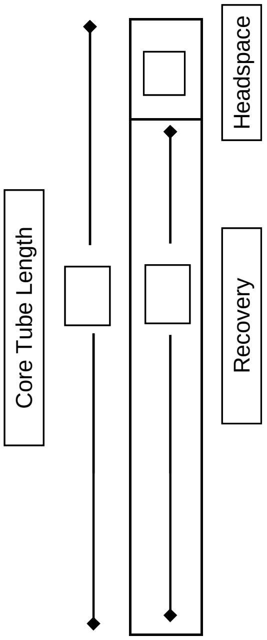
Time:
Height:

C. Mudline Elevation

(-A+B=C)

Core Collection Recovery Details:

Core Accepted: Yes / No
Core Tube Length:
Drive Penetration:
Headspace Measurement:
Recovery Measurement:
Recovery Percentage:
Total Length of Core To Process:



Drive Notes:

Core Field Observations and Description:	Sediment type, moisture, color, minor modifier, MAJOR modifier, other constituents, odor, sheen, layering, anoxic layer, debris, plant matter, shells, biota

Samples Collected (i.e. rinsate blank)

Visual Classification of Subsurface Core

Project:

Project No:

Station ID:

Core No.

Water Depth/Elevation of Core

Cored Length (feet; from log)

Core Recovery (feet)

Date

Core Pushed By

Core Logged By

Type of Core ☐ Shelby ☐ Piston Core ☐ Other

Diameter of Core (inches)

Core Quality ☐ Good ☐ Fair ☐ Poor ☐ Disturbed

Average % Recovery =

Sample Interval	Sample Analytes	Theoretical Depth in ( ) Actual Core Sections	Classification and Remarks (Color, Consistency, Moisture, Grain Size, Sheen, Odor)

Core logged by:

ATTACHMENT 2
HEALTH AND SAFETY PLAN

APPENDIX C

Health and Safety Plan
Continued Assessment Work
Former Nord Door Facility, Everett, Washington

1.0 REVIEW AND APPROVAL

This Health and Safety Plan (HASP) has been written for the use of SLR International Corp and its employees. It may also be used as a guidance document by properly trained and experienced SLR subcontractors. However, SLR does not guarantee the health or safety of any person entering this site. Questions regarding the applicability of this HASP to personnel other than SLR employees should be referred to Steve Locke at (503) 723-4423.

Due to the potential hazardous nature of this site and the activity occurring thereon, it is not possible to discover, evaluate, and provide protection for all possible hazards which may be encountered. Strict adherence to the health and safety guidelines set forth herein will reduce, but not eliminate, the potential for injury at this site. The health and safety guidelines in this HASP were prepared specifically for the former Nord Door facility in Everett, Washington and should not be used on any other site without prior research by trained health and safety specialists.

SLR claims no responsibility for the use of this HASP by others. The HASP was written for the specific site conditions, purposes, dates, and personnel specified and must be amended if these conditions or work scope change.

Client: _____ ____

Site Name: ____

Project Name: ____

Project Number: ____

Start Date: ____

Project Manager: ____

Signature: ____

Date: ____

Site Health and Safety Officer: ____

Signature: ____

Date: ____

2.0 HEALTH AND SAFETY PERSONNEL

2.1 Project Manager

The Project Manager (PM) for the former Nord Door facility continued assessment project is Scott Miller. The PM has the following responsibilities:

- Ensure the HASP is complete prior to beginning field work.
- Ensure that all equipment and supplies to perform the items in the HASP are available.
- Manage all contract requirements, including ensuring the availability of the health and safety resources.
- Coordinate all project activities with the client, subcontractors, and SLR staff.

2.2 Site Health and Safety Officer

The Site Health and Safety Officer (SHSO) for the former Nord Door continued assessment work is Chris Kramer. The SHSO has the following responsibilities:

- Ensure the HASP is completed and enforced on the first day of on-site work.
- Day to day on-site implement of the HASP. The SHSO has the authority to stop work or prohibit any personnel from working on the site at any time for not complying with any aspect of the Plan.
- Day to day communication with the PM and any other pertinent staff to ensure efficient coordination of health and safety activities with other planned field activities.

The SHSO should have the following training:

- 40-hour Health and Safety Training
- First Aid and CPR Training
- Supervisor Training
- Medical Surveillance

2.3 Site Personnel

Each person on the site has responsibility for their own health and safety, as well as assisting others in carrying out the items in the HASP. Any person observed to be in violation of the HASP should be assisted in complying with the requirements, or reported to the SHSO. Any site personnel may shut down field activities if there is a real or perceived immediate danger to life or health.

3.0 GENERAL SITE REQUIREMENTS AND BACKGROUND INFORMATION

3.1 Location, Operations, and Approximate Size of Site

Site Name and Address: Former Nord Door Facility
300 West Marine View Drive
Everett, Washington 98201

Current Site Owners: JELD-WEN, inc.

Current Site Operators: majority of the site is unused, CEMEX leases a portion

Approximate Size of Site: Approximately 47.63 acres

The Site is located on the east bank of the Snohomish River and the confluence with Port Gardner Bay. A Site Location Map has been included as Figure 1 and a Site Plan has been included as Figure 2 (Attachment 1). The site is located in the Section 7, Township 29N, Range 5E of the Willamette Meridian. The site is located in Everett Washington in Snohomish County. The site is relatively flat with the maximum elevation at approximately 15 feet above mean sea level.

3.2 Schedule of Planned Activities

It is anticipated that the schedule for the proposed field activities will follow the project schedule presented in Section 2.2 of the main Work Plan (RI/FS and Draft CAP Schedule) and that field work will start around June 2011. All activities will be performed during daylight hours.

3.3 Description of Planned Field Work

SLR will be conducting additional environmental assessment at the former Nord Door facility. The field activities to be performed by SLR will include the following:

- Installation of Geoprobe borings
- Groundwater monitoring and sampling
- Hand-auger sampling for collection of groundwater samples in Maulsby Marsh (adjacent to Site)
- Sediment sampling from a vessel
- Sediment sampling using waders or an inflatable vessel in Maulsby Marsh

3.5 Geoprobe and Hand Auger Sampling

Geoprobe (direct push) sampling, hand-auger, and surface soil sampling will be performed as a part of the environmental assessment activities. An estimated 5 Geoprobe borings will be completed using a truck-mounted Geoprobe rig; ranging in depth from approximately 5 to 15 feet. An estimated 5 hand auger samples will be completed to a depth of approximately 5 feet.

3.6 Groundwater Sampling

Groundwater samples will be collected from Geoprobe borings or groundwater monitoring wells using a 12-volt direct current powered peristaltic pump and disposable tubing. Groundwater samples will be transferred from the peristaltic pump tubing directly into the laboratory provided sample containers.

3.7 Sediment Sampling from Vessel

Sediment samples will be collected from approximately 24 locations using a vessel operated under the direction of a qualified operator. The vessel will be equipped with a frame, winch, and sediment sampling tools. Personnel on the vessel will be required to wear a certified personal flotation device (life jacket).

3.6 Sediment Sampling Using Waders or an Inflatable Vessel

Approximately 18 sediment samples will be collected using an Ekman type grab sampler, using a hand operated coring device if sediments are covered by water and the sample grab is hindered by heavy surface vegetation, or by hand if sediments are exposed. Personnel will be equipped with a certified flotation device (i.e. life jacket) and chest waders or rubber boots, or an inflatable vessel, dependent on water level at time of sampling.

3.6 Landfills and Other Areas of Potential Explosive Gas or Vapor

The site is not located in an area containing a current or former landfill, and the geology of the area is not known or suspected to contain pockets of explosive gases or vapors.

3.7 Hazardous Material Useage

No hazardous materials will be used at the site during field activities.

3.8 Waste Generation

SLR anticipates both solid and liquid waste generation as a part of the field work at the site. All investigation derived waste materials will be placed into 55-gallon steel drums, labeled and left on-site pending laboratory analysis. The waste will be characterized and properly disposed of off-site in accordance with State and Federal regulations.

4.0 SITE HEALTH AND SAFETY HAZARDS

Site health and safety hazards include known or potential chemical contaminants and physical hazards that may occur during field activities. Overall, the health and safety hazards of the anticipated activities at the site have a rating of low. The greatest potential hazards are expected to be from heavy equipment and field conditions (slips, trips, and falls).

4.1 Chemical Hazards

Based on the past site activities and facility processes and environmental sampling, the following have been designated as the primary chemical contaminants of human health concern.

- Pentachlorophenol (PCP) and creosote that may include polynuclear aromatic hydrocarbons (PAHs).
- Fuel oil, heating oil, hydraulic oils, and lubricants assessed using TPH-Dx laboratory analysis.
- Acetone, benzene, toluene and other volatile organic compounds (VOC).
- Metals including arsenic, chromium, lead, and mercury
- Dioxins and Furans
- Polychlorinated biphenyls (PCBs)

The following tables summarize the potential hazards from the above listed primary chemical contaminants of human health concern.

Contaminant of Concern:	Pentachlorophenol (PCP) and creosote
Soil Concentration:	Unknown
Groundwater Concentration:	Unknown
PEL:	0.5 mg/m3 8-hour TWA
TLV:	0.5 mg/m3 8-hour TWA
IDLH:	2.5 mg/m3 (PCP)
Warning Properties:	None
Routes of Exposure:	Ingestion and contact
Acute Health Effects:	Skin, eyes, nose, and/or throat irritation, respiratory distress, vomiting, and chest pain.
Chronic Health Effects:	Damage to eyes, nose, throat, skin, respiratory system, kidneys, and central nervous system.

Contaminant of Concern:	TPH-G (Total Petroleum Hydrocarbons – Gasoline Range)
Soil Concentration:	Unknown
Groundwater Concentration:	Unknown
PEL:	0.2 ppm 8-hour TWA
TLV:	0.2 ppm 8-hour TWA

IDLH:	N.D. (not determined)
Warning Properties:	Characteristic gasoline odor
Routes of Exposure:	Inhalation, dermal contact, ingestion
Acute Health Effects:	Eye, skin, and mucus membrane irritation; blurred vision, dizziness, confusion and slurred speech.
Chronic Health Effects:	Kidney and liver damage, central nervous system damage, and benzene can cause blood changes including leukemia and anemia.

Contaminant of Concern:	TPH-Dx (Total Petroleum Hydrocarbons – Diesel Range)
Soil Concentration:	4,160 mg/kg (as Heavy Oil)
Groundwater Concentration:	Non Detect
PEL:	25 ppm 8-hour TWA
TLV:	100 mg/m3 8-hour TWA
IDLH:	Not Applicable
Warning Properties:	Diesel odor
Routes of Exposure:	Inhalation, dermal contact, ingestion
Acute Health Effects:	Coughing, dizziness, nausea, skin and eye irritation, diarrhea, vomiting, abdominal discomfort
Chronic Health Effects:	Dermatitis, benzene can cause blood changes including leukemia and anemia

Contaminant of Concern:	Acetone
Soil Concentration:	Unknown
Groundwater Concentration:	Unknown
PEL:	1,000 ppm 8-hour TWA
TLV:	250 ppm 8-hour TWA
IDLH:	2,500 ppm (10% LEL)
Warning Properties:	Fragrant, mint-like odor
Routes of Exposure:	Inhalation, dermal contact, ingestion
Acute Health Effects:	Eye, nose, and throat irritation; dizziness, confusion and central nervous system depression.
Chronic Health Effects:	Damage to eyes, skin, repository system; central nervous system damage.

Contaminant of Concern:	Benzene
Soil Concentration:	Unknown
Groundwater Concentration:	Unknown
PEL:	TWA 1 ppm (3.19 mg/m^3)
TLV:	1 ppm as TWA, C4
IDLH:	500 ppm
Warning Properties:	Colorless to light-yellow liquid with an aromatic odor

Routes of Exposure:	Inhalation, skin absorption, ingestion, skin and/or eye contact
Acute Health Effects:	Possible effects on central nervous system, eyes, skin, dizziness, headache
Chronic Health Effects:	Possible effects on bone marrow depression, anorexia, and respiratory system (potential occupational carcinogen). Repeated or prolonged contact with skin may cause dermatitis.

Contaminant of Concern:	Toluene
Soil Concentration:	Unknown
Groundwater Concentration:	Unknown
PEL:	100 ppm 8-hour TWA
TLV:	500 ppm (10-minute maximum peak)
IDLH:	500 ppm (10% LEL)
Warning Properties:	Sweet, pungent benzene-like odor
Routes of Exposure:	Inhalation, dermal contact, ingestion
Acute Health Effects:	Eye and nose irritation; weakness, dilated pupils, discharge of tears, dizziness, and confusion.
Chronic Health Effects:	Damage to eyes, skin, repository system, and kidneys; central nervous system damage.

Contaminant of Concern:	Arsenic
Soil Concentration:	5.01 mg/kg
Groundwater Concentration:	0.0129 mg/L
PEL:	0.01 mg/m3 8-hour TWA
TLV:	0.01 mg/m3 8-hour TWA
IDLH:	100 mg/m3
Warning Properties:	None
Routes of Exposure:	Inhalation, ingestion, and contact
Acute Health Effects:	Skin irritation, respiratory distress, diarrhea, kidney damage, muscle tremor and seizure
Chronic Health Effects:	Damage to skin, respiratory system, kidneys, central nervous system, gastrointestinal tract, and reproductive system

Contaminant of Concern:	Chromium
Soil Concentration:	3,970 mg/kg
Groundwater Concentration:	1.81 mg/L
PEL:	0.5 mg/m3 8-hour TWA
TLV:	0.5 mg/m3 8-hour TWA
IDLH:	250 mg/m3
Warning Properties:	None
Routes of Exposure:	Inhalation, ingestion, and contact
Acute Health Effects:	Skin and eye irritation
Chronic Health Effects:	Dermatitis, liver, kidney, and respiratory cancer

Contaminant of Concern:	Lead
Soil Concentration:	251 mg/kg
Groundwater Concentration:	1.02 mg/L
PEL:	0.05 mg/m3 8-hour TWA
TLV:	0.05 mg/m3 8-hour TWA
IDLH:	100 mg/m3
Warning Properties:	None
Routes of Exposure:	Inhalation and ingestion
Acute Health Effects:	Weakness, excessive tiredness, irritability, constipation, anorexia, abdominal discomfort, fine tremors, and wrist drop
Chronic Health Effects:	Damage to kidneys and nervous system, anemia, high blood pressure, impotence, infertility, and reduced sex drive can also occur with overexposure to lead

Contaminant of Concern:	Mercury
Soil Concentration:	Unknown
Groundwater Concentration:	Unknown
PEL:	0.1 mg/m3 8-hour TWA (as vapor)
TLV:	0.05 mg/m3 8-hour TWA (as vapor)
IDLH:	10 mg/m3 (as vapor)
Warning Properties:	Silver-white, heavy, odorless liquid
Routes of Exposure:	Ingestion, inhalation (as vapor) and dermal contact
Acute Health Effects:	Irritation to eyes and skin; cough, chest pain, difficulty breathing, tremors, headache, and indecision
Chronic Health Effects:	Damage to eyes, skin, respiratory system, central nervous, and kidneys.

Contaminant of Concern:	PCBs (as Arochor 1242)
Soil Concentration:	Unknown
Groundwater Concentration:	Unknown
PEL:	1 mg/m3 8-hour TWA (skin)
TLV:	1 mg/m3 8-hour TWA (skin)
IDLH:	5 mg/m3 (as vapor)
Warning Properties:	None
Routes of Exposure:	Ingestion, inhalation , eye contact and dermal contact
Acute Health Effects:	Irritation to eyes and skin
Chronic Health Effects:	Damage to eyes, skin, reproductive system, liver.

Contaminant of Concern:	Dioxin/furans (expressed as 2,3,7,8-tetrachlorodibenzo-p-dioxin)
PEL:	None

TLV:	--
IDLH:	Not determined
Warning Properties:	None
Routes of Exposure:	Inhalation, skin absorption, ingestion, skin and/or eye contact
Acute Health Effects:	Irritation to eyes, in animals: liver and kidney damage; hemorrhage;
Chronic Health Effects:	Allergic dermatitis, chloracne, porphyria, gastrointestinal disturbance, teratogenic effects, damage to liver, kidneys and reproductive system, potential occupational carcinogen

PAHs are a group of chemicals that are formed during the incomplete combustion of coal, oil, and gas. Most PAHs do not dissolve easily. Typically, PAHs tend to attach to particulates in water or absorb to soil. Naphthalene is the most common PAH and benzo(a)pyrene is the most studied PAH and is ranked as an A2 suspected human carcinogen. The following table summarizes the potential hazards of PAHs:

Contaminant of Concern:	Naphthalene and benzo(a)pyrene (assumed for all PAHs)
Soil Concentration:	6,100 µg/mg (dibenzo(a,h)anthracene)
Groundwater Concentration:	1.13 µg/L (naphthalene)
PEL:	50 mg/m3 8-hour TWA (naphthalene)
TLV:	50 mg/m3 8-hour TWA (naphthalene)
IDLH:	500 ppm (naphthalene)
Warning Properties:	None
Routes of Exposure:	Inhalation, incidental ingestion, and dermal contact (PAHs have low volatilization potentials, therefore inhalation usually occurs through intake of PAHs absorbed to particulates)
Acute Health Effects:	Skin, respiratory and eye irritant, change color and properties of skin
Chronic Health Effects:	Bladder, skin and lung cancer, and reproductive damage

4.2 Physical Hazards

The following table summarizes the potential physical hazards that could occur during field work at the site:

Physical Hazard	Yes	No
Overhead/underground hazards		
● Overhead	X	
● Underground	X	
Equipment hazards		

Physical Hazard	Yes	No
● Drilling	X	
● Excavation		X
● Machinery	X	
Heat exposure		X
Cold exposure		X
Oxygen deficiency		X
Confined space *		X
Noise	X	
Ionizing radiation		X
Non-ionizing radiation		X
Fire/Explosion		X
Biological	X	
Safety		
● Holes/ditches	X	
● Steep grades	X	
● Slippery surfaces	X	
● Uneven terrain	X	
● Water hazard (sediment sampling)	X	
● Unstable surfaces	X	
● Elevated work surfaces		X
Shoring/Scaffolding		X

* SLR personnel are forbidden from entering any confined space, including excavation pits.

4.3 Task Specific Hazards

The following table summarizes the potentially hazards from each specific tasks:

Task	Hazard Rating	Identified/Anticipated Hazards
Geoprobe (direct-push) borings	Low	Heavy equipment, noise, weather stress, underground utility lines, aboveground utility lines, chemical exposure and slip-trip-fall safety
Hand-Augering and sediment sampling in Maulsby Marsh	Low	Fatigue, noise, water hazard, trains and tracks, biological

Task	Hazard Rating	Identified/Anticipated Hazards
		(snakes etc), chemical exposure, slip-trip-fall safety
Sediment sampling	Low	Water hazard, fatigue, biological (snakes etc), slip-trip-fall safety
Groundwater sampling	Low	Chemical hazards, weather stress, safety, possible truck traffic

4.4 Utilities

Before drilling and excavating at the site, it is necessary to contact the area utility locator to determine the location of all utilities lines at the site. A Utility Clearance Log (included as Attachment 2) will be completed prior to beginning any subsurface work. The following precautions will be followed to prevent injuries do to utilities:

- All located utility lines at the site will be noted and emphasized on the boring logs, location plans, and boring assignment plans.
- All electrical wires at the site will be considered live and dangerous. If any questions concerning the safety of excavating or drilling in the vicinity of a power line, the power company will be contacted.
- At least twenty feet of clearance will be maintained from overhead power lines, or ten feet if the lines are padded.

5.0 SITE HEALTH AND SAFETY PROCEDURES

5.1 Daily Site Safety Meetings

Site safety meetings will be held daily before initiating any field activity. The safety meetings will be mediated by the SHSO. Site safety meetings will also be held at any other time, as necessary, to ensure the safety and health of the employee on-site. A Daily Safety Meeting Log has been included as Attachment 3.

Prior to beginning any work at the site, each worker will be given an informal training on how the project will progress. The SHSO will inform the workers of the following information:

- Proposed work activities for the day and the potential hazards
- Provisions of this Plan
- Dry runs of the emergency procedures, including location of the medical facility
- Dry runs of the decontamination procedures, if applicable
- Chemical exposures expected at the site
- Site lay-out and zone delineation
- Warning signals and evacuation procedures

5.2 Site Security

The SHSO is responsible for preventing unauthorized entry into the work area and for knowing who is on-site at all times. Access to the work site will be controlled in the following manner:

- Cones, barricades, and/or caution tape will be used to delineate work area.

5.3 Work Limitations and Restrictions

The following work limitation and restrictions will be employed by the SHSO:

- No eating, drinking, or smoking on-site.
- No contact lenses on-site. Workers requiring vision correction must wear glasses in environments with chemicals.
- No facial hair that would interfere with respirator fit.
- The SHSO will monitor weather broadcasts before the start of outdoor work each day, and more frequently as necessary. No work will be done outdoors in inclement weather (snow, sleet, etc.) without authorization from the SHSO.

5.4 Decontamination Procedures

The following decontamination procedures will be followed:

- Personnel: Personnel will wash with soap and water before leaving the site.
- Field Equipment: Field equipment will be decontaminated prior to and after use by following these procedures:
    1. Wash equipment with detergent.
    2. Rinse with tap water.
    3. Triple rinse with purified water.
    4. Air dry.
    5. Wrap in clean polyethylene plastic, when necessary.
- Heavy Equipment: Heavy equipment will be steam cleaned or boom-cleaned, if necessary.

5.5 General Health and Safety Procedures

The following general health and safety procedures will be followed at the site:

- The Utility Clearance Log will be completed prior to beginning any subsurface work.
- Determine wind direction and try to remain upwind when collecting samples.
- Daily safety meetings will be held by the SHSO.
- Potable water must always be available at the work site.
- If toilet facilities are not located within a 5-minute walk from the decontamination facilities, either provide a chemical toilet and hand washing facilities or have a vehicle available (not the emergency vehicle) for transport to nearby facilities.
- Provide dust control by spraying soils with water or a surfactant/water solution.
- Use ground fault circuit interrupters for plug-in electrical devices and extension cords (3-pin plugs only).
- Be aware of tripping hazards with extension cords, tools, hoses, augers, etc.
- If an on-site command post is necessary, ensure that it is located upwind from sources, give prevailing winds, and locate/identify on Site Map.
- On-site personnel must be able to call off site via a telephone within 150 feet of work.
- Designate at least one vehicle for emergency use.

5.6 Perimeter Identification

The perimeters of the different field activities are included on Figure 2, Site Plan (Attachment 1). There are four classifications of “zones” or “boundaries” that could be required at a job site:

1. **Exclusion Zone**: Required when workers within that zone must wear personal protective equipment (PPE).
2. **Contamination Reduction Zone**: Required when decontamination of people and equipment leaving the Exclusion Zone is required.
3. **Support Zone**: The location where administrative and other support activities are conducted.
4. **Work Area Boundary**: Excludes non-workers from entering a potentially hazardous environment.

All tasks that are being proposed at the site are classified as Work Area Boundaries.

5.7 Personnel Protective Equipment

Personnel protective equipment (PPE) is designed to protect the body against contact with known or anticipated toxic chemicals. PPE has been designated into four different levels:

1. **Level A:** Self-contained breathing apparatus (SCBA), totally encapsulating suit, two-way radio communications.
2. **Level B:** SCBA or supplied-air respirator with an escape bottle, chemically resistant PPE, two-way radio communications.
3. **Level C:** Full- or half-face air respirator (with safety goggles), chemically resistant PPE.
4. **Level D:** No respiratory protection. Safety glasses, hard hat, steel-toe boots, long-sleeved shirt and pants. Hearing protection, gloves, and other PPE as required.

The former Nord Door facility is classified as a Level D PPE site. There is little to no risk of workers being in contact with contaminants. Level D PPE includes:

- Hard Hat (ANSI Z89.1 approved)
- Steel Toed and Shank Boots (ANSI Z41.1 approved)
- Safety Glasses (ANSI Z87.1 approved)
- Gloves
- Close Fitting Clothing
- Hearing Protection (optional)

Environmental and personnel monitoring will be conducted to evaluate the level of contamination to which site personnel or the surrounding environment are being exposed. The results of the monitoring will form the basis by which the SHSO will determine the level of PPE required for a particular operation. A photo ionization detector (PID) will be used to monitor the presence of organic vapors or gases. The PID will be used during borings and test pit excavations according to the following guide:

- 0 to 20 units (ppmv) above background – Continue work
- 20 to 50 units above background – Investigate cause and continue work if PPE adequate
- Over 50 units above background – Stop work and investigate; use ventilation to reduce levels

5.8 Safety Equipment

The following safety equipment and supplies will be available at the site at all times during field work:

- Reflective vests to be available to wear around moving vehicles, if any
- At least one 20-pound ABC-type fire extinguisher
- First Aid Kit
- Emergency eyewash
- Hearing protection in the form of disposable ear plugs to be worn around heavy equipment, machinery, or when two individuals five feet or less apart need to shout to be heard
- Soap gel or disposable wipes
- Disposable towels
- Plastic sheeting
- Cleaning brushes and tubs
- Life vest / flotation equipment (sediment sampling)

6.0 CONTIGENCY PLAN

In the unlikely event of a fire or explosion, or uncontrolled release of a contaminant, prompt action to limit the extent of the impact will be required. The SHSO shall evaluate all emergency situations and inform personnel by use of a signal horn, visual, or verbal contact, as appropriate. All personnel must know ahead of time what their duties would be in the event of an emergency.

6.1 Injury or Illness

If an injury of illness occurs at the job site, take the following action:

- Get first aid for the person immediately. Call 911 if needed.
- Notify the SHSO. The SHSO is responsible for preparing and submitting the Incident Report within 24 hours.
- The SHSO will assume charge during an emergency situation.

The location of the nearest hospital, with driving instruction, has been included as Attachment 4 to this plan. The hospital is located at:

Providence Everett Medical Center
900 Pacific Avenue
Everett, Washington 98021
(425) 261-2000

6.2 Emergency Telephone Numbers

Project Personnel

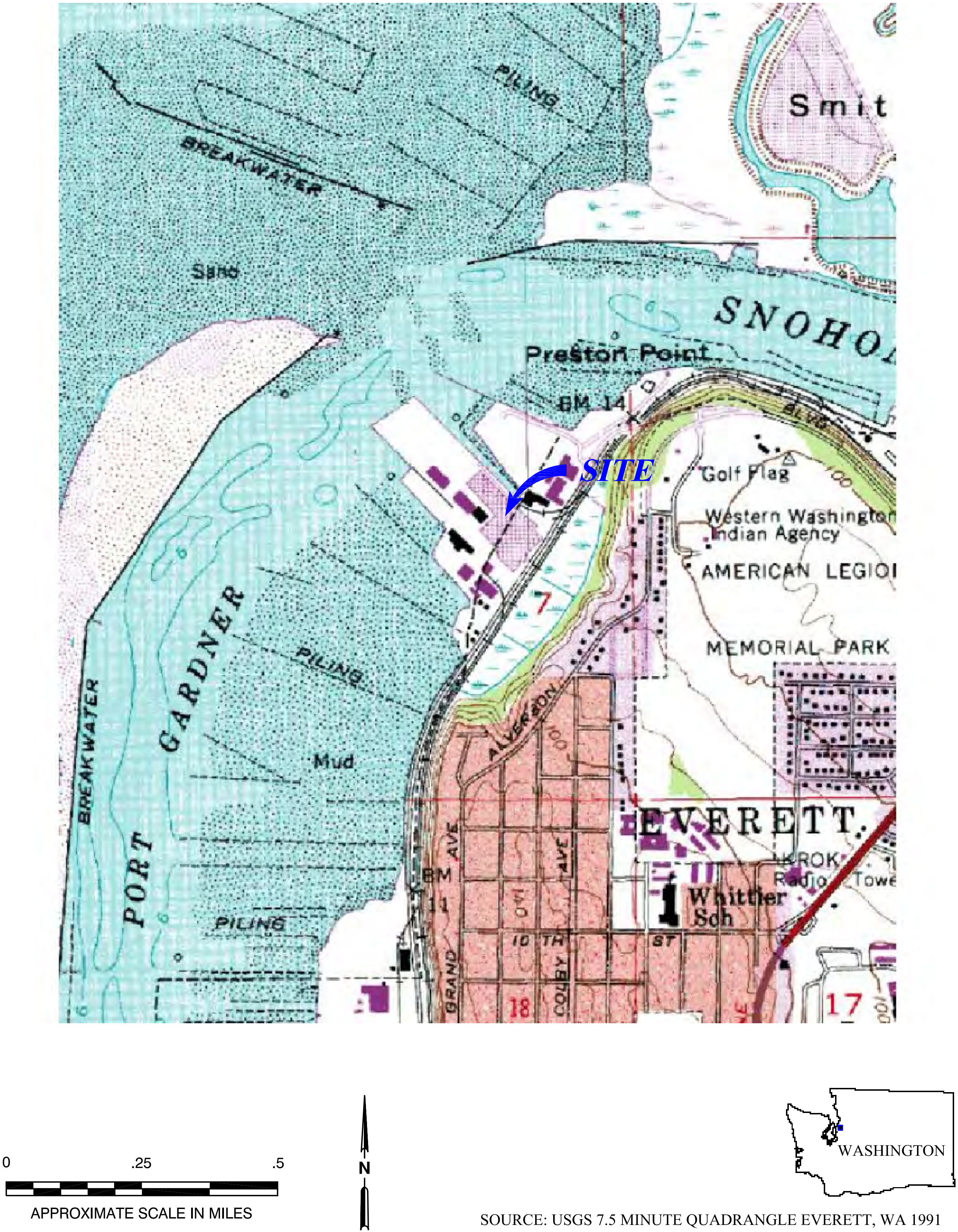
Name	Title	Cell Phone	Work Phone
Scott Miller	SLR Project Manager	(503) 572-1124	(503) 723-4423
Chris Kramer	SLR SHSO	(503) 341-2187	(503) 723-4423

Governmental Agency Contacts

Agency	Phone Number
Office of Emergency Services	(800) 852-7550
National Response Center	(800) 424-8802
One Call (Utility Locate)	(800) 424-5555
APS (Private Locater)	(425) 888-2590

Attachment 1

Figures



SOURCE: USGS 7.5 MINUTE QUADRANGLE EVERETT, WA 1991

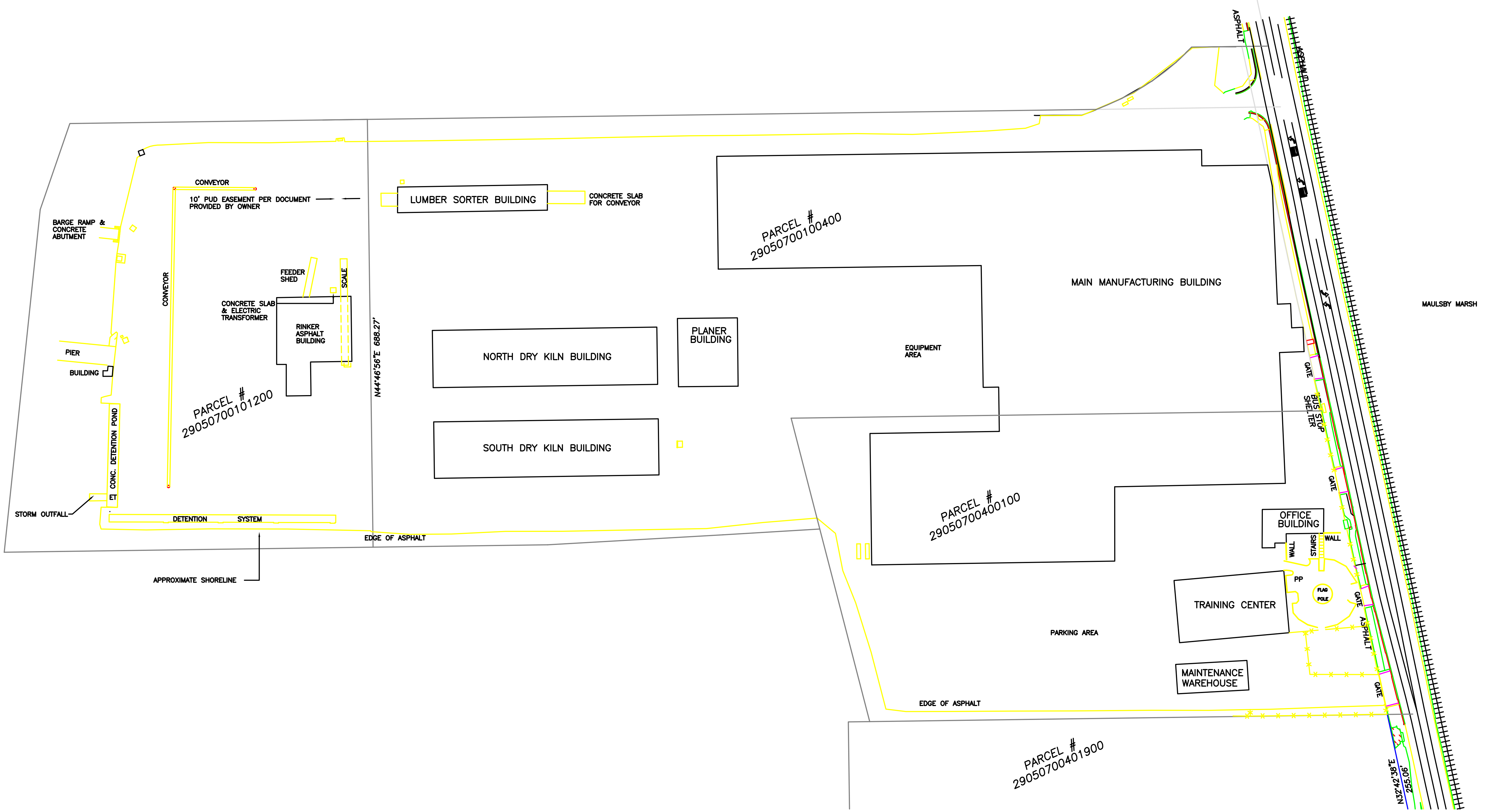
SLR International Corp

1800 Blankenship Road
Suite 440
West Linn, OR 97068

T: 503-723-4423
F: 503-723-4436

DATE 09/07
DWN. EMG
APPR.
REVIS.
PROJECT NO.
008.0228.00026

FIGURE 1
JELD-WEN NORD DOOR
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON
SITE LOCATION MAP



NOTES:
THE BUILDINGS, SURFACE UTILITIES, EDGE OF PAVEMENT, AND APPROXIMATE SHORELINE SHOWN ON THIS MAP ARE BASED ON A 2006 SURVEY PERFORMED BY WH PACIFIC.

SLR International Corp

1800 Blankenship Road
Suite 440
West Linn, OR 97068

T: 503-723-4423
F: 503-723-4436

DATE 07/07
DWN. EMG
APPR. ______
REVIS. ______
PROJECT NO.
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FIGURE 2
JELD-WEN NORD DOOR
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON
SITE PLAN

Attachment 2

Utility Clearance Log

ATTACHMENT 2

PRE-DRILLING/EXCAVATION CHECKLIST AND UTILITY CLEARANCE LOG

PROJECT:		DATE:	
LOCATION:		UTILITY LOCATOR PHONE:	
UTILITY LOCATOR:		LOCATOR CALL REFERENCE:	
DATE OF LOCATOR REQUEST:		SLR FIELD TECHNICIAN:	

Instructions: This checklist is to be completed by SLR personnel prior to initiation of filed activites as a safety measure to insure that underground structures and aboveground power lines are clearly marked in the area selected for boring or excavation. **Drilling or excavation work may not proceed until One Call has been contacted and this checklist has been completed. If any of the questions answered below are answered "no," then the project manager must be contacted and concerns/issues discussed.** "No" answers should be documented on the back of the form.

Type of Utilities and Structures	Not Present	Present	Marking (Flags, Paint, Stakes)

YES	NO	PRE-MOBILIZATION
		Is a scaled site plan, map, or drawing showing the proposed borehole locations attached?
		Does each location allow for clear entry and exit, adequate workspace, and a clear path for raising and lowering all equipment? 20 feet minimum clearance must be maintained between raised equipment and electrical lines.
		Are all of the locations and associated areas of pavement cutting at least 3 feet from any subsurface or aboveground utilities shown on client's building plans?
		Are all of the locations and associated areas of pavement cutting at least 3 feet from any subsurface or aboveground utilities shown on public right-of-way street improvement or other public property plan or site map?
		Has the Site Representative indicated no knowledge of any subsurface or aboveground utilities within 3 feet of the proposed locations? Is the Site Representative qualified to make such a determination?
		Are all of the proposed locations and associated areas of pavement cutting at least 3 feet from any subsurface utilities identified during a geophysical survey?
		Have all Utility Locating Service providers notified by the public line locator marked out their facilities in the vicinity of the locations or otherwise notified SLR that they do not have any facilities near the proposed locations?
		Are all proposed locations and associated areas of pavement cutting at least 3 feet from a visual line connecting two similar looking manhole covers?
		Are all proposed locations and associated areas of pavement cutting at least 3 feet from a visual line perpendicular to the street from the water, gas, and electrical meters?
		Are all proposed locations and associated areas of pavement cutting clear of pavement joints, curbs, crash posts, or other engineered structures?
		Does the pavement lack signs of previous excavation (e.g. no pavement subsidence, difference in pavement texture or relief, or pavement patching)? If there are signs, determine the purpose of the previous excavation.
		Before drilling, has an exploratory hole been dug to 5 feet below grade with a hole diameter greater than the outer diameter of the drilling auger?
		Does the soil encountered in the hand-dug hole appear to be native material (i.e. free of gravel, clean sand, aggregate base, or other non-native looking material)?
		Have all expected utilities been identified and all missing utilities explained?

Have any concerns noted above been discussed with the SLR Project Manager?	Yes	No
Have any concerns noted above been discussed with the client?	Yes	No

Approval to proceed:	Client Rep Name:	Title and Date:
Approval to proceed:	SLR Rep Name:	Title and Date:

Attachment 3

Daily Safety Meeting Log

ATTACHMENT 3

DAILY SAFETY MEETING LOG

PROJECT:		DATE:	
LOCATION:		START TIME:	

ISSUES DISCUSSED:	
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

ATTENDEES:

	PRINTED NAME	COMPANY	SIGNATURE
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			

MEETING CONDUCTION BY:	SIGNATURE:
SITE HEALTH AND SAFETY OFFICER:	SIGNATURE:

Attachment 4

Location of Hospital and Driving Instructions

MAPQUEST

Start:
300 W Marine View Dr
Everett, WA 98201-1030, US

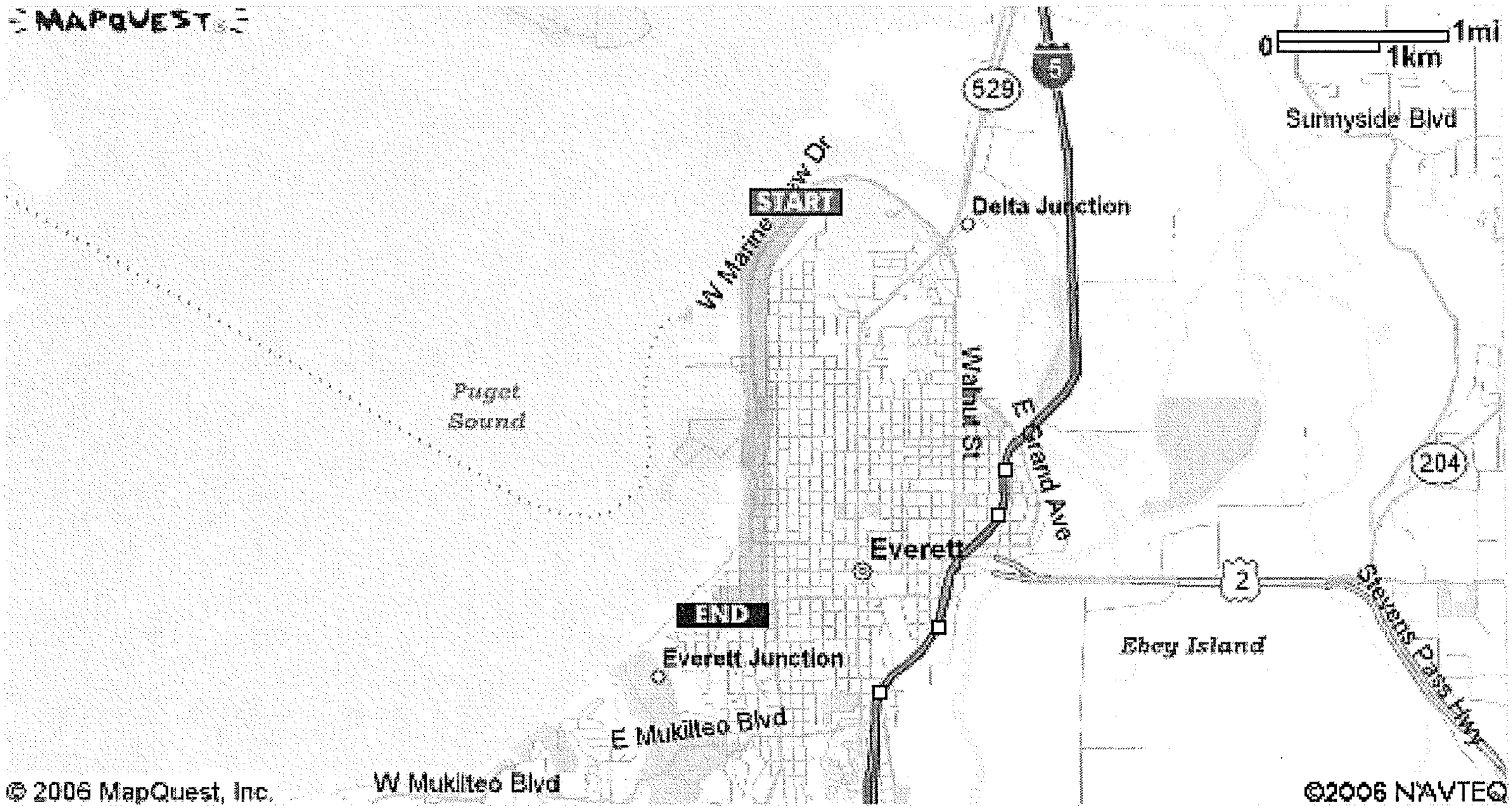
End:
900 Pacific Ave
Everett, WA 98201-4168, US

Notes:

Directions
Total Est. Time: 6 minutes **Total Est. Distance:** 2.89 miles

		Distance
START	**1:** Start out going SOUTH on W MARINE VIEW DR / WA-529 toward 10TH ST. Continue to follow W MARINE VIEW DR.	2.7 miles
→	**2:** Turn RIGHT onto PACIFIC AVE.	0.1 miles
END	**3:** End at **900 Pacific Ave** Everett, WA 98201-4168, US	

Total Est. Time: 6 minutes**Total Est. Distance:** 2.89 miles



Start:

300 W Marine View Dr
rett, WA 98201-1030, US

End:

900 Pacific Ave
Everett, WA 98201-4168, US